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WORKING GROUPS SESSION

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Phytotechny, Grass and Fodder Plants Cultivation, Vegetable Cultivation, Fruit Tree Cultivation, Grape Vine Cultivation and Wine Technology, Urban Landscape Architecture and the Arrangement of the Green Urban Spaces, Animal Growing Technology

WORKING GROUP 2: SOIL SCIENCES

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WORKING GROUP 1: PLANT CULTIVATION AND ANIMAL GROWING TECHNOLOGIES

Phytotechny, Grass and Fodder Plants Cultivation, Vegetable Cultivation, Fruit Tree Cultivation, Grape Vine Cultivation and Wine Technology, Urban Landscape Architecture and the Arrangement of the Green Urban Spaces, Animal Growing Technology

SELECȚIA ANIMALELOR ASISTATĂ DE MARKERI MOLECULARI
ANIMAL MOLECULAR MARKER ASSISTED SELECTION

BĂCILĂ VASILE, VLADU MARIUS, BĂCILĂ ANNAMARIA

Cuvinte cheie: biodiversitate, markeri moleculari, selecția animalelor
Keywords: biodiversity, molecular markers, animal selection

REZUMAT

Biologia moleculară pune la dispoziția omenirii posibilitatea conservării biodiversității prin selecția şi ameliorarea genetică a populațiilor de animale. Prin folosirea markerilor moleculari se poate estima, încă de la naşterea animalului, indiferent de sexul acestuia, potențialul productiv şi reproductiv, care vor influența eficiența economică a creşterii şi exploatării.
Selecția asistată de markeri moleculari prezintă numeroase avantaje: nu este limitată de sex, poate fi aplicată foarte timpuriu, mai ales pentru însuşirile care se măsoară pe carcasă determinând reducerea intervalului de generație, creşte presiunea de selecție, este mai eficientă economic, măreşte precizia selecției prin surse suplimentare de informație.
Markerii moleculari sunt corelați cu anumite însuşiri utile economic şi folosirea lor poate permite prognoza timpurie asupra valorii genetice a indivizilor şi luarea unor decizii timpurii în selecția animalelor.

ABSTRACT

Molecular biology offers to mankind the preservation of biodiversity through selection and genetic improvement of animal populations. Using molecular markers can be estimated, since the birth of the animal, regardless of its sex, the productive and reproductive potential, which will influence the economic efficiency of rearing and exploitation.
Molecular marker assisted selection has several advantages: it is not limited to sex, can be applied very early, especially for traits that are measured on the carcass leading to a reduced generation interval, increases the selection pressure, is more efficient economically, increases the accuracy of selection through additional sources of information.
Molecular markers are correlated with certain economically useful traits and their use may allow early prediction of genetic value of individuals and early decision in animal selection.

Selection based on the results from ascendants, descendants, collaterals or even their performance has long time been the only method to improve the productive potential of zooeconomic important animals. After 1990, how the selection and breeding of animals was made has changed, quantitative genetics based on phenotypic expression of characters receiving valuable assistance from molecular genetics.

The rapid development of genetic engineering has made possible the artificial manipulation of genetic information of living organisms, opening the way for the appearance of modern biotechnology, with a big impact on the improvement of plant and animal species.

In order to use the results of molecular biology were completed two stages. In the first phase some molecular markers associated with quantitative trait locus (QTL) were identified, and in the second phase molecular markers were used in animal selection.

Thus, molecular biology has provided for researchers an additional tool - genetic markers that can be used to increase the accuracy of selection in order to improve domestic animal populations, thereby increasing the genetic progress especially in the characters of economic interest. Research conducted at molecular level are focused on identifying genes that determine the value of quantitative characters and detection of loci of interest, such as useful markers for selection and breeding programs. The molecular marker technology has an increasingly important role in the selection and improvement of farm animals species for characters of economic interest.

Genetic markers can be divided into two groups: gene markers and molecular markers.

Gene markers are represented by genes that determine the polymorphic biochemical systems such as blood groups, serum proteins, hemoglobin, egg proteins, milk proteins and the genes that controls eye color, skin color, hair color, etc.

Molecular markers are based on DNA polymorphism and they are represented by fragments of DNA or by repeated sequences. The inclusion in the selection criteria of the information from genetic markers is called Marker Assisted Selection (MAS).

The combination of a polygenic determined character and a few major genes form a group of genes that normally segregates together, group known as QTL (Quantitative Trait Locus).

The use of genetic markers has made possible:

- animal identification with greater certainty in the sense that if it is considered more genetic markers such as genes that determine blood groups, then there is no practical possibility to meet two biological entities with the same types of genetic markers;
- establishing paternity with high certainty;
- determining the type of twins, used for recognizing the monozygotic twins;
- preventing economic losses through early diagnosis of disease or abnormal condition with genetic determination;
- analyzing the dynamics of the genetic structure of populations at different locus, both for their characterization and to specify their phylogenies or conducting taxonomic corrections;
- estimating the effects of selection, based on monitoring the development of gene frequency considered as a marker in a given population over several generations;
- establishing some correlations between genetic markers and morphological, physiological and productive traits of the animals;
- developing genetic mapping strategies for many species of animals;
- using markers to analyze genetic determinism of a quantitative trait;
- marking the whole genome.

Genetic markers are represented by major genes located in specific locus, as well as some segments of genes with some specificity that allow individualization of each DNA molecule.

Molecular marker technique can be applied with good results for many traits, but especially for: traits with low heritability (influence that genetics rather than environment has on a trait), that are difficult or expensive to measure (for example disease resistance); cannot be measured until after selection has occurred (the carcass data); lack of available phenotypic data (tenderness). Some traits most likely for applied the molecular marker assisted selection are: carcass and meat quality and palatability from all animal species,

but especially pork (PSE meat syndrome, stress syndrome, malignant hyperthermia syndrome, tenderness), various disease resistance, fertility and reproductive efficiency, carcass quantity and yield growth performance, milk production and maternal characters.
Trough molecular biology technique, animal genotype can be determined without waiting for the manifestation of phenotypic characters by genotyping the animal for the most important markers associated with important characters and then calculating the improvement value combining the information from ascendants and collaterals to those obtained by using molecular markers.
Marker assisted selection can be applied in three directions:

a. markers for qualitative characters, those characters which are determined by a genotype consisting of a single pair of genes and that shows discontinuity in the phenotypic expression;

b. markers for quantitative characters, those characters which are determined by polygenic complexes (in which determination are involved many locus);

c. markers that characterize the entire genome.

Marker assisted selection has the advantage that it allows the achievement of a much higher selection intensity. Also, by early marker assisted selection may be reduced the generation interval and increases the accuracy of selection due to the additional information provided by the markers.
Another way of using the markers is that in which is wanted to transfer a favorable genes from one breed to another. The transfer is easier when the gene that is meant to be transferred is linked with one or more markers.
All these advantages have sparked excitement among scientists, some researchers saying that in the coming years will no longer be needed using classical selection based on phenotypic expression of character, it being entirely replaced by molecular markers assisted selection, in the conditions in which in animals have been discovered molecular markers associated with most of the quantitative and qualitative characters.
In the recent years, for most animal species have been discovered markers associated with different characters.
For cattle were determined the biochemical systems from blood (for hemoglobin, transferrin, albumin, serum amylase, etc.) or milk (alpha-lactalbumin, beta-lactalbumin, alpha casein, beta casein). Also were identified markers correlated with bovine leukocyte adhesion deficiency and markers correlated with the quantity and quality of milk production (K-casein, beta-lactoglobulin, etc.).
The pigs were identified markers correlated with the quantity and quality of meat (markers for malignant hyperthermia - MH susceptibility gene to stress (halothane), RN gene), markers correlated with prolificacy (estrogen receptor gene).
For sheep have been identified chromosomal aberrations and the existence of correlations between specific diseases of sheep, the correlation between leptin genotype and meat quality, the correlation between beta-lactoglobulin genotype and milk quality.
For horses were identified markers correlated with blood group systems, markers used to determine paternity by DNA tests, markers used to determine severe combined immunodeficiency, etc.
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ACUMULAREA UNOR COMPUŞI BIOCHIMICI ÎN FRUNZA DE VIȚĂ-DE-VIE CA EFECT AL FERTILIZĂRII ORGANICE A SOLULUI VITICOL

THE ACCUMULATION OF BIOCHEMICAL COMPOUNDS IN THE GRAPEVINE LEAVES AS AN EFFECT OF THE ORGANIC FERTILIZATION OF THE VITICULTURAL SOIL

CARMEN BEJAN, EMILIA VIŞOIU

Keywords: organic fertilization, soil, biochemical compounds.

REZUMAT

Menținerea şi ameliorarea fertilității solului constituie deziderate importante în viticultură avându-se în vedere şi faptul că, vița de vie se cultivă, de regulă, pe terenuri deficitare sub aspect fito-nutritiv, sistemele eficiente de fertilizare, bazate pe utilizarea la maximum a îngrăşămintelor organice fiind de strictă actualitate. Scopul acestui studiu este de a explora relația dintre tipul de fertilizant organic aplicat solului şi performanța viței de vie sub aspectul acumulării unor compuşi biochimici implicați în creşterea şi dezvoltarea plantelor. Studiul s-a efectuat pe două soiuri de viță de vie având ca direcție de producție obținerea vinurilor roşii de calitate superioară – Cabernet Sauvignon şi Zweigelt – amplasate într-o plantație a I.N.C.D.B.H. Ştefăneşti – Argeş. Studiile efectuate au relevat influența pozitivă a fertilizării organice a solului asupra biosintezei principalilor compuşi ai metabolismului primar (glucide solubile, pigmenți clorofilieni şi carotenoizi) şi secundar (proteine, polifenoli, auxine) din frunză, pe parcursul perioadei de vegetație.

ABSTRACT

The maintenance and improvement of the soil fertility are important aims in viticulture, taking also into account that the grapevines are usually cultivated in poor phyto-nutrient soils, and thus the efficient fertilization systems based on a maximum utilization of organic fertilizers are of present interest. The goal of this study is to explore the correlation between the type of soil organic fertilizer and the grapevine performances expressed in the accumulation of biochemical compounds which are involved in the plant growth and development. The study was conducted on two grapevine varieties for which the production aims at obtaining high quality red wines - Cabernet Sauvignon and Zweigelt – and which are grown in a plantation belonging to I.N.C.D.B.H. (the National Research and Development Institute for Biotechnologies in Horticulture) in Stefanesti-Arges. The undertaken studies have shown the positive influence of the soil organic fertilization upon the biosynthesis of the primary metabolites (soluble carbohydrates, chlorophyll and carotenoid pigments) and secondary metabolites (proteins, polyphenols, auxins) in the leaf, during the vegetation season.

INTRODUCTION

The physiological responses of the grapevines are influenced by many climate, technological and cultural factors, hence the soil fertilization plays an important role in this context.

Leaf formation is a faster process at the beginning of the growth season, slowly decreasing as the number of the formed leaves increases (Moncur and others, 1989).

The biochemical compounds in the vine leaves affect in a different way the development of the physiological processes. Some of them are directly involved in carrying out these processes, such as the assimilatory pigments, enzymes and hormones, while others are energy substances or secondary products resulted in the metabolism (carbohydrates, proteins, and polyphenols). The present study concentrates on the influence of soil fertilization system on the biosynthesis of key biochemical compounds in the leaf.

MATERIAL AND METHOD

The study was conducted on two grapevine varieties for which the production aims at obtaining high quality red wines - Cabernet Sauvignon and Zweigelt – and which are grown in a plantation located in Pietroasa pilot farm, as part of I.N.C.D.B.H. (the National Research and Development Institute for Biotechnologies in Horticulture) in Stefanesti-Arges. The leaf material was taken on the marked grapevine trunks in the four different experimental plots:

V_1 - *unfertilized control, maintained that black heath;*
V_2 - fertilization with grape marc incorporated into the soil surface;
V_3 - fertilization with green fertilizers;
V_4 - fertilization with manure.

The physical-chemical analyses were carried out on the experimental varieties and variants, starting with the "blossoming" phenophase (I), continuing with the intense growth of shoots (II) until the maturity of grapes, this phenophase being characterized by a slow growth of shoots (III). The biochemical investigations on the leaf material aimed at measuring:

- the *dry matter content (%)* by dehydration of the plant material at 105°C, up to a constant mass;
- the content of *chlorophyll and carotenoid pigments*; their extraction was performed with 80% acetone and was followed by reading the optical density at three wavelengths: 440.5 nm, 644 nm and 662 nm. In the measurement of the pigment content in mg/g of green substance, the Tvet calculation formulas were used.
- the *protein* content by the Lowry method;
- the auxinic content by the colorimetric determination of the indole-3-acetic acid in the Salkowsky reaction;
- the *soluble carbohydrate* content (spectrophotometric dosage determination after the colour reaction with anthrone reactive) and the *phenolic compounds* (colorimetric determination based on the reaction with Folin-Ciocâlteu reactive).

RESULTS AND DISCUSSION

The end of the budding and the beginning of a new period of vegetative growth occurs when a sum of active temperatures of over 10^{o}C is achieved. The leaves, which are formed from the initial ring of apical buds, are simple, opposite to each other and are characterized by a high photosynthetic intensity of the sweating process and of the oxidative activity (Burzo and others, 2000).

a. The dry matter content. In the varieties studied, the dry matter content is an average of 26.5% (Cabernet Sauvignon variety) and 25.5% (Zweigelt variety) - Figure 1. The accumulation of the dry matter in the leaf material is more obvious in the variants where the soil received organic fertilization in comparison with the witness unfertilized plot. For both varieties, the fertilization with *green manure* and *grape marc*, led to the accumulation of higher quantities of dry matter in the leaf.

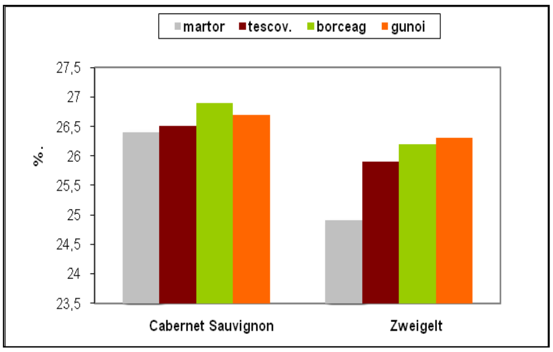

Fig. 1. The dry matter content for the studied varieties

b. The *carbohydrate content* of the leaf material was analyzed in the three important growing moments. Figures 2 and 3 illustrate the dynamics of the soluble carbohydrates accumulation during the growing season, on the experimental variants. In the first stage, the intense carbohydrate biosynthesis takes place in the leaf, their content at the "blossomed" phase ranging from 8-15% (Cabernet Sauvignon variety) and 7-10% (Zweigelt variety).

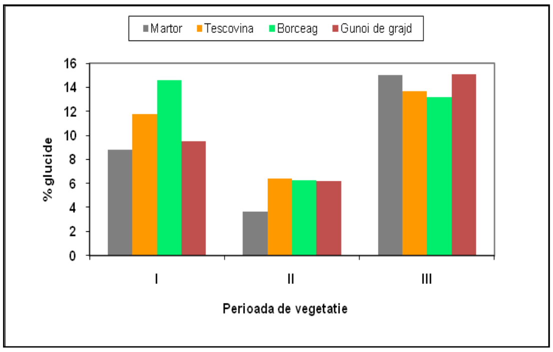

Fig. 2. Soluble carbohydrate accumulation in the leaves of the Cabernet Sauvignon variety

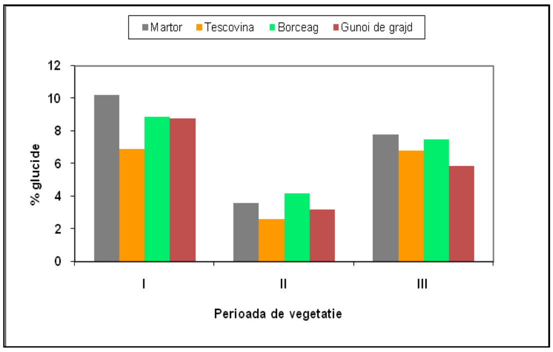

Fig. 3. Soluble carbohydrate accumulation in the leaves of the Zweigelt variety

When the grapes enter the pre-ripe period, there is a new transfer of the soluble carbohydrates from the leaves to the grape berries, the lowest values of this indicator being recorded from a quantitative point of view. Although the level of soluble carbohydrates in the leaf tissues fluctuated during the growing season, both in Cabernet Sauvignon and Zweigelt varieties, it can be concluded however, that the accumulation of these compounds was maximum during the "blooming" (I) phenophase, particularly in the *green manure* version (for Cabernet Sauvignon) and the *witness plot* version - for the Zweigelt variety. In phase II, the carbohydrates accumulation decreased significantly in the two varieties and values between 4-6% were recorded for Cabernet Sauvignon and between 2-4% for the Zweigelt variety; during the last phenophase, that of the slow growth of shoots, intense soluble carbohydrates accumulations of 14-16% take place for Cabernet Sauvignon and of 6-8% for the Zweigelt variety, which will be transported to the shoots and thus contributing to their maturation.

c. Chlorophyll and carotenoid pigments. The essential condition for photosynthesis is capturing the light energy and converting it into chemical energy by the assimilating pigments in the thylakoid system (grana) of chloroplasts.

The analysis of chlorophyll and carotenoid pigments content in leaves carried out in the "blooming" phase showed sensitively higher contents in the organic fertilized variants, compared with the witness plot. Both chlorophyll "a" and chlorophyll "b" had higher values for the soil fertilized with *grape marc* (Cabernet Sauvignon variety) and with *green manure* (Zweigelt variety) - Figures 4 and 5.

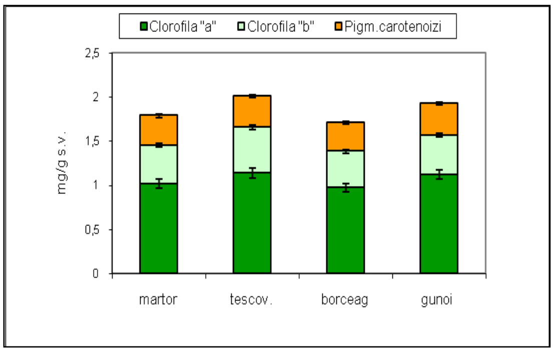

Fig. 4. Chlorophyll and carotenoid pigment content in the Cabernet Sauvignon variety

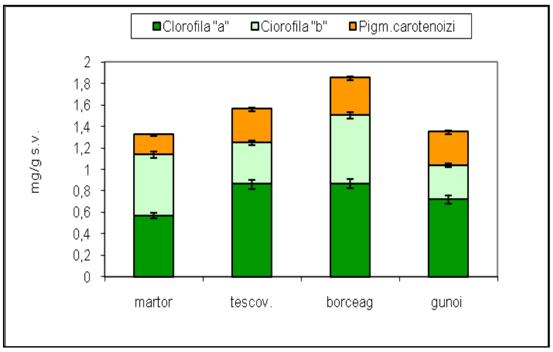

Fig. 5. Chlorophyll and carotenoid pigment content in the Zweigelt variety

The carotenoid pigments are present in sensitively equal amounts to all the three experimental variants, including the witness plot.

d. The protein and auxins content. The protein biosynthesis in the leaves was different depending on the biological potential of the variety. The analyses were performed in the "bloomed" phenophase when their concentration in the leaf reaches a maximum.

For the Cabernet Sauvignon variety (Figure 6) maximum values were recorded for the *grape marc* and *manure* variants, while for the Zweigelt variety, the *green manure* and the *grape marc* favoured the protein biosynthesis in the leaves.

Simultaneously with the measurement of the leaf proteins, that of the auxins in the growth peaks on the same marked vine trunks was performed. Auxins, quantified through the indole-3-acetic acid, had the same evolution, a direct correlation being found between auxins content and protein biosynthesis in the grapevine leaves.

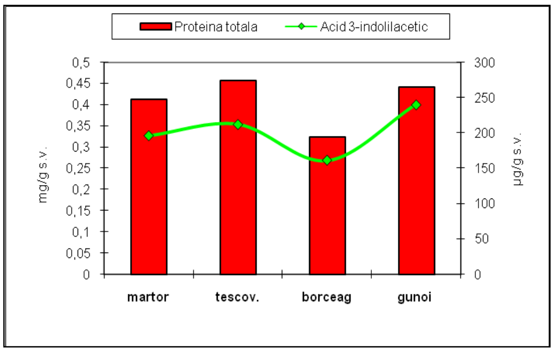

Fig. 6. The protein and auxin content in the Cabernet Sauvignon variety

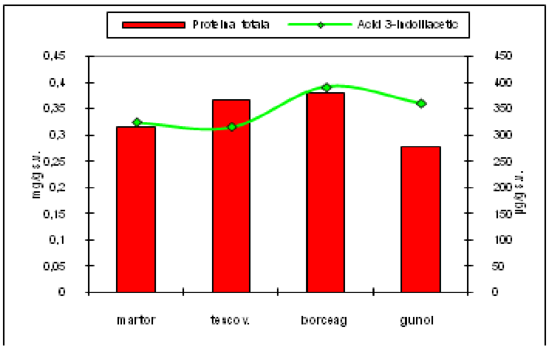

Fig. 7. The protein and auxin content in the Zweigelt variety

The variant *green manure* reached a maximum accumulation in the Zweigelt variety (Figure 7) compared with the other two variants and the experimental witness plot. At a value almost equal to that of the *green manure* variant was the *grape marc* version, while the *grape marc* variant was in the last place. The data presented in Figures 6 and 7 show that the protein accumulation in the grapevine leaves was influenced by the applied fertilizer and more than that, the *grape marc* applied on the calcareous soil, specific for the experimental polygon had a positive effect on the protein biosynthesis in the foliar material. It also shows a positive correlation between the auxins content (indole-3-acetic acid) and the protein content in the leaf.

e. Leaf *peroxidase activity*, quantified by measuring OD 403 nm, indicates a constant evolution of the three experimental variants during the three growth phenophases of the Zweigelt variety, while Cabernet Sauvignon variety showed a relatively low peroxidasic activity throughout the same three vegetative stages (Figures 8 and 9). As a general observation, there was a relative decrease in the peroxidase activity during the last vegetative phase for both varieties.

f. the phenolic compounds, as products of the intermediate metabolism, start their accumulation in the leaf material in the blooming phenophase and reach maximum concentrations in the mature leaves. The phenolic compounds present in the grapevine leaves are of flavonoid type, and are represented by: flavonoids, aldehydes, condensed tannins and anthocyanins and of nonflavonoids type represented mainly by the phenolic acids and stilbenes.

In both varieties, Cabernet Sauvignon and Zweigelt, the content of phenolic compounds in the leaf has a constant increase over the growing season, so that it doubles its value when maturity is reached (from about 50 mg/g DM to 100 mg/g DM).

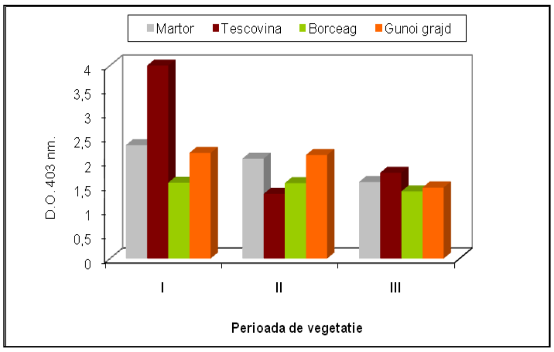

Fig. 8. Leaf peroxidase activity for the Cabernet Sauvignon variety

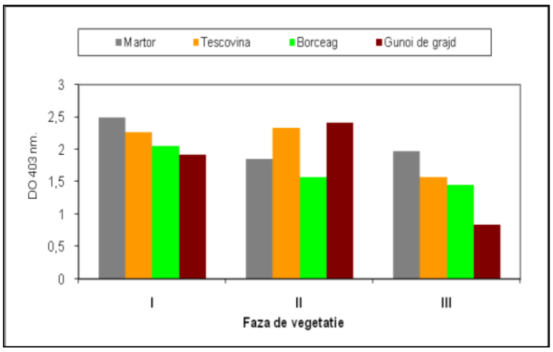

Fig. 9. Leaf peroxidase activity for the Zweigelt variety

The study conducted over a period of three years shows that the grapevine fertilization with *grape marc* positively affects the total polyphenols biosynthesis in foliar material, the values shown in Figures 10 and 11, representing the average for the three years of study.

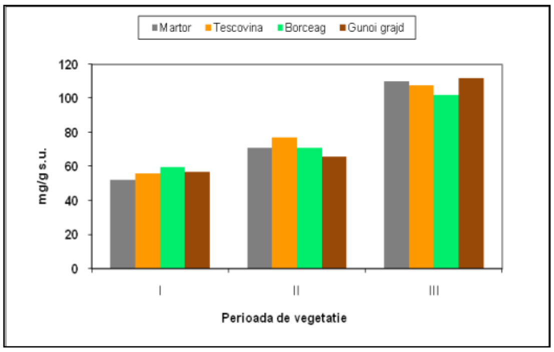

Fig. 10. Accumulation of phenolic compounds for the Cabernet Sauvignon variety

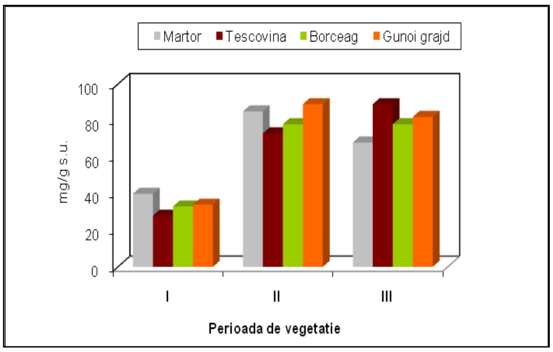

Fig. 11. Accumulation of phenolic compounds for the Zweigelt variety

It should be emphasized that both varieties being red, the amount of polyphenols at plant maturity has high values due also to the anthocyans synthesis in the mature leaves.

CONCLUSIONS

- The fertilizer applied to the soil has a lower influence on the carbohydrate biosynthesis in the leaf, as a positive correlation cannot be noted between the carbohydrate content of the foliar material and the type of fertilizer.
- The conducted study shows that the grapevine fertilization with grape marc has a positive influence on the total polyphenols biosynthesis in the foliar material.
- The soil organic fertilization had a positive influence on the dry matter accumulation in the leaf.

- The soil fertilization with grape marc had a beneficial effect on the accumulation and biosynthesis of the key biochemical compounds in the leaf.

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INFLUENȚA DESIMII DE SEMĂNAT ASUPRA UNOR HIBRIZI DE PORUMB ÎN CONDIȚIILE DE LA SCDA ŞIMNIC

THE INFLUENCE OF CROPPING DENSITY ON MAIZE HYBRIDS UNDER NATURAL CONDITIONS IN THE ARDS SIMNIC AREA

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Keywords: density, maize, yield

REZUMAT

Se analizează numai influența desimii de semănat cu datele obținute în anii 2009-2010, dintr-o experiență polifactorială (hibrizi, desimi, epoci de semănat), prelucrate statistic în sistem monofactorial. Dintre cele trei desimi experimentate (40000, 50000 şi 60000 pl/ha) în condițiile anului 2009, cu regim pluviometric favorabil, desimea de 50000 pl/ha s-a dovedit cea mai potrivită. La desimea de 60000 pl/ha producția scade fiind asemănătoare cu cea obținută la 40000 pl/ha. În condițiile anului 2010, cu ploi abundente, cele mai mari producții se obțin la desimea de 60000 pl/ha. Comportare bună are la toate cele trei desimi hibridul tardiv Kitty alături de hibridul Rapsodia. Prin urmare în condițiile în care precipitațiile sunt consistente (2009) sau chiar abundente (2010), hibrizii tardivi realizează producții mai bune.

ABSTRACT

The aim of the paper was to analyze the influence of cropping density to maize yielding capacity during two experimental years (2009 and 2010) using a polyfactors experiment with two traits (hybrids densities and sowing times). There were tested three plant densities (40000, 50000 and 60000 plants/ha) and three sowing times (15.04., 01.05., 15.05.) In the climatically conditions of 2009 year characterized by favorable rainfalls the highest yields were recorded when maize plants density was 50000 plants/ha. Yield decreased when plants density was 60000pl/ha, respectively 40000 plants/ha. In 2010 year conditions characterized by heavy rainfalls the highest yield was recorded when plants density was 60 000 plants/ha. The best results were recorded by delayed hybrid Kitty and Rapsodia. Thus, it was observed that delayed maize hybrids recorded best yields for both climatically conditions (normal and heavy rainfalls).

INTRODUCTION

Plants number per surface unit is a very important factor to realize grain yield at maize (Buren L. et al.) The Romanian varieties and local maize population had morphological and physiological traits requiring lower densities (25000-30000 plants/ha) until hybrids use. With hybrid seed sowing density increased up to 40000-50000 plants/ha even more under irrigated system (Ciulu Liliana, 2005).

Profound researches about Romanian maize germoplasma established that maize varieties and population long time cultivated especially in the south part of the country have traits that give good resistance against high temperature and lack water stress during frequent dry summers. The use of maize local sources for hybrids breeding in order to drought resistance involves special breeding work that will put together this trait with production capacity of the American germoplasma (Ilicevici S., 1972, 1994, Cosmin O., 1978, 1984). Recently studies showed that maize drought resistance has three interdependent components: agro phyto technical, physiologic-biochemical and genetic (Ilicevici S., 1994, 1997).

a) Agro phyto technical part involving sowing time and crop density for better use of soil water resources completed by measures to preserve soil water potential (autumn plow, soil preparation, weeds control) is broad studied in the paper works (Ciulu Liliana, 2005, Tianu Al., 1983, Zamfir Elena, 1999).

b) Physiologic and biochemical part describe the plants osmotic potential under drought conditions (Blum A., 1983, Terbea Maria, 1995).

Maintaining stability and integrity of the cell membrane under drought conditions represents plants physiological adaptability to the water stress. Morizet, 1990 (citied by Ciulu Liliana, 2005) showed that maize hybrids that start faster metabolic activity after water stress period have a mechanism that maintain turgescent pressure based on osmotic pressure control having a better cell membrane elasticity. Untied prolyne is one among amino acids that controls osmotic plants activity under stress conditions. The mechanism of prolyne biosynthesis is yet not entirely known (Ciulu Liliana, 2005).

c) Heredity part, less studied till now, consider local germoplasm potential but also use modern methods to obtain drought resistant genotypes, such as:

- identify of drought resistance genes, copy and introduction into valuable hybrids gene pool.
- use of GMO to create drought resistant maize hybrids (transfer of foreign drought resistance genes inside maize gene pool) (Notify Report, USA Pioneer Company, 2009)

MATERIAL AND METHOD

At ARDS Simnic, on luvic soil conditions inside a polyfactors experiment, we start to study the behavior of six newer maize hybrids planted at three different dates with three densities: 40000, 50000 and 60000 plants/ha. This paper presents only crop density influence on grain yield of the analyzed maize hybrids: Fundulea 475, Kamelias, Danubian, KWS 2376, Rapsodia and Kitty planted on time (15 April) under 2009 and 2010 conditions.Experimental data were analyzed in one factor system for each density and year. Climatic conditions regarding precipitations during experimental years did not allow exact evaluation about drought resistance of tested hybrids but favorable amount (during 2009) and exceed amount (during 2010) gave the possibility of some conclusions. Figure 1 shows rainfalls sum distribution during cold period (R), the whole vegetation period and the 40 years normal amount. Long time documentation about Simnic conditions shows a parallel between annually precipitation sum and maize yield potential. Thus, 520 l/ha average sum of precipitations ensure 3000-3200 kg/ha grains yield.

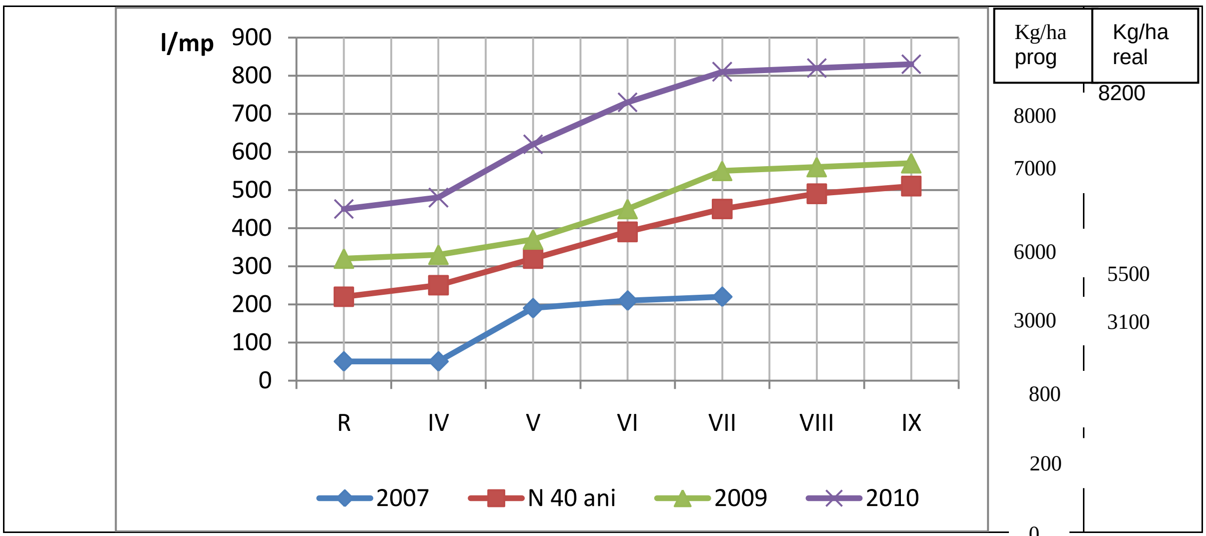

Figure 1 Total precipitations amount during maize vegetation perioc ...d average yield of tested hybrids

RESULTS AND DISCUSIONS

In 2009 starting with cold period accumulation each month present exceed of precipitations comparative with 40 years average value for this area. Among those three experimented densities 50000 plants per hectare is the most suitable. On average, tested hybrids recorded 5500 kg/ha grain yield comparative with 4950 kg/ha at 60000 plants/ha density.

The rainfalls exceed was not enough to express the advantage of maximum experimental density. Yield results of tested hybrids cultivated at 60000 plants/ha were similarly with those of same hybrids at 40000 plants/ha density.

Danubian hybrid recorded significant and distinct significant yield decreases comparative with yield average at all three tested densities (table 1).

Table1

The influence of cropping density on kernels yield at some maize hybrids tested during 2009 in the ARDS Simnic conditions

No	Hybrid	40000 plant/ha		50000 plant/ha		60000 plant/ha	
		Yield Kg/ha	% to X Signif.	Yield Kg/ha	% to X Signif.	Yield Kg/ha	% to X Signif.
1	Fundulea475	4780	96,5	5510	100,2	4950	100,4
2	Kamelias	5050	102,2	5920	107,6 x	5520	111,9 xx
3	Danubian	4540	91,7 0	4720	85,8 oo	4110	83,4 oo
4	Kws 2375	5050	102,2	5460	99,3	4710	95,5
5	Rapsodia	4930	99,6	5790	105,2	5230	106,0 x
6	Kitty	5330	107,6 x	5600	101,8	2080	103,0
Average (X)		4950		5500		4930	

DL 5% = 10,4%; DL 1% = 6,2%

During 2010 the excess of precipitations ensured good conditions to express yield potential of tested hybrids at all experimental densities (table 2).

Table 2

The influence of cropping density on kernels yield at some maize hybrids tested during 2010 in the ARDS Simnic conditions

No	Hybrid	40000 plant/ha		50000 plant/ha		60000 plant/ha	
		Yield Kg/ha	% to X Signif.	Yield Kg/ha	% to X Signif.	Yield Kg/ha	% to X Signif.
1	Fundulea475	7170	96,5	7230	95,5	8160	99,6
2	Kamelias	7400	99,6	7760	102,5	8620	105,2 x
3	Danubian	7430	100,0	6850	90,5 oo	7500	91,6 o
4	Kws 2375	7470	100,5	7520	99,3	8020	97,9
5	Rapsodia	7220	97,3	7820	103,3	7880	96,2
6	Kitty	7890	106,2 x	8260	109,1 x	8980	109,6 x
Average (X)		7430		7570		8190	

DL5%=11,0%;DL1%=6,2%

We can observe that highest density (60000 plants/ha) ensured the best yields.

Among tested genotypes also Danubian hybrid had a lower capacity for use precipitations exceed, at 50000 and 60000 plants/ha densities, showing significant yield decreases comparative with experiment yield average.

High yield capacity presented Kamelias hybrid and Kitty delayed hybrid that have at 60000 plants/ha density significant yield gains comparative with experiment yield average.

CONCLUSIONS

For the central and south part of Oltenia in normal annually precipitations or moderate amount over 40 years normal value the optimum plants density in the crop of new maize hybrids is 50000 plants/ha.

At 40000 plants/ha density there are yield potential decreases similarly with those recorded at 60000 plants/ha density.

Very good yield levels using 60000 plants/ha densities there are possible only with special rainfalls conditions registered in this area once at 10 years.

In areas without irrigation system over 50000 plants/ha density is a hazardously recommendation.

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REZULTATE PRIVIND POTENȚIALUL BIOPRODUCTIV AL UNOR SOIURI DE ARBUȘTI FRUCTIFERI ÎN ZONA COLINARĂ A OLTENIEI

RESULTS REGARDING THE BIOPRODUCTIVE POTENTIAL OF SOME VARIETIES OF SHRUBS IN THE HILLY AREA OF OLTENIA

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Keywords: fruit trees, variety, production

SUMMARY

Arbuştii fructiferi constituie un domeniu puțin explorat în zona colinară a Olteniei. La speciile şi soiurile cercetate este necesar a fi stabilite particularitățile agrobiologice în vederea aplicării unei agrotehnici diferențiate. La ambele grupe de specii – zmeur și mur, în condițiile din zona colinară a țării, eşalonarea maturării face posibilă buna organizare a procesului de producție şi recoltarea întregii producții. Producții foarte bune se înregistrează atât la zmeur - de 9,73 t fructe/ha, iar la murul fără spini se realizează o medie de 7,45 t/ha reflectând posibilitatea de cultivare a acestor specii în această zonă a Olteniei.

În zona colinară a Olteniei zmeurul şi murul fără spini poate fi extins în condiții de irigare, în plantații industriale sau grădini familiale prin soiurile: Citria, The Latham pentru zmeur, iar Thornfree şi Smoothstem pentru murul fără spini.

Shrubs trees are a less explored in the hilly area of Oltenia. To the species and varieties investigated needs to be set the agro biological features in order to apply differentiated agro technical measures. In both groups of species - raspberry and blackberry, under the conditions in the hilly area of the country, staggering maturation allows better organization of the process of production and harvesting the entire production. Very good yields are recorded both raspberries - fruit of 9.73 t / ha and the blackberry bush without thorns is made an average of 7.45 t / ha reflecting the possibility of growing these species in this region of Oltenia.

In the hilly area of Oltenia raspberry and blackberry bush without thorns can be expanded in terms of irrigation, into industrial plantations or family gardens with such varieties as: Citria, Latham for raspberry and Thornfree and Smoothstem for blackberry bush without thorns.

INTRODUCTION

Hardy species, some of them proving quite good ecological plasticity, shrubs trees are relatively easy to adapt to various conditions and culture systems. In hilly and Pre Mountains areas in our country, there are considerable areas where certain crops and fruit species cannot grow, but largely correspond to the biological requirements of shrubs trees.

Concordance between biological and climatic requirements of these areas is determined primarily by the short period of vegetation, a period characterized by higher temperatures, better lighting, sufficient rainfall, elements of great economic importance. Growing shrubs trees on farms profiled on the trees culture provides a more rational and uniform labor utilization during the entire year.

Through this paper, we consider making a special contribution to improving the range of shrubs to the hilly area of Oltenia.

MATERIAL AND METHODS

For ascertaining the behavior of some species and varieties of fruit shrubs trees in the spring of 2001 in Novaci depression, Pociovalişte village, Gorj county, it was organized a micro collection with the role of test guidance, which included species of raspberry and blackberry without thorns.

The species and varieties investigated needs to be set the agro technical and agro biological features in order to apply differentiated agro technical, for that climate zone. With a view to the intended targets were set as objectives:

- checking of raspberry and blackberry- without thorns species growing up;
- examine the production of fruit;
- fruit quality-checking.

The studies were conducted on two varieties of raspberry and four varieties of blackberry without thorns, and these have been the variants of the experience:

- raspberry variety: The Latham, Citria.
- blackberry without thorns variety: Silvan, Waldo, Smoothsthem, Thornfree.

Raspberries was planted at distances of 2.5 / 0.5 m and blackberry bush at distances of 2.5 / 1.5 m.

Settlement method was linear over three repetitions, the calculations being made by randomized block method.

RESULTS AND DISCUSSION

At the analyzed species, the flowers appear primarily at raspberry (between 20.IV-08.V) depending on climatic conditions of that year.

At 1 - 4 days occur the inflorescences at blackberry bush without thorns, ranging from 21.IV-24.IV or 05.V-08.V. Starting flourished of the same raspberry species is late on third decade of April (29.IV) or third decade of May (30.VI), resulting in avoid to compromise the crops due to the late killing frost or due to the return of the frost, such as raspberry bush in such condition can bear fruit every year.

Raspberry fruit maturation in that area begins in the second decade of June or the first decade of July (16.VI-09.VII) with the Citria variety.

Blackberry bush without thorns blooms 26 to 27 days later after the appearance of inflorescences, that is in the second decade of May or the third (17.V-22.V) or the first - the second decade of June (8.VI-12.VI.). End of flowering is it noticed in the first - the second decade of June or even third decade of June (07.VI-30.VI), and, in this case, offering a very good binding of flowers and full fruit formation, that means constant production. From the blackberry varieties without thorns is highlighted by an early maturing the Silvan variety (14.VII-07.VIII) and a late maturing the Thornfree variety (16.VIII-10.IX).

Force growth of the shrubs is given, among other, by the shrub height, number of strains carried in the bush.

By annual checking of the strains length of raspberry at the end of vegetation, we find an average of 153.0 cm / strain. Both varieties register close values to the specified media. The blackberry bush without thorns makes an average of 288.5 cm, so the strains length of this species exceeds much more then the raspberry species. It stands out trough the significantly positive values, with very long stem, the Waldo variety (298.0 cm) and Thornfree (299.0 cm) than the average. The Smoothstem and Silvan varieties register small length of the strains, these values being significantly negative.

Compared with our witness Silvan variety, the Waldo and Thornfree mentioned varieties register very significantly positive values.

Length of over 2.0 m of the strains requires mandatory support trellis. Along the length of stems, their number on the bush becomes an element of growth power. By checking the number of strains per raspberry bush species, we find that in the analyzed conditions it is forming an average of 18.0 stems.

A large number of strains, significantly positive, compared with the witness is forming to the Latham variety (20 strains).

The blackberry bush without thorns registers an average of 12.7 strains per bush. A significant number of strains per bush, with significantly positive values, that is very significant positive, register the Waldo and Thornfree varieties (15-18 strains per bush) than average.

Compared to Silvan witness, Waldo and Thornfree varieties have very significant positive values.

With a small number of strains (8-10) register the Silvan and Smoothstem varieties, where values were significantly and distinct significantly negative compared with the average. For every species, the withholding of a variety range is dependent on the production each year, and on its quality.

Performing measurements and then calculating the production of fruit obtained from raspberry, we noticed that it is obtained an average of 9.73 t fruits per hectare reflecting the possibility of raspberry bush cultivation in this area with very good results. The Citria and Latham investigated varieties can be retained in assortment for they achieved significant productivity (from 9.55 to 9.92 t / ha).

In between 2007-2009 blackberry bush without thorns achieved an average of 7.45 t / ha in this case reflecting the possibility that this species being growth in the hilly area of Oltenia. Of the four studied varieties, the Thornfree variety scored yields above average (12.6 t / ha) with significant distinct positive values.

Silvan variety made small productions (3.63 t / ha) under the same climatic conditions and agricultural technique.

Considering the main physical and chemical fruit quality traits (Table 1), we find that the raspberry can obtained big fruit (over 2.5 g / fruit) to the studied varieties Citria and Latham (2.7 to 2.6 g / fruit). S.U.S. content to the same species is between 12.4% and 14.2% expressing possibility of high exploitation of the fruits of this species.

The main physical and chemical properties to several varieties of raspberry and blackberry without thorns

Table 1

SPECIES	VARIETY (VARIANT)	I.M. mm/fruit	Weight g/fruit	S.D.S. %	Acidity in malic acid g per 100 g f.s.	Ascorbic acid mg per 100 g f.s.
RASPBERRY	1. CITRIA	18,0	2,7	12,4	1,109	42,5
	2. LATHAM	16,0	2,6	14,2	1,098	42,0
BLACKBERRY BUSH WITHOUT THORN	1.SILVAN	23,0	5,0	13,3	1,395	25,2
	2.WALDO	22,0	5,4	12,2	1,155	28,5
	3. SMOOTHSTEM	19,0	4,2	12,8	1,154	29,9
	4.THORNFREE	24,0	5,8	12,5	1,305	30,0

Acidity, trough malic acid, range between 1098 g and 1109 g per 100 g of fresh substance. Ascorbic acid score significant values ranging from 42.0 to 42.5 mg at 100 g of fresh substance. The chemical components reflect the possibility of obtaining quality raspberry fruit in the hilly area of the Oltenia.

Fruit of blackberry without thorns varieties have exceeded raspberry fruit weight, scoring averages of 5.0 to 5.8 g / fruit (Table 1). It was noticed, in terms of size, the fruit for varieties: Thornfree, Waldo and Silvan (5.0 to 5.8 g / fruit).

Solid soluble substance scores between 12.2 -13.3, and malic acid content between 1.155 and 1.305 g of fresh substance, recording a slightly acidic taste compared with raspberry varieties. Ascorbic acid achieved values between 25.2 and 30.0 mg per 100 g of fresh substance. It is to be noted in this regard, that a significant content of ascorbic acid develop the Smoothstem and Thornfree varieties (29.9 to 30.0 mg per 100 g of fresh substance).

CONCLUSIONS

1. Specific climatic conditions for hilly area of Oltenia - are good for shrubs represented by raspberry and blackberry without thorns.
2. For the investigated varieties, the early flowering scores the Silvan variety (17.V-08.VI) and a late flowering, after 4-5 days, the Thornfree variety (22.V-12.VI).
3. Raspberry fruit maturation begins, in the South area, in second decade of June or the first decade of July (16.VI-09.VII) with the Citria variety.
4. For the blackberry bush without thorns fruit ripening starts later, in the second decade of July - the first decade of August (14.VII-06.VIII) or the first decade of August - the third decade of the month (07.VIII-28.VIII).
5. For the studied species, Latham, Citria, Smoothstem and Thornfree varieties score greater force given by the length and number of strains.
6. Citria and Latham investigated varieties may be kept in the assortment for the significant productivity and consistency achieved (from 9.55 to 9.92 t / ha).
7. Higher yields score Thornfree variety (12.6 t / ha) and Smoothstem (8.43 t / ha).
8. Large and very large fruit (over 2.5 g / fruit) are obtained for all the studied varieties.
9. Soluble dry Substance (S.D.S.) from 12.4 to 14.2% for raspberry, and from 12.2 to 13.3% for blackberry bush without thorns, benefiting higher exploitation of all the varieties of shrub species studied.
10. Raspberry and blackberry bush without thorns can be extended in the hilly area of Oltenia in terms of irrigation, industrial plantations or family gardens with varieties: Citria, Latham for raspberry; Thornfree and Waldo for blackberry bush without thorns.

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INFLUENȚA PORTALTOIULUI ASUPRA PRINCIPALELOR FENOFAZE ALE CREŞTERII ŞI FRUCTIFICĂRII LA UNELE SOIURI DE PRUN SITUATE ÎN ZONA CENTRALĂ A OLTENIEI

ROOTSTOCK INFLUENCE ON THE MAIN PNENOPHASE OF GROWTH AND FRUCTIFICATION IN SOME VARIETIES OF PLUM LOCATED IN THE CENTER OF OLTENIA

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Key words: variety, rootstock, graft
Cuvinte cheie: soi, portaltoi, altoi

ABSTRACT

This paper aims to study the growth and fructification main phenophase of some plum varieties, located in a plantation established in 1995 to Didactical Agricultural Station "Banu Mărăcine".

The study was conducted during 2006/2008 on 19 varieties of plum, which has matured fruit from extra early until late, each variety is grafted on three or four rootstocks (Oteşani 8, Pixy, Miroval, Roşior văratic).

There were followed main phenophase of growth and fructification respectively: early vegetative buds swelling, early flowering, physiological fruit fall (fall in June) fruit ripening, end of vegetation and number of days of the vegetation period (days with temperatures active >5 ^{o}C).

It was found that the influence rootstock growth and fructification of the main phenophase plum varieties studied is not very large, the values recorded by four rootstocks being close.

REZUMAT

Prezenta lucrare are ca scop studiul principalelor fenofaze de creştere şi fructificare la unele soiuri de prun, amplasate într-o plantație înființată în anul 1995 la Stațiunea Didactică Banu Mărăcine.

Studiul s-a realizat în perioada 2006-2008 asupra 19 soiuri de prun, care prezintă o maturare a fructelor de la extratimpurie până la târzie, fiecare soi fiind altoit pe 3 sau 4 portaltoi (Oteşani 8, Pixy, Miroval şi Roşior văratic).

Au fost urmărite principalele fenofaze ale creşterii şi fructificării, respectiv: începutul umflării mugurilor vegetativi, începutul înfloritului, căderea fiziologică a fructelor (căderea din iunie), maturarea fructelor, sfârşitul perioadei de vegetație şi numărul de zile ale perioadei de vegetație (zile cu temperaturi active, >5^{o}C).

S-a constatat că influența portaltoiului asupra principalelor fenofaze ale creşterii şi fructificării soiurilor de prun studiate nu este foarte mare, valorile înregistrate de cei patru portaltoi fiind apropiate.

INTRODUCTION

Plum is a less demanding species to environmental factors, with high ecological plasticity, which exploit well even thinner and poorer soils.

Fruits are prized for fresh consumption, dried (prunes) and processed as jam, marmalade, compotes, jellies, liqueurs, brandy, candied fruit or pickles, are doing better than stone fruits to preserve by freezing, especially with syrup.

Fresh fruits have a similar potential of grape sugar, which is easily assimilated carbohydrates 16-20%, mostly glucose and sucrose. They are distinguished by high capacity of converting solar energy into sugars, sugar can provide 1400-3200 kg/ha.

In terms of biochemical, plums are 7-8% carbohydrate content, organic acids, vitamin C and B vitamins, minerals Ca, Fe, P, Mg, K, Na, Mn – which are indispensable components in foods man.

MATERIALS AND METHODS

The study was conducted during 2006-2008 at the Didactical Agricultural Station Banu Mărăcine, located on the east side of Craiova, a distance of about 8 Km, on the right road Craiova-Piteşti-Bucharest.

The biological material was a plum tree plantation, founded in 1995, on a brown-reddish soil, consisting of 19 varieties, tree or four rootstocks grafted onto each rootstock was represented by 10 repetitions, the experience of being located by randomized block method.

Plantation includes 19 varieties of plum, from extra late and early maturing, to the late and very late maturing, respectively: Diana, Ialomiţa, Silvia, Tuleu timpuriu, Piteştean, Centenar, Minerva, Flora, Carpatin, Vâlcean, Tita, Tuleu gras, Renclod Althan, Pescăruş, Dâmboviţa, Alina, Valor, Stanley, Record and Anna Spath. Each variety is grafted onto rootstock three or four, respectively: Oteşani 8, Pixy, Miroval and Roşior văratic.

Soil reaction (pH) is slightly acid throughout the soil profile depth, with pH range of variation from 5,50 to 6,64.

Humus content is medium to low on the horizon first, the percentage of humus was 2,35% in surface horizon, then gradually decreases to the value profile of 0,78%.

The climate zone is temperate continental with weak Mediterranean influence, but not uniformly distributed, with sufficient rainfall during the year, with dry summers and maximum rainfall until late spring-early summer (May and June).

Table 1

Speci-fication	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Average temp.	-0,8	1,9	6,9	12,5	17,5	21,5	24,0	22,7	16,5	12,2	5,5	0,6	11,7
Average/ 48 years	-1,7	0,4	5,1	11,3	16,7	20,3	22,3	21,8	17,2	11,3	5,1	-0,1	10,8
Differen-ces	0,9	1,5	1,8	1,2	0,8	1,2	1,7	0,9	-0,7	0,9	0,4	0,7	0,9

The annual average temperature on three years of study has exceeded the normal value in 48 years, an average of 0,9^{o}C, registering positive deviations throughout the year, except September, when the difference is negative (Table 1).

Annual average rainfall recorded during the study had a value of 622,5 mm, exceeding the average/48 years by 37,1 mm, but their distribution was uneven years and months (April 2007 – 0 mm precipitation)(Table 2). Positive differences from normal were found in January, March, August, September and October, while in February, April, May, June, July, November and December deviations were negative.

Table 2

Speci-fication	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Average rainfall	43,0	28,9	45,1	39,5	57,8	70,5	41,2	94,0	44,6	75,9	43,7	38,3	622,5
Average/ 48 years	38,1	37,9	40,8	51,9	63,7	72,9	54,5	48,0	38,1	40,4	52,4	46,7	585,4
Differen-ces	4,9	-9,0	4,3	-12,4	-5,9	-2,4	-13,3	46,0	6,5	35,5	-8,7	-8,4	37,1

In the phenophase growth and fructification were studied in these aspects: early vegetative buds swelling, beginning flowering, physiological fruit fall (fall in June) fruit ripening, end of vegetation and number of days of the vegetation period (days with temperatures active, >5^{o}C).

RESEARCH RESULTS

Vegetative buds swelling beginning (2007-2008), occurs when the sum of degrees of active temperatures (>5^{o}C) recorded values between 50-113^{o}C, in the case of varieties grafted on rootstocks Miroval and Oteşani 8 (calendar between March 3 and March 15), between 56-117^{o}C in Pixy rootstock (calendar between March 3 and March 16) and between 56-117^{o}C in Roşior văratic rootstock (calendar between March 6 and March 16)(Table 3.1), is thus evident that the differences recorded are very small.

Beginning of flowering (2007-2008), occurs when the amount of active degrees of temperature has ranged 129-184^{o}C, in the case of rootstocks Oteşani 8, Pixy, Miroval (calendar between March 28 and April 4), that between 129-189^{o}C in case of rootstock Roşior văratic (calendar between March 28 and April 5)(Table 3.1).

Varieties to which the triggers are blooming faster are: Diana, Silvia, Vâlcean, Ialomiţa, Centenar, Renclod Althan and Valor, and the flowering of most late are: Stanley, Dâmboviţa, Anna Spath, Alina, Tuleu gras etc.

Rootstock influence o the growth and main fructification phenophase (2007-2008)

Table 3.1

No. crt.	ROOTSTOCK	ACTIVE TEMPERATURES (>5^{o}C)	
		Vegetative buds swelling	Beginning of flowering
1.	**OTEŞANI 8**	50-113	129-184
2.	**PIXY**	50-117	129-184
3.	**MIROVAL**	50-113	129-184
4.	**ROŞIOR VĂRATIC**	56-117	129-189

Fruit maturation is done when the amount of active degrees of temperature were recorded between 1239-2710^{o}C active when varieties are grafted onto rootstock Oteşani 8 (calendar between June 30 and 12 September), between 1259-2710^{o}C grafted onto rootstock Miroval (calendar between July 1 and September 12), between 1298-2732^{o}C grafted onto rootstock Pixy (calendar between 3 July and 14 September) and between 1430-2659^{o}C grafted onto rootstock Roşior văratic (calendar between 10 July and 6 September)(Table 3.2).

The variety order of maturation is the following: Diana, Ialomița, Minerva, Piteştean, Carpatin, Vâlcean, Silvia, Centenar, Renclod Althan, Tita, Flora, Alina, Pescăruş, Dâmbovița, Tuleu gras, Stanley, Valor, Record and Anna Spath.

End of vegetation period (2006-2008) is recorded when the assets are accumulated temperatures between 2575-3125^{o}C at varieties grafted onto rootstock Oteşani 8 (calendar between October 22 and November 16), between 2581-3125^{o}C at varieties grafted onto rootstock Pixy (calendar between October 23 and November 18), between 2586-3125^{o}C at varieties grafted onto rootstocks Miroval and Roşior văratic (calendar between 24 October and November 20)(Table 3.2).

Number of days with temperatures recorded during a period of active vegetation, during the study ranged from 226-251 days at varieties grafted onto rootstock Oteşani 8, between 226-252 days at varieties grafted on Pixy rootstock, between 228-253 days at varieties grafted onto rootstock Miroval and between 227-248 days at varieties grafted on Roşior văratic rootstock (Table 3.2).

From the above we can conclude that the influence of rootstock on growth and fructification phenophase main plum varieties studied is not very large, the values recorded by the four rootstocks was close.

Rootstock influence o the growth and fructification main phenophase (2007-2008)

Table 3.2

No. crt.	ROOTSTOCK	ACTIVE TEMPERATURES (>5^{o}C)		
		Fruit maturation	End of vegetation period	Number of days with active temperatures
1.	**OTEŞANI 8**	1239-2710	2575-3125	226-251
2.	**PIXY**	1298-2732	2581-3125	226-252
3.	**MIROVAL**	1396-2710	2586-3125	228-253
4.	**ROŞIOR VĂRATIC**	1259-2659	2586-3125	227-248

Physiological fruit fall, called the fall in June, records the average values ranging from 33,6 to 49,1% seemed roots, the average maximum begin recorded in Diana variety (76,1%) and the minimum in variety Tita (22,7%)(Table 4).

In the mean values rootstock Oteşani 8, 19 varieties studied are between 34,9 to 50,2% outliers in the variety recorded Diana (79,9%) and Valor (15,4%).

At Pixy rootstock, the average values are between 34,4 to 48,3%, the maximum begin recorded in Diana variety (75,6%) and the minimum variety Tita (16,8%).

The rootstock Miroval average is between 32,1 to 49,9%, the highest value begin recorded in variety Vâlcean (77,9%) and the lowest in variety Anna Spath (19,8%).

Physiological fruit fall average to Roşior văratic rootstock is between 33,1 to 48,0%, with a maximum recorded for the variety Vâlcean (69,9%) and recorded at least one variety Minerva (17,2%).

The influence of graft/rootstock bio-system of physiological fruit fall (% of all fruits - average on 3 years)

Table 4

No crt	VARIETY	ROOTSTOCK				
		Oteşani 8	**Pixy**	**Miroval**	**Roşior v.**	**Average**
1.	**DIANA**	55,7-**79,9**	60,4-**75,6**	54,4-73,0	-	56,8-**76,1**
2.	**IALOMIȚA**	21,8-42,8	42,7-53,4	31,5-42,6	19,2-44,8	28,8-45,9
3.	**SILVIA**	29,9-51,0	35,8-51,9	35,5-45,5	-	33,7-49,4
4.	**PITEŞTEAN**	44,0-52,1	48,0-56,9	-	46,2-54,2	46,0-54,4
5.	**CENTENAR**	28,8-34,6	32,3-38,5	25,6-37,9	31,1-40,1	29,4-37,7
6.	**MINERVA**	36,5-46,9	22,5-43,3	-	**17,2**-40,1	25,4-43,4
7.	**FLORA**	30,3-34,1	27,2-47,1	27,4-44,3	38,7-44,4	30,9-42,4
8.	**CARPATIN**	30,4-38,7	20,3-54,5	22,9-73,6	30,8-59,4	26,1-56,5
9.	**VÂLCEAN**	47,3-79,2	47,0-67,2	35,9-**77,9**	40,5-**69,9**	42,6-73,5
10.	**TITA**	22,6-30,6	**16,8**-39,4	22,4-47,6	29,3-40,4	**22,7**-39,5
11.	**TULEU GRAS**	21,8-45,1	30,7-33,9	21,7-41,9	-	24,7-40,3
12.	**RENCLOD ALTHAN**	39,9-58,5	27,5-48,2	41,3-56,6	-	36,2-54,4
13.	**PESCĂRUŞ**	37,6-49,6	26,1-49,6	39,5-41,0	37,9-48,6	35,2-47,2
14.	**DÂMBOVIȚA**	26,7-49,0	30,7-41,1	36,2-42,1	31,7-39,2	31,3-42,8
15.	**ALINA**	28,2-52,8	32,7-34,7	31,2-40,5	-	30,7-42,6
16.	**VALOR**	**15,4**-45,7	29,5-47,1	22,8-33,1	-	22,5-41,9
17.	**STANLEY**	60,7-68,1	56,2-59,6	44,5-52,3	36,7-44,2	49,5-56,0
18.	**RECORD**	52,9-57,7	-	33,3-63,9	38,7-50,8	41,6-57,4
19.	**ANNA SPATH**	31,9-37,5	32,5-28,3	**19,8**-33,9	-	28,0-33,2
AVERAGE		**34,9-50,2**	**34,4-48,3**	**32,1-49,9**	**33,1-48,0**	**33,6-49,1**

CONCLUSIONS

* The influence of rootstock on growth and fructification phenophase main plum varieties studied is not very large, the values recorded by the four rootstocks being close.

***** The beginning of vegetative buds swelling occurs when the sum of degrees of active temperatures (>5°C) recorded values between 50-113°C, in the case of varieties grafted on rootstocks Oteşani 8 and Miroval, between 50-117°C in case of varieties grafted on Pixy rootstock and between 56-117°C in case of varieties grafted on Roşior văratic rootstock.

***** Beginning of flowering occurs when the amount of active degrees of temperature has value between 129-184°C, in the case of rootstocks Oteşani 8, Pixy and Miroval, respectively between 129-189°C in the case of varieties grafted onto rootstock Roşior văratic.

***** For fruit maturation is necessary a sum of active temperatures between 1239-2710°C in the case of varieties grafted onto rootstock Oteşani 8, between 1259-2710°C at varieties grafted on Miroval rootstock, between 1298-2732°C at varieties grafted on Pixy rootstock and between 1430-2659°C at varieties grafted on Roşior văratic.

* End of vegetation period is recorded when the assets are accumulated temperatures between 2575-3125°C at varieties grafted onto Oteşani 8 rootstock, between 2581-3125°C at varieties grafted on Pixy rootstock, from 2586-3125°C at varieties grafted onto rootstocks Miroval and Roşior văratic.

* Physiological fruit fall, called the fall in June, averages recorded at the four rootstocks was between 33,6 to 49,1%, the mean maximum was recorded at Diana variety (76,1%) and the minimal variety Tita (22,7%).

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CERCETĂRI PRIVIND COMPORTAREA UNOR HIBRIZI DE PEPENI VERZI ALTOIȚI PE DIFERIȚI PORTALTOI ÎN CONDIȚII DIFERITE DE CULTIVARE

RESEARCH ON THE BEHAVOIR OF HYBRIDS OF WATERMELONS GRAFTENG ON DIFFERENT ROOTSTOCKS IN DIFFERENT CONDITIONS TO CULTURE

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Cuvinte cheie: pepeni verzi, altoire, cultură protejată.
Key words: watermelons, grafting, protected culture.

REZUMAT

Pornind de la importanța altoirii plantelor de pepene verde în practică, s-a considerat necesară stabilirea portaltoilor adaptați condițiilor ecologice din zonele cu soluri nisipoase care să asigure creşterea rezistenței plantelor de pepene verde la factorii de stres termic şi hidric, creşterea rezistenței plantelor la atacul bolilor şi dăunătorilor, stabilirea cultivarelor de pepene verde pretabile la altoire în vederea obținerii de producții timpurii şi creşterii nivelului cantitativ şi calitativ al producției de pepeni verzi.

În acest scop au fost studiați hibrizii de pepeni verzi Crisby F1 şi Rica F1 altoiți pe Lagenaria syceraria (Macis F1) şi Cucurbita pepo (ES 101 F1) în cultură neprotejată şi în cultură protejată cu adă taposturi joase tip tunel.

Prin protejarea culturii cu adăposturi oase tip tunel s-a obținut o creştere a producției de 5,0 t/ha comparativ cu neprotejat. De asemenea, prin altoirea pe Macis F1, indiferent de hibrid şi metoda de cultivare creşterile de producție au fost semnificative.

Fructele de pepene verde au înregistrat creşteri în greutate la plantele altoite față de cele nealtoite, de asemenea uşoare creşteri la plantele protejate față de cele neprotejate.

La fructele de pepene verde obținute de la plantele altoite calitatea nutrițională a fost influențată pozitiv, majoritatea componentelor prezentând uşoare creşteri procentuale.

Cel mai mare profit l-a realizat hibridul Crisby F1 altoit pe Lagenaria syceraria, în cultură proteată.

ABSTRACT

Starting from the importance of vegetable grafting in practice it was considered necessary to establish rootstocks adapted ecological conditions in areas with sandy soils that provide increased resistance to plant watermelons heat and water stress factors, increase plant resistance of watermelons to attack diseases and pests, establish suitable cultivars of watermelons to grafting to obtain biological production in low Tunnel shelters, obtaining production of watermelons and increased quality and quantity of production of watermelons. For this purpose they were intended watermelons Crisby F1 hybrids and Rica F1 without grafting and grafting on Lagenaria syceraria (Macis F1) and Cucurbita pepo (ES 101 F1) unprotected and protected crop growing in low Tunnel shelters.

Tunnel shelters low culture has a production increase of 5.0 t / ha compared to unprotected. Also by grafting plants Macis F1 hybrid watermelons on whatever method of cultivation used and cultivated hybrid have been significant production increases.

Fruits have been growing watermelons in weight than those without grafting grafted plants and also slight increases in plants protected from the unprotected.

Watermelons produced from fruit from grafted plants nutritional quality was positively influenced, showing slight increases in most parts percentage.

Highest profit was achieved by grafting the hybrid Crisby F1 grafting on Syceraria Lagenaria (Macis F1) in protected culture.

INTRODUCTION

Culture watermelons is a tradition in the area with sandy soils in southern Oltenia but environmental factors do not provide the optimal growth and development of plants. Air and soil temperatures, air and soil humidity, winds which occur frequently wind phenomenon of deflation, low natural fertility is the stressors crop of watermelons

Also, the lack of suitable rotations, large scale monoculture practice, have contributed to increased virulence of pathogens (Fusarium oxysporum). Through numerous research has shown that grafting watermelons as a way to cut these stressors rootstock because of the strong root system which operates a large volume of soil can provide the quantity of water and plant nutrients and soil fertility in nature contributing both to increasing low quantitative and qualitative production of watermelons (R. Rivero, Luiz H., Romero L., 2003, Chanka A., Jeberi M., 2006, Yamasaki A., Sugiama K., 2006, Thomas V., et al., 2007).

Starting from the importance of grafting watermelon plants in practice, it was considered necessary to establish rootstocks adapted to environmental conditions in areas with sandy soils that provide increased resistance to watermelon plant temperature and water stress factors, increasing plant resistance to diseases and pest attack to tablish suitable watermelon cultivars after grafting to obtain early production and increasing the quantity and quality of product.

MATERIAL AND METHODES

To achieve the objectives in the experimental field was located DÄƒbuleni CCDCPN trifactorialÄƒ experience with the following factors:

Factor A - Method of cultivation

a1 - unprotected culture

a2 - culture protected with tunnel shelters

Factor B – grown hybrid

b1 - Crisby F1

b2 – Rica F1

Factor C – Rootstock

c1 –without grafting

c2 - grafted on Lagenaria syceraria (Macis F1)

c3 - grafted on Cucurbita pepo (ES 101 F1)

Seedlings produced in greenhouses to protect dual heated biological and grafting as a method of grafting was used "wedge in the cleft. Planting seedlings in the field was around 20 April. Culture was fertilized only with manure degree in quantity of 30 t / ha and to prevent potential treatments were made with lemon bordelezÄƒ.

RESULTS AND DISCUSSIONS

After planting in the field fixing the percentage of grafted plants was influenced by the rootstock used (Table 1).

Table 1

The percentage of grafted plants hanging

Hybrids grown.	Rootstock used	The percentage of grafted plants hanging (%)
Crisby F1	Lagenaria syceraria (Macis F1)	100
	Cucurbita pepo (ES 101 F1)	10
Rica F1	Lagenaria syceraria (Macis F1)	100
	Cucurbita pepo (ES 101 F1)	30

Plants grafted onto Lagenaria syceraria (Macis F1) had a rate of 100% grip, and in plants grafted on Cucurbita pepo (ES 101 F1), the percentage of attachment was between 10-30% due to differences between the diameter of the hzbrid and rootstock. Table 2 shows the diurnal variation of photosynthesis depending on the factors studied.

Table 2

Diurnal variation of photosynthesis

Hybrid x rootstock	Photosynthesis at hour 8 (micromoli $CO_2/m^2/s$)		Photosynthesis at hour 12 (micromoli $CO_2/m^2/s$)		Photosynthesis at hour 16 (micromoli $CO_2/m^2/s$)	
	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected
B1 c1	14,90	16,16	20,64	20,49	11,22	15,52
B1 c2	28,85	14,58	21,12	48,22	14,45	38,52
B1 c3	-	18,93	-	21,00	-	16,49
B2 c1	25,48	27,72	28,00	18,93	13,91	22,99
B2 c2	16,98	20,64	18,30	27,37	17,10	15,07
B2 c3	19,24	16,78	15,80	16,93	18,06	16,56

The hybrid Crisby F1, culture unprotected, photosynthesis recorded values from 11,22 - 20, 64 micromoles CO2/m2/s to not grafted plants and between 14.45 - 48.22 micromoles CO2/m2/s the grafted plants. It appears that, under the protection of the photosynthetic activity was more intense during the day to unprotected. Of the day was recorded at hour 12 plants grafted onto Lagenaria syceraria (Macis F1) in the protected crop.

The hybrid Rica F1 has used more natural conditions, unprotected plants presenting the highest values of photosynthesis. Photosynthesis values are consistent with the yields achieved. Transpiration intensity has a diurnal variation depending on the specific variant studied (table 3)

Table 3

Diurnal variation of transpiration

Hybrid x rootstock	Transpiration at hour 8 micromoli $CO_2/m^2/s$		Transpiration at hour 12 micromoli $CO_2/m^2/s$		Transpiration at hour 16 micromoli $CO_2/m^2/s$	
	Unprotected	Protected	Unprotected	Protected	Unprotected	Protected
B1 c1	3,43	2,22	6,02	4,66	5,44	7,04
B1 c2	3,73	2,48	6,94	4,59	6,69	8,24
B1 c3	-	2,87	-	3,18	-	9,93
B2 c1	3,48	4,74	8,29	5,51	4,64	7,04
B2 c2	3,44	3,18	4,34	6,10	6,39	5,36
B2 c3	2,97	2,79	4,85	7,13	7,48	4,17

At hour 8 transpiration values are higher in terms of lack of protection because the plants are exposed to direct airflow and relative humidity was lower than inside tunnels.

The tunnel is protected versions recorded at the lowest value in because perspiration causes condensation that forms an atmosphere saturated with water vapor the air maintains a high hygroscopicity, sweat is low due to small difference between the concentration of water vapor in the chamber substomatic and atmosphere.

Sweating increased progressively throughout the day due to temperature increase. Maximum transpiration occurred in all variants at hour16 more plants are protected at this time due to temperature increase in the protected space. Transpiration values are slightly higher in grafted plants than those not grafted.

It was determined the average weight of a watermelon fruit (Figure 1). Whichever method of cultivation and hybrid grown an average weight of a watermelon fruit is higher in grafted plants than those not grafted. Also, there is slight increase in fruit weight from plants protected from the unprotected tunnel.

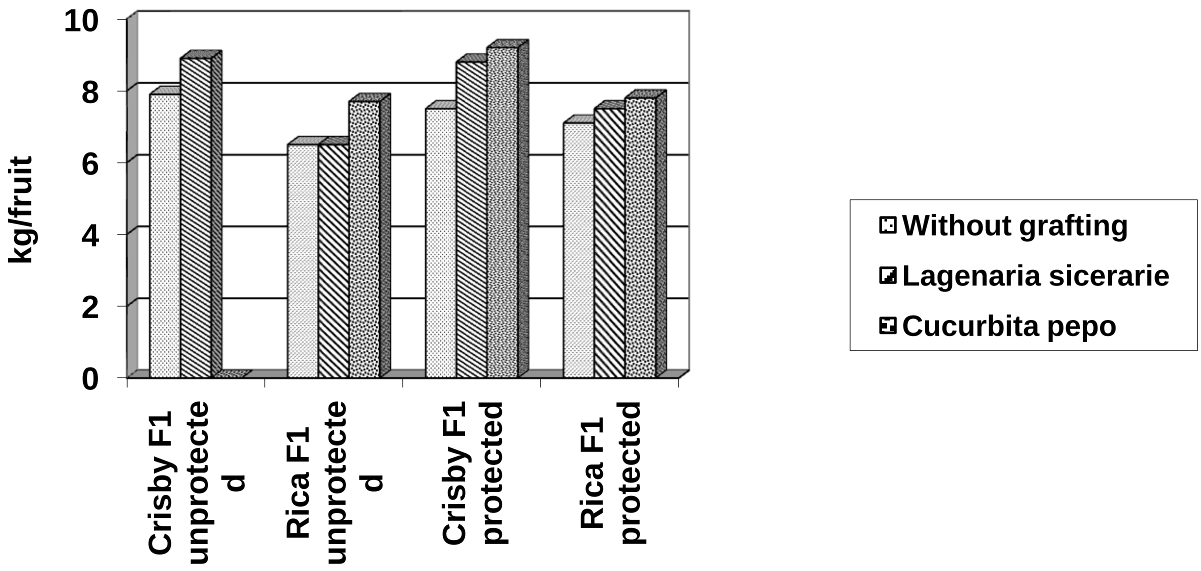


Figure 1. Influence of grafting on the averange weight of a watermelon fruit

In the culture of watermelons unprotected production was obtained on average 56.4 t / ha (Table 4). By protecting crops with low tunnel shelters carry out a production increase of 5 t / ha, significantly distinct from the point of view statistically.

Table 4

Influence of cultivation method about the production of watermelons

Cultivation method	Production obtained		Difference (t/ha)	Significance
	t/ha	%		
Unprotected	56,4	100	Mt.	
Protected	61,4	109	+5,0	**

DL 5% = 1,5 t/ha
DL 1% = 3,5 t/ha
DL 0,1% = 11,3 t/ha

Analyzing the influence of rootstock on the production of watermelon is found that, awaiting the culture medium was obtained in a yield of 72.8 t / ha (Table 5). By grafting syceraria Lagenaria (Macis F1) production increased to 72.8 t / ha resulting in an increased production of 9.2 t / ha. Grafting on Cucurbita pepo (ES 101 F1) resulted in decreases in production of watermelons Maori because of the low number of plants.

Table 5

Rootstock influence on the production of watermelons

Rootstock	Production obtain		Difference (t/ha)	Significance
	t/ha	%		
Without grafting	72,8	100	Mt.	
Lagenaria syceraria	82,0	113	+9,2	
Cucurbita pepo	20,0	24	-52,8	000

DL 5% = 10,5 t/ha
DL 1% = 14,4 t/ha
DL 0,1% = 20,1 t/ha

At the same method of growing rootstock influenced the production of watermelons (Figure 2). Both in culture and in the unprotected protected tunnel were obtained by grafting production increases syceraria Lagenaria (Macis F1).

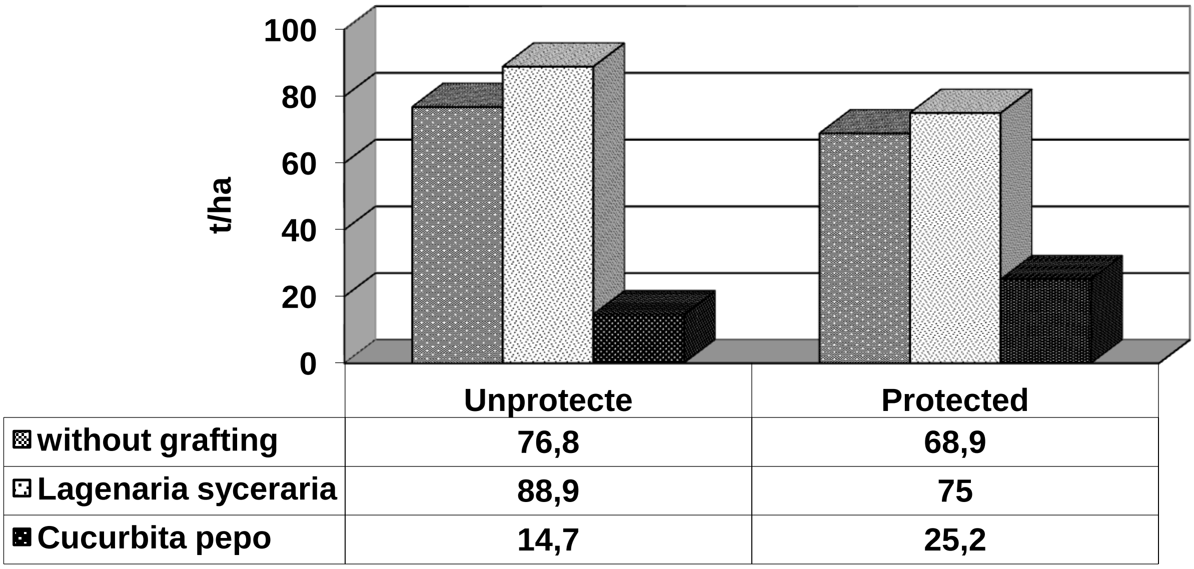
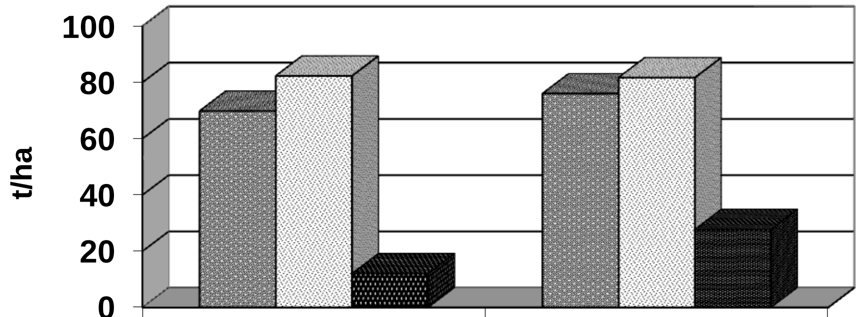


Figure 2. Rootstock influence on the production of watermelons at the same method of cultivation

Also, regardless of hybrid cultivated through grafting onto Lagenaria syceraria (Macis F1) were made to the awaiting higher production (Figure 3).

Table 6 presents the interaction of three factors studied. The crop unprotected, Crisby F1 hybrid production awaiting achieved 61.1 t / ha, and grafted onto Lagenaria syceraria (Macis F1) achieved a yield of 81.1 t / ha. In the same culture conditions, the hybrid RicaF1 awaiting a production made 92.5 t / ha, and grafted onto Lagenaria syceraria (Macis F1) achieved a yield of 96.7 t / ha.

In protected culture Crisby F1 hybrid tunnel awaiting production achieved 78.4 t / ha, and grafted onto Lagenaria syceraria (Macis F1) makes a production of 83.4 t / ha and produce an awaiting F1 hybrid production Rica 59 , 5 t / ha, and grafted onto Lagenaria syceraria (Macis F1) makes a production of 66.7 t / ha. By grafting on Cucurbita pepo (ES 101 F1) were obtained very low yields of watermelons. Hybrid Rica F1 has used more than the existing natural conditions, the highest crop yields in realizing them unprotected.



	Crisby F1	Rica F1
Without grafting	69,8	76
Lagenaria syceraria	82,3	81,7
Cucurbita pepo	12,1	27,8

Figure 3. Rootstock influence on the production of watermelons at the same hybrid

Table 6

Rootstock influence on the production of watermelons at the same hybrid and method of cultivation

Cultivation method	Hybrid	Rootstock	Production obtain t/ha	Production obtain %	Difference (t/ha)
Unprotected	Crisby F1	Without grafting	61,1	100	Mt.
		Lagenaria syceraria	81,1	133	+20,0
		Cucurbita pepo	0	0	-61,1
	Rica F1	Without grafting	92,5	100	Mt.
		Lagenaria syceraria	96,7	105	+7,2
		Cucurbita pepo	29,4	32	-63,1
Protected with tunnel	Crisby F1	Without grafting	78,4	100	Mt.
		Lagenaria syceraria	83,4	106	+5,0
		Cucurbita pepo	24,2	31	-54,2
	Rica F1	Without grafting	59,5	100	Mt.
		Lagenaria syceraria	66,7	112	+7,2
		Cucurbita pepo	26,2	44	-33,3

DL 5% = 21,1 t/ha
DL 1% = 29,0 t/ha
DL 0,1% = 40,0 t/ha

Early production is characteristic of each hybrid production but may be influenced by technological factors in the present method of cultivation and rootstock (Table 7).

Until July 15 only Crisby F1 hybrid production realized they were influenced by the method of cultivation and stock. Thus, unprotected crop yields were obtained of 6.6 t / ha not grafted plants and 4.4 t / ha the plants grafted onto Lagenaria syceraria (Macis F1) and protected crop production extratimpurii tunnel were 20 , 7 t / ha and not grafted plants of 15.7 t / ha the plants grafted onto Lagenaria syceraria (Macis F1). Note that, by grafting to obtain a slight delay in fruit maturation watermelon. In the following period (from July 16 to 31) is derived mostly from the production this time it was higher in grafted plants than those not grafted.

Table 7

Roostock influence on the early production of watermelons

Cultivation method	Hybrid	Roostock	Production until 15.VII (t/ha)	Production obtain between 16-31.VII (t/ha)	Production obtain after 01.VIII (t/ha)
Unprotected	Crisby F1	Without grafting	6,6	52,8	1,7
		Lagenaria syceraria	4,4	76,7	-
		Cucurbita pepo	-	-	-
	Rica F1	Without grafting	-	70,2	22,3
		Lagenaria syceraria	-	87,8	8,9
		Cucurbita pepo	-	29,4	-
Protected with tunnel	Crisby F1	Without grafting	20,7	50,1	7,6
		Lagenaria syceraria	15,7	54,3	13,4
		Cucurbita pepo	-	12,5	11,7
	Rica F1	Without grafting	-	39,0	20,5
		Lagenaria syceraria	-	54,6	12,1
		Cucurbita pepo	-	13,9	12,3

Determinations were made on the biochemical composition of watermelon fruit at maturity (Table 8). We determined the water content of fruit, total solids content, soluble solids content of fatty acids, carbohydrates and vitamin C.

Table 8

Biochemical composition of fruits of watermelons

Varianty	Water%	SUT %	SUS %	Acidity (acid malic/100 g s.p.)	Glucid %	Vitamin C (mg/100 g s.p.
A1 b1 c1	90,40	9,60	9,4	0,06	7,50	10,47
A1 b1 c2	89,10	10,90	10,8	0,10	8,98	14,96
A1 b1 c3	-	-	-	-	-	-
A1 b2 c1	90,30	9,70	9,5	0,11	8,17	9,50
A1 b2 c2	89,30	10,70	9,6	0,13	8,61	11,00
A1 b2 c3	90,70	9,30	9,0	0,11	8,50	11,00
A2 b1 c1	90,00	10,00	9,4	0,06	7,97	13,20
A2 b1 c2	88,50	11,50	10,6	0,10	8,85	15,40
A2 b1 c3	88,70	11,30	11,2	0,09	8,50	14,08
A2 b2 c1	89,80	10,20	10,0	0,10	7,90	11,44
A2 b2 c2	90,40	9,60	9,4	0,09	7,77	10,12
A2 b2 c3	90,80	9,20	9,0	0,13	8,79	90,24

Moisture content of watermelon fruit oscillates very narrow limits being higher in fruits from plants are not grafted and lowest in those derived from grafted plants.

TUE content is consistent with the water content was higher in fruit plants grafts. Also, SUS content recorded slight increases in grafted plants.

Fatty acids content is given by titratable acidity. The watermelons have low fruit acidity ranging from 0.06 - 0.13 g malic acid per 100 g sp Vitamin C is the main vitamin synthesized by plants, the highest values occurring in the watermelon fruit with hybrid CrisbyF1 grafted plants (15.40 mg/100 g sp).

Economic efficiency calculation was performed for each variant (Table 9). Production costs are higher than that grafted awaiting culture and also higher culture is protected from the unprotected range of 15 732-22 557 lei / ha. Achieved high yields and earliness grafted plants increased the production to realizing the most profit by planting hybrid i Crisby F1 s grafted onto Lagenaria syceraria (Macis F1)in protected crop.

Table 9

Economic efficiency of crop plants grafted watermelons depending on the hybrid and cultivation mehtod

Cultivation method	Hybrid	Rootstock	Production obtain (t/ha)	Production costs (lei/ha)	Production value (lei/ha)	Profit (lei/ha)	Profit rate (%)
Unprotectedt	Crisby F1	Without grafting	61,1	15 732	28 010	12 278	78,0
		Lagenaria syceraria		20 087	32 880	12 793	63,7
	Rica F1	Without grafting	92,5	16 672	33 770	17 098	102,5
		Lagenaria syceraria	96,7	20 649	37 790	17 141	83,0
Protected with tunnel	Crisby F1	Without grafting	78,4	18 202	32 670	14 468	79,5
		Lagenaria syceraria	83,4	22 557	41 440	18 883	83,7
	Rica F1	Without grafting	59,5	18 242	21 750	3 508	19,2
		Lagenaria	66,7	22 460	25 470	7 010	31,2

CONCLUSIONS

1.Through grafting watermelons on the F1 hybrid of the species Lagenaria Macis syceraria grip ensures a degree of 100%.

2. The F1 hybrid Crisby have registered the highest values of photosynthesis in plants grafted under the protection and F1 hybrid Rica has used more than natural climatic conditions.

3. Fruits of watermelons have been growing in weight than those not grafted grafted plants and also slight increases in plants protected from the unprotected.

4. Whichever method of cultivation and hybrid plants used by grafting watermelons Macis the F1 hybrid were made the biggest productions.

5. The fruits of watermelons obtained from grafted plants was positively influenced the nutritional quality, most showing slight increase in percentage of components.

6. The higher profit was achieved by grafting of F1 hybrid Crisby syceraria Lagenaria (Macis F1) in the protected crop.

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CERCETĂRI PRIVIND MODIFICAREA SECREȚIEI ACIZILOR GRAŞI DIN LAPTE PRIN MODUL DE NUTRIȚIE

RESEARCHES REGARDING THE ALTERATION OF MILK FAT ACIDS SECRETIONS DUE TO NUTRITION

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Keywords: milk cows, fat, feed ratios

REZUMAT

Obiectivul prezentului studiu a fost determinarea efectelor suplimentării rațiilor vacilor performante cu uleiuri vegetale asupra cantității şi calității laptelui pentru procesare în cadrul S.C.D.A. Şimnic, precum și efectul tipului de furaj de volum, nivelul concentratelor şi al suplimentelor de uleiuri vegetale asupra cantității şi calității laptelui de vacă.

Descreşterea conținutului în C 16:0 poate fi făcută prin factori care inhibă sinteza acizilor graşi sau prin suplimentări cu uleiuri din semințe de rapiță sau floarea-soarelui sărace în acid palmitic. Adăugarea de săruri de calciu cu ulei de palmier a dus la creşterea conținutului în C 16:0 cu 12 mg.

ABSTRACT

The task of this study was to determine the effects of providing additional pet food for performant cows consisting of vegetal oils on the quantity and quality of the milk to be processed within S.C.D.A. Şimnic, as well as the effect of the type of volume pet food, food concentrates and vegetal oils supplements level on the quantity and quality of cow milk.

Decreasing the content in C 16:0 can be done through factors that inhibit fat acids synthesis or supplements of canola or sunflower oils which are poor in palmitic acid. Adding calcium salts with palm oils resulted in the increase of the content in C 16:0 cu 12 mg.

INTRODUCTION

The nutrition and the alimentation of the milk cows are the most important factors that can change the milk composition. Between the milk components, fat is the most variable component.

Adding fats to the ratios of the milk cows proved to be favourable for the percentage of the milk fats.

Milk fat has too much cholesterol comparing to the polyunsaturated fats. The milk acid is the main fat acid involved here. We are discussing about replacing this acid with unsaturated fat acids.

MATERIAL AND METHOD

The researches were accomplished on Holstein-Friesian cows inside the S.C.D.A. Şimnic zootechnical farm that weighted 650 ± 20 kg. Milking was executed twice a day. The milk composition was determined on milk samples brought from 4 consecutive milking actions a week, during 5 weeks.

The administrated fodders were:

- of volume: lucerne, winter fodder, Lollium multiflorum, silage corn, Sudan grass;
- concentrated: - energetic: corn, barley, wheat, tailings;
  - protean: soya, soya schrot, sun-flower, sunflower schrot;
- extras: sun-flower oil, soya oil, palm oil.

The collecting of the fodder samples was accomplished three times a week and suffered the following analyses:

- content in dry substance (DS), gross protein, starch, gross fat, carbohydrates soluble in water and ash.

RESULTS AND DISCUSSIONS

1. The influence of feeding on milk composition.

Nutrition and alimentation are the most important factors that can change the milk composition.

Mainly, the smoother and the more homogenously dispersed in milk are the components (lactose, hydro-soluble vitamins, macro-elements), the easier to influence they are. In exchange, the grosses and less dispersed components (fat, lipo-soluble vitamins and, in a smaller measure, protein) suffer a bigger influence (table 1).

Table 1

Influence of the food on the milk content in different compounds

Milk content in:	Influence of the food
Fat	++
Fat consistency	++
Protein	+
Lactose	(+)
Lipo-soluble vitamins	++
Hydro-soluble vitamins	0
Macro-elements	0
Micro-elements:	
- B, I, Mo	++
- Co, Al, Mn	+
- Zn, Pb, Cd, Se	(+)
- Fe, Ni, Cu, Cr	0
Smell and taste	++
Germs	(+)
Nitrates	+
Urea	++

++ - very big; + - certain; (+) - small; 0 - inexistent.

The quantity and the quality of the milk fat (the percentage of the fat acids) depend on:

- ruddy metabolism, respectively the AGV quantity and report;
- the quantity and the kind of the food fat;
- the energy and protein contribution to the ration.

The main factor that can change the going of the ruddy fermentations is represented by nutrition and alimentation, interfering by: the structure of the ratios, the contribution of the structural and non-structural compounds, the feeding technique, etc. and it can change both the AGV quantity and their ruddy percentage.

Adding fats of the ratios for the milk cows proved to be favourable to the percentage of milk fat. A better influence in this direction was the one of adding fats containing fat acids with short and medium chain and especially adding the so-called protected fats. In case of using the fat addition in the rations of the cows, we must limit the total proportion of the fats at 5-7 % of DS, and the added fats must come from oleaginous seeds or a mixture of vegetal and animal fats.

By adding fats, we may also change the composition in fat acids of the milk fats.

The protein milk content is harder to influence, comparing to the fat content. Still, it was proved the possibility to influence in certain limits (± 0,3 %), this content, especially by the level of the energy report and of the protein in the ratio (table 2).

Table 2

Influence of alimentation on the protein quantity in milk

Influence factor	The direction of changing the content
Protein deficit (<60% of the requirements)	Reduction
High protein contribution (>120% reported to the requirements	Increase
Concentrate contribution in the ration	Increase at the same time with the fat decrease %
High energy contribution (>110 % reported to the requirements)	Increase

The energy and protein level in the food also influences the milk content in casein (table 3) and, respectively, in urea (table 4).

Table 3

Influence of energy and digestible protein contribution on the content of protein and casein

% reported to the requirements		Content of gross milk		
Energy	**Digestible protein**	**Protein (%)**	**Casein (%)**	**SH* Index**
40	**55**	**2,62**	**2,08**	**5,6**
75	**81**	**2,85**	**2,18**	**5,8**
100	**100**	**3,28**	**2,51**	**6,3**
100	**135**	**3,29**	**2,48**	**6,5**
124	**139**	**3,35**	**2,60**	**6,4**

*Soxhlet-Henkel Index (normal 6,0-6,8)

Table 4

Milk content in urea, depending on the level of providing the energy and the protein in food

Level provided by the requirements (%)		Urea mrnol/l milk
Energy	**Proteins**	
100	100	4,4
100	80	3,9
100	120	4,9
80	100	5,6
80	120	6,1
120	100	3,3
120	80	2,8

The milk content in minerals and vitamins depends differently on food. Therefore, the content in macro-elements cannot be changed by food, in exchange the milk content in micro-elements reflects the provender content in the respective elements.

The vitamins lipo-soluble in milk vary in the same sense as the fats while the hydro-soluble vitamins do not depend on food.

Other properties featuring the milk quality such as smell, taste, the content in butyric germs and in free cells are more or less influenced by the alimentation.

The foreign small and taste of the milk may be generated by:

- inhaling the air in the shelter, its certain components that may arrive by blood in the mammary gland, respectively in milk;
- some compounds of the provender that, as such or after certain chemical changes, get to the digestive tube, by blood, in milk;
- diffusing in warm milk certain compounds existent in the air of the shelter;
- certain fodders (brassicaceae, fodder cole rape, beetroot leaves silage, silages with high content in butyric acid, etc.) are administrated after milking and they are not deposited in the shelter because they may influence the smell and the taste of the milk;
- the conifer leaves administrated in high proportions or frozen give tot he milk a peppery, smarting taste (as the cole rapes).

Milk content of germs and free cells is related to the udder health. The inflaming processes, such as mastitis, determine an increase of the free cells of the milk, of the albumins, globulins and of the residual nitrogen, respectively a decrease of the content of lactose, casein, Ca, P and vitamins.

Milk acidity (appreciated in ^{0}T or the number of SH - Soxhlet Henkel), outside the normal values leads to the prolongation of the coagulation time or even to the impossibility of the milk coagulation, in case of cheese preparation. The milk acidity depends both on certain latent or acute disorders (ketosis, acidosis) and on alimentation: energetic undernourishment, deficit of gross cellulose in ration, pronounced protein excess, disorder of the mineral balance, etc.

The nitrates level in milk depends on the one in food. For a NO_3 content bigger than 5g/kg DS of provender, the transfer in milk is very high, 25 mg NO_3/kg milk).

2. Changing the composition and the secretion of the fat acids in milk by food factors.

Decreasing the saturated fat acids.

The newly synthesized fat acids are saturated fat acids from C 4:0 to C 16:0, because delta 9 desaturase has a very small activity of the fat acids shorter than 18 carbons even if a small proportion of C 14:0 and C16:0 is unsaturated in C 14:1 and C16:1.

The fat acids with long chain (with 16 or more carbon atoms) are inhibitors of the synthesis of the mammary fat acids because of the inhibiting effect on the ACC activity.

If fat acids with long chain are available either from the ration, either from the mobilization of the fat tissue, then the percentage of the fat acids with medium chain is diminished (C 8:0 - C 14:0) or C 16:0 in milk fat. This happens because of the following causes:

- a big secretion of fat acids with long chain;
- newly synthesized fat acids and reduced quantities;
- the quantitative decrease of the acetate and of 3 HB.

The proportion of the acids C 4:0, C 6:0 and C 8:0 was changed by adding protected oils or by duodenal infusion (table 5).

The mobilization of the body fat increases to C 18:0 and C 18:1. The decrease of the fat acids from C 16:0 to C 18:0 is favourable to the human health.

The decrease of the content of C 16:0 may be made by factors that inhibit the synthesis of the fat acids or by adding oils of rape or sun-flower seeds poor in palmitic acid. Adding calcium salts with pal oil (770 g/day in 6 experimentations) has lead to the increase of the content of C 16:0 with 12 mg.

Linoleic acid. The use of certain quantities of vegetal oils encapsulated in foddering the animals leads to a milk fat rich in Linoleic acid (more than 35 % of the milk fat).

In the classic foddering with volume fodders without adding lipids to the Linoleic acid percentage in the milk fat is between 2-3 %.

Table 5

The effect of adding vegetal oils on the composition of the milk fat acids (g/100 g fat)

	Rape oil duodenal infusion		Encapsulated soya oil		Unprotected soya oil		Ca Salts + pal oil	
	Witness	+630 g/day	Witness	+630 g/day	Witness	+630 g/day	Witness	+630 g/day
C 4:0	3,0	3,1	1,4	1,7	3,1	2,8	2,9	3,3
C 6:0	2,2	2,3	1,8	1,5	2,7	1,7	2,0	2,5
C 8:0	2,1	2,3	1,0	0,8	1,7	1,3	2,0	1,8
C 10:0	4,4	4,1	3,3	2,1	4,0	1,9	4,2	3,4
C 12:0	4,8	4,7	4,0	2,2	4,5	2,3	5,1	3,8
C 14:0	12,2	10,8	12,2	7,1	12,9	8,7	12,0	10,4
C 16:0	33,7	26,2	29,0	17,5	32,2	23,9	31,6	33,3
C 18:0	7,6	7,7	13,4	15,3	11,2	12,9	6,5	7,3
C 18:1	18,1	23,3	24,6	32,8	23,6	38,9	19,6	23,0
C 18:2	1,9	6,4	7,6	16,2	2,2	3,2	2,8	2,8
C 18:3	0,2	2,8	1,9	3,0	-	-	0,2	0,2
Milk fat g/day	976	1047	930	1064	782	706	1065	1152

The linoleic acid. The increase of the linoleic acid quantity in the milk fat (with maximum 20 %) may be accomplished by protected oils with proteins treated with formaldehydes administrated in the animals ration.

With reasonable additions of protected oils, the milk linoleic acid reaches 6,4 %. The efficiency of the transfer of linoleic acid at the level of the milk duodenum is contained between 35-70 %. Grass is the main source of C 18:3.

Conjugated linoleic acid. Very many researches were accomplished on trans fat acids. This is for the fact that the isomers of the conjugated linoleic acid (CLA) favourably influence the human health (prevents cancer, arthrosclerosis, peroxidation of fats and of obesity, models the immune function).

CLA is an intermediary during the hydrogenation of the trans linoleic acid -11 C 18:1 – is the common intermediary in bio-hydrogenation of the linoleic acid and of α acid and linoleic γ (table 6).

Table 6

Food factors that affect the CLA fat content for milk cows

Decreased values: 0,2-0,8 %	Average values: 0,8-1,6 %	High values: > 1,6 %
Corn silage	Fresh grass	Rape oil
Grass silage (hay or pasture)	Rations poor in fibre	Soya oil
Vegetal saturated fats	Peanut oil	Sun-flower oil
Raw soya	Rape oil	Calcium salts with soya
Thermally treated soya	Soya oil	Fish oil

CONCLUSIONS

1. In case of using the fat addition in the cows ratios, we must limit the total fat proportion to 5-7 % of DS, and the added fats must come from oleaginous seeds or a mixture of vegetal and animal fats.

2. The protein content of the milk is harder to influence reported to the fat one. Still, it was proved the possibility to influence in certain limits (± 0,3 %) this content, especially by the level of the energy report and protein of the ration.

3. The macro-elements content cannot be changed by food, but the micro-elements content of the milk reflects the fodder content in the respective elements.

4. The vitamins lipo-soluble in milk varies in the same sense as the fats, while the hydro-soluble vitamins do not depend on food.

5. The milk content of germs and free cells is related to the udder health. The inflaming processes, such as mastitis, determine an increase of the free cells of the milk, of the albumins, globulins and of the residual nitrogen, respectively a decrease of the content of lactose, casein, Ca, P and vitamins.

6. The nitrates level in milk depends on the one in food. For a NO_3 content bigger than 5g/kg DS of provender, the transfer in milk is very high, 25 mg NO_3/kg milk.

7. The decrease of the content of C 16:0 may be made by factors that inhibit the synthesis of the fat acids or by adding oils of rape or sun-flower seeds poor in palmitic acid. Adding calcium salts with pal oil (770 g/day in 6 experimentations) has lead to the increase of the content of C 16:0 with 12 mg.

8. The use of certain quantities of vegetal oils encapsulated in foddering the animals leads to a milk fat rich in linoleic acid (more than 35 % of the milk fat).

9. The increase of the linoleic acid quantity in the milk fat (with maximum 20 %) may be accomplished by protected oils with proteins treated with formaldehydes administrated in the animals ration.

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CERCETĂRI PRIVIND INFLUENŢA HRĂNIRII PROTEICE ASUPRA PRODUCŢIEI DE LAPTE LA VACI

RESEARCHES REGARDING THE INFLUENCE OF PROTEAN FEEDING ON THE PRODUCTION OF COW MILKS

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Keywords: milk cows, concentrated forage, Spanish trefoil, green pea

REZUMAT

Cercetările au avut ca scop determinarea influenţ ei hrănirii vacilor de lapte cu lucernă ş i mazăre masă verde asupra cantităţ ii, dar mai ales a calităţ ii laptelui obţ inut. Deşi consumurile de masă verde sunt apropiate ca valoare, cantitățile de proteină consumate au fost ridicate. În funcție de furajul verde pe care animalele l-au primit în rație, producțiile nu s-au diferențiat semnificativ.

Calitatea laptelui ş i a grăsimii din lapte, la vacile luate în studiu, a fost în limite aproximativ normale pentru sezonul de vară, având un conţ inut ridicat de acizi graş i nesaturaţ i.

ABSTRACT

Researches had the purpose of determining the influence of milk cows feeding with Spanish trefoil and green pea on the quantity and especially on the quality of resulting milk. Although the consumptions of green forage are close in value, the amounts of consumed protein were high. Depending on the green forage that the animals received as a ratio, productions were not significantly different.

The quality of milk and milk fat in studied cows was within approximately normal ranges for the summer season, with a high content of unsaturated fat acids.

INTRODUCTION

The specialty literature mentions that the forage influence on the milk production and quality for cows usually varies depending on the composition of the rations that were administrated and also the manner the animals were subsequently fed.

The different nutritive value of the different forages may influence positively or negatively both the milk quantity daily obtained from a cow and its quality, in different milk components.

MATERIAL AND METHOD

The works were accomplished in 2009, in production conditions at S.C.D.A. Şimnic-Craiova, in May-June on Holstein-Friesen cows grouped in two almost equal batches depending on the age (6-8 years), lactations (4-5 years), lactation stage (the 3rd and 4th month) and the milk production.

Both the lucerne and the peas were sowed in different ages in order to provide high quality green meal during the entire experience.

The experience had place according to the following plan:

Batch	Preparing time (7 days)	Experimenting time (25 days)
I	***Green meal lucerne +*** Concentrate mixture	Green meal peas + Concentrate mixture
II	Green meal lucerne + Concentrate mixture	Green meal lucerne + Concentrate mixture

The concentrate mixture was administrated to the cows depending on the milk production and it was the same for both of the experiences (50 % roaring corn, 30 % barley and 20 % sun-flower schrot). The green meal was administrated raked, ad lib. The forages quantities given on the batches and also the tailings were weighted for each of them, their nutritive value being calculated depending on the valid norms.

The registration of the milk production and the determination of the fat and protein percentage were individually and daily executed. The cream samples for determining the fat quality were taken at the beginning of the experience, then in the 8th day, in the 15th day, and in the 25th day, two days in a row.

RESULTS AND DISCUSSIONS

1. Forages consumption.

The forage consumption of the cows in both of the batches during the experience is shown in table 1.

From the table data, it results that the animals received about 78 kg of lucerne and peas green meal, among which the tailings represented 9,8 % for the peas batch and 7,7 % for the lucerne batch. As a consequence, we found that the cows preferred rather lucerne than peas, even if the quantities of the consumed forages were equal (2,84 kg) for both of the batches. From here, it results the partial conclusion that shows a better consumption of the lucerne green meal by the cows, compared to the peas green meal, so a better palatability of this forage.

Table 1

Consumed forages (average kg/head/day)

Batch	Green meal (kg)			Concentrates (kg)	% of the nutritive value of the ration	
	Administrated	Rest	Consumed		Green meal	Concentrates
I	77,17	7,60	69,57	2,84	79,0	21,0
II	78,26	6,00	72,26	2,84	79,6	20,4

The consumption of forages, green meal and concentrates and also of nutritive unities and protein for 1 litre of milk obtained (table 2) was very close for both of the batches.

Table 2

Consumed forages for 1 litre of milk

Batch with	Green meal (kg)	Concentrates (kg)	U.N.	P.D. (g)
Peas(I)	5,01	0,205	0,82	143
Lucerne (II)	5,22	0,205	0,85	147

For both of the batches, we may notice the fact that even if the green meal consumptions are close as value, the consumed protein quantities were high, of 143 g for the peas batch and 147 g for the lucerne batch. Still, these values show that peas may substitute a big part of the protein necessary of the milk cows, in quantities as good as lucerne.

2. Milk production.

The quantitative milk production and also its fat and protein content are presented in table 3.

From the presented data, we found that for the peas batch the milk production/day/head was of 27,83 kg, and for the lucerne one of 28 kg/day, so productions that were not significantly different, depending on the green forage the animals had received in ration.

Regarding the fat and protein content, for both of the batches, we found no significant differences, neither in the preparing time, nor in the experimenting one. Thus, the fat percentage varied from 3,69-3,70 %, in both of the experiences periods and the protein one from 3,24-3,28 % .

Table 3

Average production of milk, fat and protein /head/day

Batch with:	Preparing time			Experimental time		
	Milk production	Fat %	Proteins %	Milk production	Fat %	Proteins %
	$\overline{X} \pm s_{\bar{x}}$	$\overline{X} \pm s_{\bar{x}}$	$\overline{X} \pm s_{\bar{x}}$	$\overline{X} \pm s_{\bar{x}}$	$\overline{X} \pm s_{\bar{x}}$	$\overline{X} \pm s_{\bar{x}}$
Peas	27,83±0,205	3,69 ± 0,194	3,28± 0,213	28,87±0,174	3,70± 0,244	*3,24± 0,214*
Lucerne	28,0 ± 0,197	3,70 ± 0,183	3,26 ± 0,212	28,82 ± 0,229	3,69 ± 0,244	*3,28± 0,297*

From the accomplished calculations, it resulted that the milk caloric value was also close and varied between 689-705 Kcal/l milk.

3. Milk fat quality.

The physical-chemical constants of the milk fat of the two batches fed with peas and lucerne green meal are shown in table 4.

Table 4

Fat quality

Batch with	Preparing time				Experimental time			
	Acidity	**Melting ^{0}C**	**Refraction**	**Iodine**	**Acidity**	**Melting ^{0}C**	**Refraction**	*Iodine*
Peas	**1,20**	**28,5**	**44,0**	**39,27**	**1,20**	**30,2**	**43,3**	*36,09*
Lucerne	**1,20**	**28,5**	**44,1**	**39,17**	**1,20**	**30,1**	**43,6**	*37,27*

Thus, we found that when the cows were fed with the same lucerne green meal, there were no differences at the qualitative fat indexes between the two periods, the preparing one and the experimenting one.

Still, due to the meteorological conditions in June 2009, when the environmental temperature was over 18^{0}C, we found a change of the refraction index and of the iodine index with about 5 % and respectively, 6 %, under the normal milk values.

I mention that Jonhson (1984) and Richoardson (1978) shown that the high temperatures of the environment associated with high humidity produce changes in the chemical composition of the milk fat.

In the proper experimental period, for the peas batch we found certain changes of the physical-chemical qualities of the milk fats. Thus, the unsaturated fat acids and the refraction index decreased (from 44,0 to 43,3), but the melting temperature increased from 28,5^{0}C to 30,2^{0}C. The decrease of the iodine index from 39,17 to 36,09 is explained by hurrying the vegetation phase of the green meal because of the summer high temperatures.

CONCLUSIONS

By analysing and comparing the results obtained for the cows in the two batches fed with lucerne and peas green meal, we may delimit the following conclusions:

1. The cows would rather consume the lucerne green meal than the peas green meal, the tailings difference between them being 1,60 kg/cow/day.
2. The animals foraged with peas green meal had actually the same quantitative milk production as the ones fed with green lucerne.
3. The quality of the milk obtained from the cows fed with peas was close to the one of the milk of the cows fed with lucerne. The observed and determined differences were statistically insignificant.
4. The fat quality of the milk of the cows fed with peas green meal was like the one of the cows fed with lucerne, in approximately normal limits for summertime, with a high content of unsaturated fat acids.

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EFECTELE UTILIZARII INGRASAMINTELOR LA CULTURA DE GRAU

THE EFFECTS OF USING FERTILIZERS TO WHEAT CROPS

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Keywords: fertilizers, efficiency, nitrogen

REZUMAT

Este extrem de important a realiza optimul economic în administrarea îngrăşămintelor. Pe plan mondial se folosesc "coeficienții de răspuns" ai îngrăşămintelor, materializați în cantitatea suplimentară de produse obținute la kg de supliment de produs fertilizant. Aceasta oscilează între 8 şi 12 kg la cereale. Deşi se realizează sporuri de producție, costurile respective rămân prohibitive, mai ales pentru țările tributare importurilor. Grâul de toamnă se numără printre culturile agricole care reacționează pozitiv la aplicarea îngrăşămintelor în toate condițiile pedoclimatice din România.

ABSTRACT

It is extremely important to achieve optimum economic fertilizer management. Worldwide use "response factors" of fertilizers, resulted in an additional quantity of products produced per kg fertilizer product supplement. It varies between 8 and 12 kg of cereals. While production increases are achieved, these costs remain prohibitive, especially for import dependent countries. Among winter wheat crops are reacting positively to the application of fertilizers in all climatic conditions in Romania.

INTRODUCTION

The need to increase agricultural production through the use of chemical fertilizers is derived from the objective requirements of social development. Irrational use of chemical fertilizers requires studying the interaction between plants, soil and environmental conditions, analysis of soil fertility status, the establishment of chemical fertilizers. Content in soil N, P and K, the main elements involved in the nutrition of agricultural plants is much less than their requirements for obtaining higher production of quantitatively and qualitatively. Export of nutrients from the soil taken by plants with production, especially in the last 20 years was slightly offset by the application of fertilizers. Harmonization of ecological factors, rational use and improvement of physical, chemical and biological soil, stimulating the development of income can be achieved by applying new technologies in which the principal element mineral fertilization. Knowing the effects of chemical fertilizers for cereals and industrial crops, depending on climatic conditions, the dose ratio of fertilizer and nutrients, allows determining the amounts to be allocated judiciously to achieve optimal economic effect, a higher quality of production and viability in terms of energy crops. The results covered by this paper aims to contribute to useful information for economic and energy efficiency for wheat in the specific conditions of experimentation. In this regard, the following are the objectives of the research conducted succinctly:

- Determination of total crop growth and average growth due to unilateral application of compound fertilizers based on phosphorus and nitrogen.
- Effect of NP fertilizers on economic efficiency.

- Effect of NP fertilizers on energy efficiency.

MATERIAL AND METHOD

Experimental data for wheat crop came from Trajan's Valu Research Station. Experiences led technical, economy and energy efficiency of culture in terms of agrofond 80 kg. P2O5/ha and increasing doses of nitrogen (V1 - 0 kg N / ha, V2 - 60 kg N / ha, V3 - 120 kg N / ha, V4 - 180 kg N / ha).

RESULTS AND DISCUSSIONS

The data presented in Table 1 clear that under a complete and correct application technologies and normal natural conditions, with 80 kg phosphorus per hectare could be obtained an output of 3890 kg / ha.

Economic results of such a level of production are as follows. Total expenditures are for 1900 lei per hectare, is still lower as a result of reduced fertilizer use. The cost of a kilogram of wheat production reached 0.49 lei, and one kilogram is profit to 0.16 lei, in a price of only 0.65 lei per one kilogram of wheat in 2007. In connection with this price, we should mention that he did not fully reflect supply and demand of wheat in 2007.Thus the average price of wheat was 0.65 euro / kg, while a kilo of flour can reach 3 lei. So, it was encouraged or supported producer who wins (still a good production 3890 kg / ha) only 33% of expenses incurred or 0.16 lei per kilogram of wheat, while three intermediaries between the manufacturer and located consumer - wheat buyer, who turns wheat into flour and bread manufacturer, including one who sells it - get a net income of at least 3 lei per kilogram of wheat, so over 18 times more than the manufacturer. From this came exaggerated, some would be re-distributed or shared with the producer in the form of grants.

Another reason to consider the price as unusual, in determining which were not taken into account the principles or the rigors of the market economy is that in 2006 when the price of wheat was 0.50 lei, in 2007 the price of materials used and agricultural work have increased by at least 40% over the previous year, while wheat prices rose by only 30%, which was a part of farmers, especially those who had lower yields, to lose this culture. In terms of energy consumed and energy produced, the situation is different in a positive way. I mean, all materials used, all mechanical work done by human strength or converted into energy units per hectare amounts to 2984 kWh.

Consumption is low because they did not use nitrogen, which has a very high ratio compared to other materials or energy forces. To obtain a kilogram of nitrogen active substance is consumed 25.7 kWh.

In these circumstances this level of technology and production of grain production was obtained at an energy equivalent of 17,505 kWh. Net energy balance or energy is 14,521 kWh per hectare, with an efficiency of 5.86. That is, energy consumed per unit of 5.86 units were obtained. This is proof that agriculture is not much energy as it would appear as large quantities of oil consumed in the form of diesel for agricultural work performance, but is a big energy producer. In addition to the energy stored in grains, it can get a significant amount of secondary energy. Thus, on average, one hectare of wheat production to obtain a secondary layer of straw, which produces energy equivalent to 1200 liters of oil or 13,000 kWh.To present a more complete picture, the energy consumption per hectare and per tonne was calculated and Mega Mega Joule and Calories.

In other technological options were used constant doses of phosphorus (80 kg / hectare to) and increasing doses of nitrogen (60, 120 and 180 kg. / To per hectare). In the version with 60 kg nitrogen, growth of production was 1020 kg / ha. So one kg of nitrogen were obtained 17 kg of wheat, which substantially increases the economic efficiency of these inputs.

Production increased by 26.2% as per hectare production cost was reduced from 0.49 lei to 0.45 lei per kilogram. Profit rose to 0.20 per kilogram lei per hectare profit increased 55% and the profit rate increased from 33.07% to 44.18%. In terms of energy, what interests us most is the energy or net energy balance, which increased from 17 505 kWh / ha to 22 095 kWh / ha.

Of course, the energy consumed per hectare increases due to nitrogen use. Why is the energy consumed per tonne increase energy efficiency is reduced, but this apparently unfavorable evolution of these indicators is far surpassed by reducing the cost of energy units consumed.

So technological efficiency correlates with energy efficiency and value. That is, the increase produced decreases production costs, increase profits, and increase net energy per hectare, reduced cost of energy units consumed and increase the value of units produced. In terms of cost of a unit of energy consumed is noted that energy consumption increases as its cost decreases, although not related to yields, declined to say that due to increasing production cost.

In this case, the phenomenon is caused by the increase of nitrogen, which has a high coefficient per kilogram. For example, nitrogen per kilogram S.A. return 25.7 kWh and the price is 0.6 lei/ kg to In a technology with 120 kg nitrogen / ha and it costs 72 lei represents 2.87% of total expenditure and 50% of total energy consumption per hectare. So, nitrogen is to increase energy consumption per hectare, which reduces cost. At the same time, the cost of energy units produced is at a much lower and decreases more nitrogen variants.

Once again be stressed that energy from agriculture, besides that it has a special use value as food for human existence, is much cheaper, at least for wheat production. On doubling the amount of nitrogen, ie 120 kg to per hectare, in variant 3 (V3), increased production reached 1980 kg / ha, achieving a 50.9% increase.In this case the cost fell to 0.42 euro / kg per kilogram profit rose to 0.23 lei. Net profit rose to 1312 lei per hectare, compared to nitrogen-free technological variant (V1) the difference being 683.5. The profit rate reached 52.4%. And if this alternative energy use per hectare and per tonne increase energy efficiency decreases as a result of doubling the amount of nitrogen, but the net energy increase from 17,506 kWh to 20,193 kWh. In version 4 with 180 kg S.A. nitrogen per hectare, increased production reached 2430 kg / ha increased by 62.5%. So growth is not growth in the proportion of variants 2 and 3 but shows an increase in economic and energy efficiency.

In version 2 with 60 kg nitrogen, the increase was 1020 kg / ha, 17 kg wheat back to 1 kg nitrogen. In version 3 the increase was 1980 kg wheat, returning 16.5 kg wheat 1 kg nitrogen, and variant 4 was 2430 kg gain, returning 13.5 kg wheat 1 kg nitrogen. Another calculation shows that in version 3 with 60 kg nitrogen addition (the difference between V3 and V2 version is 60 kg nitrogen) were produced only 960 kg wheat, 1020 kg compared to those obtained with only 60 kg in version 2, for 16 kg of wheat for 1 kg nitrogen per hectare as production increases and 1 kg nitrogen very close. But, to triple the amount of nitrogen, its effect starts to decrease, so that the third quantity of 60 kg nitrogen to obtain an increase of only 450 kg per hectare and 7.5 kg wheat per 1 kg of nitrogen variant 3.

In total, 180 kg nitrogen, however, increased production from 62.5% came from version control (without nitrogen), and 1 kg nitrogen and 13.5 kg wheat were made, which resulted in the reduction of production cost and increase profit porphyria rate. In terms of energy indicators, applying fertilizer consumption per hectare is increasing, consumption per tonne increase energy efficiency decreases. But what is most important, expressing the energy efficiency indicators are positive. This increases the energy produced per hectare, net energy increase and the cost of consumed energy unit also decreases.

Table 1

Economic indicators and energy to wheat crop

Nr. crt.	Specification	U.M.	P_2O_5 80kg/ha			
			V1 - No	V_2 - N_{60}	V_3 - N_{120}	V_4 -N_{180}
1.	Average production	kg/ha	3890	4910	5870	6320
2.	Increased production	kg/ha	-	1020	1980	2430
		%	100	126.2	150,9	162,5
3.	Expenditures	lei/ha	1653,00	1925,74	2178,04	2304,18
4.	Labor expenses	lei/ha	80,75	89,20	101,39	105,65
5.	Other expenses (indirect)	lei/ha	166,25	198,56	224,07	231,37
6.	Total production expenses	lei/ha	1900,00	2213,50	2503,50	2641,20
7.	Production cost	lei/kg	0,49	0,45	0,42	0,41
8.	Profit per kg	lei/kg	0,16	0,20	0,23	0,24
9.	Profit per ha	lei/ha	628,50	978,00	1312,00	1466,80
10.	Price per kg	lei/kg	0,65	0,65	0,65	0,65
11.	The value of grain production	lei/ha	2528,50	3191,50	3815,50	4108,00
12.	Profit rate	%	33,07	44,18	52,40	55,53
13.	Productivity labor	days-p/ha	3,35	3,70	4,20	4,40
		hours-p/t d.c.	6,88	6,03	5,72	5,56
		hours-mec./ t	3,65	2,95	2,65	2,40
14.	Consumption fuel (diesel)	l/ha	64,30	69,30	75,60	78,50
		l/t	16,50	14,11	12,87	12,42
15.	Energy consumption per hectare	kWh	2984	4589	6222	7792
16.	Energy consumption per tonne	kWh	767	935	1060	1233
17.	Energy from grain production	kWh /ha	17505	22095	26415	28440
18.	Energy balance (net energy)	kWh /ha	14521	17506	20193	20648
19.	Energy efficiency	eg. obt./ eg.cons.	5.86	4,81	4,24	3,65
20.	Energy consumption per hectare	Mj	10748	16529	22411	28066
21.	Energy consumption per tonne	Mj	2763	3366	3818	4440
22.	Energy consumption per hectare	Mcal.	2405	369	5015	6280
23.	Energy consumption per tonne	Mcal.	618	753	854	993

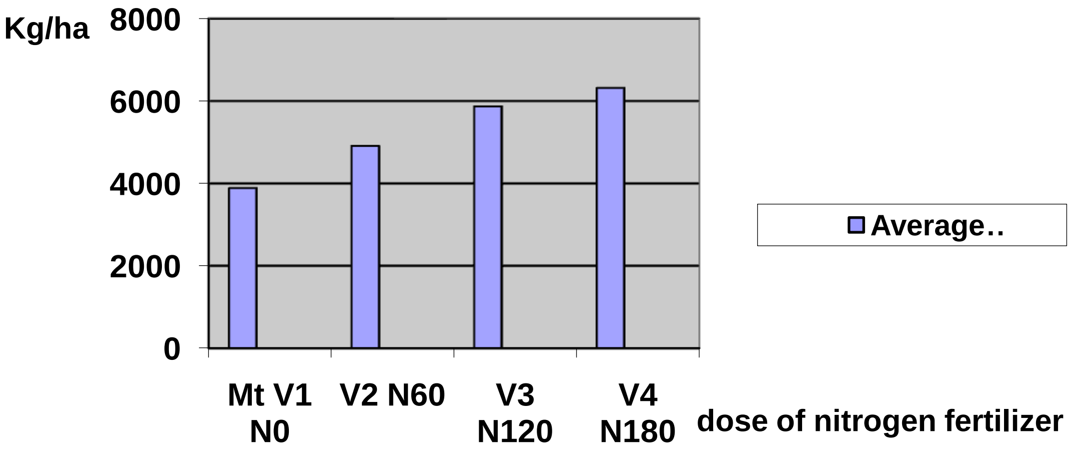

Figure 1 Average wheat production in S.C.D.C.I. "Valu lui Traian"

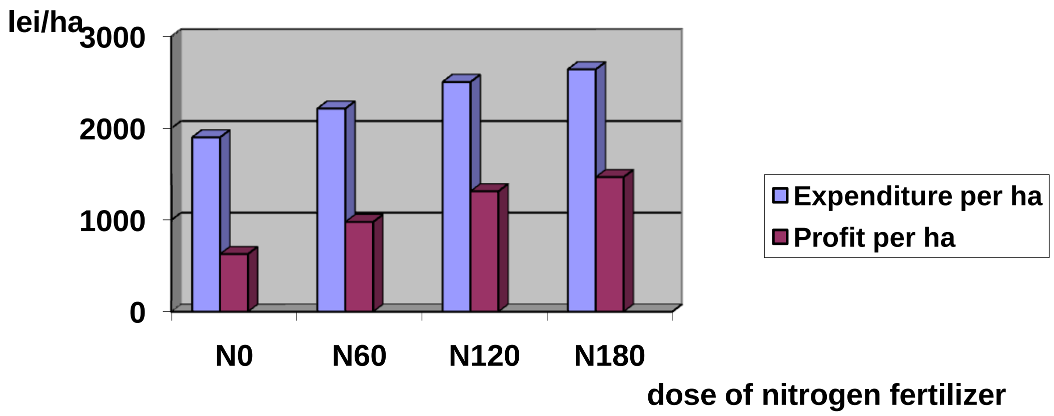

Figure 2 Expenditure and profit recorded in S.C.D.C.I. "Valu lui Traian" for wheat crop

CONCLUSIONS

In terms of a complete technology, properly applied chernozem Dobrogea, constant background of P2O5 (80 kg / ha) and increasing doses of N (0 –180 kg / ha), production increased from 3890 kg / ha to 6320 kg / ha to 1 kg N resulting in 13.5 kg of wheat. This resulted in cost reduction production (from 0.49 to 0.41 euro / kg), increased profit (from 0.16 to 0.24 euro / kg) and the profit rate (from 33.07 to 55.53%). At the same time, the energy balance increased (from 14,521 to 20,648 kWh / ha), energy efficiency fell (from 5.86 to 3.65). Results obtained on individual farms and companies highlighted situations advocates - from economically - to cultivate wheat on large surfaces and can also ensure complete and modern technologies, which lead to obtaining high yields with low cost, that cost.

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INFLUENȚA ÎNGRĂŞĂMINTELOR ASUPRA NIVELULUI ŞI CALITĂȚII PRODUCȚIEI DE FLOAREA-SOARELUI

INFLUENCE OF FERTILIZERS ON LEVEL AND QUALITY OF SUNFLOWER PRODUCTION

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Keywords: sunflower, efficiency production, fertilizers, quality

REZUMAT

Efectul aplicarii îngrăşămintelor cu azot şi fosfor asupra producției de floarea soarelui a fost studiat pe un cernoziom din Câmpia Romana şi a evidențiat rolul hotărâtor al îngrăşămintelor minerale asupra culturii de floarea soarelui, in 2007. Am lărgit sfera de interpretare a rezultatelor prin calcularea - sub aspectul consecințelor, privite din punct de vedere tehnic - a sporului total de producție la hectar şi a sporului mediu pe kg de s.a. aplicat.

ABSTRACT

Effect of applying nitrogen and phosphorus fertilizers on sunflower production was studied in a mold of the Romanian Plain and highlighted the crucial role of mineral fertilizers on sunflower crop in 2007. We expanded the scope of interpretation of the results by calculating - in terms of consequences, viewed from a technical standpoint - to gain total production per hectare and average gain per kg to applied.

INTRODUCTION

Although sunflower is a great consumer of nutrients, fertilizers recovered less directly administered, compared with wheat or other plants root system fasciculated (Saric, 1972). She recovered very well, the effect of fertilizers applied in previous years especially if they were given optimal doses in terms of technology, nutrients inaccessible due to pivoting root system is developing very much in depth reaching 2 feet deep, and because that the root of sunflower has many root hairs, something that allows it to have a great capacity to absorb water and nutrients from the soil. Yet the sunflower crop, as indeed for most crop plants, chemical fertilizers have an important role in obtaining high yields and high quality. Knowing the effects of chemical fertilizers for cereals and industrial crops, depending on climatic conditions, the dose ratio of fertilizer and nutrients, allows determining the amounts to be allocated judiciously to achieve optimal economic effect, a higher quality of production and viability in terms of energy crops.

MATERIAL AND METHOD

For sunflower crop cultivation technology has been respected for irrigated conditions, the experimental factors as nitrogen and phosphorus. Method of settlement of the experience is two-factor method subdivided parcels in six repetitions, experience and twenty-five variants including the application of nitrogen and phosphorus.

Factor A - PHOSPHORUS (Kg P2O5/ha):	Factor B = NITROGEN (Kg N/ha):
a1 = 0 kg/ha	b1 = 0 kg/ha
a2 = 40 kg /ha	b2 = 40 kg/ha
a3 = 80 kg/ha	b3 = 80 kg/ha
a4 = 120 kg /ha	b4 = 120 kg/ha
a5 = 160 kg/ha	b5 = 160 kg/ha

Phosphorus is applied as superphosphate focused entirely fall, prior to plowing, and nitrogen is applied in two phases: the preparation and carrying out land praşilelor. Production was determined to complete baking of the sample obtained by weighing the two middle rows of the plot, after winnowing and conditioning parameters STAS physical purity, reporting per hectare was at 9% humidity.

RESULTS AND DISCUSSIONS

Effect of applying nitrogen and phosphorus fertilizers on sunflower production was studied in a mold of the Romanian Plain (Marculesti) and highlighted the crucial role of mineral fertilizers on sunflower crop in 2007. We expanded the scope of interpretation of the results by calculating - in terms of consequences, viewed from a technical standpoint - to gain total production per hectare and average gain per kg to applied. We also proceeded to the economic assessment, calculating a reasonable set of indicators, which allowed broadening in economic interpretation, effect of nitrogen fertilizer, phosphorus fertilizer, and various combinations on the sunflower crop. Research undertaken in Baragan Plain - allowed the selection of 25 technological variants grouped as follows: V1 - unfertilized control variant variants V2 - V5 - that factor is studied by nitrogen fertilizers, four leveling of graduation (N40 - N160 kg.sa / ha) variants V6 - V9 - the factor is studied with phosphorus fertilizers, with four levels of graduation (P40 - P160 kg as / ha) variants V10 - V25 - the same graduations of the two factors taken in various combinations. In unfertilised control variant - production was 1883 kg / ha demanding effort 1559.99 lei / ha resulting in total revenues of 1694.70 lei / ha. The cost of technology was a result of 0.828 lei / kg and gross margin of 439 lei / ha.

Unilateral action of factor four levels of nitrogen resulted in production increases graduation ranging from 197 kg / ha (V2-N40) and 511 kg / ha (V5 - N160), respectively from 10.46 to 27.13%. Application of nitrogen caused a significant increase compared to the control of all four variants fertilized. Total effort in technological costs (variable) - reflect increases ranging from 7.89 to 34.69% due to high fertilizer costs and application materials. It appears that the growth rate of total economic effort (7.89 to 34.69%) is higher than the growth effect of product value (from 10.46 to 27.13%). Technical efficiency of nitrogen use factor is expressed by the average gain per unit factor, which is reduced from 4.92 kg sunflower seed / kg N was applied V2 - N40 at 3.19 kg sunflower / kg N was in V5 - N160. It expresses the possibility of converting the factor N in different doses of the sunflower crop. Economic efficiency of nitrogen utilization factor is reflected in the indicator cost synthetic technology. Lowering cost of production compared to the control occurs in V2, V3 and V4, the largest drop being 3.02% in V2 and up from 3.14% in V5 blank. Gross margin recorded the following values: 517.2 lei (V2), 545.74 lei (V3), 523.28 lei (V4) and V5 463.2 lei, the highest value occurring in V3, 24,31% compared to the control.

Gross profit rate at an estimated selling price of 0.9 lei / kg sunflower, the lowest recorded value of 5.4% in variant V5, and the highest rate of 12% was recorded for the V2 version. They conclude that the rate of return, as one of the main indicators of economic efficiency, economic conversion points they provide important nitrogen use sunflower and that the most favorable in this regard is the appropriate dose V2 N40 kg as / ha for the circumstances.

Influence factor unilateral graded in four levels of phosphorus allocation and additionally reflects the total effect on output ranging between 12.05% and 25.75%, the highest value in the V9-P160 (Table 2). What is the average gain one kilogram S.A. phosphorus fertilizer is reduced from 5.67 kg sunflower oil / kg to P V6 - P40 to 3.03 kg in V9-P160. A reduction in the conversion factor of almost 1.8 times P to the V6. The production cost for variant V7 reduces by 7.6% compared to the control - not fertilized, and the variants V6, V8 and V9 registered cost is close to a witness, but less than its value.

Gross margin recorded the largest increase of 44.53% in V7 - P80, 634.51 value of lei per hectare, compared to the control which shows value of 439 lei / ha. Highest gross profit was recorded at V7 and was valued at 310.16 Euro / ha, with 130.24% higher than for the profit level of the control variant. Profit rate on all variants fertilized with phosphorus doses exclusive profit outpaced registered version control, the largest being found in variant V7 (17.6%).

Research conducted on the combined effect of nitrogen and phosphorus fertilizer for sunflower, for 2007, led to reveal the following issues (Table 3).

• Under the technical aspect of the cumulative effect produced by increasing doses of nitrogen agrofond P40, representing 22.99 to 41.52% from unfertilised variant values the largest occurring in combinations and P40N160 P40N120-V12-V13.
• Economically, total expenditure increased from 14.87% to 38.98% for V10 and V13 from version control, driven in particular by increased material costs. Revenues per hectare due to the combination of interaction factors increase from 22.99 to 41.52% compared to the control.
• In terms of technical efficiency - in case of application of fertilizer with nitrogen - to graduate from 40 kg / ha to 160 kg as / ha on a P40 phosphor agrofond constant is found that:
• average gain per kg of nitrogen S.A. is variable and is reduced from 5.15 kg in sunflower at 3.46 kg in V13 V10;
• Average growth rate for total nitrogen and phosphorus fertilizers applied to ensure most favorable conversion factors 5.41 kg / kg to applied V1 - P40N40.
• In terms of economic efficiency, lowest cost technology (93.47% compared to the control) is performed in the V10-V11-P40N80 P40N40 and followed by the V12 and V13 which underlines the marked influence on the cost of the factors investigated.
• Gross margin increases ranging from 35.83% recorded in the V13 - P40N160 and 50.71% in the V11 - P40N80.
• The gross profit rate increased most of the variants V10 and V11, namely 16.3%.
• Technical and economic efficiency indicators emphasize the high level efficiency of nitrogen and phosphorus combination of factors, with a maximum at v11 - P40N80. Combination of increasing nitrogen doses on P80 agrofond (variants V14-V17) in the technical cause greater effects from combinations discussed above, increased production falling from 34.09% to 52.84% in V14 and v17, with increases exceeding 10 to 12% on most of the variants V10, V13 (with graduations same factor but agrofond nitrogen P40).
• In terms of expenditure, it is increasing by 21-45% to 14-39% in previous versions (on agrofond P40).
• The technical conversion of combinations of two factors is reduced from 5.65 kg per kg N to sunflower 3.61 kg in the V14 to V17, average gain per kg decreases fertilizer was applied at 5.35 kg sunflower in V14 - at 4.14 V17 kg.

* Cost of technology is slightly lower values compared with agro P40. Combinations of the variants V14, V15 and v17 provides the technological limits of cost reduction, by 5% to 9.79% in v17 V14 and V15, compared to the control.

* Gross margin high values and increases from 59% to 75% compared to the control. Absolute record high profit (V15 - 416.47 Euro / ha, v17 - 326.21 Euro / ha), marked by large increases, significant compared to the control, which expresses the most favorable combinations of the two economic conversion factors namely P80N80 review - V15.
• The profit rate was between 14.40 and 20.40%. Combining the same dose of nitrogen in increasing the agrofond P120-V18-V21 variants determined in the technical effects of the combinations higher than the P80 agrofond, increased production is between 36% and 54% for N160 N40, which represents growth of production 1-3% compared to similar combinations on agrofond P80. In terms of total expenditure recorded increases ranging between 26-50% compared to the control, due to high consumption of fertilizers, by 5-6% higher than agrofond P80 variants. Combination of factors determined the effect of income and prices registered increases ranging between 36-53% compared to the control unfertilised. Technical conversion of the combination embodied in the two growth factors Average per kg was applied is reduced from 4.47 kg sunflower in V19, the 3.61 kg V21.
• Technology cost values are higher than previously considered agro P80. N80P120-V19 combination provides the lowest cost technology - with 7.86% lower compared to the control.
• Gross margin recorded higher values ranging from 69.04% to 47.25% in V19 and V21, compared with controls.
• Gross profit rate ranged between 17.90% and 11.30% for variant V19 to V21.
• The combination of increasing doses of nitrogen on agrofond P160 (V22-variants V25), results in production increases ranging from 37.38 to 54.43%.
• In terms of expenditure, they recorded increases ranging from 31% and 55%, 5.5% higher than P120 variants examined in the agro and 10.5 to 11.5% higher than P80 agro variants analyzed, because consumption of factors.
• Average growth rate per kg was applied is reduced from 4.21 kg per kg sunflower S.A. applied to 3.20 kg in V25 to V23.
• Technology cost values are between 0.762 lei / kg and the V23 0.832 lei / kg V25, recorded at the cost of production surpassed only unfertilised variant V25. The profit rate recorded values ranging between 18% and 8.2% V23 V25, only the last variant is under the control value obtained.

Table 1

Influence of nitrogen fertilizer on sunflower production and technical and economic consequences

Indicators	U.M.	V1 Mt	V2 N-40	V3 N-80	V4 N-	V5 N-
Production	Kg/ha	1883	2080	2260	2350	2394
	%	100	110,46	120,02	124,80	127,13
Total growth	Kg/ha	-	197	377	467	511
	%	-	10,46	20,02	24,80	27,13
Average gain	Kg/kg s.a.	-	4,925	4,71	3,89	3,19
Production value	lei	1694,70	1872,00	2034,00	2115,00	2154,60
The main production	lei	1694,70	1872,00	2034,00	2115,00	2154,60
Grants	lei	264,0	264,0	264,0	264,0	264,0
Gross product	lei	1958,70	2136,00	2298,00	2379,00	2418,60
Total expenditure	lei	1559,99	1671,21	1820.46	1934,46	2044,28
The main production	lei	1559,99	1671,21	1820,46	1934,46	2044,28
Variable Expenses	lei	1255,70	1354,80	1488,26	1591,72	1691,40
Raw materials and supplies	lei	370,92	455,72	540,52	625,32	710,12
Sowing and planting stock	lei	100,00	100,00	100,00	100,00	100,00
Chemical fertilizers	lei	0	84,80	169,60	254,40	339,20

Pesticides	lei	270,92	270,92	270,92	270,92	270,92
Expenses mechanized	lei	807,93	810,81	847,05	854,21	857,71
Supply Expenditure	lei	37,09	45,57	54,05	62,53	71,01
Insurance	lei	39,76	42,70	46,64	49,66	52,56
Fixed Expenses	lei	304,29	316,41	332,20	342,74	352,88
Taxable income	lei	134,71	200,79	213.54	180,54	110,32
Taxes	lei	21.55	32.13	34,17	28,89	17,65
Net income + grants	lei	377,16	432,66	443,37	415,65	356,67
Gross profit rate	%	8,6	12,0	11,7	9,3	5,4
Net profit + subsidy rate	%	24,2	25,9	24,3	21,5	17,4
Gross margin	lei	439	517,2	545,74	523,28	463,2
Cost of production	lei/kg	0,828	0,803	0,805	0,823	0,854
Estimated price recovery	lei/kg	0,900	0,900	0,900	0,900	0,900

Table 2

Influence of phosphorus fertilizer on sunflower production and technical and economic consequences

Indicators	U.M.	V1 Mt	V6 P-40	V7 P-80	V8 P-120	V9 P-160
Production	Kg/ha	1883	2110	2299	2353	2368
	%	100	112,05	122,09	124,96	125,75
Total growth	Kg/ha	-	227	416	470	485
	%	-	12,05	22,09	24,96	25,75
Average gain	Kg/kg s.a.	-	5,67	5,2	3,91	3,03
Production value	lei	1694,70	1899,00	2069,10	2117,70	2131,20
The main production	lei	1694,70	1899,00	2069,10	2117,70	2131,20
Grants	lei	264,0	264,0	264,00	264,00	264,00
Gross product	lei	1958,70	2163,00	2333,10	2381,70	2395,20
Total expenditure	lei	1559,99	1665,36	1758,94	1840,29	1918,11
The main production	lei	1559,99	1665,36	1758,94	1840,29	1918,11
Variable Expenses	lei	1255,70	1349,72	1434,59	1508.41	1579,04
Raw materials and supplies	lei	370,92	429,72	488,52	547,32	606,12
Sowing and planting stock	lei	100,00	100,00	100,00	100.00	100,00
Chemical fertilizers	lei	0	58,80	117,60	176,40	235,20
Pesticides	lei	270,92	270,92	270,92	270.92	270,92
Expenses mechanized	lei	807,93	834,48	852,20	859,19	863,09
Supply Expenditure	lei	37,09	42,97	48,85	54,73	60,61
Insurance	lei	39,76	42,55	45,02	47,17	49,22
Fixed Expenses	lei	304,29	315,64	324,35	331,88	339,07
Taxable income	lei	134,71	233,64	310,16	277,41	213,09
Taxes	lei	21.55	37,38	49,62	44,39	34,09
Net income + grants	lei	377,16	460,26	524.54	497,02	443,00
Gross profit rate	%	8,6	14,00	17,6	15,1	11,1
Net profit + subsidy rate	%	24,2	27,6	29,8	27,0	23,1
Gross margin	lei	439	549,28	634,51	609,29	552,16
Cost of production	lei/kg	0,828	0,789	0,765	0,782	0,810
Estimated price recovery	lei/kg	0,900	0,900	0,900	0,900	0,900

Table 3

Influence of nitrogen and phosphorus fertilizer on sunflower production and technical and economic consequences

Indicators	U.M.	V1 Mt	V10 P40N40
Production	Kg/ha	1883	2316
	%	100	122,99
Total growth	Kg/ha	-	433
	%	-	22,99
Average gain	Kg/ kg s.a.	-	5,41
Production value	lei	1694,70	2084,40
The main production	lei	1694,70	2084,40
Grants	lei	264,0	264,0
Gross product	lei	1958,70	2348,40
Total expenditure	lei	1559,99	1791,99
The main production	lei	1559,99	1791,99
Variable Expenses	lei	1255,70	1462,74
Raw materials and supplies	lei	370,92	514,52
Sowing and planting stock	lei	100,00	100,00
Chemical fertilizers	lei	0	143,60
Pesticides	lei	270,92	270,92
Expenses mechanized	lei	807,93	850,88
Supply Expenditure	lei	37,09	51,45
Insurance	lei	39,76	45,89
Fixed Expenses	lei	304,29	329,25
Taxable income	lei	134,71	292,41
Taxes	lei	21.55	46,79
Net income + grants	lei	377,16	509,62
Gross profit rate	%	8,6	16,3
Net profit + subsidy rate	%	24,2	28,4
Gross margin	lei	439	621,66
Cost of production	lei/kg	0,828	0,774
Estimated price recovery	lei/kg	0,900	0,900

Table 3 (continuation)

Indicators	U.M.	V11 P40N80	V12 P40N120	V13 P40N160	V14 P80N40	V15 P80N80	V16 P80N120
Production	Kg/ha	2510	2620	2665	2525	2728	2815
	%	133,29	139,13	141,52	134,09	144,87	149,49
Total growth	Kg/ha	627	737	782	642	845	932
	%	33,29	39,13	41,52	34,09	44,87	49,49
Average gain	Kg/ kg s.a	5,22	4,60	3,91	5,35	5,28	4,66
Production value	lei	2259,00	2358,00	2398,50	2272,50	2455,20	2533,50
The main production	lei	2259,00	2358,00	2398,50	2272,50	2455,20	2533,50
Grants	lei	264,00	264,00	264,00	264,00	264,00	264,00
Gross product	lei	2523,00	2622,00	2662,52	2536,50	2719,20	2797,50
Total expenditure	lei	1942,51	2058,32	2168,22	1887,39	2038,73	2152,44
The main production	lei	1942,51	2058,32	2168,22	1887,39	2038,73	2152,44
Variable Expenses	lei	1597,35	1702,45	1802,20	1549,25	1684,60	1787,80
Raw materials and supplies	lei	599,32	684,12	768,92	573,32	658,12	742,92

Sowing and planting stock	lei	100,00	100,00	100,00	100,00	100,00	100,00
Chemical fertilizers	lei	228,40	313,20	398,00	202,40	287,20	372,00
Pesticides	lei	270,92	270,92	270,92	270,92	270,92	270,92
Expenses mechanized	lei	888,23	896,99	900,56	870,19	908,26	915,18
Supply Expenditure	lei	59,93	68,41	76,89	57,33	65,81	74,29
Insurance	lei	49,87	52,93	55,83	48,41	52,41	55,41
Fixed Expenses	lei	345,16	355,87	366,02	338,14	354,13	364,64
Taxable income	lei	316,49	299,68	230,28	385,11	416,47	381,06
Taxes	lei	50,64	47,95	36,84	61,61	66,63	60,97
Net income + grants	lei	529,85	515,73	457,44	587,50	613,84	584,09
Gross profit rate	%	16,3	14,5	10,6	20,4	20,4	17,7
Net profit + subsidy rate	%	27,3	25,0	21,1	31,1	30,1	27,1
Gross margin	lei	661,65	655,55	596,3	723,25	770,6	745,7
Cost of production	lei/kg	0,774	0,786	0,813	0,747	0,747	0,765
Estimated price recovery	lei/kg	0,900	0.900	0.900	0.900	0.900	0.900

Table 3 (continuation)

Indicators	U.M.	V17 P80N160	V18 P120N40	V19 P120N80	V20 P120N120	V21 P120N160
Production	Kg/ha	2878	2572	2778	2863	2896
	%	152,84	136,59	147,53	152,04	153,79
Total growth	Kg/ha	995	689	895	980	1013
	%	52,84	36,59	47,53	52,04	53,79
Average gain	Kg/kg s.a	4,14	4,30	4,47	4,08	3,61
Production value	lei	2590,20	2314,80	2500,20	2576,70	2606,40
The main production	lei	2590,20	2314,80	2500,20	2576,70	2606,40
Grants	lei	264,00	264,00	264,00	264,00	264,00
Gross product	lei	2854,20	2578,80	2764,20	2840,70	2870,40
Total expenditure	lei	2263,99	1968.10	2119,72	2233,26	2342,09
The main production	lei	2263,99	1968,10	2119,72	2233,26	2342,09
Variable Expenses	lei	1889,05	1622,50	1758,10	1861,14	1959,93
Raw materials and supplies	lei	827,72	6332,12	716,92	801,72	886,52
Sowing and planting stock	lei	100,00	100,00	100,00	100,00	100,00
Chemical fertilizers	lei	456,80	261,20	346,00	430,80	515,60
Pesticides	lei	270,92	270,92	270,92	270,92	270,92
Expenses mechanized	lei	920,20	876,63	914,94	921,70	924,33
Supply Expenditure	lei	82,77	63,21	71,69	80,17	88,65
Insurance	lei	58,36	50,54	54,55	57,55	60,43
Fixed Expenses	lei	374,94	345,60	361,62	372,12	382,16
Taxable income	lei	326,21	346,70	380,48	343,44	264,31
Taxes	lei	52,19	55,47	60,88	54,95	42,29
Net income + grants	lei	538,02	555,23	583.60	552,49	486.02
Gross profit rate	**%**	14,4	17,6	17,9	15,4	11,3
Net profit + subsidy rate	**%**	23,8	28,2	27.5	24,7	20,7
Gross margin	lei	701,15	692,3	742,1	715,56	646,47
Cost of production	lei/kg	0,787	0,765	0,763	0,780	0,809
Estimated price recovery	lei/kg	0.900	0.900	0.900	0.900	0.900

Table 3 (continuation)

Indicators	U.M.	V22 P160N40	V23 P160N80	V24 PI60N120	V25 P160N160
Production	Kg/ha	2587	2894	2895	2908
	%	137,38	153,69	153,74	154,43
Total growth	Kg/ha	704	1011	1012	1025
	%	37,38	53,69	53,74	54,43
Average gain	Kg/kg s.a.	3,52	4,21	3,61	3,20
Production value	lei	2328,30	2604,60	2605,50	2617,20
The main production	lei	2328,30	2604,60	2605,50	2617,20
Grants	lei	264,00	264,00	264,00	264,00
Gross product	lei	2592,30	2868,60	2869,50	2881,20
Total expenditure	lei	2045,92	2206,69	2312,59	2419,63
The main production	lei	2045,92	2206,69	2312,59	2419,63
Variable Expenses	lei	1693,13	1837,00	1933,14	2030,30
Raw materials and supplies	lei	690,92	775,72	860,52	945,32
Sowing and planting stock	lei	100,00	100,00	100,00	100,00
Chemical fertilizers	lei	320,00	404,80	489,60	574,40
Pesticides	lei	270,92	270,92	270,92	270,92
Expenses mechanized	lei	880,52	926,86	926,93	927,97
Supply Expenditure	lei	69,09	77,57	86,05	94,53
Insurance	lei	52,60	56,85	59,64	62,48
Fixed Expenses	lei	352,79	369,69	379,45	389,33
Taxable income	lei	282,38	397,91	292,91	197,57
Taxes	lei	45,18	63,66	46,87	31,61
Net income + grants	lei	1,20	598,25	510,04	429,96
Gross profit rate	**%**	13,8	18,0	12,7	8,2
Net profit + subsidy rate	**%**	24,5	27,1	22,0	17,8
Gross margin	lei	635,17	767,6	672,36	586,9
Cost of production	lei/kg	0,791	0,762	0,799	0,832
Estimated price recovery	lei/kg	0.900	0.900	0.900	0.900

CONCLUSIONS

In 2007, the five agrofonduri experimental application of phosphorus, variant 80 kg / ha to determine the most efficient production of sunflower. Experimental variants that have made the most effective productions were P80N0, and P80N80 P80N40. Nitrogen was the determining factor in increasing economic efficiency in terms of seed production. Seed production above variants ranged from 2.299 t / ha and 2.728 t / ha. Labor consumption and diesel was lower with fertilization at 80 kg / ha phosphorus 80 kg / ha nitrogen. Economic indicators: gross profit and profit rate also had the highest values for variant P80N80.

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CERCETĂRI PRIVIND COMPETIȚIA INTRASPECIFICĂ LA SPECIA *TRIFOLIUM PRATENSE*, CULTIVATĂ LA PREAJBA – GORJ

RESEARCHES CONCERNING INTRA – SPECIFIC COMPETITION TO *TRIFOLIUM PRATENSE*, GROWN IN PREAJBA – GORJ

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Cuvinte cheie: trifoi rosu, competitie intraspecifică, distanța între rânduri
Key words: red clover, intra – specific competition, distance between rows.

ABSTRACT

For the study of intra-specific competition on Trifolium pratense, in spring of 2006 at the research field from Preajba - Gorj was located an experience, the land was plowed since autumn 2005. Application of chemical fertilizer with 100 kg/ha N, 50 kg/ha P_2O_5, 50 kg/ha K_2O at Trifolium pratense increased the yield of dry matter on linear meter with 14 %, the increase being distinct significantly, which demonstrates the usefulness of fertilizers to obtain higher production of feed. For the Trifolium pretense, the increased distance between rows from 15 to 50 cm led to the yield growth with 108 % per meter that shows high intra – specific competition in the case of the close rows sown, especially the particular aggressiveness of the red clover to himself.

REZUMAT

Pentru studiul competiției intraspecifice la Trifolium pratense, în primăvara anului 2006 în câmpul de cercetare de la Preajba – Gorj a fost amplasată o experiență, terenul fiind arat încă din toamna anului 2005. Aplicarea îngrăşămintelor chimice cu 100 kg/ha N, 50 kg/ha P_2O_5, 50 kg/ha K_2O la Trifolium pratense a sporit producția de substanță uscată la metru liniar cu 14 %, sporul fiind distinct semnificativ, ceea ce demonstrează utilitatea îngrăşămintelor pentru obținerea unor producții mai mari de furaj. Creşterea distanței de semănat între rândurile de trifoi, de la 15 cm la 50 cm a dus la sporirea producției cu 108 % ceea ce pune în evidență intensitatea ridicată a competiției intraspecifice în cazul semănatului în rânduri dese, mai precis agresivitatea deosebită a trifoiului față de el însuşi.

INTRODUCTION

Lemee G. (1978), considers as "biotic factors" all actions that organisms living in the same community he carries some of the others directly.

Intraspecific and interspecific relationships, both direct and indirect, manifested in the biocenoses are extremely diverse and complex.

Of the relationships between organisms or populations into agro-biocenoses, competition plays a very important role because, among other things, may have major economic effects.

Some authors have used the concept of competition in a broader sense, including the concept of physiological phenomena secretion of toxic substances by some creatures, as well as indirect actions resulting from changing environmental conditions such as shade tree carried by a population on some grass species.

Lemee G. (1978) defines competition as a competition that is established between organisms or groups of organisms for food and energy resources when the total demand for optimal growth is higher then availabilities.

Referring to the effects of competition, Malcolm W.N. (1966), considers that a situation of competition is the emergence of depressive effects on the production of individuals, highlighted in some or the other, in comparison with what happens if they are isolated.

Intraspecific competition, that which takes place between individuals of the same species, is stronger than inter-specific one, as in the first case, it is individuals who have similar requirements to environmental factors.

Within plant communities, competition is triggered and regulated by numerous factors that are either spatial relationships between individuals, individuals own biology or stationary environmental conditions.

MATERIAL AND METHOD

For the study of intra-specific competition on *Trifolium pratense*, in spring 2006 in the research field from Preajba - Gorj was located an experience, the land was plowed since autumn 2005.

The location system of experience was in subdivided parcels with four repetitions, being sown red clover, variety Merviot. There were included in the study two factors:

A factor – the fertilization:

a_1 – unfertilized;

a_2 – 100 kg ha^{-1} N, 50 kg ha^{-1} P_2O_5, 50 kg ha^{-1} K_2O;

B factor – distance between rows:

b_1 – 15 cm (close rows);

b_2 – 50 cm (distant rows).

In 2006, two harvests were taken, and in 2007, three harvests. Harvesting were performed in the following scheme: in each varant-repetition was collected and weighed 2 m long on row of plants, after which the variants were fully mowing, taking into account the weighing and the weight of biomass in the line of 2 m.

The dry matter was determined by the oven, and the calculations were performed by analysis of variance, apart from harvesting on the line and on entire plot. The results were expressed in g / l.m. and t / ha dry matter.

RESULTS AND DISCUSSIONS

Production of dry matter at linear meter averaged over two years (2006-2007)

Production of dry matter at linear meter of red clover has been widely influenced by agrofond (Table 1).

Table 1

Separate influence of agrofond on Trifolium pratense dry matter yield, average 2006 – 2007 (g/l.m.)

No.	Agrofond (kg ha^{-1})	Yield (g/l.m. d.m.)	%	Difference	Significance
1	0	232	100	-	Control
2	100N $50P_2O_5$ $50K_2O$	264	114	32	**

DL 5 % = 8 g/l.m. d.m.
DL 1 % = 16 g/l.m. d.m.
DL 0,1 % = 35 g/l.m. d.m.

In average, regardless size of nutrition space, on unfertilized was obtained an yield of 232 g / l.m. d.m., and at agrofond 100 kg / ha N, 50 kg / ha P2O5, 50 kg / ha K2O more with 32 g/l.m., namely 264 g / m.l. The difference achieved using chemical fertilizers is significant and proves that on poor and acidic soils, as the Preajba luvosoil, red clover fertilization is necessary for higher production.

Relevant information on the effect of intraspecific competition on *Trifolium pratense* species can be obtained from data on the separate influence of nutrition area (Table 2 and Figure 1).

Table 2

Influence of intra-specific competition on Trifolium pratense yield, average 2006 - 2007 (g / l.m.)

No	Nutrition space	Yield (g/l.m. d.m.)	%	Difference	Significance
1	Close rows (15 cm)	161	100	-	Control
2	Distant rows (50 cm)	335	208	174	***

DL 5 % = 27 g/l.m. d.m.
DL 1 % = 41 g/l.m. d.m.
DL 0,1 % = 65 g/l.m. d.m.

Grown in close rows at 15 cm, dry matter yield at the linear meter was 161 g. If the red clover was grown in rows spaced at 50 cm, weight of plant mass doubled from a linear meter, to 335 was g.

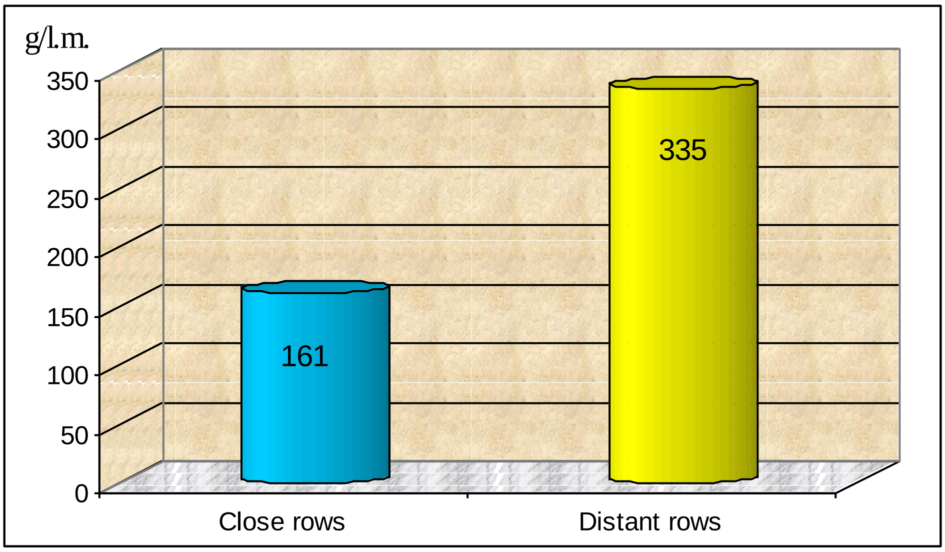

Figure 1. Influence of distance between rows (intra-specific competition) on the red clover yield, average 2006-2007 (g / l.m. dry matter)

It is clear that the greatest harvest of red clover on row planting distance of 50 cm is due to reduced intra-specific competition and is manifested by increasing size, weight and branching plant. In contrast, in case of close rows, when plants are subjected to consistently and strongly "competitive pressure", the effect on the growth of plant shoots is negative.

The big difference between the plant weight at linear meter in the two areas of nutrition (174 g or 108%) shows high intensity of intra-specific competition, aggressiveness of the species of *Trifolium pratense* to itself.

Intraspecific competition is present both in the absence of chemical fertilizers and in their presence (Table 3).

Table 3

Influence of intra-specific competition on the basis of agrofond on Trifolium pratense dry matter yield, average 2006 - 2007 (g / l.m.)

No	Agrofond (kg ha^{-1})	Nutrition space	Yield (g/l.m. d.m.)	%	Difference	Significance
1	0	Close rows (15 cm)	151	100	-	Control
2		Distant rows (50 cm)	314	208	163	***
3	100N $50P_2O_5$ $50K_2O$	Close rows (15 cm)	171	100	-	Control
4		Distant rows (50 cm)	357	209	186	***

DL 5 % = 39 g/l.m. d.m.
DL 1 % = 59 g/l.m. d.m.
DL 0,1 % = 95 g/l.m. d.m.

At variants without fertilization, the meter production of red clover grown in rows spaced at 50 cm exceeded 163 g yields the meter if sown crop in close to 15 cm rows, and the treatment of 100 kg / ha N, 50 kg / ha P2O5, 50 kg / ha K2O exceeded with 186 g. So, even in the presence of supplementary food caused by fertilizer administrated, competition between plants of the same species is maintained at a high level.

Production of dry matter per hectare on average two years (2006-2007)

In average for the two years of experimentation (2006-2007) the culture of red clover gave 8.18 t / ha d.m. without fertilizer, high output demonstrating the suitability of the species in the area, and 9.29 t / ha by fertilization with 100 kg/ha N, 50 kg/ha P_2O_5, 50 kg/ha K_2O (Table 4).

Table 4

Separate influence of fertilizers on Trifolium pratense dry matter yield, average 2006 - 2007 (t / ha d.m.)

No	Agrofond (kg ha^{-1})	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	0	8.18	100	-	Control
2	100N $50P_2O_5$ $50K_2O$	9.29	113	1.11	***

DL 5 % = 0.04 t ha^{-1} d.m.
DL 1 % = 0.07 t ha^{-1} d.m.
DL 0,1 % = 0.17 t ha^{-1} d.m.

Achieved growth of 13% or 1.11 t / ha d.m. is very significant and demonstrates the usefulness of chemical fertilizers with nitrogen, phosphorus and potassium to red clover crops.

Regarding the influence of nutrition space on the production of dry matter per hectare, the results appear quite different from the plant row production (Table 5).

The highest production of 10.76 t / ha d.m. was obtained from crops sown in close rows, while the crop sown in distant rows, gave only 6.71 t / ha s.u., that is 4.05 t / ha less, negative difference highly achieved (Figure 2).

Table 5

Influence of intra-specific competition on the Trifolium pretense yield, average 2006 - 2007 (t / ha dry matter)

No	Nutrition space	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	Close rows (15 cm)	10.76	100	-	Control
2	Distant rows (50 cm)	6.71	62	-4.05	000

DL 5 % = 1.50 t ha^{-1} d.m.; DL 1 % = 2.27 t ha^{-1} d.m.; DL 0,1 % = 3.65 t ha^{-1} d.m.

The conclusion is self-evident that at 15 cm planting distance between rows, although intra-specific competition is particularly strong, the number of plants per unit area is higher and the area of nutrition better used, which ensures higher production. At the 50 cm distance between rows, lower yield proves that although intra-specific competition is much reduced, the area of nutrition is not used properly.

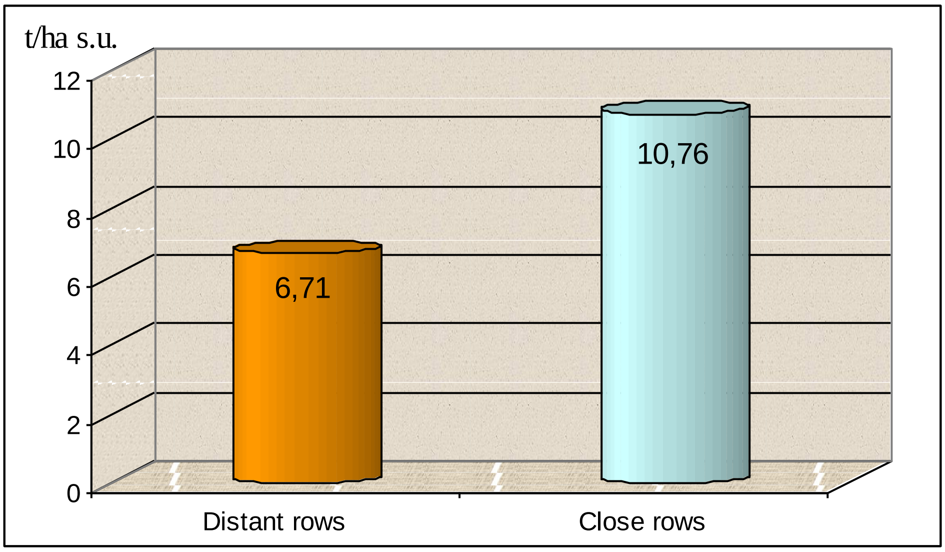

Figure 2. Influence of distance between rows (intra-specific competition) on the red clover yield, average 2006-2007 (t / ha d.m.)

From data listed in Table 6 may find higher yields from crops sown in close rows than that in distant rows, both at variants without fertilization and variant fertilized with 100 kg/ha N, 50 kg/ha P_2O_5, 50 kg/ha K_2O. Differences between the two sewing systems are negative distinct significantly.

Table 6

Influence of intra-specific competition on the basis of agrofond on Trifolium pratense yield, average 2006 - 2007 (t / ha d.m.)

No	Agrofond (kg ha^{-1})	Nutrition space	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	0	Close rows (15 cm)	10.08	100	-	Control
2		Distant rows (50 cm)	6.28	62	-3.80	00
3	100N 50P_2O_5 50K_2O	Close rows (15 cm)	11.44	100	-	Control
4		Distant rows (50 cm)	7.15	62	-4.29	00

DL 5 % = 2.12 t ha^{-1} d.m.; DL 1 % = 3.21 t ha^{-1} d.m.; DL 0,1 % = 5.16 t ha^{-1} d.m.

CONCLUSIONS

1. Application of chemical fertilizer with 100 kg/ha N, 50 kg/ha P_2O_5, 50 kg/ha K_2O at Trifolium pratense increased production of total dry matter with 14%, the increase being distinct significantly, which demonstrates the usefulness of fertilizers to obtain higher production of feed.

2. For the *Trifolium pratense* the increased distance between rows from 15 to 50 cm led to the yield growth with 108 % per meter that shows high intra – specific competition in the case of the close rows sown, especially the particular aggressiveness of the red clover to himself.

3. Intra-specific competition remained at a high intensity both in case of variants without fertilizers and at fertilization with 100 kg/ha N, 50 kg/ha P_2O_5, 50 kg/ha K_2O.

4. Considering the dry matter yield, *Trifolium pratense* sown in close rows obtained a superior production towards distant rows (10.76 t h^{-1} towards 6.71 t ha^{-1}) because of the better use of the nutrition area.

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COMPORTAREA UNOR SOIURI DE CARTOF PRIVIND DINAMICA DE ACUMULARE IN TUBERCULI CULTIVATE PE SOLURILE NISIPOASE DIN SUDUL OLTENIEI

THE BEHAVIOUR OF SOME POTATO VARIETIES ON THE DYNAMICS OF ACCUMULATION IN TUBERS GROWN ON SANDY SOILS IN SOUTHERN OLTENIA

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Key words: tubers, production,sandy soils

REZUMAT

Cartoful este cultura care realizează producții foarte ridicate, dar este şi foarte pretențioasă la condițiile ecologice şi tehnologice.

Producțiile de cartof sunt influențate de un complex de factori biologici, ecologici şi tehnologici. Factorul care limitează cel mai puternic producția este seceta din perioada mai-septembrie, în momentul formării şi acumulării intense a tuberculilor ce apare cu mare frecvență în toate zonele de cultură din țară.

Soiurile de cartof testate la SCDCPN Dabuleni in ceea ce priveste dinamica de acumulare in tuberculi au demonstrat ca factorul soi reprezinta veriga tehnologica foarte importanta . Alegerea corecta a soiului conduce la reusita culturii de cartof.

ABSTRACT

Potato production is very high performing culture, but also very demanding environmental conditions and technological.

Production of potatoes is influenced by a complex of biological factors, environmental or technological. Strongest factor limiting production is drought period from May to September, when training and intense accumulation of tubers, which occurs with great frequency in all areas of culture in the country.

Potato varieties tested in SCDCPN Dabuleni regarding the dynamics of accumulation in tubers showed that the factor variety is important technological link. Choosing the right variety of potato crop leads to success.

INTRODUCTION

Admission to a culture growing number of potato varieties and increased genetic diversity means a high possibility to choose varieties that suffer less due to unfavorable factors of culture(Fodor, 1982, Catelly, 1983).

Expanding and maintaining valuable crop varieties depends much on cultural, economic requirements, especially the ecological resources to which a new genotype should have a high degree of adaptability (Fodor, 1982, Catelly, 1983, Maxim and Saghin, 1990).

Sandy soils in southern Oltenia area offers favorable conditions for the early potato crop by high average temperatures to be recorded in February and March, temperatures contribute to the value of these sandy soils, which contributes to the production of potatoes for consumption early a date is not recorded in any other area of the country. For eating early and early summer and mid early varieties is recommended that rapid accumulation dynamics and achieves very good yields under irrigated potato production work essential for early consumption and summer (Chichea, 2000).

MATERIAL AND METHOD

In this experience to the behavior of the 11 romanian and foreign potato genotypes created in Suceava, Brasov and Targu Secuiesc.

Experience in the experimental field was located on a sandy soil with low nitrogen content (0.06%), well stocked extractable phosphorus (79.5 ppm), exchangeable potassium supplied medium (67 ppm), and low in humus (0.55%) with a pH of 6.72 which indicates a moderate acid reaction.

The varieties studied were: Magic, Astral (varieties developed in Suceava), Tampa, Cosmos, Dumbrava (varieties developed in Brasov), Redsec, Mikel, Luiza (varieties created in Targu Secuiesc) and foreign varieties Impala, Tresor, Virgo.

Technology applied technology expertise was the cultivation of potatoes on sandysoils.

During the growing and harvesting were carried out observations and measurements of the dynamics of accumulation in tubers at 45 days after emergence, 55de springing days and physiological maturity, the production of marketable tubers per hectare. Samples were collected to determine the shapes of leaves and water, the concentration of cellular juice and the tubers were determined dry substance total, dry soluble substance, total carbohydrate, acidity, the vitamin C.

RESULTS AND DISCUSSIONS

Climatic conditions affect the potato crop by the effect of temperature, precipitation,light,airrelativehumidity.

Evolution of climatic factors in the sandy soils in southern Oltenia, during the growing season of 2009 he enrolled in general in the normal range for this area. (table 1). The average monthly temperature ranged from 6.5^0C in March and 23.5^0C in July with positive influence on growth and development of potato plants. During the growing season there were absolute maximum temperatures of 36.5^0C and 37.8^0C, amid a lack of rainfall that led to the installation of droughts,irrigation is necessary.

Absolute minimum temperatures during the growing season ranged from -4.3^0C in March and 13.4^0C in August, noting their growth, with higher values in August compared with July.

The amount of precipitation during the growing season was poor, registering 272.3mm, unevenly distributed, with periods of 10-15 days without precipitation. The largest amount of water was recorded in July of 100.8 mm.

Rainfall in terms of capacity and their distribution during the growing influence success or failure of a crop by soil or excess water from the atmosphere.

Table 1

Air temperature (average, maximum and minimum) (0C) during March-August 2009 the weather station recorded a SCDCPN Dabuleni

Month / Decade	III	IV	V	VI	VII	VIII
I	6,2	13,3	15,8	21,4	23,2	23,0
II	5,0	12,8	20,5	22,5	22,7	23,8
III	8,4	12,1	19.0	20,9	24,6	23,5
Average monthly	6,5	12,7	18,5	21,6	23,5	23,4
Monthly Maximum	21,3	25,5	31,7	36,5	37,8	37,8
Minimum monthly	-4,3	0,8	4,7	9,0	11,2	13,4
Precipitation (mm Monthly Amount	42,2	21,3	23,4	72,2	100,8	12,4

Table 2

Influence of variety on the number of tubers / nest and production recorded at 45 days after springing

No.	Variety	Yield. total of tubers.(t/ha)	Nr. tub./nest>35mm and production		Nr. tub./nest <35 mm and production	
			No.	t/ha	No.	t/ha
1	Magic	11.36	2.19	9.70	1.23	1.64
2	Astral	7.55	1.34	6.04	1.32	1.51
3	Tampa	8.26	1.54	5.83	2.14	1.42
4	Cosmos	10.74	1.89	9.18	1.47	1.55
5	Dumbrava	6.54	1.40	5.01	1.14	1.53
6	Redsec	10.91	2.03	8.62	1.75	2.29
7	Mikel	11.14	2.03	7.25	2.81	3.88
8	Luiza	8.49	1.22	4.99	2.82	3.49
9	Impala	10.19	1.81	8.18	1.41	2.0
10	Tresor	4.54	0.81	3.10	1.42	1.43
11	Virgo	12.03	1.78	9.68	2.00	2.4

The number of tubers and their size is a character very much variety influented production level per unit area. If we analyze the results presented in table 2 can be seen as variants cultivated varieties have registered a large number of marketable tubers: Magic has made a 2.19 average number of marketable tubers / nest, Redsec achieved a 2.03 average number of marketable tubers /nest, Mikel and achieved a 2.03 average number of marketable tubers / nest and recorded the highest production of marketable tubers. In table 3 presents the results of average realized productions depending on the variety grown in the climatic conditions in the south of the country in 55 days of vegetation. In terms of total average production of tubers harvested at 55 days of vegetation the best results were obtained for variants cultivated varieties: Virgo, which was made an average production of 17.30 t / ha, in which Tampa achieved an average total production of 14.79 t / ha, which was done Impala 13.9 t / ha and Cosmos which was done a production of 13.55 t / ha.

In terms of average production of marketable tubers harvested at 55 days of vegetation the best results were obtained for variants cultivated varieties: Virgo, which was made an average production of 14.92 t / ha, on which Cosmos achieved 11.85 t / ha, which was performed Tampa 11.79 t / ha.

Table3

Influence of variety on the number of tubers / nest and production recorded at 55 days after springing

No.	Variety	Yield. total of tubers.(t/ha)	No.tub/nest >35mm and production		No.tub/nest <35 mm and production	
			No.	t/ha	No.	t/ha
1	Magic	10.82	1.89	8.87	1.25	1.94
2	Astral	13.12	2.40	10.85	1.56	2.27
3	Tampa	14.79	2.68	11.79	1.87	3.0
4	Cosmos	13.55	2.13	11.85	1.19	1.69
5	Dumbrava	8.36	1.27	5.62	1.88	2.73
6	Redsec	14.04	2.51	9.84	2.63	4.19
7	Mikel	11.65	1.70	6.87	3.14	4.77
8	Luiza	13.23	2.04	9.69	2.86	3.53
9	Impala	13.90	2.17	10.55	2.56	3.35
10	Tresor	12.18	1.67	11.11	0.62	1.06
11	Virgo	17.30	2.08	14.92	1.49	2.38

If we analyze the results on the average number of tubers per nest in 55 days depending on the variety of vegetation presented in table 3 can be seen as variants cultivated varieties have registered a production of tubers were recorded and a large number of marketable tubers: Tampa achieved a 2.68 average number of marketable tubers / nest, Redsec achieved a 2.51 average number of marketable tubers /nest and Astral made a 2.40 average number of marketable tubers/nest.

It can be seen as variants cultivated varieties that have achieved the highest number of tubers /nest recorded and the largest production of marketable tubers. In table 4 the results on average productions made depending on the variety grown in the climatic conditions in the south of the country's potato plant physiological maturity. In terms of total average production of tubers harvested at maturity the best results were obtained for variants cultivated varieties: Virgo, which was performed an average of 46.11 t / ha, which was conducted Mikel total production average of 45.09 t / ha, which was done Redsec 44.44 t / ha, which was conducted Tampa average production of 44.38 t / ha, which Cosmos was made a production of 42.55 t / ha.

In terms of average production of marketable tubers harvested at maturity, the best results were obtained for variants cultivated varieties: Virgo, which was performed an average of 42.49 t / ha, which was achieved 35.91 Cosmos t / ha, which was conducted Astral production of 34.90, which was conducted Redsec average production of 34.78 t / ha.

Table 4

Influence of variety on the number of tubers / recorded production and physiological maturity

No.	Variety	Yield total of tubers.(t/ha)	No.tub/nest >35mm and production		No.tub/nest <35 mm and production	
			No.	t/ha	No.	t/ha
1	Magic	36.98	6,39	30.22	4,00	6.75
2	Astral	42.25	5,99	34.90	3,97	7.34
3	Tampa	44.38	6,45	32.95	6,31	11.44
4	Cosmos	42.55	6,49	35.91	3,24	6.63
5	Dumbrava	32.77	5,01	26.71	4,94	8.05
6	Redsec	44.44	7,06	34.78	5,61	9.65
7	Mikel	45.09	7,43	33.48	6,12	11.61
8	Luiza	42.13	6,56	29.51	7,02	12.62
9	Impala	38.52	6,12	31.17	3,78	7.34
10	Tresor	32.47	4,21	29.39	1,97	3.08
11	Virgo	46.11	5,88	42.49	2,51	4.62

If we analyze the results presented in table 4 can be ascertained that the 11 varieties grown variants that have registered a production test of tubers were recorded and an average number of marketable tubers greater as follows: Mikel has made an average number of seven, 43 tubers commercial / nest, Redsec achieved a 7.06 average number of marketable tubers / nest, Tampa has made a 6.45 average number of marketable tubers / nest, Cosmos achieved a 6.49 average number of marketable tubers / nest, Magic has achieved a 6.39 average number of marketable tubers / Impala nest and made an average of 6.12 tubers commercial / nest.

Table 5

Variations of some physiological indices of potato varieties

Variety	Total water (%)	Dry substance (%)	Cellular juice concentration (%)
Magic	86,9	10,7	7,0
Astral	87,8	10,9	6,7
Tampa	86,5	13,5	7,2
Cosmos	89,3	10,7	6,4
Dumbrava	87,3	12,7	6,2
Redsec	88,9	11,1	6,6
Mikel	86,0	14,0	6,3
Luiza	86,8	13,2	6,1
Impala	88,9	11,1	7,4
Tresor	88,0	11,9	7,2
Virgo	89,1	10,9	6,2

Foliar hydration was between 89.3% and 86% for the variety to variety Cosmos, Mikel. The dry matter content varied between 10.7% and 14% for the variety of the variety Magic, Mikel. Cellular juice concentration was between 6.1% and 7.4% for the variety Luiza, Impala. Varieties Impala, Tresor, Tampa cellular juice increase their concentration is more easily adaptable to atmospheric drought.

Table6

Influence of variety on the biochemical composition of potato tubers 2009

No.	Variety	Dry substance total %	Water %	Dry soluble substance %	Total carbohydr ate%	Acidity g ac.apple/ 100g fs	The vitamin C mg/100g fs
1	Magic	22,93	77,07	4,93	1,70	0,17	11,0
2	Astral	22,50	77,50	4,37	1,58	0,16	13,05
3	Tampa	18,07	81,93	4,83	2,02	0,17	14,81
4	Cosmos	15,70	84,30	4,93	2,04	0,18	10,65
5	Dumbrava	23,0	77,0	5,0	1,57	0,15	12,17
6	Redsec	19,03	80,97	4,80	2,10	0,18	13,57
7	Mikel	21,43	78,57	5,07	1,70	0,17	14,41
8	Luiza	22,40	77,60	4,53	1,92	0,16	16,28
9	Impala	17,70	82,28	4,13	1,88	0,17	12,47
10	Tresor	22,57	77,43	4,47	2,08	0,13	12,92
11	Virgo	18,0	82,0	4,30	1,89	0,17	15,14

The varieties studied a larger amount of total solids were introduced varieties Dumbrava (23%), Magic (22.9%), Tresor (22.5%).

The amount of soluble solids from potato tubers showed values between 4.13% and 5.07% for the variety to variety Impala, Mikel. A higher content of soluble solids was determined and the varieties Dumbrava, Cosmos, Magic.

The potato varieties studied, carbohydrate content was between 1.57% and 2.1% for the variety to variety Dumbrava, Redsec.

Titratable acid content of potato is low, less than 1%, which is characteristic of the species.Vitamin C content of potato varieties studied ranged from 10.65 mg/100 g fresh substance to variety Cosmos and 15.4 mg/100 g fresh substance to variety Virgo

CONCLUSIONS

Potato varieties tested in terms CCDCPN Dabuleni dynamics of accumulation in plant tubers have shown that factor is very important technological links. Choosing the right variety of potato crop leads to success.
Total production of tubers in the climatic conditions made plain area varied greatly depending on the variety grown and harvest time. Such variants cultivated varieties Virgo, Redsec, Cosmos and Tampa were maintained at a high level of production in the first two that harvesting at 45 and 55 days of vegetation, which shows that this variety makes an early production of marketable tubers. Also, these varieties have achieved higher production and physiological maturity which demonstrates that there are productive Astral varieties cultivated variants, Luiza, Mikel, recorded a lower level of production of marketable tubers in the first harvest, but the maturity physiological of the plant achieved a total production level to other varieties of tubers, which shows that these varieties are late.
As for the influence of variety on the nutritional quality of potato tubers, the best results were obtained in the varieties: Dumbrava, Magic were revealed by a higher content of total solids, soluble and varieties Virgo, Cosmos and were characterized by a high content of vitamin C.

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ACȚIUNEA UNOR BIOSTIMULATORI ASUPRA SOLULUI ŞI CULTURII DE RIDICHI DE LUNĂ

THE EFFECT OF BIOSTIMULATORS ON SOIL AND THE GROWTH OF RED GLOBE RADISHES

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Keywords: solarium, bio stimulators, electrical conductivity, soil analysis

SUMMARY

Throughout Europe, ecological agriculture has known constant growth over the last years. Farmers who practice ecological agriculture return the favour by maintaining and even improving – where possible – the natural parameters and the quality of these resources. The present study illustrates this, by having used only bio stimulators on a crop of red globe radishes grown in solarium. We concluded that the use of ***Bio Rootz*** *determined a growth in P and K on which it was applied; the use of* ***Humusil, humic acids, Bio Leafz Pro Balace*** *and* ***P&R*** *determined a growth of the morphological elements of the plant (leaf count and leaf size); upon establishing the results had on electrical conductivity, we concluded that the effects of these bio stimulators were highly positive, yet distinct for each case.*

Agricultura ecologică este un sector al agriculturii europene care a cunoscut o creştere constantă în ultimii ani. Fermierii care practică agricultura ecologică întorc această favoare prin menținerea, iar acolo unde este posibil, îmbunătățirea parametrilor naturali şi a calității resurselor solului. Studiul de față reflectă cele menționate anterior prin faptul că am utilizat numai biostimulatori într-o cultură de ridichi de lună înființată în solar şi am constatat că aplicarea produsului ***Bio Rootz*** *a determinat o crestere a continutului de P şi K la variantele la care a fost administrat ,* ***Humusil-ul*** *,**Acizii humici, Bio Leafz Pro Balance** şi **P & R** au determinat o creştere a elementelor morfologice ale plantelor (număr de frunze în rozetă şi lungimea acestora) iar la determinarea electroconductivitatii s-a constatat un efect foarte bun al tratamentelor cu biostimulatorii aplicați , cu precizarea că fiecare cultivar a reacționat în moduri diferite.*

INTRODUCTION

Respect for every living organism is a founding principle of ecological agriculture, starting with the smallest microorganism in the soil to the tallest tree above it. This is why every link in the ecological food chain is designed to maintain and even increase the diversity of plants and animals. Improving biodiversity is often a result of good practices in ecological agriculture as well in line with EU regulations regarding ecological agricultural production. Soil is probably the most important – but still, neglected – natural resource. (Bireescu L & collaborators, 2002). It is essential to life on earth, as the main nutrient for plants, which then provide foods and oxygen to animals and humans. Farmers who practice ecological agriculture respect the value of the soil, by carefully monitoring how they supplement it as well as what it gives back (Cardei E & collaborators, 2007) being aware of the impact that their activity has on its fertility and composition.

Extra-radicular nutrient supplementation contributes not only to the adjustment of nutrient deficits but also to ensuring considerable surpluses in crop production. (Newman & collaborators, 1981; Parker & collaborators, 1980; Boote & collaborators, 1978)

Soil fertility and the nutrition of vegetable plants grown in solariums, present particularities to outdoor crops. (Stoleru V. & collaborators, 2006) due to the hugely different ratio between the plant above ground and its radicular system, bringing about important implications on the nutrition of plants grown in solariums.

It's granted that solarium crops require a higher level of fertilizers than outdoor crops and that the unutilized excesses remain in the soil and eventually become pollutants. There is an effort to meet this problem by looking at various fertilization methods, a primary being that of using ecological fertilizers. (Bita & collaborators, 2009; Dinu& collaborators, 2009)

The residues of vegetable plants resulting from decomposition contribute to the enhancement of the soil with manure. There are substantial differences between plant varieties as far as the quantity of annual vegetal residue; they are determined by the soil type, the climate, the geographical area, the variety and hybrid type and the technology used in the maintenance of the crop. (Lixandru, 2005)

MATERIAL AND METHOD

The research was conducted in 2010, in an unheated solarium, located in Banu Maracine. The study was carried out on Redo and Cherry Belle red globe radishes. The crop was planted on March 3rd 2010.

The crop was planted in rows 10-12 cm apart, 0.5-1 cm deep, using 4-5g of seed/m^2. The study was organised having two factors in mind, Factor A regarded the growth of the two grades: a_1 – Redo crop and a_2 –Chery Belle crop; Factor B regarded the treatment applied to plants in seven variants: b_1 – unfertilized; b_2 – fertilized with Bio Rootz 10 ml/10 l water; b_3 – fertilized with Humusil 100 ml/10 l water; b_4 – fertilized with humic acids 250 ml/10 l water; b_5- fertilized with Bio Leafz 10 ml/10 l water; b_6- fertilized with Pro Balance 30 ml/ 10 l water; b_7 fertilized with P & R 30 ml/ 10 l water.

Treatments were applied in the growth stage, by fine spraying the leaves of the plant. Due to a growth period of only 1 ½ months, there was only one treatment applied every two weeks since their sprouting.

RESULTS AND DISCUSSION

To what the research of red globe radishes is concerned, one has followed aspects regarding the soil supply with phosphorus, potassium, N-NH4 and N-NO3 ions, as well as its pH, the observations related to the plant's development in reference to the number of leaves one finds on the plant and the length of the latter, as well as determinations executed to the thickened root. We have also determined the plant's electro conductivity in the growth process.

Knowing the right pH of the soil or the sub layer on which the plants develop has a meaningful bearing, as the Ph is involved in the dynamics, mobility and accessibility of the nutritive elements, in the activity of the microorganisms and in the decomposition and synthesis processes of the soil's organic matter, etc. In literature, the information regarding the right pH for every species of plants is, on one hand quite controversial, whereas on the other hand, the information is rarely being centralized in broad tables where one can easily find and use them for different purposes; on different occasions the information has a qualitative nature, referring only to reaction, while in some species it simply doesn't exist.

This being the case, after carrying out the treatment during the growth stage, one has sampled the soil and has determined the pH, the content in N-NH4 and N-NO3 ions, as well as the existing phosphorous and potassium.

One must also mention that for the second, third, fourth and sixth variants, one has implemented soil treatments in the actual moment of planting the red globe radishes culture.

From the data gathered in table 1 one can notice the soil's pH has registered values between 8,71-9,23 with a soil reaction of high alkalinity. From literature, we know that the red globe radishes need a pH between 6,0-7,4 for a proper development and growth. The biggest values have been registered in V4, V5, V7, V2 and V3, while on the first variant (untreated sample) the soil' reaction wasn't the best.

To what the N-NH4 content is concerned, one has registered values between 2,19 and 15,29%, with the biggest values in V6 and V7 and the lowest in V1. The N-NO3 content has been between 7,35 and 12,6, with the biggest values in V6 and V7 as well, followed by V3 and V4, while the lowest value has been in V1.

Thus, we can draw a conclusion that the implemented soil treatment with Humusil, humic acids and Pro Balance has determined a richer soil supply of N-NH4 and N-NO3.

To what the phosphorous supply is concerned, the best supply has been found in V4 and V5, starting from V1 which has had 111,8ppm and is considered a good supply. Variants 6, 7 and 3 have had a medium, while V2 a very bad one, although the prospect of the Bio Rootz product had been recommending it more as a soil treatment for, besides fostering a good development of the radishes system, it also determines a soil's richness in macro and micro elements.

The potassium content (ppm) has registered values between 213-420 ppm, which has situated soil, as far as our experience has indicated, as having a medium supplying status in V5 and V6, good in V1, V2,V3 and V4 and very good in V7.

Table 1

Ground measurements

Var.	Specific variant	pH Value	N-NH4	N-NO3	P (ppm)	K (ppm)
1.	Unfertilized	8,99	2,19	7,35	111,8	284
2.	Bio Rootz 10 ml/10 l water	9,23	8,25	7,60	29,0	352
3.	Humusil 100 ml/10 l water	9,23	7,14	9,45	72,8	395
4.	Acizi humici 250 ml/10 l water	9,31	6,60	9,45	139,8	295
5.	Bio Leafz 10 ml/10 l water	9,31	4,90	8,60	130,0	265
6.	Pro Balance 30 ml/ 10 l water	8,71	13,20	11,70	91,4	213
7.	P & R 30 ml/ 10 l water	9,27	15,39	12,60	84,2	420

During growth period measurements were made concerning the average number of leaves per plant as well as their growth in length. (figure 1)

The lab analysis was undertaken individually for each group of variants, according to both factors considered in this study.

Considering Factor A, and its two grades we establish that the average number of leaves per plant is generally higher for grade a_1 than a_2 which indicated that Redo has a faster growth rate than Cherry Belle.

By comparing both grades of Factor A to the 7 variants of Factor B, we found considerable differences.

By comparing a_1b_1 with a_2b_1 (and so on – for each variant) we ascertain that there are major differences in the results and one can only explain this by the different treatments applied either to the soil or the plant.

Upon analysis of Factor B, we observe that some of the product had either slowed down or balanced the growth mechanism of the plant.

The average leaf count for a_1b_1 (7.66 leaves) was the highest recorded value, and that of a_2b_7 (5.66 leaves) was the lowest.

The a_2 varieties produced increased values compared to those of the untreated sample, with the exception of those of a_2b_7, which were below those recorded in the untreated sample.

We observe that for the a_1 grade only two samples knew a positive difference to the untreated sample, while for the a_2 grade, 5 out of six variants registered positive differences to the untreated sample.

To what the average leaf count is concerned, we found that the Redo variety is not very responsive to the treatments applied, while Cherry Belle registered values above the untreated sample, for 5 out of six variants. Concerning V_3 we can safely say that the low leaf count is a positive, as there are elements such as the thickened root that is highly superior to that of the untreated sample.

The length of the leaves for the a_1 grade registered superior values to the untreated sample in he case of V_3, V_4, V_7, V_8, which was not consistent with the average number of leaves of the plant. We are safe to conclude that the use of humic acids and Pro Balance determined the most pertinent results for this grade.

For the a_2 grade, only in the case of a_2b_3, were values above those of the untreated sample registered. Regarding treatments applied to Cherry Belle, the effects were rather hampering compared to the Redo variety, a_2b_3, being the only variant to exceed the untreated sample by 10.34%.

During growth, on the April 16th and April 23rd, we determined the electrical conductivity of radish plants, in retrospect to a month of fertilization with bio stimulators.

During the first stage (on April 16th 2010, figure 2) we noted that the a_1 grade registered elevated values as far as electrical conductivity is concerned, between 13.9-22.1 μS/cm; the lowest value was in the case of a_2b_4 while the highest was in the case of a_1b_2. The a_1b_3, a_1b_5 and a_1b_6 variants knew values above those of the untreated sample.

Regarding the a_1 grade, on April 23rd 2010, we observed that electrical conductivity decreased in the untreated sample (14,9 μS/cm) but knew superior values in all its other variants.

In the case of a_2, measurements were found to be between 15,4 – 20,8 μS/cm, the highest value being recorded for the untreated sample, which demonstrates that 4 days in, from when the treatment was applied, there was no electrical conductivity above that of the untreated sample.

CONCLUSIONS

Following the observations made and the measurements drawn from growing red globe radishes in solarium while undergoing bio-stimulating treatments, we concluded:

- Determination made at soil level showed a strong alkaline reaction, which failed to be explained, implying that further research on the water used for irrigation will need to be done to clarify this finding.
- P and K levels in the soil were medium, good and very good for all variants, except V_2 (registering very low levels) – the treatment in this case was Bio Rootz which is designed to "*increase the absorption capacity of the plant for the intake of fertilizers and nutrients, by 40%",* according to the label.
- The morphology of the plant (leaf count and leaf size) was emphasized in the case of a_1, treated with Pro Balance and humic acids, P&R and in the case of a_2, treated with Bio Leafz, humic acids and humusil.
- During the first growth stage (16.04.2010) we note that in the case of a_1 electrical conductivity values situated between13.9-22.1. For variants a_1b_3, a_1b_5 and a_1b_6 the values were above that of the untreated sample. On the 23rd of April, for a_1 electrical conductivity decreased for the untreated sample and registered superior values for all the other variants.

- In the case of a_2, the values were found to be between 15.4-20.8 μS/cm, the highest was registered for the untreated sample in the first stage of measurements, while 11 days later the treatment resulted in the outcome questioned by this research; all variants registered values superior to the untreated sample, between 15 – 22.3 μS/cm.

All in all, the measurments taken on the Redo crop were higher than those for Cherry Belle, values which will reflect in the quality of the edible plant organs of the red globe radish.

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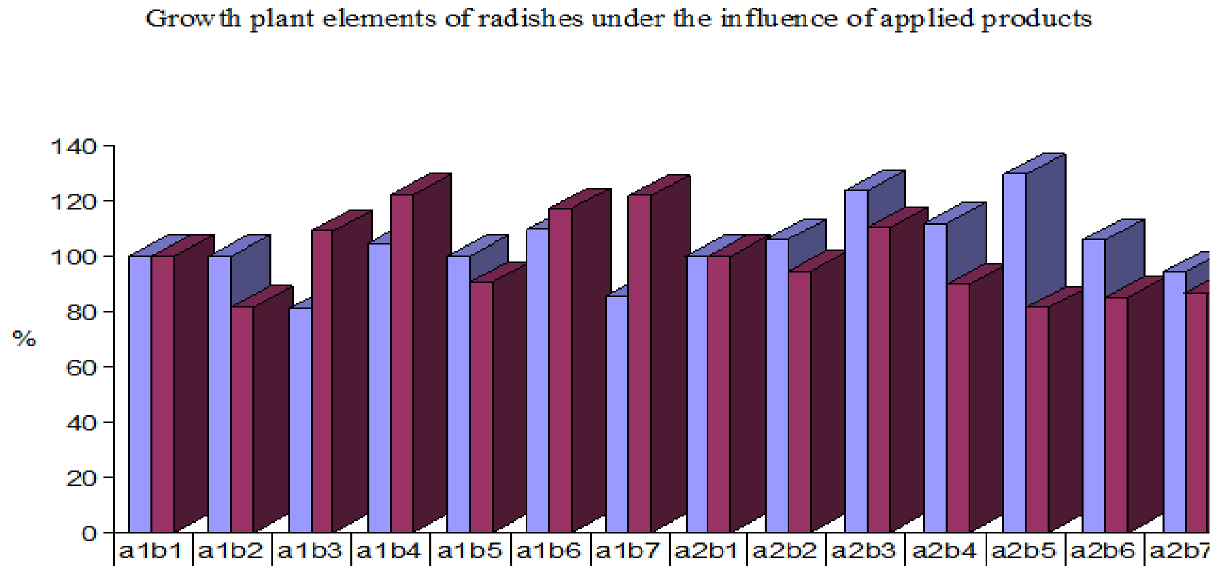
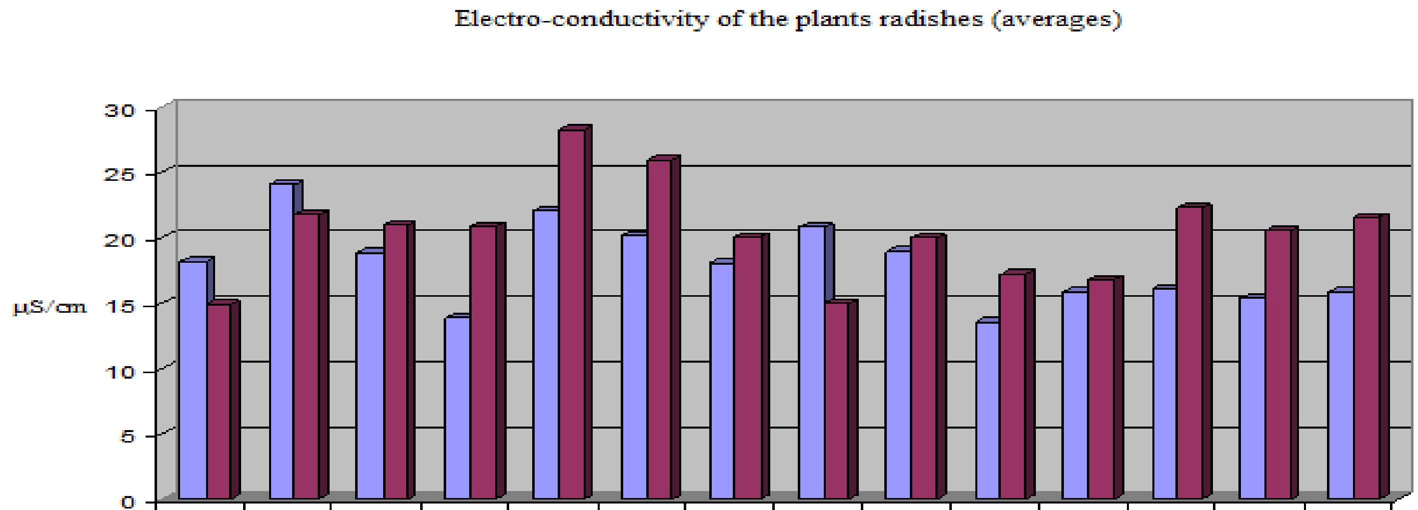


	a1b1	a1b2	a1b3	a1b4	a1b5	a1b6	a1b7	a2b1	a2b2	a2b3	a2b4	a2b5	a2b6	a2b7
number of leaves per plant %	100	100	80,8	105	100	109	85,7	100	106	124	112	130	106	94,1
length of the plant leaves%	100	81,6	109	122	90,6	117	122	100	94,4	110	89,7	81,4	85,1	86,7

Figure 1



	a1b1	a1b2	a1b3	a1b4	a1b5	a1b6	a1b7	a2b1	a2b2	a2b3	a2b4	a2b5	a2b6	a2b7
First determination	18,2	24,1	18,9	13,9	22,1	20,2	18,1	20,8	19	13,6	15,9	16,1	15,4	15,9
Second determin	14,9	21,8	21	20,9	28,3	26	20,1	15	20	17,2	16,8	22,3	20,6	21,6

Figure 2

CERCETĂRI PRIVIND UTILIZAREA GERMOPLASMEI LOCALE DE VIȚĂ DE VIE CA SURSĂ DE TIPICITATE ŞI AUTENTICITATE

RESEARCH ON USE OF LOCAL VINE GERMPLASM AS A SOURCE OF TYPICAL AND AUTHENTICITY

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Keywords: local vine germplasm, typical wines

REZUMAT

Intensificarea concurenței de pe piața mondială a vinului prin alăturarea în ultimul timp a unor noi competitori (Chile, Argentina, Australia, China) alături de producătorii consacrați (Franța, Italia, Spania, etc.) impune căutarea unor soluții în vederea menținerii cotei de piață pentru producătorii români. În acest sens obținerea unor vinuri de înaltă calitate din soiurile deja cunoscute este obligatorie dar nu constituie întotdeauna o reuşită, impunându-se ca o necesitate stringentă oferirea unor produse tipice, autentice care să satisfacă exigențele consumatorului. Acest lucru este posibil prin repunerea în valoare a soiurilor vechi româneşti care au fost într-un con de umbră o perioadă îndelungată şi prin căutarea unor noi soiuri şi biotipuri locale valoroase care există din abundență în partea de vest a României şi care nu sunt cunoscute de către consumatori.

ABSTRACT

Intensifying competition on the world wine market by joining the last time new competitors (Chile, Argentina, Australia, China) with renowned producers (France, Italy, Spain,etc.) solutions should be sought to maintain market share for Romanian producers. In achieving this high quality wine varieties already known is required but not always successful, established itself as a strong need to offer typical products, authentic to meet consumer demands. This is possible by the restoration of the value old Romanian varieties who were in obscurity a long period and seeking new varieties and valuable local biotypes which are abundant in the western part of Romania and they are not known by consumers.

INTRODUCTION

Vines are grown successfully in many countries, its cultivation is considered one of the most efficient agricultural activities.

The western area of Romania has a great tradition in viticulture, in this area is growing vines for centuries both in growing areas enclosed and in yards and family gardens. Since ancient times there were many local varieties and biotypes invaluable, who made as fame of the wines produced in this region to be known, including most of the royal courts of Europe in those times.

MATERIAL AND METHODS

The research was conducted in 2007, 2008 and 2009 on local varieties and biotypes from the territory of Arad counties, Caras-Severin, Timis and Alba .

After sampling the samples from over 100 varieties and data analysis on the attributes ampelographic, physical-chemical and technological were kept 54 local varieties and biotypes, which is suitable for obtaining wines and which are important for research.

Their ampelography characterization consisted of the analysis on the most important ampelography descriptors: leaf, bunch, grape , and to determine the name of local varieties and cultivars have appealed to numerous criteria (popular local name if it exists, the initials of the communities in which they were found, initials of the street they were discovered, house number of householders, ampelographic and technological qualities which predominate, etc.).

Results were comparative analyzed with the Cabernet Sauvignon varieties and Fetească regala considered the control options.

Table 1

Distribution of local biotypes and varieties on areas and localities

The area	Locality	Number of local varieties and biotypes
ARAD	Rosia	4
	Paulian	-
	Misca	-
	Maderat	2
	Ineu	2
TIMIS	Timisoara	1
	Sarlota	-
	Buzias	22
	Silagiu	12
	Izvin	-
	Ghiroda	2
	Recas	-
	Sacalaz	-
	Urseni	1
CARAS - SEVERIN	Liubcova	-
	Moldova Noua	1
ALBA	Alba Iulia	1
	Petresti	1
	Sebes	1
	Aiud	4
TOTAL		54

RESULTS OBTAINED

As the description of ampelography varieties and local biotypes of wine grape, they were characterized by small or medium-sized grapes (80-250 g); grapes dense placed in bunch (compact grapes, "beaten").

The pulp of grapes was juicy and allowed the accumulation of large amounts of sugars, peel of the grape being thin. In this respect, were noted the varieties: Patrujarca de Buzias, Fraga alba de Silagiu, Ruginiu de Silagiu, Ineu 2, Negru mic de Buzias.

Between the cultivars found to be destined to produce wines, were samples taken which were vinified in small quantities of wine. For equal processing conditions have the same technology used for wine for all cultivars according to their group: red wine cultivars and white wine cultivars.

Table 2

Physico-chemical and technological characteristics of grape varieties and local biotypes of wine in 2007

Variety / Biotype	Locality	Sugar content(g/l)	Acidity content(g/l H_2SO_4)	Gluco-acidimetry Index	Difference from the control (Sugar)
White					
Mustoasa de Maderat	Maderat	173	6,6	26,21	-15
Mustoasa de Maderat -selectie clonala	Maderat	167	6,9	24,20	-21
Alb aromat de Rosia	Rosia nr.90 Salcu	165	6,2	26,61	-23
Aripat roz de Rosia	Rosia nr.90 Salcu	116	7,9	14,68	-72
Roz de Buzias	Buzias	171	5,6	30,53	-17
Buzias AS	Buzias	204	4,2	48,57	+16
Fraga alba de Silagiu	Silagiu	204	3,9	52,3	+16
Ruginiu de Silagiu	Silagiu	217	3,1	70	+29
Ineu 1	Ineu	160	4,3	37,2	-28
Roz marunt de Buzias	Buzias-A.Saguna	182	3,8	47,89	-6
Roz batut de Silagiu	Silagiu	125	7,5	16,66	-63
Feteasca Regala	Timisoara	188	4,3	43,72	-
Red					
Variety / Biotype	Locality	Sugar content(g/l)	Acidity content(g/l H_2SO_4)	Gluco-acidimetry Index	Difference from the control (Sugar)
Negru batut de Rosia	Rosia nr.90 Salcu	185	3,7	50	-9
Negru aromat de Moldova Noua	Moldova Noua	175	5,8	30,17	-19
RD negru	Rosia	149	6,2	24,03	-45
Negru mic de Buzias	Buzias	213	3,1	68,70	+19
Ineu 2	Ineu	193	3,5	55,14	-1
Cabernet Sauvignon	Timisoara	194	3,5	55,42	-

In 2007, analyzing the local grape varieties and biotypes for white wines, compared with the Fetească regala variety taken as a control option, have found a value in terms of sugar content to varieties: Ruginiu de Silagiu , Fragă albă de Silagiu şi Buziaş AS.

Between local varieties and biotypes for red wines, in 2007, only one which exceeded the witness in the sugar content was Negru mic de Buziaş, remaining cultivars are its lower.

Table 3

Physico-chemical and technological characteristics of grape varieties and local biotypes of wine in 2008

Variety / Biotype	Locality	Sugar content(g/l)	Acidity content(g/l H_2SO_4)	Gluco-acidimetry Index	Difference from the control (Sugar)
White					
Roze Macui	Alba-Iulia	126	9,8	12,85	-54
Verde Rar de Petresti	Petresti-Alba	163	8,1	20,41	-17
Auriu batut de Aiud	Aiud	179	6,4	27,97	-1
Rara de Aiud	Aiud	162	8,1	20,00	-18
Ruginiu de Aiud	Aiud	156	8,6	18,14	-24
Roz batut de Buzias	Buzias	178	5,6	31,78	-2
Roze de Silagiu	Silagiu	175	5,8	31,89	-5
Roz cu aripioara	Buzias	129	8,1	15,92	-51
Patrujarca de Buzias	Buzias	236	3,8	62,10	+56
Compact de Buzias	Buzias	194	4,2	46,19	+14
Pintenat de Buzias	Buzias	197	4,1	48,04	+17
Roz deformat de Buzias	Buzias	156	6,1	25,57	-24
Roz de Ghiroda	Ghiroda	174	5,8	30,00	-6
Feteasca Regala	Timisoara	180	4,6	39,13	-
Red					
Variety / Biotype	Locality	Sugar content(g/l)	Acidity content(g/l H_2SO_4)	Gluco-acidimetry Index	Difference from the control (Sugar)
Vinetiu de Sebes	Sebes	171	7,6	22,50	-17
Negru rar de Aiud	Aiud	198	5.4	36,67	+10
Negru mic de Silagiu	Silagiu	186	4.6	40,43	-2
Negru pruinat de Buzias	Buzias	186	4,5	41,33	-2
Rosu compact	Buzias	151	6,4	23,59	-37
Negru aripat de Silagiu	Silagiu	152	6,3	24,12	-36
Cabernet Sauvignon	Timisoara	188	4,5	41,77	-

Analyzing the local grape varieties and biotypes for white wines, in 2008, was found that the highest sugar content was to Buziaş Pătrujarcă variety (236 g/l), followed by Pintenat de Buzias with 197 g / l sugar content and Auriu batut de Aiud with 179 g / l sugar content.

In 2008, between local varieties and biotypes for red wines, was noted about sugar content Negru de Aiud variety with a sugar content of 198 g / l .

Table 4

Physico-chemical and technological characteristics of grape varieties and local biotypes of wine in 2009

Variety / Biotype	Locality	Sugar content(g/l)	Acidity content(g/l H_2SO_4)	Gluco-acidimetry Index	Difference from the control (Sugar)
White					
Roz de Buzias	Buzias	171	5,6	30,53	-27
Fraga alba de Silagiu	Silagiu	204	3,9	52,3	+6
Ruginiu de Silagiu	Silagiu	217	3,1	70	+19
Roz marunt de Buzias	Buzias-A.Saguna	182	3,8	47,89	-16
Roz batut de Silagiu	Silagiu	125	7,5	16,66	-73
Roz batut de Buzias	Buzias	178	5,6	31,78	-20
Roze de Silagiu	Silagiu	175	5,8	31,89	-23
Roz cu aripioara	Buzias	129	8,1	15,92	-69
Compact de Buzias	Buzias	194	4,2	46,19	-4
Pintenat de Buzias	Buzias	197	4,1	48,04	-1
Roz deformat de Buzias	Buzias	156	6,1	25,57	-42
Roz de Ghiroda	Ghiroda	174	5,8	30,00	-24
Feteasca Regala	Timisoara	198	4,8	41,25	-
Red					
Variety / Biotype	Locality	Sugar content(g/l)	Acidity content(g/l H_2SO_4)	Gluco-acidimetry Index	Difference from the control (Sugar)
Negru mic de Silagiu	Silagiu	186	4.6	40,43	-24
Negru mic de Buzias	Buzias	213	3,1	68,70	+3
Negru pruinat de Buzias	Buzias	186	4,5	41,33	-24
Rosu compact	Buzias	151	6,4	23,59	-59
Negru aripat de Silagiu	Silagiu	152	6,3	24,12	-58
Cabernet Sauvignon	Timisoara	210	4,7	44,68	-

In 2009 were noted and are recommended for the wine white production the varieties: Ruginiu de Silagiu and Fraga alba de Silagiu, which recorded higher concentrations of sugars compared with control Fetească regala.

Between local varieties and biotypes for red wines, only one which exceeded the witness in the sugar content was Negru mic de Buziaş, remaining cultivars are its lower, just like in 2007.

At the beginning of fermentation for most varieties this stum has a balanced composition. To some varieties, the high sugar content allows obtaining high quality wines which may be dry, semidry, semisweet or sweet, thus satisfying a wide range of consumer demands (Roz batut de Buzias, Fraga alba de Silagiu, Ruginiu de Silagiu, Negru batut de Rosia, Ineu 2, Negru mic de Buzias).

Other varieties can be highlighted by greater acidity using such for to obtain champagnes and sparkling wines, or can be used as correction of acidity at varieties lacking in acidity or in warmest years, drought years.

CONCLUSIONS

Most local varieties and biotypes identified and taken into research are high-value , but they are unknown and can not be sold at a higher level.

The growing culture technology for these varieties is reduced to a simple cutting, 1-2 hoeing, harvesting, while pesticide treatments are missing or limited to 1-2 splashing with Bordeaux mixture. Which leads us to affirm that grapes obtained can be considered organic grapes, that the future will be very appreciated by a large segment of the market which is oriented increasingly more towards organic products, healthy for human body.

Local varieties and biotypes investigated had a balanced chemical composition, they recommend to obtain their delicious wines, balanced, but some with a lower alcoholic strength, it is and one of the world trends in winemaking. In this group are remarkable varieties: Verde rar de Petresti, Alb aromat de Rosia, Roz batut de Buzias.

Also been noted a varietal differentiation depending on the area of origin. Varieties of the Alba-Iulia, Aiud area is distinguished by a pronounced acidity, while the sugar content is lower.

Varieties of the Buzias-Silagiu area have a higher sugar content and a lower acid content.

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CERCETĂRI PRIVIND EFICIENTIZAREA TEHNOLOGIILOR VITICOLE PRIN CREŞTEREA GRADULUI DE MECANIZARE ŞI REDUCERE A MUNCII MANUALE

RESEARCH ON GRAPEVINE IMPROVEMENT TECHNOLOGIES BY INCREASING DEGREE OF MECHANIZATION AND REDUCTION OF MANUAL WORK

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Keywords: mechanized growing technologies, economic efficiency

REZUMAT

Lipsa forței de muncă calificată, pretențiile tot mai exagerate a forței de muncă existente şi calitatea tot mai redusă a prestației acesteia impun căutarea unor soluții tehnologice de efectuare mecanizată a majorității lucrărilor, fără a afecta calitatea producției şi fără a influența negativ mediul de cultură. Cercetările au fost efectuate în plantația viticolă a S.D.Timişoara şi în plantații private şi au vizat atât tehnologiile de înființare a plantațiilor viticole cât şi cele de întreținere. Comparativ cu tehnologiile clasice au fost propuse variante alternative şi au fost analizate comparativ rezultatele obținute şi eficiența economică.

ABSTRACT

Lack of skilled labor, more exaggerated claims of the existing workforce and increasing the quality of the service reduced its search for technological solutions necessary to perform the majority of mechanical work, without affecting product quality without negatively impacting the culture medium. The research was carried out in the vineyard planting S.D.Timişoara and private plantations and so are covered the technologies for establishment of vineyard, as well as the maintenance. Compared with conventional technologies have been proposed alternatives and results were weighed and economic efficiency.

INTRODUCTION

Viticulture can not be seen outside of contemporary issues, including climate change, pollution due to industrial development, environmental protection, etc., so the classical culture technologies should be streamlined to adopt a new way of thinking and action to lead to rationing technological measures.

To achieve competitive products foundation is variety which is the primary factor. This should be complemented by an appropriate culture technology, a competitive processing and an appropriate marketing.

Due to the diversity of soil, climate, biological traits of different varieties, if the vines can not produce a framework technology culture universally valid . Culture technologies must be applied differently depending on the variety grown, ecological conditions of each growing area, specific climatic conditions each year, but taking into account the destination of production and logistics and financial possibilities of each vineyards.

MATERIAL AND METHOD

The research was conducted in years 2008, 2009 and 2010 in three different centers of vine growing plantations : Recaş, Buziaş-Silagiu and Minis. The main technological sequences were addressed: pruning, soil maintenance, fertilization, operations in the vegetation, plant treatments, the evolution of grapes maturation and harvesting . All these technological sequences performed in correlation with climatic conditions, cultivated variety and scope of production can provide quantitative and qualitative pluses leading to an business efficiency of vineyards.

With regard to fertilization, we performed experiments with varieties Victoria and Muscat Hamburg, experimental variants were been established of different types and doses of fertilizers, chemicals, organical, combined, placed after the randomized block method.

V_1 – manure – 40 t/ha

V_2 – green manure - mash

V_3 – foliar fertilization

V_4 – Nitrogen fertilization -150 kg / ha active ingredient

V_5 - complex fertilizers (control) - N 50, P 100, K 100 kg / ha active ingredient

V_6 – foliar fertilizer + 80 kg N / ha active ingredient

V_7 – foliar fertilization + complex fertilizers - N 50, P 100, K 100 kg / ha active ingredient

V_8 – foliar fertilization + organic + manure 30 t/ha

To obtain a high quality wine production is very important to be balanced legally of quantity and quality, so it were been pursued productive varieties Fetească regală, Fetească albă, Muscat Ottonel şi Burgund in under cutting differential implementation .

Experimental variants consist of cutting the fruition differentially , form of equal loads of fruit but applied to different fruit-bearing elements: segment of chord vines, respectively chord at vines. Have intervened on varieties with the following types of cutting: V 1 – 30 buds distributed on segment of chord vines; V 2 – 30 buds distributed on chord vines; V 3 – 40 buds distributed on segment of chord vines;V 4 – 40 buds distributed on chord vines;V 5 – 50 buds distributed on segment of chord vines;V 6 – 50 buds distributed on chord vines.

In order to optimize costs with phytosanitary treatments, without influence on condition phytosanitary of the vine plantations, we organized in all three areas of comparative experiments with different treatment regimens.

RESULTS OBTAINED

Vines grown in different soil and climatic conditions, reason for fertilization of the vineyard has some problems, which makes it almost impossible to develop a unique system of fertilization of vines.

By choosing the experimental variants we tried to find a version suitable for the conditions from Minis, Recas, Buziaş-Silagiu vineyards, by which to reduce the quantities of chemical fertilizers without reducing significantly the production and quality, improving conditions characteristics of the soil and reducing environmental pollution effects and wine products. We considered control V5 version where we used complex fertilizers because it is the most widely used in viticulture.

For both varieties and in all three vineyards, variants timing was almost identical, variants who have been registred the biggest productions are V7 and V8.

In terms of production quality assessed on the basis of sugar content and acidity, to both varieties, variants with the best results were V8 and V1.

The V1 variant think that the results are less obvious knowing that the maximum effect of manure recorded in two and three years after application.

Comparing the quantitative and qualitative production in the three vineyards, we conclude that in Recas vineyard have obtained the highest production quantitative values, and in the Silagiu Buziaş vineyard have recorded the best values in terms of quality production of grape.

Table 1

Influence of fertilization variants on production and quality to the variety Victoria, in 2009

Variant fertilization	Vineyard area	Production		Sugar content (g/l)	Acid content (g/l H_2SO_4)	The difference from the control (kg/ha)
		Kg/ha	%			
V_1	Minis	13250	95,32	156	3,5	-650
	Recas	13605	95,35	178	3,2	-663
	Buzias	12970	95,47	184	3,0	-615
V_2	Minis	13415	96,51	147	3,6	-485
	Recas	13775	96,54	168	3,3	-493
	Buzias	13120	96,57	175	3,1	-465
V_3	Minis	13420	96,54	150	3,6	-480
	Recas	13780	96,57	172	3,4	-488
	Buzias	13105	96,46	180	3,2	-480
V_4	Minis	13670	98,34	142	3,9	-230
	Recas	14042	98,41	166	3,5	-226
	Buzias	13325	98,08	172	3,4	-260
V_5 (C)	Minis	13900	100	155	3,5	-
	Recas	14268	100	176	3,1	-
	Buzias	13585	100	181	3,0	-
V_6	Minis	14140	101,72	151	3,6	+240
	Recas	14512	101,71	174	3,3	+244
	Buzias	13840	101,87	183	3,2	+255
V_7	Minis	14852	106,84	152	3,6	+952
	Recas	15223	106,69	177	3,2	+955
	Buzias	14562	107,19	186	3,1	+977
V_8	Minis	14470	104,10	158	3,5	+570
	Recas	14835	103,97	183	3,1	+567
	Buzias	14150	104,15	190	3,0	+565

Regarding the varieties studied, they have retained specific characteristics, the Victoria variety recording extra production, and the Muscat Hamburg variety was evidenced by a greater accumulation of sugar.

Cutting the fruition is one of the most important works in the culture technology of the vine and at the same time the most difficult to execute, with a high consumption work. The cutting types and forms of leadership vine trellis have evolved more, in recent years trying to adopt as simple solutions in order to facilitate carrying other out works. In making these cuts of fructification must take into account genetic traits of the variety and climatic conditions during buds differentiation.

Regarding the quantity and quality of grape production, to the Fetească regala variety, V5 version has the highest production, compared with the control has a very significant positive value. The Fetească alba variety recorded a distinctly significant positive production at V4 variant compared with the control.

At the Muscat Ottonel variety V3 variant has a distinctly significant positive value compared with production of the control and the V6 variant is significantly negative. At The Burgund variety, variants V4, V5 and V6 were recorded positive significant productions.

The quality of production was assessed based on sugar content and acidity. Are distinguished by a good quality the Burgund and the Muscat Ottonel varieties, to which sugar has values over 190 g / l in all experimental variants.

We note that the Fetească alba variety has a larger quantity of sugar for variants with a lesser load of fruition, but V3 and V4 variants recorded a balance between production and quality.

Table 2

Influence of fertilization variants on production and quality to the variety Muscat de Hamburg , in 2009

Variant fertilization	Vineyard area	Production		Sugar content (g/l)	Acid content (g/l H_2SO_4)	The difference from the control (kg/ha)
		Kg/ha	%			
V_1	Minis	12330	94,26	179	4,4	-750
	Recas	12692	94,35	200	4,0	-759
	Buzias	12040	94,06	204	3,9	-760
V_2	Minis	12400	94,80	184	4,2	-680
	Recas	12765	94,90	209	3,8	-686
	Buzias	12080	94,37	215	3,6	-720
V_3	Minis	12520	95,71	180	4,5	-560
	Recas	12890	95,82	202	4,1	-561
	Buzias	12208	95,37	207	4,0	-592
V_4	Minis	12762	97,56	177	4,6	-318
	Recas	13123	97,56	197	4,2	-328
	Buzias	12442	97,20	201	4,1	-358
V_5 (C)	Minis	13080	100	181	4,3	-
	Recas	13451	100	206	4,0	-
	Buzias	12800	100	211	3,8	-
V_6	Minis	13410	102,52	181	4,5	+330
	Recas	13768	102,35	208	4,1	+317
	Buzias	13131	102,58	214	3,9	+331
V_7	Minis	14092	107,73	175	4,7	+1012
	Recas	14464	107,53	193	4,4	+1013
	Buzias	13792	107,75	199	4,2	+992
V_8	Minis	13985	106,91	185	4,0	+905
	Recas	14350	106,68	212	3,7	+899
	Buzias	13660	106,71	225	3,5	+860

Table 3

Quantitative and qualitative production in 2009 according to the cutting variants

Variety	Variant	Production (kg/ha)	Sugar content (g/l)	Acid content (g/l H_2SO_4)	The difference from the control (kg/ha)	Significance
Fetească regală	V 1(mt)	6791	194	5,1	-	-
	V 2	8098	196	5,2	+1307	-
	V 3	9207	193	5,0	+2416	*
	V 4	9769	195	5,1	+2978	**
	V 5	12182	195	4,9	+5391	***
	V 6	10291	191	4,9	+3500	**
DL5%=1667 DL1%=2751 DL0,1%= 4988						
Fetească albă	V 1(mt)	5808	205	4,5	-	-
	V 2	6833	213	4,6	+1025	-
	V 3	7304	210	4,4	+1496	*
	V 4	8241	219	4,5	+2433	**
	V 5	7949	207	4,7	+2141	*
	V 6	7764	204	4,8	+1956	*
DL5%=1123 DL1%=2208 DL0,1%= 5098						
Muscat Ottonel	V 1(mt)	8611	202	3,5	-	-
	V 2	9100	200	3,5	+489	-
	V 3	11900	198	3,3	+3289	**
	V 4	9930	196	3,4	+1319	-

	V 5	7306	201	3,7	-1305	-
	V 6	6560	199	3,9	-2051	0
DL5%=1665 DL1%= 3541 DL0,1%=6905						
Burgund	V 1(mt)	9700	208	4,2	-	-
	V 2	9920	209	4,1	+220	-
	V 3	10150	203	4,0	+450	-
	V 4	11028	204	4,1	+1328	*
	V 5	10744	205	4,3	+1044	*
	V 6	10780	206	4,0	+1080	*
DL5%=984 DL1%=2207 DL0,1%= 4499						

Phytosanitary treatments against pests and diseases

As required by modern viticulture must be developed efficient treatment regimens and less polluting taking into account environmental and economic conditions of the area of culture.

We analyzed comparatively the production in to the two parcels after applying the 8 treatments. We appreciate that carrying out treatment against gray mold must be executed obligatorily and timely to avoid damage, the more justified in terms of increased production being the third treatment.

We believe that both regimens chosen can be used successfully. Mention that, in favorable years for vine cultivation, no serious attacks of diseases and pests, is not economically effective to use expensive phytosanitary products, difference in production is not very significant. Below we present schemes of treatment used.

Table 4

Plan 1 for phytosanitary treatments against pests and diseases from vineyards used in parcel I

No.	Date	Phenophase	Pest or disease	Commercial product and dose
1	20-30 IV	Bud break	Mites , Powdery mildew	Neoron 500 EC 0,1%; Decis 25WG 0,03%; Karathane Gold 0,05%
2	10-20 V	10-15 cm shoots	Mites , Moths, Powdery mildew	Envidor 240 SC 0,04% 0,4 l/ha; Calypso 480 SC 100 mi/ha; Flint max 0,16 kg/ha
3	20-30 V	25-30 cm shoots, bunches release	Downy mildew, Powdery mildew	Ridomil Plus Gold 42,5WP 3kg/ha, Talendo 0,225l/ha
4	30 V – 10 VI	Before flowering	Downy mildew, Powdery mildew, Moths (gen. I)	Melody Duo 2kg/ha, Flint max 0,16 kg/ha Decis 25WG 0,03%, 30 g/ha
5	10-20 VI	After flowering	Downy mildew, Powdery mildew, Gray mold	Ridomil Plus Gold 42,5WP 3kg/ha, Talendo 0,225l/ha Teldor 500 SC 1 l/ha
6	20 – 30 VI	Growth of the berries	Downy mildew, Powdery mildew	Melody Duo 2kg/ha, Flint max 0,16 kg/ha
7	1-20VII	Compacting of the bunches	Downy mildew, Powdery mildew, Gray mold, Moths	Ridomil Plus Gold 42,5WP 3kg/ha, Talendo 0,225l/ha Teldor 500 SC 1 l/ha Envidor 240 SC 0,04% 0,4 l/ha
8	20 VII – 10 VIII	Beginning of the ripening	Downy mildew, Powdery mildew, Gray mold, Mites, Moths (gen. II)	Melody Duo 2kg/ha, Flint max 0,16 kg/ha Mythos 3 l/ha, Neoron 500 EC 0,1%; Calypso 480 SC 100 mi/ha

Table 5

Plan 2 for phytosanitary treatments against pests and diseases from vineyards used in parcel II

No.	Data	Phenophase	Pest or disease	Commercial product and dose
1	20-30 IV	Bud break	Mites , Powdery mildew	Nissorun 0,05%; Decis 2,5 EC 0,03%, 0,3l/ha; Kumulus DF 0,3%
2	10-20 V	10-15 cm shoots	Mites , Moths, Powdery mildew	Apollo 50 SC 0,04%, Karate Zeon 0,02%, Falcon 460 EC 0,3l/Ha
3	20-30 V	25-30 cm shoots, bunches release	Downy mildew, Powdery mildew	Mikal Flash 3kg/ha, Folicur Solo 250EW 0,4l/ha
4	30 V – 10 VI	Before flowering	Downy mildew, Powdery mildew, Moths (gen. I)	Curzate F 2,5kg/ha, Falcon 460 EC 0,3l/Ha Decis 2,5 EC 0,03%, 0,3l/ha
5	10-20 VI	After flowering	Downy mildew, Powdery mildew, Gray mold	Mikal Flash 3kg/ha, Folicur Solo 250EW 0,4l/ha Topsin 70PU 0,1%
6	20 – 30 VI	Growth of the berries	Downy mildew, Powdery mildew	Curzate F 2,5kg/ha, Falcon 460 EC 0,3l/Ha
7	1-20VII	Compacting of the bunches	Downy mildew, Powdery mildew, Gray mold, Moths	Mikal Flash 3kg/ha, Folicur Solo 250EW 0,4l/ha Topsin 70PU 0,1% Apollo 50 SC 0,04%
8	20 VII – 10 VIII	Beginning of the ripening	Downy mildew, Powdery mildew, Gray mold, Mites, Moths (gen. II)	Curzate F 2,5kg/ha, Falcon 460 EC 0,3l/Ha Shavit 25EC 0,02% Nissorun 0,05%; Karate Zeon 0,02%

Research on soil maintenance systems revealed important conclusions for current situation of viticulture. The maintenance of soil black field, which until recently was almost generalized in the culture system in Romania, gave very similar results in terms of quantity and quality, compared with the other experimental systems that in both locations proved viable alternative to conventional technology.

Social conjuncture and economic from recent times makes the system maintenance of soil by the permanent of green, because of its many advantages (low labor requirements, limiting the number of passes with the agricultural aggregate, reducing fuel consumption, reducing soil erosion, allowing phytosanitary treatments and in to with heavy rainfall periods), to impose ever more.

Below we present comparative main technological sequences from the classical technology and from of alternative technologies.

Given the issues workforce were designed the new technology models, so as to minimize the number of working days / ha / year. The table below illustrates the number of working days necessary for conventional technologies and the required for new technology models.

Through new technologies, through rationalization of works and introduction of modern technical solutions (trellis with metal poles and mobile wires, the maintenance of green land, etc.) succeeded reducing by approximately 40% of the number of days work / ha / year.

Harvesting grapes is another sequence that can be improved by the introduction of mechanized harvesting, widely practiced in countries like Germany, Italy, Spain, France, etc.

Table 6

Comparative elements of classical technologies and newly proposed

Technological sequence	Classical Technology	Alternative technologies
The maintenance of soil	Black field	-Maintaining in green land by total or alternative -Maintenance by growing plants for green manure
Fruition cuts	Almost generalized at chord	Differently depending on the variety, especially at the segment of the chord
Fertilization	- without fertilization - with complex fertilizers	Differentiated according to agro-chemical analysis of soil
Green operations	Limited to tying shoots	Differentiated on varieties
Combating pests and diseases	Usually with little treatments and cheap products	The coverage, as a scheme with alternative products
Harvesting	Without tracking ripening of the grapes, depending on the type of wine desired	With the establishment the optimal timing of harvest depending on the type of wine desired

Table 7

Number of working days needed for conventional technology and required for new technology models

Technological sequence	Necessary of work days / ha / year	
	Classical Technology	Alternative technologies
The maintenance of soil	25	8
Fruition cuts	20	20
Review of support systems	5	2
leading and tying the vine chords	10	-
Green operations	20	10
Combating pests and diseases	5	5
Harvesting	15	15
TOTAL	100	60

CONCLUSIONS

Given the concept of sustainable viticulture increasingly more current, variants fertilized with organic fertilizer and green manure in the conditions investigated can be considered as alternatives to chemical fertilization.

In terms of Buziaş vineyard, foliar fertilization combined with organic fertilization gave very good results both in terms of production obtained and from the point of view of biological concept becoming more current in viticulture.

Foliar fertilization combined with chemical fertilizers has also given good results, given that we have reduced the quantities of chemical fertilizer per hectare and hence the degree of environmental pollution.

In the use of green manure yields obtained were lower compared with control options, instead favorable effect on soil and environment is very important.

Cutting to fruition is one of the most important works from technology of culture of the vine at the same time most difficult to execute, with a high consumption of work. The cutting types and forms of leadership vine trellis have evolved more, in recent years trying to adopt as simple solutions in order to facilitate carrying other out works.

Regarding the application of phytosanitary treatments, making of the first treatments with preventive role is very important but noted that it is not always necessary application of 5-6 treatments to combat disease as happened in our case at downy mildew, if weather conditions were not conducive to the development of this disease.

We recommend the use of alternative products phytopathogenic to not create resistant breeds and reduce consumption of expensive products by using them in smaller doses mixed with phytosanitary products cheaper, but have the same spectrum of combat.

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MANAGEMENTUL MICORIZEI ARBUSCULARE INSTALATA IN CULTURA ORGANICĂ A TOMATELOR (*Lycopersicon esculentum* Mill.)

THE MANAGEMENT OF ARBUSCULAR MYCORRHIZA INSTALLED IN ORGANIC TOMATO CROP (*Lycopersicon esculentum* Mill.)

ADRIAN DULUGEAC

Keywords: Glomus intraradices, inoculation, vesicular arbuscular mycorrhiza, tomato (Lycopersicum esculentum Mil.).

REZUMAT

Specia fungală Glomus intraradices a fost utilizată ca inocul pentru propagarea simbiozei micorizale în cultura tomatelor fertilizate organic, în câmp. Concentrațiile inoculilor micorizali de 150 spori şi 200 spori la 10g sol au indus diferențe foarte semnificative comparativ cu varianta martor privind creşterile vegetative ale plantelor de tomate şi acumulările de substanțe nutritive în rădăcinile acestora. Rezultatele obținute au demonstrat că plantele de tomate micorizate ale soiului Cristina fertilizate organic cu 30t/ha îşi pot dubla cantitatea de biomasă ca efect al dublării volumului absorbit al principalilor nutrienți necesari în perioada de creştere vegetativă într-un areal climatic caracterizat prin temperaturi ridicate.

ABSTRACT

Fungal species Glomus intraradices was used as inoculum for the propagation of the symbiosis of mycorrhiza in the organic fertilized tomato crop in the field. Mycorrhiza inoculum concentrations of 150 spores and 200 spores in 10g soil induced significant differences compared with version control on vegetative growth of tomato plants and accumulation of nutrients in their roots. The results showed that tomato plants mycorrhiyed of the variety Cristina, organic fertilized with 30t/ha, can double the amount of biomass as a result of doubling the main nutrients required volume absorbed during vegetative growth in an area characterized by high temperature climate.

INTRODUCTION

Arbuscular mycorrhizal fungi (AMF) form an integral part of many of the traditional agricultural crop production systems (Schübler A. et al., 2001), where they colonise plant roots through artificial symbiosis introduced via inoculation. This symbiosis is characterised by a bi-directional exchange of nutrients between the plant and the fungus (Smith et al., 1994), in which the host plant provides carbohydrates (sugars) to the fungus, whereas the fungus provides the host with a range of nutrients, in particular phosphorus, but also other macro- and micronutrients. The benefits rendered to the host plants primarily include enhanced water and nutrient uptake, leading to increased growth and fructification. Inoculation with AM can also benefit plants by increasing photosynthesis, and increasing resistance to pest and disease (Johansson, J.F.et al., 2004, D. Popa et al., 2007a). Most of the above-mentioned benefits were demonstrated under traditional cultivation practices in soil, although several articles have reported successful root colonisation and subsequent benefits to crops in soil less mediums (Ryan and Graham 2002, D. Popa et al., 2007b).

The aim of this investigation was to conduct a soil experiment to assess the success of inoculating tomato plants with AM fungi, to quantify growth and nutritional benefits and to find optimum combinations between organic cultural practices, individual tomato cultivars and concentration of AM inoculum to produce premium quality organic fruit.

MATERIAL AND METHOD

The experimental field was located and conducted in Voicesti-Valcea during experimental years 2009. This legume-growing ecosystem, regarding the air relative humidity, had low values during April-September of 36%-66%, which favorized the instalation of a very accented hydric stress climat. We have to notify the droughtness climat, with pluvio-metric deficite of 42,8 mm respectively 48,6 mm. Besides the fact that there has been recorded a long period of droughtness, the air average temperature during the vegetation period, has been higher than the multiannual average. The soil are brown reddish with pH 5.45, 0.16 g N/100 g soil, 0.04 g P/100g soil, 2.9 g total C/100 g soil, and experimental field were manured with 30 t/ha.

The cultivars used as host plant were 'Cristina' obtained from MEFIM AGRO-Craiova. Tomato seeds were sown in pots filed with soil (these soils had been found to be ideal for propagating the fungi used in this study) and inoculated in may with *Glomus intraradices* Schenck & Smith (provided by the BIOTERRA University-Bucharest). The AM fungi were applied as aqueous dispersion of spores and injected in pots in three doses: 50 spores/10g soil, 150 spores/10g soil and 200 spores/10g soil, each plot contained one single seed. Colonized tomato seeds were planted in may at a 0.80 m row spacing, spaced 0.40 m apart. A randomized complete block design was adopted, with 4 variants and 4 replications, each consisting of 5 plants. The field experimental variants involved in the study and sampling of the material used for analyses were: V1- Control (uninoculated plants); V2- Inoculation with 50 spores *G. intraradices* ; V3- inoculation with 150 spores *G. intraradices*; V4- inoculation with 200 spores *G. intraradices.* Normal cultural practices for the experiment were followed for irrigation, but without fertilization and pesticide application.

After the last fruit harvest, tomato plants were completely harvested and analyzed and samples were taken from the entire root system. These root samples were cleared in KOH and stained with trypan blue (Phillips and Hayman, 1970), and the percentage of root colonization was measured by the line intersect method (Giovannetti and Mosse, 1980). The spore densities were determined by centrifugation and sugar flotation and spores were identified.

The morphological growth characteristics such as the height plants, leaf number per plant, stem diameter, and biomas per plant were analyzed. Total green leaf area was estimated by multipling the product of the length and maximum width of each leaf by a factor 0.73 (McCree, 1974). Nitrate and phosphate were determined in the tomato plants by ion chromatography (Mettler Toledo Titrator DL 58). Sodium, potassium, calcium, magnesium were determined by flame spectrofotometry (Perkin Elmer A Analist 700) after wet digestion of tomato plants samples in a HNO_3 : $HClO_4$ (5 : 1) mixture. The analyses were performed on observations for four different variants, replicated four times. The influence of these factors and their interactions were tested with an ANOVA. Student's *t*-L.S.D. (Least Significant Difference) was calculated at the 5%, 1% and 0.01% significant levels to compare treatment means. The means were compared by L.S.D.using SPPS program version 11.

RESULTS AND DISCUSSIONS

The present study was carried out to evaluate the quality and the best quantity of the mycorrhizal inoculum for a maximum and beneficial effects of AM on tomato growth. The average spore numbers did not differ significantly among the three variants (V2, V3 and V4) after fruit harvested, the average colonization levels of AM fungi ranged from 62.99-75.67%.

Table 1

Effects of arbuscular mycorrhiza (AM) on tomato plant growth after fruit harvested

	Plant height, cm	%	Dif.	Signific.
V1 Control	67,525	100,00	Control	-
V2+50spores	68,32	101,18	0,795	*
V3+150spores	70,408	104,27	2,8825	***
V4+200spores	72,705	107,67	5,18	***
DL 5%=0,6196cm; DL 1%=0,8582cm; DL 0,01%=1,184cm				
	Leaf number per plant	%	Dif.	Signific.
V1 Control	84,75	100	Control	-
V2+50spores	86,25	101,77	1,5	**
V3+150spores	90,25	106,49	5,5	***
V4+200spores	96	113,27	11,25	***
DL 5%=1,0724; DL 1%=1,4852; DL 0,01%=2,0491				
	Leaf area, cm^2 per plant	%	Dif.	Signific.
V1 Control	11804	100	Control	-
V2+50spores	12314	104,32	510,05	-
V3+150spores	14100	119,45	2295,5	***
V4+200spores	16793	142,27	4989,2	***
DL 5%=586,51cm^2; DL 1%=812,3cm^2; DL 0,01%=1120,7cm^2				
	Stem diameter, mm	%	Dif.	Signific.
V1 Control	8,4	100	Control	-
V2+50spores	8,525	101,49	0,125	-
V3+150spores	9,375	111,61	0,975	***
V4+200spores	11,725	139,58	3,325	***
DL 5%=0,4548mm; DL 1%=0,6299mm; DL 0,01%=0,869mm				
	Biomass, gram per plant	%	Dif.	Signific.
V1 Control	1385,8	100	Control	-
V2+50spores	1499,3	108,19	113,5	-
V3+150spores	1983,5	143,14	597,75	***
V4+200spores	2819,8	203,48	1434	***
DL 5%=173,24g/plant; DL 1%=239,93g/plant; DL 0,01%=331,02g/plant				

The AM effectiveness was assessed as the absolute contribution to the plants growth or nutrient uptake of the mycorrhizal tomato plants. Micorrhizal effects on biomas was quantized by leaf aria, plant heigth, leaf number and stem diameter amount. Significantly higher plant length (72,7cm/plant), total leaf area (16793cm^2/plant) and biomass (2819,8 g/plant) were obtained in AM variants of the tomato plants grown in the soil of the experimental field (*Table 1 and* ***Figure 1***). Higher concentration of macronutrients absorbed in roots of tomato plants (and significant differences compared with version control) was observed in V3 and V4 variants (*Table 2*).

Table 2

Effects of AM on potassium, calcium, magnesium and sodium absorbed in roots of tomato plants

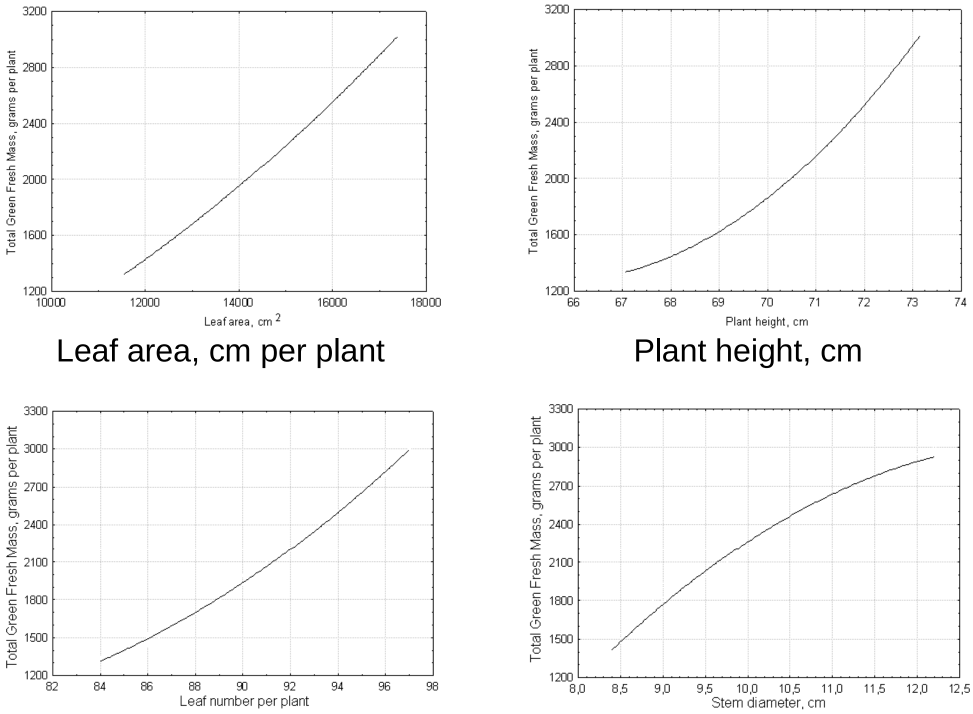
	Potassium, ppm	%	Dif.	Signific.
V1 Control	564	100	Control	-
V2+50spores	614,25	108,91	50,25	*
V3+150spores	769	136,35	205	***
V4+200spores	823	145,92	259	***
DL 5%= 41,994 DL 1%=58,16 DL 0,01%=80,242				
	Calcium, ppm	%	Dif.	Signific.
V1 Control	248,5	100	Control	-
V2+50spores	274,5	110,46	26	*
V3+150spores	355,5	143,06	107	***
V4+200spores	388,5	156,34	140	***
DL 5%=21,823 DL 1%=30,225 DL 0,01%=41,7				
	Magnesium, ppm	%	Dif.	Signific.
V1 Control	226	100	Control	-
V2+50spores	270,25	119,58	44,25	-
V3+150spores	474,5	209,96	248,5	***
V4+200spores	879,75	389,27	653,75	***
DL 5%=82,147 DL 1%=113,77 DL 0,01%=156,97				
	Sodium, ppm	%	Dif.	Signific.
V1 Control	203	100	Control	-
V2+50spores	214	105,42	11	*
V3+150spores	247,25	121,8	44,25	***
V4+200spores	256	126,11	53	***
DL 5%=9,4534 DL 1%=13,093 DL 0,01%=18,064				

Table 3

Effects of AM on nitrogen and phosphorus absorbed in roots of tomato plants

Variants	Nitrogen, ppm	%	Dif.	Signific.
V1 Control	748	100	Control	-
V2+50spores	784,25	104,85	36,25	*
V3+150spores	909	121,52	161	***
V4+200spores	1016,8	135,93	268,75	***
DL 5%=32,691 DL 1%=45,276 DL 0,01%=62,466				
	Phosphorus, ppm	%	Dif	Signific.
V1 Control	28,25	100	Control	-
V2+M(50spores)	30,75	108,85	2,5	**
V3+M(150spores)	37,75	133,63	9,5	***
V4+M(200spores)	40,75	144,25	12,5	***
DL 5%=1,7209 DL 1%=2,3834 DL 0,01%=3,2883				

The best level of absorbtion was achieved by magnesium (879,75ppm, *Table 2*) and phosphorus (40,75ppm, *Table 3*), absorbed in double main compared with cantrol.



Leaf area, cm per plant | Plant height, cm

Leaf number per plant | Stem diameter, cm

Figure 1. Micorrhizal effects on biomas quantized by leaf aria, plant heigth, leaf number and stem diameter amount

Organic sources of nutrients, such as farmyard manure, compost and crop residues, do not seem to suppress AM and may even stimulate them. Tomato roots colonized by *G. intraradices* showed about 3-fold increase in density (***Figure 2***). Mycorrhizal colonization with *Glomus intraradices* improved the drought tolerance of field-grown tomato plants as a result of enhanced phosphorus status under varying intensities of drought stress. We have suggested that the tomato host plant drought tolerance resulting from AM colonization may be explained by a greater root surface area or densely proliferated root growth or hydraulic differences between root systems. The ability of AM fungi to protect the host plant against progressive drought appears to be related to intrinsic capacity of mycorrhizal fungi to resist drought stress and may not be associated with any specific physiological mechanism affected by the *Glomus* species.

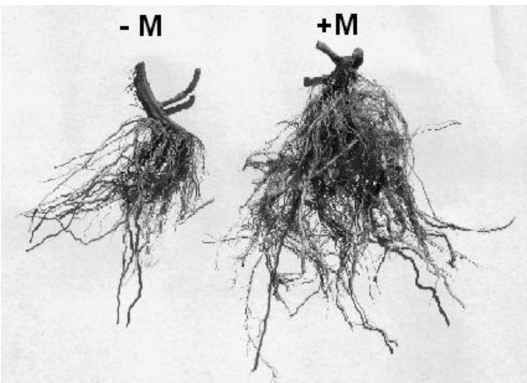


Figure 2. The density rooting system of tomato plants nonmycorrhized (-M) and mycorrhized (+M).

CONCLUSIONS

Mycorrhiza *G. intraradices* was effective in morphological growth of tomato in arid climatic of 2009 year, the practices used in this treatment are aligned with methods that are in favor with advocates for organic horticulture.

Direct inoculation of tomato seeds sown in pots filed with soil, which are then transplanted into the field, can be particularly successful at establishing strong mycorrhizal colonisation, and only requires small amounts of *Glomus intraradices* spores, the best inoculum concentration was 150-200 spores per 10g soil.

The results showed that tomato plants mycorrhiyed of the variety Cristina, organic fertilized with 30t/ha, can double the amount of biomass as a result of doubling the main nutrients required volume absorbed during vegetative growth in an area characterized by high temperature climate.

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EFECTUL MICORIZEI ARBUSCULARE ASUPRA PRODUCTIEI DE TOMATE

EFEECTS OF ARBUSCULAR MYCORRHIZA ON THE TOMATOES YIELD

ADRIAN DULUGEAC

Keywords: Glomus intraradices, VAM, tomato (Lycopersicum esculentum Mil.),yield.

REZUMAT

Specia fungală Glomus intraradices a fost utilizată ca inocul pentru propagarea simbiozei micorizale în cultura tomatelor fertilizate organic, în câmp. Concentrațiile inoculilor micorizali de 150 spori şi 200 spori la 10g sol au indus diferențe foarte semnificative comparativ cu varianta martor privind numărul de fructe pe metrul pătrat şi implicit producția de tomate pe metrul pătrat. Analiza statistică a rezultatelor obținute au demonstrat că variția producției de fructe pe metrul pătrat realizată de plantele micorizate ale soiului Cristina, fertilizate organic cu 30t/ha este influențată în proporție de 74.35% de variția gradului de micorizare (r=0.8623), în condițiile climatice disturbante ale anului 2009, care au favorizat instalarea foarte accentuată a secetei.

ABSTRACT

Fungal species Glomus intraradices was used as inoculum for the propagation of the mycorrhiza symbiosis in the organic fertilized tomato crop, in the field. Mycorrhiza inoculum concentrations of 150 spores and 200 spores in 10g soil induced significant differences compared with version control on the number of fruit per square meter and thus the production of tomatoes per square meter. Statistical analysis results showed that fruit production per square meter variations of the variety carried out by Cristina mycorrhized plants, fertilized with organic 30t/ha, is influenced in rate of 74.35% by mycorrhizal degree variations (r=0.8623), in climatic disturbances of 2009, which favorized the instalation of a very accented droughtness climat.

INTRODUCTION

About 80% of the terrestrial plant species are known to be mycorrhizal (Smith & Read, 2007). According to Oda (2003), tomatoes are difficult to grow during the hot-wet season, because flooding, waterlooged soils, diseases and high temperatures can significantly reduce yields. Tomato plants are generally not especially drought-tolerant, but some will perform better than others under drought conditions. The vesicular-arbuscular mycorrhizal (VAM) fungal symbiosis is widely believed to protect host plants from detrimental effects of drought (Ruiz-Lozano, J.M., 2003). Soils used for agricultural production have a low diversity of AM compared with natural ecosystems (Menendez et al., 2001) and are often dominated by *Glomus* species (Daniell et al., 2001; Jansa et al., 2003; Troeh and Loynachan, 2003; Sjoberg et al., 2004). One reason for this is the low diversity of hosts, which reaches its most extreme form in crop monoculture (Burrows and Pfleger, 2002; Oehl et al., 2003). Tomato plants inoculated with *G. fasciculatus*, *G. mosseae*, and *G. etunicatus* produced a yield of from 200-300% greater than the controls (McGraw A.C. and N. C. Schenck N.C., 1980). Mycorrhiza inoculation has been shown by many workers to promote growth and development of plants including tomato (Osundina and Liasu 1996) in both clean and contaminated soils(Liasu et al, 2005).

We conducted experiments to test whether VAM effects on physiological drought resistance would be more pronounced under dry land condition, mycorrhizal dependency of tomato roots and finaly, in this study, we evaluated an commercial commonly grown cultivar under field conditions to determined how their yield can be improved through the intalation of arbuscular mycorrhizal fungi.

MATERIAL AND METHOD

The experimental field was located and conducted in Voicesti-Valcea, Romania during experimental years 2009. This legume-growing ecosystem, regarding the air relative humidity, had low values during April-September of 36%-66%, which favorized the instalation of a very accented hydric stress climat. We have to notify the droughtness climat, with pluvio-metric deficite of 42,8 mm respectively 48,6 mm. Besides the fact that there has been recorded a long period of droughtness, the air average temperature during the vegetation period, has been higher than the multiannual average. The soil are brown reddish with pH 5.45, 0.16 g N/100 g soil, 0.04 g P/100g soil, 2.9 g total C/100 g soil, and experimental field were manured with 30 t/ha.

The cultivars used as host plant were 'Cristina' *(Lycopersicum esculentum* Mil.), obtained from MEFIM AGRO-Craiova. Tomato seeds were sown in pots filed with soil (these soils had been found to be ideal for propagating the fungi used in this study) and inoculated in may with *Glomus intraradices* Schenck & Smith (provided by the BIOTERRA University-Bucharest). The AM fungi were applied as aqueous dispersion of spores and injected in pots in three doses: 50 spores/10g soil, 150 spores/10g soil and 200 spores/10g soil, each plot contained one single seed. Colonized tomato seeds were transplanted in may at a 0.80 m row spacing, spaced 0.40 m apart. A randomized complete block design was adopted, with 4 variants and 4 replications, each consisting of 5 plants. The field experimental variants involved in the study and sampling of the material used for analyses were: V1- Control (uninoculated plants); V2- Inoculation with 50 spores *G. intraradices* ; V3- inoculation with 150 spores *G. intraradices*; V4- inoculation with 200 spores *G. intraradices.* Normal cultural practices for the experiment were followed for irrigation, but without fertilization and pesticide application.

To estimate the extent of AM colonization, 9 randomly selected root fragments from each variants (V2-V4) were mounted on slides. The presence or absence of AM colonization (internal hyphae, vesicles or arbuscles) was determined using light microscopy (x100) on intersecting vertical gridlines (McGonigle *et al*., 1990). Root colonization (%) was quantified as follows:

$$\text{Root colonization } (\%) = Ni / Nt \times 100\ (\%),$$

where Ni is the number of vertical gridlines intersected by infected roots (AM) and Nt is the total number of vertical gridlines intersected by roots (both infected and noninfected).

The number of spores in the soil samples was determined by a modification of the sucrose centrifugation method (Daniels and Skipper, 1982). Three grams of air-dried soil was suspended in water and centrifuged at 1500 rpm for 5 min. The precipitate was then suspended in 50% sucrose and centrifuged at 1500 rpm for 1 min. The supernatant was poured into a 45-μm sieve and rinsed with distilled water. After washing the inner surface, the contents of the sieve were transferred to a petri dish containing distilled water. The number of spores in the petri dish was counted under a dissecting microscope (x10–x100).

The ‘Brix value’ (or Total Soluble Content) is simply a convenient relative measure of solids content but is not an exact %ww measure. For fast determinations, we using a portable digital Brix meter RQflex-10 (Merck).

The analyses were performed on observations for four different variants, replicated four times. The influence of these factors and their interactions were tested with an ANOVA. Student's *t*-L.S.D. (Least Significant Difference) was calculated at the 5%, 1% and 0.01% significant levels to compare treatment means. The means were compared by L.S.D.using SPPS program version 11.

RESULTS AND DISCUSSIONS

This study investigate the potential impact of mycorrhizal fungi, which have been acknowledged as a new class of bio-fertilizers, on the quality of vegetables. To verify such a hypothesis, we selected tomato (*Lycopersicum esculentum* Mil**.**) as a model plant to examine whether the beneficial effects of mycorrhizal fungi on plant development may be extended to some qualitative fruit features.

The first fruit was obtained for the mycorrhizal variant V4 at 78 days after the sowing, while in the variant control non-micorrhized V1, the first fruit was obtained 12 days later. The fruits was harvested from all the 60 inoculated plants, with an average productivity of 181,1 pieces of fruit per m^2, while 20 of non-mycorrhizal plants (V1-control) were productive, with an average of 156,4 fruits per m^2 (*Table 1*). The inoculated plants produced fruit for a longer period (78 days of productivity, compared to 37 days for the control plants). Six months after seeding, all mycorrhized plants and only 12 control plants were still viable.

The better and most semnificative yield performances (*Table 2*) of the inoculated tomato plants in experimental field (V3 and V4) is due to the fact that AM fungi in the presence of organic matter not only promote growth but also speeded decomposition with mycorrhiza and other soil micro-organism cooperating in degrading organic waste (Osundina and Liasu 1996, Barea et al, 2005).

Table 1

Experimental average results obteined

		Experimental variants			
		V1 Control	V2 +50spores	V3 +150spores	V4 +200spores
Root colonization	%	-	64,36	71,97	75,56
Total Yield	Kg/m^2	15,01	15,64	17,32	19,24
	No. friut/m^2	156,4	162,6	180,4	200,4
Total soluble content	%	5,05	5,06	5,14	5,31
Juice pH	pH	4,00	4,00	4,03	4,05

Table 2

Effects of arbuscular mycorrhiza (AM) on tomato yield

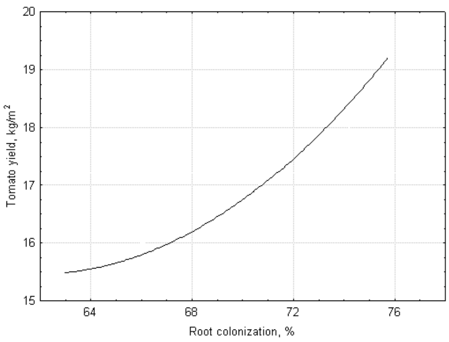
Experimental variants	Total Yield		Dif	Semnif.
	Kg/m^2	%		
V1 Control	15,013	100	Control	-
V2+50spores	15,638	104,16	0,625	*
V3+150spores	17,318	115,35	2,305	***
V4+200spores	19,24	128,16	4,2275	***
DL 5%=0,5007 DL 1%=0,6935 DL 0,01%=0,9568 [Kg/m^2]				
Experimental variants	Total Yield		Dif.	Semnif.
	no. fruits/m^2	%		
V1 Control	156,25	100	Control	-
V2+50spores	162,5	104	6,25	*
V3+150spores	180,25	115,36	24	***
V4+200spores	200,25	128,16	44	***
DL 5%=5,255 DL 1%=7,2781 DL 0,01%=10,041 [no. fruits/m^2]				

Total tomato yield covering the whole cultivation period was significantly different based on dose of micorrhizal inoculum. The most semnificative yield differences of the inoculated tomato plants in experimental field (V3 2,305 kg/m^2 and V4 4,2275 kg/m^2) comparativ with control (V1) were sustained by the correlation coefficient r=0,8623 what demonstrate that fruit production per square meter variations of the variety Cristina from mycorrhized plants, fertilized with organic 30t/ha, is influenced in rate of 74.35% by mycorrhizal degree variations, in climatic disturbances of 2009, which favorized the instalation of a very accented droughtness climat.

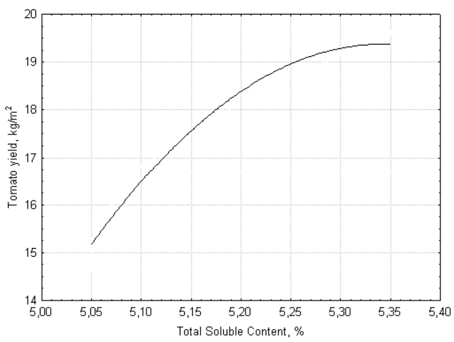
Table 3

Effects of arbuscular mycorrhiza (AM) on total soluble contents and pH of the tomato fruits harvested

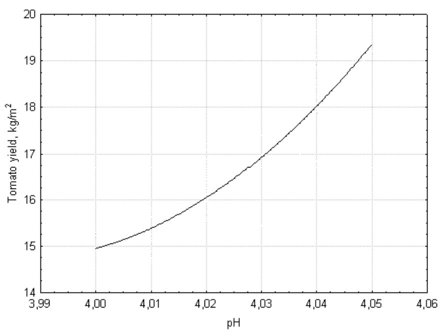
Experimental variants	Total Soluble Content		Dif.	Signific.
	ºBrix	%		
V1 Control	5,05	100	Control	-
V2+50spores	5,0625	100,25	0,0125	-
V3+150spores	5,135	101,68	0,085	***
V4+200spores	5,3075	105,1	0,2575	***
DL 5%=0,0341; DL 1%=0,0473; DL 0,01%=0,0652 [^{0}Brix]				
Experimental variants	pH		Dif.	Semnif.
	pH	%		
V1 Control	4,005	100	Control	-
V2+50spores	4,02	100,37	0,015	*
V3+150spores	4,0325	100,69	0,0275	***
V4+200spores	4,045	101	0,04	***
DL 5%=0,0113 DL 1%=0,0156 DL 0,01%=0,0216 [pH]				



Root colonization, %



Total Soluble Content, %



pH

Figure 1. Indirect effects of AM on tomato yield from root colonization, total soluble content and pH of the fruits

The process of total yield of any tomato plants of each variant is energy-dependent from photosynthates (***Figure 1***) like a total soluble contents and pH. The higher total soluble contents (TSC) and most significantly different was observed in micorrhized variants (*Table 3*) from average TSC 5,14% (V3) to 5,31% (V4), variants with higher biomass acumulated and higher number of fruits per m^2 (*Table 1*) by reson of a great development and sustenable mycorrhiza who act indirect on tomato yield by nutritional process maximized.

CONCLUSIONS

Inoculation with *Glomus intraradices* increased fruit yield and fruit number of tomato plants of "Cristina" cultivar grown in open systems in climatic disturbances of 2009, which favorized the instalation of a very accented droughtness climat. Benefits obtainable from optimal use of vesicular arbuscular mycorrhiza can include: increased drought tolerance and reduced water consumption; more plant material of higher quality classes; faster and better growth (including root growth); higher and earlier marketable yield; earlier ripening of fruits; efficient use of organic fertilizers, leading to more environmentally friendly production.

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STRATEGII GLOBALE DE DEZVOLTARE RECOMANDATE SECTORULUI VITI-VINICOL ROMÂNESC ÎN CONDIŢIILE CRIZEI EUROPENE DE SUPRAPRODUCŢIE

OVERALL STRATEGIES RECOMMENDED OF THE DEVELOPMENT ROMANIAN VITICULTURE-WINE SECTOR IN THE EUROPEAN CRISIS CONDITIONS OF OVERPRODUCTION

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MIHAI SEPTIMIU MARICA, FLORENTINA EREMIA

Key words: romanian viticulture sector, wine market, grafted vines, hybrid direct producers.

REZUMAT

Studiul analizează în profunzime cadrul economic şi legislativ actual al pieţei vinului, atât la nivel naţional cât şi la nivel mondial. Sunt trecuţi în revistă, pe rând, toţi factorii ce pot influenţa în mod direct sau indirect politicile sectoriale de dezvoltare a comerţului cu vinuri, precum şi principalii indicatori macro-economici. De asemenea sunt demontate toate mecanismele economice, sociale şi politice, ce pot determina sau chiar impune anumite tendinţe de dezvoltare pe plan naţional şi internaţional.

ABSTRACT

The study examines in depth the environment economic and legislative current wine market, both nationally and globally. All factors that can influence directly or indirectly sectoral policies for the development of trade in wine and the main macro-economic indicators are all in the past review. All economic, social and political mechanisms, which may cause or even impose certain development trends at the national and international are also dismantled.

INTRODUCTION

Wine market and derivative products is a particularly dynamic market, sometimes unpredictable, in order to indentify correctly the trends and future strategies were used and interpreted data with retrograde.

There are analyzed the main chronological transformations that have occurred for each historical stage, and their imprint on the wine. Are listed with both objectivity and discernment positive achievements and the economic and patrimonial failure of Viticulture-wine sector.

The historical stages through the Romanian society and fingerprint left on wine trade by various regimes are also summary reviewed. Although these data are not very eloquent, and analyzed on a global long of time can provide important elements in the identification of trends and future management strategies.

What gives unique work are the main strategies and measures recommended Romanian economic operators active on the world market for Wine in order to increase the sales of Romanian wines, nuanced and scientifically substantiated.

MATERIAL AND METHOD

This paper came out as a need for purpose of a fairly review of the specific condition of the Romanian wine business, in the required condition of the European exclusive market. For

a more accurate and relevant use, they have been processed collected and stored up data by the well known professional national establishments as like „Romanian National Archives” (fund archive no. 484) and „Romanian National Institute of Statistics”.
They are used as sources the data collected by authors from archives (access allowed no. 580/2004), and also data shown in the papers „The farms and livestock, the period 1837-1939”, „Romanian Statistical Yearbook 2008”, „Romanian Statistical Yearbook 2009” and „Romanian agriculture (1938-1990)”.
The surface evolution under plantations grafts and H.D.P. in Romania (figure 1 & 2):
- 1859 = 83,000 ha vines on own roots;
- 1880 = 137,176 ha vines on own roots;
- 1909 = 63,224 ha vines on own roots + 10,753 ha grafted vines;
- 1914 = 39,992 ha vines on own roots + 31,475 ha grafted vines;
- 1924 = 105,086 ha vines on own roots + 104,948 ha grafted vines;
- 1927 = 38,222 ha vines on own roots + 93,711 ha hybrid direct producers + 107,892 ha grafted vines;
- 1933 = 27,254 ha vines on own roots + 140,315 ha hybrid direct producers + 105,626 ha grafted vines;
- 1937 = 26,118 ha vines on own roots + 218,721 ha hybrid direct producers + 120,590 ha grafted vines;
- 1948 = 96,600 ha hybrid direct producers + 115,400 ha grafted vines;
- 1955 = 112,900 ha hybrid direct producers + 100,300 ha grafted vines;
- 1965 = 137,400 ha hybrid direct producers + 104,800 ha grafted vines;
- 1975 = 115,200 ha hybrid direct producers + 180,500 ha grafted vines;
- 1980 = 92,900 ha hybrid direct producers + 166,300 ha grafted vines;
- 1985 = 77,200 ha hybrid direct producers + 172,000 ha grafted vines;
- 1990 = 62,600 ha hybrid direct producers + 161,100 ha grafted vines;
- 1995 = 102,800 ha hybrid direct producers + 146,000 ha grafted vines;
- 1999 = 117,000 ha hybrid direct producers + 130,000 ha grafted vines;
- 2005 = 92,000 ha hybrid direct producers + 98,600 ha grafted vines;
- 2008 = 94,100 ha hybrid direct producers + 100,800 ha grafted vines.

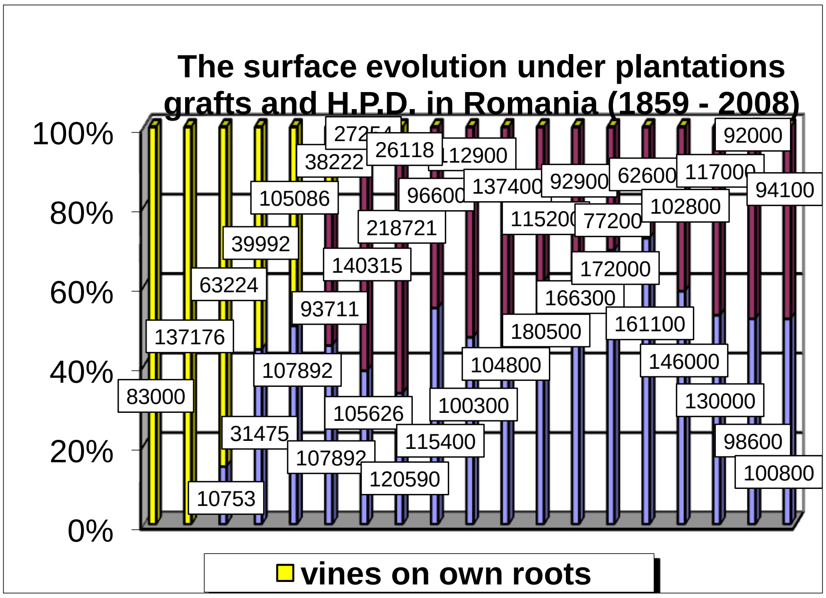
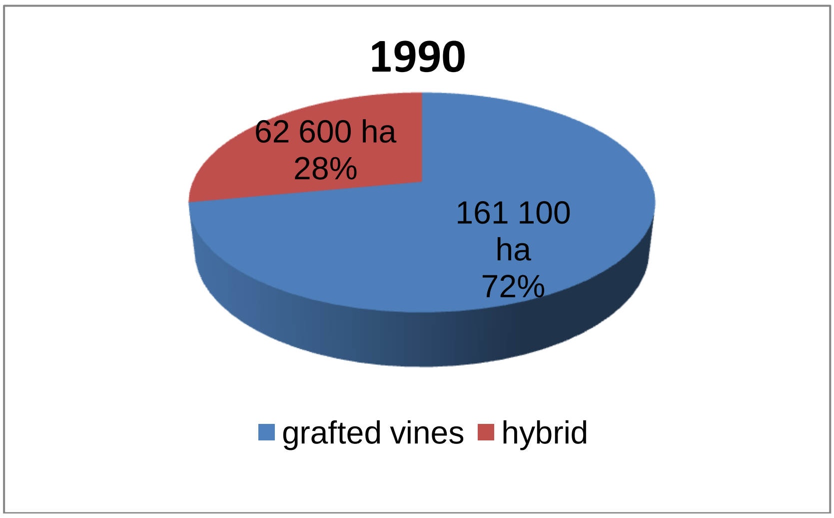
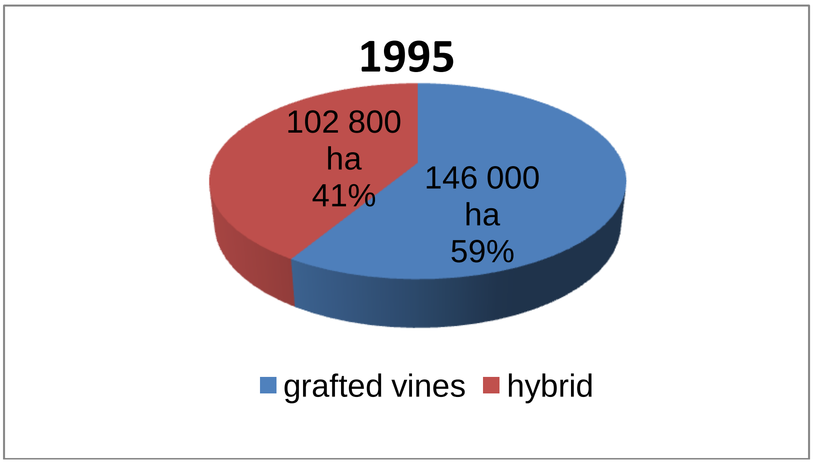
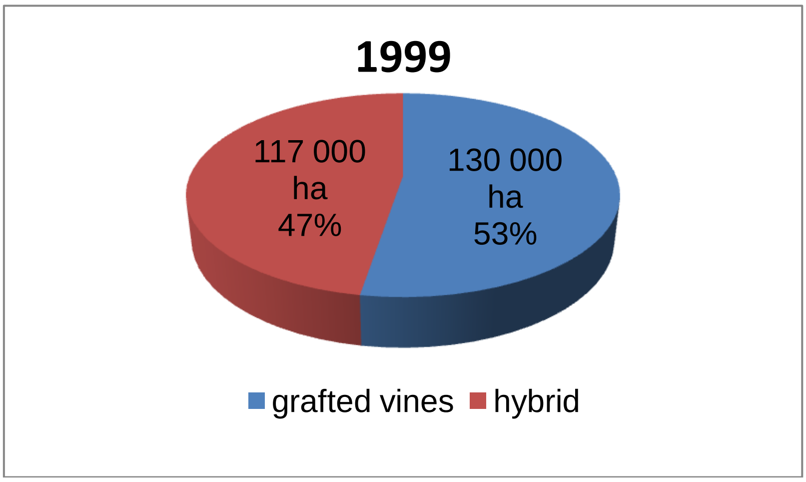
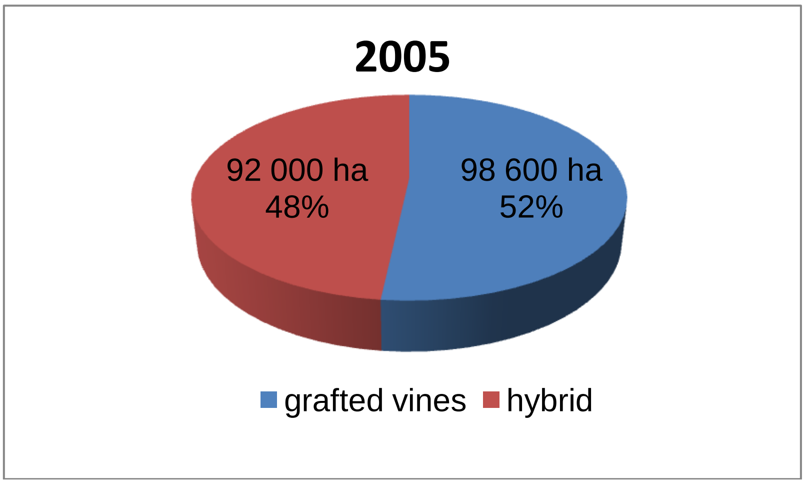


Figure 1 - The surface evolution under plantations grafts and H.D.P.


1990
62 600 ha
28%
161 100
ha
72%
grafted vines
hybrid


1995
102 800
ha
41%
146 000
ha
59%
grafted vines
hybrid


1999
117 000
ha
47%
130 000
ha
53%
grafted vines
hybrid



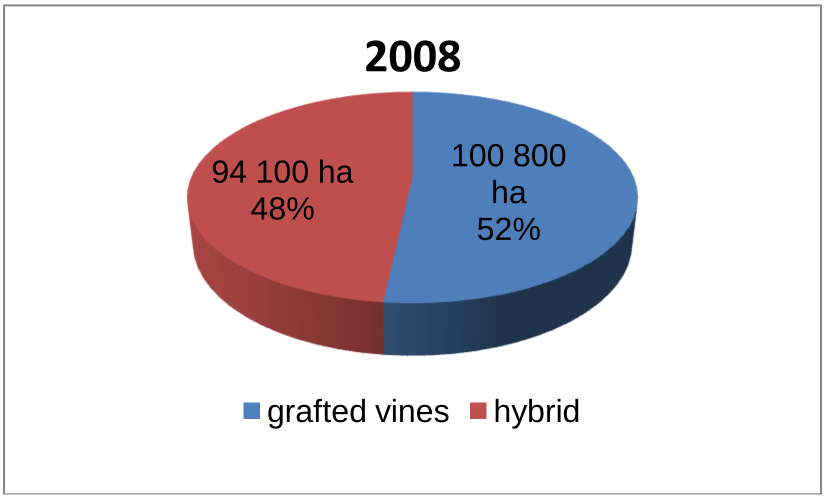


Figure 2 - The surface evolution under plantations grafts and H.D.P. (1990 – 2008)

RESULTS AND DISCUSSIONS

» Weak points:

1. The large share of hybrid direct producers (H.D.P.)

Areas occupied by direct producer hybrids and the production of grapes from these presents a big problem for Romanian wine trade because under Romanian and European legislation wines hybrids, even in mixed wines from Vitis vinifera, are prohibited from trading. In this context, the short and medium term, Romania is the impossibility of increasing production capacity winery, even under conditions of market demand, because the biological and economic ballast for the wines of hybrids.

2. Unfavorable international conjuncture

It is clear that in recent years tended to occur European restrict wine production areas, and even reduced, with all collateral economic consequences resulting from it: unemployment, retraining, economic recession for small local communities, etc. In other words, at this time throughout the European wine community is expensive and sell low. Also, under pressure from existing stocks, finding new outlets, for the producer equals with wine eastern European invasion that anyway it not faces the quality standards.

» Strengths:

1. Pedo-climatic potential

Located one side of the parallel of 45 degrees, Romania offers an extremely favorable climate cultivation of vines around its entire territory.

The Rules (EC). 479/2008 which was published in the „Official Journal of the European Union” 06.06.2008 delimiting areas of European vines, depending on favorable pedo-climatic into six classes: A class, B class, CI class, CII class, CIII a class and CIII b class.

The legislation applicable in all Member States and binding in its entirety recognizes favorable pedo-climatic Romanian vineyards including them in classes B, CI and CII (figure 3).

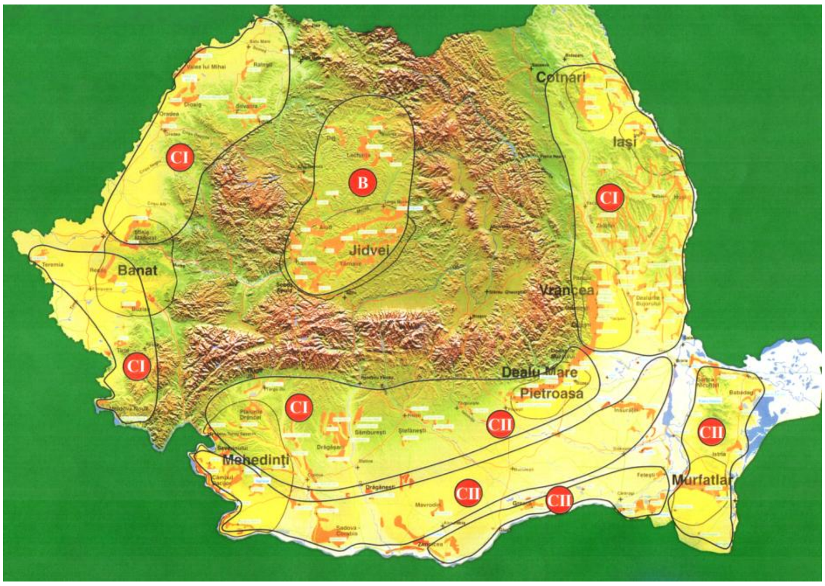


Figure 3 - Romanian vineyards including them in classes B, CI and CII

2. Small producers, the development sector winemaking Romanian

Analysis of trends in the European and international, independent wine producers are known all over the world, significant pressures from multinational competitors. Over time, the wine will lose its becoming more "local citizenship" to be integrated into global production networks, controlled by transnational companies, with a redoubtable financial strength.

To counteract this, small local producers are able to modernize winemaking holdings by accessing European funds for rural development and free association in regional cooperatives.

CONCLUSIONS

» Romania, importing country

According to official statistics in recent years, acknowledged officials and the employers, Romania has the status of the wine importing country. For example, only in the first half of 2007 the quantity of wine imported was nearly three times greater than that exported. Thus, Romania became approximately 21,000,000 liters of wine of which approximately

10,000,000 liters of Spain only, while total exports to Romania amounted to 8,620,000 liters of wine; this trend is maintaining and the future.

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NOILE PREVEDERI LEGISLATIVE EUROPENE CU PRIVIRE LA CONCEPTUL DE AGRICULTURĂ ECOLOGICĂ ŞI INFLUENŢA ACESTORA ASUPRA CREŞTERII CALITĂŢII PRODUSELOR AGRO-ALIMENTARE

NEW EUROPEAN LEGISLATIVE STIPULATIONS REGARDING THE NOTION OF ECOLOGICAL AGRICULTURE AND THEIR INFLUENCE ON THE QUALITY OF FOOD PRODUCT

GALAN CATALIN, DUMITRESCU CARMEN, CARETU GEORGETA, ATUDOSIEI NICOLE–LIVIA

Key words: ecological agriculture, G.M.O., Rules (E.U.) nr.271/2010, label of ecological products.

REZUMAT

Lucrarea face o analiză a principalelor norme legislative europene cu privire la agricultura ecologică, punând accept pe noile prevederi adoptate prin Regulamentul (U.E.) nr. 271 din 24 martie 2010.

Conform noilor prevederi, consumatorii ce cumpără produse ecologice care poartă sigla U.E. pot avea încrederea că:

» cel puţin 95% din ingrediente au fost produse după tehnologii ş i metode agreate de conceptul de agricultură ecologică;

» produsul respectă regulile schemei oficiale de inspecţie;

» produsul provine direct de la producător sau procesator, într-un pachet sigilat;

» produsul poartă numele producătorului, procesatorului sau vânzătorului şi numele sau codul organismului de inspecţie şi certificare.

ABSTRACT

The paper makes an analysis of the main European legislative standards regarding ecological agriculture, increasing new stipulation adopted through the rule nr. 271, from 24th of March, 2010.

In accordance with the new stipulations, consumers who buy ecological products marked by E. U.'s logo may believe that:

- least of 95% of ingredients have been made by methods and technologies agreed by the notion of ecological agriculture;
- product respects rules of official scheme of inspection;
- product proceeds direct from the producer or processor in a sealed package;
- product has the name of its producer, processor or seller and name or code of the organism which inspects and certifies.

INTRODUCTION

The notion of ecosystem was introduced by Tansley (1935) who defined it as being made by biotope and biocoenosis.

Ecosystem unites the alive community (biocoenosis) with physical medium (biotope). At the beginning of XXth Century, Rudolf Steiner introduced the notion of biodynamic agriculture. The author proposed the practicing of a biological dynamic agriculture (biodynamic).

According to this notion an agricultural exploitation works like an alive organism, Steiner making a correlation between the tradition of a healthy agriculture with modern methods of applying cultural techniques, justified from the ecological point of view.

In agriculture of the last decade has been spread the notion of agricultural ecosystem which is defined as that functional unit of biosphere created and controlled by people in order to obtain high quality productions in advantageous economical conditions, but protecting the environment (L. Dejeu and collaborators, 1997; M. Oslobeanu and collaborators, 1994).

So, we talk about everything is developing in air, water, soil and which has a direct or indirect connection with an agricultural area.

MATERIAL AND METHOD

According to current legislation the notion of ecological agriculture named in other countries “organic”, “biodynamic” or “biological”, it is fundamental different by conventional agriculture through new rules and typical technologies which have as a purpose producing of healthy food, “clean”, in correlation with conservation and protection of medium.

“Ecological agriculture“ is a protected and attributed term by E. U. to Romania for defining this system of agriculture.

Legislative framework regarding practicing of ecological agriculture and the way of labeling the ecological products is settled by E. U. through:

- Rules (EC) no.834/2007 of the Council regarding ecological production and labeling the ecological products;
- Rules (EC) no. 889/2008 of Committee for establishing of standards of applying of Rules (EC) no. 834/2007;
- Rules (EC) of Council no.967/2008;
- Rules (E.U.) no.271 from 24th March, 2010.

These norms are very exactly and want to increase confidence of consumers for the products with E.U. logo.

Ecological products are obtained according with rules and principles from these regulations, or for the imports according to an equivalent system, with the same rigor.

RESULTS AND DISCUSSIONS

Main stages of changing for a classical agricultural exploitation in a certified ecological exploitation are:

1. Contacting an accredited company for certification;

The Company for certification will give the producer in exchange of a fee, all legislative norms and technical standards which must be respected in an ecological exploitation. Also, it will train the personnel to respect traceability of equipments in a farm.

2. Making a preliminary analysis for soil, water and ground water to eliminate the possibility of existence of a pollution factor with great remanence which can compromise reconversion of the plantation;

Surfaces near a major pollution source with great remanence will be excluded, such as chemical plant, highways, pesticide warehouse etc.

3. Reconversion which means permanent monitoring of bio–chemical parameters of soil, water, plants and agricultural products;

Monitoring is made by the company for certification in exchange of a fee paid by producer.

4. Releasing of a “Concordance certificate” by company for certification at the end of the reconversion period.

Agricultors who respected rules of production will receive the certificate of ecological product and will label products with mention “ecological”. Reconversion period is minimum 3 years, indifferent of culture type, in this period the farmer may sell him products with label “reconversion products”.

Another problem approached by the new legislative stipulations is representing by substances approved by ecological agriculture. Ecological agriculture is extremely restrictive regarding substances used for nutrition deficiency, the effect of different pathogens or effects of climatic accidents (hail, drought, frost etc.). For example, in ecological agriculture is accepted the following substances:

- natural fertilizer obtained from alga;
- contact pesticides (bordeleza juice, sulfocalcic juice);
- organic pesticides like “ Eco – friendly Meristem S. L. “ obtained from phytohormones and plants inhibitors (ex. Tricoderma meristem, Biomer oidio, Biomer botrytis, Chitomer);
- bio-fertilizer based on bacteria which fix nitrogen, genetic unmodified such as Azobacter, Baccilus megaterium, Clostridium (ex. Ecofertil P, Azofertil).

Also, are approved bio-products based on microorganisms useful for crop plants or based on natural compounds (extracts from plants – “botanical”). Because of their biological character, bio-preparations have a complex action on crop plants, the most correct term being: bio-preparations for agricultural usage.

In this context, biotechnologies have an essential role in medium protection by contribution on isolating and extracting vegetable hormones with inhibitor role and antifungal and in selection of useful bacteria from agro technical point of view, products named bio-preparations.

An example is bio-preparations based on antagonist fungus Trichoderma. Homologated as bio-fungicides, some bio-preparations stimulate vegetable growth (Baker R. 1988, “Trichoderma spp. as plant – growth stimulants”) and this stimulating of plants growth is because of bio-fungicides action in plants nutrition.

CONCLUSION

In accordance with the new stipulations adopted through the Rule (E.U.) no. 271, from 24th of March, 2010, consumers who buy ecological products marked by E. U.’s logo may believe that:

- least of 95% of ingredients have been made by methods and technologies agreed by the notion of ecological agriculture;
- product respects rules of official scheme of inspection;
- product proceeds direct from the producer or processor in a sealed package;
- product has the name of its producer, processor or seller and name or code of the organism which inspects and certifies;
- products with new ecological label will not contain any product or subproduct proceeded from genetic modified organisms (GMO).

Also it was introduced a unique system of mandatory labeling valid in all Member States as 1st of July, 2010. New logo for certified organic products is available in two versions: a version and a black color (Fig. 1).

Fig. 1 – Ecological logo of E.U. valid since
1st of July 2010

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10. **Rules (E.C.) of Council no. 967/2008**;
11. **Rules (E.C.) no. 271 since 24th March 2010**.

CERCETĂRI PRIVIND INFLUENȚA INGRĂŞĂMINTELOR MINERALE ASUPRA PRODUCȚIEI LA SOIUL DE PRUN STANLEY, CULTIVAT ÎN ZONA IŞALNIȚA – DOLJ

RESEARCHES ON THE INFLUENCE OF FERTILIZERS ON THE PLUM YIELD WITH STANLEY VARIETY CROPPED IN ISALNITA – DOLJ ZONE

LAZEANU P., BECHERESCU C., DOBRE M.

Keywords: plum tree, plum yield, productivity indicator

ABSTRACT

Within Isalnita commune, on the shore of Amaradia stream there was planted a plum orchard with 625 trees/hectare density. There have been determined the soil features: humus = 3.48%, available P=23 ppm; available K=280 ppm; pH in water=6.93. The researches have included 10 treatments: V1 – control, not fertilized; V2 – $N_{30}P_{20}K_{30}$; V3 – $N_{35}P_{25}K_{35}$; V4 – $N_{40}P_{30}K_{40}$; V5 – $N_{50}P_{40}K_{45}$; V6 – $N_{60}P_{50}K_{50}$; V7 – $N_{70}P_{55}K_{55}$; V8 – $N_{90}P_{60}K_{60}$; V9 – $N_{100}P_{70}K_{70}$; N10 – $N_{120}P_{80}K_{80}$. The experiment had 5 replications. One year after planting there begun to take measurements of trunk diameter. The results have been statistically processed and presented within a previous paper (Lazeanu P., 2009). The experiment lasts from 2001, on. The plum yield is very significantly correlated with the fertilizer dose, NPK, only with doses higher than 160 kg. There was calculated the productivity indicator, IP = fruits mass (kg) / surface of trunk section (cm^2).

INTRODUCTION

There were researched the behavior of Stanley plum tree variety on soil and clime conditions of Isalnita – Dolj. There was established that the chemical fertilizers highly influence the plums yield.

MATERIAL AND METHOD

There was initiated a plum tree orchard with Stanley variety at a plant density of 625 trees per hectare. The variants were as follows: V1 – control, not fertilized; V2 – $N_{30}P_{20}K_{30}$; V3 – $N_{35}P_{25}K_{35}$; V4 – $N_{40}P_{30}K_{40}$; V5 – $N_{50}P_{40}K_{45}$; V6 – $N_{60}P_{50}K_{50}$; V7 – $N_{70}P_{55}K_{55}$; V8 – $N_{90}P_{60}K_{60}$; V9 – $N_{100}P_{70}K_{70}$; N10 – $N_{120}P_{80}K_{80}$. As fertilizers there were used ammonium nitrate, potassium chlorine and superphosphate. Each variant has had 5 replications. There were made soil analysis: humus, pH, available P, available K on the entire soil profile. The analysis methods were the official ones, elaborated by ICPA Bucharest. There was, also, determined the plums yield. There was calculated the productivity indicator.

RESULTS AND DISCUSSIONS

The first table comprises the plum yield and the second table, the productivity indicators.

Table 1

The average plum yield of Stanley variety in function of fertilizer dose within 2003-2007 period

	Specification	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
2003	Yield Kg/tree	2.13	3.80	5.02	5.70	6.47	7.02	7.45	7.78	7.90	7.07
	Dif. Kg	Ctrl.	1.67	2.89	3.57	4.34	4.89	5.32	5.65	5.77	4.94
	DL 5% = 0.33 DL 1% = 0.45 DL 0.1% = 0.58										
	Sign.		***	***	***	***	***	***	***	***	***
2004	Yield Kg/tree	5.4	7.3	8.0	10.2	11.8	13.5	15.0	16.8	19.0	19.5
	Dif. Kg	Ctrl.	1.9	2.6	4.8	6.4	8.1	9.6	11.4	13.6	14.1
	DL 5% = 0.55 DL 1% = 0.74 DL 0.1% = 0.97										
	Sign.		***	***	***	***	***	***	***	***	***
2005	Yield Kg/tree	8.8	11.2	12.0	15.5	17.8	21.1	22.3	26.0	29.2	31.0
	Dif. Kg	Ctrl.	2.4	3.2	6.7	9.0	12.3	13.5	17.2	20.4	22.2
	DL 5% = 0.42 DL 1% = 0.56 DL 0.1% = 0.73										
	Sign.		***	***	***	***	***	***	***	***	***
2006	Yield Kg/tree	12.0	15.0	16.0	20.9	24.7	27.9	32.1	35.0	40.1	42.0
	Dif. Kg	Ctrl.	3.0	4.0	8.9	12.7	15.9	20.1	23.0	28.1	30.0
	DL 5% = 7.79 DL 1% = 10.43 DL 0.1% = 13.65										
	Sign.		*	**	***	***	***	***	***	***	***
2007	Yield Kg/tree	16.9	25.0	27.8	30.0	34.0	36.3	43.0	48.1	52.9	54.0
	Dif. Kg	Ctrl.	8.1	10.9	13.0	17.1	19.4	26.1	31.2	36.0	37.0
	DL 5% = 10.37 DL 1% = 13.87 DL 0.1% = 18.16										
	Sign.			*	*	**	***	***	***	***	***

Table 2

The productivity indicator, IP, of Stanley variety in function of fertilizers doses within 2003-2007 period (kg/cm^2)

Year	Specification	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
2003	Yield Kg	2.13	3.80	5.02	5.70	6.47	7.02	7.45	7.78	7.90	7.07
	Surface cm^2	14.04	19.08	20.82	17.19	17.34	20.83	21.06	22.47	22.30	22.97
	I.P. kg/cm^2	0.15	0.20	0.24	0.33	0.37	0.34	0.35	0.35	0.35	0.31
2004	Yield Kg	5.4	7.3	8.0	10.2	11.8	13.5	15.0	16.8	19.0	19.5
	Surface cm^2	26.86	28.45	33.98	30.17	34.19	45.34	51.75	59.42	68.18	58.05
	I.P. kg/cm^2	0.20	0.26	0.23	0.34	0.34	0.30	0.29	0.28	0.28	0.33
2005	Yield Kg	8.8	11.2	12.0	15.5	17.8	21.1	22.3	26.0	29.2	31.0
	Surface cm^2	44.15	43.33	53.68	56.32	65.00	76.16	84.58	94.47	110.23	112.10
	I.P. kg/cm^2	0.20	0.25	0.22	0.28	0.27	0.27	0.26	0.27	0.26	0.27
2006	Yield Kg	12.0	15.0	16.0	20.9	24.7	27.9	32.1	35.0	40.1	42.0
	Surface cm^2	64.01	59.69	72.80	74.62	90.72	102.91	107.82	115.50	135.95	138.44
	I.P. kg/cm^2	0.19	0.25	0.22	0.28	0.27	0.27	0.30	0.30	0.29	0.30
2007	Yield Kg	16.9	25.0	27.8	30.0	34.0	36.3	43.0	48.1	52.9	54.0
	Surface cm^2	80.87	72.34	95.50	97.94	106.91	120.31	124.23	134.10	153.86	165.50
	I.P. kg/cm^2	0.21	0.34	0.29	0.31	0.32	0.30	0.35	0.36	0.34	0.33

The data from the first table show that within 2003-2007 period the influence of fertilization on the plum yield is very significant for all treatments yet in 2006 and 2007 only for high fertilizer doses.

There was proven that there is a link between the plums yield and the section of the trunk. The ratio between the mass of fruits and the section of the trunk is called productivity indicator. It is measured in kg fruits per cm^2 (Teaci D. ș .a., 1985, Voiculescu N., 1999). It is written as IP. We can assume that high values mean a rentable fruit tree that gives a high yield per unity of trunk surface.

If we compare the evolution in time of the productivity indicator for a certain variant (for a certain fertilizer dose) there can be noticed different values during tree life. They can be explained by good conditions for high IP s and less favorable conditions for low IP s. The data from the second table show that the control variant not fertilized recorded similar values of IP during time, about 0.2 kg/cm^2. It is the lowest value. It can be assumed that IP is a value for a fruit tree plant grown in natural conditions (control variant). There is noticed that IP is influenced by the fertilizer doses (not only by climatic conditions). We consider that the signification of this indicator has to be established by further researches.

CONCLUSIONS

1. There is very significant correlation between the plums yield of Stanley variety and the NPK dose yet for doses higher than 160 kg/ha. This phenomenon can be explained by good soil supplying by humus and nutrients.
2. The values of the IP indicator for Stanley variety have been minimal (0,2 kg/cm^2) for the not fertilized variant and maximal (0.36 kg/cm^2) for $N_{90}P_{60}K_{60}$ variant. The IP is influenced by both climatic conditions and fertilizer doses.
3. Due to high plums yield recorded we recommend the Stanley plum tree variety to be grown in Isalnita – Dolj conditions.

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CERCETĂRI PRIVIND COMPORTAREA UNOR CULTIVARE LA RAPIŢA DE TOAMNĂ CULTIVATĂ ÎN CONDIŢIILE ECOPEDOLOGICE DIN CÂMPIA CARACALULUI

RESEARCH REGARDING THE BEHAVIOUR OF SOME CULTIVARS OF WINTER RAPE CULTIVATED IN THE ECOLOGICAL CONDITIONS FROM CARACAL PLAIN

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Keywords: coltza, height, seeds per fruit, yields.

REZUMAT

Rapiţa coltza (de toamnă) se cultivă pentru seminţele sale ce conţin 42-49% ulei, folosit în diverse scopuri, în ultimul timp fiind din ce în ce mai mult întrebuinţat direct în alimentaţia oamenilor şi la fabricarea margarinei. În ţările avansate din vestul Europei (Germania), uleiul de rapiţă în amestec cu butanul este utilizat drept carburant pentru motoarele diesel, ca atare sau sub formă de ester metilic, numit "diester", mai economic decât motorina, biodegradabil şi cu implicaţii în limitarea poluării atmosferice şi în combaterea efectului de seră (Berea, 1998).

Uleiul de rapiţă poate fi folosit în industria textilă, industria pielăriei, a materialelor plastice, a lacurilor, vopselelor, cernelurilor, detergenţilor, tensioactivilor, în industria poligrafică, la iluminat sau ca lubrifiant, ulei pentru pictură, lumânări şi surfactanţi, la fabricarea agenţilor antipraf, ca adjuvant pentru pesticide, ca fluide hidraulice.

ABSTACT

Coltza rape (winter) grown for its seeds that contain 42-49% oil, used for various purposes in recent times is becoming more and feed people directly employed in the manufacture of margarine. In advanced countries of Western Europe (Germany), rapeseed oil blended with butane is used as fuel for diesel engines, as such or as methyl ester, called diester, more economical than gas, biodegradable and implications in limiting atmospheric pollution and combating the greenhouse effect (Beer, 1998).

Rapeseed oil can be used in the textile, leather, plastics, varnishes, paints, inks, detergents, tensioactivs, in the printing industry, the lighting or as a lubricant, oil paintings, candles and surfactants in the manufacture of dust agents as adjuvant for pesticides, as hydraulic fluids.

INTRODUCTION

In Romania is quite low yields of rape, only 2 to 2.5 tones / ha, and the price of a tone reached the port of Constanta deposits varies between 220-225 dollars per ton.

The explosion of demand for biodiesel in the global market affected areas that rape is grown in Romania. If in 2005, the area was approximately 50.000 ha nationally in 2006 doubled to reach 100.000 ha, and in 2009 the increase was substantial - about 600.000 ha.

This requires that there is a well-documented information on varieties and hybrids of rapeseed grown, knowing that the central area of Oltenia is known as an area with dry climate.

MATERIAL AND METHOD

Given that weather conditions in Romania are much different from Western Europe are required to be tested cultivars (varieties and hybrids) are sold in the country with great professionalism and the goal being to highlight those varieties and hybrids that exhibit high adaptability.

The objective of this paper is to assess against a set of sorts and a set of hybrids of different origins in the rape of climate and soil conditions of ARDS Caracal and recommend the best solution in terms of adaptability.

Were tested 15 cultivars of rape from three companies, as follows:

- from LIMAGRAIN: ***Adriana, Ontario, Manitoba, Champlain, Andrick, Artoga***;
- from SYNGENTA: ***Tocca, Nelson, Formula, Smart***;
- from MONSANTO: ***Executive, Exagone, Extended, Exotic, Excel***;

Variants were tested in batches of 300 m^2 demonstration plots. Within these large plots were harvested samples per 5m^2 of three points located on the diagonal in which plot measurements were made above.

In each of these variants were determinate some parameters as:

- *date of started blooming* - when 10% of the plants began to flourish;
- *last date flourished* - when over 75% of plants have gone the flourish stage;
- *average height of plants* - mean of 20 plants /variant;
- *number of branches / plant* - average 10 plants to maturity;
- *fruits number / plant* - average 10 plants to maturity;
- *number of grains /fruit* - average of 25 determinations;
- *harvesting moisture -%* determined with portable field analyzer;
- *production* - calculated at 9% STAS humidity;

The previous plant was winter wheat. The sowing date was 2nd of September. The density of sowing was 70 germinable seeds/m^2. As fertilizers we use in autumn were applied a dose of 50 kg of nitrogen and 50 kg of phosphorus, and in spring only nitrogen, of 80 kg/ha. The date of harvesting was 8th of July.

RESULTS AND DISCUSSIONS

From a climate perspective, the year of experience 2008 - 2009 was held as a warm year with less rainfall in the first part of the vegetation of rape (September 2008 - January 2009) and cooler and more rain, especially towards the end of rapeseed crop vegetation (figure 1).

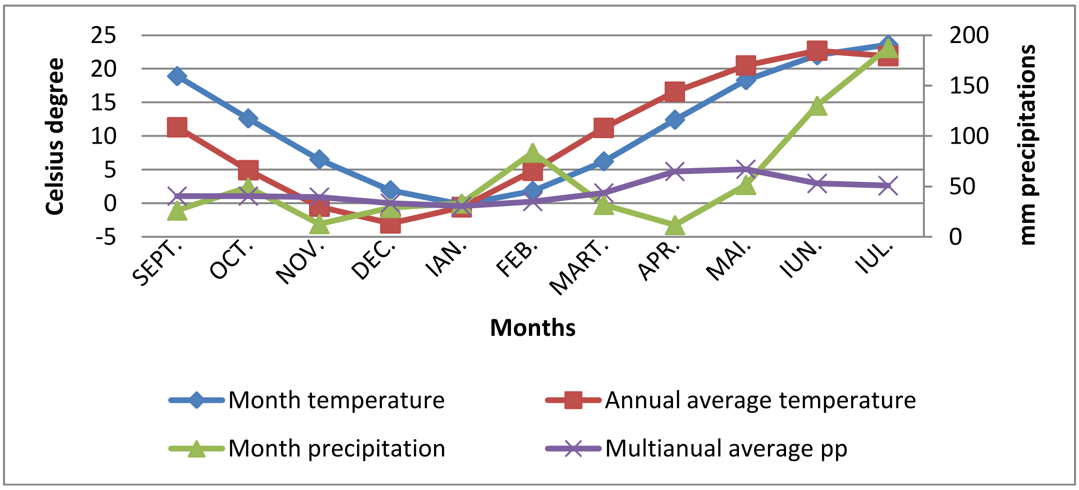

Figure 1 – The climate conditions in vegetation

period of coltza (2008 – 2009)

Lower than the annual average temperatures in winter and late spring of 2009 led to record losses of plants during the cold and reduce plant density and vegetation resume in the spring was more difficult, all these aspects, leading to reduction in grain yield obtained STAS final cultivars tested.

Towards the end of the vegetation in June and July was more abundant rainfall, with very large, 130.2 mm in June, which led to foster rape attack pathogens and diminished crop production in some and hampered harvesting.

Related to the blooming period - the rapeseed cultivars tested in 2009 in Caracal ARDS was monitored during the flowering season, noting the date when 10% of flowering inflorescences when they began to flaunt flowers and end dates of flowering when 75% of inflorescences were covered stage flowering (table no. 1).

Table 1

Blooming period on coltza cultivars tested in 2009 at ARDS Caracal

No.	Origin	Cultivars	Start blooming	End blooming
1.	**LIMAGRAIN**	Adriana	17.IV	12.V
2.		Ontario	16.IV	11.V
3.		Manitoba	17.IV	11.V
4.		Champlain	16.IV	12.V
5.		Andrick	16.IV	11.V
6.		Artoga	15.IV	11.V
7.	**SYNGENTA**	Toccata	15.IV	12.V
8.		Nelson	15.IV	13.V
9.		Formula	16.IV	12.V
10.		Smart	15.IV	14.V
11.	**MONSANTO**	Executive	15.IV	10.V
12.		Exagone	16.IV	11.V
13.		Extend	16.IV	10.V
14.		Exotic	15.IV	12.V
15.		Excel	16.IV	12.V

Regarding the earliness of the cultivars tested three companies is apparent that there were significant differences between cultivation.

There is, however, executives at Monsanto cultivar whose blooming period is the smallest, starting and ending on and flowering 15.IV 10 V, followed by the Exagone of the same company with the onset of flowering on 16. IV and end it on 11.V.

With higher in triggering precocious flowering period of fall and the company Syngenta cultivars whose flowering onset occurs at three of them, namely Toccata, Nelson and Smart, the 15.IV, and at the fourth - Formula - on 16.IV.

Limagreen cultivars from the company had an average delay of 1-2 days to start flowering, with periods longer than all other forms of range of 1-2 days.

Plants height - was another character to watch and record rapeseed cultivars studied (figure 2). The data obtained show large differences between cultivars with different origins and even within the same origins.

The cultivars from the company recorded Limagrain limits ranged from 147 cm to 173 cm cultivar to cultivar Ontario and Manitoba, he being the one who had the highest of all plants tested range.

The company Syngenta cultivars proved to be more homogeneous in this regard and had similar values in terms of plant height of between 158 cm and 170 cm Nelson cultivar to cultivar formula.

Cultivars from Monsanto recorded higher amplitudes between minimum and maximum values of plant height. They were between 143 cm and 172 cm Exotic cultivar to cultivar Executive.

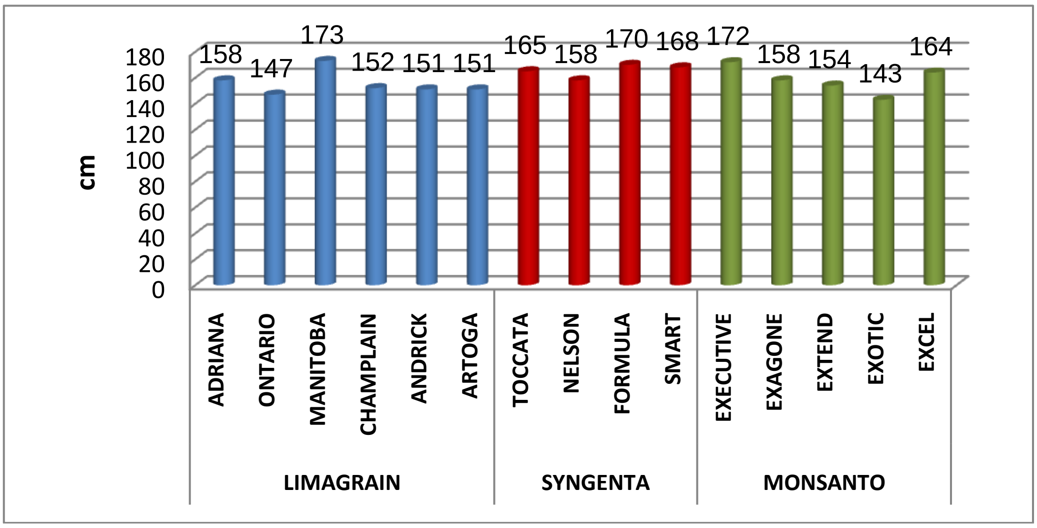

Figure 2 – The plants' height determinate at plant's maturity

Study of this nature was necessary because the trend in improvement of this crop cultivation is to obtain as low waist to prevent falling plants with a high degree of branching and also one of the first branch insertion height as low stem.

Biomass consists of cultivation should be as small to promote rapid harvesting without losses as shaking and consume less fuel.

Number of branches per plant - is a character that directly affects productivity, farmers preferring cultivars with a high degree of branching to increase the number of fruits/plant (figure 3).

The degree of branching is a cultivar of hereditary, but by directing some technological links it can be influenced to increase the number of branches.

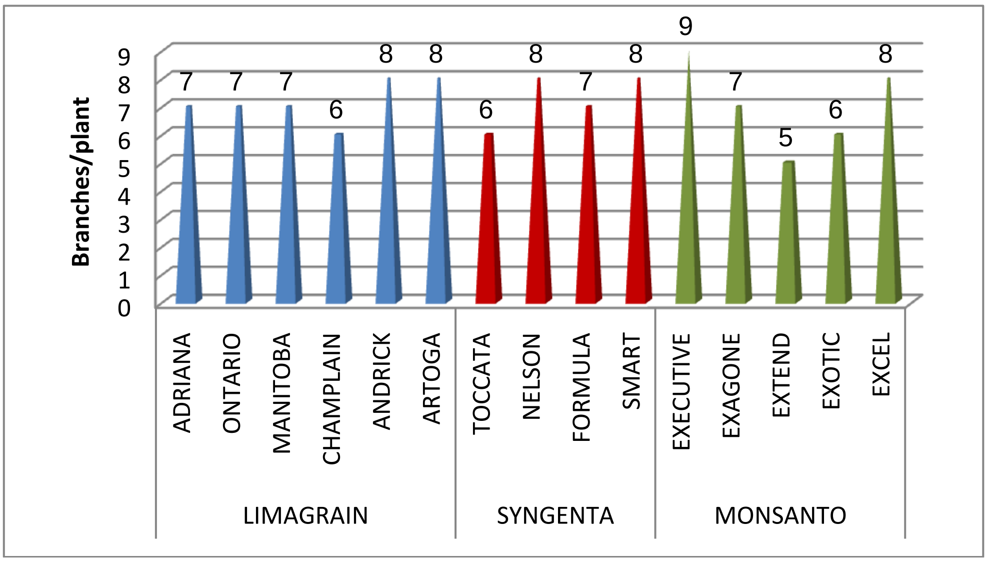

Figure 3 – Number of branches/plant measured at rape maturity

The range tested was found the following situation:

- the Limagrain cultivars with one exception the number of branches per plant was more than 7, the highest values of eight branches on a plant being registered cultivars Artoga and Andrick;
- the firm Syngenta cultivars produce the same maximum number of branches - 8, respectively cultivars Smart and Nelson;
- a more varied degree of branching cultivars are recorded at Monsanto, where I obtained both the higher degree of branching - 9 - Executive cultivar - and the lowest value in the range - 5 - Extended cultivar.

In terms of number of fruits per plant to undergo testing range with high amplitude values we obtained from cultivation, ranging from 152 fruits/plant to the company Limagrain Adriana and 350 fruits per plant cultivation Andrick from the same company (figure 4).

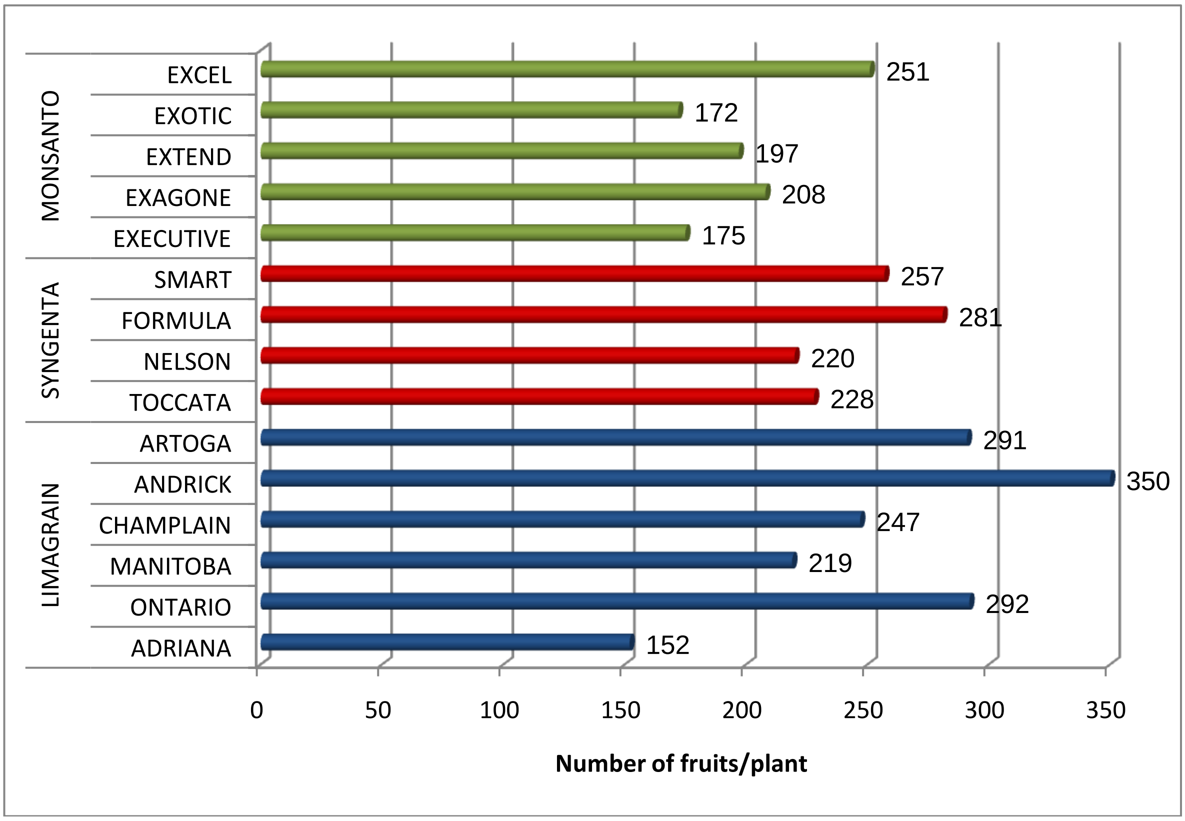

Figure 4 – Number of fruits/plant measured at rape maturity

Cultivars experienced firms Monsanto and Syngenta have proven to be more homogeneous in this regard, with smaller variations between the approved designs and market the seeds with values between 220 and 281fruits/plants at firm Syngenta and 172 and 251 fruits per plant from Monsanto.

The constancy and the magnitude of these characters from the companies Syngenta and Monsanto found in the vegetation period had direct implications on the production obtained in the determinations were made and resulted in obtaining higher yields on average over the two companies in the assortment of hand compared with the company Limagrain

Number of grains/fruit - experienced varied assortment of 17 grains/Exotic fruit cultivation of Monsanto to 26 grains/fruit per cultivar Artoga from Limagrain firm.

From Figure 5 we can see that most cultivars the number of grains/fruit was higher than 21, with a greater consistency in company Syngenta where the values were mostly recorded over 22 to 23 grains/fruit.

A large amplitude between the forms tested in this regard, a note from Monsanto, where the difference between the lowest and the highest is 7 grains/fruit.

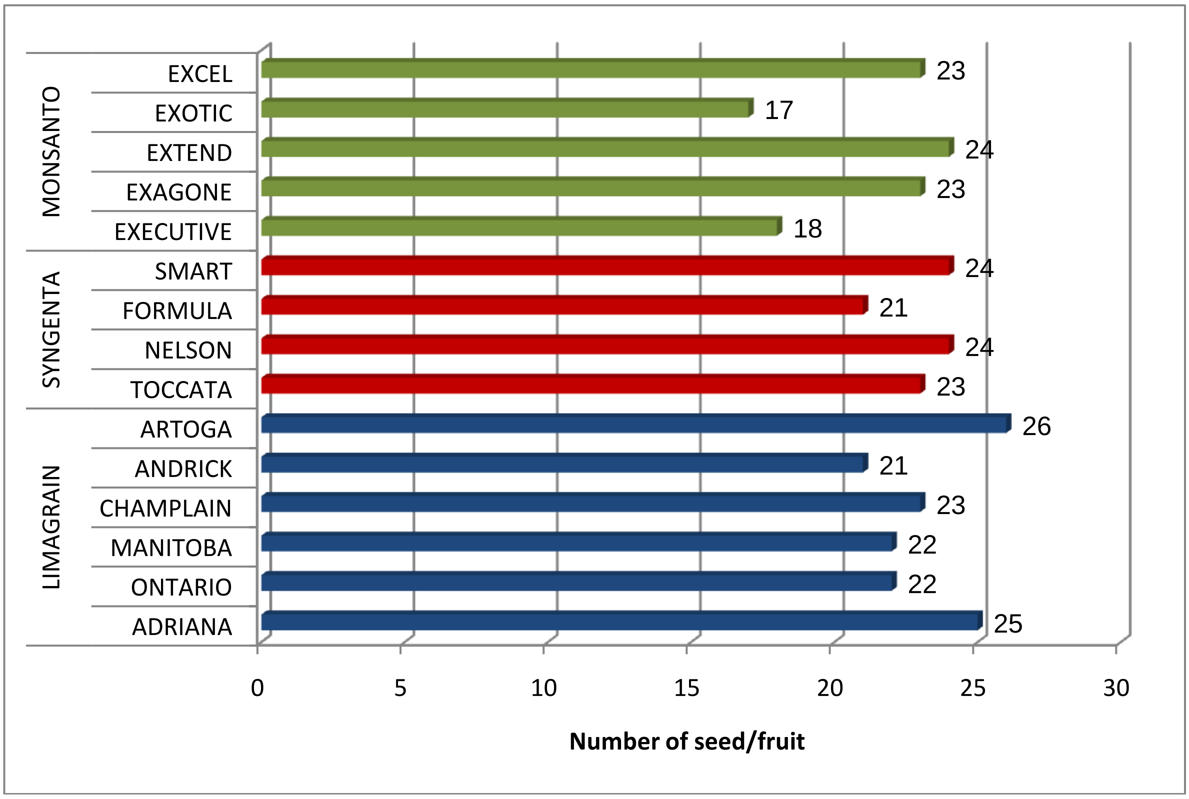

Figure 5 – Number of seeds/fruit measured at rape maturity

In terms of **production determined and corrected at 9% humidity STAS** we note the following (table 2):

• company cultivars Limagrain - have obtained yields between 1923 kg / ha in Manitoba cultivar and 2632 kg / ha Artoga cultivar. Compared with the control - media / experience, which had a value of 2410 kg / ha - a single cultivar had a blank production exceeded of 224 kg / ha, which meant an increase in production achieved with 9.2% , growth is significant statistically assured.

• cultivars of company Syngenta - have achieved higher production than the control, with one exception - where the production of the Smart cultivation was 2100 kg / ha more than with 310 kg / ha than the average / experience. Significant production increases were registered cultivars and Nelson formula, with increases of respectively 249 and 148 kg / ha compared to the control. The highest production of the cultivars was obtained from Syngenta Company Toccata, with an increase in production of 400 kg / ha increase in considered as highly statistically significant.

• Monsanto cultivars - as in the case of the Syngenta very well behaved production increases beyond the blank between 193 and 373 kg / ha. There is this sort of cultivar Excel that Monsanto has made a 15.4% increase compared to the control, growth of statistically considered as very significant. Exagon cultivar has achieved a production of 2716 kg / ha, signing a pledge with a distinct increase production significantly, by 12.6%.

Analyzing the overall production values obtained in testing in 2009, we can say that my rape grown productions at Caracal plain in no irrigated conditions were good throughout their range of experience resulting in an average 2410 kg / ha.

Table 2

The yield, the differences and significations on rape cultivars experimented in 2009 in ARDS Caracal

No.	Origin	Cultivar	Yields STAS 9% Kg/ha	Differences Kg/ha	%	Signification
1	LIMAGRAIN	Adriana	1977	-433	82.0	OOO
2		Ontario	2308	-102	95.7	-
3		Manitoba	1923	-487	79.8	OOO
4		Champlain	2173	-237	90.1	O
5		Andrick	2148	-262	89.1	O
6		Artoga	2632	+224	109.2	*
7	SYNGENTA	Toccata	2810	+400	116.5	***
8		Nelson	2558	+148	106.1	*
9		Formula	2659	+249	110.3	*
10		Smart	2100	-310	87.1	OO
11	MONSANTO	Executive	2141	-270	88.8	OO
12		Exagone	2716	+306	112.6	**
13		Extend	2603	+193	108.0	*
14		Exotic	2630	+220	109.1	*
15		Excel	2783	+373	115.4	***
16	**AVERAGE/EXPERIENCE**		**2410**	**MT**	**100**	**MT**

DL 5% = 140 kg/ha;
DL 1% = 265 kg/ha;
DL 0.1% = 370 kg/ha.

There is this sort of company Syngenta Toccata cultivars tested, with a production of 2810 kg / ha and the cultivation of Excel, from Monsanto, with a production model for 2783 kg / ha.

With good production values fall and Exagon, Nelson, Formula, Extend, Exotic and Artoga cultivars with production values of over 2500 kg / ha.

The lowest range of subject testing were obtained from Manitoba and Adriana cultivars, with values of 1923respectively and 1977 kg / ha, belonging to the firm Limagrain.

Limagrain Company cultivars, although the first part of vegetation indices have been followed during the experiment at high values have achieved lower than average production / experience.

CONCLUSIONS

From the presented data we can summarize the following major conclusions:

- in terms of the range experienced during the flowering season was a slight difference in the onset of flowering earlier than 1-2 days at Syngenta and Monsanto cultivars from the range provided by the company Limagrain;
- of the 15 with a shorter cultivation of flowering cultivars are noted Monsanto - Executive and Extend;
- in terms of height at maturity, the firm Syngenta cultivars proved to be more homogeneous, with little difference in the type;
- the highest plants were recorded in cultivar plants Manitomba of Limagrain firm, with 173 cm and the mother plant height value determined at the cultivar Exotic belonging to Monsanto, with 143 cm;
- number of branches / plant was on average between 7 and 8, with larger amplitudes at Monsanto where he registered cultivars and the lowest, 5 branches/plant, the cultivar Extend;
- fruits number / plant varied widely, the minimum and maximum values recorded of the same company - Limagrain - 152 fruits on Adriana plant cultivar and 350 respectively fruits on Andrick plants, from this point of view flourishing as homogeneity range in Syngenta Company;
- number of grains/fruit was generally greater than 21 in most cultivars, the highest value being registered at the company Limagrain on Artoga cultivar;
- STAS grain yield obtained adjusted for humidity than 9%, was good and ranged between 1923 kg / ha in the firm cultivar Manitomba from Limagrain and 2810 kg/ha to cultivar Toccata of the company Syngenta;
- production of over 2600 kg/ha were obtained in Excel, Exagone, Exotic and Extend cultivars on the company Monsanto and Syngenta cultivars Formula from the company and Artoga to the Limagrain firm;
- good behavior in terms of production were the sorts of firm Monsanto and Syngenta with one exception have exceeded the witness - average /experience;

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CERCETĂRI PRIVIND INTRODUCEREA SISTEMULUI DE SEMĂNAT ÎN FÂŞII LA PAJISTILE TEMPORARE DE LA PREAJBA – GORJ

RESEARCHES CONCERNING INTRODUCTION OF BANDS SOWING AT TEMPORARY MEADOWS FROM PREAJBA-GORJ

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Cuvinte cheie: metoda de semanat, pajiste temporara, productie.
Key words: sowing method, temporary meadow, yield.

ABSTRACT

Following researches, it was found that legumes have a lower participation, both in terms of land coverage and gravimetric in feed, compared to the percentages established in the seed mixture. At Experimental Centre from Preajba-Gorj was tested separately sowing in bands of different widths of grasses and legumes, compared with sowing components together by mechanical mixing of the seeds. Temporary meadows established by alternative bands of grasses and legumes have given on two year average an yield of 5.79 t/ha dry matter, superior to pastures seeded with a mechanical mixture of seeds (4.97 t/ha dry matter).

REZUMAT

În urma cercetărilor efectuate s-a constatat că leguminoasele au o participare mai redusă, atât în ceea ce priveşte gradul de acoperire a terenului cât şi gravimetric, în furaj, față de procentele stabilite anterior în amestecul de semințe. La Centrul Experimental de la Preajba-Gorj s-a testat semănatul separat, în fâşii de diferite lățimi a gramineelor şi leguminoaselor, în comparație cu semănatul componentelor împreună prin amestecul mecanic de semințe.

Pajiştile temporare realizate prin însămânțarea în fâşii alternative a gramineelor şi leguminoaselor au dat în medie pe doi ani o producție de 5,79 t/ha s.u., superioară față de producția pajiştilor însămânțate cu amestec de semințe (4,97 t/ha s.u.).

INTRODUCTION

Many and complex research performed in our country, revealed the superiority of mixtures of grasses and legumes in comparison with the other two variants: mixtures of grasses or monocultures.

In research conducted in the hilly region of Oltenia, as well as in other areas of the country with poor and acidic soils, it was found that legumes have a lower participation, both in terms of land coverage and gravimetric in feed, compared to the percentages previously established in the seed mixture. Moreover, since the third year of vegetation the existing legumes on ground are severely reduced by extinction, which negatively influence the quantitative yield and especially forage quality.

Given the above issues, at the Experimental Center Preajba-Gorj has executed an experience that was sought to create better vegetation conditions for legumes. To achieve this goal was tested separately seeding in bands of different widths of grasses and legumes, compared with sowing components together by mechanical mixing of seeds.

MATERIAL AND METHODES

Experience was founded in spring 2005 on a flat surface, the weather conditions were normal at Preajba-Gorj, for all the years of experimentation.

The location system of the experience was into subdivided lots with three factors, in four repetitions. A factor – the sown method: a_1 = grass and legumes in mixture; a_2 = grass and legumes separated, in bands; B factor – the proportion between grass and legumes: b_1 = 75/25 %; b_2 = 50/50 %; b_3 = 25/75 %; C factor – the mixture: c_1 = *Dactylis glomerata* + *Trifolium pratense*; c_2 = *Phleum pratense* + *Lotus corniculatus*.

The dimensions of a variant - repetition were: length 5.6 m, width 3.2 m, total area 17.92 sq m, harvested area 12.8 sq m.

To achieve graduations o B factor in a_1 was sown mechanical mixture of seed and in a_2, graduations of B factor consisted of band width of the grass and legumes in relation with the total width variant. As for b_1 graduation the grass width band was 2.40 m and 0.80 m for the legumes band, for b_2 graduation width for both strips was 1.6 m, and for b_3 the width of the band of grass was 0.80 m and 2.40 m for the legume band.

Annually, the experience was uniformly fertilized with 50 kg / ha P_2O_5 and 50 kg / ha K_2O. Nitrogen, at a dose of 120 kg / ha was applied in two rounds (80 kg / ha in spring + 40 kg / ha after first mowing) across the entire surface of the seed mixture sown (a1) and only on grasses for the variants sown in bands.

Experience was harvested with mowing machine. Strips of grasses and legumes were harvested and weighed separately; the variant production is calculated by adding the two weighings. Separate harvesting of bands has enabled an accurate determination of the gravimetric ratio of grasses and legumes.

Data were capitalized in 2005 and 2006 by calculating the variance analysis for experiments with three factors. In 2007 (the third vegetation year) was found almost complete disappearance of the species *Trifolium pratense* from the both meadow sown in mixture and in bands, a normal situation, knowing short vivacity of this species, which can be exploited a longer period of two, rarely three years.

REZULTS AND DISCUSSIONS

Dry matter yield in average of two years (2005 – 2006)

On average the two years of experimentation (2005 - 2006) established the temporary meadow mixture seed gave a yield of 4.97 t / ha d.m., while meadow fouded by seeding grassland components in separate bands gave 5.79 t / ha d. m., with 0.82 t / h more (Table 1).

The difference between the two meadows proved significant, demonstrating the superiority of sowing grasses and legumes in bands, method, moreover, widespread in Western countries, non-practicing so far in our country.

Table 1

The influence of sowing method on temporary meadow yield from Preajba-Gorj (t/ha d.m., average 2005 – 2006)

No.	Variant	Yield (t/ha d.m.)	%	Difference	Significance
1	Mixture	4.97	100	-	Control
2	Bands	5.79	116	0.82	*

DL 5 % = 0.59 t/ha d.m.; DL 1 % = 1.38 t/ha d.m.; DL 0,1 % = 4.39 t/ha d.m.

To refer more positive influence on production seeding in bands, it is useful to examine the combined influence of sowing method the proportion of grasses and legumes (Table 2).

The interaction between these two factors has led to swings in production between 4.40 and 6.60 t / ha d.m. Maximum yield was obtained by sowing in bands with proportion grass / legume by 25/75% and the minimum seeding mixed with 75/25% ratio of components.

Table 2

Temporary meadow yield under the combined influence of sowing method and proportion of grasses / legumes (average 2005-2006)

No.	Variant		Yield t/ha d.m.	%	Difference	Seignificance
	Proportion G/L	Sowing method				
1	75/25	Mixture	4.40	100	-	Control
2		Bands	4.89	111	0.49	* *
3	50/50	Mixture	5.06	100	-	Control
4		Bands	5.75	114	0.69	* *
5	25/75	Mixture	5.46	100	-	Control
6		Bands	6.60	121	1.14	* *

DL 5 % = 0.32 t/ha d.m.; DL 1 % = 0.37 t/ha d.m.; DL 0.1 % = 1,81 t/ha d.m.

Within each of the three proportions, sowing in bands was superior toward mechanical mix of seeds. Distinct significant differences, progressively increase with the proportion of legumes, were 0.49 t / ha (at proportion 75/25%), 0.69 t / ha (at proportion 50/50%) and 1, 14 t / ha at proportion of 25/75%.

The two mixtures, regardless of the proportion of participating components, behaved differently, depending on the method of sowing (Table 3).

Table 3

Dry matter yield of mixtures sown in different systems (t/ha d.m., average 2005 – 2006)

No.	Variant		Yield t/ha d.m.	%	Difference	Significance
	Sown method	Mixture type				
1	Mixture	D.g. + T.p.	5.08	104	0.22	-
2		Ph.p + L.c.	4.86	100	-	Control
3	Bands	D.g. + T.p.	6.23	118	0.96	* * *
4		Ph.p + L.c.	5.27	100	-	Control

DL 5 % = 0.29 t/ha s.u.; DL 1 % = 0.41 t/ha s.u.; DL 0,1 % = 0.58 t/ha s.u.

At mixed sowing the yields were smaller and very close: 4.86 t / ha at mixture of *Phleum pratense* + *Lotus corniculatus* and 5.08 t / ha d.m. at mixture of *Dactylis glomerata* + *Trifolium pratense* (Figure 1). If the components were sown in bands were also obtained higher production and differentiated: 5.27 t / ha d.m. at *Phleum pratense* + *Lotus corniculatus* and 6.23 t/ha at *Dactylis glomerata* + *Trifolium pratense*.

These data indicate that at the mixed seeding legume contribution to the formation of yield was low due to low proportion in which they were found in vegetal carpet. Accepting the fact that the two grasses have contributed in terms of quantity approximately equal, results that at the seeding into bands legumes, (mainly *Trifolium pratense*) had a much greater contribution to the yield formation.

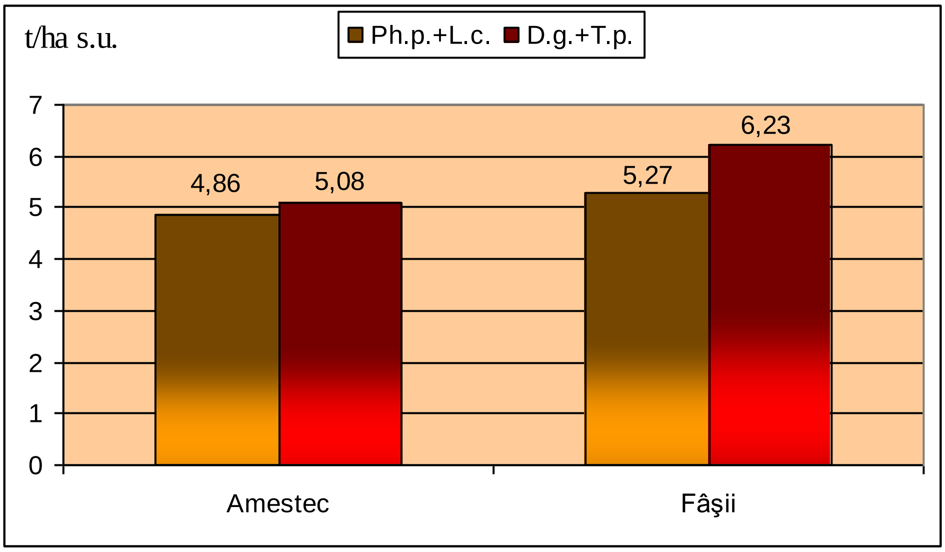

Figure 1. Temporary meadows yields under the combined influence of the mixture and method of sowing (average 2005-2006)

Triple interaction of factors (sowing method x mixture x proportion) determined widely yields oscillation (Table 4, Figure 2). The largest amount of dry matter of 7.51 t / ha was obtained at variant sowed in bands with *Dactylis glomerata* and *Trifolium pratense* in a ratio of 25/75%, and lowest at variant sown in mixture with *Phleum pratense* + *Lotus corniculatus* in a ratio of 75/25% (4.34 t / ha d.m.).

Table 4

The influence of sowing method on yields of mixtures with different proportions between sown grasses and legumes (t / ha d.m., average 2005-2006)

No.	Variant			Yield t/ha d.m.	%	Difference	Significance
	Proportion G/L	Mixture type	Sown method				
1	75/25	D.g. + T.p.	Mixture	4.46	100	-	Control
2			Bands	5.10	114	0.64	-
3		Ph.p + L.c.	Mixture	4.34	100	-	Control
4			Bands	4.68	108	0.34	-
5	50/50	D.g. + T.p.	Mixture	5.09	100	-	Control
6			Bands	6.08	119	0.99	*
7		Ph.p + L.c.	Mixture	5.02	100	-	Control
8			Bands	5.42	108	0.40	-
9	25/75	D.g. + T.p.	Mixture	5.69	100	-	Control
10			Bands	7.51	132	1.82	* *
11		Ph.p + L.c.	Mixture	5.23	100	-	Control
12			Bands	5.70	109	0.47	-

DL 5 % = 0.72 t/ha d.m.; DL 1 % = 1.32 t/ha d.m.; DL 0,1 % = 3.22 t/ha d..

Within each mixture and proportions the sowing of components into bands gave higher yields compared to sowing components together by mechanical mixing of seeds with 0.34 up to 1.82 t / ha d.m.

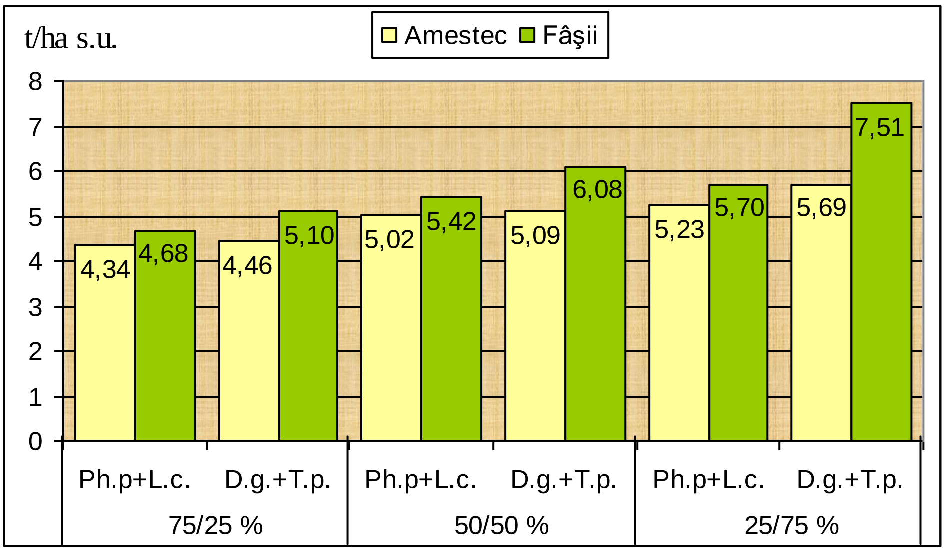

Figure 2. Changes in temporary meadows yield under the influence of triple interaction: sowing method x mixture type x ratio grasses / legumes (average 2005-2006)

Increases caused by separate bands sowing were significant or distinct significant only for meadows of *Dactylis glomerata* + *Trifolium pratense* at proportions of 50/50% and 25/75%, the rest of the variants are not showing degree of assurance.

Consequently, the positive quantitative effect of sowing components separately was manifested especially at species *Trifolium pratense* and most of all when the legume band width was at least equal to the grasses band width.

CONCLUSIONS

1. In order to obtain a more valuable feed with a higher proportion of legumes, temporary meadows can be established by sowing grasses and legumes in separate alternative bands of different widths.

2. Temporary meadows sown into bands will be exploited only by mowing, the mixture of components can be done at the hay obtaining by the plant mass mixing.

3. Temporary meadows produced by seeding in alternatives bands of grasses and legumes have given two-year average yield of 5.79 t / ha d.m., superior to pastures seeded with a mixture of seeds (4.97 t / ha dry matter).

4. Temporary meadow consists of *Dactylis glomerata* + *Trifolium pratense* gave a higher yield toward *Phleum pratense* + *Lotus corniculatus* meadow, the difference being made mainly by red clover which has a size and productive capacity superior to bird's-foot trefoil.

5. Depending on the desired feed type (energy, balanced or protein feed) can choose one of the mentioned widths of the bands.

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INFLUENŢA FERTILIZĂRII ASUPRA PRODUCŢIEI DE POTASIU, CALITATEA DE STRUGURI ŞI VIN SAUVIGNON BLANC

INFLUENCE OF POTASSIUM FERTILIZATION ON YIELD, QUALITY OF GRAPES AND WINE OF CV. SAUVIGNON BLANC

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Key words: *potassium, yield, grape and wine quality*

REZUMAT

Scopul acestui studiu a fost de a determina efectul de îngrăşăminte potasiu îngrăşăminte asupra randamentului, struguri şi vin de calitate a Sauvignon blanc. În experiment, au fost utilizate următoarele variante: de control (fără fertilizare) şi variante cu doze de îngrăşăminte de 50, 100 şi 150 kg K_2O/ha. Înainte de a aplica ingrasaminte o analiză a compoziției chimice a solului. Producția de struguri pe hectar a fost cea mai mică atunci când se aplică 50 kg K_2O/ha în comparație cu celelalte trei variante, în timp ce cea mai mare randament a fost înregistrat la o doză de 150 îngrăşăminte K_2O/ha kg. Conținut de zahăr a fost de aproximativ aceeaşi pentru toate cele patru variante, cu o uşoară variație în utilizarea de kg K_2O/ha 150 (20,6%) şi de control (22,2%). . În analiza de vin sa dovedit a fi cele mai de potasiu în vin a acumulat în utilizarea de 150 K_2O/ha (749 mg/l), cel puțin în variantele cu 50 K_2O/ha (547 mg/l).

ABSTRACT

The aim of this research was to determine the effect of potassium fertilizers on yield, grape and wine quality of cv. Sauvignon blanc. In this experiment the following variants were used: control (without fertilization) and variants with fertilizer were it used doses of 50, 100 and 150 kg K_2O/ha. Grape yield per hectar was the lowest when applied 50 kg K_2O/ha compared to the other three variants, while the highest yield was recorded at a fertilizer dose of 150 kg K2O/ha. Sugar content was approximately the same for all four variants with a slight variation were is used 150 kg K2O/ha (20.6%) and in controls (22.2%). In the analysis of wine was founded the most potassium in wine has accumulated where it used 150 K_2O/ha (749 mg/l), and the least in the variants with 50 K_2O/ha (547 mg/l).

INTRODUCTION

Potassium takes a significant role in nutrition and metabolism of grape vine. According to the content in a plant tissues potassium is located just behind the nitrogen. It is known that the vine needs high potassium doses because potassium is essential for proper growth and development. Potassium takes an important role in the synthesis and metabolism of protein and carbohydrates, photosynthesis, regulation of osmotic pressure in the cell, chlorophyll synthesis, participate in the functioning of over 60 enzyme systems in plant cell, opening and closing of stomata, and very important role in resistance to low temperature (Ličina, 2009). Potassium deficiencies manifested chlorotic edges of older leaves and inter wienal chlorosis of leaf and can be compensate by proper use of potassium fertilizer. The influence of potassium is also manifested in the grapes size, yield and berries coloration in the cluster (Creasy and Creasy, 2009).

Needs for potassium during the growing season is growing constantly. So, the accumulation of potassium in the leaves and shoots increased until the august, and in some grape varieties, by mid-august (Marković, 1998, Lafon et al., 1965). Increasing potassium fertilizer doses is evident on increasing leaf mass and shoot length. In accordance with the applied fertilizer dose increased the potassium content in the produced wine (Kang et al., 2010).

Fertilization with potassium fertilizers has influence on the pH of wine, especially when applying high fertilizers doses. According Trogusu and Pohl (1978), increased amount of K^+ ions reduces the pH of wine and increased microbial activity that can go in a negative direction.

MATERIAL AND METHOD

Research were carried-out in the vineyard of Demonstration Farm "Radmilovac" on the Faculty of Agriculture in Zemun on cv. Sauvignon blanc, which was grafted to the rootstock Berlandieri x Riparia Kober 5BB. Experimental vineyard was based on a gentle slope of southern exposure. The lines extending in the direction of southeast-northwest with a line spacing of 3 m and spacing between vines in line of 1 m. Type of soil in the vineyard was eutric cambisols. Training system is double asymmetric cordon (Nakalamic, 1991). Experimental design was a block design where each treatment has eighteen vines which are arranged in three replications with six vines. Before fertilization was done detailed agrochemical analysis of soil. In this experiment the following treatments were used (we used 50% KCl): control (without fertilization) and treatments with fertilizer were it used doses of 50, 100 and 150 kg K_2O/ha, while the nitrogen was added as 30 kg N/ha and 50 kg phosphorus P_2O_5/ha.

At grapes harvest was determined grapes yield per vine on the basis of which the yield was determined by the set bud, shoot and ha.

The quality of grapes (the share of sugar and acids in the must) was determined with Oechsle mostwaage and values were determined using a Dujardin-Salleron table, while the acid was determined by titration with n/4 NaOH.

In the winemaking process wine was prepared for all treatments. Using volumetric method was determined a specific weight, content of alcohol, total extract (by pycnometer), total acidity (as tartaric acid by Rebelein method), free SO_2 (Ripper's method), pH, ash (ignition in platinum cups), ash alkalinity (using hydrochloric acid), the contents of K (were it use the atomic absorber). Sensory characteristics were investigated by tasting wines from 10 members of the tasting committee of the Faculty of Agriculture. Collected data were statistically analyzed using the method of analysis of variance.

RESULTS AND DISCUSSIONS

Before applying the appropriate fertilizer dose by treatments was done detailed agrochemical analysis of soil. For the soil analysis samples was collected from four depths (0-30, 30-60, 60-90 and 90-120 cm), as shown in table 1.

The results indicate that soil was neutral pH reaction, whose acidity slightly increases with depth. The surface layer of soil pH is 7.4 in H_2O, and the mild acidity (pH 6.7-6.9 in H_2O), represented in layers to a depth of 60-90 cm and 90-120 cm. Percentage of total N ranged from 0.16% to 0.21% and slightly decreases with depth, which this land is classified as high amounts of nitrogen (0.1 to 0.2%), which fits most eutric cambisol in Serbia. Total nitrogen, however, does not correspond with the level of available forms of nitrogen ($NH4+NO_3$) which level in the profile is quite high (210 kg N/ha at a depth of 0-120 cm), and was used small doses of nitrogen fertilizer during the research period (30 kg N/ha). The humus content is satisfactory for growing grapes. According to the available phosphorus content, soil in the deeper layers is poor, while the surface layer of high amounts of phosphorus. Potassium contents ranged from 11.95-14.15 mg K_2O/100 g soil, so that this land belongs to the medium amounts of soil potassium. Calcium was the highest in the layer of 0-30 cm (464 mg/100 g soil) and lowest in the layer from 90-120 cm (399 mg/100 g soil).

Table 1

Agrochemical properties of the test plots before fertilization with K fertilizers

Depth (cm)	pH H_2O	pH nKCl	Humus %	N %	NH_4 mg/kg	NO_3 mg/kg	P_2O_5 mg/100g	K_2O mg/100g	Ca mg/100g
0-30	7.4	6.5	3.30	0.21	10.5	3.50	15.0	11.95	464
30-60	7.4	6.5	2.11	0.19	10.5	5.25	8.7	14.15	404
60-90	6.7	5.4	1.88	0.16	10.0	5.25	7.8	12.75	354
90-120	6.9	5.7	1.64	0.16	12.1	7.00	8.7	12.25	399

Grape yield per bud varied in a wide range at 77.0 g (a fertilization treatment with 50 kg K_2O/ha) to 150.2 (a treatment with 150 kg K_2O/ha). If observed average value of this ratio with treatments, it is evident downtrend in bud productivity with increasing bud loads caused as stated in the work Nakalamić (1981). In relation to the treatment with 50 kg K_2O/ha other three treatments has a strong statistical significance in the yield of grapes per bud.

The grapes yield per shoot ranged between 86.7 g (with treatment from 50 kg K_2O/ha) and 150.2 g (in the treatment with 150 kg K_2O/ha). Variation between the fertilized treatments was very significant compared to control. The grapes yield per shoot varied in a wide range of 127.0 g (treatment with 50 kg K_2O/ha) to 220.4 g (the control treatment). Among all the treatment ware very significant differences except between the control treatment and treatment with 150 kg K_2O/ha. The grapes yield per vine varied from 1.092 kg (treatment with 50 kg K_2O/ha) to 1.893 kg (treatment with 150 kg K_2O/ha). The average values of yield per plant were correlated with the load of vines fruitful buds, while fertilizers dose showed different effects. Fertilization with 50 kg K_2O/ha obtained significantly lower grapes yield per vine in relation to the other three treatment. Grape yield per hectare ranged from 3.633 t (in the treatment with 50 kg K_2O/ha) to 6.3 t (for the most fertilized treatment with150 kg K_2O/ha). Treatment with 50 kg K_2O/ha was significantly lower yield compared to the other three fertilized treatment (table 2).

Table 2

Indicators of the grape yield

<table>
<tr><th>Indicators</th><th>Control</th><th>50 kg K_2O/ha</th><th>100 kg K_2O/ha</th><th>150 kg K_2O/ha</th></tr>
<tr><td>Grape yield/bud (g)</td><td>144,6</td><td>77,0</td><td>90,9</td><td>150,2</td></tr>
<tr><td>Grape yield/developed shoot (g)</td><td>158,9</td><td>86,7</td><td>96,2</td><td>150,2</td></tr>
<tr><td rowspan="3">Grape yield/shoot (g)</td><td>220,4</td><td>127,0</td><td>195,3</td><td>220,1</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>LSD $_{0,05}$</td><td>3,9295</td></tr>
<tr><td>LSD $_{0,01}$</td><td>6,5110</td></tr>
<tr><td rowspan="3">Grape yield/vine (kg)</td><td>1,85</td><td>1,09</td><td>1,32</td><td>1,89</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>LSD $_{0,05}$</td><td>0,0398</td></tr>
<tr><td>LSD $_{0,01}$</td><td>0,0659</td></tr>
<tr><td rowspan="3">Grape yield/hektar (t)</td><td>6,166</td><td>3,633</td><td>4,400</td><td>6,300</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>LSD $_{0,05}$</td><td>0,2788</td></tr>
<tr><td>LSD $_{0,01}$</td><td>0,4624</td></tr>
</table>

Must sugar content varied from 20.6% (treatment with 150 kg K_2O/ha) to 22.2% (control). Between treatment with 150 kg K_2O/ha and the other three treatments is statistically very significant difference, since the sugar content of these treatment was significantly lower than in the other three treatments. On this basis it can be concluded that the content of sugar in the opposite variation varied yield of grapes. Depending on the treatment with the sugar yield (production capacity) of 518.1 kg/ha (the treatment with 50 kg K_2O/ha) to 890.2 kg/ha (in controls). Significantly lower sugar yield per hectare had a treatment with 50 kg K_2O/ha compared to the other three treatments. The content of total acids in the average level of treatments and ranged from 7.00 g/l (treatment with 100 kg K_2O/ha) to 7.63 g/l (control) and has the opposite trend of variation of sugar. Maturity index of the most varied in the treatment with 100 kg K_2O/ha (table 3).

Table 3

Quality indicators of must

Indicators	Control	50 kg K_2O/ha	100 kg K_2O/ha	150 kg K_2O/ha
Sugar content in must(%)	22,2	21,9	21,9	20,6
			LSD $_{0,05}$	0,0217
			LSD $_{0,01}$	0,0360
Sugar yield (kg/ha)	890,2	518,1	630,0	844,8
Content of acid (g/l)	7,63	7,56	7,00	7,10
			LSD $_{0,05}$	0,0325
			LSD $_{0,01}$	0,0540
Maturity index	2,90	2,89	3,12	2,90

Chemical analysis of wines (Table 4) showed that the specific gravity of wine ranged of 0.099270 (treatment with 100 kg K_2O/ha) to 0.99340 (treatments with 50 kg K_2O/ha and control). The alcohol content was inversely proportional to the specific gravity and its content is lowest in the treatment with 150 kg K_2O/ha (11.8% vol.), and the highest in the treatment with 100 kg K_2O/ha (12.7% vol.). Extract content showed a more favorable share of the wine from the control treatment (25.8 g/l) compared to all other treatment, especially in relation to treatment with 150 kg K_2O/ha (22.42 g/l). The total acid content expressed as tartaric, varied in wine in the treatment with 100 kg K_2O/ha with 7.0 g/l, over the control and treatment with 50 kg and reached a maximum K_2O/ha in the treatment with 150 kg K_2O/ha (8, 0 g/l). Proportion of free SO_2 ranged from 6.40 mg/l (in treatments with 50 and 150 kg K_2O/ha) to 8.6 mg/l (in the treatment with 100 kg K_2O/ha), while the pH ranged from 3.80 (in the treatment with 150 kg K_2O/ha) to 3.97 (in the treatment with 100 kg K_2O/ha).

Ash content varied in a wide range. The lowest ash content was recorded at the control treatment (1.5 g/l) and highest in the treatment with 50 kg K_2O/ha (5.00 g/l), a treatment with 100 kg K_2O/ha ash contained 3.5 g/l, a treatment with 150 kg K_2O/ha 5.00 g/l ash. Alkalinity of wine is proportional to ash content and the lowest value registered at the control treatment, and the highest in the treatment with 50 kg K_2O/ha.

Mineral matter content is expressed through the share of Ca, Mg and K (mg/l). The lowest content of Ca was incorporated in the treatment with 50 kg K_2O/ha (39.78 mg/l) and highest in the treatment with 150 kg K_2O/ha (46.80 mg/l). The highest magnesium content were in the wine produced in the control treatment (68.90 mg/l), at least in the treatment with 150 kg K_2O/ha (56.10 mg/l).

Results of potassium content in wine indicates that the introduction of high doses of potassium fertilizer in the soil affect its increased content in wine. Potassium content in wine varied with treatments, so the average content of potassium was noted in the control treatment and treatments with 50 kg K_2O/ha (547.0 mg/l), while the highest values observed at a dose of 150 kg fertilizer K_2O/ha (749.0 mg/l) and 100 kg K_2O/ha (798.0 mg/l).

Table 4

Qualitative composition of wine

Indicators	Control	50 kg K_2O/ha	100 kg K_2O/ha	150 kg K_2O/ha
Specific gravity	0,9934	0,9934	0,9927	0,9931
Alcohol content (%)	12,60	12,20	12,70	11,80
Total ekstrakt (g/l)	25,80	24,50	24,24	22,42
Total acid (g/l)	7,50	7,60	7,00	8,00

Free SO_2 (mg/l)	7,68	6,40	8,96	6,40
pH	3,90	3,89	3,970	3,80
Ash (g)	1,50	6,50	3,50	5,00
Alkalinity (ml/HCl)	6,70	16,50	10,15	14,55
Ca (mg/l)	44,64	39,78	42,34	46,80
Mg (mg/l)	68,90	65,90	61,70	56,10
K (mg/l)	547,0	547,0	798,0	749,0

Sensory evaluation of wines obtained in the grading after vine making process. The wine made from grapes of the treatment with 50 kg K_2O/ha (18.2 points), while the other three treatment ratings ranged from 17.6 to 17.8 points (table 5).

Table 5

Sensory evaluation of wines

Indicators	Control	50 kg K_2O/ha	100 kg K_2O/ha	150 kg K_2O/ha
Color	2	2	2	2
Clearness	2	2	2	2
Fragrance	3,2	3,4	3,1	3,2
Taste	10,5	10,8	10,7	10,5
Total	17,7	18,2	17,8	17,6

CONCLUSIONS

Fertilization treatments did not showed proper increasing impact on grapes yield in except treatment with 150 kg K_2O/ha.

Used fertilizer dose have showed great significance to the achieved quality of grapes was evaluated by the content of sugars and acids in the must, with the control treatment and a treatment with a dose of 50 kg fertilizer K_2O/ha significantly different from the other two treatment.

Analysis of wine quality, it was concluded that the wines have good quality, as confirmed by the Commission who are tasting wine.

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INFLUENŢA EPOCII DE SEMĂNAT ASUPRA EVOLUŢIEI ATACULUI PATOGENULUI *PYRENOPHORA TRITICI-REPENTIS* LA UN SORTIMENT DE SOIURI DE GRÂU DE TOAMNĂ LA SCDA ŞIMNIC

THE INFLUENCE OF SOWING TIME TO THE EVOLUTION OF *PYRENOPHORA TRITICI-REPENTIS* TO A SET OF WINTER WHEAT VARIETIES IN ARDS ŞIMNIC AREA

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Keywords: AUDPC, sowing time, pathogen, yield, wheat

REZUMAT

În ultimii ani arsura galbenă a frunzelor de grâu produsă de Pyrenophora tritici-repentis cu anamorfa Drechslera tritici-repentis (sinonim Helminthosporium tritici-repentis) a devenit o boală foliară importanţă a grâului în întreaga lume. Un sortiment de douăzeci şi cinci de soiuri de grâu de toamnă au fost evaluate privind comportarea lor faţă de atacul acestui patogen în condiţii de infecţie naturală şi de semănat la două epoci diferite (normală şi tardivă). Pentru ambele epoci de semănat, dintre soiurile afectate cea mai ridicată valoare AUDPC a fost înregistrată de soiurile Renan, Autan şi Exotic, în vreme ce la polul opus s-au aflat soiurile Meunier şi Serina. Nu a fost constată nici o corelaţie între AUDPC şi producţie pentru ambele epoci de semănat (-0,18, respective -0,25). Analizând valoarile medii AUDPC s-a observant că diferenţa de -8,92 dintre cele două epoci nu a prezentat nici o semnificaţie, ceea ce a condus la concluzia că în condiţiile anului 2008 atacul patogenului Pyrenophora tritici-repentis nu a fost influenţat de epoca de semănat.

ABSTRACT

In the last years tan spot caused by *Pyrenophora tritici-repentis* anamorph *Drechslera tritici-repentis* (synonym *Helminthosporium tritici-repentis*) has gained predominance among foliar wheat diseases worldwide. A set of twenty-five winter wheat cultivars have been evaluated for their response to *Pyrenophora tritici-repentis* attack in natural infection using two sowing times (normal and delayed). The highest AUDPC values were recorded by Renan, Autan and Exotic cultivars, whereas the lowest AUDPC values were recorded by Meunier şi Serina cultivars, for both sowing times. There was none correlation between AUDPC and grain yield for both sowing times (-0,18, respectively -0,25). Analyzing the mean AUDPC values for both sowing times it was observed a difference by -8,92 with no statistically significance, meaning that in the 2008 year conditions the *Pyrenophora tritici-repentis* attack wasn`t influenced by sowing time.

INTRODUCERE

The fungus *Pyrenophora tritici repentis* (Died.) anamorph *Drechslera tritici repentis* (Died.) Shoemaker (synonym *Helminthosporium tritici repentis)* causes tan spot of wheat worldwide (Hosford, 1982). Since the 1970`s the disease has become a serious problem and caused significantly losses (3 to 50%) in major wheat growing areas. The fungus produces lens-shaped necrotic lesions with chlorotic halo on susceptible cultivars. The pathogen can over-season on diseased seed, infected crop residue, and overwintering grass hosts (De Wolf et al., 1998). Two quantitative types of symptoms, tan necrosis (nec^+) and extensive chlorosis (chl^+) produced by *Pyrenophora tritici repentis* on susceptible wheat genotypes were indentified by Lamari and Bernier (1989). These types of symptoms are under independent genetic control of the host (Lamari and Bernier, 1991). Tan spot reduced total yield, kernel weight (Schilder and Bergstrom, 1994; Shabber and Bockus, 1988), total biomass (Kremer and Hoffmann, 1992) and/or grain quality because of red-smudge symptom (Fernandez et.al., 1994). Increase in the severity of the disease has been linked with expansion of the area under conservation tillage practices, especially zero tillage, which allow the build-up of inoculums on the wheat stubble over time (Kein, 2001).The objective of this study was to evaluate the tan spot severity in two different sowing times (normal and delayed) in Simnic area as well as the response of the wheat cultivars to pathogen attack.

MATERIAL AND METHOD

The experiment was conducted in the Breeding and Plant Protection Laboratory field from ARDS Simnic on brown reddish soil (ph 5.6; 1.8% humus) which has been cropped to pea the previous season. Thus, the field was plowed and disked prior to planting and weeds control was realized using 1 l/ha recommended dose Dicopur Top herbicide. Twenty-five winter wheat cultivars with diverse origin were evaluated for their response to *Pyrenophora tritici-repentis* natural infection under field conditions Plots were fertilized at sowing with 40 kg/ha of N and 40 kg/ha of P_2O_5 basal applyed and top-dressed with 60 kg/ha of N on early spring (March). The layout was a randomized complete block design in a strip-plot system with three replications. Plot size was 7 m^2. Seeding was on October 16^{th} 2007 (normal time) and October 30^{th} 2007 (delayed time) using a seed rate of 550 grains/ m^2. The data on the weather conditions (temperatures and amount of rainfall) were collected during the main disease-spreading period (from April to June). The growth stages of plants were recorded according to the Zadoks scale (Zadoks et al., 1974). Disease evaluation was started when initial necrotic symptoms were noticed in the canopy of the wheat cultivars (Z39-ligule of the last leaf just visible) and continued on stages Z53 (1/4 of head out) and Z61 (the beginning of flowering). The diseased area was vissualy assessed on 10 randomly selected main tillers from each plot. Visual scoring of percent diseased area was done using a quantitative rating scale based on lesion size and necrotic leaf area (Raymond et al., 1985). Individual leaf-disease rating were averaged to obtain a mean score for each replication. To determine the diseases severity for each cultivar was used Area under Disease Progress Curve - AUDPC (Shaner and Finney, 1977):

$$\text{A.U.D.P.C.} = \sum_{i=1}^{a}\left[\left\{\frac{Yi + Y(i+1)}{2}\right\} x(t(i+1) - ti)\right]$$

Where: Yi = the disease score at t_i time;

$t_{(i+1)}$- t_i = days between two consecutive disease scoring times.

Area under Disease Progress Curve - AUDPC express the quantitative measure of epidemic development of disease (Reynolds and Neher ,1997).

EDAPHOLOGICAL AND CLIMATICALLY CONDITIONS

ARDS Simnic is known as a droughty area caused by irregular rainfalls and high temperatures.

In fig. no.1 can be observed the climatically conditions which favor the evolution of the fungus *Pyrenophora tritici repentis* in 2008 year closely linked with the optimal temperatures ascospores and conidia infections as primary and secondary infection source.

Production of primary inoculums of tan spot depends on the successful survival and saprophytic growth of *Pyrenophora tritici-repentis* in the residues. In 2008 during April to May the weather conditions were suitable for the release of ascospores from pseudothecia and in the following months the second conidia-infection cycle was produced. Researchers determined that levels of primary inoculums have been correlated with the development of the tan spot epidemics in the field (Zhang and Pfender, 1993).

Our experiment suggest that optimal temperature for the incidence of ascospores in April and the beginning of May leaded to a severe epidemic of tan spot in the field.

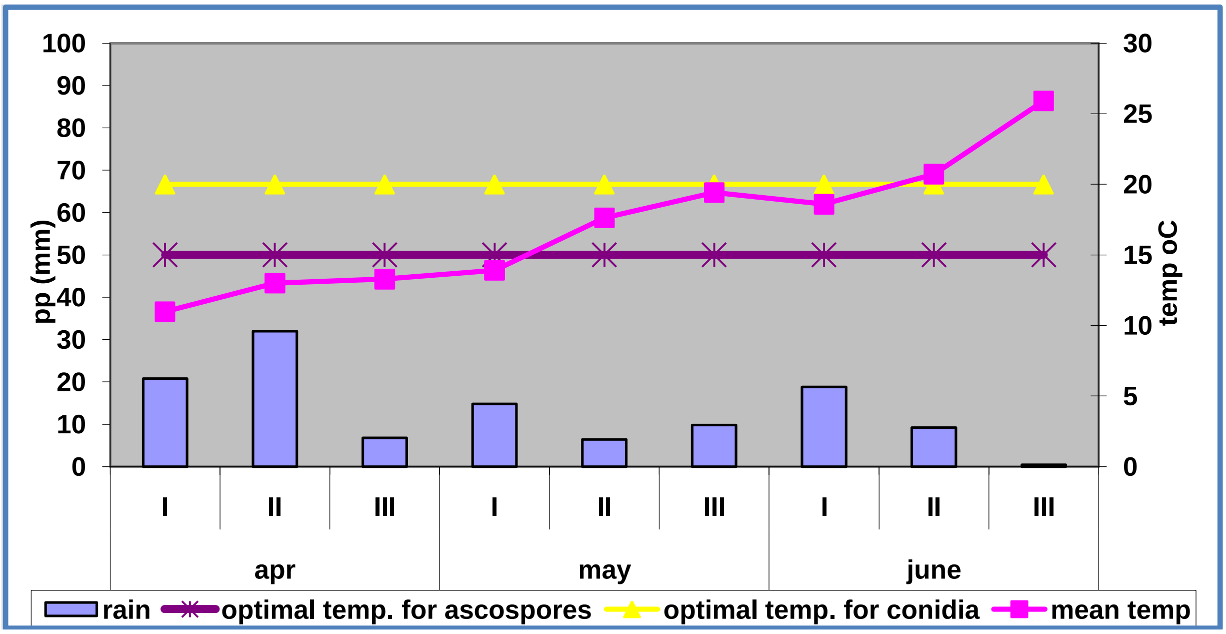

Fig. 1. The optimal temperatures for the development of tan spot and weather conditions during the 2008 growing season

Because of the humidity caused by the amount of rainfall in May and the first part of June, tan spot disease develops faster due to the conidia infections, which are considered secondary inoculums. The conidia were produced in cycles and this aspect assures the new infections and spreads the diseases in the field. A longer wet period can be observed in Fig.1 form May to June. Researchers observed that a longer post-inoculum wet period and optimal temperature increased conidial germination, the number of germs per conidium, teenght of germ tubes, appressoria production, papillae production and percentage of appressoria colonization host cells (Hosford et al., 1987; Summerell and Burges, 1989; Sah, 1993).

RESULTS AND DISCUSSIONS

The cultivars behavior to the *Pyrenophora tritici-repentis* attack was different depending on their susceptibility. Among all tested cultivars in 2008 only sixteen developed tan spot symptoms on the leaves (Briana, Glosa, Josef, Autan, Enesco, Renan, Serina, Cubus, Meunier, Exotic, Orion, Martina, Mariska, Renesansa and Isengrain), while 9 cultivars didn`t show any symptom (Frini, Dunai, Carolina, Capo, Fridoline, Aztec, Bercy, Cezanne, Cordiale) for any sowing time.

It was observed that for the first two evaluations the disease evolution was slow comparatively with the third evaluation depending on the climatically conditions.The researches done by Francl, 1998 suggest that potential *Pyrenophora tritici-repentis* inoculum was higher after flowering stage then before leading to diseases development through crop maturity. This can be explained by high temperatures and inoculum pressure in the last crop stages, making even resistant wheat cultivars more sensitive to pathogen attack.

The highest AUDPC values were recorded when wheat was sowing at normal time comparatively with delayed time. Due to high infection pressure and favorable climatically conditions which permit successive infections with conidia it were observed that the pathogen attack was more aggressive for delayed sowing time. Thus, the difference between AUDPC values for both sowing times was -8,92 without statistical significance.

The highest AUDPC values for both sowing times were recorded by Autan, Renan and Exotic, while to the opposite side were Martina, Serina, Meunier and Renesansa (Tables no.1 and 2). High AUDPC values could be determined also by heat, which influence the pathogen development as previously suggest Nema et. al., 1973; Sharma et. al.,2003). Comparatively with the control (Meunier) the differences for both sowing times were very positive significant, excepting Martina which presented a positive difference for normal sowing time and also Renesansa and Martina without significant differences. There wasn`t any correlation between AUDPC values and yield for both sowing times (-0,20, respectively -0,29). Thus, the cultivar Autan recorded high yields for both sowing times despite its high AUDPC values. For Renan the low yield level could be explain by high AUDPC value, while Meunier recorded the lowest yields and AUDPC values for both sowing times. A possible explanation for the cultivars with high yields despite high AUDPC values could be the tolerance to pathogen attack (Sharma et. al., 2003). For Meunier it was observed that it can`t perform to ARDS Simnic area probably because its low adaptability.

Table 1

The AUDPC and yield values recorded by a winter wheat set seeded at normal time in the conditions of the attack of *Pyrenophora tritici-repentis* in ARDS Simnic area

No.	Cultivar	AUDPC[1]	Diff. comp. with control	Signif.	Diff. comp. with average	Signif.	Yield[3] kg/ha 2008	Diff. comp. with control	Signif.
1.	Renan	529	489,74	***	349,02	***	3600	672	*
2	Autan	481,85	442,59	***	301,87	***	4479	1551	***
3	Exotic	382,31	343,05	***	148,33	***	4026	1098	***
4	Josef	234,67	195,41	***	54,69	ooo	4191	1263	***
5	Apache	229,79	190,53	***	49,81	ooo	4037	1109	***
6	Mariska	183,49	144,23	***	3,51		3510	582	
7	Briana	180,56	141,3	***	0,58		4609	1681	***
8	Isengrain	159,49	120,23	***	-20,49	oo	3788	860	**
9	Glosa	96,42	57,16	***	-83,56	ooo	3900	972	**
10	Cubus	82,95	43,69	***	-97,03	ooo	4067	1139	***
11	Enesco	71,55	32,29	***	-108,43	ooo	4422	1494	***
12	Orion	66,48	27,22	***	-113,5	ooo	4917	1989	***
13	Martina	56,35	17,09	*	-123,63	ooo	4755	1827	***
14	Renesansa	44,83	5,57		-135,15	ooo	4752	1824	***
15	Serina	40,72	1,46		-139,26	ooo	4247	1319	***
16	Meunier	39,26	Mt		-140,72	ooo	2928	Mt	
	MEAN[2] AUDPC	179,98							

LSD 5% = 13,458; 1% = 18,142; 0,1% = 24,079 LSD 5% = 593kg; 1% = 804kg; 0,1% = 1076kg

[1] Mean AUDPC on three replications for each cultivar
[2] Mean AUDPC of the experience
[3] Mean Yield kg/ha

Table 2

The AUDPC and yield values recorded by a winter wheat set seeded at delayed time in the conditions of the attack of *Pyrenophora tritici-repentis* in ARDS Simnic area

No.	Cultivar	AUDPC[1]	Diff. comp. with control	Signif.	Diff. comp. with average	Signif.	Yield[3] kg/ha 2008	Diff. comp. with control	Signif.
1.	Renan	490,26	459,59	***	319,2	***	3084	512	*
2	Autan	448,36	417,69	***	277,3	***	3376	804	**
3	Exotic	348,28	317,61	***	177,22	***	3274	702	**
4	Apache	246,60	215,93	***	75,54	***	3058	486	*
5	Josef	218,44	187,77	***	47,38	***	3034	462	
6	Mariska	197,20	166,53	***	26,14	***	2648	77	
7	Isengrain	155,98	125,31	***	-15,08	o	2820	248	
8	Briana	145,42	114,75	***	-25,64	ooo	3457	885	**
9	Enesco	106,53	75,86	***	64,53	***	3267	695	*
10	Glosa	94,94	64,27	***	-76,12	ooo	3053	481	
11	Cubus	70,75	40,08	***	-100,31	ooo	3502	903	***
12	Orion	60,78	30,11	***	-110,28	ooo	3651	1079	***
13	Renesansa	44,13	13,46	*	-126,93	ooo	3544	972	***
14	Martina	41,52	10,85		-129,54	ooo	3864	1292	***
15	Serina	37,17	6,5		-133,89	ooo	3900	1321	***
16	Meunier MEAN[2] AUDPC	30,67 171,06	Mt.		-140,39	ooo	2572	Mt.	

LSD 5% = 13,458; 1% = 18,142; 0,1% = 24,079 **LSD 5% = 483kg; 1% = 655kg; 0,1% = 877kg**

[1] Mean AUDPC on three replications for each cultivar
[2] Mean AUDPC of the experience
[3] Mean Yield kg/ha

CONCLUSIONS

The differences among cultivars reactions to *Pyrenophora tritici-repentis* show that the evolution of pathogen attack was specific for each cultivar depending on the infection moment, sowing time and cultivar resistance. It was observed that pathogen attack started early for wheat seeded to normal time due to ascospores infections, leading to higher AUDPC values comparatively with delayed time. The difference between AUDPC values for both sowing times was -8,92 without significance due to higher pathogen aggressiveness showed to delayed time because of successive infection with conidia. The highest AUDPC values for both sowing times were recorded by Renan, Autan and Exotic. There was observed that Autan, Exotic and Apache cultivars recorded high yields despite high AUDPC values, probably because of its resistance. The high AUDPC values could be determined also by heat, which influence the pathogen aggressiveness.

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INFLUENȚA EPOCII DE SEMĂNAT ASUPRA PRODUCȚIEI ŞI ELEMENTELOR DE PRODUCTIVITATE LA GRAUL DE TOAMNĂ

THE INFLUENCE OF SOWING TIME ON WINTER WHEAT YIELD AND ITS MAIN COMPONENTS

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Keywords: winter wheat, sowing time, yield, components

REZUMAT

Lucrarea prezintă evoluția culturii de grâu sub influența epocii de semănat în zona de sud a țării. Obținerea de sporuri şi stabilitatea recoltei la graul de toamnă este posibilă dacă se asigură o calitate bună a semănatului şi respectarea intervalului optim de semănat. Datele experimentale obținute ne arată că variabilitatea productivității individuale a plantelor de grâu poate creşte odată cu întârzierea datei semănatului cu până la 10-13% pentru numărul de boabe/plantă şi între 10-24% pentru greutatea boabelor/plantă, iar acestea conduc la reducerea producției la hectar cu până la 1400-3400 kg/ha. Influența condițiilor climatice se manifestă prin variații mari şi limitări ale producției şi elementelor de productivitate la cultura de grâu.

ABSTRACT

The paper is focused to the evolution of wheat crop under the influence of sowing time in the south of the country. To obtain yield increase and stability is necessary to respect at least two traits: sowing quality and optimum sowing time. The experimental data show that the yield variability of individual plants may increase with 10-13% for the number of grains / plant and 10-24% for grain weight / plant when sowing time was delayed leading to yield decrease which ranged from 1400 kg/ha to 3400 kg/ha. The variation of climatically conditions influenced negatively wheat yield and its main components.

ITRODUCTION

The recommendations for wheat crop regarding fast and uniform seeds emergence and good cropping conditions during growth stages are close related with soil moisture availability. To see the cultivars yielding potential is necessary to have in view the relation between rainfalls and yield when is established the sowing time (Iagaru, 1998; Lupu 2001; Popa, 1995, 2003). The previous researches regarding the influence of sowing time and climatically conditions to winter wheat yielding capacity showed that other technological conditions are also important (Epplin and Peeper, 1998; Mazurek, 1995).

MATERIAL AND METHODES

The trail was conducted in the Agrotechics Laboratory from National Agricultural Research and Development Institute Fundulea on black earth (chernozem) in rainfed conditions. The observations were done during 2006-2009 years. The variants included five sowing times which ranged from 15th September to 15th November for all years and the cultivar was Boema. The layout was a randomized complete block design with four replications. Plot size was 31 m^2 and the harvested surface was 12 m^2. The data were statistically evaluated using analysis of variance procedure (Saulescu, 1967). The data on the weather conditions (temperatures and rainfalls) were collected during wheat growing period and were done correlated with yield main components. There were determined also: number of plants emerged/m^2, heads number/m^2, fertile tillers/plant, grains weight/plant.

CLIMATICALLY CONDITIONS

The climatically conditions recorded during experimental period were variable influencing the plants growth and yielding capacity. Thus, the experimental years were characterized by high temperatures and low rainfalls (Fig.1). The lowest rainfalls (243 mm below multiannual average) and high temperatures (+ 2,4 ^{o} C over multiannual average) recorded in 2006-2007 made this year unfavorable for winter wheat crop.

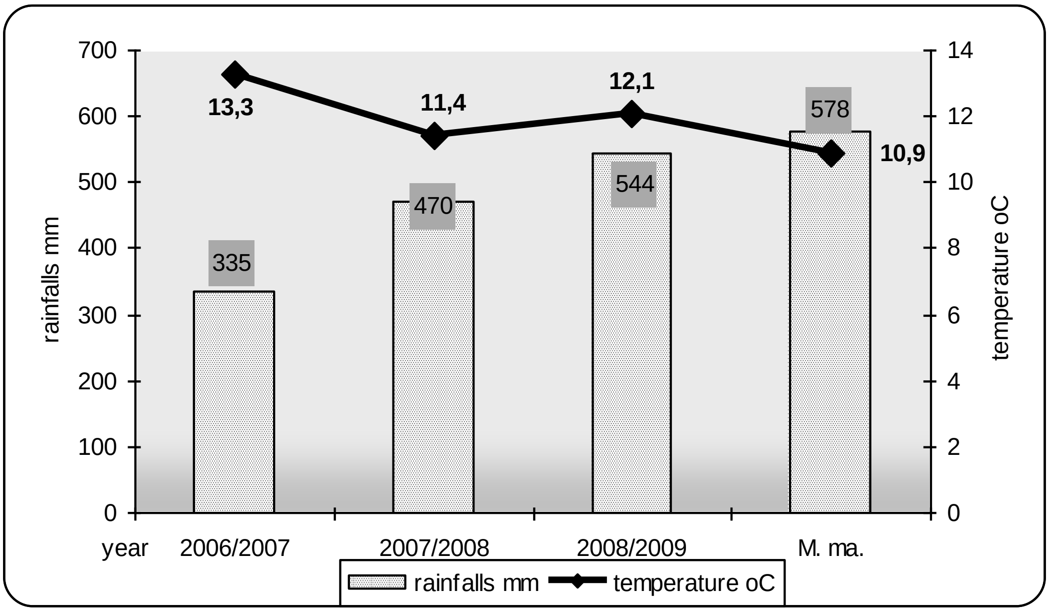

Fig.1. The evolution of climatically conditions during 2006-2009 years to NARDI Fundulea

RESULTS AND DISCUSSIONS

The wheat yield was influenced by climatically conditions specific for each year and by sowing time. Thus, it was observed a yield depression with 1900-3250 kg/ha when sowing time is delayed until November, comparatively with the yield recorded when wheat was sowing in the first half of October. When was practiced early sowing time the pests and pathogens attack favored by climatically conditions and faster plants development, the yield decreased with 1400-2650 kg/ha, especially in the years with high rainfalls and temperatures during first growth stages. Among all experimental years the lowest yield was recorded in 2007 when sowing time and climatically conditions were close related (Fig.2).

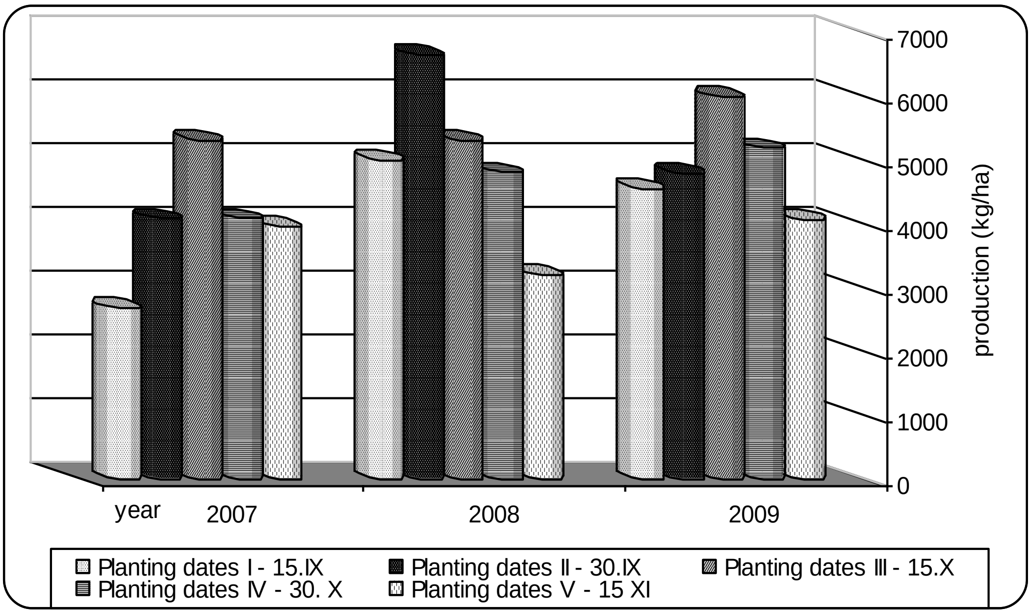

Fig. 2. The influence of sowing time to Boema yielding capacity (q/ha)

During 2006-2007 plants number /m^2 decreased when wheat was sowing in September from 395 plants/m^2 to 303 plants/m^2 (23%) in early spring and to 220 plants/m^2 (45%) in harvest time, comparatively when wheat was sowing in October (control). Thus, the plants number depression was lower when wheat was sowing in October (17% in early spring and 39% in harvest time). When wheat was sowing in the fourth and the fifth sowing times plants number/m^2 ranged from 18% to 27% in early spring and from 48% to 52% in harvest time. During 2008-2009 the plant losses/m^2 ranged from 18% to 30% when wheat was sowing in September comparatively with the control which recorded 10% in spring and 26% in harvest time. When wheat was sowing in November there were recorded plant number losses which ranged from 11-15% in spring to 33-36% in harvest. The plants number losses/m^2 and a decrease of fertile tillers number/plant leaded to reduced ears number/m^2.

When the sowing time was done in 1st-15th October the efficiency indexes were high. Thus, when wheat was sowing in delayed times fertile tillers number/plant decreased with 22-33%, grains number/plant with 10-23% and grains weight/plant with 20-24%, comparatively with the control (sowing time -15th October).

Early sowing time lead to a decrease of fertile tillers number/plant with 33% comparatively with the control and also a decrease of grains number/plant with 21% and grains weight /plant with 10% (Tables 1 and 2).

The variations of individual plants yielding capacity was due to losses during winter, to pathogens and pests attack and to unfertile tillers.

When wheat was early sowing there were observed patches without plants which leaded to more adapted plants due to marginal effect.

Table 1

Influence of sowing time on the emergence and development of wheat plants

Specification		2007				2008				2009			
		Number of plants emerg/m^2	Number of plants in spring/m^2	Number of plants in harvest/ m^2	Number of ears /m	Number of plants emerg/ m^2	Number of plants in spring/m^2	Number of plants in harv./m^2	Number of ears /m^2	Number of plants emerg/m^2	Number of plants in spring/m^2	Number of plants at harv./m^2	Number of ears /m^2
Sowing times	PD I	395^{00}	303^{00}	220^{00}	308^{00o}	433^{00}	373	311**	439^{000}	425^{00}	349^{000}	297^{000}	469^{000}
	PD II	402	343**	225^{00}	333^{00}	436	380	303	465^{00}	430	394**	302^{000}	514^{00}
	PD III-mt	410	337	246	352	439	378	302	491	436	389	319	533
	PD IV	415**	342**	211^{000}	341	443**	359^{00}	292^{0}	411^{000}	430	368^{00}	289^{000}	496^{00}
	PD V	400^{0}	292^{000}	189^{000}	309^{00o}	439*	352^{00}	280^{000}	399^{000}	416^{00}	367^{00}	268^{000}	440^{000}
DL	5%	16	15	13	12	27	17	23	25	20	17	13	46
DL	1%	19	17	20	15	32	21	33	37	27	22	24	58
DL	0,1%	25	22	30	20	54	35	51	62	32	29	36	72

Table 2

Influence of sowing time on yielding capacity of individual wheat plants

Specification		2007			2008			2009		
		Fertile tillers no./plant	Grains number/plan t	Grains weight/plant	Fertile tillers no./plant	Grains number/plan t	Grains weight/plant	Fertile tillers no./plant	Grains number/plan t	Grain weight/plant
Sowing times	PD I	0,9	30	1,9	$1,4^{0}$	50	1,7	$1,2^{0}$	50	1,9
	PD II	1,0	31	2,0	1,6	51	1,8	1,6	52	2,0
	PD III	1,2	32	2,0	1,8	51	1,9	1,8	61	2,1
	PD IV	$0,9^{0}$	31	1,9	1,5	49	1,7	1,4	50	$1,8^{0}$
	PD V	$0,8^{0}$	30	$1,6^{0}$	$1,4^{0}$	47	$1,5^{0}$	$1,2^{0}$	48	$1,6^{00}$
DL	5%	0,10	2,30	0,12	0,17	3,88	0,29	0,16	3,55	0,27
DL	1%	0,13	3,79	0,19	0,24	5,65	0,39	0,22	5,70	0,38
DL	0,1%	0,19	5,20	0,26	0,30	7,04	0,50	0,31	9,04	0,55

There was established a positive correlation between ears number/m^2 and delayed sowing days (y=14,5x + 304; R^2 = 0,723***) (Fig.3). The relation between rainfalls and winter wheat yield sowing in different time's emphasized very significant positive values of correlation coefficient (Fig.4).

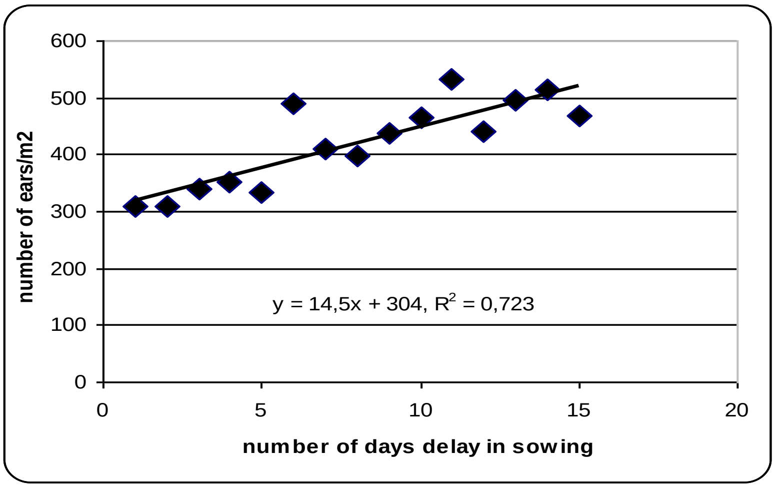

Fig. 3 .The relation between the days from sowing and ears number for Boema variety during 2007-2009

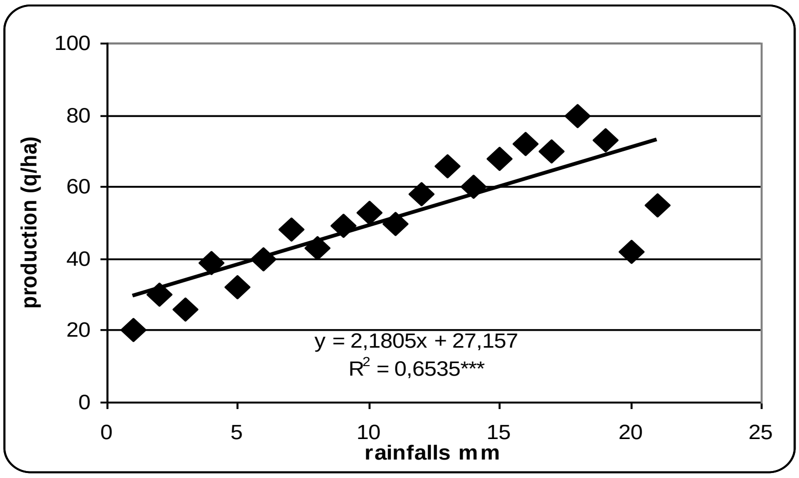

Fig.4. The relation between the rainfalls and the yield of Boema variety during 2007-2009

Analyzing the relation between yield and its main components were observed positive correlations with distinct and very significant values (r = 0,590** for ears number/m^2 and grain yield/ha; r= 0,639*** for grains number/ear and gain yield/ha)(Table 3).

Tabel 3

Relation between individual yield components and wheat yield/ha during 2007-2009

Specification	Function	Correlation coefficient/signification
Ears number/ m^2 / grain yield	y= 0,602x+18,067	0,590 **
Grains number/ ear/ grain yield	y= 1,190x+8,380	0,639**

The researches regarding the influence of sowing time to wheat yield emphasize major yield depressions when sowing time is delayed. Thus, is recommended to respect the optimum sowing time close linked with other technological measures.

CONCLUSIONS

- Wheat sowing time beside climatically conditions influence directly plants growth depending on plant stage and represent one of the most important technological treatments.
- When climatically conditions recorded significant variations comparatively with multiannual average value (case of 2006/2007 period) the plants growth stages will be disturbed leading to yield depression.
- The variability of individual plants yielding capacity increase when sowing time is delayed with 10-13% for grains number/plant and with 5-15% for grains weight/plant leading to a yield depression of 7,5-19,5 q/ha.
- The variation of yielding individual capacity of wheat plants is large and is due to plant losses caused by unfavorable climatically conditions, pests and diseases attack and unfertile tillers number.

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MANAGEMENTUL TEHNOLOGIC LA GRÂUL DE TOAMNĂ CULTIVAT ÎN DOUĂ SISTEME DE CULTURĂ ŞI INFLUENȚA LUI ASUPRA PRODUCȚIEI ŞI A UNOR CARACTERE MORFOLOGICE, ÎN CONDIȚIILE DE LA S.C.D.A. ŞIMNIC

THE TECHNOLOGICAL MANAGEMENT OF WINTER WHEAT CULTIVATED IN TWO SYSTEMS AND ITS INFLUENCE ON YIELD AND MORPHOLOGICAL TRAITS IN ARDS SIMNIC CONDITIONS

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Keywords: wheat, technological management, conventional system, ecological system, different ground

REZUMAT

În condițiile de la S.C.D.A. Şimnic a fost studiată influența managementului tehnologic aplicat asupra producției, taliei şi numărului de spice/m^2, timp de trei ani (2008-2010). Experiența în sistem convențional a avut două nivele de fertilizare $N_{16}P_{80}$ (inputuri reduse) şi $N_{100}P_{80}$ (inputuri ridicate), planta premergătoare în cei trei ani fiind mazărea. Experiența în sistem ecologic a avut ca plantă premergătoare în primul an lucerna, în cel de-al doilea an floarea soarelui, iar în cel de-al treilea an ogor, fără să se aplice îngrăşăminte chimice sau pesticide. În condițiile în care s-a aplicat tehnologia ecologică (fără tratament la sământă, fără erbicidare, fără îngrăşăminte), cea mai bună producție în medie pe cei doi ani a fost obținută la soiul Gruia cu 881 kg/ha mai mult decât la soiul Dropia, acest spor fiind distinct semnificativ. Managementul tehnologic aplicat influențează producția şi talia, numărul de spice/mp nefiind modificat.

ABSTRACT

During three years under ARDS Simnic conditions was studied the technological management influence on yield, plant height and spikes number per square meter. In the conventional system the experiment had two levels of fertilization: $N_{16}P_{80}$ dose (low input) and $N_{100}P_{80}$ dose (high input) with pea like previous crop during all three years. In the ecological crop system (without chemical fertilizers and pesticides treatments) for the first experimental year the previous crop was alfalfa, than sunflower and in the third year was used a previously seedless area. In the ecological conditions, on two years average, Gruia variety recorded the best yield level (with 881 kg/ha more than Dropia) its gain being significantly distinct. Technological management influenced the yield and plants height but the number of spikes per square meter was unchanged.

INTRODUCTION

Based on the fast increase of the ecological products market (around 21 mild. in 2004 and 25.5 mild. euro in 2005) during 2004 European Union adopted a general strategy so called Lisbon Strategy favoring this market including financial support through informational programs, research, reorganize and fortify the law frame. Also, concordant with the activity report of The Organic Agriculture Research Institute from Swiss land one problem of the ecological agriculture is the low level of seed production caused by the phyto technical problems, lack of national and international rules, data about available seed and mostly caused by the lack of the appropriate genotypes for ecological conditions. About the conditions inside the eco-vegetal system Kopke (2005) said that comparatively with the conventional system there is:

-lower availability of the nutritive substances especially nitrogen and phosphorus with consequences on the yield level (due to growth limitation) and baking quality (due to the lower protein content of the kernels)

-higher weeding risk due to the lack of the herbicides

-higher diseases attack risk controlled under intensive agriculture using pesticides (Toncea, 2007)

All these make difficult the achievement of the quality parameters required by the industry: transparency, protein content (minimum 12%), specific weight (minimum 78 kg/hl), foreign bodies' content (maximum 3%) and falling number (minimum 250). The experiments conducted at ARDS Simnic during 2008-2010 follow the comparative study of the different management applied to the same winter wheat varieties and point out the wheat varieties appropriate for ecologic conditions.

MATERIAL AND METHOD

During three years (2008-2010) the experiments were conducted in conventional and ecologic system with 25 Romanian and foreign varieties in three replications. In conventional system the experiment had two levels of fertilization: $N_{16}P_{80}$ and $N_{100}P_{80}$ with pea like previous crop. In the ecological crop system for the first experimental year the previous crop was alfalfa, than sunflower and in the third fallow, without chemical fertilizers or pesticides. Tested varieties were: Flamura85, Lovrin34, Dropia, Alex, Simnic30, Albota69, Trivale, Romulus, Boema, Crina, Delabrad, Dor, Faur, Glosa, Gruia, Izvor, Ciprian, Briana Litera (Romania), Serina (Hungary), Capo (Austria), Apache (French), Josef (Austria), Exotic (French), The technological management is presented in table 1.

Table 1

Work	Ecological system	Conventional system	
		Low input	High input
Previously crop	2007 - alfalfa 6 years 2008 – sunflower 2009 - fallow	2007-pea 2008-pea 2009-pea	2007-pea 2008-pea 2009-pea
Plow+ harrow	Tractor 100 HP + Plough PP3 +harrow (1ha)	Tractor 100 HP + Plough PP3 +harrow (1ha)	Tractor 100 HP + Plough PP3 +harrow (1ha)
Fertilized with complex fertilizers 12:52:0 type– 200 kg/ha	-	Tractor 100CP + MA 6	Tractor 100CP + MA 6
Disk	Tractor 100HP + DH 3	Tractor 100HP + DH 3	Tractor 100HP + DH 3
Tillage with combinator	Tractor 100HP + combinator	Tractor 100HP + combinator	Tractor 100HP + combinator
Seed treatment with DIVIDENT – 1l/ha	-	Manually	Manually
Planting with: 550 g.k/m^2 density Planting dates	Small plots drill(1,5 m width) 21.10.2007 19.10.2008 24.10.2009	Small plots drill(1,5 m width) 12.10.2007 16.10.2008 9.10.2009	Small plots drill(1,5 m width) 15.10.2007 16.10.2008 15.10.2009
Fertilized with ammonium nitrate – 200 kg/ha	-	Tractor 100HP + fertilizer distributor (MA 6)	Tractor 100HP + fertilizer distributor (MA 6)
Manually weeds control	Plough raker		
Chemical weeds control using Mustang 0,5 l/ha	-	Tractor 100HP + sprayer (MET)	Tractor 100HP + sprayer (MET)
Harvest	Small plots combine (width by 1,5 m)	Small plots combine (width by 1,5 m)	Small plots combine (width by 1,5 m)

RESULTS AND DISCUSSIONS

During the fall of 2007 the amount of precipitations in October was over the normal value (with 139mm) leading to a uniform rise of the wheat plants.

The snow went down during the winter leaded in the spring of 2008 to the water bogging phenomena and so that diminished the number of the plants.

Even if the total amount of the precipitations was over normal value (for 75 years) calculated in the central part of Oltenia, during December 2007, February and March 2008, May and June 2008, the precipitations amount was lower (figure 1).

This lack of water was doubled by the higher temperature values comparative with the normal values of the area. During April the climatic conditions were better helping to obtain the winter wheat yield but in generally the agricultural year 2007-2008 was not a favorable one for wheat crop.

The next year 2008-2009 started with a higher amount of precipitations (99,0mm) at planting time that determinate a good uniformity of the plants. In generally the amount of precipitations was higher than normal during the whole vegetation period with exceed in February and a decrease in April (430.0mm total amount) (figure1).

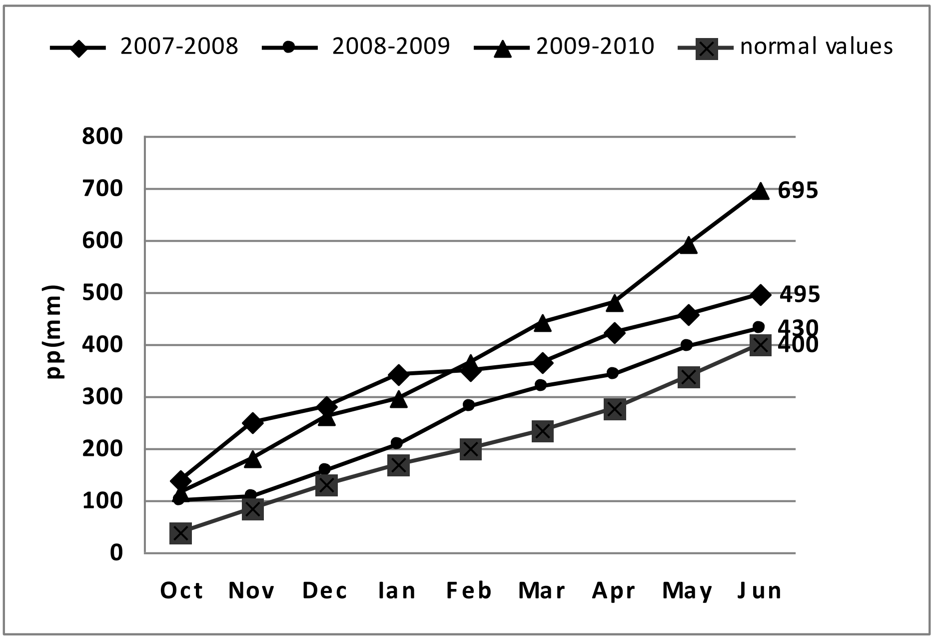

Figure 1. Total annually precipitations amount over the normal value calculated on 73 years

Even if during the agricultural year 2009-2010 went down the highest amount of precipitations the yield level was not the highest too.

Previous studies showed that at over 548 mm precipitations during whole wheat vegetation period the yield starts to decrease (Gabriela Paunescu et al., 1997).

The temperatures were also higher than normal values calculated for 68 years.

The yield levels obtained in 2008, 2009 and 2010 show that on luvic soil at Simnic they depend on the annually climatic conditions and technology system.

Due to the low amount of the precipitations during 2008 the yield levels were also low under all three crop technologies: conventional low and high input, as well as under ecologic conditions against 2009 and 2010 when the yield levels were good.

To study the technological management influence on the height of plants, number of plants/m^2 and the yield were calculated average values for each trait and limit differences.

In the conventional with low input system the yields were among 3714 kg/ha at Josef and 4619 kg/ha at Exotic variety.

Average results obtained on $N_{16}P_{80}$ ground show 19-356 kg/ha yield increases at Trivale, Apache, Ciprian, Serina, Exotic and Litera comparative with the check variety Dropia (table 2), but not statistically assured.

Table 2

Wheat varieties yields under conventional system with $N_{16}P_{80}$ fertilization

No	Variety	Yield (kg/ha) 2008	Yield (kg/ha) 2009	Yield (kg/ha) 2010	Average	Dif.+ Signific.	%
1	Flamura85	3359	5587	3746	4231	-62	99
2	Lovrin 34	2926	5602	3679	4069	-224	95
3	Dropia	3038	5596	4245	4293	0	100
4	Alex	2713	5395	4080	4063	-230	95
5	Şimnic 30	2784	5005	3570	3786	-507	88
6	Albota 69	2656	5075	3514	3748	-545 ^{o}	87
7	Trivale	3022	5707	4206	4312	19	100
8	Romulus	2973	5327	-	4150	-143	97
9	Boema	3203	5312	3666	4060	-233	95
10	Crina	3674	5022	3779	4158	-135	97
11	Delabrad	2956	5409	3435	3933	-360	92
12	Dor	2952	5923	3744	4206	-87	98
13	Faur	2587	5656	3160	3801	-492	89
14	Glosa	3181	5146	4090	4139	-154	96
15	Gruia	3120	5890	3372	4127	-166	96
16	Izvor	3097	5186	4308	4197	-96	98
17	Ciprian	3219	5871	3895	4328	35	101
18	Briana	3206	4755	3878	3946	-347	92
19	Serina	3336	5789	4264	4463	170	104
20	Capo	3120	5166	4129	4138	-155	96
21	Apache	3414	5509	4078	4334	41	101
22	Renan	2302	5757	-	4030	-264	94
23	Josef	2667	5254	3221	3714	-579 ^{o}	87
24	Exotic	3264	5523	5071	4619	326	108
25	Litera	3388	5835	4186	4470	177	104

LD 5% = 525 kg/ha ; LD 1% = 712 kg/ha ; LD 0,1 = 953 kg/ha

Based on three years average under Dropia like yield potential were Albota69 and Josef varieties with 545 kg/ha respectively 579 kg/ha significant yield decreases.

In the conventional with $N_{16}P_{80}$ ground none of the tested varieties was superior to Dropia.

On $N_{100}P_{80}$ ground the three years average yield was over 4000 kg/ha with minimum limit by 4170 kg/ha at Capo and maximum 5165 kg/ha at Trivale (table 3).

A significant yield gain comparative with check variety Dropia recorded Trivale (+609 kg/ha). Also Ciprian, Alex, Lovrin34, Flamura85, Albota69, Simnic30, Romulus, Boema, Crina, Delabrad, Glosa, Gruia, Izvor, Apache, Exotic and Litera varieties presented yield gains by 26 until 557 kg/ha but not statistically assured.

There were also wheat varieties under Dropia like yield potential such as: Romulus (with 148 kg/ha less than Dropia), Dor with 97 kg/ha less, Faur with 256 kg/ha less, Briana with 197 kg/ha less, Serina with 43 kg/ha less, Capo with 386 kg/ha less, Renan with 289 kg/ha less, Josef with 199 kg/ha less than Dropia, but they were not statistically assured.

Table 3

Wheat varieties yields under conventional system with $N_{100}P_{80}$ fertilization

No	Variety	Yield (kg/ha) 2008	Yield (kg/ha) 2009	Yield (kg/ha) 2010	Average	Dif.+ Signific.	%
1	Flamura85	4265	5244	4565	4691	135	97
2	Lovrin 34	3956	5400	5484	4947	391	102
3	Dropia	3579	5231	4857	4556	0	94
4	Alex	3970	5555	5815	5113	557	105
5	Simnic 30	4224	5235	4345	4601	45	95
6	Albota 69	3937	5273	5116	4775	219	98
7	Trivale	4091	5128	6277	5165	609*	106
8	Romulus	3938	4878		4408	-148	91
9	Boema	4241	4989	4796	4675	119	96
10	Crina	3598	5069	5835	4834	278	100
11	Delabrad	4306	5785	4394	4828	272	99
12	Dor	2274	5839	5265	4459	-97	92
13	Faur	2924	5536	4439	4300	-256	89
14	Glosa	3185	5699	5190	4691	135	97
15	Gruia	2964	5214	6027	4735	179	97
16	Izvor	3178	5621	4948	4582	26	94
17	Ciprian	3894	5808	5112	4938	382	102
18	Briana	4053	4995	4029	4359	-197	90
19	Serina	3394	5379	4765	4513	-43	93
20	Capo	3694	4407	4410	4170	-386	86
21	Apache	3537	5869	5011	4806	250	99
22	Renan	3081	5454		4268	-289	88
23	Josef	3659	5048	4364	4357	-199	90
24	Exotic	3648	5241	5604	4831	275	99
25	Litera	4122	5282	4680	4695	139	97

LD 5% = 591 kg/ha ; LD 1% = 800 kg/ha ; LD 0,1% = 1078 kg/ha

In ecological conditions system (without seed treatment, herbicides and fertilizers) during three years the best average yield level was realized by Gruia variety with 881 kg/ha more than Dropia this being a significant gain. Other varieties had higher yields than Dropia: Ciprian with 652 kg/ha more, Crina with 689 kg/ha, Serina with 463 kg/ha, Simnic 30 with 470 kg/ha, Trivale with 485 kg/ha, Izvor with 445 kg/ha and Glosa with 522 kg/ha more but without statistical insurance (table 4).

In ecological conditions were also varieties with lower yield than Dropia but the only significant decrease was recorded by Renan (-1491 kg/ha). Low yield levels were also at Capo (3461 kg/ha), Briana (3597 kg/ha), Alex (3872 kg/ha) but the differences were not statistically ensured.

The limits of the average yields for this crop system were 2324 kg/ha at Renan and 4696 kg/ha at Gruia varieties.

In the conventional with high input system on three years average the height of the plants had values by 68 cm at Renan and 104 cm at Trivale.

Table 4

Winter wheat varieties yields under ecologic system

No	Variety	Yield (kg/ha) 2008	Yield (kg/ha) 2009	Yield (kg/ha) 2010	Average	Dif.+ Signific.	%
1	Flamura 85	3633	3690	5119	4147	332	109
2	Lovrin 34	3700	3233	5774	4236	421	111
3	Dropia	3175	3418	4853	3815	0	100
4	Alex	2808	2814	5993	3872	57	101
5	Simnic 30	3875	3855	5125	4285	470	112
6	Albota 69	3650	3249	5168	4022	207	105
7	Trivale	3408	4474	5018	4300	485	113
8	Romulus	2883	4079		3481	-334	91
9	Boema	2692	4537	5630	4286	471	112
10	Crina	2967	4410	6135	4504	689	118
11	Delabrad	2658	3991	5856	4168	353	109
12	Dor	2667	3807	5583	4019	204	105
13	Faur	3475	3654	5415	4181	366	110
14	Glosa	3100	4625	5587	4437	622	116
15	Gruia	4675	4562	4850	4696	881*	123
16	Izvor	2808	3967	6006	4260	445	112
17	Ciprian	3517	4654	5231	4467	652	117
18	Briana	2925	3264	4602	3597	-218	94
19	Serina	3158	4650	5026	4278	463	112
20	Capo	2200	3417	4766	3461	-354	91
21	Apache	2717	3639	4979	3778	-37	99
22	Renan	1308	3340		2324	-1491^{oo}	61
23	Josef	2700	3627	5026	3784	-31	99
24	Exotic	2900	3739	4902	3847	32	101
25	Litera	3125	2968	4894	3662	-153	96

LD 5% = 857 kg/ha ; LD 1% = 1162 kg/ha ; LD 0,1% = 1556kg/ha

In the conventional low input system the height of the plants had values by 62-101 cm at the same varieties and in the ecologic system these values were by 51 cm at Apache and Renan and maximum 88 cm at Capo (table 5).

Comparative with Dropia the most cultivated variety in Romania Simnic30, Trivale and Serina presented height gains statistically ensured for both conventional systems. Exotic and Renan presented for all cropping systems a significant height diminish. In ecologic system there are more varieties with statistically insurance height increase comparative with Dropia.

This situation was determinate by the strongly decrease of the Dropia height caused by the weeds infestation mainly with Convolvulus arvensis.

Regarding the number of spikes per square meter were values among 402 (Litera) and 588 spikes/m^2 (Izvor) in the high input conventional system, among 438-625 spikes/m^2 at Lovrin 34 respectively Crina in the low input conventional system and 377 minimum (Apache) and 562 spikes/m^2 maximum in the ecological system (Table 6).

In none crop system the number of spikes per square meter of tested varieties presented statistically ensured differences comparative with Dropia.

This suggests that cropping system influence is not reflected on this yield part- the number of spikes per square meter.

Table 5

Plants height at wheat varieties tested under different crop systems

Variety	Conventional high input		Conventional low input		Ecologic	
	Height (cm)	Diferen+ Signific.	Height (cm)	Diferen+ Signific.	Height (cm)	Diferen+ Signific.
Flamura 85	79	0	81	0	75	10
Lovrin 34	85	6	77	-4	62	-3
Dropia	79	0	81	0	65	0
Alex	85	6	85	4	58	-8
Simnic 30	101	22***	96	15**	62	-3
Albota 69	95	16**	90	9	73	8
Trivale	104	25***	101	20***	75	10
Romulus	81	2	81	0	66	1
Boema	79	0	81	0	71	6
Crina	78	-2	76	-5	70	5
Delabrad	83	4	78	-4	70	5
Dor	79	-1	76	-5	82	17*
Faur	78	-2	77	-5	68	3
Glosa	81	2	76	-5	85	20**
Gruia	80	1	80	-1	68	3
Izvor	86	7	88	7	78	13*
Ciprian	90	11*	87	6	76	11
Briana	89	10*	85	4	78	13*
Serina	96	17**	94	13*	85	20**
Capo	93	14*	90	9	88	23**
Apache	80	1	86	5	51	-14^{o}
Renan	68	-11^{o}	62	-19^{ooo}	51	-14^{o}
Josef	82	3	85	4	69	4
Exotic	69	-10^{o}	68	-13^{o}	53	-13^{o}
Litera	83	4	83	2	75	10
DL 5%	10 cm		10 cm		13 cm	
DL 1%	13 cm		14 cm		18 cm	
DL 0.1%	18 cm		19 cm		24 cm	

Table 6

Spikes number of wheat varieties tested under different crop systems

Variety	Conventional high input		Conventional low input		Ecologic	
	Spikes no/m^2	Diferen+ Signific.	Spikes no/m^2	Diferen+ Signific.	Spikes no/m^2	Diferen+ Signific.
Flamura 85	438	-59	508	0	422	-46
Lovrin 34	462	-35	438	-70	473	5
Dropia	497	0	508	0	468	0
Alex	542	45	513	5	482	14
Simnic 30	498	1	448	-60	508	40
Albota 69	522	25	532	24	548	80
Trivale	468	-29	465	-43	445	-23
Romulus	422	-75	492	-16	435	-33
Boema	423	-74	502	-6	512	44
Crina	432	-65	472	-36	513	45
Delabrad	500	3	625	117	483	15
Dor	448	-49	553	45	510	42
Faur	430	-67	505	-3	507	39
Glosa	487	-10	533	25	512	44
Gruia	492	-5	485	-23	488	20
Izvor	588	91	508	0	458	-10
Ciprian	413	-84	503	-5	562	94
Briana	473	-24	527	19	460	-8
Serina	503	6	445	-63	470	2
Capo	533	36	497	-11	452	-16
Apache	565	68	515	7	377	-91
Renan	437	-60	506	-2	378	-90
Josef	465	-32	460	-48	450	-18
Exotic	435	-62	482	-26	505	37
Litera	402	-95	512	4	512	44
DL 5%	98		132		107	
DL 1%	130		177		143	
DL 0.1%	170		230		186	

CONCLUSIONS

▪On three years average in the high input conventional system were obtained the highest yield;

▪The lowest yield was obtained in the ecological system but the maximum in this system was almost equal with the maximum in the low inputs conventional system;

▪Under ecological technology (without seed treatment, herbicides and fertilizers) the best average yield (on three years) had Gruia variety, with 881 kg/ha more than check variety Dropia, a distinct significant gain;

▪Most of the tested varieties gave good yields in ecological conditions but there are also some exceptions that are not recommend for this conditions: Renan, Capo, Alex varieties;

▪The yield and the plants height were influenced by the applied technological management but the number of spikes per square meter was unchanged.

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CERCETĂRI PRIVIND INFLUENȚA EPOCII DE SEMĂNAT ASUPRA PRODUCȚIEI ŞI CALITĂȚII LA GRÂUL DE TOAMNĂ ÎN CONDIȚIILE DE LA ŞIMNIC

STUDIES REGARDING PLANTING TIME INFLUENCE ON WINTER WHEAT PRODUCTION AND QUALITY UNDER SIMNIC CONDITIONS

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REZUMAT

Cercetările ce au avut ca scop studiul comparativ al soiurilor de grâu de toamnă autohtone pe luvosolul de la Şimnic, semănate la epoci diferite, au fost efectuate la S.C.D.A. Şimnic timp de 2 ani (2007-2009). Au fost testate 25 soiuri de grâu comun de proveniență românească şi străină (factorul A), la două epoci de semănat (factorul B).

Fără excepție, la epoca de semănat normală producțiile obținute au fost mai mari decât atunci când semănatul a fost întârziat. Corelația dintre producția obținută când s-a semănat la epocă normală şi producția obținută când s-a semănat la epocă tardivă sugerează faptul că la o creştere a producție cu 100 kg/ha la epocă normală, producția creşte cu doar 44,6 kg/ha când semănatul este întârziat. În medie, la toate soiurile testate, valoarea masei hectolitrice scade foarte semnificativ când se întârzie semănatul (74,1 kg/hl față de 76,6 kg/hl).

ABSTRACT

During two years (2007-2009) on a luvic soil at ARDS Simnic have been performed a study in order to compare winter wheat varieties planted at different dates. Have been tested 25 varieties created in Romania and other countries (A factor) planted at two different dates (B factor). Without exception, the yields obtained at normal planting time were higher than those obtained at delayed date. The correlation between these shows that for 100 kg/ha yield increase at normal planting time there is only 44.6 kg/ha yield increase at delayed planting time. On average, all varieties showed a very significant decrease of hectoliter weight under delayed planting time (74.1 respectively 76.6 kg/hl).

INTRODUCTION

Planting work is a very important part of the technologic chain of the wheat crop. Under optimal conditions this will ensure a regular plant rising, a normal development during active autumn vegetation period, going through tillering and hardening stages with well development of the root system, steps required for minimum losses during winter conditions. Such crop will grow vigorously in spring, covering the area and reducing weeds nutrition possibilities. Very important is to respect the optimal planting time. This may contribute with 40-50% sometime with 80% to realize the yield level.

In a normal year is already known that planting time is around 1-10 October for the half south part and with 5-10 days earlier for the other half of our country.

Usually planting work starts when air temperature is around 13-15^{0}C and has to be finished in 10-15 days at temperatures around 8-9^{0}C.

Depending on the weather conditions planting can start with 6-7 days earlier or later. In 2006 the farmers had better results planting later because of a soft winter compared with years when winter came in November and is better to plant earlier.

Important is that during autumn vegetation period to have 40-50 days with higher than 5^0C temperatures, to accumulate 450-550 degrees, to develop roots system, to accumulate in leaves and tillering node the carbohydrates that will help wheat plants to cross cold season without losses.

MATERIAL AND METHOD

Studies had like aim the comparative analysis of the Romanian winter wheat varieties planted at different dates, for a correct area recommendation concerning planting date pointing out those varieties that express maximum genetic possibilities for yield and quality accounting this factor.

During two years (2007-2009) have been tested 25 Romanian and foreign winter wheat varieties (A factor), at two different planting dates (B factor).

A factor-the variety had 25 graduations: a_1=Dropia, a_2=Flamura85, a_3=Boema, a_4=Glosa, a_5=Exotic, a_6=Alex, a_7=Apache, a_8=Bercy, a_9=Cezanne, a_{10}=Enesco, a_{11}=Elet, a_{12}=Gobe, a_{13}=Kalasz, A_{14}=Miska, a_{15}=Othalom, a_{16}=Petur, a_{17}=Serina, a_{18}=Magvas, a_{19}=Kalasz, a_{20}=Palma, a_{21}=Pobeda, a_{22}=Renan, a_{23}=Renesansa, a_{24}=Gruia, a_{25}=Briana.

B factor-planting data had two graduations: b_1=normal planting time (11 October) and b_2=delayed planting time (28 October).

At these varieties have been analyzed morphological, physiological and quality traits the results being mainly connected by yield, hectoliter (test) weight, wet gluten content, protein content, gluten index and the correlations between them at two different planting dates. The experiments have been placed in the field of the Wheat Breeding Laboratory of the Agricultural Research and Development Station from Simnic organized with subdivided plots with two factors, three replications and 25 varieties.

During testing time we made determinations in the field and laboratory.

In the field was considered the kernels weight per 5 square meters plot and then the yield per hectare with humidity correction from harvest to standard humidity (14%).

In the laboratory were determinate: test weight (TW)-using GRANOMAT apparatus, wet gluten content-manually, protein content-using PERTEN INFRATEC apparatus and gluten index with alveograph.

Were calculated the limit differences for the main studied traits using the program for subdivided plots with two factors.

Were calculated also the regression coefficients, determination coefficients and linear equations for the relations: yield at normal planting time and yield at delayed planting time, test weight at normal and delayed planting time, protein content at normal and delayed planting time, wet gluten content at normal and delayed planting time and gluten index for both conditions.

RESULTS AND DISCUSSIONS

During the autumn of 2007 the amount of precipitations in October was over the normal value (with 139mm) leading to a uniform rise of the wheat plants.

The snow went down during the winter leaded in the spring of 2008 to the water bogging phenomena so that diminished the number of the plants.

Even if the total amount of the precipitations was over normal value (for 75 years) calculated in the central part of Oltenia, during December 2007, February and March 2008, May and June 2008, the precipitation amount was lower.

This lake of water was doubled by the higher temperature values comparatively with the normal values of the area. During April the climatic conditions were better helping to obtain the winter wheat yield but in generally the agronomic year 2007-2008 was not a favorable one for wheat crop.

The next year 2008-2009 started at planting time with a higher amount of precipitations (99,0mm) this determinate a good uniformity of the plants. In generally the amount of precipitations was higher than normal during the whole vegetation period with exceed in February and a decrease in April (430.0mm total amount) (figure 2).

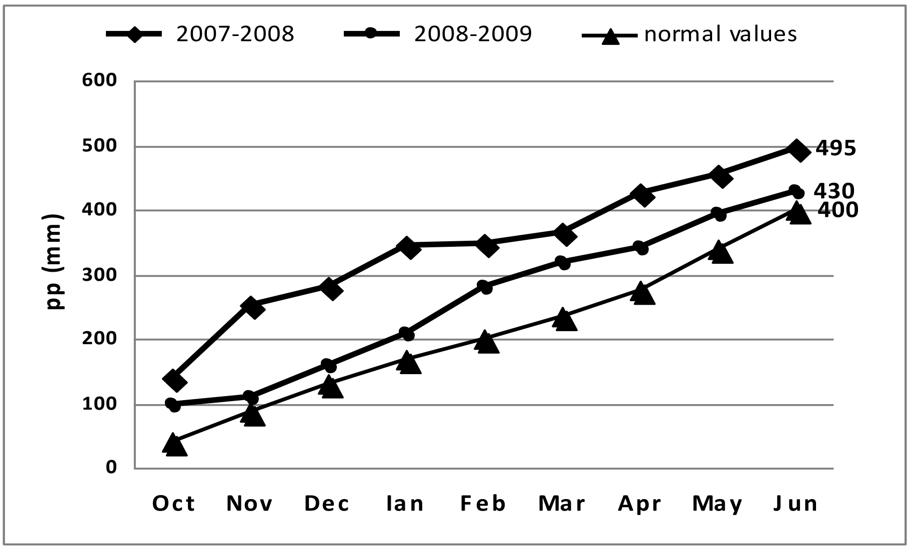

Figure 2. The sum of precipitations over the normal value for the area during testing period

Without exception the yields obtained at normal planting date were higher. In this conditions minimum and maximum values were recorded by Othalom-49.1q/ha and Gruia-68.1q/ha, and by Bercy-41,6q/ha respectively Gruia-57q/ha under delayed planting time conditions.

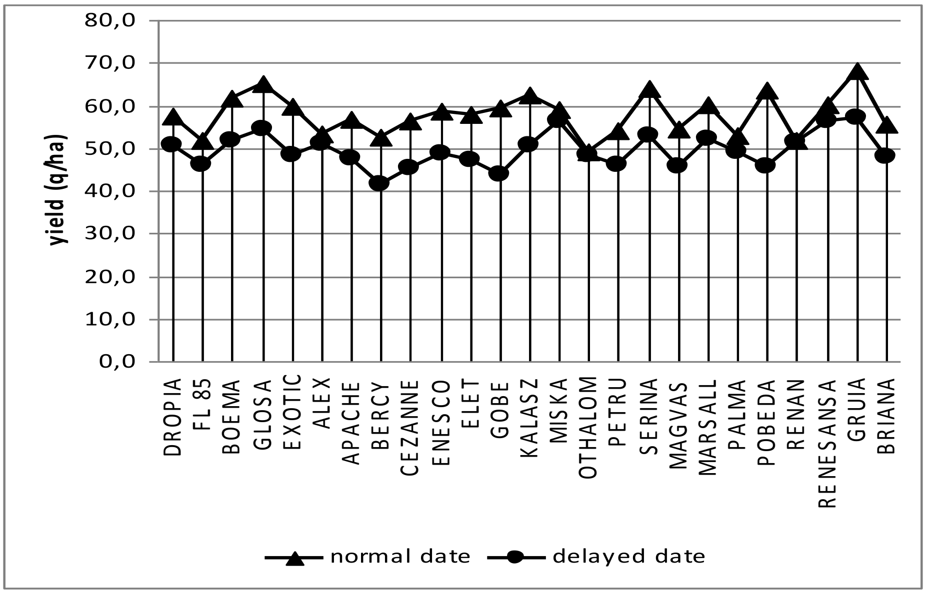

Figure 3. Variety x planting time interaction, DL5%=9,2q/ha, DL1%=11,8q/ha; DL 0.1%=14.4q/ha. The yield levels of tested varieties obtained in two different planting time conditions

Looking after the statistically assured differences some of tested varieties showed significant yield decreases under delayed planting time conditions. These are: Boema, Glosa, Exotic, Bercy, Cezanne, Enesco, Elet, Gobe, Kalasz, Serina, Pobeda and Gruia. Lower yield decreases under the same conditions recorded Alex (2.4q/ha difference), Miska (2.6q/ha difference), Renan (0.7q/ha difference) and Othalom (0.8 q/ha difference). The calculated correlation between the yield obtained at normal planting date and those obtained at delayed planting date suggest that for 100q/ha increase under normal conditions corresponded only 44.6q/ha increase under delayed planting time conditions.

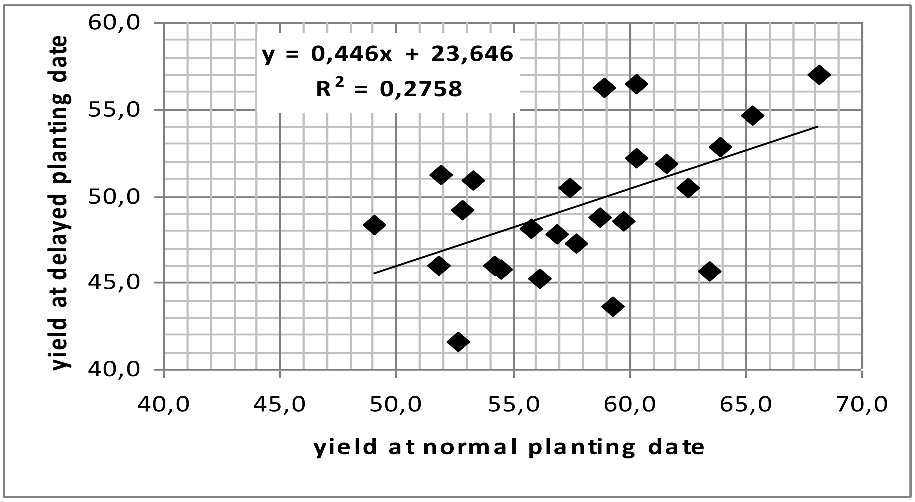

Figure 4. The correlation between the yields under normal and delayed time planting

When the planting was made on time the highest value for test weight was registered by Flamura85-80kg/hl and the smallest by Bercy-69.9kg/hl. The last one presented also the smallest test weight value under delayed planting time conditions.

French varieties, in generally request longer period to fill up the grains so that the higher temperatures recorded at Simnic transform their flour in bran without content (fig.5)

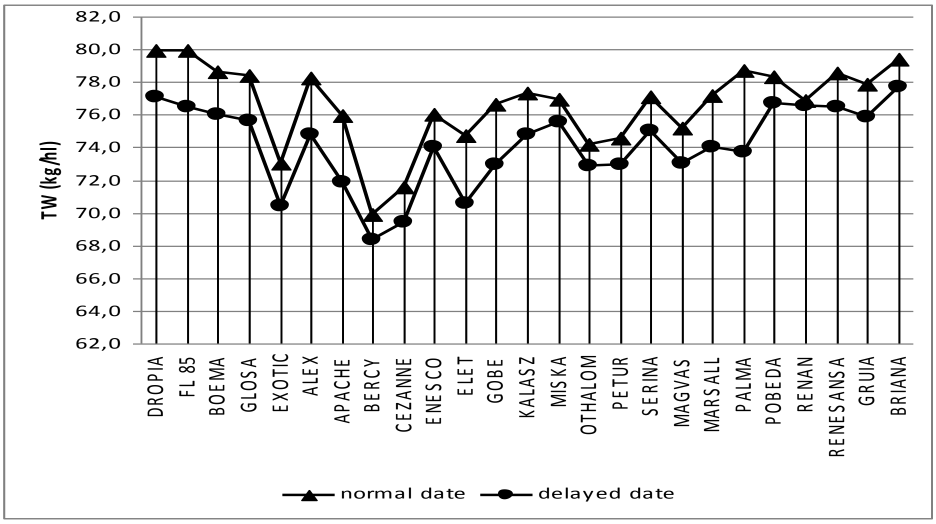

Figure 5. Variety x planting time interaction, DL5%=1.7 kg/hl, DL1%=2.3 kg/hl; DL 0.1%=3.0 kg/hl. Test weight value at tested varieties at two planting dates

Under delayed planting time conditions Briana variety registered the highest test weight value being the earliest variety capable of maximum use of the time for fill up the grain.

On average, at all tested varieties the test weight value significantly decrease under delayed planting time conditions (74.1kg/hl against 76.6 kg/hl) except Bercy, Miska, Pobeda and Renan.

It must say that there are varieties that indifferently by the planting date their TW value was not over 75 kg/hl the minimum taken value. These are the foreign varieties: Exotic, Bercy, Cezanne, Othalom and Petur.

Regarding the correlation between the test weight values under the two different planting data, this is very close, the determination coefficient being by 83% (figure 6). The best position in the graphic representation has Briana variety, above the line, registering 79.4 kg/hl planted at normal date and 77.7kg/hl planted after two weeks.

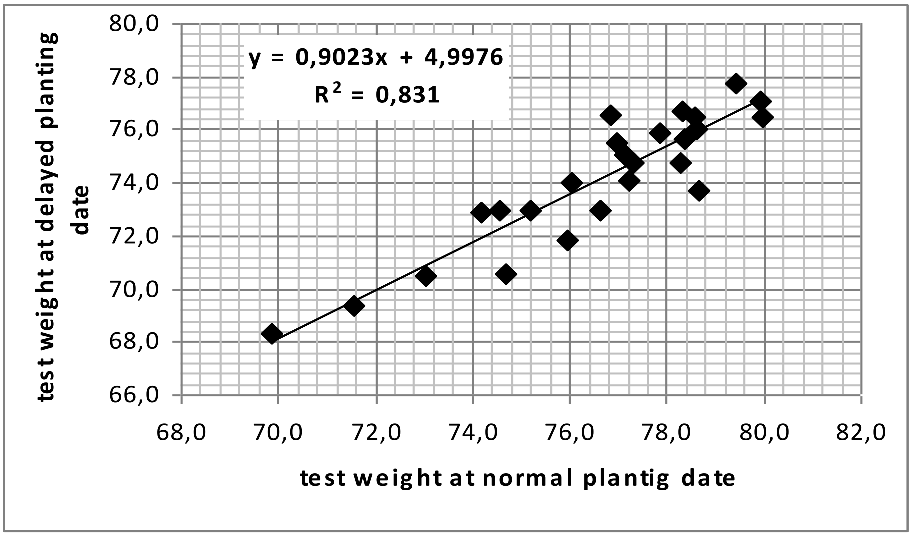

Figure 6. The correlation between test weight values obtained at two different planting dates

The wheat flour has a very good quality value at over 26% wet gluten content, a good quality at 24-26% wet gluten content, satisfactory quality at 22-24% and poor quality under 22% wet gluten content.

With only two exceptions, the wet gluten content of the varieties planted later is higher than for the same varieties planted in time. At normal planting date the range of the wet gluten content was from 17.3% (Enesco) to 26.6% (Apache). At delayed planting time the grains of Renesansa variety had the smallest wet gluten content -22.3% and those of Alex the highest value-32.1% for the same traits (figure 7).

Except Apache all other varieties presented statistically assured decreases at normal planting time against delayed planting time.

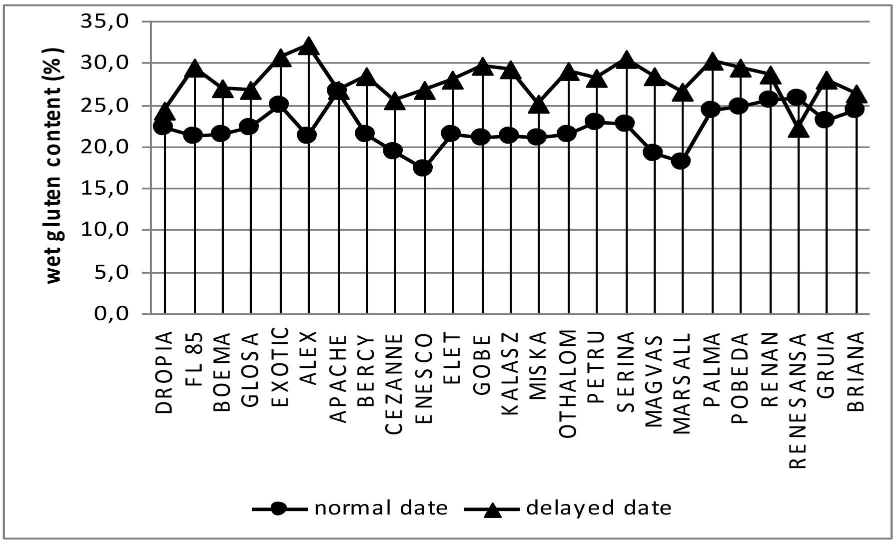

Figure 7. Variety x planting time interaction, DL5%=1.1%; DL1%=1.4%; DL 0.1%=1.9%. Wet gluten content at tested varieties under two different planting dates

The correlation between wet gluten content at normal planting time and delayed planting time is almost a flat line, leading to the conclusion that later planting did not modify the varieties classification after wet gluten content (Figure 8).

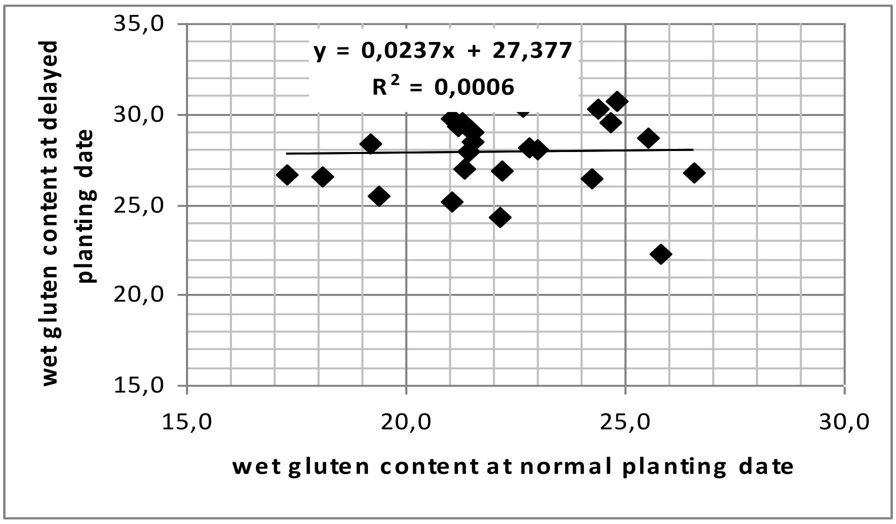

Figure 8. The correlation between the wet gluten content at normal planting time and delayed planting time

Looking after kernel protein content the quality classification said that for a very good quality the protein must be over 13%, for good quality around 12-13%, satisfactory 10-12% and unsatisfactory below 10%.

Under delayed planting time conditions the values of this character significantly increased compared with the average value of varieties obtained under normal planting time conditions.

The rainfalls came at the end of May-begin of June still found green leaves at later planted varieties so that the protein accumulation process was longer resulting higher values comparative with the same varieties planted on time. At these the leaves were already dry and the accumulation process interrupted.

Under normal planting time conditions the highest protein content recorded Renan variety (13.4%). When planting time was two weeks later, the best results obtained Bercy and Paloma (14.5). All tested varieties except Miska, Renan and Renesansa presented statistically assured decreases of the protein content at normal planting time against delayed planting time.

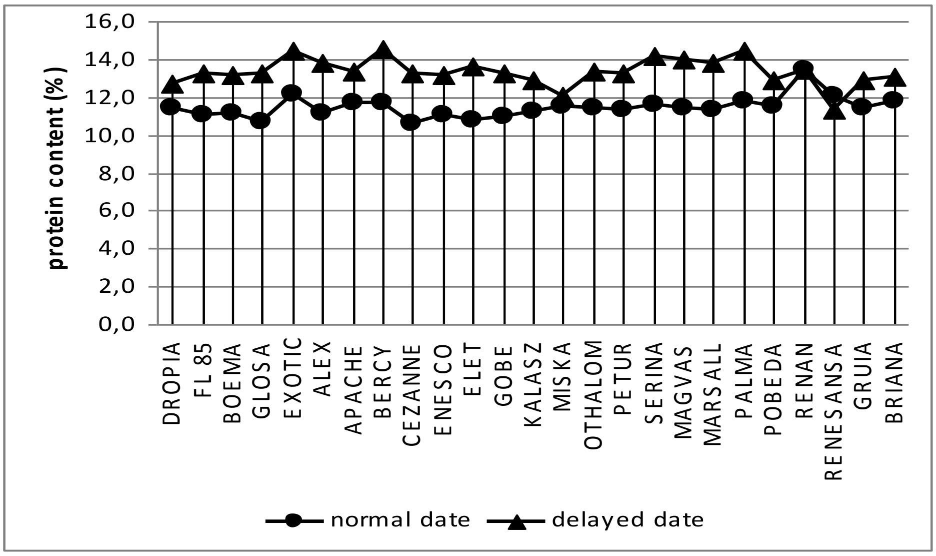

Figure 9.Variety x planting time interaction, DL5%=1.1%; DL1%=1.4%; DL 0.1%=1.9%. Protein content at tested varieties under two different planting dates

Protein content can be not influenced by the delayed of planting time. There is no correlation between the protein content at normal and delayed planting time. A variety with low protein content can be not improved under this aspect only with this technological aspect. The correlation line is straight like at the wet gluten content. Thus, a variety that has low protein content under normal planting time conditions and has a specific place comparatively with other tested varieties will be not different under delayed planting conditions (Figure 10).

Gluten index may vary among 0 and 100 but for baking quality the optimum values are around 65-80.

Even if the value was with 9 units lower at later planting, it was still good no matter planting date, having values around 60.

Only three among tested varieties presented very significant higher gluten index values under normal planting time conditions: Alex, Gobe and Serina (figure 11).

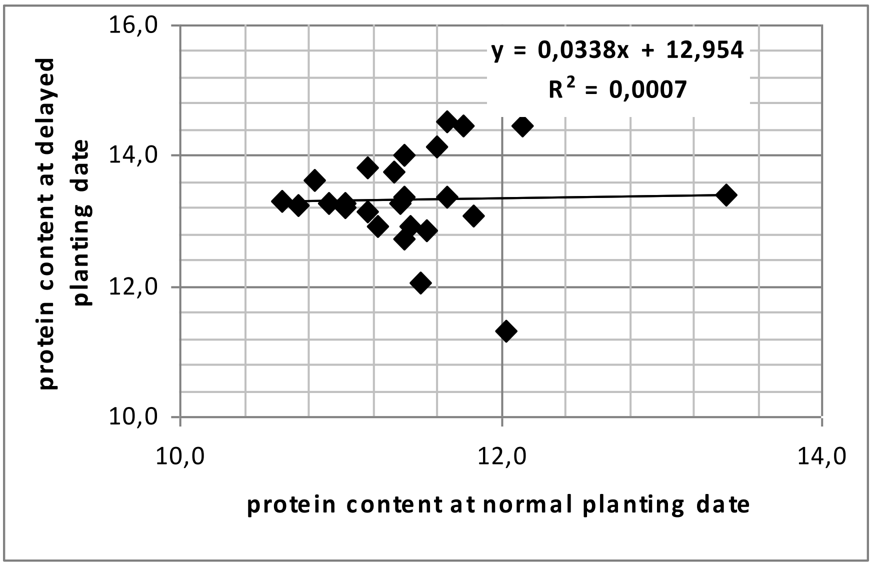

Figure 10. The correlation between protein content of varieties tested in two different planting time conditions.

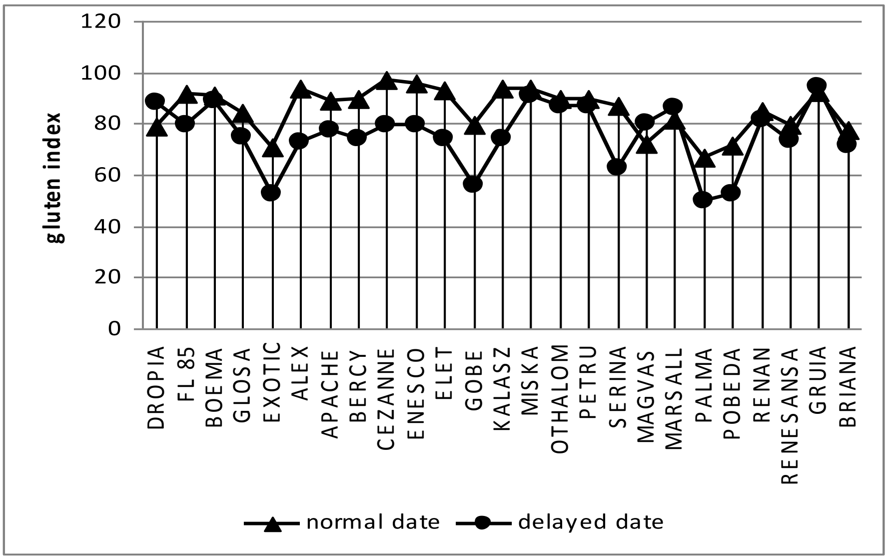

Figure 11. Variety x planting time interaction, DL5%=1.1%; DL1%=1.4%; DL 0.1%=1.9%. Gluten index values at wheat varieties tested in two different planting dates

The delayed of planting determinate the value of gluten index in percentage by 34%. The best position on the correlation line with gluten index value among 65 and 80 have: Magvas, Renesansa and Briana (Figure 12).

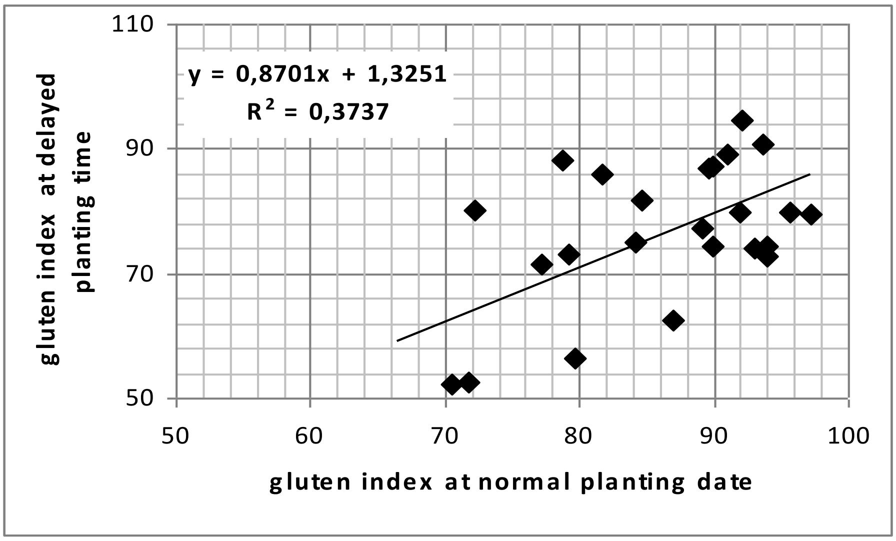

Figure 12. The correlation between gluten index at normal and delayed planting time

CONCLUSIONS

- In normal planting time conditions, without exception all tested varieties obtained higher yields than in delayed planting time conditions.
- The correlation between the yield obtained under normal and delayed conditions shows that for 100 kg/ha yield increase in normal conditions correspond only 44kg/ha yield increase in delayed planting time conditions.
- For most of tested varieties the plants height was influenced by the planting date

- On average at all tested varieties the hectoliter (test) weight significantly decreased when planting date was two weeks later (74.1kg/hl respectively 76.6kg/hl)
- With only two exceptions, under delayed planting time conditions the wet gluten content was higher comparative with second planting date
- Protein content can be not influenced by the delayed planting date. There is no correlation between the protein content of the varieties planted on time and the protein content of the same varieties planted later. A variety with low protein content can be not improved only using this technological aspect

Looking after obtained yield we recommend Gruia, Glosa and Serina varieties –with the highest yields under both conditions. Alex and Miska varieties registered low yield differences between planting dates so that can be cultivated on large areas even later. The losses are insignificantly.

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INFLUENȚA NUMĂRULUI DE CELULE SOMATICE DIN LAPTELE MATERIE PRIMĂ ASUPRA COMPOZIȚIEI LAPTELUI DE VACĂ

INFLUENCE OF BULK MILK SOMATIC CELL COUNT ON COW MILK COMPOSITION

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Key words: milk somatic cell count, milk fat, milk protein,milk urea nitrogen
Cuvinte cheie: număr de celule somatice, grăsime, proteină, azot ureic

REZUMAT

Studiul s-a realizat în ferma proprie în vara anului 2010 pe probe de lapte din ferma prelevate din tanc. Au fost determinaț i următorii parametrii: număr de celule somatice, grăsime, substanț e solide negrase, proteină, azot ureic ș i testul pentru antibiotice ș i substanț e inhibitoare. Laptele cu număr mare de celule somatice se caracterizează printr-un conț inut scăzut de proteină ș i substanț e solide negrase, dar nivel crescut de grăsime comparativ cu laptele cu număr mic de celule somatice. O valoare medie a azotul ureic de 12,68 sugerează o posibilă carenț ă nutriț ională a raț iei. Substanț e inhibitoare ș i antibiotice nu au fost detectate.

ABSTRACT

The experiment was done on samples of milk collected from the farm bulk tank milk in the summer of 2010. The fallowing parameters were determined: somatic cell count, fat, solid non-fat, protein,urea nitrogen and the test for antibiotic or inhibitory substances. High somatic cell count milk has lower protein and solid non-fat levels and increased levels of fat than low cell count milk. Mean milk urea nitrogen of 12.68 indicates a possible dietary deficiency. No antibiotic or inhibitory substances were detected.

INTRODUCTION

Somatic cell counts can be run on milk from the bulk tank as an indicator of herd mastitis status. Bulk tank SCC indicates the overall level of mammary inflammation in the milking herd at each milking. It is the bulk tank SCC that is used by the milk processor plant to determine milk quality premiums to the producer. A single cow with high SCC probably will not increase the bulk tank SCC by very much, however if the herd has many chronically infected cows, then the bulk tank SCC may increase significantly. High SCC milk is not desirable because it reduces the shelf life of dairy products and diminishes the quantity and quality of milk.

Effects on protein contents

It is generally accepted that during mastitis, there is an decrease in caseins coupled with an influx of blood-borne proteins (such as serum albumin, immunoglobulins, the minor serum proteins, transferring, α- macroglobulin) into the milk .

According to Auldist *et al*. (1995) and Auldist and Hubble (1998) this increase in proteins of blood serum origin during mastitis is possibly due to a disruption to the integrity of the mammary epithelia by microbial toxins and opening of the tight junctions. Auldist and Hubble (1998) continue that the decrease in casein concentrations during mastitis is largely due to post-secretory degradation of casein by proteinases originating from mastitis-causing organisms, leucocytes or the blood and in part to a reduction in the synthesis and secretion of casein as a result of physical damage to the mammary epithelial cells by microbial toxins during mastitis. This has important implications for the manufacturing potential of the milk, particularly, but not exclusively, for cheese manufacture.

On the other hand, the whey proteins synthesised de novo are relatively resistant to proteolytic attack. However, in mastitic and high SCC milk there is an evident decrease in α-lactalbumin and β-lactoglobulin. This would be, according to Auldist and Hubble (1998), partly due to impaired cellular synthetic and secretory function, and partly due to leakage of these proteins out of the milk and into the extra-cellular fluid via the paracellular pathways that proliferate during mastitis. To support their theory the authors mention that an elevated concentrations of α-lactalbumin in the blood of cows with elevated SCC is registered. Mastitis is also associated with increases in the concentrations of many different enzymes in milk, which can play significant roles in the diagnosis of sub-clinical mastitis. The main caseinolytic enzyme in milk, plasmin, is normally found in milk in small quantities. The plasmin is derived from plasminogen which originates in the blood and probably leaks into the milk in greater amounts due to disruption of the epithelium. Plasmin's primary function in the blood is dissolving clots. Elevated activity of plasmin occurs both in mastitic milk and milk from late lactation. Plasmin is able to rapidly cleave β-casein into the smaller δ-casein and polypeptide fragments (proteose peptones) which then diffuse into the whey. Proteolysis by activated plasmin from the blood, proteolytic enzymes from mastitis-causing organisms and phagocytes leads to poor curding, lowered cheese yield, a bitter taste of dairy products etc.

Effects on fat contents

There are contradictory results in the literature dealing with the effect of mastitis on fat content. For example, Auldist and Hubble (1998) report a decrease in fat concentration, but the majority of the authors recorded an increase in total fat content of mastitic milk.

According to Bruckmaier *et al*. (2004) the increase in fat concentration indicates that there is a reduced lactose synthesis and therefore reduced milk volume while the fat synthesis is only slightly depressed. Over a period of time, the total output of fat from a quarter is likely to be reduced, because of the lower volume of milk. In addition the leakage of lactose from the milk will take with it water and the volume of secretion left in the gland will decrease. The fat droplets however are large relative to the gaps between the cells and are contained within the alveole and consequently their concentration increases.

Milk fat globule membranes are susceptible to the action of lipase enzymes, produced by leukocytes that invade the mammary gland in response to infection, resulting in breakdown of triglycerides, oxidation of fatty acids and off-flavours. It has been assumed that milk with a high SCC is more susceptible to spontaneous lipolysis. The factors that increase the hydrolysis of triacylglycerols in the fat droplet, during mastitis, are very poorly understood. One possible explanation is that this process may be accentuated by the addition of blood-serum components (Na+ and Cl-) to the milk during mastitis.

Antibiotic Residues

These are residual antibiotic in the milk and tissue after treatment with antibiotic for mastitis.. Each antibiotic has a prescribed period where the milk from that cow should not be put into the bulk tank. The presence of antibiotics is prohibit in milk intended for human consumption to protect hypersensitive individuals from exposure to specific antibiotics and to reduce the remote possibility of the emerge of antibiotic resistant organism in milk.

Milk urea nitrogen

Urea is produced in the liver from ammonia derived mainly from the breakdown of the protein in the rumen and from normal daily metabolism of absorbed amino acids and body protein. If bacteria in the rumen cannot capture the ammonia and convert it to microbial protein, the excess ammonia is absorbed across the rumen wall. Excess ammonia circulating in blood can be toxic and the conversion of blood ammonia to urea is the way to prevent the toxicity. The body excretes blood urea in urine and milk. Urea nitrogen (N) levels in blood and milk of an individual cow are highly related. Milk urea nitrogen (MUN) values should not be use by themselves when evaluate a herds's feeding program but can be used in conjunction with evaluating milk productions records feeding management practices, and dry matter, degradable protein, undegradable protein, nonstructural carbohydrates, and water intake.

MUN can help determine the protein status of a group of cows, not individual cows. The average value for milk urea nitrogen can be used effectively to detect when major inadequacies in protein and energy nutrition are occuring at the ruminal level. When evaluating the feeding program, the protein fractions and amount of nonstructural carbohydrates supplied in the balanced ration first should be re-evaluate.There are various ranges reported for MUN, which can make the interpretation challenging. Some researchers recommend a range of 10 to 14 mg/dl while others recommend a range of 8 to 14 mg/dl. The later range reflects rations that are formulated to the cow's requirement for protein and excel in the balanced of protein, protein fractions and carbohydrates to capture excess ruminal ammonia. The aim of this study was to investigate the relationships between somatic cell counts and milk composition.

MATERIAL AND METHOD

The work was completed at Agricultural Research & Development Station Șimnic (A.R.D.S.S.) Romania. Somatic cell count was estimated using SOMASCOPE milk test MK II (Delta instruments). Fat, solids non-fat,protein were determined using Ultrasonic Milk Analyzers ECOMILK(EON trading). Presence of antibiotic or inhibitory substances was tested with EKOTEST(EON trading). Assays were made on 52 composite milk samples collected in sterile bottles directily from the bulk milk tank. The milk samples were collected twice per day after each milking. Milk samples, were taken to measure also milk urea nitrogen. Samples were analysed at Institut of Animal Diagnostic and Health Bucharest Romania (I.D.S.A. Bucharest, Romania). Data were analysed statistically.

RESULTS AND DISCUSSIONS

Table 1 shows correlations among variables in the study. The mean protein content in milk decreased from 3.42±0.10 to 3.32±0.04. This decreased was previous reported (2) and the results of the present study suggest that is due to the influx of SCC in the milk. The fat content of milk rise steadily reaching a peak of 4.07±0,5 in the samples with over 600 000 cells/ml.

With regard to levels of solids non-fat, a dropping was notice from 9.04±0.28 to 8.79±0.06. No antibiotic or inhibitory substances were detected.

Table 1

Values of examined parameters

Season summer	n	Protein	Fat	Solids non fat	Somatic cells/ml X 1.000	Urea nitrogen mg/100 ml		Antibiotics and inhibitory substances
Somatic score	52	52	52	52	52	25		52
1	7	3.42±0.10	3.77±0.29	9.04±0.24	106	6	12.33±4.24	N.D. not detected
2	5	3.45±0.03	3.97±0.06	8.62 ±0. 4	306	5	12±3.52	N.D.
3	16	3.45±0.5	3.95±0.30	8.60 ±0.49	538	6	11.5±4.84	N.D.
4	6	3.27±0.4	4.07±0.5	8.72 ±0.7	670	4	12.5±3.87	N.D.
5	10	3.32±0.08	4.01±0.1	8.72 ±0.26	890	5	13.5±3.24	N.D.
6	9	3.32±0.04	3.99±0.05	8.79 ±0.06	1 150	-	-	N.D.
minimum	-	2.29	2.23	6.01	100	-	8	-
maximum	-	4.04	4.75	10.75	1 339	-	21	-
Total (mean value)	52	3.36	3.96	8.73	621	-	12.68	-

1-<200 000 somatic cells/ml
2-200 000 -400 000 somatic cells/ml
3-400 000-600 000 somatic cells/ml
4-600 000-800 000 somatic cells/ml
5-800 000-1 000 000 somatic cells/ml
6->1 000 000 somatic cells/ml

More than half of the samples for milk urea nitrogen (52%) are below 10 mg/dl. These results show an excess of energy and an imbalanced of ruminal protein, protein fraction and energy (nonstructural carbohydrates).

CONCLUSIONS

- The total protein content does not seem to change significantly and these variations in protein are probably due to the decline in levels of casein.
- High cell count milk has lower solid non-fat levels, but incred levels of fat probably as a result of incresed levels of blood constituents in milk and decred levels of the components of mammary origin.
- When interpreting bulk tank SCC it is important to remember that elevation of the count may result from a few cows having exceptionally high cell counts or from a general elevation of counts in many of the cows in the herd. The large variations of somatic cells observed in this study are probably the result of one or two cows with more than 1 000 000 cells/ml. The influence of season (summer) can also explain these figures.
- Bulk tank counts do not provide any information about which cows are affected. Never the less they alert that there are problems in the herd. The somatic cells must be determine from individual quarter samples.
- Mean milk urea nitrogen of 12.68 indicates a possible dietary deficiency, which can result when the rumen bacteria yield is reduced, thereby limiting milk production and milk protein yield.

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STUDII PRIVIND UNELE PROCESELE DE CREŞTERE VEGETATIVĂ IN ANUL AL DOILEA AL PERIOADEI DE VEGETAȚIE, LA UNELE SOIURI DE CIREŞ ALTOITE PE DIVERŞI PORTALTOI VEGETATIVI

STUDIES REGARDING THE SOME PROCESS OF VEGETATIVE GROWING IN THE END OF SECOND VEGETATION PERIOD AT SEVERAL CHERRY CULTIVARS GRAFTED ON DIFFERENT VEGETATIVE ROOTSTOCKS

CRISTIAN POPESCU, MONICA MOTOUNU, NICOLAE TĂNĂSESCU

Keywords: cherry, dwarf rootstocks, IP - C 7, Gisela 5, biometric parameters

REZUMAT

Experimentul a fost realizat la Institutul de Cercetare-Dezvoltare pentru Pomicultură de la Pitesti - Mărăcineni, într-un lot demonstartiv de livadă intensivă de cireş înființat în primăvara anului 2009. Materialul vegetal de studiu a fost reprezentat de soiurile Daria şi Radu (soiuri româneşti altoite pe portaltoiul vegetativ românesc IP - C7) şi de soiul Skeena (soi canadian foarte valoros, altoit pe portaltoiul vegetativ german Gisela 5. Distanța de plantare a fost de 4 x 2 m. Obiectivele acestui studiu au avut în vedere analiza unor parametri biometrici ca: suprafața secțiunii trunchiului, circumferinta trunchiului, lungimea totală a lăstarilor, numărul total de lăstari, lungimea medie a lăstarilor, numărul lăstarilor < 50 cm şi > 50 cm. Portaltoiul vegetativ românesc IP - C7 este compatibil cu soiurile româneşti de cireş luate în studiu (Daria şi Radu), după doi ani de la plantare şi nu sunt semne de incompatibilitate. Din rezultatele cercetărilor noastre redate în lucrarea de față, nu reies diferențe semnificative între pomi, în ceea ce priveşte parametri studiați.

ABSTRACT

The experiment was set up at the Fruit Growing Research Institute from Pitesti – Maracineni, in the spring of 2009. The experimental plant material consisted of sweet cherry trees of the Daria and Radu, romanian cultivars grafted on IP – C7, romanian rootstocks and Skeena cultivar grafted on Gisela 5 rootstock. Trees are two years old, grafted on vegetative dwarfing rootstocks. The planting distance was 4 x 2 m. The objectives of this study were to analyze the several biometric parameters as: trunk section area, trunk circumference, total length of shoots, total number of shoots, average length of shoots, shoots number < 50 cm and shoots number > 50 cm. Romanian vegetative rootstock IP - C7 is compatible with cherry varieties under study (Daria, Roger, Bucium) after two years of planting, and there are no signs of incompatibility. After two years there are no significant differences between trees in the studied parameters

INTRODUCTION

Intensive planting systems, utilizing dwarf rootstocks is necessary in modern orchards. Such systems are highly productive and also easier to manage and to harvest than the more extensive systems with larger trees. Much of the reduction in tree size, necessary for the success of high density planting systems is achieved using dwarfing rootstocks *(Ugolik and Kantorowicz-Bak, 1996).*

Very intensive studies on sweet cherry rootstocks were carried out in many countries *(Perry, 1987; Perry and Cummins, 1990; Callesen, 1998; Sansavini and Lugli, 1998; Wertheim et al., 1998).*

The cultivars Kordia and Regina grafted on Colt rootstock had more lateral shoots than the other rootstocks. Sweet cherry tree cultivars grafted on F 12/1 and Colt rootstocks were more compatible than Prunus avium and Prunus mahaleb. The cultivar has influenced only the height and the average length of lateral shoots of sweet cherry scions. Kordia and Regina sweet cherry tree cultivars obtained in a nursery did not show any symptoms of physiological incompatibility in the tested rootstocks *(Stachowiak et al., 2007).*

In the fifth year of the experiment, the sweet cherry trees growing in the combinations with the rootstocks 'F12/1' and 'Colt' showed the strongest growth. The combinations with 'Gisela 5' dwarfing rootstock grew least vigorously. The trees with 'Gisela 5' interstems grafted on the rootstock 'Colt' produced the highest yields (more than 30 kg per tree). Five years after being planted, 'Kordia' trees with 'Gisela 5' interstem grafted on 'F12/1' rootstock had the highest cumulative yield. Trees with 'Gisela 5' interstems grafted on the 'Colt' rootstock and those grafted directly on the 'Colt' rootstock produced similar yields. Trees grafted directly on the 'Gisela 5' rootstock had the lowest yields *(Bielicki and, Rozpara, 2010).*

All commercially grown sweet cherries use a rootstock in combination with a grafted or budded scion variety. Rootstocks can directly influence productivity, precocity, tree size, tree architecture, fruit size, and fruit quality. The choice of certain rootstocks will also influence many horticultural decisions such as pruning, training, tree support, and labor management. Traditionally, both sweet and tart cherry growers have relied on vigorous rootstocks which develop large (15-20 feet) trees that take several years to reach full production potential. Recently, dwarfing or semi-dwarfing rootstocks (i.e., Gisela 5 and 6, Edabriz, and Weiroot) have become available. These rootstocks allow growers to produce smaller trees at a higher density. In addition, most size-controlling rootstocks are precocious, meaning they begin flowering earlier in the life cycle of the tree *(Gutzwiler and Lang, 2001)*.

Using the sweet and tart cherry NC 140 rootstock planting at Traverse City, Michigan, rootstock influence on floral and vegetative growth were measured on two-year-old shoots. Three relatively uniform branches on five trees for each rootstock were selected and divided into three equal parts based on length. Analyses thus far show that rootstock genotype affects sweet cherry floral architecture and placement, including relative amount of spur and lateral branch development. Basal, middle, and apical sections correspond to the representative branch, show the rootstock induced differences in floral architecture (buds per spur, flowers per bud, total flowers per branch section) and illustrate the differences between low (dwarfing), intermediate (semi-dwarfing), and high (standard size) rootstocks *(Lang, 2001).*

Studies by Budan, 2007, have shown that in competition cultures, foreign varieties of cherry, Kordia, Skeena, Ferovia and others, have a good vegetation and yielding in climatic conditions of Romania

The types IP-C vegetative rootstoks, established in Romania, has a good compatibility with most romanian and foreign varieties of cherry (Maladin et al., 1991)

MATERIAL AND METHOD

The experiment was set up at the Fruit Growing Research Institute from Pitesti – Maracineni, in the spring of 2009 (figure 1). The experimental plant material consisted of sweet cherry trees of the Daria and Radu, romanian cultivars grafted on IP – C7, romanian rootstocks and Skeena cultivar grafted on Gisela 5 rootstock. Trees are two years old, grafted on vegetative dwarfing rootstocks. The planting distance was 4 x 2 m. The objectives of this study were to analyze the several biometric parameters as: trunk section area, trunk circumference, total length of shoots, total number of shoots, average length of shoots, shoots number < 50 cm and shoots number > 50 cm.

Cherry rootstocks have been selected for a number of reasons, including precocity, productivity, vigor control and compatibility between rootstock and cultivar.

Results have been interpreted using SPSS 16.0 for Windows.

Figure. 1. Experimental field - Fruit Growing Research Institute from Pitesti – Maracineni

RESULTS AND DISCUSSIONS

Regard the results achieved for trunk section area, at the end of 2th vegetation after planting the studied cultivars grafted on Romanian rootstocks and Gisela 5 rootstock there are no significant differences. The results of Radu and Daria varieties grafted on romanian rootstock are lower compared with the results of Skeena cultivar grafted on Gisela 5 rootstock. The values obtained ranged from 756,58 mm^2 for Daria / IP – C7 to 848,08 mm^2 (figure 2).

During the period of 2004 – 2005 the rootstocks Gisela 5, Weiroot 10, Weiroot 13, Weiroot 53, Weiroot 72, Weiroot 158 and P1 as well as selections of Giessen series – Gi – 195/20 and Gi – 497/8 were tested for cherry cultivar Stella. At the end of 9th vegetation after planting, the trees on rootstocks P1, Weiroot 10 and Weiroot 13 had the thickest trunks whereas those on rootstock Gisela 5 had the thinnest ones. Depending on growth vigor induced to the scion, the rootstocks can be distributed to theee groups: vigorously growing – P1, Weiroot 10 and 13, semi – dwarfing – Gi – 497/8, Weiroot 158, Weiroot 53, Gisela 4, Gi – 195/20 and Weiroot 72, extremely dwarfing – Gisela 5 *(Papachatzis, 2006).*

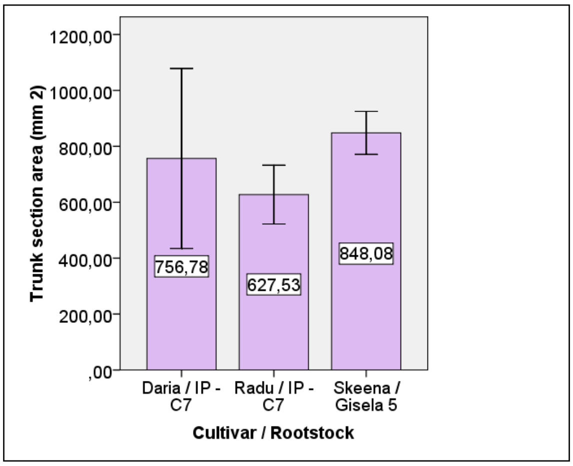


Figure. 2. Results regarding trunk section area (mm^2)

Romanian rootstocks induced the lowest values for trunk circumference (figure 3). Skeena cultivars grafted on the Gisela 5 vegetative rootstock with vigor reduced were scored the highest values of trunk circumference. The statistic interpretation shows that between values there are not significant differences.

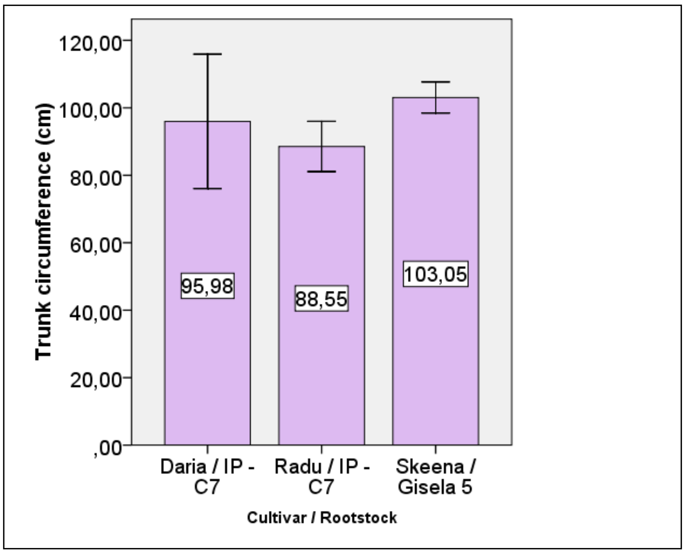


Figure 3. Results regarding trunk circumference (cm)

At the end of 2[th] vegetation after planting, the total length of shoots were ranged between 939,33 cm and 1078,60 cm (figure 4). The bigger value for total length of shoots was registered for Skeena cultivar grafted on Gisela 5 vegetative rootstock. Between Radu cherry cultivar grafted on IP – C7 Romanian vegetative rootstock and Skeena cultivar grafted on Gisela 5 vegetative cultivar there are significant differences analyzing form statistic point of view. We observed that Radu cultivar on IP – C7 rootstock have the most dwarfing tree, followed by Daria / IP – C7 and Skeena / Gisela 5.

Regarding the results for total number of shoots figure 5 shows that Skeena cultivar grafted on Gisela 5 rootstock have the bigger number of shoots (30 shoots). The statistic analyzing shows that between values of total number of shoots growing on trees are significant differences (figure 5).

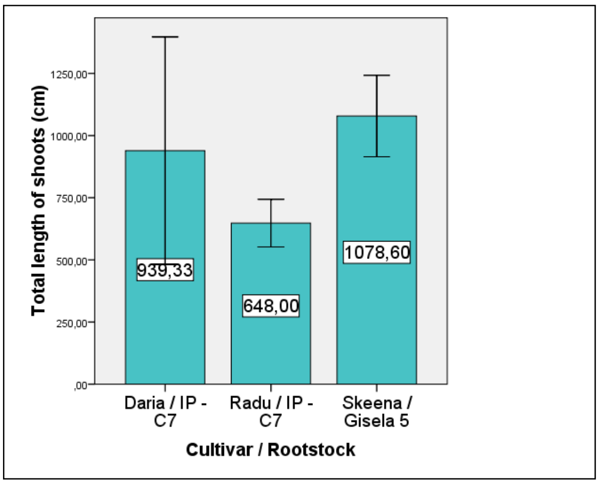


Figure 4. Total length of shoots

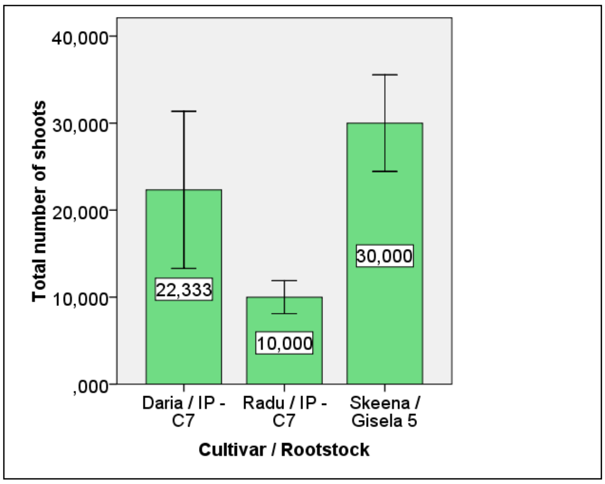


Figure. 5. Total number of shoots

Average length of shoots was ranged from 35 (Skeena) to 64 shoots (Radu). Radu cultivar has the smaller number of shoots but with bigger average growing of shoots. The smaller average length of shoots was registered at Skeena cultivar grafted on Gisela 5 cultivar (figure 6).

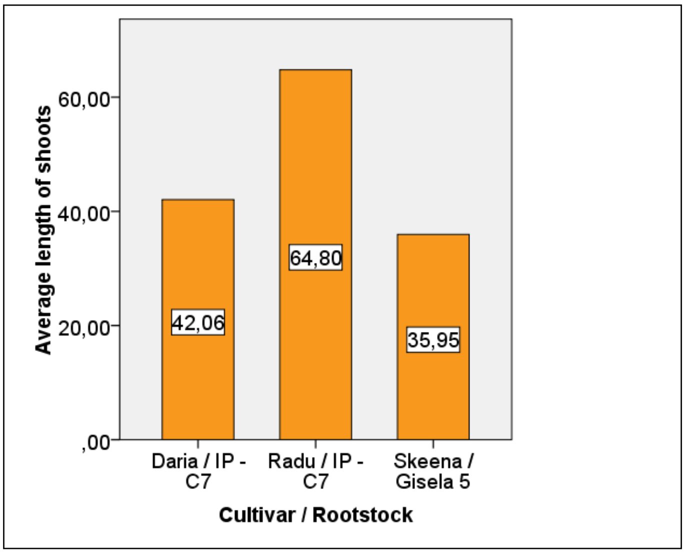
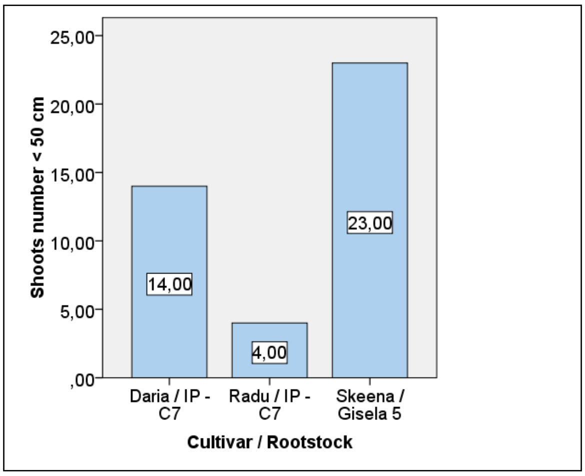


Figure 6. Results regarding average length of shoots

The lowest number of shoots with length less than 50 cm was recorded for Radu cherry cultivar grafted on IP – C7 rootstock, while the highest number of shoots with length less than 50 cm was observed for Skeena cultivar. Daria variety registered intermediate values (figure 7).

Number of shoots with more than 50 cm length varied between 6 and 8. Daria cultivar had the highest growth of shoots after the second year of vegetation (figure 8).



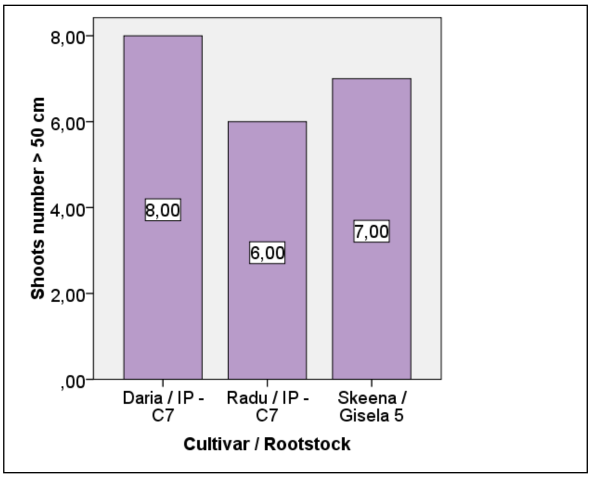


Figure 7. Shoots number < 50 cm ***Figure 8. Shoots number > 50 cm***

CONCLUSIONS

The IP - C7 Romanian vegetative rootstock is compatible with cherry varieties under study. After two years of planting, there are no signs of incompatibility (thickening in the grafting point, low rise trunk, small shoots). After two years of planting, no significant differences between trees in the parameters studied. The values obtained are relatively close to each other, which demonstrate that at least two years after planting, IP - C7 Romanian rootstock and the Romanian cultivars studied, have corresponding increases similar with varieties grafted on Gisela 5 valuable foreign rootstock. The research will continue in the coming years with other parameters of growth and fructification.

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INFLUENTA INCOLTIRII IN SPIC A BOABELOR ASUPRA DETERMINARII GERMINATIEI LA SEMINTELE DE GRAU DE TOAMNA

INFLUENCE OF SPIKES SPROUTING TO GERMINATION OF WINTER WHEAT SEEDS

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Keywords: Dormancy, germination, Triticum aestivum, water, winter wheat

REZUMAT

Absorbtia apei in boabele de grau inaintea recoltarii la soiurile de grau (Triticum aestivum L.) ce prezinta sau nu rezistenta genetica la incoltirea in spic a fost analizata prin observatii directe si analiza datelor climaterice ale regiunii de unde au fost prelevate probele supuse analizelor. Prin analiza germinatiilor la cinci soiuri de grau de toamna in laborator, s-a observat ca un soi a pornit in germinatie mai timpuriu decat celelalte, in conditii de temperatura si precipitatii constante in timpul pre-recoltarii; dar s-a observat ca in anii cu alternante ale valorilor de temperatura si precipitatii dinaintea recoltarii, se pot intalni situatii de reactie diferita a unor genotipuri la incoltirea in spic sau la declansarea repausului seminal inaintea recoltarii. In soiuri apropiate genetic, fie cu rezistenta la incoltirea in spic, fie sensibile la incoltirea in spic, atat volumul de apa absorbita in spic cat si modul de distributie a apei in bob nu a dat rezultate diferite mai devreme de 18 h, cand incoltirea a inceput sa devina evidenta la soiurile sensibile la incoltirea inspic. Cea mai buna germinatie in laborator a fost obtinuta la soiul Dropia (92%) iar cea mai slaba la soiul Dor (83%). Pentru soiul Crina care a prezentat un procent de 7% boabe incoltite in spic, germinatia finala a fost de 88%, ceea ce confirma ca boabele incoltite in spic pot produce germeni normali in cadrul testelor ISTA privind germinatia.

ABSTRACT

*The movement of water into harvest-ripe grains of dormant and non-dormant genotypes of wheat (**Triticum aestivum** L.) was investigated using observation methods and analysis of climacterically data of regions of crops wherefrom the samples were taken. By analyses of germination of five varieties of winter wheat into laboratory, it could be observed that one variety is going to start germination earlier than others, in constant climacteric values of temperatures and rain during the harvest season, but, could be noticed that during the years with alternates values of temperatures and rains during the ripening the grain could be observed different reactions of genotypes to dormancy of germination and spikes sprouting into the head' spikelet before harvesting. In closely related genotypes, with either a spikes' sprouting or a non-spikes' sprouting genotype, neither the rate of increase in water content nor the pattern of water distribution within the grain was significantly different until 18 h, when germination became apparent in the spikes' sprouting.. The best germination have been observed by Dropia variety (92%) and the last place among analyzed varieties have been taken by Dor variety (83%). To the Crina variety, where have been founded 7% of sprouting seeds into the samples, has as laboratory results a germination of 88%, which confirm that the sprouting seeds could produce normal germs during ISTA germination test into laboratory.*

INTRODUCTION

The movement of water into ripe and dry grains is a critical step in germination, preharvest sprouting, expression of dormancy, and processes such as conditioning for optimum milling performance. Imbibing and maintaining grains under warm, moist conditions is the only means of determining the dormancy or germinability of wheat grains. Variation in the rate or the pathway of water movement may affect measurement of the dormancy phenotype and might also be involved in the dormancy mechanism. Preharvest sprouting, or the germination of grain in the spike, can occur prior to harvest maturity if the crop is exposed to wet, humid conditions. The majority of wheat-growing climates throughout the world experience rain during harvest, which can result in sprouted grain and a loss of quality premiums. Although there are a number of management techniques and varietal differences that can reduce the risk of sprouting, these are largely ineffective if adverse environmental conditions persist. Grain dormancy is the most reliable protection against preharvest sprouting in a broad range of environments and will significantly protect against preharvest sprouting.

Dormancy in some plant species is controlled, at least in part, by differential permeability to water of the seed coat between dormant and non-dormant genotypes (Bewley and Black, 1982). The possibility that differences in grain water uptake or seed coat water permeability could be associated with dormancy in wheat, as in other species (Finch-Savage and Leubner-Metzger, 2006), has not been discounted. Wheat caryopses, commonly called grains, like the caryopses of other cereals and grasses, are indehiscent fruit having a single seed surrounded by a seed coat and, in turn, enclosed within a thin, adherent pericarp (fruit coat) (Bradbury et al., 1956; Black et al., 2006). In this investigation, the term coat is used to refer to the tissues, pericarp (inner and outer) and the true seed coat (testa and nucellus), that surround the germ (embryo, scutellum, and epiblast) and endosperm (aleurone and starchy endosperm) of the wheat grain.

In white-grained wheat, dormancy is relatively rare, but genetic studies have indicated that there appears to be more than one factor which contributes to dormancy (Mares, 1999). According to the model proposed by Mares (1999), there is at least one gene expressed in the embryo that controls a transient sensitivity to abscisic acid (ABA) which, on its own, gives rise to an intermediate dormant phenotype. Another unknown factor controlled by a gene that is expressed in the coat of dormant genotypes, can interact with the sensitive embryo to produce a stronger complete dormant phenotype (Mares, 1999).

The aim of this investigation was initially employed over a period of 0–18 h after the start of imbibition, i.e. prior to the rupture of the seed coat and the first physical evidence of germination in the non-dormant genotype, to address the question of whether dormancy involved differences in grain water uptake or seed coat permeability and to determine the pattern of water movement into imbibing grains.

MATERIAL AND METHODS

Grain of the following bread wheat (*Triticum aestivum* L.) genotypes, representing the extremes in the range of genetic variation for grain dormancy in winter wheat, was used: Dropia, Boema, Glossa a genetically dormant (sprouting resistant) and genetically non-dormant (sprouting susceptible) varieties Crina and Dor. Large samples of grain were harvested from field plots of each genotype at harvest-ripeness by gentle hand-threshing this time period.

Temperatures and volumes of rain during ripening of grains of cereals have been registered by meteorologically station of Craiova using international standards methods.

Measuring of temperatures during germination into germination thermo-cabinet has been made, automatically by the thermometers incorporated into thermo-cabined, which have been calibrated by National Metrological Authority.

The samples of grains were taken, carried into laboratory and primary have been observed, counted and registered the sprouted seeds. After that have been homogenized and counted four repetitions of 100 seeds of pure grains for every varieties of Dropia, Boema, Glossa, Dor and Crina which have transferred to germination laboratory. The samples were lied to un wet substrate (filter paper), using method between paper. .

Due to the seed's dormancy of grain of wheat, which could be longer or shorter accordingly with genetics of varieties and influences of environmental condition during harvest season, the samples have been physically thermal treated by pre-cooling at 10°C for 4 to 8 days up to getting of coleoptiles and seminal roots from 70% of seeds.

The time of pre-cooling (4 to 8 days) is not counted as germination time, accordingly to the ISTA norms for germination of cereals seed determination.

The germination substrates (filter paper with neutral pH) have been moist with municipal pipe-water, with neutral pH, both of them been free of fito-toxic substances. The filter paper have a good capacity to water retention in order to assure the moist necessary to seeds to germinate throw the all garminative period (8 days).

The all repetition have been introduced into germination cabinet, into plastics bag, uncolored and transparent, with dimensions large enough to permit development of germs.

The results have been interpreted using international ISTA methods for determination of cereal's seed germination.

RESULTS AND DISCUSSION

The records have been made from year 2005 in Şimnic area, from begining of grain formation up to harvest time. Could be observed o constant rising from one day to the next along the entire periods without thermical shocks. The average daily temperatures recorded have values between 11.9°C and 23.6°C, with an amplitude of 11.7°C (Figure 1). The rainfall recorded for these periods, not very often in these seasons, have been with high values, having an influence of full ripening time. For entire periods analised, the amount of rainfall recorded were of 170.30 mm, due to 134.3 mm in last ten days before harvesting (Figure 2).

The last vegetative period have been caracterised by high values of dayly variaton of temperatures and rainfall.

The bahavior of these two factors, temeprature and rainfall could start the complex biochemical processes of activation of grows's hormons and to spiklets' sprouting phenomena.

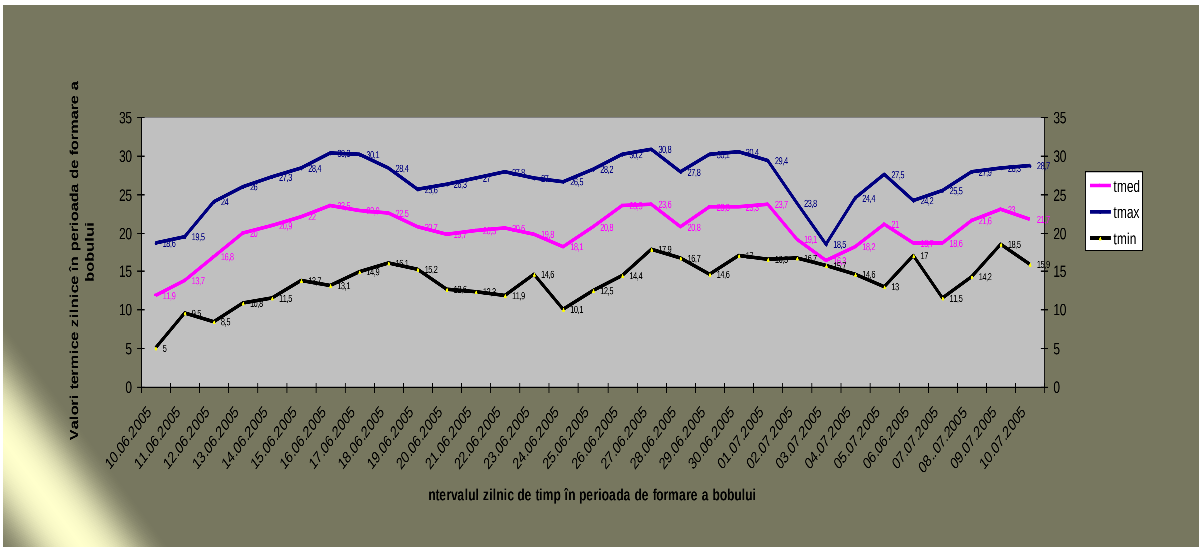

Figure 1. Temperatures recorded in summer of 2005 during ripening of wheat (SMH Craiova, 2005)

Table 1

Sprouting seeds in spikelets before harvesting founded into analized samples (four repetition of 100 seeds)

Variety	Spikelet's sprouting seeds (nr.)				Sprouting seeds (%)
	Repetition R1	Repetition R1	Repetition R1	Repetition R1	
DOR	2	6	4	1	3.25
CRINA	4	8	7	9	7.00
GLOSA	4	1	2	4	2.75
BOEMA	4	1	2	0	1.75
DROPIA	1	2	3	1	1.75

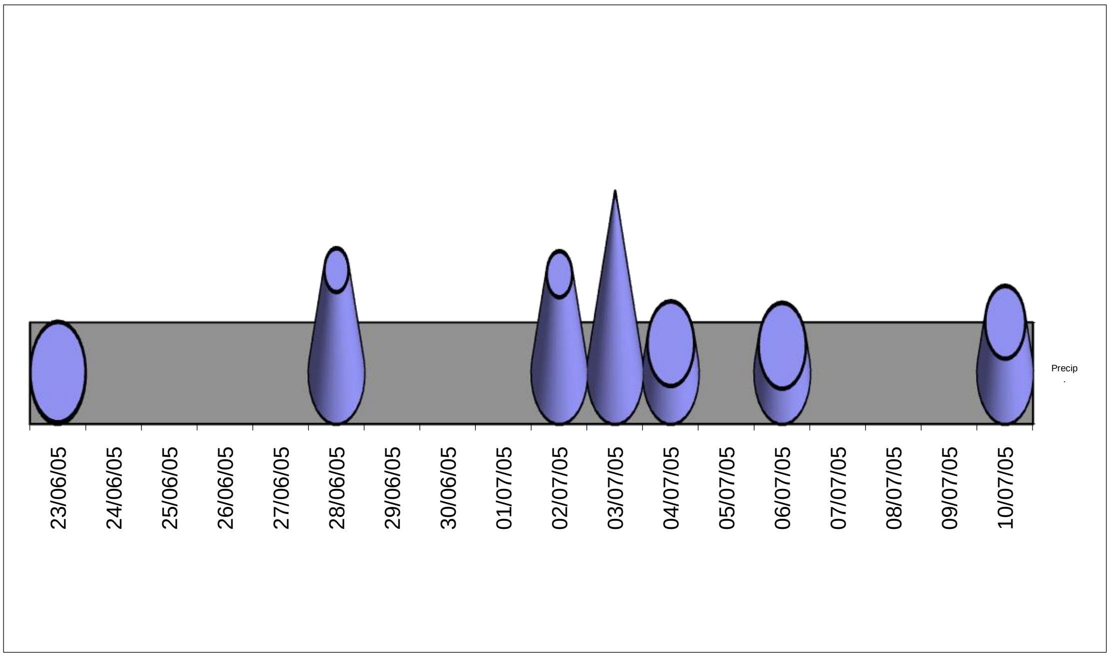

Figure 2. Rainfalles recorded in summer of 2005 during ripening of wheat (SMH Craiova, 2005)

The primary observation into laboratory show that among five varieties of winter wheat analyzed, two varieties shows that are genetically non-dormand (Crina and Dor) and three varieties present genetically characteristics as dormand varieties (Glosa, Boema and Dropia). From sample's analyzed, the Crina variety present 7.00 % of seeds sprouted into spikes. The Boema and Dropia varieties show a resistence to spike's sprouting in climatic condition of summer 2005 in Craiova area (Table 1).

After the analyses of germination after 48 h, 72 h and 96 h, into laboratory could be seen that the highest germination have been obtained by Dropia variety with 92 % of normal germs after 96 h, followed by Boema variety with 90% of normal germs developed after 96 h. The smallest germination have been obtained by Dor variety with 83% of normal germs developed after 96 h. Could be seen also that after 48 h, Dor variety have developed more sprouts than Glosa variety, but at the end of germination time, Dor variety have developed 83 normal germs comparative with Glosa variety which developed 85 normal germs.

Table 2

Germination of wheat's seeds determined at temperature of 20°C

Variety	Time of germination (h)		
	48	**72**	**96**
	Sprouts (%)		**Normal germs (%)**
DOR	19	70	83
CRINA	27	77	88
GLOSA	18	81	85
BOEMA	29	73	90
DROPIA	33	92	92

From sample's analyzed, the Crina variety present 7.00 % of seeds sprouted into spikes, but after 48 h of germination developed 27 sprouts, more than Glosa variety which have developed 18 sprouts and presented 2,75% of sprouting seeds in spikes, and more than Dor variety which have developed 19 sprouts after 48 h of germination and which have presented 3.25% of sprouting seeds in spikes. After 72 h of germination the highest sprouting level have been obtained by Dropia with 92 sprouts, followed by Glosa variety with 81 sprouts, Crina variety with 77 sprouts, Boema variety with 73 sprouts and Dor variety with 70 sprouts.

After 96 h of germination the Crina variety could rich higher value of normal germs (88%) than Glosa variety (85%) and than Dor variety (83%), even if have registred an higher percent of spikes sprouting than these varieties.

CONCLUSIONS

Dormancy of wheat's seeds is an important characteristic of variety with major impact in faculty of germination of seeds, with importance in producing of seed certificates technologies. In the other way the spike's sprouting present an importance for quality of wheat grains and also for producing of certificate seed of wheat, especially in regions with high rainfalls during harvesting season, and high level of relative humidity of air.

The mainly effects of sprouting into wheat spikes are: reducing of a high amount of carbon hydrates into the grains, reducing of volumes weight, reducing biological activity of grains by infestation with some parasitic fungi which could produce mycotoxines.

Resistivity to spike's sprouting for the wheat varieties results by combination of effects of factors which have influences in water absorption in the spikelets, loosing of moist of spikes during ripening, dormancy capacity of wheat varieties and degradation rate of chemical compounds of seeds during germination process.

The total effect of these factors is calling *robur contra pluvium*, the resistance to effect of rainfall.

Dormancy of wheat' seed in a genetical character and have an influence in limits the effects of spikes' sprouting. In the other way in some regions where the time between harvest and sowing is shorter than 60 days, could have an negative effect by limiting the germination capacity of the seeds into soil.

In Simnic area in summer 2005 seasons the five varieties of winter wheat analyzed shown that the sprouting into the spikes of some varieties due to moist condition during harvest and pre-harvest time has no major influence on germination of seeds of these varieties. The Crina variety's seeds have a higher level of germination, determined by ISTA methods

in comparation with Glosa variety's seeds which have been more resistant to spike's sprouting than Crina variety.
The higher level of dormancy of wheat' seeds has not always as effects the high level of seeds germination, e.g. the Boema variety's seeds which has an dormant genotypes has an comparative germination with Crina's seeds which has an non–dormant genotypes.
As a consequence the level of sprouting spike's seeds is not a references into ISTA norms for seed certificates of wheat.
After analizes into laboratory could not be exactly determined the time necessary for differt genotipes of wheat for finish the dormancy period. The dormancy time could be longer or schorter, depending not only by genotypes but also by wheather condition during pre-harvest and harveting time. The spike's sprouting, after dormancy in the rainy years, could be as results of interactions of some factors as biological, mechanical, phisiological and which could establish some desequilibrium at functional level of biological activities of seeds.

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INFLUENȚA FERTILIZĂRII ASUPRA INDICILOR DE CALITATE DETERMINAȚI CU ALVEOGRAFUL LA GRÂUL DE TOAMNĂ CULTIVAT PE LUVOSOLUL DE LA SCDA ȘIMNIC

THE FERTILIZING INFLUENCE ON QUALITY PARAMETERS TESTED WITH ALVEOGRAPH FOR WINTER WHEAT CROPPED IN ARDS SIMNIC AREA

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Keywords: alveographe, parameter, quality, wheat

REZUMAT

La S.C.D.A. Șimnic au fost testate 25 de soiuri de grâu românești și străine, în două condiții tehnologice: fertilizare numai în toamnă cu N16P80 și fertilizare cu N100P80 aplicată în toamnă și primăvară. În anul 2009 au fost determinți o serie de parametrii cu ajutorul alveografului pentru a deterina calitatea grânelor testate. Cel mai stabil dintre soiuri a fost Bercy la care nici unul dintre indicii de calitate nu a fost influențat de scăderea dozei de azot. Din punct de vedere al puterii făinii (W) în condiții de fertilizare cu N100P80 s-au evidențiat soiurile: Dropia, Flamura 85, Boema, Kalasz, Miska, Renan și Gruia. În condițiile în care doza de azot a fost redusă niciunul dintre soiuri nu a înregistrat valori ale puterii făinii peste 200 cm^2.

ABSTRACT

Twenty-five winter wheat cultivars with Romanian and foreign origins were tested to ARDS Simnic area in two different technological conditions: fertilized with N16P80 in autumn and N100P80 in autumn and early spring. In 2009 year there were determined grains quality parameters using the alveograph. The most stabile cultivar was Bercy for which none of quality parameters weren`t influenced by nitrogen dose decrease. Considering the flour power index (W) can be pointed the cultivars Dropia, Flamura 85, Boema, Kalasz, Miska, Renan and Gruia in the constitition of fertilizing with high nitrogen dose (N100P80). When the fertilizing was realized with low nitrogen dose (N16P80) the flour power index was below 200 cm^2 for all tested cultivars.

INTRODUCTION

The alveogragh method is based on the measurement of resistance of standard flour dough to biaxial stretching under air pressure. The method involves five consecutive samples and the result is considered their average value (Bettge et. al., 1989). The dough is analyzed under air pressure and the measurement is represented by a graphic curve with geometric parameters. Thus, the alveograph records: maxim curve high (H) which can be multiply with a standard coefficient (1,1) and results the extension dough resistance; curve length (L, mm) which express the dough extension; extension index (G) which can be determined using curve length index and the formula $G=2,226\sqrt{L}$; curve surface (S) which measure the total energy absorbed by dough in the extension process (W) using formula (1,32 x G xS)/L or 6,54 x S x 10^3 (the results are expressed as 10^4/Jouli/dough game); dough resilience index (I_e) expressed as ratio between dough resistance to 40 mm from the curve start (P_{200}) and maxim resistance (P); P/L ratio express the dough elasticity (Addo, 1990).The previous studies done by Ames et. al, 2003, showed that the fertilizing influence only the protein content , glutenic index and flour power.

MATERIAL AND METHOD

Working protocol:

1. A sample of 250 g wheat flour is mixed with a salty solution to result dough.
2. Five dough balls with 4,5 cm diameter are placed in the alveographe and keep it to controlled temperature of 25^{o}C for 20 min. long.
3. Each dough ball is individually tested. The alveograph flows in the dough ball till this became like a sphere which can break down.
4. The pressure created in the dough sphere is noticed like a curve on the alveograph graphic paper.

A stronger dough ball requests a high force to flow and break down the sphere (P index). A bigger sphere means that it can be more elastic and can be extended in a fine membrane before it breaks down (L index). A bigger sphere will have also a larger curve area (W index). The alveograph test is used by millers and bakers for a better quality product. P index represents the force necessary to extend the dough ball. It is indicated by maxim curve high and expressed in mm. L index represents the dough extensibility before the sphere breaks down. It is indicated by curve length and is expressed in mm. P/L ratio represents the balance between dough power and extensibility. W index represents the area under the curve as an expression between dough power and its extensibility. It is expressed in jouli.

The flour ratings depending on W index:

- □ 130 - flour is unfitted for bread;
- □ 170 – flour can absorb water equal with half of its weight; it is good for biscuits and short pasta;
- 190-220 – poor flour;
- 180-260 – flour can absorb water equal with 65 % of its weight; it is good for pizza and similar products;
- 180-320 – flour with rapid growth power;
- 230-290 – flour with normal growth power;
- 230-350 - flour can absorb water equal with 75 % of its weight; it is good for muffins and pastry products;
- □ 300– flour for bread;
- □ 350- flour can absorb water equal with 90 % of its weight. Normally, this kind of flour is mixed with another one without normal growth power;
- 300-370 – good for normal growth time;
- 380-450 – good for a longer growth time.

The alveograme of flour parameters fitted for milling and backing process must have the following values: P (65-70 mm), L (130-150 mm), G (25-30), P/L (0,55-0,65), W □ 200 cm^2 (Banu et al., 2000).

The flour with low P value and high L value is good for cakes and other similar products, while the flour with high P value is good for bread.

In ARDS Simnic area have been tested twenty-five Romanian and foreign wheat varieties in two different technological conditions: fertilized with N16P80 in autumn and N100P80 in autumn and early spring. In 2009 year there were determined flour quality parameters using the alveograph: maxim curve high (H), curve length (L, mm), extension index (G), flour power (W), P/L ratio express the dough elasticity, where P=1,1 x H, dough elasticity index – $I_{e.}$

RESULTS AND DISSCUTIONS

There was observed that fertilizing level didn`t influence the maxim curve high (H). This parameter is used to calculate extension index (G) leading to the following values: 46,2-116,6 for N16P80 fertilizing rate and 52,8-116,6 for N100P80 fertilizing rate (Fig.1).

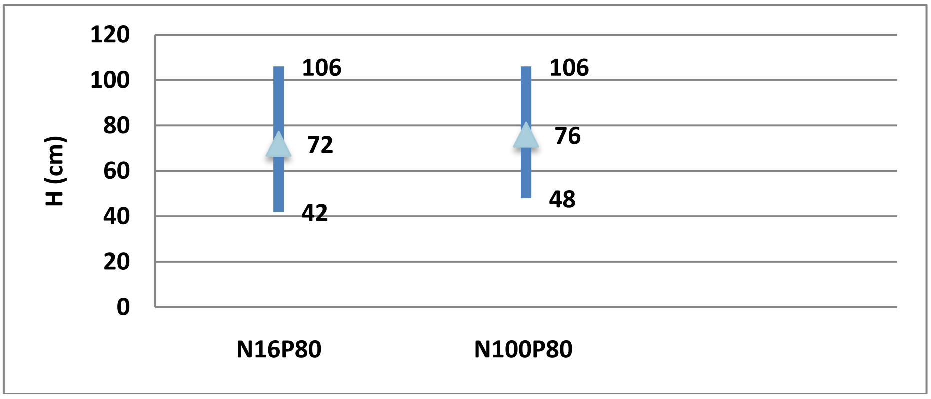

Fig. 1.The limits of maxim curve high for both fertilizing rates

Considering curve length parameter it was observed that fertilizing level determine significant differences, but all values range below standard rating established for quality wheat flour (130-150) (fig.2).

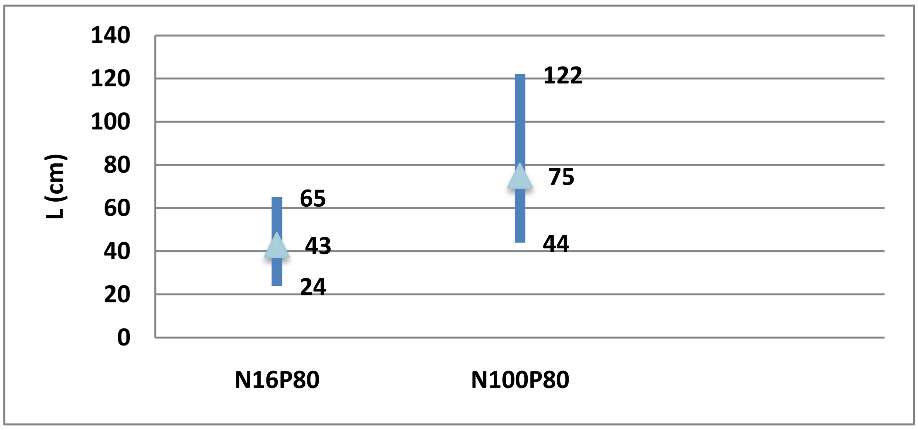

Fig. 2.The limits of curve length for both fertilizing rates

The values of extension index ranged below recommended interval (25-30). The flour provided form the variants fertilized with N16P80 rate recorded low extension index values (Fig.3).

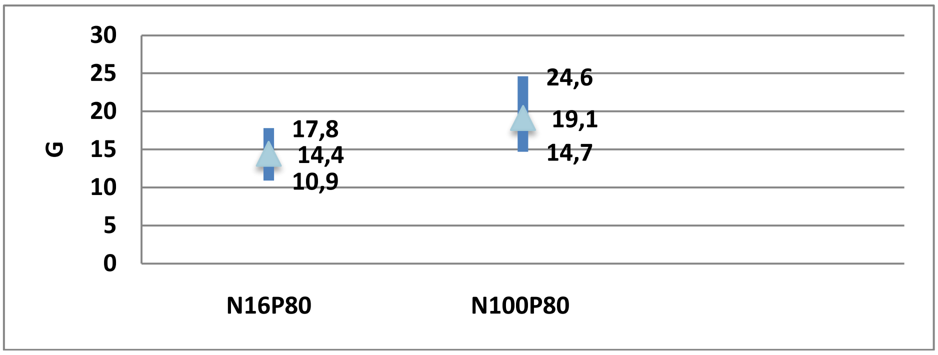

Fig. 3.The limits of extension index for both fertilizing rates

The values of flour power index (W) up to 200 jouli/100 g dough were recorded only to the variants fertilized in early spring. Those provided from the variants fertilized only in autumn ranged all below standard limits (Fig 4). The same situation was recorded for P/L ratio (Fig. 5).

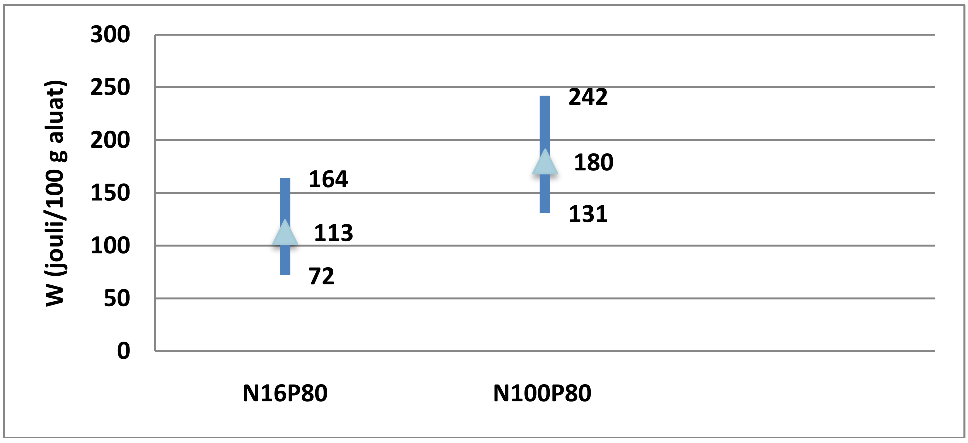

Fig. 4.The limits of flour power index for both fertilizing rates

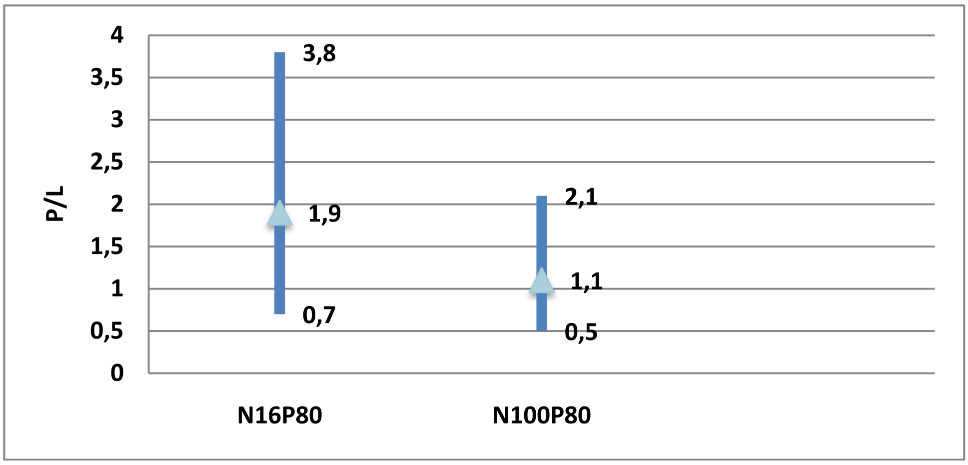

Fig. 5.The limits of P/L ratio for both fertilizing rates

The limit differences for variety x fertilizing level interaction emphasized that comparatively with N100P80 rate, only two varieties (miska and Marsall) presented differences statistically assured for all parameters. For the varieties Dropia, Enesco, Kalasz, Palma, Renesansa and Gruia excepting maxim curve high for all other parameters is the same situation like previous one. For Apache and Renan varieties P/L ratio had no significant differences between fertilizing rates. For Glosa variety only the flour power parameter had no significant difference (Table 1). Among all tested varieties the most stabile one was Bercy because none of the parameters tested with alveographe hasn`t influenced by nitrogen rate decrease, which strongly influenced the curve length and extension index (differences statistically assured for 23 varieties among 25 tested). The nitrogen rate decrease didn`t have a significant influence to maxim curve high (differences statistically assured for 5 varieties among 25 tested). Considering flour power index the following varieties recorded good values when they were fertilized with N100P80: Dropia, Flamura 85, Boema, Kalasz, Miska, Renan and Gruia. When the nitrogen rate was low the flour power index was below 200 cm^2 for all tested varieties.

Table 1

The interaction variety x fertilizing for the parameters determined by alveograph for a winter wheat set

No.	A.Variety	B*	H		L		G		W		P/L	
			val	diff	val	diff	val	diff	val	diff	val	diff
1	Dropia	B1	95	mt	65	mt	17.8	mt	225	mt	1.59	mt
		B2	100	5	38	-27^{oo}	13.8	-4^{oo}	164	-61^{o}	2.6	1.01**
2	Fl 85	B1	89	mt	66	mt	18	mt	210	mt	1.4	mt
		B2	92	3	43	-23^{o}	14.5	-3.5^{o}	159	-51^{o}	1.27	-0.13
3	Boema	B1	88	mt	75	mt	19.1	mt	222	mt	1.26	mt
		B2	76	-12	45	-30^{oo}	15	-4.1^{oo}	133	-89^{ooo}	1.71	0.45
4	Glosa	B1	85	mt	71	mt	18.7	mt	198	mt	1.26	mt
		B2	106	21**	38	-33^{oo}	13.6	-5.1^{ooo}	155	-43	3.29	2.03***
5	Exotic	B1	67	mt	71	mt	18.7	mt	144	mt	0.96	mt
		B2	77	10	36	-35^{ooo}	13.4	-5.3^{ooo}	112	-32	2.15	1.19***
6	Alex	B1	83	mt	69	mt	18.5	mt	193	mt	1.21	mt
		B2	75	-8	49	-20^{o}	15.5	-3^{o}	134	-59^{o}	1.58	0.37
7	Apache	B1	62	mt	122	mt	24.6	mt	202	mt	0.52	mt
		B2	42	-20^{oo}	65	-57^{ooo}	17.8	-6.8^{ooo}	91	-111^{ooo}	0.70	0.18
8	Bercy	B1	64	mt	80	mt	19.7	mt	155	mt	0.86	mt
		B2	52	-12	64	-16	17.7	-2	111	-44	0.82	-0.04
9	Cezanne	B1	65	mt	60	mt	16.6	mt	134	mt	1.36	mt
		B2	53	-12	41	-19	14.3	-2.3	87	-47^{o}	1.31	-0.05
10	Enesco	B1	66	mt	58	mt	16.9	mt	140	mt	1.20	mt
		B2	60	-6	29	-29^{oo}	11.9	-5^{ooo}	72	-68^{oo}	2.19	1.99***
11	Elet	B1	73	mt	69	mt	18.5	mt	157	mt	1.08	mt
		B2	68	-5	44	-25^{o}	14.7	-3.8^{oo}	77	-80^{oo}	1.61	0.53
12	Gobe	B1	48	mt	100	mt	22.2	mt	131	mt	0.48	mt
		B2	53	5	45	-55^{ooo}	14.8	-7.5^{ooo}	89	-42	1.29	0.81*
13	Kalasz	B1	92	mt	69	mt	18.3	mt	211	mt	1.46	mt
		B2	101	3	31	-38^{ooo}	12.3	-6^{ooo}	132	-79^{ooo}	3.36	1.90***
14	Miska	B1	76	mt	82	mt	19.9	mt	204	mt	1.02	mt
		B2	62	-14^{o}	38	-45^{ooo}	13.7	-6.2^{ooo}	95	-109^{ooo}	1.66	0.64*
15	Othalom	B1	54	mt	86	mt	20.6	mt	142	mt	0.66	mt
		B2	52	-2	60	-28^{oo}	17.2	-3.4^{o}	107	-35	0.86	0.20
16	Petur	B1	59	mt	93	mt	21.4	mt	168	mt	0.64	mt
		B2	53	-6	57	-36^{ooo}	16.7	-4.7^{oo}	107	-61^{o}	0.94	0.30
17	Serina	B1	70	mt	73	mt	19	mt	172	mt	1.00	mt
		B2	63	-6	42	-31^{oo}	14.3	-4.7^{oo}	106	-66^{o}	1.63	0.63
18	Magvas	B1	90	mt	50	mt	15.6	mt	154	mt	1.88	mt
		B2	87	-3	30	-20^{o}	12.1	-3.5^{o}	107	-47^{o}	3.16	1.28***
19	Marsall	B1	92	mt	44	mt	14.7	mt	148	mt	2.08	mt
		B2	75	-17^{o}	24	-20^{o}	10.9	-3.8^{oo}	75	-73^{oo}	3.15	1.07**
20	Palma	B1	106	mt	52	mt	16.1	mt	196	mt	2.05	mt
		B2	101	-5	27	-25^{o}	11.5	-4.6^{oo}	113	-83^{ooo}	3.81	1.76***
21	Pobeda	B1	70	mt	84	mt	20.2	mt	175	mt	0.91	mt
		B2	73	3	51	-33^{oo}	15.8	-4.4^{oo}	135	-40	1.57	0.66*
22	Renan	B1	78	mt	105	mt	22.7	mt	242	mt	0.78	mt
		B2	60	-18^{o}	56	-49^{ooo}	16.7	-6^{ooo}	119	-123^{ooo}	1.08	0.30
23	Renesansa	B1	69	mt	71	mt	18.7	mt	170	mt	0.99	mt
		B2	62	-7	35	-36^{ooo}	13.1	-5.6^{ooo}	93	-77^{oo}	1.81	0.82*
24	Gruia	B1	73	mt	84	mt	20.3	mt	213	mt	0.90	mt
		B2	76	3	34	-50^{ooo}	12.8	-7.5^{ooo}	106	-107^{ooo}	2.37	1.47***
25	Briana	B1	77	mt	78	mt	19.6	mt	196	mt	1.00	mt
		B2	72	-5	54	-24^{oo}	16.4	-3.2^{o}	146	-50^{o}	1.33	0.33
	LSD 0.1%			14		20		2.8		47		0.64
	1%			19		27		3.7		63		0.88
	5%			24		35		4.9		81		1.12

B1 – N100P80
B2 – N16P80

CONCLUSIONS

- When the nitrogen rate decreases the varieties Miska and Marsall recorded differences statistically assured for all studied parameters.
- For the varieties Dropia, Enesco, Kalasz, Palma, Renesansa and Gruia ony four parameters, excepting maxim curve high, were affected by nitrogen rate decrease.
- Excepting P/L ratio all other parameters were affected by nitrogen rate decrease for Apache and Renan varieties.
- Excepting flour power index all other parameters were affected by nitrogen rate decrease for Glosa variety.
- Among all tested varieties the most stabile one was Bercy because none of the parameters tested with alveograph hasn`t influenced by nitrogen rate decrease.

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QUALITY PARAMETERS AND YIELD ELEMENTS CORRELATION AT ROMANIAN AND FOREIGN WINTER WHEAT VARIETIES CULTIVATED IN DIFFERENT TECHNOLOGICAL CONDITIONS ON LUVIC SOIL AT ARDS SIMNIC

PARAMETRII DE CALITATE ȘI CORELAȚIA CU ELEMENTELE DE PRODUCȚIE LA UN SORTIMENT DE SOIURI DE GRÂU ROMÂNEŞTI ŞI STRĂINE ÎN DIFERITE CONDIȚII TEHNOLOGICE PE LUVOSOLUL DE LA S.C.D.A. ŞIMNIC

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Keywords: wheat, on time planting, delayed planting, yield, quality

REZUMAT

La S.C.D.A. Şimnic au fost testate 25 de soiuri de grâu româneşti şi străine, în trei condiții tehnologice: fertilizare numai în toamnă cu $N_{16}P_{80}$, fertilizare cu $N_{100}P_{80}$ aplicată în toamnă şi în primăvară, ambele semănate în epoca normala de cultivare a grâului şi în epocă tardivă. La fiecare dintre acestea s-au efectuat determinări în câmp şi în laborator privind producția şi calitatea.Corelații semnificative comune celor 3 condiții tehnologice au fost: conținutul de gluten umed cu lungimea curbei la alveograf, cu indicele de extensibilitate şi cu conținutul de proteină; indicele glutenic cu conținutul de proteină; înălțimea maximă a curbei cu lățimea ei, cu indicele de extensibilitate, cu puterea făinii, cu raportul P/L şi cu masa hectolitrică; lungimea curbei cu indicele de extensibilitate şi cu raportul P/L; indicele de extensibilitate cu indicele de elasticitate şi cu raportul P/L; puterea făinii cu masa hectolitrică şi cu indicele de sedimentare; masa hectolitrică cu talia; masa a 1000 de cu greutatea boabelor/spic; numărul de boabe/spic cu greutatea boabelor/spic.

ABSTRACT

At ARDS from Simnic have been tested 25 winter wheat varieties of different origin cultivated under three technological conditions: fertilized with $N_{16}P_{80}$ dose applied only in autumn, with $N_{100}P_{80}$ dose applied in autumn and spring planted on and delayed time. Each genotype was observed in field and laboratory regarding yield potential and quality. Common significant correlations were found at: wet gluten content with the length of the curve at alveograph, with extensibility index and protein content; gluten index with protein content; the maximum length with curve width, with extensibility index, the power of the flour with P/L ratio and hectoliter weight; the curve length with extensibility index and P/L ratio; the power of the flour with hectoliter (test) weight and Zeleny index; the hectoliter weight with plant height; TKW with kernels weight per ear; the number of kernels per ear with kernels weight per ear.

INTRODUCTION

The number of the analysis methods of wheat flour technological characteristics is growing continuously because of the powerful need to anticipate as soon as is possible their technological behavior. This is the result of some interactions usually studied based on some quality parameters such as: the protein content, the strength of gluten, Zeleny index, falling number, extensibility and resistance index and others. It was proved that at least for classic parameters of wheat flour (protein content, gluten index, wet gluten content and falling number) the theoretical values from the literature not always ensure an optimum technological behavior. The explanation can be found in the number of factors controlling flour technological behavior and their possibilities to interact.

Many studies attempt to explore the way how the flour quality parameters depend one of each other and thus the way how one parameter value can be predicted, with an understandable error, based on the others parameters value. A study of Anne Ingver and Reine Koppel at Jogeva Plant Breeding Institute from Estonia (2004) showed some interesting correlations between physic-chemical, extensograph and farinograph parameters and the volume of the bread prepared from the flour of the Estonian wheat cultivated during 1999-2003.

Thus, the protein content was correlated with wet gluten content in a comparable level with that attain by the same parameters of the Romanian varieties flour (Popa, 2007) and the flour hygroscopic potential rise similarly also once with the protein and wet gluten content increase.

The flours with higher protein (respectively gluten) content generated more stable dough with longer forming times**.**

MATERIAL AND METHOD

During 2008 at ARDS Simnic was studied an experiment with 25 Romanian and foreign winter wheat varieties cultivated in three technological conditions: fertilized with $N_{16}P_{80}$ only in autumn, with $N_{100}P_{80}$ applied in autumn and spring, both planted in normal and delayed period.

Were tested Romanian varieties: Dropia, Flamura85, Boema, Glosa, Alex, Gruia, and Simnic50 (ex-Briana), French varieties: Exotic, Apache, Bercy, Cezanne, Enesco and Renan; Hungarian varieties: Elet, Gobe, Kalasz, Miska, Othalom, Petur, Serina, Magvas, Marsall, Palma and Serbian varieties: Pobeda and Renesansa.

For each variety were made field and laboratory observations.

These were: kernels humidity at harvest (H%), wet gluten content (wG), gluten index (GI), falling number (FN.): other determinations with alveograph: the maximum high of the curve-H, the length of the curve-L, extensibility index-G, the power of wheat flour-W, the ratio between the resistance and the length of the curve-P/L where P=1,1 x H, elasticity index-Ie, protein content (Pr%), hectoliter (test) weight (TW), deformation index (def), 1000 kernels weight (TKW), kernels number per ear (K.no/ear), kernels yield (Yield), the number of plants/m^2 (Pl.no.), plants height (cm), Zeleny index (ml).

RESULTS AND DISCUSSIONS

All these determinate characteristics were correlated for each technological condition. The signification of the correlation coefficient pointed out the value from that the correlation is significant by 0,350 (F>4,274).

Under $N_{100}P_{80}$ dose and on time planting conditions (table 1) were found the following correlations:

-Harvest humidity with protein content- in the way that as long as humidity decrease the protein content is higher

-Wet gluten content was negative correlated with gluten index and positive correlated with curve length at alveograph, extensibility index, elasticity index, protein content and deformation index. The last two correlations suggest that based on wet gluten content it can anticipate the deformation and protein content. It can also anticipate the wet gluten content of the sample based on those three characteristics: curve length, extensibility index and elasticity index gave by the alveograph.

-Gluten index is negative correlated with protein content

-Falling number is positive correlated with P/L ratio and negative correlated with elasticity index-with other words a dough with high elasticity value has an intense enzymatic activity (low falling number value) causing seriously problems and making the flour improper.

-The maximum high of the curve is negative correlated with its width and extensibility index, and positive correlated with flour power, P/L ratio, test weight and kernels weight per ear. A negative correlation was also observed between this characteristic and plants number per square meter. The maximum height of the curve is normal to be correlated with the other characteristics determinate using the alveograph because they are known using some kind of formulas. For instance P value from P/L ratio is calculated with: P=1.1 x H.

-The length of the curve is positive correlated with extensibility index, elasticity index, protein content and negative correlated with P/L ratio and kernels weight/ear. It is also normal for curve length to be significant correlated with the others parameters gave by the alveograph. For instance the extensibility index is calculated using formula $G=2.226\sqrt{L}$.

-Extensibility index (like the curve length) is negative correlated with P/L ratio and kernels weight/ear. There is also significant negative correlation between this parameter and elasticity index, and protein content. Kernels weight/ear may give important clues about wheat kernels quality being correlated with those three parameters from the alveograph.

-Power of the wheat flour is positive correlated with extensibility index, protein content, test weight and sedimentation index. Knowing that flour power is a very important element on the seed market in West Europe ($W>200\ cm^2$) and an alveograph is not a common apparatus we can predict this character based on protein content, test weight and Zeleny index. Protein content being also closely correlated with curve length and extensibility index is in addition element for those above because $W= (1.32 \cdot G \cdot S)/L$.

-P/L ratio is negative correlated with elasticity index and positive correlated with kernels weight/ear.

-Elasticity index is positive correlated with test weight and negative correlated with plants number per square meter.

-Protein content is negative correlated with kernels number/ear

-Test weight is positive correlated with plants height

-1000 kernels weight is positive correlated with kernels weight/ear

-Kernels number/ear is positive correlated with kernels weight/ear and sedimentation index

-Kernels weight/ear is negative correlated with plants number/m^2 and positive correlated with sedimentation index.

When plants had enough nitrogen the kernels weight per ear can give quality indications using significant correlations with those four characteristics gave by the alveograph and sedimentation index.

The significant correlation between flour power value and protein content, test weight and sedimentation index may us consider that once with determination of the last three parameters we have considerable data about the first character.

Table 1

Traits correlations at $N_{100}P_{80}$ fertilizer dose

	wG	GI	FN	H	L	G	W	P/L	Ie	Pr%	KW	def1	TKW	K.no. /ear	KW/ear	yield	Plant no.	Ear no.	Height	Zeleny
U%	- 0.250	- 0.087	- 0.210	0.039	- 0.041	- 0.032	- 0.069	0.051	0.083	- 0.350	0.102	- 0.275	- 0.013	0.157	0.270	0.222	- 0.034	- 0.096	0.158	0.146
wG		-0.37	0.024	-0.04	0.637	0.641	0.506	-0.4	0.366	0.741	0.198	0.351	0.162	-0.33	-0.17	-0.07	-0.09	-0.01	0.15	0.156
GI			-0	-0.25	0.169	0.162	0.073	-0.26	0.231	-0.39	-0.22	-0.24	-0.16	0.311	-0.08	-0	0.159	0.103	-0.32	0.107
FN				0.3	-0.11	-0.16	0.181	0.357	-0.4	0.072	-0.12	-0.13	0.049	0.308	0.312	-0.21	-0.57	0.287	-0.45	0.184
H					-0.61	-0.6	0.555	0.852	-0.11	0.026	0.552	-0.18	0.156	0.21	0.529	0.038	-0.51	-0.03	0.241	0.087
L						0.996	0.242	-0.88	0.489	0.349	-0.09	0.241	-0.2	-0.25	-0.46	-0.05	0.197	0.217	-0.09	0.25
wG							0.255	-0.89	0.541	0.348	-0.06	0.265	-0.19	-0.29	-0.48	-0.04	0.23	0.209	-0.05	0.231
W								0.073	0.583	0.351	0.633	-0.03	0.021	0.051	0.21	0.098	-0.22	0.173	0.304	0.375
P/L									-0.51	-0.2	0.27	-0.27	0.135	0.307	0.559	-0.01	-0.48	-0.13	0.09	-0.07
Ie										0.186	0.383	0.126	-0.01	-0.23	-0.11	0.118	0.344	0.092	0.303	0.201
Pr											0.038	0.18	0.084	-0.45	-0.29	-0.22	0.105	0.195	0.089	-0.19
TW												0.102	0.254	-0.19	0.196	0.278	-0.2	-0.01	0.695	0.126
def													0.272	-0.5	-0.26	-0.14	0.077	0.212	0.105	-0.18
TKW														-0.1	0.414	0.2	-0.17	-0.1	0.181	0.002
K/sp															0.686	0.273	-0.26	-0.1	-0.13	0.65
Kw/sp																0.289	-0.47	-0.19	0.113	0.562
yield																	-0.06	-0.17	0.367	0.278
Pl.no																		0.139	0.245	-0.24
Ear no																			-0.21	0.008
Height																				0.134

When nitrogen was not enough for the plants development have been found significant correlations, several different compared with previously technology and some more than at $N_{80}P_{100}$ fertilization variant (table 2). Common correlations, showing that nitrogen dose has no influence on the link between studied characters, are:

-wet gluten content negative correlated with gluten index and positive correlated with curve length, extensibility index, elasticity index, protein content and deformation index

-gluten index negative correlated with protein content

-the maximum height of the curve negative correlated with its width and extensibility index and positive correlated with flour power, P/L ratio, test weight and kernels weight/ear.

-curve length positive correlated with extensibility and elasticity index also negative correlated with P/L ratio

-extensibility index positive correlated with elasticity index and negative correlated with P/L ratio

-flour power positive correlated with protein content, test weight and sedimentation index

-P/L ration negative correlated with elasticity index

-test weight positive correlated with plants height. This is possible to be caused by the foreign varieties (most of the tested varieties) usually with lower plants height compared with Romanians, later than those, with affected kernels (produced during filling period) and so that with lower test weight.

-1000 kernels weight positive correlated with kernels weight/ear

-kernels number/ear positive correlated with kernels weight/ear

-kernels weight/ear positive correlated with sedimentation index

The weight of 1000 kernels was the most affected trait when nitrogen dose was diminished. This trait registered significant positive correlations with kernels humidity, maximum height of the curve, flour power, P/L ratio, protein content, test weight and significant negative correlations with maximum length of the curve and extensibility index.

Very important is that flour power (very important indicator to describe flour potential) also under this technological condition was correlated with protein content, test weight and sedimentation index as well as is also important the positive correlation between kernels weight/ear and sedimentation index.

Looking to all above data and also to those obtained under delayed planting time condition (table 3) we can conclude common correlations under any technological conditions:

- -wet gluten content was positive correlated with curve length, extensibility index, elasticity index and protein content
- gluten index is negative correlated with protein content
- the maximum height of the curve is negative correlated with its width and extensibility index and positive correlated with flour power, P/L ratio and test weight
- curve length is positive correlated with extensibility index and negative correlated with P/L ratio
- flour power was positive correlated with test weight and sedimentation index
- test weight is positive correlated with plants height
- 1000 kernels weight was positive correlated with kernels weight/ear
- kernels weight/ear was positive correlated with sedimentation index

Under $N_{80}P_{100}$ fertilization variant have been found no correlations between yield and studied elements. Under others technological conditions ($N_{16}P_{80}$ fertilization doze and delayed planting) it was only one common correlation between yield and plants height.

Table 2

Traits correlations at N_{16} P_{80} fertilizer dose

	wG	GI	FN	H	L	G	W	P/L	Ie	Pr%	TW	def1	TKW	K no /ear	Kw/ ear	yield	Pl. no	Ear No.	Height	Zeleny
U%	1E-04	0.096	-0.04	0.441	-0.24	-0.25	0.293	0.437	-0.23	-0	0.23	0.061	0.473	-0.2	0.182	0.052	-0.31	-0.19	0.282	0.144
wG		-0.56	-0.15	0.196	0.489	0.511	0.696	-0.22	0.493	0.76	0.263	0.58	0.159	0.034	0.127	0.074	0.046	-0.07	0.29	0.352
GI			-0.01	-0.13	-0.31	-0.33	-0.48	0.143	-0.48	-0.45	-0.22	-0.46	-0.04	-0.19	-0.18	0.143	-0.13	0.186	-0.14	-0.22
FN				-0.02	0.13	0.129	-0.03	-0.04	0.196	-0.09	-0.33	-0.21	0.003	0.267	0.208	0.194	0.053	0.388	-0.39	0.237
H					-0.6	-0.58	0.634	0.869	-0.49	0.272	0.587	0.217	0.571	-0.09	0.37	0.15	0.1	0.143	0.383	0.218
L						0.997	0.149	-0.86	0.891	0.246	-0.32	0.093	-0.37	0.256	-0.09	-0.04	-0.15	-0.06	-0.16	0.169
wG							0.176	-0.86	0.898	0.268	-0.3	0.101	-0.35	0.267	-0.07	-0.03	-0.14	-0.08	-0.14	0.198
W								0.209	0.194	0.658	0.624	0.455	0.465	0.027	0.367	0.113	-0.03	-0.12	0.526	0.555
P/L									-0.75	-0.08	0.41	0.027	0.449	-0.18	0.203	0.061	0.138	0.241	0.212	-0.07
Ie										0.251	-0.22	0.197	-0.3	0.188	-0.11	-0.11	0.001	-0.07	-0.12	0.221
Pr%											0.455	0.541	0.518	-0.04	0.317	0.163	0.049	-0.2	0.48	0.458
TW												0.303	0.567	-0.26	0.202	-0.05	0.158	-0.43	0.681	0.19
def													0.27	-0.02	0.166	0.275	-0.11	-0.2	0.468	0.234
TKW														-0.22	0.492	0.022	-0.22	-0.34	0.274	0.402
k.no /ear															0.725	0.163	-0.22	0.022	-0.08	0.276
K. w /ear																0.228	-0.37	-0.22	0.179	0.553
yield																	-0.15	0.073	0.395	0.122
Plant No.																		0.261	0.077	-0.41
Ear No.																			-0.49	-0.2
Height																				0.198

CONCLUSIONS

Studied elements pointed out that flour power (W), a very important indicator, can be anticipated based on existing correlations between W and test weight and also between W and sedimentation index indifferently by the technological condition. Under normal planting time conditions the flour power is correlated also with the protein content.

All existing correlations between traits (obtained using alveograph apparatus) are expected ones because traits values come one from other being calculated based on formulas. The most important correlation is between the maximum height of the curve and test weight indifferently by the technological condition.

Under these three technological conditions was found no correlation between yield and one of studied elements.

Another aspect pointed out from these studies is that winter varieties with high wet gluten content show higher length of the curve, higher extensibility index value and their protein content value is closer to superior limit.

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EFICACITATEA ŞI SELECTIVITATEA UNOR ERBICIDE APLICATE LA DIFERITE EPOCI ÎN COMBATEREA BURUIENILOR ŞI INFLUENȚA LOR ASUPRA PRODUCȚIEI LA DIFERITE SOIURI DE GRÂU

EFFICIENCY AND SELECTIVITY OF VARIOUS HERBICIDES APPLIED TO THE DIFFERENT STAGES IN WEED FIGHTING AND THEIR INFLUENCE ON THE YIELD OF THE DISTINCT VARIETIES OF WHEAT

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REZUMAT

În condițiile de la SCDA Teleorman ,situată în Câmpia Burnasului , unde grâul se cultivă pe suprafețe întinse , speciile de buruieni dominante sunt : Sinapis arvensis(55%), Veronica ssp., Matricaria inodora , Galium aparine , Polygonum convolvulus, Cirsium arvense , Convolvulus arvensis, s-au folosit următoarele erbicide :Arrat+DASH, Dialen S. DMA-6 ,Lancelot ,Lancet ,Mustang , Granstar , Buctril U, aplicate la trei epoci, la două soiuri – Dropia şi Boema.

Eficacitatea erbicidelor a fost de 94-96% la epoca I de aplicare, de 93-97% la epoca a II –a şi de 90-92% la epoca a III-a de aplicare.

Efectul mai slab al erbicidelor aplicate la epoca a III-a s-a datorat fazei mai avansate în vegetație a buruienilor, care au depăşit stadiul de rozetă.

Erbicidele pe bază de dicamba /2,4D au produs asupra plantelor de grâu la cele două soiuri la epoca a III-a de aplicare , simptome fitotoxice evidente, diminuând producția cu 700-800 kg/ha.

SUMMARY

In conditions of ARDS Teleorman located in the plains Burnas, where wheat is grown on large areas, are the dominant weed species: Sinapis arvensis (55%), Veronica ssp, Matricaria odorless belongs Galium, Polygonum Convolvulus, Cirsium arvense, Convolvulus arvensis, following herbicides were used: Arrat + DASH, S. Dialen DMA -6, Lancelot, The Lancet, Mustang, Granstar, Buctril U, applied at III period, two varieties – Dropia and Boema.

Herbicide efficacy was 94-96% at times I application, 93-97% in the second period and 90-92% in the third period of application.

Weaker effect of herbicides applied to the III period was due to more advanced stage of weed growth, which exceeded the rosette stage.

Herbicides based on dicamba / 2,4 D were produced on plants of two wheat varieties to the III period of application, obvious phytotoxic symptoms, reducing production by 700-800kg / ha.

INTRODUCTION

The research on weed fighting in cereal grain crops is the use of new combined herbicides (based on 2-3 active substances) and granules, which have increased efficiency, reduced environmental impact, reducing of the residual effect on the next crops, using small doses per hectare, fight weeds even at low temperature (5-60C) and time of application flexibility.

Since the structure of wheat in our country has radically changed by the cultivation of almost entirely Romanian varieties, we have studied weed control and the influence of different herbicides in wheat crop in function of the variety and the time of application.

THE MATERIAL AND THE METHOD OF RESEARCH

Research has been conducted in the experimental field of SCDA Teleorman on a chernozem soil type cambic which is characterized by a high content of humus (3.43 to 3.61%), 45% clay in the arable layer and a pH of 6.0 to 6.3.

The method of settlement was randomized blocks with plot area of 25 m2, repeated four times. Herbicide treatments were performed on the vegetation, three eras, the varieties Dropia and La Boheme. The influence of the moment of application to the two varieties was studied for the following herbicides (Table 1).

Table 1

Herbicides used in wheat experiences
S.C.D.A. – Teleorman

No.	Commercial name	The company	S.a. content	dose L;kg/ha
1	Arrat+DASH	BASF	25% tritosulfuron+dicamba 50%	0,2+0,5
2	Dialen Super	Syngenta	Dicamba 120 g/l+ acid 2,4D 344g/l	1,0
3	DMA – 6	Dow Agrosciences	660 g/l sare DMA a 2,4 D	1.0
4	Lancelot 450 WG	Dow Agrosciences	Florasulam 15% + aminopiralid 30%	0,033
5	Lancet	Dow Agrosciences	80 g/l fluroxipyr +450 g/l 2,4 D	1.0
6	Mustang	Dow Agrosciences	6,25 g/l florasulam + 300 g/l 2,4 D ester	0.6
7	Granstar 75 DF	Dupont	75% tribenuron-metil	0.020
8	Buctril Universal	Bayer Crop Science	280 g/l bromoxinil + 280 g/l acid 2,4 D	1.0

Herbicides were applied with a manually operated equipment worn, using a SOLO 456 device, using a quantity of 300 l / ha.

After the application of herbicides, we made numerous observations on the selectivity and efficacy of herbicides in weed control.

Before harvesting, for each variant we made gravimetric determinations on the remaining weed species, calculating the percentages of their control.

Grain yield was calculated at 14% standard moisture. Processing and interpretation of data was performed by the analysis of variance.

RESULTS AND DISCUSSION

The results for the Dropia variety of wheat (Table 2) showed that this very well tolerated herbicides based on: dicamba / 2,4 D fluroxipyr / 2,4 D florasulam / 2,4 D, tribenuron -methyl, bromoxynil / 2,4 D, when they were applied to the training phase of the twinning of the first internode of wheat plants (note EWRS-1).

Table 2

The efficacy and selectivity of herbicides applied at different times at the autumn wheat, Dropia variety.

Herbicides applied	dose L; KG/HA	Selective. Notes EWRS	Weeds Combat %	Production		Production losses caused asncompared to I era	
				KG/HA	%	KG/HA	%
Untreated Control	-	1.0	0	2820	100	-	-
Epoch I phase of training to first internode							
Arrat+DASH	0.2+0.5	1.0	96	4360	154	MT.	100
Dialen S	1.0	1.0	95	4275	151	MT.	100
DMA – 6	1.0	1.0	95	4310	152	MT.	100
Lancelot	0.033	1.0	96	4335	153	MT.	100
Lancet	1.0	1.0	96	4370	154	MT.	100
Mustang	0.6	1.0	97	4380	155	MT.	100
Granstar 75 DF	0.020	1.0	95	4315	153	MT.	100
Buctril Universal	1.0	1.0	96	4355	154	MT.	100
Epoch II phase 2-3 internode							
Arrat+DASH	0.2+0.5	2.5	94	3990	141	-370	91
Dialen S	1.0	3.0	93	3830	132	-447	89
DMA – 6	1.0	2.0	94	4160	147	-150	96
Lancelot	0.033	1.0	93	4240	150	- 95	98
Lancet	1.0	1.0	95	4330	153	- 40	99
Mustang	0.6	1.0	97	4375	155	- 5	100
Granstar 75 DF	0.020	1.0	95	4280	151	- 35	99
Buctril Universal	1.0	1.0	96	4340	153	- 15	99
Epoch III – emergence of last leaf							
Arrat+DASH	0.2+0.5	3.5	90	3570	126	-785	82
Dialen S	1.0	4.0	90	3470	123	-805	81
DMA – 6	1.0	3.0	90	3660	129	-650	85
Lancelot	0.033	1.0	90	4175	148	-160	96
Lancet	1.0	1.0	93	4290	152	- 80	98
Mustang	0.6	1.0	94	4310	152	- 70	98
Granstar 75 DF	0.020	1.0	93	4175	148	-140	97
Buctril Universal	1.0	1.0	92	4280	151	- 75	98

Note: 2 EWRS: no phytotoxic symptoms DL 5% = 455 kg / ha
9 EWRS: DL plant destroyed 95-100% DL 1% = 593 kg / ha
DL 0.1% = 756 kg / ha

For the second application period, phase 2-3 (taxidermy) in dicamba-based herbicides there were phytotoxic symptoms (notes EWRS-2 ,5-3). These were evidenced by a slower plant growth and at ripening stage there were partially and totally sterile heads, which resulted in lower production and with 350-445 kg / ha compared to age I.

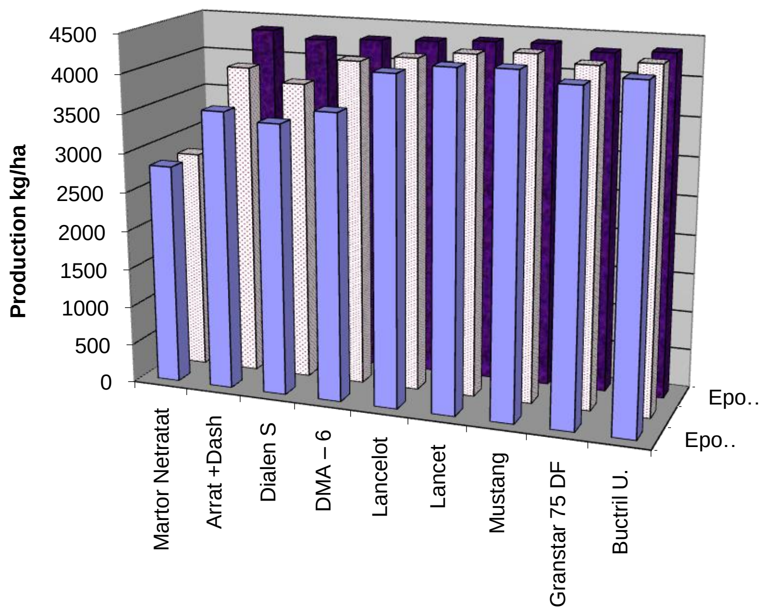
Phytotoxic symptoms on wheat plants were more important (notes EWRS-3 ,5-4) when dicamba-based herbicides were applied during the onset of the last leaf (Bellows Age III).

In this moment of application, because of very pronounced phytotoxicity on wheat the production was lower than that of the first era (twin-first internode) to 700-800 kg / ha. Herbicides: Lancelot, The Lancet, Mustang, Granstar and Buctril were tolerated by the variety Dropia even at the last phase of developing leaves (bellows), when the losses as compared to the first era (twin-first internode) were small and statistically uninsured.

In what concerns the weed fighting the infestation was strong with the species: Sinapis arvensis (51%), Viola arvensis (10%), Veronica persica (10%), Matricaria odorless, Galium belongs, Convolvulus arvensis and Cirsium arvense.

In such cases of infestation with weeds, herbicides applied during the first period fought the weeds as a percentage of 94-96%, increasing production by 1355-1635 kg / ha (Fig. 1).

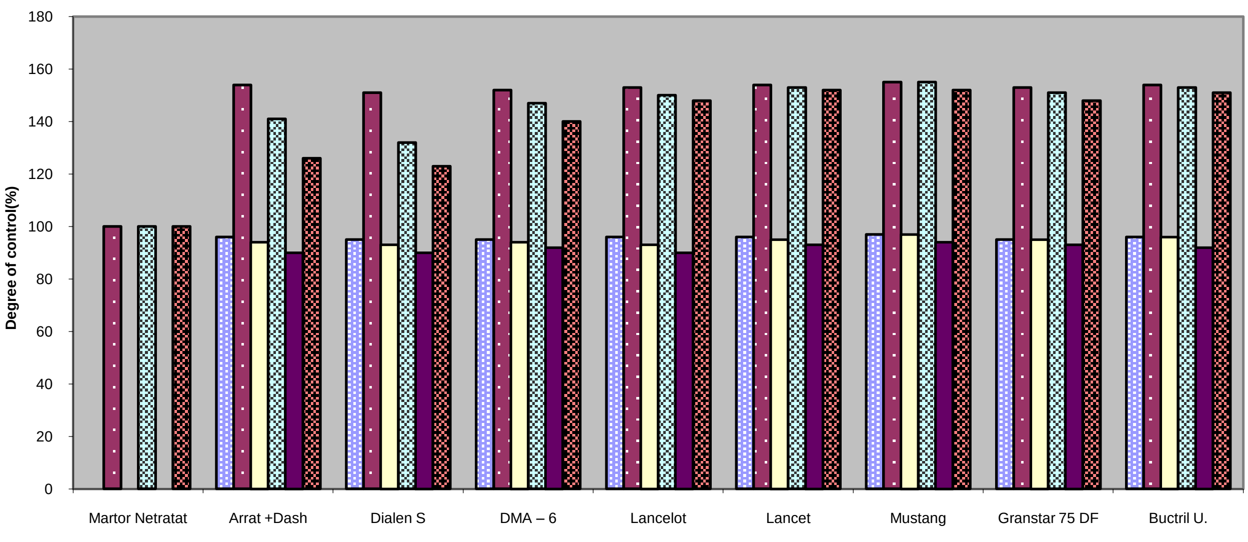
Fig.1 Influence of application on the production of wheat - Dropia.



In the second period of application (2-3 internodes) the degree of weed fighting was virtually equal to that of the first era of the herbicides Mustang Granstar and Buctril, and the other herbicides' efficiency was slightly lower (93-94%).

Harvesting gains obtained at this time as compared to the untreated control were 1010-1555 kg / ha (or 32-55%) (Fig. 2).

Fig.2.Relationship between the degree of weed (%) and wheat production (%) depending on the time of apllication of herbicides variety - Dropia



At the third time of application (final phase of leaf-skin appearance), the effectiveness of herbicides on weed control was reduced, the degree of control varies between 90-94%, with growths typically 650-1490 kg / ha compared to untreated.

A good effect on the weeds at this age had the herbicides Mustang, Lancelot, and

Granstar Lancet.

The Boheme wheat variety, compared with the variety Dropia, better tolerated dicamba-based herbicides (Table 3).

Table 3.

The efficiemcy and selectivity of herbicides applied at different times at the autumn wheat, Boema

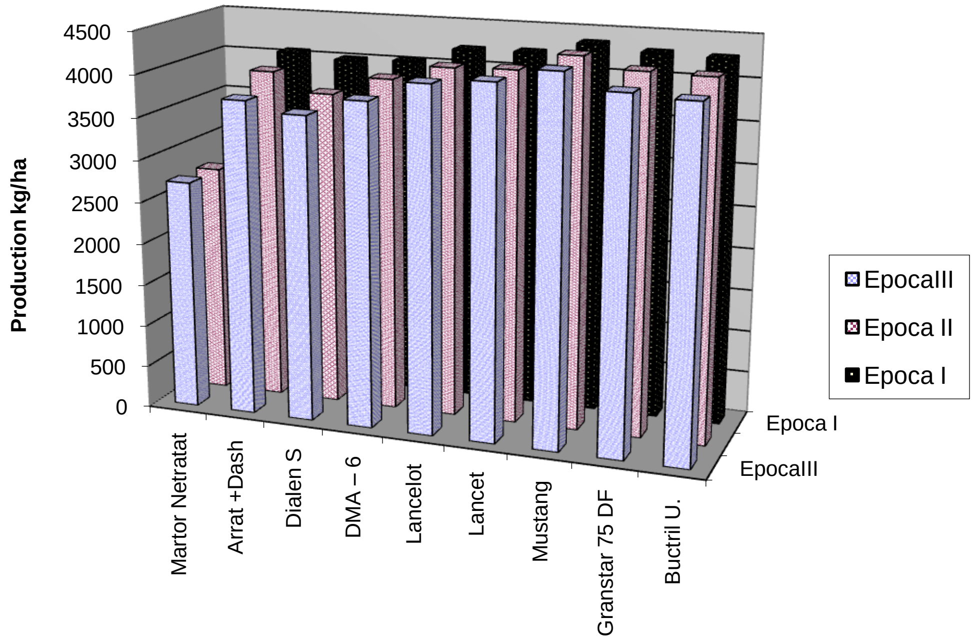
Herbicides applied	dose L; KG/HA	Selective. Notes EWRS	Weeds Combat %	Production		Production losses caused asncompared to I era	
				KG/HA	%	KG/HA	%
Untreated Control	-	*1.0*	*0*	*2725*	*100*	-	-
Epoch I phase of training to first internode							
Arrat+DASH	0.2+0.5	1.0	95	4060	149	MT.	100
Dialen S	1.0	1.0	94	4005	147	MT.	100
DMA – 6	1.0	1.0	95	4035	148	MT.	100
Lancelot	0.033	1.0	96	4210	154	MT.	100
Lancet	1.0	1.0	96	4220	155	MT.	100
Mustang	0.6	1.0	96	4360	160	MT.	100
Granstar 75 DF	0.020+1%	1.0	96	4295	157	MT.	100
Buctril Universal	1.0	1.0	96	4275	157	MT.	100
Epoch II phase 2-3 internode							
Arrat+DASH	0.2+0.5	1.5	93	3950	145	-110	97
Dialen S	1.0	2.0	92	3730	137	-275	93
DMA – 6	1.0	1.5	93	3950	145	- 85	97
Lancelot	0.033	1.0	94	4125	151	- 85	98
Lancet	1.0	1.0	94	4145	152	- 75	98
Mustang	0.6	1.0	94	4345	159	- 15	99
Granstar 75 DF	0.0202+1%	1.0	94	4215	154	- 80	98
Buctril Universal	1.0	1.0	94	4200	154	- 75	98
Epoch III – emergence of last leaf							
Arrat+DASH	0.2+0.5	2.0	90	3740	137	-320	92
Dialen S	1.0	2.5	90	3620	132	-385	90
DMA – 6	1.0	1.5	91	3830	141	-205	94
Lancelot	0.033	1.0	92	4070	149	-140	96
Lancet	1.0	1.0	93	4135	151	- 85	97
Mustang	0.6	1.0	93	4295	157	- 65	98
Granstar 75 DF	0.020+1%	1.0	92	4110	150	-185	96
Buctril Universal	1.0	1.0	90	4070	149	-205	95

Note: 1 EWRS: no phytotoxic symptoms DL 5% = 473 kg / ha
9 EWRS: DL plant destroyed 95-100% DL 1% = 611 kg / ha
DL 0.1% = 774 kg / ha

The EWRS notes on selectivity were 1.5 to 2.5 with small and insignificant loss of harvest in late epochs (epoch II and III) as compared to the best epoch (epoch I).

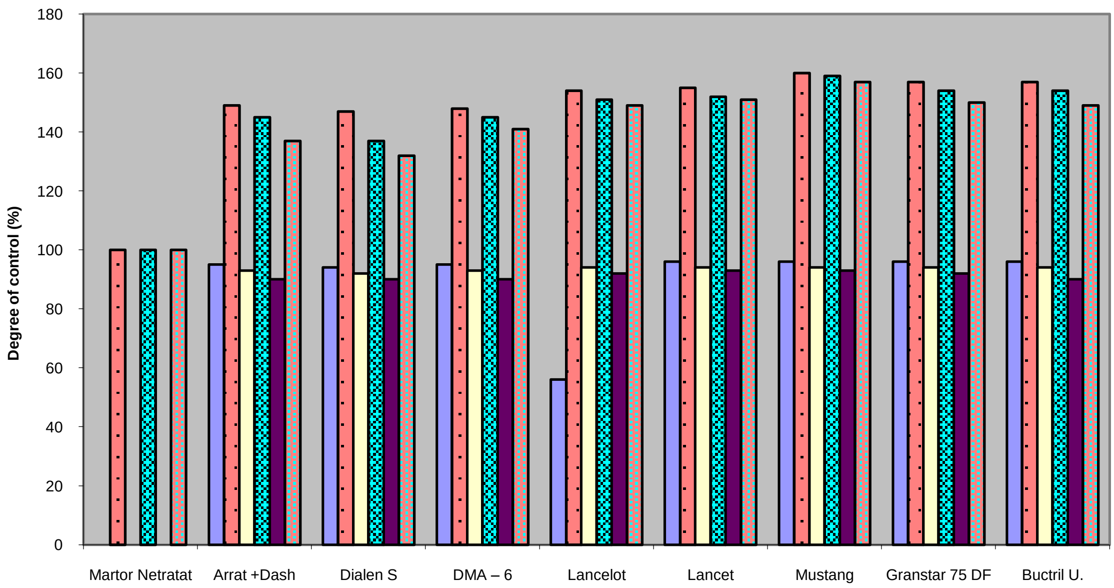
The effectiveness of the weed was better at the first implementing era, when there was a degree of control by 95-97% and increased production of 1560 kg / ha compared to untreated or 51-55% (Fig. 3).

Fig. 3.Influence of application on the production of wheat - Boema



The stage of the late application of herbicides was less effective, the degree of control varied between 90-94% (Fig. 4). Weaker effect on the weeds of herbicides applied at age II and III is due to more advanced stages of weed growth, which exceeded the rosette stage.

Fig.4.Relationship between the degree of weed (%) and wheat production (%) depending on the time of apllication of herbicides variety Boema



A very good effect on the weeds at these ages had the herbicides Mustang Granstar, Lancelot and Lancet.

CONCLUSIONS

1. Herbicides Arrat + DASH., Dialen S, DMA-6, Lancelot, The Lancet, Mustang, Granstar, Buctril - applied to the two varieties of wheat Dropia and Boema in twinning-up phase to the formation of the first internode of the plants proved to be selective and fought the weeds at the rate of 94-97%, increasing production by more than 1300 kg / ha, depending on the degree of weed.

2. Applied in late age, when wheat plants were at the stage or bellows taxidermy, dicamba-based herbicides produced phytotoxic symptoms more important for the variety Dropia as compared to the variety Boema.

3. The Dropia wheat variety proved to be more sensitive to delayed application of dicamba-based herbicides, reducing production by 370-445 kg / ha when herbicides were given during 2-3 internodes, and more than 785-805 kg / ha when they were given during the bellows stage.

4. The Boema wheat variety tolerated better dicamba-based herbicides even applied later proveing to produce robust harvest, losses were small, insignificant.

5. All the other herbicides (Lancelot, Lancet, Mustang, Granstar, Buctril) implemented in phases 2-3 of the bellows internodes and wheat plants were tolerated by the Dropia and Boema wheat varieties.

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STUDIUL DETERMINISMULUI GENETIC AL MĂRIMII SEMINȚEI LA NĂUT (Cicer arietinum L.)

STUDY OF THE GENETIC DETERMINISM OF CHICKPEAS SEED SIZE (Cicer arietinum L.)

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REZUMAT

Studiul hibridologic a 5 genotipuri parentale de năut şi a hibrizilor lor direcți în generația F_1 a permis elucidarea unor aspecte privind controlul genetic al mărimii seminței la năut.

Rezultatele experimentale obținute au arătat că în determinismul genetic al mărimii seminței la năut au fost implicate atât efectele de aditivitate (gi), cât şi efectele de dominanță (l, li, lij) ale genelor cu rol în ereditatea acestui caracter genetic cantitativ, acționând după un mecanism genetic de tip „dominanță parțială”: $(H_1/D)^{1/2}$ =0,82 şi Vr/Wr = 0,87, confirmat şi de rezultatul analizei grafice.

Frecvența genelor dominante a fost în exces față de cea a genelor recesive.

Genele dominante şi recesive au fost asimetric distribuite printre părinți, ca şi alelele dominante şi recesive ($H_2/4H_1$ = 0,21).

Pentru setul de genitori analizați s-a evidențiat existența unei gene sau a unui grup de gene dominante strâns asociate, care a influențat ereditatea acestui caracter ($h^{2/}/H_2$ = 0,87).

Coeficienții de ereditate pentru caracterul analizat au avut valori de 0,72 în sens restrâns şi 0,99 în sens larg.

ABSTRACT

The hibridologic study of five parental genotypes of chickpea and their F1 generation hybrids has allowed elucidating some aspects of genetic control of seed size in chickpea.

The experimental results obtained showed that in the genetic determinism of seed size in chickpea have been involved both additivity effects (gi) and dominance effects (l, li, LIJ) of the genes involved in quantitative genetic inheritance of this character, acting as a genetic mechanism of "partial dominance" (H1 / D) 1 / 2 = 0.82 and Vr / Wr = 0.87, graphical analysis confirmed the result.

Dominant gene frequency was in excess of the recessive gene.

Dominant and recessive genes were asymmetrically distributed among parents, so were dominant and recessive alleles as (H2/4H1 = 0.21).

The analyzed genitors set revealed the existence of a gene or a closely related group of dominant genes that influence this trait heritability (h2 / / h2 = 0.87).

Heritability coefficients analyzed for the character had values of 0.72 and 0.99 narrowly broadly.

INTRODUCTION

Seed size is an important element in chickpea productivity because consumers tend to prefer large food grain chickpeas of Kabul type, breeders around the world strive to achieve a productive type of plant that would produce a large number of pods and seeds with seed size expressed as MMB over 300 g.

Eser D. et al., K. and Arora Lokendra P.P. (1991, 1992) showed that the weight of 1000 grains in chickpeas was significantly correlated with seed production and Rodica Sturzu et al., (2004) found that MMB is positively correlated with seed production per plant (r = 0.330 *) and negatively with other elements of productivity and crude protein content. Singh et al. (1992) using dialele analysis established that the grain size is controlled by genetic effects additive.

O. Singh et al. (1993) analyzing the variance of general and specific combinative ability, concluded that additive gene effect was predominant character of the mass of 1000 grains, as shown by Salimath and Bahl (1988) and Shinde et al. (1990).

Rao S.S. et al. (1994) studied the genetic variability, eritability, progress and genetic correlations, establishing the existence of a coefficient of variation and genotypic eritabilitate high genetic progress and a large seed size. It was also noted that the 1000 grain weight was positively correlated with seed production.

O. Singh and S. Kumar (1995) studying the heredity of chickpea seed size showed that the feature of "small seeds" was partially dominant over the nature "big seed", a major contributor to genetic variation were additive genes effects, the action of the nonaditive gene type and dominance x dominance interaction additivity affected to a lesser extent the expression of this trait. Both eritability and estimated genetic progress were high and the minimum number of factors involved in controlling the grain size varied between 1.33 and 2.19.

THE MATERIAL AND THE METHOD OF RESEARCH

In order to determine seed size in chickpea heredity, the SCDA Teleorman held in 2008-2009, a series of experiments that included five parental genotypes of chickpea with different geographical origin: PI 451 628 (Iran), P.I. 107 128 (Italy), P.I. 46 219 (India), Men (Romania) and Stepnovoi (Bulgaria), with their forthright in F1 hybrids, obtained by crossing dialelă direct sown field after randomized block method in three repetitions.

Seed size was determined in the laboratory at 10 plants in each repetition chickpeas.

The experimental results were statistically analyzed in the following sequence: analysis of variance for groups of experiments (Ceapoiu, N., 1968), analysis of variance table dialel ½ (Walters and Morton, 1978), analysis of covariance and variance of hybrids with a parent strings common (Jinks and Hayman, 1953; Hayman, 1954), estimation of genetic variance components and heritability coefficients (Jinks, 1954; Hayman, 1954 b; Mather and Jinks, 1974), parents theoretical maximum number of dominant and recessive genes, the correlation average value of parental and corresponding amount of covariance and variance (Mather and Jinks, 1974).

RESULTS AND DISCUSSION

Chickpea seed size expressed as seed mass in 1000 seeds is a quantitative genetic data in determining the relative importance of production.

Average results M.M.B. the chick (Table 2) showed that the 15 genotypes examined had a different reaction, MMB having values of 121.66 g in hybrid P.I. 451628/P.I. 107 128 up to 342.67 g parental genotype PI 462 196, experimental data representing the average over two years (2008-2009).

Table 1

Seed size in chickpea parental genotypes studied.

Nr. crt.	Genotype	M.M.B. (g)
1.	P.I. 451628	130,33
2.	P.I. 107128	279,00
3.	P.I. 462196	342,67
4.	Bărbuța	227,33
5.	Stepnovoi	333,67
MEDIA		262,60
DL 5%		6,42
DL 1%		9,34
DL 0,1%		14,01

S.C.D.A. Teleorman, 2008-2009

Table 2

Mean seed size at the five parental genotypes of chickpea and forthright in their F1 hybrids. S.C.D.A. Teleorman, 2008-2009

Nr. crt.	Genotype	M.M.B. (g)
1.	P.I. 451628	130,33
2.	P.I. 451628/ P.I. 107128	121,66
3.	P.I. 451628/ P.I. 462196	320,00
4.	P.I. 451628/ Bărbuța	189,00
5.	P.I. 451628/ Stepnovoi	310,00
6.	P.I. 107128	279,00
7.	P.I. 107128/ P.I. 462196	334,33
8.	P.I. 107128/ Bărbuța	258,00
9.	P.I. 107128/ Stepnovoi	270,00
10.	P.I. 462196	342,67
11.	P.I. 462196/ Bărbuța	311,66
12.	P.I. 462196/ Stepnovoi	335,33
13.	Bărbuța	227,33
14.	Bărbuța/ Stepnovoi	285,66
15.	Stepnovoi	333,66
MEDIA		269,90
DL 5%		5,288
DL 1%		7,119
DL 0,1%		9,467

The analysis of the variance for groups of experiments (Ceapoiu, N., 1968) showed that differences between genotypes were analyzed separately significant F-test against the error variance (Table 3).

The differences statistically assured allowed further detailed study of the variance decomposition and the character, using statistical methods mentioned above.

Table 3

Analysis of variance for seed size in chickpea.
S.C.D.A. Teleorman, 2008-2009

Case variability	M.M.B. (g)			
	SP	GL	s^2	F
Block	80,55	2	40,28	4,04*
Genotype	221815,80	14	15843,98	1587,52**
Error	279,45	28		
Variability coefficient (%)	11,704			

Analysis of variance table dialel ½

For this analysis, genetic variance was decomposed into components additivity effects (gi) and dominance (l, li and LIJ) genes involved in controlling heredity MMB (G) chickpeas, using the model proposed by Walters and Morton (1978).

For the character seed size (g) chickpeas, both additivity and the effects of dominance were provided statistically significant F-test being distinct (Table 4).

This suggested that the genetic control of seed size (g) in are involved both components additivity (gi) and the dominance (l, li, LIJ).

Although the dominance of heredity is involved in chickpeas seed size (g), however, the data suggest that the additivity effects of the of gene have an even greater share of the total genetic variance.

The significance of all three types of dominance effects highlights the following:
- Dominance of seed size (g) the chick is unidirectional (part l)
- Positive and negative alleles controlling this character are quite unevenly distributed among the parents (component li);
- For this set of genitors and the investigated character was indicated the presence of significant residual dominance due to the existence of hybrids with specific reaction (LIJ component).

Table 4

Analysis of variance table 1/2 dialel for chickpeas seed size (g) .
S.C.D.A. Teleorman, 2008-2009

Case variability	M.M.B. (g)			
	SP	GL	s^2	F
Additive contribution of genotype i (gi)	91404,94	4	22851,23	2289,62**
Deviation due to dominance (l)	1202,68	1	1202,68	120,50**
Deviation due to genotype i (li)	15867,47	4	3966,87	397,47**
Deviation due to interbreeding ixj	36694,39	5	7338,88	735,33**
Error	279,45	28	9,98	-

* Significant to 5%
** Significant to 1%
Mathematical model: Yij = m + gi + gj + l + li + LIJ (Walters and Morton, 1978)

Since this model allows a level of detail in each parental genotype of both additivity effects (gi) and the dominance of the (l, li, LIJ), it makes possible an appreciation from this point of view of all five parental genotypes.

Thus, in terms of additivity effects (gi), chickpea genotypes that have contributed to MMB growth were P.I. 462 196, Stepnovoi and P.I. 107,128 and to the decrease of this character were Bărbuța and PI 451 628 (Table 5).

Regarding the effects of dominance, dominance positive deviations for MMB of the chickpeas due to genotype i (li) gave PI varieties 462 196, P.I. And 451,628 Bărbuța, and negative deviations of dominance gave additional variety PI 107 128 (Table 6).

Hybrid combinations with specific positive reaction MMB for the chickpea (the dominance deviation due to interbreeding ixj = LIJ) were PI 451628/Stepnovoi, P.I. 107128/Bărbuța, P.I. 451628/P.I. 462 196, P.I. 107128/P.I. 462,196 and P.I. 462196/Bărbuța and hybrid combinations with specific negative reaction to MMB the chickpeas were P.I. 451628/P.I. 107 128, P.I. 462196/Stepnovoi, P.I. 451628/Bărbuța, P.I. 462196/Bărbuța, Men / Stepnovoi and P.I. 107128/Stepnovoi (Table 7).

Table 5

Additivity effects of parental genotypes (gi) for MMB for the chickpeas. S.C.D.A. Teleorman, 2008-2009

Nr. crt.	Genotype	M.M.B. (g)
1.	P.I. 451628	- 66,1333 ± 0,6654
2.	P.I. 107128	8,2000 ± 0,6654
3.	P.I. 462196	40,0333 ± 0,6654
4.	Bărbuța	- 17,6333 ± 0,6654
5.	Stepnovoi	35,5333 ± 0,6654
	Σgi	0

Table 6

Additional dominance deviations due to and genotype (li) for MMB the parental genotypes of chickpea. S.C.D.A. Teleorman, 2008-2009

Nr. crt.	Genotype	M.M.B. (g)
1.	P.I. 451628	14,93 ± 1,5525
2.	P.I. 107128	- 44,96 ± 1,5525
3.	P.I. 462196	28,99 ± 1,5525
4.	Bărbuța	0,99 ± 1,5525
5.	Stepnovoi	0,04 ± 1,5525
	li	10,97 ± 1,00

Table 7

The dominance deviation (LIJ) due to interbreeding ixj MMB (G) for the parental genotypes of chickpea. S.C.D.A. Teleorman, 2008-2009

Nr. crt.	Maternal genotype	Paternal genotype			
		2	3	4	5
1.	P.I. 451628	-63,9445	28,6111	- 16,7222	52,0555
2.	P.I. 107128		28,5000	37,8333	- 2,3889
3.	P.I. 462196			-14,2778	- 42,8333
4.	Bărbuța				- 6,8333
5.	Stepnovoi				

Graphical analysis of chickpeas covariance (Wr) and variance (Vr) MMB (G)

A new stage, more advanced of the decomposition process the and study in detail of the total genetic variance of chickpeas seed character size (g), analyzed in this paper is the graphical analysis of covariance (Wr) and variance (Vr) and the determination of the components of their genetic variance.

The first phase of this analysis is the analysis of variance of the difference between the covariance and variance (Wr-Vr) of the five rows of parental genotypes as a test of homogeneity of their covariance (Wr) and variance (Vr) (table 8).

Table 8

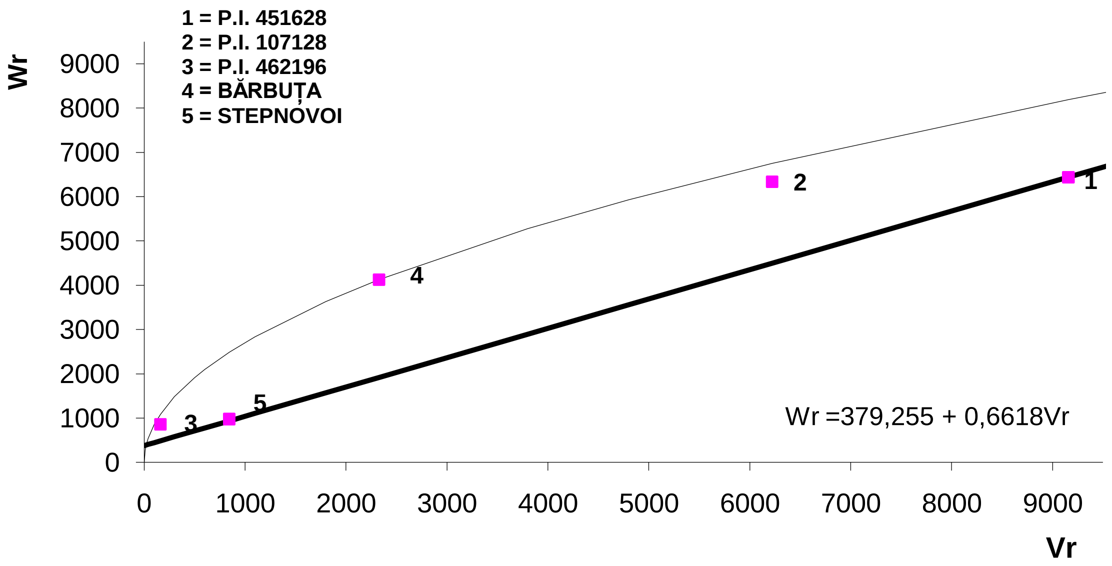
Wr-Vr analysis of variance for M.M.B. (G) chickpeas
S.C.D.A. Teleorman, 2008-2009

Cause of variability	M.M.B. (g)			
	SP	*GL*	s^2	F
Repetitions	789,67	2	394,83	2,13 ^{NS}
Genotypes	1431,05	4	357,76	1,93 ^{NS}
Error	1482,96	8	185,37	
Total	3703,68	14		

** Significant to 1%

The results have shown that for the character studied the difference between the covariance and variance values of hybrid strings with a common parent (Wr-Vr) were relatively homogeneous and not significantly different. This implies that nonalelic interactions involved in the genetic control of the seed size (g) for this set of genotypes do not have a level that would complicate their expression, confirming that the additivity x dominance model proposed to explain the genetic heredity of this nature was appropriate. The same was confirmed by the lack of significance to the slope unity of the regression line (Fig. 1).

Fig. 1Graphical analysis of covariance and variance of hybrids strings with a common parent highlights



Graphical analysis of covariance and variance of hybrids strings with a common parent highlights:

- the intersection of the Wr ordinate just above point of origin, with positive value indicates a genetic determinism of "partial dominance";
- Remoteness of the parabola and points from the regression line shows that both the effects of dominance and additivity have played a role in the genetic determinism of the character;
- From the order of the parental genotypes along the regression line we see the distribution of the dominant and recessive genes inferred on the grain size of the chickpeas among the five parental genotypes. Thus, the genotype with the highest accumulation of dominant genes was PI 462 196, and the genotype with the highest accumulation of recessive genes was PI 451 628, the other genotypes ranging between them;
- None of the studied parental genotypes theoretically father did not come close to an aggregate maximum of dominant or recessive genes.

Estimation of components of the genetic variance and heritability coefficients for seed size in chickpea

Based on the covariance (Wr) and variance (Vr) of the hybrid chains with a common parent we determined a series of components of genetic variance, resulting in the following genetic parameters: D, H1, H2, F and h2, and a proportionate number of values among them which have a genetic significance (Table 8).

The data show that the parameters characterizing genetic MMB for the chickpeas were significant, showing that in terms of its genetic determinism this character was not much influenced by environmental conditions.

Table 9

Genetic variance components values for chickpeas seed size (g). S.C.D.A. Teleorman, 2008-2009

Nr. crt.	Genetic parameters	M.M.B. (g)
1.	D	341,57 ± 0,5900
2.	H_1	233,54 ± 0,1256
3.	H_2	199,44 ± 0,1035
4.	F	137,64 ± 0,1361
5.	h^2	174,52 ± 0,1714
VALORI PROPORȚIONALE		
6.	$(H_1/D)^{1/2}$	0,8269
7.	Vr/Wr	0,8748
8.	$H_2/4H_1$	0,2135
9.	$\frac{(4DH_1)^{1/2}+F}{(4DH_1)^{1/2}-F}$	1,6443
10.	$\frac{1/2F}{[D(H_1-H_2)]^{1/2}}$	0,7331
11.	h^2/H_2	0,8751
12.	Coeficienții de ereditate: - în sens restrâns	0,7224
	- în sens larg	0,9983

Correlations between seed size and other quantitative characters analyzed for chickpea

The values of correlation coefficients between the MMB and other quantitative characters analyzed for chickpea genotypes in this study have shown significant positive correlations with seed weight per plant (+ .691 **), plant size (+ .515 *), the total number of pods per plant (+ 0.452 *), number of fertile pods per plant (+ 0.519 *) and number of seeds per plant (+ 0.484 *), proving the close connection between these characters, which must be considered in the selection and productivity improvement process for chickpeas (Table 10).

M.M.B. insignificantly correlated (- .273) with the number of seed pods. negatively

Table 10

Correlations between seed size (g) and other quantitative characters for chickpea.
S.C.D.A. Teleorman, 2008-2009

Nr. crt.	Character examined	Seed size (g)
1.	Talia plantei (cm)	+ 0,515*
2.	Înălțimea de inserție a primei păstăi bazale (cm)	+ 0,348
3.	Numărul total de păstăi pe plantă	+ 0,452*
4.	Numărul de păstăi fertile pe plantă	+ 0,519*
5.	Numărul de semințe pe plantă	- 0,484*
6.	Greutatea semințelor pe plantă (g)	+ 0,691**
7.	Numărul de semințe în păstaie	- 0,273

CONCLUSIONS

1. Differences between the 15 analyzed chickpea genotypes were significant in the Ftest against the error variance.
2. In the heredity of the chickpeas seed size (g) were involved both additivity and dominance effects of genes, the dominance effects the leading role.
3. The genetic determinism of the chickpea seed size (g) is of "partial dominance" type, graphic analysis confirmed the result.
4. Dominant gene frequency is in excess as compared to the recessive genes
5. Dominant and recessive genes were asymmetrically distributed among the parents.
6. Dominance was not variable from one locus to another.
7. Chickpeas seed size (g) is a highly hereditar of quantitative genetic data, in the narrow sense heritability coefficient is 0.72, and 0.99 broad.
8. Chickpeas seed size (g) was significantly positively correlated with the plant size and the other elements of productivity, except number of seeds in a pod.
9. The experimental results obtained are strictly valid for the set of parents genitors used in this study.

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INFLUENȚA GRADULUI DE COMBATERE AL BURUIENILOR ȘI AL MASEI TOTALE DE BURUIENI ASUPRA PRODUCȚIEI LA PORUMB PE CERNOZIOMUL DE LA SCDA MĂRCULEȘTI

THE INFLUENCE OF WEEDING DEGREE CONTROL AND WEED GREEN TOTAL MASS TO THE MAIZE YIELD ON BLACK EARTH (CHERNOZEM) FROM MĂRCULEȘTI

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Keywords: weeds, total mass, maize, yield

REZUMAT

De-a lungul timpului buruienile – plante în locuri nepotrivite – au constituit unul dintre factorii limitativi ai producției agricole și una dintre cele mai importante probleme care l-au influențat pe om în efortul de a-și asigura hrana. În variantele tratate, erbicidele au fost aplicate în trei epoci diferite: preemergent, postemergent timpriu și postemergent. În cei trei ani 2007-2009, în cultura de porumb au apărut 11 specii de buruieni, dintre care 8 specii dicotile anuale și perene și 3 specii monocotile anuale și perene.În medie pe anii 2007-2009, producțiile au fost cuprinse între 2464 kg/ha la martorul neprășit și 8488 kg/ha la martorul prășit mecanic și manual. Corelația dintre cele două elemente este foarte strânsă, coeficientul de determinație fiind de 83%. Creșterea gradului de combatere a buruienilor cu 1% a dus la o creștere a producției de porumb cu 60 kg/ha. În medie masa totală de buruieni a oscilat între 32 kg/ha la variant erbicidată cu Lumax, Equip și Mustang la 27114 kg/ha la martorul neprășit.Relația dintre cele două elemente este foarte strânsă, în sens negative, coeficientul de determinație fiind de 84%.Regresia liniară arată că pentru o creștere cu 100 kg/ha a masei totale de buruieni scade producția de porumb cu 21 kg/ha.

ABSTRACT

Over the years weeds - plants in unfit place - represent one of the yield limiting factors and also the main problem that must be solved by humanity for food save goal. The herbicides were applied in three different stages: pre-plant, early post-plant and post-plant. For all three years 2007-2009, in the maize crop were presented 11 weed species, as follows: 8 annual and perennial dicotyledonous species and three annual and perennial monocotyledonous species. As average on three years 2007-2009, the yields ranged between 2464 kg/ha (the control variant without weeding control) and 8488 kg/ha (mechanical and manual weeding control).The correlation between these two elements is very close and the determination coefficient is 83%. The increase of weeds control degree with 1% leads to 60 kg/ha yields increase. The weeds total mass ranged between 32 kg/ha (the variant with Lumax+Equip+Mustang) to 27114 kg/ha (the control variant without weeding control). The relation between these two elements is negative very close and the determination coefficient is 84%. The lineal regression slows that the increase of weeds total mass with 100 kg/ha leads to 21 kg/ha yield decrease.

INTRODUCTION

The weeds proceed from wild plants, first as ruderal weeds and then as segetal weeds. Is known that weeds named “plants in unfit place” represent the main problem that must be solved by humanity for food save goal. Until last forty years the knowledge about weeds was a brief description. The damages produced by weeds are different from those of other biotic limiters from crop system.

In the climatically conditions of our country, characterized by rain fed in the cropping period, the water reserve from soil is diminished by direct weeds consumption in the critical cropping periods or by tillage (Berca, 2004).

The damages caused by weeds are multiple and influenced annually by a set of edaphological and social factors. Thus, the estimation of yield losses due by weeds has a large variation from one author to other (Mortimer, 1990). From all biotical limiters (diseases, pests and weeds), the last ones determine the highest losses. Globally, the losses due by diseases and pests represent 9-12% and those determined by weeds 14-15% (Van Assche, 1989).Weeds control is actually considered as art and science in the same time due to the cumulate knowledge from soil science, agrotechnics, biology, biochemistry, physiology, vegetal morphology and chemistry. The modern agriculture was stimulated and significantly influenced by the research developed in the weeds control.

MATERIAL AND METHODS

The experiment leads on the black earth from ARDS Marculesti during three years (2007-2009). The experiences were evaluated in a randomized complete block design with four replications. Each plot was 25 m^2. The herbicides were applied in three different stages: pre-plant, early post-plant and post-plant, when maize plants had 4-6 leaves and monocotyledonous annual weeds had 2-4 leaves, monocotyledonous perennial weeds had 15-20 cm high dicotyledonous annual and perennial weeds were in seedling stage.

The variants were:

1. Control I – 2 mechanical and manual weeding
2. Control II – no weeding
3. Merlin Duo (pre-plant)
4. Merlin Duo (early post-plant)
5. Merlin Duo (pre-plant) + Equip (post-plant)
6. Merlin Duo (early post-plant) + Mustang (post-plant)
7. Merlin Duo (pre-plant) + Equip (post-plant) + Mustang (post-plant)
8. Lumax (pre-plant)
9. Lumax (early post-plant)
10. Lumax (pre-plant) + Equip (post-plant)
11. Lumax (early post-plant) + Mustang (post-plant)
12. Lumax (pre-plant) + Equip (post-plant) + Mustang (post-plant)
13. Equip (post-plant)
14. Mustang (post-plant)

For all three years 2007-2009, in the maize crop were presented 11 weed species, as follows: 8 annual and perennial dicotyledonous species (*Xanthium strumarium, Chenopodium album, Amaranthus retroflexus, Polygonum persicaria, Hibiscus trionum, Portulaca oleraceea, Cirsium arvense, Convolvulus arvensis*) and three annual and perennial monocotyledonous species (*Echinocloa crus galli, Setaria glauca, Sorgum halepense*).

For all three experimental years, in every month during maize cropping period, the rainfalls were below multiannual average with the exception of August 2007, May 2008 and July 2009. Generally, all three years were droughty but the water lack was supplied by irrigation.

In 2007 the temperature was up to multiannual average for all maize cropping period. The 2008 and 2009 years were similar, with temperatures in June, July and August up to multiannual average.

RESULTS AND DISCUSSIONS

The results obtained between 2008-2010 showed the superiority of the variants treated with herbicides. Thus, the maize yields were correlated with herbicides selectivity and weeds degree (table no.1).

The herbicides Merlin Duo 2,5 l/ha, Equip 1,75 l/ha and Lumax 3,5 l/ha proved selectivity for maize crop and a high control for annual and perennial monocotyledonous weeds (97-100%). These herbicides had a low control to annual and perennial dicotyledonous weeds, diminishing the yield very significant comparatively with the control with mechanical and manual weeding. The yield losses recorded by these variants ranged between 2818 kg/ha and 3322 kg/ha in 2007, between 2215 kg/ha and 4859 kg/ha in 2008 and between 2823 kg/ha and 5071 kg/ha in 2009.

When the herbicide Merlin Duo 2,5 l/ha was applied early post-plant the control weeds degree was 86% and the yield losses were lower 1997 kg/ha in 2007, 1710 kg/ha in 2008 and 1573 kg/ha in 2009.

When the herbicide Lumax 3,5 l/ha was applied early post-plant the yield losses were 2410 kg/ha in 2007, 1967 kg/ha in 2008 and 1873 kg/ha in 2009 due to the low effect of the herbicide in the control of annual and perennial dicotyledonous weeds.

The herbicide Mustang 0,5 l/ha applied during maize crop vegetation has a very good efficiency in the control of annual and perennial weeds (96-100%), but the yield losses were very high due to the annual and perennial monocotyledonous weeds. Thus, in 2007 the yield losses were 4172 kg/ha comparatively with the control, in 2008 -3207 kg/ha and in 2009-5726 kg/ha.

The combinations of herbicides used for the control of monocotyledonous and dicotyledonous weeds were tolerated in a high level and also had a large control to the annual and perennial monocotyledonous and dicotyledonous weeds (97-1005), but the yields were to the same level with the control. The yield losses were low and ranged between 137-252 kg/ha in 2007, 107-218 kg/ha in 2008 and 61-183 kg/ha in 2009.

As average on 2007-2009 the herbicides Merlin Duo 2,5l/ha (pre-plant and early post-plant), Lumax 3,5 l/ha (pre-plant and early post-plant) and Equip 1,75 l/ha (post-plant) had a total control to annual and perennial monocotyledonous weeds leading to very significant yield decrease with 2618-4417 kg/ha.

The highest yields were obtained on the plots with both monocotyledonous and dicotyledonous weeds control.

The yield losses due to weeding degree comparatively with the variants with mechanical and manual weeding techniques were 6024 kg/ha as average on three years. The losses recorded between weeding plots and no-weeding plots were 71%.

Weeding control is maintained with mechanical techniques between row spaces and manually on each row. The highest yield is realized when both weeding control are used. Manual weeding control involves a lot of work and actually can be replaced more efficiently by herbicides.

Comparatively with the control variant without weeds control the variant with manual and mechanical weeds control beside to herbicides recorded the highest efficiency when is applied a herbicide early post-plant (Merlin Duo or Lumax) and one herbicide for annual and perennial dicotyledonous weeds during crop vegetation period (Mustang).

The differences between weeding techniques and herbicides application was insignificant (1-3%) leading to the recommendation to replace the manual effort (table no.2) with herbicides. Thus, the results emphasized the possibility to assure a very good cultural hygiene using herbicides, giving up to mechanical and manual weeding.

Table 1

The influence of herbicides applied to maize crop before and after plants emerge to the yield level during 2007, 2008 and 2009

No.	Variant	Dose	Time of application	2007 year			2008 year			2009 year		
				Kg/ha	Diff.	Signif	Kg/ha	Diff	Signif	Kg/ha	Diff	Signif
1	Martor I – 2 praşile mecanice + manual	-	-	6982	Mt		8870	Mt		9613	Mt	
2	Martor II neprăşit	-	-	1273	-5709	ooo	2938	-5932	ooo	3180	-6433	ooo
3	Merlin Duo	2,5	pre-plant	4164	-2818	ooo	6655	-2215	ooo	6790	-2823	ooo
4	Merlin Duo	2,5	early post-pl.	4985	-1997	ooo	7160	-1710	ooo	8040	-1573	ooo
5	Merlin Duo+Equip	2,5+1,75	pre+post. pl	4450	-2532	ooo	6875	-1995	ooo	7100	-2513	ooo
6	Merlin Duo+Mustang	2,5+0,5	early post pl.+post pl.	5833	-1149	ooo	7986	-884	o	8730	-883	oo
7	Merlin Duo+Equip + Mustang	2,5+1,75+0,5	pre+early post+post	6845	-137		8763	-107		9552	-61	
8	Lumax	3,5	pre-plant	2965	-3017	ooo	4316	-4554	ooo	5205	-4408	ooo
9	Lumax	3,5	early post-plant.	4572	-2410	ooo	6903	-1967	ooo	7740	-1873	ooo
10	Lumax + Equip	3,5+1,75	pre+post	4381	-2601	ooo	6706	-2164	ooo	7362	-2251	ooo
11	Lumax + Mustang	3,5+0,5	early post pl.+post	4680	-2302	ooo	6980	-1890	ooo	7821	-1792	ooo
12	Lumax + Equip +Mustang	3,5+1,75+0,5	pre+early post+post	6730	-252		8652	-218		9430	-183	
13	Equip	2,5	post plant	3660	-3322	ooo	4011	-4959	ooo	4542	-5071	ooo
14	Mustang	0,5	post plant	2810	-4171	ooo	3207	-5663	ooo	3887	-5126	ooo
			LSD 5% =		672			841			496	
			1% =		732			1206			670	
			0,1 % =		810			1676			891	

Table 2

The influence of herbicides applied to maize crop before and after plants emerge to the yield level – average 2007-2009

No.	Variant	Dose	Time of application)	Average yield Kg/ha	Diff.	%	Signif.
1	Martor I – 2 praşile mecanice + manual	-	-	8488	Mt	100	
2	Martor II nepräşit	-	-	2464	-6024	29	ooo
3	Merlin Duo	2,5	pre-plant	5870	-2618	69	ooo
4	Merlin Duo	2,5	early post-plant.	6728	-1760	79	ooo
5	Merlin Duo+Equip	2,5+1,75	pre-plant+post pl.	6142	-2346	72	ooo
6	Merlin Duo+Mustang	2,5+0,5	Early post-pl.+post pl.	7516	-972	88	oo
7	Merlin Duo+Equip + Mustang	2,5+1,75+0,5	pre+early post+post	8387	-101	99	
8	Lumax	3,5	pre-plant	4495	-3993	53	ooo
9	Lumax	3,5	early post-plant.	6405	-2083	75	ooo
10	Lumax + Equip	3,5+1,75	pre+post pl.	6150	-2338	72	ooo
11	Lumax + Mustang	3,5+0,5	Early post pl.+post pl.	6494	-1994	76	ooo
12	Lumax + Equip +Mustang	3,5+1,75+0,5	pre+post+post	8271	-217	97	
13	Equip	2,5	post plant	4071	-4417	48	ooo
14	Mustang	0,5	post plant	3301	-5187	39	ooo

LSD 5% =788 kg/ha; 1% =1064 kg/ha; 0,1 % =1420 kg/ha

As average on three years 2007-2009, the yields ranged between 2464 kg/ha (the control variant without weeding control) and 8488 kg/ha (mechanical and manual weeding control). The weeds control degree ranged between 0% (the control variant without weeding control) and 100% (manual + mechanical techniques +Lumax +Equip+Mustang). The correlation between these two elements is very close and the determination coefficient is 83%. Thus, the weeds control degree influences the yield with 83%. The increase of weeds control degree with 1% leads to 60 kg/ha yields increase (Fig. 1).

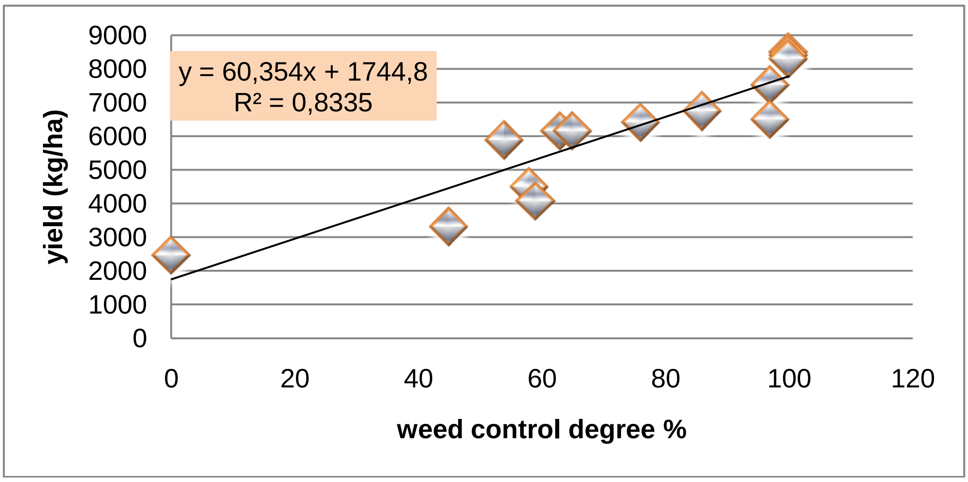

Fig. 1. The correlation between weed control degree and maize yield on three years average in the conditions from ARDS Mărculeşti

The weeds total mass ranged between 32 kg/ha (the variant with Lumax+Equip+Mustang) to 27114 kg/ha (the control variant without weeding control). The relation between these two elements is negative very close and the determination coefficient is 84%. The lineal regression slows that the increase of weeds total mass with 100 kg/ha leads to 21 kg/ha yield decrease (fig.2).

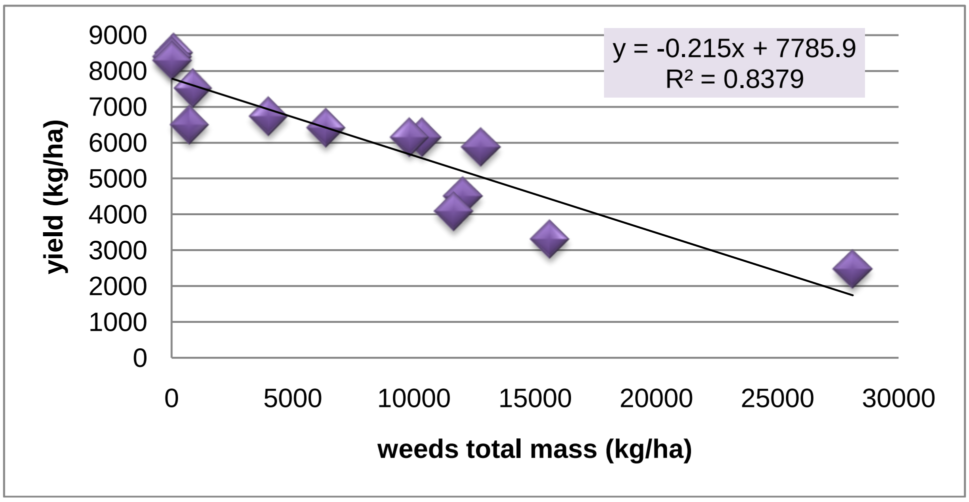

Fig. 2. The correlation between weeds total mass and maize yield on three years average in the conditions from ARDS Mărculeşti

CONCLUSIONS

As average on three years 2007-2009, the yields ranged between 2464 kg/ha (the control variant without weeding control) and 8488 kg/ha (mechanical and manual weeding control). The weeds control degree ranged between 0% (the control variant without weeding control) and 100% (manual + mechanical techniques +Lumax +Equip+Mustang). The correlation between these two elements is very close and the determination coefficient is 83%. Thus, the weeds control degree influences the yield with 83%. The increase of weeds control degree with 1% leads to 60 kg/ha yields increase.

The weeds total mass ranged between 32 kg/ha (the variant with Lumax+Equip+Mustang) to 27114 kg/ha (the control variant without weeding control). The relation between these two elements is negative very close and the determination coefficient is 84%. The lineal regression slows that the increase of weeds total mass with 100 kg/ha leads to 21 kg/ha yield decrease.

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STUDIUL EFICACITĂȚII ERBICIDELOR APLICATE PENTRU COMBATEREA BURUIENILOR DIN CULTURA PORUMBULUI PE CERNOZIOMUL DE LA SCDA MĂRCULEȘTI

THE EFFICIENCY STUDY OF THE HERBICIDES USED TO CONTROL WEED FROM MAIZE CROP ON THE BLACK EARTH (CHERNOZEM) FROM MĂRCULEȘTI

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Keywords: weeds, herbicide, maize,

REZUMAT

Alături de dăunători ș i patogeni, buruienile reprezintă unul dintre cei mai importanț i limitatori ai producț iei. Pagubele produse de buruieni sunt multiple ș i diferă ca procent în funcț ie de un complex foarte mare de factori pedoclimatici ș i sociali. În variantele tratate, erbicidele au fost aplicate în trei epoci diferite: preemergent, postemergent timpriu ș i postemergent. Ca medie pe trei ani 2007-2009 erbicidele Merlin Duo 2,5 l/ha (preemergent ș i postemergent timpuriu), Lumax 3,5 l/ha (preemergent ș i post emergent timpuriu) ș i Equip 1,75 l/ha (postemergent) au manifestat un control total asupra buruienilor monocotiledonate anuale ș i perene ș i slab asupra buruienilor dicotiledonate anuale ș i perene.

ABSTRACT

Beside pests and diseases, weeds represent one of the main constrainers for crop production. The damages caused by weeds are multiple and influenced annually by a set of edaphological and social factors. The herbicides were applied in three different stages: pre-plant, early post-plant and post-plant. As average on 2007-2009 the herbicides Merlin Duo 2,5l/ha (pre-plant and early post-plant), Lumax 3,5 l/ha (pre-plant and early post-plant) and Equip 1,75 l/ha (post-plant) had a total control to annual and perennial monocotyledonous weeds and low efficiency to annual and perennial dicotyledonous species.

INTRODUCTION

Romanian fields are highly infested with weeds. Thus, is necessary to use all the control techniques till the fields will become clean. The biological reserve of weed seeds from the soil cumulated with their resistance for a long time, represent the main weeding source. After 1960, the researches realized by Sarpe et. al.,(1961, 1962) had as a goal the control of monocotyledonous and dicotyledonous weeds using atrazine applied on the plants row in the same time with sowing and manual weeding between rows or on the hall surface. In the dry springs these methods were inefficient and also unfavorable for the next crops due to the residual effect of atrazine. Thus, it become necessary to associate the herbicides with atrazine with those with butylate, EPTC, metolachlor, keeping the recommendation to incorporate both in the soil at 8-10 depth (Paunescu, 1998). It was observed that everywhere is fertile land the weeds are presented, so they fight to conquer old lost territories (Nagy et al., 2004). Weeds are known as constrainers using water and nutrients from the soil leading to yield decreases (Ionescu-Sisesti, 1962). Recently, weed was any plant, except fungus, which interact with human being goals and necessities or a plant which grows where it isn`t expected (Naylor, 2002). Usually, weeds are more adapted than crops, emerge before them, cover the land and later compete for water and nutrients (Froud-Williams, 1999). After sowing, maize seeds need time to emerge. Suddenly, weeds emerge first, thus in the fields untreated with herbicides they must be controlled immediately using manual weeding.

MATERIAL AND METHODS

The goal of researches was to emphasize the effectiveness of simple and associated herbicides with isoxaflutol, terbutilazin, florasulfuron, isoxadifen-etil, mesotrione, metolaclor, florasulan and 2,4 D EHE against weeds from the maize crop on the irrigated black earth from Marculesti and which are the most proper combinations, as follows:

- Isoxaflutole + terbutilazin = Merlin Duo 2,5 l/ha (pre-plant and early post plant)
- Florasulfuron + isoxadifen-etil = Equip 1,75-2,5 l/ha (post plant)
- Mesotrione + metolaclor + terbutilazin = Lumax 3,5 l/ha (pre-plant and early post plant).
- Florasulan + 2,4 D EHE acide = Mustang 0,5 l/ha (post plant).

The experiment leads on the black earth from ARDS Marculesti during three years (2007-2009). The experiences were evaluated in a randomized complete block design with four replications. Each plot was 25 m^2. The herbicides were applied in three different stages: pre-plant, early post-plant and post-plant, when maize plants had 4-6 leaves and monocotyledonous annual weeds had 2-4 leaves, monocotyledonous perennial weeds had 15-20 cm high dicotyledonous annual and perennial weeds were in seedling stage.

The variants were:

1. Control I – 2 mechanical and manual weeding
2. Control II – no weeding
3. Merlin Duo (pre-plant)
4. Merlin Duo (early post-plant)
5. Merlin Duo (pre-plant) + Equip (post-plant)
6. Merlin Duo (early post-plant) + Mustang (post-plant)
7. Merlin Duo (pre-plant) + Equip (post-plant) + Mustang (post-plant)
8. Lumax (pre-plant)
9. Lumax (early post-plant)
10. Lumax (pre-plant) + Equip (post-plant)
11. Lumax (early post-plant) + Mustang (post-plant)
12. Lumax (pre-plant) + Equip (post-plant) + Mustang (post-plant)
13. Equip (post-plant)
14. Mustang (post-plant)

For all three experimental years, in every month during maize cropping period, the rainfalls were below multiannual average with the exception of August 2007, May 2008 and July 2009. Generally, all three years were droughty but the water lack was supplied by irrigation. In 2007 the temperature was up to multiannual average for all maize cropping period. The 2008 and 2009 years were similar, with temperatures in June, July and August up to multiannual average.

RESULTS AND DISCUSSIONS

In Marculesti area maize crop is exposed to highly weeding degree in the lack of proper control measures. The annual weather conditions are also important. For all three years 2007-2009, in the maize crop were presented 11 weed species, as follows: 8 annual and perennial dicotyledonous species (*Xanthium strumarium, Chenopodium album, Amaranthus retroflexus, Polygonum persicaria, Hibiscus trionum, Portulaca oleraceea, Cirsium arvense, Convolvulus arvensis*) and three annual and perennial monocotyledonous species (*Echinocloa crus galli, Setaria glauca, Sorgum halepense*).

Dominant weed species were annual monocotyledonous with 45% for all three years. On the second position were annual dicotyledonous with 25%. Perennial dicotyledonous species represented 20% and perennial monocotyledonous species 10-15% (table no.1). These date show clearly that weeding degree was high for each year for both species and plants/surface unit. Generally, weed species had a large variability as plants number and completely different as quantity. These weeds presented also a different cover degree for each year recording high values leading to the herbicide necessity. The large amount of weeds every year showed the huge seeds reserve from the soil.

Table 1

The weeds identified in the experiment every year

2007		2008		2009	
Weeds species	%	Weeds species	%	Weeds species	%
ECHCR	30	ECHCR	35	ECHCR	40
SORHA	10	SORHA	10	SORHA	15
SETGL	10	SETGL	10	SETGL	5
CIRAR	10	CIRAR	10	CIRAR	15
XANST	10	XANST	10	XANST	5
CONAR	10	CONAR	10	CONAR	15
CHEAL	5	CHEAL	5	CHEAL	3
AMARE	5	AMARE	5	AMARE	2
POLPE	5	POLPE	5	POLPE	-
HIBTR	3	HIBTR	-	HIBTR	-
POROL	2	POROL	-	POROL	-
TOTAL	100		100		100
annual monocotyledonous	45	annual monocotyledonous	45	annual monocotyledonous	45
perennial monocotyledonous	10	perennial monocotyledonous	10	perennial monocotyledonous	15
annual dicotyledonous	25	annual dicotyledonous	25	annual dicotyledonous	20
perennial dicotyledonous	20	perennial dicotyledonous	20	perennial dicotyledonous	20
TOTAL	100		100		100

Manual weeding is common worldwide and represents an option for ecological agriculture and for environmental protection. The positive effects are important depending on burrow techniques. The problem is if we can use this method to control weeds without yield losses.

Actually, manual weeding become very important for ecological weeds control followed by other control techniques such as reduced herbicide doses, biological and/or physical methods. It was observed that weeds control degree was 97-100% on the plots with severe manual weeding control comparatively with that recorded on the plots without weeding control (Tables no.2-4). Undoubtedly, herbicides represent the most imported control method, but are necessary to choose the most proper herbicide combinations depending on weed species and crop. In 2007 year because of rainfed conditions (157,5 mm) weeds quantity was low 25391 kg/ha. In these droughty conditions the rainfalls after herbicide treatment were reduced (2,5 mm after 20 days far from herbicide application) (Table no.2). All herbicides used for weeds control from maize crop were selective. On the control plot the total mass of weeds was 25391 kg/ha divided in 13550 kg/ha annual monocotyledonous species, 520 kg/ha perennial monocotyledonous species, 10191 kg/ha annual dicotyledonous species and 1130 kg/ha perennial dicotyledonous species. The herbicides Merlin Duo 2,5 l/ha and Lumax 3,5 l/ha pre-plant applied had a high control for annual monocotyledonous weeds (99-100%), till for the perennial monocotyledonous weeds was only 8-27%. The control of annual and perennial dicotyledonous weeds was low 3-13%. The total control degree for both herbicides was 56-60%.

When these both herbicides were applied early post-plant the total control degree for each plot ranged between 73-86% due to most resistant annual and perennial dicotyledonous weeds such as *Xantium strumarium, Cirsium arvense, Convolvulus* *arvensis* and *Sorghum halepense* a perennial monocotyledonous weed. When herbicides Merlin Duo 2,5 l/ha and Lumax 3,5 l/ha were used together with Equip 1,75 l/ha the total control degree for annual and perennial monocotyledonous species was 100% and 14-24% for annual and perennial dicotyledonous species.

The highest control degree for weeds was recorded when the treatment was done with Merlin Duo + Equip and Lumax + Equip for each plot (100%). The herbicide Equip 2,5 l/ha has an efficiency of 100% control for perennial monocotyledonous weeds and only 69% control for annual monocotyledonous weeds. The control degree for annual and perennial dicotyledonous weeds was 3-4%. The herbicide Mustang recorded an efficiency of 95-100% control for annual and perennial dicotyledonous weeds. In 2008 year were recorded normal rainfalls (257,8 mm). On the control plot the total mass of weeds was 30020 kg/ha divided in 15560 kg/ha annual monocotyledonous species, 960 kg/ha perennial monocotyledonous species, 11870 kg/ha annual dicotyledonous species and 1630 kg/ha perennial dicotyledonous species (table no.3). In this year the herbicides applied for control of annual and perennial monocotyledonous species recorded 86-100% efficiency. High efficiency of herbicides in 2008 was due also to rainfalls which come down after treatments (38,6 mm). In 2009 year all used herbicides provided selectivity for maize crop (Table no.4). There were recorded 219,4 mm rainfalls and weeds quantity was 28200 kg/ha green mass. Weeding degree in maize crop in 2009 was high, so in control plot the total mass of weeds was 28200 kg/ha divided in 15400 kg/ha annual monocotyledonous species, 730 kg/ha perennial monocotyledonous species, 11275 kg/ha annual dicotyledonous species and 1525 kg/ha perennial dicotyledonous species. The herbicides which contain isoxaflutole + terbutilazin (2,5 l/ha) and mesotrione + metolaclor + terbutilazin (3,5 l/ha) pre-plant applied had high efficiency to control annual monocotyledonous species (Echinochloa crus-gali, Setaria glauca) recording 99% control and low efficiency to control perennial monocotyledonous species (Sorghum halepense) recording 5-15% control. These formulas had also low efficiency to control annual and perennial dicotyledonous species (1-5%). The total control degree was 53-54%. When the herbicide Merlin Duo 2,5 l/ha was applied early post plant the control degree was 85%. This had also a good control to annual monocotyledonous species (100%) and only 67% to perennial monocotyledonous species. The annual and perennial dicotyledonous species were controlled only 61-69%. When the herbicide Lumax 3,5 l/ha was applied early post plant the total control degree was 73%. The control degree was 100% for annual monocotyledonous species, 62% for perennial monocotyledonous species and 39-67% for the annual and perennial dicotyledonous species. When there two herbicides were applied together with florasulfuron + isoxadifen-etil 1,75 l/ha recommended for the control of perennial monocotyledonous species, the efficiency is growing up to 100%. The efficiency for the control of annual and perennial dicotyledonous species was low (23-41%). The total control degree was 64-66%.When the herbicides used for the control of monocotyledonous species were applied together with another one which contain flosasuflam + acid 2,4 D EHE 0,5 l/ha used for the control of annual and perennial dicotyledonous, the efficiency was growing up to 72-97%. When was used a combination of three herbicides such as Merlin Duo 2,5 l/ha (pre-plant applied), Equip 1,75 l/ha and Mustang 0,5 l/ha (post plant applied) the efficiency was 100%. If it was applied only Equip when Sorghum halepense was 10-15 cm high the herbicide efficiency was 100% for perennial monocotyledonous species and 66% for annual monocotyledonous species. The control degree of annual and perennial dicotyledonous species was low (3-14%). When was applied only Mustang the control of annual and perennial dicotyledonous species was 96-99%. As average on 2007-2009 the herbicides Merlin Duo 2,5l/ha (pre-plant and early post-plant), Lumax 3,5 l/ha (pre-plant and early post-plant) and Equip 1,75 l/ha (post-plant) had a total control to annual and perennial monocotyledonous weeds and low efficiency to annual and perennial dicotyledonous species (Table no.5).

Table 2

The selectivity and efficiency of herbicides applied to maize crop before and after plants emerge in 2007 year

No.	Variant	Dose l/ha	Time of application	Select EWRS	A.M. Kg/ha	CD	A.D. Kg/ha	CD	P.D. Kg/ha	CD	P.M. Kg/ha	CD	Total kg/ha	CD
1	Martor I – 2 praşile mecanice + manual	-	-	1	-	100	-	100	90	99	-	100	90	100
2	Martor II nepră̆şit	-	-	1	13550	0	10191	0	1130	0	520	0	25391	0
3	Merlin Duo	2,5	pre	1	90	99	9580	6	1100	3	475	8	11245	56
4	Merlin Duo	2,5	postem timp.	1	-	100	2800	63	540	52	160	70	3500	86
5	Merlin Duo+Equip	2,5+1,75	pre+post	1	-	100	8800	14	940	17	-	100	9740	62
6	Merlin Duo+Mustang	2,5+0,5	postem timp.+post	1	85	99	40	0	60	95	470	10	655	97
7	Merlin Duo+Equip + Mustang	2,5+1,75+0,5	pre+post+ post	1	-	100	-	0	55	95	-	-	55	100
8	Lumax	3,5	pre	1	70	100	8830	13	1006	11	380	27	10286	60
9	Lumax	3,5	postem timp.	1	-	100	5360	48	430	62	110	79	5900	73
10	Lumax + Equip	3,5+1,75	pre+post	1	-	100	7800	24	980	13	-	-	8780	66
11	Lumax + Mustang	3,5+0,5	postem timp.+post	1	66	100	20	100	45	96	355	32	486	98
12	Lumax + Equip +Mustang	3,5+1,75+0,5	pre+post+ post	1	-	100	-	100	35	97	-	100	35	100
13	Equip	2,5	post	1	700	69	8830	4	1100	3	-	100	10630	58
14	Mustang	0,5	post	1	13480	0	45	0	55	95	520	0	14100	45

A.M = annual monocotyledonous; A.D. = annual dycotyiledonous; P.D. = perrenial dycotyledonous; P.M.= perrenial monoctyledonous; C.D. = control degree

Table 3

The selectivity and efficiency of herbicides applied to maize crop before and after plants emerge in 2008 year

No.	Variant	Dose l/ha	Time of application	Select. EWRS	A.M. Kg/ ha	CD	P.M. Kg/ha	CD	A.D. Kg/ha	CD	P.D. Kg/ha	CD	Total kg/ha	CD
1	Martor I – 2 praşile mecanice + manual	-	-	1	-	100	-	100	-	100	100	94	100	100
2	Martor II neprăşit	-	-	1	15560	0	960	0	11870	0	1630	0	30020	0
3	Merlin Duo	2,5	pre	1	135	99	920	4	11370	4	1590	2	14015	53
4	Merlin Duo	2,5	postem timp.	1	-	100	130	86	3400	71	680	58	4210	86
5	Merlin Duo+Equip	2,5+1,75	pre+post	1	-	100	-	100	10280	13	1470	10	11700	61
6	Merlin Duo+Mustang	2,5+0,5	postem timp.+post	1	130	99	900	6	40	100	70	96	1140	96
7	Merlin Duo+Equip + Mustang	2,5+1,75+0,5	pre+post+post	1	-	100	-	100	-	100	50	97	50	100
8	Lumax	3,5	pre	1	90	100	845	12	9960	25	1540	6	11435	62
9	Lumax	3,5	postem timp.	1	-	100	95	90	4870	59	560	66	5525	82
10	Lumax + Equip	3,5+1,75	pre+post	1	-	100	-	100	10110	15	1440	12	11550	62
11	Lumax + Mustang	3,5+0,5	postem timp.+post	1	80	100	835	13	25	100	55	97	995	97
12	Lumax + Equip +Mustang	3,5+1,75+0,5	pre+post+post	1	-	100	-	100	-	100	40	98	40	100
13	Equip	2,5	post	1	800	69	-	100	9880	8	1600	2	12280	60
14	Mustang	0,5	post	1	15500	0	955	0	55	100	70	96	16650	45

A.M = annual monocotyledonous; A.D. = annual dycotyiledonous; P.D. = perrenial dycotyledonous; P.M.= perrenial monoctyledonous

C.D. = control degree

Table 4

The selectivity and efficiency of herbicides applied to maize crop before and after plants emerge in 2009 year

No.	Variant	Dose L/ha	Time of application	Select EWRS	A.M. Kg/ ha	CD	A.D. Kg/ha	CD	P.D. Kg/ha	CD	P.D. Kg/ha	CD	Total kg/ha	CD
1	Martor I – 2 praşile mecanice + manual	-	-	1	-	100	-	100	120	97	-	100	120	100
2	Martor II neprăşit	-	-	1	15400	0	11275	0	1525	0	730	0	28200	0
3	Merlin Duo	2,5	pre	1	150	99	10720	5	1515	1	690	5	13075	54
4	Merlin Duo	2,5	postem timp.	1	-	100	3500	69	600	61	240	67	4340	85
5	Merlin Duo+Equip	2,5+1,75	pre+post	1	-	100	8700	23	950	38	-	100	9650	66
6	Merlin Duo+Mustang	2,5+0,5	postem timp.+post	1	130	99	45	100	40	97	680	7	895	97
7	Merlin Duo+Equip + Mustang	2,5+1,75+0,5	pre+post+ post	1	-	100	-	100	30	98	-	100	30	100
8	Lumax	3,5	pre	1	100	99	11130	1	1508	1	620	15	13258	53
9	Lumax	3,5	postem timp.	1	-	100	6920	39	500	67	280	62	7700	73
10	Lumax + Equip	3,5+1,75	pre+post	1	-	100	8300	26	900	41	-	100	10100	64
11	Lumax + Mustang	3,5+0,5	postem timp.+post	1	190	100	30	100	35	98	610	16	765	72
12	Lumax + Equip +Mustang	3,5+1,75+0,5	pre+post+post	1	-	100	-	100	20	99	-	100	20	100
13	Equip	2,5	post	1	1900	66	9700	14	1480	3	-	100	12080	57
14	Mustang	0,5	post	1	15300	0	65	99	55	96	725	0	16145	43

A.M = annual monocotyledonous; A.D. = annual dycotyiledonous; P.D. = perrenial dycotyledonous; P.M.= perrenial monoctyledonous

C.D. = control degree

Table 5

The selectivity and efficiency of herbicides applied to maize crop before and after plants emerge (average 2007-2009)

No.	Variant	Dose l/ha	Time of application	Select EWRS	A.M. Kg/ ha	CD	P.M. Kg/ha	CD	A.D. Kg/ha	CD	P.D. Kg/ha	CD	Total kg/ha	CD
1	Martor I – 2 praşile mecanice + manual	-	-	1	-	100	-	100	-	100	103	97	103	100
2	Martor II neprăşit	-	-	1	14837	0	737	0	11112	0	1428	0	28114	0
3	Merlin Duo	2,5	pre	1	125	99	695	6	3233	71	1402	2	12778	54
4	Merlin Duo	2,5	postem timp.	1	-	100	177	74	9260	17	607	57	4017	86
5	Merlin Duo+Equip	2,5+1, 75	pre+post	1	-	100	-	100	9243	13	1120	22	10363	63
6	Merlin Duo+Mustang	2,5+0, 5	postem timp.+post	1	115	99	683	8	42	100	57	96	897	97
7	Merlin Duo+Equip + Mustang	2,5+1, 75+0,5	pre+post+po st	1	-	100	-	100	-	100	45	97	45	100
8	Lumax	3,5	pre	1	87	100	615	18	9973	10	1351	6	12026	58
9	Lumax	3,5	postem timp.	1	-	100	162	77	5717	49	497	65	6376	76
10	Lumax + Equip	3,5+1, 75	pre+post	1	-	100	-	100	8737	22	1107	22	9844	65
11	Lumax + Mustang	3,5+0, 5	postem timp.+post	1	79	100	600	20	25	100	45	97	749	97
12	Lumax + Equip +Mustang	3,5+1, 75+0,5	pre+post+po st	1	-	100	-	100	-	100	32	98	32	100
13	Equip	2,5	post	1	800	95	-	100	9470	5	1393	3	11663	59
14	Mustang	0,5	post	1	14760	0	733	0	55	100	60	96	15628	45

A.M = annual monocotyledonous; A.D. = annual dycotyiledonous; P.D. = perrenial dycotyledonous; P.M.= perrenial monoctyledonous

C.D. = control degree

CONCLUSIONS

As average on three years 2007-2009, the herbicides Merlin Duo 2,5 l/ha, Lumax 3,5 l/ha and Equip 1,75 l/ha had a total control to annual and perennial monocotyledonous weeds (95-100%) and low efficiency to annual and perennial dicotyledonous species (2-22%).

The herbicide Mustang 0,5 l/ha applied during maize crop vegetation has a very good efficiency in the control of annual and perennial weeds (96-100%).

The herbicides Merlin Duo 2,5 l/ha, Lumax 3,5 l/ha and Equip 1,75 l/ha proved selectivity for maize crop and controlled significantly annual and perennial monocotyledonous weeds. These herbicides had a low effect to annual and perennial dicotyledonous species which diminished significantly the yield comparatively with the control.

The combinations of herbicides used for the control of monocotyledonous and dicotyledonous weeds were tolerated in a high level and also had a large control to the annual and perennial monocotyledonous and dicotyledonous weeds (97-100%).

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COMPORTAREA UNOR HIBRIZI DE FLOAREA-SOARELUI SUB INFLUENTA INGRASAMINTELOR CHIMICE, IN CONDITIILE CULTIVARII ACESTORA IN ZONA STOENESTI - OLT

THE BEHAVIOUR OF CERTAIN SUN FLOWER HYBRIDS UNDER THE INFLUENCE OF CHEMICAL FERTILIZERS IN THE TERMS OF CULTIVATING THEM IN THE AREA STOENESTI-OLT

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REZUMAT

Sporirea productiei de floarea-soarelui in conditiile nou create in agricultura dupa evenimentele din 1989 (in principal de faramitare a terenurilor agricole prin improprietarirea celor in drept), implica folosirea ingrasamintelor chimice, asa cum reiese din cercetarile efectuate pana in prezent, ridica potentialul de fertilitate al solurilor si contribuie in mod direct la sporirea productiei la hectar. In cadrul S.C.Semrom Oltenia S.A, ferma Stoenesti, in perioada 2008-2010 s-au efectuat cercetari care au urmarit stabilirea nivelurilor optime de fertilizare, care sa asigure productii mari si economice la noii hibrizi de floarea-soarelui cultivati pe un cernoziom de tip cambic.

ABSTRACT

Increasing the sun-flower production under the newly created circumstances in agriculture after the events from 1989 (mainly of dividing agricultural fields by appropriating to their rightful owners), involves the use of chemical fertilizers, which, as shown from the researches made until now, increases the fertility potential of the soils and contributes directly to the growth of the production per hectare. Within the framework of S.C. SEMROM OLTENIA S.A, STOENESTI farm, between 2008-2010, researches were made to establish the optimum levels of fertilization, in order to provide large and thrifty productions at the new sun-flower hybrids, cultivated on a cambic chernozem.

INTRODUCTION

As a result of applying the law of the land, agricultural land has been divided and it's been reached that through the allotment to coexist small holdings, mostly up to three hectares.
In this respect, the present paper shows the advantages of using chemical fertilizers, leading to increased agricultural production per hectare.
The research was limited to corn for grain and sunflower grown in the area Stoenesti, Jud. Olt.
We used a series of corn hibryds and sunflower seeds, fertilizers and appropriate comparisons were made between their productions.

MATERIAL AND METHOD

The experience in the period 2008-2010 was performed on a chernozem-cambic soil. The settlement of the experience was made after the method of subdivided field plots with two factors, A-Agrofund (doses of fertilizers – kg a.o/ha):a1=N_0P_0;a2=$N_{40}P_{40}$;a3=$N_{80}P_{80}$;a4=$N_{80}P_{80}K_{80}$;a5=$N_{120}P_{120}$;a6=$N_{120}P_{120}K_{120}$, B – sunflower hybrids:b1 – Select (Witness -mt);b2-Performer;b3-PR63A80;b4 – PR64A44.
The Performer and Select hybrids are simple, Romanian hybrids, created at I.C.C.P.T Fundulea, and the PR63A80 and PR64A44 are also simple hybrids, created in The United States by the Pioneer company.
It was used a culture technology that is specific to fields with chernozem soils.
Fall plowing has harrowed, and the seedbed preparation was made with the three-disc harrow and the combinator, the final seedbed preparation work being done perpendicular to the direction of sowing (5-6 cm depth with the combinator).
Maize grain was used as pre-plant. It was ensured a density of 50000 plants/ha for all hybrids of sunflower (the experience was made without irrigation).
Rainfall recorded in the three years of experimentation has oscillated a lot. 2008 was characterized by a rainfall amount close to the annual average, rainfall recorded in April, May and June inducing the achievement of high sunflower yields.
2009 was characterized by a deficit of 47, 4 mm from the multiannual average but rainfall in March and those of June and July have provided high yields of sunflower. In 2010 there were over 80,6 mm from the multiannual average rainfall but they were not spread evenly across the stages of vegetation.
Monthly and annual average temperatures have fluctuated around the normal in all the years of experimentation.
Productions were calculated at 11% humidity and production results have been recovered by the analysis of variance method.

RESULTS AND DISCUSSIONS

The obtained experimental results highlight the fact that sunflower grown on chernozem - cambic type soils from Stoenesti area, Jud.Olt, registers considerable production increases (table 1).
The average production obtained on the unfertilized variant was of 2460 kg/ha. By applying a dose of 40 kg nitrogen/ha a.o. and 40 kg P_2O_5/ha was obtained an average production of 2980 kg seeds/ha , with an increase of 520 kg/ha.
By increasing the dose of nitrogen fertilizer at 80 kg/ha + 80 kg P_2O_5 was achieved the highest production, namely 3140 kg/ha of sunflower seeds, with an increase of 680 kg compared to control.

Table 1

The influence of the agro fund on the production of sunflower on the chernozem-cambic soil type from Stoenesti area, Jud.Olt

Agrofund kg/ha	Average production		Production increase	Significance
	Kg/ha	%		
N_0P_0(mt)	2460	100	-	-
$N_{40}P_{40}$	2980	121	520	***
$N_{80}P_{80}$	3140	128	680	***
$N_{80}P_{80}K_{80}$	3070	125	610	***
$N_{120}P_{120}$	3030	124	570	***
$N_{120}P_{120}K_{120}$	2980	121	520	***

DL 5% = 56 kg/ha
DL 1% = 75 kg/ha
DL 0,1% = 97 kg/ha

Potassium fertilizers did not result in significant production increases, the soil being sufficiently supplied in this item (over 15-17 mg K_2O/100 kg dry soil).
By applying fertilizers doses above 80 kg N a.o./ha + 80 kg P_2O_5 a.o/ha (120 kg N a.o/ha + 120 kg P_2O_5 a.o/ha, namely, 120 kg N a.o/ha + 120 kg P_2O_5 a.o/ha + 120 kg K_2O a.o/ha) were not achieved production increases, but on the contrary, it declined from the original version.
Analyzing the behavior of each hybrid in part on the six levels of fertilization, shows the following:
- The Select hybrid has achieved a an average production of 2360 kg/ha on the unfertilized variant; the highest production, of 3170 kg/ha was achieved on the agrofund 80 kg N/ha a.o + 80 kg P2O5/ha a.o, with an increase of 819 kg/ha. Above this level of fertilization, the productions obtained were slightly lower (3020 – 3100 kg/ha);
- The Performer hybrid has achieved at the unfertilized variant 2220 kg/ha sunflower seeds; Production has reached its highest level on the agro fund 80 kg N/ha a.o + 80 kg P_2O_5/ha a.o (3085 kg/ha), with a production increase of 865 kg/ha;
- The PR63A80 hybrid has achieved the highest production – 3328 kg/ha on the agro fund 80 kg N + 80 kg P_2O_5/ha a.o, with an increase of 998 kg/ha compared to unfertilized control (2330 kg/ha);
- The PR64A44 hybrid has given a maximum production on the agrofund 80 kg N/ha + 80 kg P_2O_5/ha a.o (3176 kg/ha), with an increase of 896 kg/ha compared to control (table 1);
The production increases compared to the unfertilized variant were quite significant on all agrofunds.
Regarding the average productions registered by the 4 hybrids in the experimenting period, we can conclude that the PR63A80 hybrid has achieved higher productions, compared to the other hybrids, registering an average production of 3280 kg/ha, with a very significant increase, of 190 kg/ha compared to the Select hybrid, taken as control.

Table 2

The influence of fertilizer doses (kg/ha) on the production of certain sunflower hybrids

Crt.No	Hybrid / Agrofund	N_0P_0	$N_{40}P_{40}$	$N_{80}P_{80}$	$N_{80}P_{80}K_{80}$	$N_{120}P_{120}$	$N_{120}P_{120}K_{120}$
1	Select	2360	2980	3179	3100	3079	3020
2	Performer	2220	2925	3085	3000	2930	2866
3	PR63A80	2320	3060	3328	3270	3186	3099
4	PR64A44	2280	2960	3176	3050	3034	3136

DL 5% = 188 kg/ha
DL 1% = 235 kg/ha
DL 0, 1% = 290 kg/ha

Table 3

Average productions and certain features of sunflower hybrids, which were experienced at S.C.Semrom Oltenia S.A

Hybrid	Production Kg/ha	Difference Kg/ha	Significance	Vegetation period days	Waist cm	MMB g
Select(mt)	3090	mt	-	122	174	68
Performer	2970	-120		112	172	66
PR63A80	3280	190	***	114	158	66
PR64A44	3060	-30		120	176	65

DL 5% = 76 kg/ha
DL 1% = 97 kg/ha
DL 0, 1% = 120 kg/ha

The superiority of the hybrid PR63A80 in terms of production capacity is also observed in Table 1, where the production level is superior to the other 3 hybrids on 5 of the 6 agro funds (on agrofund $N_{120}P_{120}K_{120}$ hybrid PR64A44 has achieved a production of 3136 kg/ha, with 37 kg more compared to PR63A80).
Research conducted during the vegetation period on certain morphophysiological traits lead to the conclusion that, in the terms of S.C.Semrom Oltenia S.A, the Select hybrid reaches maturity after a period of 122 days. The PR64A44 hybrid has reached maturity 2 days earlier than the Select hybrid, and both hybrids PR63A80 and Performer, with 8, namely 10 days earlier.
The average waists of the plants were 176 cm at the PR64A44 hybrid, 174 cm at the Select hybrid,172 cm at the Performer hybrid and 158 cm at the PR63A80 hybrid.
Regarding MMB, there weren't observed big differences, the value being comprised between 65 g at the PR64A44 hybrid and 68 g at the Select hybrid.

CONCLUSIONS

1. Sunflower, grown on the chernozem-cambic soil from Stoenesti area, Jud.Olt, achieves production increases by applying fertilization.
2. By applying the agrofund 80 kg N + 80 kg P_2O_5/ha a.o it has been achieved a maximum production of 3140 kg, with an increase of 680 kg/ha compared to the unfertilized control variant that was used.
3. All the 4 experienced hybrids in the specific culture conditions from S.C.Semrom Oltenia S.A , Stoenesti area, Jud.Olt (chernozem-cambic) have achieved the highest production increases throughout the administration of agrofund 80 kg N + 80 kg P_2O_5/ha a.o.
4. Regarding the production capacity, the PR63A80 has given the highest average production, of 3280 kg/ha, being followed by the Select hybrid – 3090 kg/ha, the PR64A44 – 3060 kg/ha and the Performer hybrid, with 2970 kg/ha.
The PR63A80, early hybrid (the vegetation period is 114 days) was also characterized by favorable morphological traits, such as plant vigor and uniformity.

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INFLUENTA APLICARII DE DURATA A INGRASAMINTELOR MINERALE SI ORGANICE ASUPRA UNOR INDICATORI DE FERTILITATE A SOLULUI LA PORUMBUL CULTIVAT PE UN SOL PRELUVOSOL ROSCAT DIN ZONA CENTRALA A OLTENIEI

THE INFLUENCE OF LONG TERM APPLYING OF MINERAL AND ORGANIC FERTILIZERS ON CERTAIN SOIL FERTILITY INDICATORS AT THE MAIZE CULTIVATED ON A REDDISH PRELUVOSOIL FROM THE CENTRAL AREA OF OLTENIA

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Keywords: ***manure, nitrogen content, chemical fertilizers***

REZUMAT

Cercetarile au fost realizate pe un sol brun-roscat din Statiunea Didactica Banu-Maracine, in perioada 1998-2002, in conditii de irigare, cand fertilizari organice si anorganice au fost aplicate la porumb si a fost observata evolutia anumitor indicatori ai fertilitatii solului. Am incercat sa raspundem la intrebarea daca elementele nutritive exportate din sol prin productie afecteaza sau nu fertilizarea organica si anorganica.
Cercetarile efectuate in tara in numeroase statiuni de cercetare arata ca porumbul extrage din sol elemente chimice nutritive in cantitati insemnate, fiind considerat sub acest aspect ca una din plantele mari consumatoare [1,3].
Prin folosirea sistematica a ingrasamintelor chimice si organice, solul cunoaste modificari importante inclusiv in ceea ce priveste continutul in elemente nutritive.

ABSTRACT

The researches have been carried out on the brown-reddish soil from Banu-Maracine Didactic Station, between 1998-2002 in irrigated conditions, when the organic and inorganic fertilization were applied to corn and was observed the evolution of certain soil fertility indicators. We have tried to answer the question whether the nutrients exported from the soil by yield does affect the organic and inorganic fertilization.
The researches carried out in the country in several Research Stations show that maize extracts from the soil nourishing chemical elements in rather large quantities, this aspect turning him into one of the most consuming plants [1,3].
By using systematically chemical and organic fertilizers, the soil suffers several important alterations inclusively regarding the content in nourishing chemical elements.
Increasing the sun-flower production under the newly created circumstances in agriculture after the events from 1989 (mainly of dividing agricultural fields by appropriating to their rightful owners), involves the use of chemical fertilizers, which, as shown from the researches made until now, increases the fertility potential of the soils and contributes directly to the growth of the production per hectare. Within the framework of S.C. SEMROM OLTENIA S.A, STOENESTI farm, between 2008-2010, researches were made to establish the optimum levels of fertilization, in order to provide large and thrifty productions at the new sun-flower hybrids, cultivated on a cambic chernozem.

INTRODUCTION

In the current context of ecological crops, it has been observed the effect of fertility increase, using manure.
Also, it was tried a combination of the two forms of soil fertility enhancement, respectively, through chemical and organic fertilizers.
Research carried out on the brown-reddish soil from the central area of Oltenia were made for observing the development of soil fertility, using manure.

MATERIAL AND METHOD

Surveys were conducted in 1994-2002, on a brown-reddish soil in the central area of Oltenia, without irrigation, when was made organic and chemical fertilization at maize and was followed the evolution of soil fertility indicators, in this paper being presented the results of 1998-2002.
There were studied 2 factors: factor A – manure with 3 graduations (a_1-unfertilized; a_2 – 15 t/ha manure; a_3 – 30 t/ha manure) and factor B – chemical fertilizers with 8 graduations (b_1 – unfertilized; b_2 – N_{64}; b_3 – P_{48}; b_4 – K_{80}; b_5 – $N_{64}P_{48}$; b_6 – $N_{64}K_{80}$; b_7 – $P_{48}K_{80}$; b_8 – $N_{64}P_{48}K_{80}$).
The performed experiments were polifactorial and placed in subdivided parcels, have required a calculation of multiple dispersional analysis, using the polynomial functions of first degree ($y=ax+b$) and polynomial functions of second degree ($y=ax^2+bx+c$). Functions were considered reprezentative only when the correlation coefficient or ratio was at least significant.

RESULTS AND DISCUSSIONS

From the data in table 1 we can notice that, after maize, in the concrete conditions of the carried out experiment, (fertilized variants for 5 years with manure compared to the unfertilized control this whole period of time), the soil content in humus, nitrogen as well as the chlorine quantity from the aqueous extract were the only indicators which were improved throughout applying manure.
The humus content showed higher values and even higher as the dose of manure was higher.
We appreciate this as being normal, manure not being fully mineralized, in the specimen collection process(these being done from all 4 rehearsal of the experiment) also taking decomposing organic matter, which have increased the values of the indicator in question, from 2,07% at the unfertilized control variant, to 2,26% at the variant fertilized with 30 t/ha manure.
Total nitrogen showed an increasing trend, together with increasing doses of manure, because the correlation always exists between the soil humus content and total nitrogen.
The C1 anion in the aqueous extract has been strongly reduced under the influence of manure doses, by applying 30 t/ha manure obtaining a 3 time decrease of the chlorine ion.
On the evolution of soil fertility traits compared with chemical fertilizers applied to maize, from table 2 it is apparent that chemical fertilizers have changed in quite a small range the soil fertility indicators.
The PH value of the soil shows a decreasing tendency, respectively, of increasing acidity in the options which have received chemical fertilizers with nitrogen, potassium, nitrogen plus potassium, respectively, nitrogen, phosphorus and potassium.
These values of the soil PH swing in very small limits and we believe that they are not correlated to the chemical fertilizers applied to corn crop.

There are obvious the trends of increasing soil organic matter, in the variants which have received more fertilizer, especially with nitrogen, at least as obvious being the growth trends of mobile phosphorus, in the variants that have received phosphorus as fertilizer, and last but not least, the growth trends of mobile potassium, in the variants that have received potassium as fertilizer.
The modifications of these agro-chemical indicators have occurred, as seen from the data presented in Table 3, due to an increased export of nutrients from the soil, in fertilized variants.

Table 1

The influence of the manure on some agrochemical indicators of the brown-reddish soil, applied to corn, average value of the 1998-2002 period

The variant	**The horizon**	**Depth (cm)**	**pH**		**Humus**		**N total**		**P_{ppm}**		**K_{ppm}**		**Cl^-**		**SO_4^-**	
			%	dif	%	dif	%	dif	ppm	dif	ppm	dif	mg/100	dif	mg/100	Dif
Unfert.	Aa	25	6,05	-	2,07	-	0,098	-	19,17	-	108,0	-	21,0	-	18,7	-
Manure 15 t/ha	Aa	25	6,11	-0,07	2,1 8	0,1 1	0,120	0,022	18,7	0,10	113,7	0,57	11,0	-10	20,0	1,3
Manure 30 t/ha	Aa	25	6,18	-0,13	2,2 6	0,1 9	0,122	0,024	18,0	-0,17	95,2	-1,28	7,0	-14	20,0	1,3

Table 2

The influence of the manure applied to corn on some agrochemical indicators of the brown-reddish soil, average value of the 1998-2002 period

The variant	**The horizon**	**Depth (cm)**	**pH**		**Humus**		**N total**		**P_{ppm}**		**K_{ppm}**		**Cl^-**		**SO_4^-**	
			%	dif	%	dif	%	dif	ppm	dif	ppm	dif	mg/100	dif	mg/100	Dif
Unfert.	Aa	25	6,2	-	2,07	-	0,086	-	20,0	-	105,0	-	11,5	-	21,5	-
N_{64}	Aa	25	6,04	-0,16	2,05	0,02	0,108	0,021	20,5	0,05	105,0	-	11,08	0,3	21,9	0,4
P_{48}	Aa	25	6,24	0,04	2,10	0,03	0,098	0,012	22,7	0,27	108,0	0,30	12,2	0,7	19,3	-2,2
K_{80}	Aa	25	6,14	-0,06	2,12	0,05	0,093	0,007	20,5	0,05	114,0	0,90	9,5	-1,9	13,2	-8,3
$N_{64}P_{48}$	Aa	25	6,20	-	2,14	0,07	0,112	0,014	22,6	0,26	132,0	2,70	12,5	1,0	20,4	-1,1
$N_{64}K_{80}$	Aa	25	6,10	-0,10	2,17	0,1	0,116	0,018	21,50	0,15	156,0	5,70	7,8	3,7	15,5	-6,0
$P_{48}K_{80}$	Aa	25	6,30	0,10	2,19	0,12	0,102	0,016	23,50	0,35	118,0	4,30	7,5	-4,0	15,9	-5,6
$N_{64}P_{48}K_{80}$	Aa	25	6,09	-0,11	2,2	0,13	0,118	0,020	23,0	0,30	150,0	4,50	9,1	2,4	16,4	-5,1

Table 3

The loosing of the soil nutrients and the amount of the fertilizer active ingredients used (Average values of the 1998-2002 period)

	N		**P_2O_5**		**K_20**	
	Kg/ha	**User grade**	**Kg/ha**	**User grade**	**Kg/ha**	**User grade**
Fertilisers						
Unfert.	43,5	-	21,4	-	10,2	
N_{64}	64,2	32,4	22,0	-	10,6	
P_{48}	58,4	-	25,9	9,37	10,9	
K_{80}	49,8	-	21,4	-	11,8	
$N_{64}P_{48}$	70,6	42,34	32,8	23,75	11,2	
$N_{64}K_{80}$	80,2	57,34	22,5	-	11,9	
$P_{48}K_{80}$	48,3	-	28,1	13,95	10,0	
$N_{64}P_{48}K_{80}$	87,5	68,75	32,41	22,91	13,5	
Unfert.	42,6	-	22,0	-	10,5	
Manurel5 t/ha	71,3	-	27,4	-	11,9	
Manure30 t/ha	90,0	-	32,8	-	12,2	

CONCLUSIONS

1. The soil content in humus, nitrogen and the amount of chlorine in the aqueous extract were the only indicators improved by manure application.
2. There is a trend of increasing soil organic matter in the options which have received more fertilizers, especially with nitrogen, of growth of mobile phosphorus variants that have received phosphorus fertilizer and of growth of mobile potassium in the variants which have received potassium as fertilizer.
3. The change of the agrochemical indicators occurred due to an increased export of chemical elements in soil nutrients, in the case of fertilized variants.
4. The amount of nitrogen exported from the soil was of 43,5 kg/ha at the control variant(V_1), of 87,5 kg/ha at the $N_{64}P_{48}K_{80}$ variant (V_8), 80,2 kg/ha at the $N_{64}K_{80}$ variant (V_6), 70,6 kg/ha at the $N_{64}P_{48}$ variant(V_5), small amounts of nitrogen being exported in the variants that have received only phosphorus (V_3), potassium (V_4) or phosphorus and potassium (V_7) as fertilizer.
5. The variants in which was incorporated manure into the soil have achieved a considerable nitrogen export (90, respectively, 71,3 kg/ha).
6. The usability of nitrogen registers its highest values at V_8 (68,75%) concomitant with the higher productions obtained and it decreases at V_5 and V_6.
7. The highest values of the utilization coefficient of phosphorus were achieved at the variants which have received: nitrogen and phosphorus (V_5 – 23,75%), nitrogen, phosphorus and potassium (V_8 – 22,9%), phosphorus and potassium (V_7 – 13,95%).

8. The potassium export was very reduced and the usability very low, the analysis being made at harvesting and a part of the potassium immigrating into the soil.

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INFLUENȚA DIFERITELOR MĂSURI TEHNOLOGICE ASUPRA CALITĂȚII DE PANIFICAȚIE LA GRÂU ÎN CONDIȚIILE DE LA SCDA ȘIMNIC

THE INFLUENCE OF DIFFERENT TREATMENTS TO WHEAT BAKING QUALITY IN ARDS SIMNIC AREA CONDITIONS

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REZUMAT

Principalul obiectiv al tehnologiilor agricole este acela de a oferi cele mai bune condiții pentru creșterea și dezvoltarea plantelor și de a asigura nivele ridicate ale producției. Conținutul în proteină al semințelor de grâu este influențat pozitiv de orice măsură menită să sporească fertilitatea solului. Una dintre aceste măsuri este și rotația culturii cu o leguminoasă. Cel mai scăzut conținut în proteină s-a înregistrat în condiții de monocultură (11,9% PB), urmat de rotația de patru ani (12,7 % PB), de cea de doi ani (12,9% PB) și cea de trei ani (13,2% PB).Comparativ cu monocultura, conținutul în proteină a fost mai mare cu 8% în rotația de doi ani și cu 11% în cea de trei ani. Cel mai ridicat conținut în proteină a fost obținut atunci când grâul a urmat după mazăre. Aplicarea îngrășămintelor cu azot determină o creștere a conținutului în proteină cu 2,1-2,4%, comparativ cu martorul nefertilizat în cadrul aceleiași rotații. Îngrășămintele cu fosfor aplicate singure determină o creștere nesemnificativă a conținutului în proteină pentru toate rotațiile experimentate (0,5%), dar au un efect pozitiv atunci când sunt aplicate împreună cu îngrășămintele cu azot ($N_{100}P_{60}$) de 1,9-2,3% atunci când grâul urmează după mazăre și porumb în rotațiile de doi și trei ani. Gunoiul de grajd determină o creștere a conținutului în proteină cu 1,2-1,5% în rotațiile de doi și patru ani după porumb.

ABSTRACT

The main goal of cropping technologies is to offer the most proper conditions for plants development and to suport high yield levels. The protein content of wheat grains is positively influenced by any measure that increase soil fertility. One of these measures is crop rotation using vegetables as previous crop. The lowest protein content was recorded in monoculture system (11,9% BP), followed by four years crop rotation (12,7% BP), two years rotation (12,9% BP) and three years crop rotation (13,2% BP).Comparatively with monoculture system the protein content was higher with 8% in two years crop rotation and 11% in three years crop rotation system. The best protein content was recorded when wheat followed after pea. Nitrogen fertilizer improved the protein content with 2,1-2,4% comparatively with the unfertilized control for the same crop rotations. The phosphorus fertilizer lonely applied determined low protein increases for all crop rotations (0,5 %), but had a positive effect to protein content when was applied with nitrogen fertilizer ($N_{100}P_{60}$) with 1,9-2,3% when wheat followed after pea and maize in two and three years crop rotations. The manure determined the increase of protein content with 1,2-1,5 % in two and four years crop rotations when wheat followed after maize.

INTRODUCTION

The effect of crop rotation and fertilizing level to yield capacity is unnoticed sometimes. Al the benefits of crop rotation have finally positively effect to yield and its quality. Beside crop rotation and fertilizing level the climatically conditions play an important role to obtain high yields. The wheat yielding capacity is also different depending on crop rotation and organic and chemical fertilizing system. Crop rotation and especially the fertilizing system have an important influence to yielding and quality parameters. The wheat baking quality can be emphasizing considering the correlation between quality and amount of grain proteins with ecological and technological factors, such as: soil, climatically conditions, previous crop and fertilizing level (Tianu et al., 1995). Through its components nitrogen, phosphorus, potassium, manure can affects considerably the protein synthesis (Clarke et al., 1987; Popescu et al., 1997). The protein content depends by wheat variety, cropping technology (irrigated, rainfed, fertilizing) and edaphological conditions (Balteanu, 1997). Usually, high protein content (13% BP) means a good baking quality (Oproiu, 1987). The experiences realized to ARDS Simnic area in 2008-2010 were focused on the influence of fertilizing level and crop rotation to quality parameters of Briana variety.

MATERIAL AND METHODS

The luvosoil from ARDS Simnic is characterized by low fertility, pH value which ranged from 5,7 to 6,9 (in water extract), low humus content between 0,48% deeply and 1,8% on the top. The nitrogen content is correlated directly with humus content and has low values on whole soil profile. The phosphorus content is 54 ppm and the potassium content ranged between 84-128 ppm. The climatically conditions during the experiment were favorable for wheat cropping, even if the rainfalls and temperatures determined different results. The layout was designed as split-plots with two factors:

Factor A- crop rotation
a_1 – monoculture
a_2 – two year crop rotation maize-wheat
a_3 – three years crop rotation maize-pea-wheat
a_4 – four years crop rotation maize- wheat-sun-flower-wheat

Factor B – fertilizing level
b_1 – unfertilized
b_2 – N_{100}
b_3 – P_{60}
b_4 – $N_{100}P_{60}$
b_5 – 20 t/ha manure

RESULTS AND DISCUSSIONS

The results obtained between 2008-2010 showed that in ARDS Simnic area conditions the manure, nitrogen and phosphorus fertilizers influenced differently the grains protein content depending on climatically conditions and previous crop. It was observed also a closed relation between fertilizing levels and protein content as much as between previous crop and protein content. The data presented in table no.1 show a progressive high protein content beginning with monoculture thought three years crop rotation. The lowest protein content was recorded in monoculture system (11,9% PB), followed by four years crop rotation (12,7% PB), two years rotation (12,9% PB) and three years crop rotation (13,2% PB).Comparatively with monoculture system the protein content was higher with 8% in two years crop rotation and 11% in three years crop rotation system. The best protein content was recorded when wheat followed after pea.

Table 1

The influence of crop rotation to wheat grains protein content

Crop rotation	Fetilizer level	Protein content 2008	Protein content 2009	Protein Content 2010	Average	Diff.	%
Wheat monocrop	Unfertilized	11,5	11,1	10,5	10,0	Control	Control
	N_{100}	13,3	12,3	11,8	12,5		
	P_{60}	12,1	11,2	10,6	11,3		
	$N_{100}P_{60}$	12,6	12,9	12,0	12,5		
	20 t/ha manure	11,3	13,5	11,4	12,1		
Average		**12,2**	**12,2**	**11,2**	**11,9**		
Two years crop rotation Maize-wheat	Unfertilized	11,7	12,1	11,2	11,7	0,8	107
	N_{100}	13,8	13,8	12,8	13,5	1,0	108
	P_{60}	12,4	12,3	11,8	12,2	0,9	108
	$N_{100}P_{60}$	14,4	14,3	13,2	14,0	1,5*	112
	20 t/ha manure	12,9	14,0	12,8	13,2	1,1	109
Average		**13,0**	**13,3**	**12,4**	**12,9**	**1,0**	**108**
Three years crop rotation Maize-pea-wheat	Unfertilized	12,7	12,2	11,8	12,2	1,3*	112
	N_{100}	14,6	14,8	13,6	14,3	1,8**	114
	P_{60}	12,6	12,4	12,2	12,4	1,1	110
	$N_{100}P_{60}$	14,5	14,3	13,4	14,1	1,6**	113
	20 t/ha manure	12,9	13,8	13,0	13,2	1,1	109
Average		**13,5**	**13,5**	**12,8**	**13,2**	**1,3***	**111**
Four years crop rotation Maize-wheat-sun-flower-wheat	Unfertilized	11,5	12,1	11,4	11,7	0,8	107
	N_{100}	14,5	14,7	13,2	14,1	1,6*	113
	P_{60}	12,2	11,7	11,7	11,9	0,6	105
	$N_{100}P_{60}$	13,1	13,7	12,8	13,2	0,7	106
	20 t/ha manure	12,5	13,2	12,4	12,7	0,6	105
Average		**12,7**	**13,1**	**12,3**	**12,7**	**0,8**	**107**

LSD 5% = 1,2%; 1% = 1,7%; 0,1% = 2,4%

The phosphorus and potassium fertilizers influence differently the protein content depending on the climatically conditions. (table no.2).The average protein content values recorded on different fertilizing levels showed an increase of this parameter for variants fertilized with nitrogen (N_{100}) for both three and four years. Nitrogen fertilizer improved the protein content with 2,1-2,4% comparatively with the unfertilized control for the same crop rotations.

The phosphorus fertilizer lonely applied determined low protein increases for all crop rotations (0,5 %), but had a positive effect to protein content when was applied with nitrogen fertilizer ($N_{100}P_{60}$) and with 1,9-2,3% when wheat followed after pea and maize in two and three years crop rotations.

The protein content recorded by unfertilized variant was low (11,6%) in all crop rotations. The manure determined the increase of protein content with 1,2-1,5 % in two and four years crop rotations when wheat followed after maize.

Table 2

The influence of fertilizing level to wheat grains protein content

Crop rotation	Protein content 2008	Protein content 2009	Protein content 2010	Average	Diff.	%
Unfertilized						
Wheat monocrop	11,5	11,1	10,2	10,9		
2 years maize-wheat	11,7	12,1	11,2	11,7	Control	Control
3 years maize-pea-wheat	12,7	12,2	11,8	12,2		
4 years maize-wheat-sun-flower-wheat	11,5	12,1	11,4	11,7		
Average	11,8	11,9	**11,2**	**11,6**		
Nitrogen fertilizer						
Wheat monocrop	13,3	12,3	11,8	12,5	$1,6^{**}$	114
2 years maize-wheat	13,8	13,8	12,8	13,5	$1,8^{**}$	115
3 years maize-pea-wheat	14,6	14,8	13,6	14,3	$2,1^{***}$	117
4 years maize-wheat-sun-flower-wheat	14,5	14,7	13,2	14,1	$2,4^{***}$	120
Average	**14,1**	**13,9**	**12,9**	**13,6**	**2,0**	**117**
Phosphorus fertilizer						
Wheat monocrop	12,1	11,2	10,6	11,3	0,4	104
2 years maize-wheat	12,4	12,3	11,8	12,2	0,5	104
3 years maize-pea-wheat	12,6	12,4	12,2	12,4	0,2	102
4 years maize-wheat-sun-flower-wheat	12,2	11,7	11,7	11,9	0,2	102
Average	**12,3**	**11,9**	**11,6**	**11,9**	**0,3**	**103**
NP fertilizer						
Wheat monocrop	12,6	12,9	12,0	12,5	$1,6^{**}$	115
2 years maize-wheat	14,4	14,3	13,2	14,0	$2,3^{***}$	120
3 years maize-pea-wheat	14,5	14,3	13,4	14,1	$1,9^{***}$	115
4 years maize-wheat-sun-flower-wheat	13,1	13,7	12,8	13,2	$1,5^{***}$	113
Average	**13,6**	**13,8**	**12,9**	**13,4**	**1,8****	**115**
Manure						
Wheat monocrop	11,3	13,5	11,4	12,1	$1,2^{*}$	111
2 years maize-wheat	12,9	14,0	12,8	13,2	$1,5^{**}$	113
3 years maize-pea-wheat	12,9	13,8	13,0	13,2	1,0	108
4 years maize-wheat-sun-flower-wheat	12,5	13,2	12,4	12,7	1,0	108
Average	**12,4**	**13,6**	**12,4**	**12,8**	**1,2***	**110**

DL 5% = 1,1%; DL 1% = 1,5%; DL 0,1% = 2,0%

CONCLUSIONS

The protein content is influenced by relation fertilizing level-crop rotation. The nitrogen fertilizer determines the increase of protein content when wheat followed after pea and maize. The phosphorus fertilizer determines low protein increases for both pea and maize used as previous crops. The manure determines low protein content increases. The higher protein content was recorded in three years crop rotation and pea used as previous crop.

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INFLUENȚA CONDIȚIILOR CLIMATICE ASUPRA POTENȚIALULUI PRODUCTIV LA PORUMB ÎN ZONA OLTENIEI

THE INFLUENCE OF CLIMATICALLY CONDITIONS TO MAIZE YIELDING CAPACITY IN OLTENIA AREA

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Keywords: climatically conditions, maize, yield capacity

REZUMAT

Un set de şapte hibrizi de porumb au fost experimentați la S.C.D.A.Şimnic în 2008 şi 2009, doi ani diferiți din punct de vedere climatic. Pentru a analiza influența condițiilor climatice asupra potențialului productiv al acestor hibrizi s-a calculat producția STAS/ha cu stabilirea diferențelor limită pentru fiecare hibrid în parte şi fiecare an de experimentare. Variația distribuției producției atât între repetiții, cât şi între cei doi ani de experimentare s-a calculat cu ajutorul coeficientului de variație. Repartizând cantitatea totală de precipitații din perioada de vegetație a porumbului şi producția obținută în funcție de fazele de dezvoltare a plantelor s-a analizat şi influența alor factori de mediu (secetă, arşiță, stres hidric) cuantificabili sau nu.

ABSTRACT

Seven maize hybrids have been tested in two different years 2008 and 2009 in ARDS Simnic area conditions. To analyze the influence of climatically conditions to maize yielding capacity it was calculated STAS yield/ha for each hybrid and experimental year. The yield variation among replications and experimental years was established with variation coefficient. Splitting the rainfalls between sowing day until maize harvest and analyzing the yield depending crop stages, it could be observed the influence of other crop constrainers (drought, heat, water stress) even they could be counted or not.

INTRODUCTION

In the last years, the evolution of climatically conditions in Romania recorded large annual and seasonal variations for most of climatically factors which negatively influenced the crops yielding capacity (Mitu and Richita, 2007). Heat and water are two factors that influence equally the maize crop evolution. Water stress and drought lead always to different yield losses levels depending on the constrainer length, its intensity and crop stage. The present paper is focus on the influence of climatically conditions (rainfalls and temperatures) to maize yielding capacity in two different years 2008 and 2009.

MATERIAL AND METHOD

The biological material was represented by seven maize hybrids, as follows: F 376, Symba, Arobase, PR 38A24, Thermo, Tako and Galactic. The experiments were layout to ARDS Simnic under natural field conditions for two years 2007-2008 and 2008-2009. For each hybrid and experimental year it was calculated STAS yield/ha. To establish the significance of yield differences was used the analyze of variance (Săulescu, 1967). The yield variability among trail replications for each and both years was calculated with variation coefficient (vc%) (Ceapoiu, 1968).

RESULTS AND DISSCUTIONS

The yield of each hybrid is the result of its genetic correlated with aphological factors. For the maize hybrids included in this experiment, the genetic potential of each one was influenced by the rainfalls and temperatures characteristic for experimental year. Thus, comparatively with the control (group average), in 2008 could be noticed the differences recorded by F 376 (+682 kg/ha – very significant) and Thermo (+352 kg/ha – significant). The hybrid Pako recorded a very significant yield decrease (- 679 kg/ha) (Table 1).

Table 1

The yielding capacity of maize hybrids in ARDS Simnic area in 2008 year

No.	Hybrid	Yield Kg/ha	%	Diff.	Signif.
1	F 376	3680	123	+682	***
2	Symba	3030	101	+32	
3	Arobase	2700	90	-298	
4	PR 38 A 24	2790	93	-208	
5	Thermo	3350	112	+352	*
6	Pako	2319	77	-679	ooo
7	Galactic	3110	104	+112	
	Average (control)	2998	100		

LSD 5%= 277,79; 0,1%=385,04; 1%= 534,92

In 2009 the hybrids Symba and Thermo recorded a very significant yield increase comparatively with the control (+763 kg/ha and + 703 kg/ha), while Arobase recorded a very significant decrease (-797 kg/ha). The hybrids Pako and Galactic recorded significant distinct decreases (-397 kg/ha and -327 kg/ha) (Table 2).

Table 2

The yielding capacity of maize hybrids in ARDS Simnic area in 2009 year

No.	Hybrid	Yield Kg/ha	%	Diff.	Signif.
1	F 376	6990	99	-77	
2	Symba	7830	111	+763	***
3	Arobase	6270	89	-797	ooo
4	PR 38 A 24	7200	102	+133	
5	Thermo	7770	110	+703	***
6	Pako	6670	94	-397	oo
7	Galactic	6740	95	-327	oo
	Average (control)	7067	100		

LSD 5%= 217,43; 0,1%=301,37; 1%= 418,68

These results showed that 2009 year was more favorable for maize crop comparatively with 2008 year, giving also the possibility for each hybrid to express its genetic potential. The yield differenced between these two years were positive and ranged between 3310 kg/ha (F 376) to 4800 kg/ha (Symba) (Table 3).

Table 3

The yield differences of maize hybrids between 2008 and 2009 years

No.	Hybrid	Yield Kg/ha		Yield differences between 2009 and 2008 years Kg/ha
		2008	2009	
1	F 376	3680	6990	+3310
2	Symba	3030	7830	+4800
3	Arobase	2700	6270	+3570
4	PR 38 A 24	2790	7200	+4410
5	Thermo	3350	7770	+4420
6	Pako	2319	6670	+4351
7	Galactic	3110	6740	+3630

Considering maize crop period (April-August) as a criteria to distribute the rainfalls for each month it was observed that in 2008 year, half of rainfalls came down in June (19%) – Julie (47%) when usually are formed and finalized the yield main components.(Table 4). The high temperature from June (+5,4 ^oC up to multiannual average) leaded to inhibition of metabolic and physiological processes which negatively influenced the main yield components. In these conditions, even in Julie (2008) came down 47% of total rainfalls, the yield was only 1409 kg/ha comparatively with the same month in 2009 when the average yield was 3110 kg/ha.

Table 4

Yield distribution depending on rainfalls came down in 2008 and 2009 years

Specification	April		May		June		Julie		August		Total	
	Cant.	%	Cant.	%	Cant.	%	Cant.	%	Cant.	%	Cant.	%
Rainfalls 2008 l/m^2	52	22	28	12	44	19	111,2	47	0	0	235,2	100
Average yield 2008 kg/ha	659	22	360	12	570	19	1409	47	0	0	2998	100
Rainfalls 2009 l/m^2	13	5	32	14	75,5	32	104,5	44	11	5	236	100
Average yield 2009 kg/ha	353	5	989	14	2262	32	3110	44	353	5	7067	100

In 2009 year the rainfalls-temperatures balance was better than in 2008 year. Obviously, the yield in 2009 year was the result of many other climatically factors interaction, even they were counted or not. For 2008 year the yield was influenced by drought, heat and water stress especially in May, June, Julie leading to significant decreases. It was observed also that the rainfalls came down during maize crop period were almost similar for both experimental years (235, 2 l/m^2 in 2008 and 236, 0 l/m^2 in 2009), but its distribution and interactions with other climatically factors were different.

The variance coefficient (vc %) for each tested hybrid and experimental year (Table 5) show that yield variation was low for both years. The variation coefficient for Arobase hybrid was 12,04% and showed a medium yield variation. It was observed also that climatically changes were reflected by variation coefficients of yield for each tested hybrid. The lowest yield variation was recorded by F 376 (cv = 34,03%) and the highest by Pako (cv = 53,14%).

Table 5

The variation coefficients of yield for tested hybrids

No.	Hybrid	Yield Kg/ha		Variation coefficient (vc %)
		2008	2009	2008 + 2009
1	F 376	1,16	1,11	34,03
2	Symba	0,89	1,28	48,42
3	Arobase	12,04	2,32	43,87
4	PR 38 A 24	5,33	0,60	48,34
5	Thermo	1,61	0,71	43,55
6	Pako	5,27	3,99	53,14
7	Galactic	5,74	0,42	40,37

CONCLUSIONS

Considering climatically conditions, 2009 year was more favorable for maize crop comparatively with 2008 year, giving also the possibility for each hybrid to express its genetic potential. The yield differenced between these two years were positive and ranged between 3310 kg/ha (F 376) to 4800 kg/ha (Symba).

The rainfalls came down during maize crop period were almost similar for both experimental years (235, 2 l/m^2 in 2008 and 236, 0 l/m^2 in 2009), but its distribution and interactions with other climatically factors were different leading to various yield levels.

The variance coefficient (vc %) for each tested hybrid and experimental year show that yield variation was low for both years.

Climatically changes were reflected by low variation coefficients of yield for each tested hybrid.

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COMPORTAREA UNOR HIBRIZI DE PORUMB TIMPURII ŞI EXTRATIMPURII ÎN ZONA CENTRALĂ A OLTENIEI ŞI AVANTAJELE EXTINDERII LOR ÎN CULTURĂ

THE BEHAVIOUR OF PRECOCIOUS AND EXTRA-PRECOCIOUS MAIZE HYBRIDS IN CENTRAL OLTENIA AREA AND THE ADVANTAGES INVOLVED BY ITS CROPPING ADOPTION

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Keywords: advantage, maize, yield

REZUMAT

Şase hibrizi de porumb timpurii şi extratimpurii semănați în două epoci diferite au fost testați în condițiile climatice ale anului 2009 la SCDA Şimnic şi analizați prin prisma elementelor de producție şi a calității acesteia. S-au analizat aspectele fenologice privind înfloritul, mătăsitul şi maturitatea fiziologică, precum şi aspecte fenotipice privind înălțimea totală şi înălțimea de inserție a ştiuletelui. Din punct de vedere al potențialului productiv şi al elementelor de producție s-a urmărit: MMB-ul, MH-ul, randamentul, producția boabe STAS kg/ha, precum şi calitatea acesteia reflectată prin conținutul în proteină şi grăsimi din bob. S-au remarcat hibrizii Symba, Eagle şi Olympic atât pentru epoca întâi, cât şi pentru cea de-a doua epocă de semănat.

ABSTRACT

Six precocious and extra-precocious maize hybrids seeded in two different times have been tested in 2009 in ARDS Simnic area conditions considering main yield components and its quality. There were analyzed phenological traits as blossom, silk stage and technological maturity and also phenotypic traits as total plant high and corn cob high insertion. The main yield components analyzed were: 1000 kernel weight, test weight, output, STAS Yield kg/ha and yield quality reflected by protein and oil grain content. For both sowing times were noticed Symba, Eagle and Olympic.

INTRODUCTION

The most important trait which is interesting equally for researcher and farmer is represented by yielding capacity, which is linked with principal maize characters and with its tolerance to biotic and abiotic constrainers (Sarca, 2004). Selection for yield promotes indirectly the cultivars with superior physiological traits (Duvick and Cassman, 1999). The goal of present paper was to present the advantages and limits of precocious and extra-precocious hybrids cropped in central Oltenia area considering yield components and its quality.

MATERIAL AND METHOD

The biological material was represented by six maize hybrids, as follows: three extra-precocious hybrids (NK Ravello, NK Top, NK Eagle) and three precocious hybrids (NK Olympic, NK Arobase, NK Symba). The experiment was layout to A.R.D.S. Simnic under natural field conditions in 2009. The tested hybrids were sowing in two different times: first sowing time (13.04.2009) and second sowing time (27.04.2009). For each hybrid and experimental year it was calculated STAS yield/ha. To establish the significance of yield differences was used the analyze of variance (Săulescu, 1967). The protein and oil grain content was determined using Inframatic Grain Analizer.

RESULTS AND DISSCUTIONS

The heavy rainfalls come down in May and the temperatures closed to multiannual average for this area assured favorable conditions for crop development. It was observed also uniform plants growing for each sowing time. Thus, the difference between two sowing times noticed at blossom stage was only 4-7 days, whereas Eagle and Arobase recorded 7 days. (Table 1). The same difference (7 days) was noticed for silk stage only for Arobase. The physiological maturity was noticed at the beginning of August, giving the possibility to tillage the land for next crops. This is one of the advantages of extra-precocious and precocious hybrids cropping. Other advantages are the plants vigor, shorter crop stages, yield components are formed earlier and thus these maize hybrids avoid drought and summer heat days.

Table 1

Main stages dates of tested maize hybrids

Hybrid	Blossom		Silk stage		Physiological maturity	
	1st Sowing time	2nd Sowing time	1st Sowing time	2nd Sowing time	1st Sowing time	2nd Sowing time
Ravello	24.06	29.06	25.06	1.07	4.08	6.08
Top	22.06	26.06	24.06	28.06	3.08	7.08
Eagle	23.06	30.06	25.06	1.07	7.08	8.08
Olympic	28.06	2.07	29.06	3.07	8.08	9.08
Arobase	23.06	30.06	25.06	2.07	6.08	9.08
Symba	30.06	4.07	2.07	6.07	9.08	13.08

It was observed that for tested hybrids the yield components were formed since the first decade of Julie. Total high and main corn cob insertion high showed that maize hybrids seeded in the second sowing timed were more vigorous (Table 2).

The average high of tested hybrids was 195,8 cm for first sowing time and 204,0 com for second sowing time. Differences between sowing times are maintained also for corn cob insertion high. For each genotype were observed deviations from average value. Thus, for Ravello total high and corn cob insertion high recorded lower values for the second sowing time. For the hybrids Eagle and Arobase the corn cob insertion high value is lower in the second sowing time comparatively with the first one.

The 1000 kernels weight ranged between 200 and 300 g depending kernel size and their harvest moisture. The lowest test weight value was recorded by Olympic for both sowing times (70 kg, respectively 69 kg). Considering the output percent the highest values were recorded for the second sowing times, excepting Arobase hybrid.

Table 2

Biometrical measurements for tested maize hybrids

Hybrids	Total high		Corn cob insertion high		1000 kernel weight g		Test weight kg		Output %	
	1st Sowing time	2nd Sowing time	1st Sowing time	2nd Sowing time	1st Sowing time	2nd Sowing time	1st Sowing time	2nd Sowing time	1st Sowing time	2nd Sowing time
Ravello	193	187	55	50	286	304	81	78	84	85
Top	195	205	50	60	259	304	80	72	82	85
Eagle	180	200	65	55	282	269	74	68	84	85
Olympic	210	215	60	70	273	239	70	69	85	85
Arobase	200	210	50	45	269	252	76	73	84	82
Symba	197	207	70	80	239	237	73	72	85	85

Average	195,8	204	58,3	60,0	

Considering yielding capacity of tested hybrids it was observed that is specific for each hybrid and sowing time (Table 3).

Table 3

Yield data recorded by tested maize hybrids

Hybrid	Sowing time		Yield difference between two sowing times
	1st sowing time	2nd sowing time	
Ravello	6750^{ooo}	6000^{ooo}	750
Top	6640^{ooo}	6290^{ooo}	350
Eagle	8290***	7320***	970
Olympic	8020**	7470***	550
Arobase	7250^{o}	6270^{ooo}	980
Symba	8590***	7830***	760
Average	7590	6863	
LSD 5% =	262,63	222,92	
1% =	368,64	312,91	
0,1% =	520,44	441,75	

For the first sowing times the highest yields were recorded by Symba (8590 kg/ha), Eagle (8290 kg/ha) and Olympic (8020 kg/ha), whereas for the second sowing times by Symba (7830 kg/ha), Olympic (7470 kg/ha) and Eagle (7320 kg/ha). The yield differences between two sowing times ranged between 350 kg/ha (Top) and 980 kg/ha (Arobase). It can be easily observed that precocious and extra -precocious hybrids record highest yield when they are early planted leading to 1000 kg/ha yield increase.

Even the yields recorded from the first sowing times were high; it was observed that the average yield of each tested hybrid recoded from the second sowing time was closer of experiment yield average. Thus, for a higher yield stability and uniformity is recommended the second sowing time for precocious and extra-precocious hybrids.

Yield quality was reflected by protein and oil content. Thus, kernel oil content ranged between 4,7 % (Eagle – 1st sowing time) and 6,0% (Ravello – for both sowing times), whereas protein content ranged between 12,4 % (Eagle – 1st sowing time) and 14,7% (Ravello - 1st sowing time) (Table 4). Considering yield quality was noticed Ravello.

Table 5

Yield quality components of tested maize hybrids

Hybrid	Protein content %		Oil content %	
	1st sowing time	2nd sowing time	1st sowing time	2nd sowing time
Ravello	14,7	14,6	6,0	6,0
Top	14,4	14,5	5,6	5,3
Eagle	12,4	12,5	4,7	5,1
Olympic	13,3	13,5	5,5	5,1
Arobase	12,8	13,2	5,3	5,1
Symba	13,2	13,4	4,8	4,8

CONCLUSIONS

Among the advantages of precocious and extra-precocious maize hybrids are the plants vigor, faster emergency, shorter crop stages, yield components are formed earlier, leading to better tolerance to drought and summer days' heat.

Considering yield efficiency was noticed the hybrids Symba, Eagle and Olympus for both sowing times.

For a higher yield stability and uniformity is recommended the second sowing time for precocious and extra-precocious hybrids.

Yield quality reflected by protein and oil content was good for all tested maize hybrids.

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CERCETĂRI PRIVID COMBATEREA BURUIENILOR DIN CULTURA GRAULUI SI INFLUENTA ERBICIDELOR ASUPRA CALITATII DE PANIFICATIE

RESEARCH CONCERNING WHEAT CROP WEED CONTROL AND HERBICIDE INFLUENCE ON BREAD QUALITY

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ABSTRACT:

This paper presents experimental results on the effectiveness of herbicides to combat weeds in wheat crop and their impact on quality of bread.

Herbicide Sekator Progess (amidosulfuron + Iodosulfuron) had good efficacy in dicotyledonous annual and perennial weeds in comparison with herbicide Granstar 75 DF (tribenurom-methyl) has not fought Gallium species belongs.

Herbicide Sekator Progress was also noted regarding the influence on the quality of bread, compared with Granstar75 DF herbicide.

Keywords: herbicide, wheat, wet gluten,

INTRODUCTION

Maintaining weed-free wheat crop, using herbicides, leads to rescue a production of wheat, which is between 10-25% (Alexandrina Popescu, 1999).

Depending on the degree of weed, the herbicide used for weed control, the exchanges that occur at subcelular the wheat crop may affect photosynthesis, transpiration, translocation and utilization of carbohydrates and organic acids. Consequently, the quality of protein produced may be different from the same production increases (Kadar Royal, 1999; Vilau N., 2002).

The paper presents results on the effectiveness of herbicides and their influences on indices of bread.

MATERIAL AND METHOD

The research was conducted in 2009-2010 in RDAS Caracal.

Herbicide treatments were made when the wheat was in end stage twinning formation of the first internode. After the treatments were made their comments on the selectivity and effectiveness of existing herbicides on weeds. At harvest gravimetric determinations were made on the weed species present, yield per hectare has been brought to standard humidity.

After 80 days have been the amount of wet gluten analysis, deformation, and then calculated the index of gluten.

RESULTS AND DISCUSSION

Herbicides used in wheat treatment (applied to the optimal age) did not show any phytotoxic effect on culture.

Although the weed was practically the same floristic composition during experimentation was differentiated quantitatively (Table 1). In 2009 the amount of weed (the degree of weed) was lower (2036 kg / ha of weeds) to 2010 (4219 kg / ha). Share held the annual weeds (88% in 2009 and 83% in 2010). Annual dicotyledonous weed species present in 2010, belongs Galium species had a significant weight.

Table 1

Efficacy of herbicides in weed control winter wheat crop-Caracal

ENTRY	RATE	**Weed kg/ha**							**Control %**
		annual dicotyledonous species		**perenial dicotyledonous species**		**Total**			
		2009	2010	*2009*	2010	*2009*	2010	**Average**	
UNTREATED	-	*1725*	3524	*311*	695	*2036*	4219	**3128**	0
Sekator Progress OD (amidosulfuron 100 g/l+ iodosulfuron-metil-Na 25 g/l +safener)	150 ml/ha	*14*	12	*87*	91	*101*	103	**102**	97
Granstar 75 DF (75% tribenurom metil)	20 g/ha	*176*	289	*99*	174	*275*	463	**369**	88

By using the Progress Sekator herbicide dose of 150 ml / ha did a very good control of both annual dicotyledonous species as well as those perennial in both years of experimentation, the average degree of weed control was 97%.

The herbicide Granstar 75 DF control less Gallium species and therefore the degree of control was weak, 88% averaged over the two years of experimentation.

Table 2

Influence of herbicides on wheat yield-Caracal

ENTRY	Rate	Yield kg/ha			Dif. Kg/ha	%
		2009	2010	Average		
UNTREATED	-	3650	4847	4249	**Mt.**	**100**
Sekator Progress OD (amidosulfuron 100 g/l+iodosulfuron-metil-Na 25 g/l +safener)	150 ml/ha	4340	5994	5167	**918**	**121.6**
Granstar 75 DF (75% tribenurom metil)	20 g/ha	3890	5840	4865	**616**	**114.5**

LSD 5%=1153 kg/ha

Production results obtained from wheat growing shows (Table 2) that required treatment with herbicides on wheat crop may be lost count as major production. Be treated with herbicides in wheat crop production has saved an average of 616 kg / ha by using Granstar 75 DF herbicide and 918 kg / ha for herbicide application Sekator Progress.

Gluten is one of the main components of flour that gives dough physical properties of particular importance in the production process. The gluten content of flour is a flour bigger the better it is for working and obtain a higher quality bread.

Table 3

Influence of herbicides on some indices of wheat bread-Caracal

ENTRY	Rate	2009			2010		
		wet gluten %	deformation index mm	Gluten index	wet gluten %	deformation index mm	Gluten index
UNTREATED	-	24,7	6	39,8	24,4	7	37,7
Sekator Progress OD (amidosulfuron 100 g/l+ iodosulfuron-metil-Na 25 g/l +safener)	150 ml/ha	28,3	3	51,1	27,9	5	46,7
Granstar 75 DF (75% tribenurom metil)	20 g/ha	27,0	11	34,7	28,6	11	36,8

Gluten quality is determined by its elasticity, expressed by the index strain.
After deformation of gluten flour index is classified as follows:
2-5 mm short-flour (strong);
5-15 mm-good meals;
15-20 mm-thin flour;
over 20 mm - very weak flours.

From the results in both years (Table 3) shows that the presence of weeds in wheat crop has negative influence on gluten content, it is between 24.4 to 24.7%. The use of herbicides in weed control, increased the amount of gluten, depending on the year to 27 to 28.6%, not a major difference between the two herbicides used.

Herbicides used were a major influence on deformation index in both years of experimentation, so it appears that the herbicide Sekator Progress OD index of deformation is small (3-5 mm) than the untreated control (6-7 mm), while that the product Granstar 75 DF deformation index is much higher (11 mm), as flours obtained from the two products fall into different quality classes.

Gluten is a synthetic index, index calculated according to the amount of gluten and the index of deformation and gives a more complete information on the quality of flour. Gluten index, the variant treated with Granstar meal was lower than in untreated control, deformation due to gluten. The best flour for bread is obtained for the variant treated with Sekator progress because of this positive influence on both the amount of gluten product, especially as the elasticity.

CONCLUSIONS

***** We believe that treatment with herbicides to winter wheat crop is a factor that directly influences the plant and indirectly by the removal of weed competition. Sekator herbicide has achieved the best control of weeds (97)%.

* Herbicides used resulted in an increased amount of wet gluten from the untreated control.

* Both herbicides were influenced gluten elasticity (deformation index) Granstar 75 DF our product index increased deformation of the product Sekator Progress OD deformation index decreased, falling flours obtained in different quality classes.

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SOIA CULTIVATĂ ÎN CADRUL UNUI SISTEM ALTERNATIV PE BAZĂ DE MULCI VEGETAL BIOACTIV

SOYBEANS PLANTED IN AN ALTERNATIVE SYSTEM BASED ON BIOACTIVE PLANT MULCH

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Keywords: bioactive rape mulch, soybean, rhizobium

***SUMMARY**:*

This paper presents the results of the soybean crop cultivation in an alternative agriculture system using bioactive plant Mulching, Mulching obtained by winter rape.

The mulching effect is reduced due to the unavailability of the all input material with a ratio C: N high and get a number of advantages in terms of weed control and soil water conservation.

Winter rapeseed crop was turned into mulch by chopping in the spring, plus a solid bio Trichoderma strains. Another category represented a bioproducts containing highly active strains rhizobii in symbiosis with nitrogen-fixing soybean roots.

The beneficial effects of the new system were measured in soybean production to achieve the same level or superior to the classical technology.

INTRODUCTION

Bioactive mulch has several effects reflected by slower mineralization of plant material when it remains on the soil surface, limiting weed development, protection against phytopathogenic, soil and water conservation in stimulating plant development.

Studies undertaken so far have revealed a high agronomic potential of this new technological solutions.

Soybean cultivation in this system benefit from the effects of technological solutions. Combining this system with the use of nitrogen-fixing bacteria in soybean seed treatment to ensure resolution of the contradiction that exists between the demand for protein, on the one hand and the depletion of conventional energy sources on the other hand, by eliminating or reducing chemical fertilizers with nitrogen . Hera (1973) has shown that seed treatment with Rhizobium japonicum soybean maximum yield was obtained chernozem soils without nitrogen fertilizer management

This paper presents an alternative agriculture system is supporting farmers in warmer areas in southern Romania aridizare course.

MATERIAL AND METHOD

Experience has been placed in R&DAS Caracal, 2010, on clay chernozem soil type, with a humus content of 2.7-2.9% in water, pH 6.8, 33% clay content, with the following:

E1-intensive control, plowing and herbicides;

E2 - rape mulch by chopping, herbicide;

E3 - bioactive mulch, mulch by chopping rape, herbicide treatment with Trichoderma granules mixed with straw;

E4 - bioactive mulch, mulch by chopping rape, herbicide treatment with Trichoderma granules mixed with straw, soybean seed treatment with PGPR.

Trichoderma based Biopreparatul was done by mixing 2 g to 1 kg grain chaff.
Treatment with PGPR bacteria-soybean seeding was done on the day.
Experience has been executed without fertilization
Information Technology:
Chopped-rape - May 11, 2010;
-Plowing- (entry 1) May 15, 2010;
-pruning - May 16, 2010;
-Sowing - May 19, 2010 , **ISIDORE** variety;
-Applied treatment with Trichoderma granules mixed with straw -19 May;
- Emergence - May 31, 2010;
-Herbicides - Pantera - 1.5 l / ha + 14 June 2010
- Pulsar - 0.7 l / ha
- Beginning bloom - July 3-5, 2010.
- Irrigate - 600 m^3 / ha August 5, 2010;
- Harvesters - September 22, 2010.

RESULTS AND DISCUSSION

Rainfall in the first part of vegetation period were in excess quantities (167.4 mm and 107 mm in June). Precipitation from the period of maximum consumption in July (6.6 mm) and August (29.4 mm), were very small, on a background of high temperatures, larger

Table 1

The influence of different technological systems on growth and morphological characteristics of soybean crop –Caracal -2010

ENTRY	Vigour * Average flowering plants to July 5.	Plant height at harvest (cm).	Number of inserts with pods / plant	Number of grains in the pod.
Witness intensive, plowing	7	57,2	11,4	2,09
Rape mulch by chopping	7,5	56,9	11,7	2,12
Mulch bioactive (Tricoderma treatment granules mixed with straw)	8,5	57,1	11,7	2,12
Mulch bioactive (Tricoderma treatment with granules mixed with straw) + soybean seed treatment with PGPR	8,9	58,4	11,9	2,14

* Vigor - 1 - small plants with small leaves
9 - large plants with sturdy leaves

than the annual average of 0.9 to 3, 0 ° C. For this reason, irrigation was applied to 600 cm / ha on August 5, during seed filling.

And morphological changes of the main elements of productivity under the influence of different technological systems were subject to detailed measurements carried out in vegetation and harvesting.

The results show that different technological systems have strong influence on growth and morphological characteristics of soybean culture (Table 1).

Plant vigor was much different during the flowering season. On a scale of 1-9, the technological system where rape has been buried by plowing plant vigor was only 7.

The technological system in which rape was allowed by chopping and mulching the soil surface, plant vigor was 7.5. The technological system with bioactive mulch (treatment Tricoderma granules mixed with straw) was 8.5 plant vigor and the technological system and treatment with the addition of soybean seed nitrogen-fixing bacterial strains, plant vigor was 8.9 Plant height was not significantly influenced, however, the technological system bioactive mulch + seed treatment with PGPR plants had the greatest height (58.4 cm).

A distinction was made between technological systems in terms of number of insertions and the number of leguminous beans in their pods, elements that had the same allure with the vigor of plants.

Table 2

The influence of different values of biometric technology systems nodozităților of the soybean crop - Caracal 2010

ENTRY	Nodule plant frequency (%)	Nodule number per plant	Nodule weight per plant (g)
Witness intensive, plowing	100	75	2,04
Rape mulch by chopping	100	63	1,98
Mulch bioactive (Tricoderma treatment granules mixed with straw)	100	92	2,03
Mulch bioactive (Tricoderma treatment with granules mixed with straw) + soybean seed treatment with PGPR	100	81	2,13

The data listed in Table 2 shows that the frequency of plants with nodule was 100% in all systems. With regard to nodule number were differences between the systems. If the system was incorporated by plowing rape nodozităților number was 75 / plant, weight of 2.04 g weight about equal to the variant bioactive mulch (2.03 g / plant), but where the number of nodule was higher.

The mulch bioactive variant, where soybean seed has been treated with selected strains of Rhizobium nodule number / plant was 81, but most weight / plant (2.13 g), being higher nodozitățile as if variant show where the soil has been aired. Good capacity of fixing atmospheric nitrogen is primarily determined not by the total number of nodule but their total mass (M Prodan -1985)

Table 3

The influence of different culture systems on production technology of soybean Caracal- 2010

ENTRY	Moisture at harvest (%)	Weight of 1000 seeds (g)	Production (Kg / ha) to 13% U	Relative Production	
				%	%
Witness intensive, plowing	13,5	188	2635	100 Mt.	98.1 °
Rape mulch by chopping	14,7	202	2685	101.9*	100 Mt.
Mulch bioactive (Tricoderma treatment granules mixed with straw)	14,8	212	2740	104***	102 *
Mulch bioactive (Tricoderma treatment with granules mixed with straw) + soybean seed treatment with PGPR	14,8	219	2965	112.5***	110.4 ***

LSD 5% - 42 kg/ha 1.6%
LSD 1% - 61 kg/ha 2.3%
LSD0,1% - 89 kg/ha 3.4%

Higher harvest moisture variations mulching (14.7 to 14.8% U) reflects the fact that soil water is lost more difficult due to the presence Mulching the soil surface, extending the show vegetation compared with control culture (13.5% U) .

In close accordance with the above determinations on plant vigor, number and weight nodozităților and number of beans in the pod are the results of the 1000 production and seed weight (Table 3). Reflecting the contribution of each system to achieve good grain production .

Rapeseed production in the version with mulch (101.9%) is significantly positive in comparison with the classical variant.

Yields in mulch bioactive variants are significantly positive (from 104 to 112.5%) compared with the classical variant.

Mulching bioactive superiority is found in very significant and positive significant difference compared with the technology only with rape mulch by chopping. Treating soybean seed highly active strains of nitrogen fixing rhizobii production increase is substantial: 280 kg / ha (10.4%) compared with the technological system with rape mulch by chopping and 330 kg / ha (12.5%) compared with the traditional technology.

CONCLUSIONS

-In dry conditions, sometimes excessive in the south of Romania, the technological system with rape mulch is beneficial for soil water conservation;

-Bioactive-mulch soil water conservation or addition has the effect of stimulating the development of soybean plants, and lengthens the growing season of soybean.

-Mulch may be beneficial to the bioactive organic nutrition through mineralization gradually incorporated into mulch bioactive elements, resulting in production increases.

-Mulch and bacterizarea bioactive essential changes have occurred and morphological indices of elements in soybean productivity.

-Productions made in different technological systems are closely correlated with morphological indices and productivity elements.

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EVALUAREA CAPACITĂȚII DE REGENERARE A RESURSELOR GENETICE VITICOLE AUTOHTONE, ÎN CONDIȚII *IN VITRO*

ASSESSMENT OF THE REGENERATION CAPACITY OF INDIGENOUS GRAPEVINE GENETIC RESOURCES, USING *IN VITRO* CONDITIONS

EMILIA VIŞOIU, IONELA CĂTĂLINA GUȚĂ, CARMEN BEJAN, ELENA COCUȚA BUCIUMEANU

Keywords: grapevine, in vitro regeneration, Initial multiplication material

REZUMAT

Studiile întreprinse au avut scopul de a evalua potențialul regenerativ în cultură in vitro a apexurilor intens regenerative şi a mugurilor axilari, prelevate de la plante aparținând clonelor extrase din soiurile autohtone Fetească albă (8 Iaşi, 1 Odobeşti, 29 Blaj,72 Ştefăneşti) şi Fetească regală (21 Blaj, 97 Ştefăneşti). Mediul Murashige – Skoog (1962) suplimentat cu bioregulatori de creştere specifici viței de vie (benzilaminopurina – 1- 0,5 mg/l BAP şi acidul β indolilacetic - 0,5 mg/l AIA), a constituit mediul de bază pentru declanşarea şi întreținerea proceselor de regenerare şi multiplicare in vitro a apexurilor intens regenerative şi a mugurilor axilari.

Datele înregistrate au fost prelucrate statistic prin metoda regresiilor, utilizând ecuația polinomială, coeficientul de corelație având valori maxime sau apropiate de maxim. Pentru evidențierea diferențelor semnificative între clone, privind numărul de formațiuni rezultate/explant inițiat, la sfârşitul perioadei de monitorizare (110 zile cultură in vitro), s-a utilizat programul SPSS for Windows 10.

În cazul clonelor de Fetească regală (21 Bl şi 72 Şt) nu au fost semnalate diferențe semnificative privind tipurile de formațiuni identificate după 110 zile, atât la culturile inițiate din apexuri, cât şi la cele provenind din muguri axilari.

Culturile de apexuri aparținând clonelor de Fetească albă au înregistrat diferențe semnificative privind diferitele tipuri de formațiuni evaluate, semnificația la $P < 0,05$ a fost apreciată ca fiind negativă, considerând ca martor media experimentului.

În cultura in vitro, rezultatele obținute privind indicii de multiplicare (muguri adventivi, număr de primordii de lăstari şi minilăstari) la clonele soiurilor Fetească albă şi Fetească regală, s-au diferențiat în funcție de capacitatea regenerativă a fiecărei clone, de tipul de explant şi de balanța hormonală.

ABSTRACT

The undertaken studies were meant to assess the regenerative potential, in a plant in vitro culture, of highly regenerative small shoot apices and axillary buds, taken from plants belonging to clones derived from indigenous varieties of Feteasca alba (8 Iasi, 1 Odobesti, 29 Blaj, 72 Stefanesti) and Feteasca regala (21 Blaj, 97 Stefanesti). The Murashige - Skoog medium (1962) supplemented with growth bio regulators, specific to the grapevine (benzilaminopurine - 1 - 0.5 mg/l BAP) and the β-indolacetic acid - 0.5 mg/l IAA) represented the basic environment to trigger and maintain the in vitro regeneration and multiplication processes of intense regenerative small shoot apices and axillary buds.

The recorded data were statistically processed using the regression method, and the polynomial equation, the correlation coefficient having maximum or near maximum values. To highlight the significant differences between the clones, regarding the number of the resulted formations/initiated explants, the SPSS for Windows 10 program was used at the end of the monitoring period (110 days of in vitro culture).

For Feteasca regala (21 Bl and 72 St) clones, significant differences were not reported on the types of formations identified after 110 days, both in the plant cultures initiated from small shoot apices and those from axillary buds.

The cultures of small shoot apices from clones of Feteasca alba showed considerable differences on the different types of the assessed formations, the significance at P <0.05 was considered to be negative, taking the average of the experiment as a comparison index.

In the in vitro culture, the results on the multiplication indices (adventitious buds, number of primary shoots and small shoots) for the clones of Feteasca alba and Feteasca regala varieties, were differentiated according to the regenerative capacity of each clone, the type of explants and the hormonal balance.

INTRODUCTION

In the viticulture germplasm collection, including G_0 *Initial propagation material*, and formed by INCDBH (National Institute for Research & Development for Biotechnologies in Horticulture) Stefanesti (the only collection of its kind at the national level), there are preserved varieties and clones of indigenous as well as of worldwide origin (Vişoiu et al., 2000). In order to expand their use into production under the current legislation (Order 1267/2005), there is the requirement that the newly approved fruitful and parent stocks of grapevine varieties and clones, after having been listed in the official list of varieties, they should undergo the phases of the certification scheme for the grapevine multiplication material, before being transferred in the storage greenhouse, together with the G_0 *Initial propagating material* (Buciumeanu et al., 2003).

The biotechnological methods based on the *in vitro* culture multiplication of those types of explants that keep unaltered their variety genetic heritage through the regeneration processes, are frequently used in the certification of the G_0 *initial* propagating grapevine material.

The undertaken studies were meant to assess the regenerative potential, in a plant *in vitro* culture, of the valuable clones from the indigenous varieties of Feteasca alba and Feteasca regala, which support the Romanian grapevine varieties, as a core factor of the quality and diversity of the Romanian wines.

MATERIALS AND METHODS

Parent plants from single-eye cuttings, fortified in nutrient pots and belonging to the indigenous varieties of Feteasca alba (8 Iasi, 1 Odobesti, 29 Blaj, 72 Stefanesti) and Feteasca regala (21 Blaj, 97 Stefanesti), have been the source of biological material supply that was individualized in intense regenerative plant apices and axillary buds (Fig. 1).

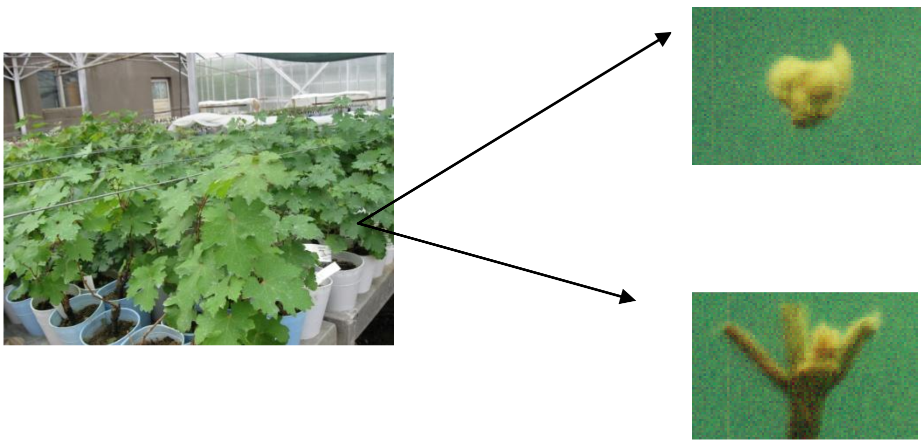


Fig. 1 Parent plants donors of explants

Aseptisation and inoculation of biological material were made according to the methodology presented in other works in the field, too, and published by our team of researchers (Visoiu et al., 2006).

The basic medium was Murashige - Skoog (1962) wit hormone compounds added, like benzilaminopurine (BAP) in concentrations of 0.5-1mg/l and α indolilacetic acid (IAA) - 0.5 mg/l.

The processes of multiplication into subcultures were carried out in air-conditioned rooms, with possibilities of maintaining a constant temperature of 25 $\pm$ 1^0C, I.L. = 3.000 – 4.000 lux and in photoperiodism with a duration of 16 hours of light and 8 hours of dark.

Observations and measurements were made, during three subcultures (110 days of *in vitro* culture), on the regeneration potential of each clone and the growth rate of the vegetative formations (adventitious buds, primary shoots and shoots) produced during the multiplication process in the culture media.

The recorded data were statistically processed using the regression method, and the polynomial equation. To highlight the significant differences between the clones, regarding the number of the resulted formations/ initiated explants, the SPSS for Windows 10 program was used at the end of the monitoring period (110 days of *in vitro* culture). The tables show the average values of 3 repetitions ± d.s. The differences between the clones of the same variety, depending on the type of explants used to initiate the plant culture, were analyzed with One Way ANOVA - LSD, the significance being assessed at $P < 0.05$.

RESEARCH RESULTS

An important role in strengthening an *in vitro* culture is played by the full preservation of the regenerative capacity of the inoculated cells, during all the subcultures, thus ensuring the resumption of the physiological processes whenever needed.

The importance of the presence of each category of substances for the *in vitro* multiplication processes of the grapevines derives from the combined influence of all the components of the plant culture media, which being present in a balanced concentrations and ratio, may trigger and stimulate the cyto-differentiation processes in the explants.

For the Feteasca regala variety, the fluctuations in the propagation indices were differentiated by type of explants (intense regenerative apex or axillary buds) during the 110 days of culture and less significantly by clone (Fig. 2).

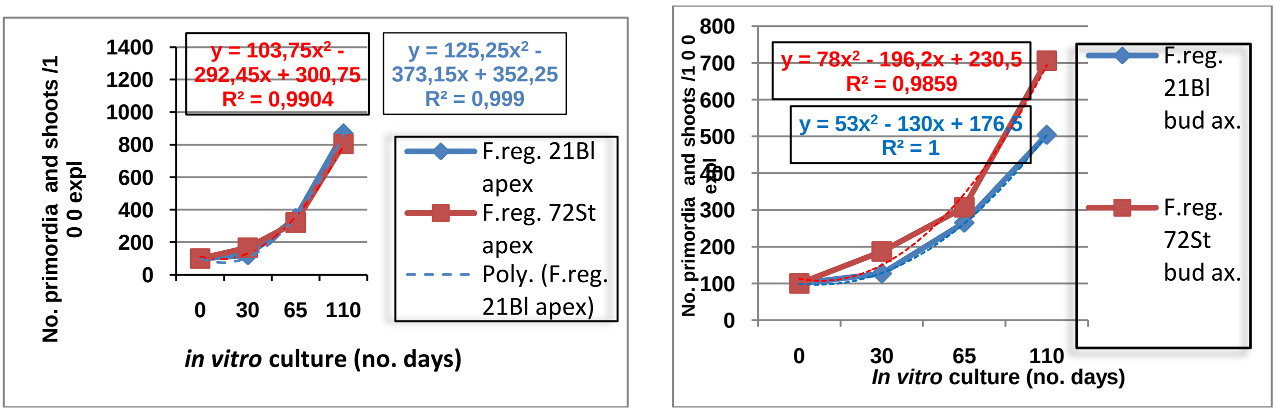
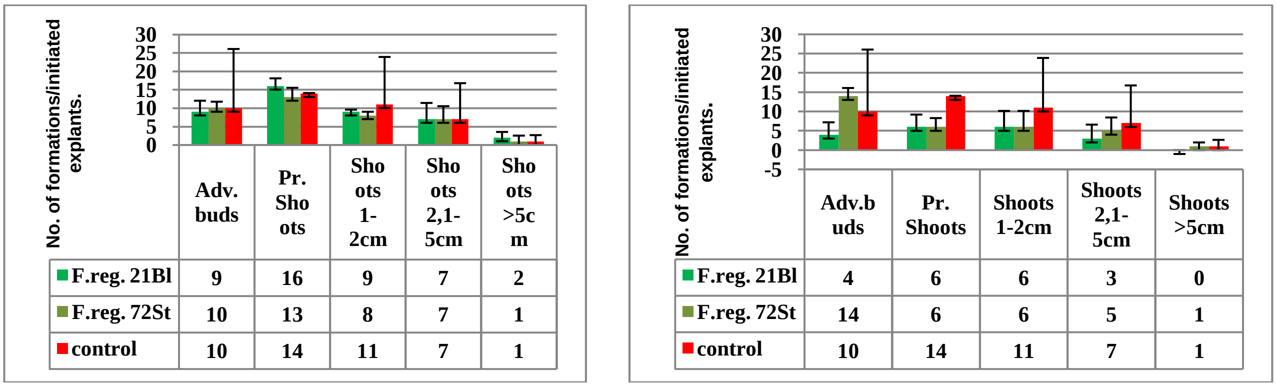


Fig. 2. Reactivity in the *in vitro* culture of the explants originated in the clones of Feteasca regala variety

The data recorded within 30 days after initiation, showed a slower propagation rate, specific to the culture stabilization process. This process was done by creating active meristematic centres, very active especially in the plant apices, which immediately after, led to the configuration of the vegetative formations specific to the multiplication.

A comparative analysis of the reactivity of the two types of explants showed a higher rate of multiplication for the intense regenerative plant apices in comparison with the axillary buds, in both clones of the Feteasca regala variety (21 Bl and 72 St). This behaviour of the plant apices proved to be contrary to the one described in the specialized literature (Heloire et al., 1997), which indicates a higher regenerative potential of the axillary buds. The difference in the organogenetic potential of the two types of explants can be attributed to the more active cell metabolism of the plant apices (smaller explants), which makes better use of the energy released by the degradation of carbohydrates (the energy substrate in the culture medium). As for the axillary buds, the caulogenesis processes were predominantly based on the removal of apical dominance and stimulation of multiple axillary shoot growth due to the cytokinins present in the culture medium.

The structure of the biological material resulting from the regeneration process after 110 days of *in vitro* culture, showed a greater number of adventitious buds and primary shoots (primordia), compared with the individualized shoots of 1-5 cm. These results demonstrate that there is a sufficient reserve for further multiplication, if we want to obtain a larger quantity of biological material regenerated through the *in vitro* culture (Fig. 3 a. and b.).



	Adv. buds	Pr. Shoots	Shoots 1-2cm	Shoots 2,1-5cm	Shoots >5cm
F.reg. 21Bl	9	16	9	7	2
F.reg. 72St	10	13	8	7	1
control	10	14	11	7	1

a- apex

	Adv.buds	Pr. Shoots	Shoots 1-2cm	Shoots 2,1-5cm	Shoots >5cm
F.reg. 21Bl	4	6	6	3	0
F.reg. 72St	14	6	6	5	1
control	10	14	11	7	1

b- axillary bud

Fig.3. The composition of the biological material resulting from the multiplication process in the clones of Feteasca regala variety

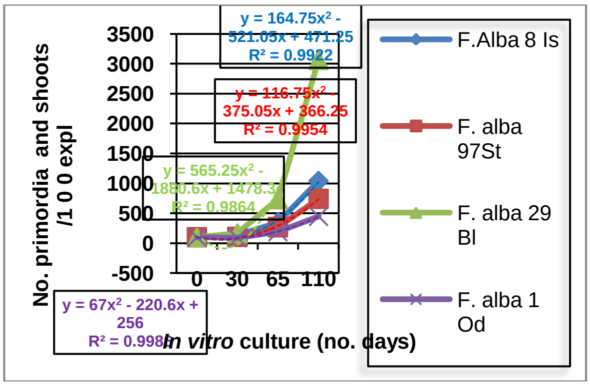
Values are averages ± d.s. based on 3 repetitions, the bars indicate standard deviations, without significant differences compared to the control value (the average of the experiment), at $P < 0.05$.

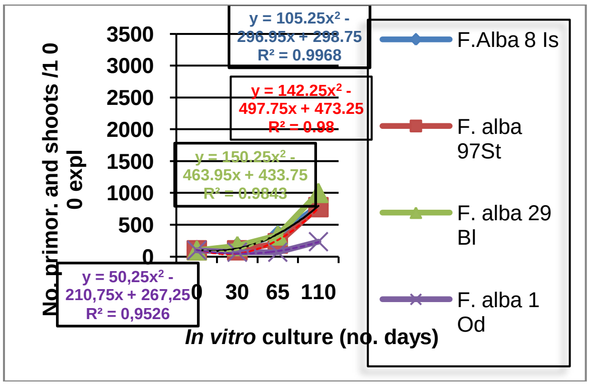
The quantitative analysis of the constituents in the biological material, depending on the type of explants, showed the superiority of the shoot apices over the axillary buds, and for the clones, Feteasca regala 72 St gave a greater number of formations/initiated explants.

However, the statistical interpretation of the results using SPSS for Windows 10 and the analysis of the differences between the clones of Feteasca regala variety, depending on the type of explants, using the One Way ANOVA – LSD method, showed that there are not significant differences at $P < 0.05$.

With respect to the vitrification phenomenon, the observations made during the 110 days of the *in vitro* culture, showed a low frequency, which led to the use of the entire quantity of biological material resulting from the multiplication.

The morphogenetic response of the explants originated from the clones of Feteasca alba (8 IS, 29 Bl, 97 St., 1 Od), a variety with environmental regeneration potential, was characterized by significant variations in the propagation rate, depending on the type of explants and genotype. The propagation rate increased especially after 60-65 days of *in vitro* culture (at a concentration of 1mg/l BA and 0.5 mg/l IAA in the culture medium) period during which the proliferation process continued by forming vegetative centres that have evolved in the primary shoots (primordial) and shoots (Fig. 4a and b).





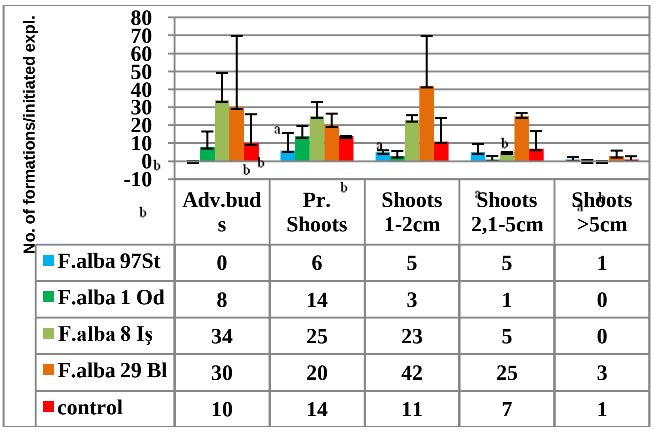
a- apex b-axillary bud

Fig. 4 Reactivity in the *in vitro* culture of the explants originated in the clones of Feteasca alba variety

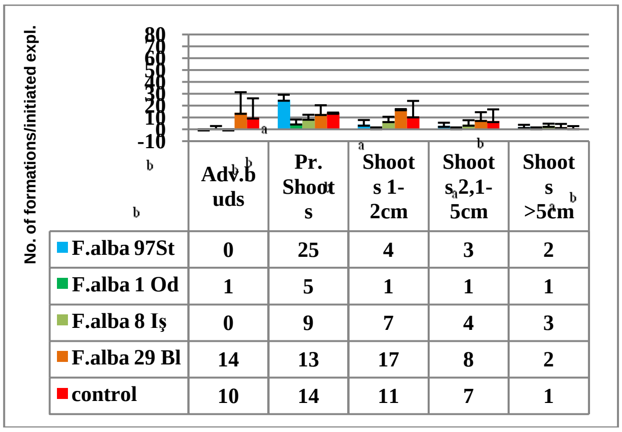
The results of the research showed a significant stimulus in terms of the apex regenerative capacity compared to that of the axillary buds, recorded under similar conditions. The maximum number of groups of primary shoots and shoots obtained in the period of the *in vitro* tested culture was over 30/inoculated explant, for the clone of Bl Feteasca alba 29 Bl, using the intense regenerative apex as an explants. The other clones had relatively close values, of 5-10 groups of primary shoots and shoots/explant. The clearly superior regenerative potential of the Feteasca alba 29 Bl clone, was probably due to the endogenous regenerative capacity, the clone having been selected for high productivity indices.

In a quantitative analysis of the biological material obtained after the 110 days of *in vitro* culture, a total of the vegetative formations (adventitious buds, primary shoots and shoots), the same clone of Feteasca alba 29 Bl is highlighted.

The adventitious buds of 8-34/apex and the primary shoots of 6-25/inoculated apex are predominant in the composition of the biological material originating in all the four clones of the variety Feteasca alba. Shoots with heights of 1-5cm, were individualized in a number of 25-42/apex in the regenerated material belonging to the Feteasca alba 29 Bl clone.The statistical analysis of the results highlights negative correlations compared to the average of the experiment (control value) for all the constituents, especially for the Feteasca alba 8 Is clone, using the intense regenerative apex as an explant. This was due to the formation of clusters of adventitious buds and primary shoots at the expense of the small shoots growing (raising) process. For the clones of Feteasca alba 97 St and Feteasca alba 1Od, significant differences were obtained only at the adventitious buds and the primary shoots (Fig. 5).



	Adv.buds	Pr. Shoots	Shoots 1-2cm	Shoots 2,1-5cm	Shoots >5cm
F.alba 97St	0	6	5	5	1
F.alba 1 Od	8	14	3	1	0
F.alba 8 Iş	34	25	23	5	0
F.alba 29 Bl	30	20	42	25	3
control	10	14	11	7	1



	Adv.buds	Pr. Shoots	Shoots 1-2cm	Shoots 2,1-5cm	Shoots >5cm
F.alba 97St	0	25	4	3	2
F.alba 1 Od	1	5	1	1	1
F.alba 8 Iş	0	9	7	4	3
F.alba 29 Bl	14	13	17	8	2
control	10	14	11	7	1

a- apex b-axillary bud

Fig. 5. The composition of the biological material resulting from the propagation process in the clones of Feteasca alba grapevine variety

The observations and measurements carried out on the biological material resulted from the plant cultures in which axillary buds were used as explants, have demonstrated that their regenerative potential is below the apices, achieving a multiplication rate 2-3 times lower. The small shoots elongation in the third subculture was minimal, there were no significant differences compared with the control value, in terms of number of regenerated shoots.

The overall results obtained during the experiment in the two types of explants, for the clones of Feteasca alba grapevine variety, showed that the percentage of the small shoots (2.1-5cm) was obtained especially for the axillary buds by using doses of 0.5 mg/l BA.

The qualitative analysis of the biological material resulted from the explants regeneration showed a normal morphology without vitrification issues or necrosis (Fig. 6).

Fig.6 Biological material multiplied *in vitro*
(the clone of Feteasca alba 29 Bl)

The success in the multiplication process for the clones of Feteasca alba and Feteasca regala vine varieties supposed the achievement of a differentiated ratio between the two groups of hormones (citokinins and auxins); in the first 60-65 days of *in vitro* culture the hormonal balance was in favour of the citokinins and during the second part of the plant culture there was an equal ratio. The regenerative potential of the clones in the same vine variety was significantly influenced by the type of the explant and less by the genotype (clone). Therefore, for this study in which the statistical analysis of the results is used, it was found that, regardless of the geographical area from which the clonal selection was made, the regenerative capacity assessed by the *in vitro* multiplication indices, shows no significant differences between the clones.

CONCLUSIONS

- The optimal alternative for both types of explants from all the studied genotypes (Feteasca regala 21 Bl, Feteasca regala 97 St, Feteasca alba 8 Is, Feteasca alba 1 Od, Feteasca alba 29 Bl and Feteasca alba 72 St.) turned out to be that in which the BAP concentration was of 1 mg/l (for the first 60-65 days) and the auxinic one remains within 0.5 mg / l;
- The maximum number of groups of primary shoots and shoots, obtained during the period of the *in vitro* tested culture, was over 30/inoculated explant for the clone of Feteasca alba 29 Bl, using the intense regenerative explant as an apex;
- The statistical analysis of results revealed that regardless of the geographical area from which the clonal selection was made, the regenerative capacity assessed by *in vitro* multiplication indices, showed no significant differences between the clones.

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FRACȚIUNE DE POTASIU DIN SOL LA APLICAREA DE K ÎNGRĂŞĂMINTE DIFERITE, ŞI ACUMULAREA ACESTEIA ÎN ORGANELE DE VIȚĂ DEVIE

FRAKCIJE KALIJUMA U ZEMLJIŠTU PRI RAZLIČITOM K ĐUBRENJU I NJEGOVO NAKUPLJANJE U ORGANIMA VINOVE LOZE

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Keywords: potassium, grape, K soil fraction.

REZUMAT

Studiu de trei ani într-o vie tanara sol brun de pădure cambisol eutric investigat efectul de creştere a dozelor de îngrăşăminte de potasiu (50, 100, 150 kg K_2O/ha) la fracțiunile sale în sol şi acumularea acesteia în organele viță de vie (frunze, trage). Două fracțiuni disponibile K (extracție cu soluție de AL şi 0,1 N acetat de amoniu), fracțiune de potasiu fixe şi K_2O total în sol au fost determinate. Cele mai mari doze de îngrăşăminte (150 kg K_2O/ha) a făcut o creştere semnificativă a acestui element în fracțiuni disponibile (17.31 mg/100 AL metodă şi 16.70 mg/100g 0,1 N NH_4OAc), potasiu dar nu a fost proporțional crescut în fracțiune fix. Influența fertilizării potasiu nu a afecta conținutul său în frunze, în timp ce doze mai mari de îngrăşăminte K a crescut conținutul său în lăstarii (Ø-0,82% K_2O; 150kg K_2O/ha-0,92%).

ABSTRACT

The three-year study in a young vineyard on brown forest soil (eutric cambisol) investigated the effect of increasing doses of potassium fertilizer (50, 100, 150 kg K_2O/ha) to its fractions in soil and its accumulation in the grapevines organs (leafs, shoots). Two available K fractions (extraction with AL solution and 0.1 N ammonium acetate), fixed potassium fraction and the total K in the soil were determined. The highest doses of fertilizers (150 kg K_2O/ha) made a significant increase of this element in available fractions (17.31 mg/100 AL method and 16.70 mg/100g 0,1N NH_4OAc), but potassium was not proportionally increased in fixed fraction. The influence of potassium fertilization did not affect its content in leaves, while K fertilization increased its content in shoots (Ø-0,82% K_2O; 150kg K_2O/ha-0,92%).

INTRODUCTION

In grape nutrition, potassium is generally recognized as one of the most important nutrient, inducing a high rate of potassium fertilizer practice. After years, this high dose of applied potassium in vineyards (Italy: 100-200 kgK_2O/ha - Fregoni,1985), Germany: 200 kg for light and 360 kg K_2O/ha for heavy clay vineyard soils (Platz et al.1980) was changed (60 kg K_2O/ha in France - Delas et al.1990), as a consequence that excessive potassium fertilization can lead to an increase in juice grapes pH (Boulton,1980) and a decrease in the yeast-assimilable nitrogen and ammonia of the fruit (Wehmeier,2002). Also, it's excess in wine may be precipitated as potassium tartrate during cold stabilization, requiring the winery to adjust pH to avoid losing an important sensory component of the wine. Undesirably high potassium levels are a documented problem in some Australian vineyard (Krstic et al. 2003).

Concerning that some important soil conditions influence K nutrition (soil type, clay content, water regime), the amount of applied K usually differs from country to country, usually guided by the concept that the potassium utilization by yield should be a matter of balance with K fertilizer application. Added K from fertilizer increases its available content in soil, but its utilization is controlled by different soil/rootstock factors, where a certain amount of applied K is left. The fate of applied potassium is similar to that of other cations in soil: K^+ remains in soil solution, it can be adsorbed by soil colloids, or concerning a selective penetration of K^+ in clay interlayer of 2:1 clay minerals (fixed K^+), it makes certain amount of K temporary unavailable, but potentially it could be source of K for plants. With an intensive K fertilization of new vineyard during the tree years, we tried to estimate the efficiency of this measure on K soil fractions and K reserves. Two different methods for evaluation of available K were used (standard AL method and 1N ammonium-acetate extraction), and, also, the K fixing processes after fertilization was monitored.

MATERIAL AND METHOD

During the planting a new vineyard (cv. Sauvignon blanc/Kober 5BB), close to the Belgrade (Radmilovac location) a three-year experiment was set up on brown forest soil (eutric cambisol). Each experimental plot in three repetitions (54 m^2, as 6x3x3 m) was fertilized in late winter with 0 kg K_2O/ha, 50 kg K_2O/ha, 100 kg K_2O/ha, 150 K_2O/ha, respectively, using KCl (50% K_2O). After determination the soil chemical properties (Sparks, 1996), an initial content of total potassium in soil was estimated by using HF (48%) and conc.H_2SO_4 for destroying clay minerals lettuce. Two methods for the extraction of exchangeable K were used: standard Egner-Rhiem AL method and 1N ammonium-acetate. Another soil K fraction (fixed potassium) was measured by Knudsen et al.1989. procedure, where released K^+ was estimated by using KCl in 24h extraction by 1N ammonium-acetate. All K measurements were done by AAS. P fertilizers (50 kgP_2O_5/ha from super phosphate) was added to the experimental plots in late winter as a starting fertilizer, while N was added in two doses in spring (60 kg N/ha from KAN fertiliser). The soil and plant samples were collected during and at the end of the vegetation. After wet digestion, plant material was analyzed by standard procedure.

RESULTS AND DISCUSSIONS

Agrochemical properties for the vineyard's eutric cambisol are presented at the Table 1, with estimated total K in soil profile. This K amount obtained by destroying a soil K bearing lettuce, gives up to the thousand times higher K content than its available form (Graph 1). However, dispute intensive K fertilization, no significant changes of total K were observed during three years experimental period.

Table 1

The vineyard soil agrochemical properties with the amount of total potassium in profile

Depth	pH	pH	Humus	N	NH_4	NO_3	P_2O_5	Ca	Mg	Tot.K
cm	H_2O	KCl	%	%	mg/ 100g	mg/ 100g	mg/ 100g	mg/ 100g	mg/ 100g	mg/ 100g
0-30	7.4	6.5	3.31	0.21	10.5	3.5	11.1	564	23.2	1870
30-60	7.4	6.5	2.11	0.19	10.5	5.2	14.0	494	20.2	1870
60-90	6.7	5.4	1.88	0.16	10.0	5.2	9.0	350	22.1	1910
90-120	6.9	5.7	1.64	0.16	11.2	7.0	8.0	399	23.1	1920

This total K fraction of soil K is usually predominant (Sparks,1987), but the rate of this K utilized by plants concerning their demand is usually of minor importance. Other three K fractions play a more important role in grape nutrition: K adsorbed in exchangeable form to the soil colloids and K in soil solution. Also, a potential K source for plants in soils belongs to fixed K. Added K with fertilizer enriched some of these soil K fractions, but the way of its distribution depends to a great extent on soil type, moisture, and its 2 :1 clay minerals (Huang, 2005).

Table 2

The effect of potassium fertilization on its soil fraction during three years period

Treatment	Depth	AL-K_2O	NH_4OAc-K_2O	Fix-K_2O
	cm	mg/100g	mg/100g	mg/100g
Control	0-30	16,7	15,2	99,3
	30-60	16,5	16,2	97,5
	60-90	14,9	14,4	95,5
	90-120	15,3	15,2	97,6
50 kgK_2O/ha	0-30	17,0	16,7	99,5
	30-60	17,0	16,5	99,7
	60-90	16,6	17,0	101,6
	90-120	17,1	16,8	102,3
100 kgK_2O/ha	0-30	17,6	17,4	99,2
	30-60	17,5	17,1	98,2
	60-90	17,4	17,5	101,1
	90-120	17,0	16,7	99,2
150 kgK_2O/ha	0-30	20,3	18,3	102,9
	30-60	18,1	18,3	104,1
	60-90	16,0	15,4	99,2
	90-120	14,7	14,8	99,7

Both used methods (AL method and 1N NH_4OAc) estimated very similar amounts of extracted available potassium, showing no fertilization effects at the lower K doses (50-100 kgK/ha). The average value over the experimental period has a significant K increase only with the highest rate of applied K (150 kg K_2O/ha), referring to the top soil layers (0-30 cm and 30-60 cm) as was expected. Between tested methods, 1N NH_4OAc extraction proved to be a more sensitive, detecting the fertilizing effect of 100 kg K_2O/ha application, but in general, a vigorous increase of available soils K during the experiment was not found, having just 3,6 mgK_2O/100g more then control at the highest K dose (0-30 cm/150kg/ha). Generally, recommended doses for potassium fertilizer for high grapevine yield are very low compared to the K bulk soil available reserves. If the total available quantity of potassium is calculated based on its content of 15.6 mg/100 g (Ø; 0-30 cm), a considerable amount of this element is available to the plants (702 kg/ha). The deeper soil layers (30-60 cm, 60-90 cm), where grape roots mainly take up their nutrients, are even with higher K saturation. In such nutrient medium it comes out that small K fertilizer rate can not induce any fertilization effects. Some data (Burkart, 1975) also indicate that in some cases rates as high as 300 kg K_2O/ha gave only slight responses to the soil potassium level.

Potassium applied from fertilizers undergoes fixation in 2:1 clay minerals. Concerning that content of clay in our soils range from 12.7% (0-30 cm) to 23.9% (30-60 cm), this process was of importance for K status in soil. According to some investigations, a large sum of K from fertilizer can be fixed (>50%), especially if the 2:1 clays are dominant in soil (Arifin et al. 1973). According to control, the significant values were not determined even with the highest K treatments (150 kg K_2O/ha), where the amount of fixed K^+ usually exceeds the amount of K applied with fertilizers. The difference of fixed K^+ in a control (99.3 mg K_2O/100 g; 0-30 cm), and fixed K^+ in the treatment with 150 K_2O/ha (102.9 mg K_2O/100 g) is 3.6 mg/100 g, means that this soil layer was enriched with 162 kg/ha of potassium (3.6 mg/100 g x 10.000 m^2 x 30cm x 1.5 g/cm^3). So, this K content in a fixed form (which also includes available forms of K) was not achieved by fertilization, and the obtained results pointed out that the changes of this fraction of potassium were not dependent on fertilization effect. Such results could be affected by not homogenized soil profile, which derives from soil cultivation up to the 120 cm depth. Also, the soil samples collected for fixed K analyses could have a great variation in such profiles. This is also confirmed by the variation of fixed K^+ estimated in the deepest layer (Table 2), which could be hardly affected with added potassium without similar K changes in the upper layers.

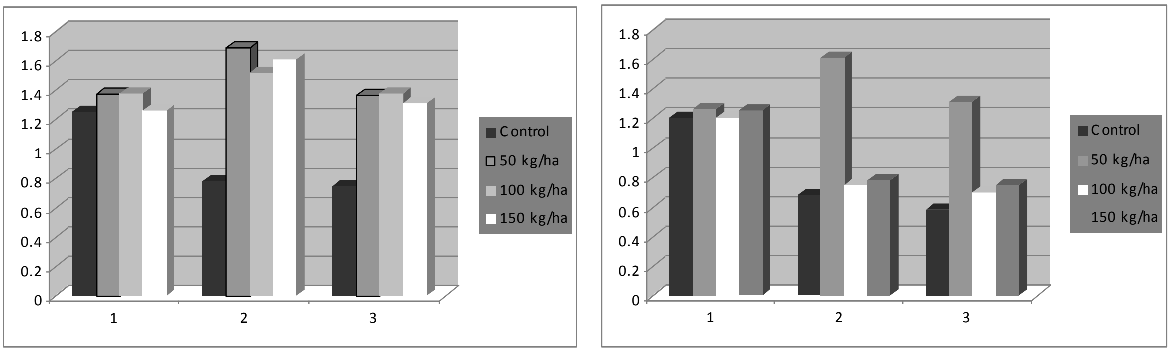

Figure1: Potassium content (%) in leaves and shoots during three years experiment

This experiment was focused on the relation between soil K fraction and its accumulation in organs (leaf, shoots) (Fig.1,2). According to the results, grafts K reserves play a great role in supplying vine in the first year, where no significant differences between treatments were observed. Potassium fertilization in second year of the experiment brought also variable increase in leaf K content, but in the third year no differences were observed. Shoot's potassium was more related to the K fertilization. It could be said that linear correlation exist between increased K doses and K concentration in this organ for the last years of experiment, where higher doses of K fertilizer increased its content in shoots (Ø-0, 82% K_2O; 150kg K_2O/ha-0,92%). The calculated K uptake by formed biomass of shoots (mass of pruned canes x K conc.) give even better illustration about the K fertilization effect on grape growth. This is the way to overcome “dilution effect” related to content of some element in plant tissue, especially shoots and canes, which have much bigger biomass then leaves. One more aspect in this investigation was included: a correlation between K soil fraction and its accumulation in organs. However, no significant correlation was found between these the K content in any fraction in soil and its accumulation in organs. This is a consequence of the specific nutrient distribution between perennial organs, which accumulate nutrients and serves as storage organs, buffering fertilization effect (Licina et al. 1992).

CONCLUSIONS

The biggest K soil reservoir lies in clay mineral lettuce, but it is of minor importance for grape nutrition. The applied K fertilizers didn't affected this total and K fixed fraction. Only the highest doses of fertilizers (150 kg K_2O/ha) made a significant increase of this element in available fractions (17.31 mg/100 AL method and 16.70 mg/100g 0,1N NH_4OAc), but potassium was not proportionally increased in fixed fraction. The influence of potassium fertilization did not affect its content in leaves, while K fertilization increased its content in shoots (Ø-0,82% K_2O; 150kg K_2O/ha-0,92%).

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CERCETĂRI PRIVIND PLANIFICAREA FĂTĂRILOR LA VACILE DE LAPTE

RESEARCHES CONCERNING THE MILKING CATTLE CALVING PLANNING

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Cuvinte cheie: controlul ciclului sexual, reproducție, hormoni
Keywords: sexual cycle control, reproduction, hormons

REZUMAT

Importanța economică a controlului fecundității la taurine a fost demonstrată în cadrul numeroaselor studii efectuate în lume în acest domeniu. Acestea au avut în vedere utilizarea şi îmbunătățirea tehnicilor moderne de reproducție. Cu condiția cunoaşterii prealabile a nivelului activității ovariene femelelor, un tratament cu progesteroni completat eventual cu prostaglandine şi/sau Gonadotrofine Serice (PMSG), se pot obține, fără detectarea prealabilă a căldurilor, printr-o singură însămânțare sistematică nivele de fertilitate egale sau superioare celor obținute prim metode tradiționale de reproducție.

Variabilitatea rezultatelor obținute în cadrul studiilor întreprinse pentru simplificarea acestui tratament nu au condus deocamdată la o schemă unică de administrare. De asemenea, s-a constatat că repetarea administrării acestui tip de tratament asupra aceluiaşi lot, nu este incompatibilă cu obținerea unui bun nivel genetic şi a unui bilanț tehnico-economic pozitiv. Astfel, în prezent fermierii pot planifica reproducția vacilor, fără a mai fi necesară depistarea şi urmărirea oestrului în condițiile menținerii indicatorilor de reproducție ai lotului.

ABSTRACT

The economic importance of fecundity in cattle has been demonstrated in numerous studies conducted worldwide in this field. They took into account the use and improvement of modern breeding techniques. In condition to prior knowledge of female ovarian activity levels, an progesterone treatment possibly supplemented with prostaglandins and / or Serum Gonadotropin (PMSG), without prior detection of heat, can be obtained on a single systematic insemination fertility levels at or above the traditional breeding methods.

Variability of results from researches undertaken to simplify the treatment not yet led to a single scheme of management. It was also found that repeated administration of such treatment on the same lot is not incompatible with obtaining a good genetic level and a positive economic and technical balance. Thus, farmers can plan now cows breeding without the need for oestrus detection and tracking while maintaining the lot breeding indicators.

INTRODUCTION

The technical aspects of milk production are related on the one hand to the female of obtaining, on the other hand, socio-economic constraints that may interfere with the breeding of cattle in general and in particular dairy cows.

In milk production farms, parturition date choice depending on fertilization is possible at the moment using hormonal treatments that remove constraints related to heat detection. The main economic advantage resulting from rigorous planning births in dairy farms is to obtain an increase of production due to prolonged period of lactation.

Knowledge of steroid hormones and gonadotropins secretion during sexual cycle and the interaction between the ovary and hypothalamic-pituitary complex allowed the development of techniques for control of the sexual cycle. They allow the onset of heat and ovulation on the moment chose by the farmer depending on the specific economic and technical criteria, whatever of ovarian status at start of treatment. This allows the start insemination campaign before the transition period to the grazing time, which allows grouping of births in an interval of maximum two months.

Heat and ovulation planning became possible due to the emergence of products and treatment techniques that have proved effective in laboratory tests and from the experimental stations.

MATERIALS AND METHODS

The study was performed in 2009 on SC Inagro SRL, Breasta, Dolj, over the milk cows farm effective. The effective of farms was 33 females of which 25 cows and 8 heifers Holstein race.

Were followed fertility and calving twins both for cows and heifers on different concentrations and combinations of hormonal products in order to obtain a grouped calving.

In order to perform the study, both cows and heifers in lot were divided in 2 groups as presented in table 1.

Table 1

Female groups structure

Specifications	Total female	Group 1	Group 2
Cows	25	13	12
Heifers	8	4	4
Total	33	17	16

The hormonal treatment was done with various combinations of the following products: Norgestomet - 3 mg - implant subcutaneously (17-hydroxy-11b-methyl-19-norpregn-4-ene-3,20-dione acetate) for all cows and heiffers, Norgestomet injectable solution and Estradiol valeriate ((17β)- estra- 1, 3, 5(10)- triene- 3, 17- diol).

Norgestomet is a progestative and Estradiol valeriate is an estrogen, both being used as hormonal products in animal treatments.

The 4 groups resulted (2 of cows and 2 of heifers) were treated following different treatment schemes (fig. 1 and 2)

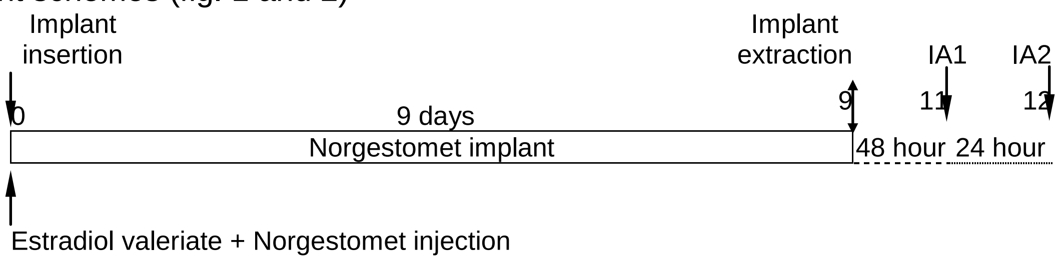


Fig. 1 – Treatment schemes applied on first groups of cows and heifers

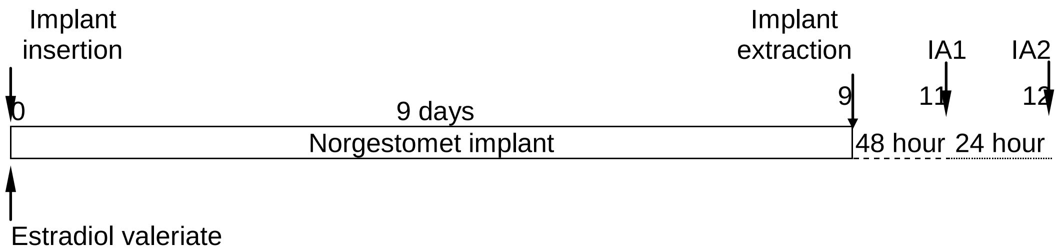


Fig. 2 – Treatment schemes applied on the second groups of cows and heifers

The Norgestomet implant containing 3 mg of active substance was kept for 9 days.

The implant administrations were done subcutaneous on external side of the ear.

Administration simultaneous (day 1) of an intramuscular injection of a solution containing 3 mg Norgestomet and 5 mg Estradiol valeriate allows to obtain a high level of progestative in blood serum in short time and also prevents a too early and reduced ovulation due estogenous hormone which eliminate the yellow body.

For to observe the progestative level influence over the fertility indicators, on the treatment applied to second female groups was suppressed the intramuscular dose of Norgestoment, being applied only the dose of estrogenous hormone.

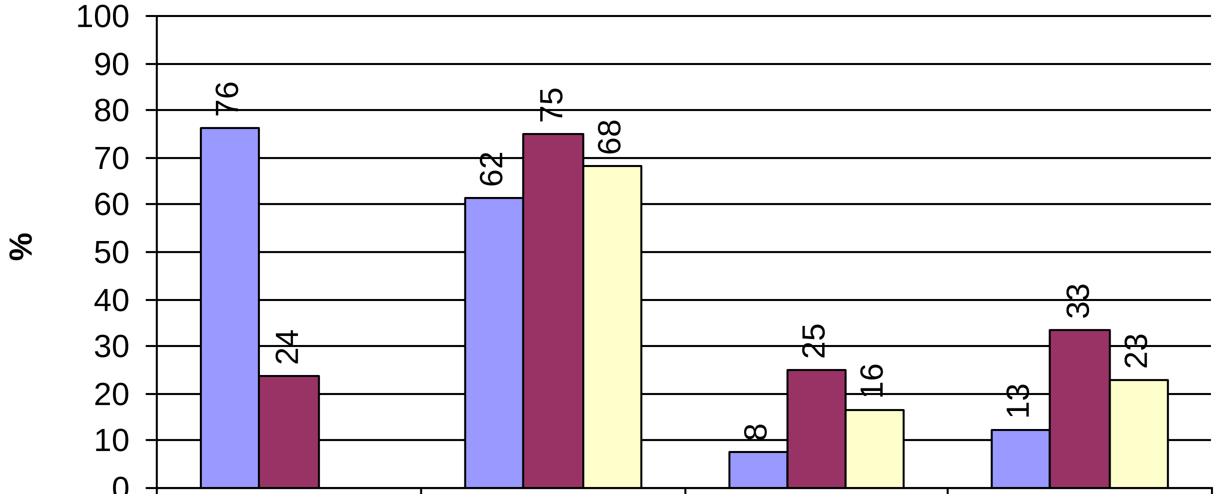
After treatment cows and heifers were artificial inseminated at an interval of 48 hours and repeated at 72 hours using semen material from SC Semtest SA - Craiova.

Were followed fertility and calving twins both for cows and heifers on different concentrations and combinations of hormonal products.

RESEARCH RESULTS

After artificial insemination and gestation period results were collected and analyzed.

The dates collected on first groups of cows and heifers receiving injectable solution of progestative and estrogenous is presented in figure 1.



	Lot component	Calving	Twin calving from total female	Twin calving from total calving
Cows	76	62	8	13
Heifers	24	75	25	33
Average		68	16	23

Fig. 1 - Situation of calving and twin calving after applying the implant and injected progestative and estrogen treatment (%)

From the total lot of 13 cows included in first group, were obtained 8 calving, representing 62% fertility. This rate is easy higher to those obtained on normal conditions when insemination is made according to the heat cycle. Literatures mention that normal cycle insemination fertility results are 50-60%.

Fertility rate obtained in heifers case is 75% which is more higher than in the normal case mention in literature.

Concerning the twins calving obtained in the first females groups this have values of 8 and, respective 25% of total female treated.

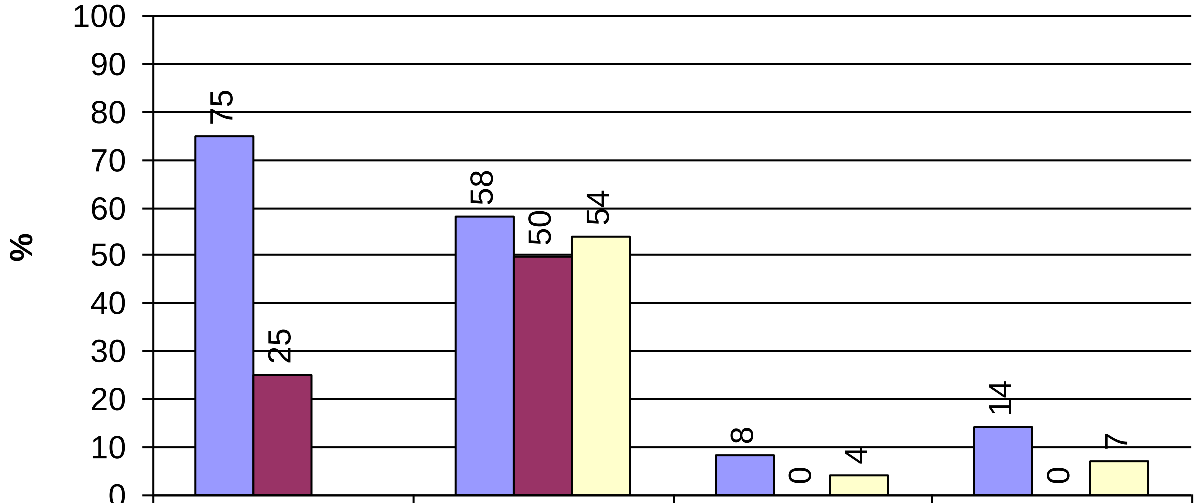
Reported to total calving registered this indicator have values of 13 and, respective 33% for the cows and heifers groups treated with progestative and estrogenic injection mix supplementary to the progestative implant.

In condition to obtain all the other advantage of grouped calving, the rates obtained during this study are very encouraging for practice.

On the case of first scheme of treatment, the lot average recorded were 68% fertility of which 23% was twins calving. Also reported to the total number of female included in this lot were obtained a twin calving average rate of 16%.

For to determine influence of increase of progestative dose administrate to the females, the second groups received additional to the progestative implant only a injected dose of estrogen.

Results obtained in this case are presented in figure 2.



	Lot component	Calving	Twin calving from total female	Twin calving from total calving
Cows	75	58	8	14
Heifers	25	50	0	0
Average		54	4	7

Fig. 2 - Situation of calving and twin calving after applying the implant and injected estrogen treatment (%)

In the case of cows, fertility recorded has a value close to those obtained on first group, being smaller with only 4%. With a value of fertility of 58% recorded, treatment with estrogens and implant applied to milking cows is close to superior limit of fertility mentioned in literature in case of normal insemination.

Concerning milking heifers subjected to this treatment, fertility results are smaller with 25% than in case of first group which received a supplementary dose of progestative.

Percent of twin calving recorded in cows group is the same with those recorded in first experience.

In heifers case, was not recorded twin calving follow to this treatment scheme.

Average of total fertility reached on the second lot was 54%, with 14% less than in first lot case.

Also, twin calving recorded after use of these treatment scheme is smaller due on the heifers case were not recorded any of these. Average results concerning this indicator obtained on this lot represent only a quarter reported to first lot female effective and only a third reported to calving registered.

CONCLUSIONS

Grouped calving is possible an accessible for regular farmers on this moment due the hormonal treatments available on market.

Fertility rate obtained using hormonal treatment is similar to those registered using traditional breeding methods based on female natural heat period.

Using a supplementary dose of progestative hormone at the beginning of treatment offer a better results both for cows and heifers, because it generated better results both for fertility and twin calving obtained.

Comparing results obtained on the two milking cows groups, we observe that fertility is with 4% smaller if we suppress progestative injectable dose but the twins calving have the same values than the first group.

In the case of suppress progestative hormone dose injected, milking heifers group registered fertility smaller with 25% comparative with first group, twin calving being 0.

This is due probably theirs insufficient development of hormonal system.

We can mention that during the study was not observed any malformation to the calves obtained.

We consider that in necessary and possible to extend these method uses due the technical, logistical and financial advantage which can be obtained comparative with the traditional breeding methods used in Romanian farms.

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WORKING GROUP 2: SOIL SCIENCES

Pedology, Agrochemistry, Agrotechnics, Soil Iprovement Works, Equipments and Systems for Irrigation

CATEGORII DE FOLOSINTE ALE TERENURI LOR, FORMATIUNI DE VEGETATIE SI ASPECTE PALEOBOTANICE SI PALEOCLIMATICE, PE BAZA DE ANALIZE SPOROPALINICE, IN ZONA DEPRESIONARA LITENI-CIPRIAN PORUMBESCU, DIN JUDETUL SUCEAVA

LAND USE CATEGORIES, VEGETATION FORMATIONS AND PALEOBOTANICS AND PALEOCLIMATICS ASPECTS, ON SPOROPOLINICS BASE, IN THE DEPRESSION AREA LITENI-CIPRIAN PORUMBESCU, SUCEAVA COUNTY

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Keywords: paleobotany, paleoclimate, sporopolinic analyse, land use, soil texture class

REZUMAT

Amplasata in extremitatea de vest a podisului Sucevei, depresiunea Liteni a fost investigata sub un alt aspect, mai putin abordat in cercetarile geografice, geobotanice, pedologice sau din alte domenii conexe si anume: paleoclimatic si paleobotanic. Lucrul s-a datorat cartarilor efectuate asupra depozitelor rocelor parentale de soluri, care ne-au oferit posibilitatea identificarii, prin analize palinologice de laborator, a elementelor de flora cuaternara si implicit posibilitatea de reconstituire a evolutiei climatice si a vegetatiei din ultima parte a Pleistocenului si parima parte a Holocenului. Sunt prezentate, de asemenea, categoriile de folosinte ale terenului, lucrarea fiind insotita si de o harta geobotanica si tabele cu date analitice.

ABSTRACT

Located in the extreme west of the Suceava plateau, Liteni depression was investigated on another aspect, less discussed in geographical research, geobotany, soil or other related areas, so as paleobotanical and paleoclimatic. The research resulted on parental deposits, which gave us the possibility to identify, through laboratory palynological analyse, the evidence of quaternary flora and thus the possibility of reconstructing the evolution of climate and vegetation and the last part of Pleistocen and the first part of the Holocene. There are also presented, categories of land uses in the graphic, the paper also being accompanied by geobotanic map and tables with analytical data.

INTRODUCTION

The use of land for different purposes and destinations has always been an interest, because the geographical environment, pedological, agronomic or under any other name would be, it is and will remain the venue space and development interests of human society.

Depression is situated in the extreme west-northwest structural unit platform (Moldavian Plateau - subunit of Suceava Plateau) in contact with the Miocene, Carpathian hills (geo-morphological Ciungi spurs, altitude 692m) and the Bukovina.

MATERIAL AND METHOD

The pragmatic part of work focuses on categories of land and how they are used, the theoretical description is based on present vegetation formations, and paleobotany and paleoclimatic characterization, reconstruction was done using sporopolinice analysis.

RESULTS AND DISCUSSIONS

1. Categories of land use of Liteni space depression belong to both agriculture and forestry. They are: arable land, pastures and hayfields, orchards and forests. Counterproductive, a distinct category is represented by wetlands, meadow p. Somuz but also its tributaries such as: Humaria, Stupca, Lamaseanca, Bradatel, etc.. These lands may even have gained in the last times, the profitable use hydro-ameliorative measures, such as meadow Somuz next to the city (with glitter and water development).

Arable land has the largest area, with approximately 70% of the territory. This issues concern the intense literacy of the depression area, that land was taken aside for a long time, taking advantage of favorable soil coating (pratozioms, cernoziomoide soils, SRCS 1980, faeozems / SRTS 2003).

Arable land is superimposed on an embossed apron, and some areas such as the Vorniceni micro-depression.

Pastures and hayfields ranks second among the categories of uses, by land. The two uses correspond to the relief of cuestas, most frequently, but erosion of basins and larger portions of the alluvial plains.

Morphometric, pastures and hayfields, and superimpose a variety of slopes (10° and more) and as energy and fragmentation, of 0-5m, in the case of 250-500m and meadows in the area of contact with the relief Carpathian hills. Pastures and hayfields occupy about 7% of the agricultural area of the basin. Regarding the development of this category of use is the way its rational exploitation are. It is known that triggered extensive landslides fronts and expansion of surface erosion depth is often caused by irrational use of the agricultural categories. Grazing, which is still practiced on the surfaces of cuestas (Bradatel, Lamasanca, Bunesti, Stupca), provisional balance remains below ground, triggering frequent geomorphic processes.

Measures taken in case of Hacicadar and Frumoasa cuesta of flora reserve, concerning protection of these areas through wire fences to ensure a rational grazing, controlled also by sowing restore fertility to these uses of selected herbs with phyto-sanitary protection.

Orchards and its surfaces are investigated at 5% and have a more comprehensive development at Bunesti basins, Radasanca and Lamaseni.

Geomorphological cuestes underlines the subsequent network of parael mentioned. Orchards were located in basins of Dragoiasca and Fundoaia, the radius of Vorniceni, Dragoesti and Lucacesti localities.

In the outskirts of villages Rădăşeni and Lamaseni orchards occupy an area concentrated in the upper and middle basin p. Radasanca.

Geomorphological, perimeters are affected by current processes, where landslides and erosion are widespread.

Choice of land where the fruit is to be arranged, you must consider the following: gradient <15 ° and exhibitions to be sunny microclimate uninfluenced by the wind or temperature inversions and the quality of the underlying soil and rocks to foster the development of a normal root.

Orchards in the Liteni area depression were usually placed in the lower third of slopes, colluvial Glacis corresponding sectors.

Our researches has shown that under microclimatic aspect and micro-relief, land with fruit trees have good conditions for development. Instead, the lithological and hydrogeological aspect finds an imperfect drainage, an excess of groundwater specific for deluvio and deluvio-colluvial deposits that affects the root system of trees, hence the relocation of the perimeter of the middle third and upper slope. Where this has not occurred, the orchards are dry slowly, or have died (in case of Bunesti area). In Rădăşeni, the benchmark for the apple crop in Moldova (Falticeni SCDP) is currently faced with many hearths drying due to the planting site, the tableland or behind of monticuli slip, where they suffered long periods of time standing the influence of excess moisture.

The forests surrounding only peripheral the depression and have an effective area of 2% of the 220 km². Forested areas are found in the west and southwest (Ciprian Porumbescu-Corlata and Rotopanesti-Bradatel). The surfaces shows a fragmentation energy and steep slope. Between localities Bradatel and Botesti the forest occupy the Moldova terrace bridge (Dumbrava Terrace) but whose fragmentation is low.

Marshes – the land is unproductive with permanent excess of hydrological and hydro-geological. A large development of alluvial plains is in sectors or poor areas of the confluence with the main river Somuz. It occupies 1% of the area.

In these sectors plan relief have only fragmentary horizontal (2-3 km/km²) and hydro morph soils (Gleice and Lacovisti) do not have an agronomic importance.

Establishment of floodplain of river Somuz, next to the Falticeni city must be continued and further upstream watersheds up to but downstream to the confluence with Siret from Dolhasca.

2. Vegetation formations and reconstructions based on sporopolinice analysis - were side-comparative explanation of the current situation, the evolution that has a climate and vegetation of the last period of the Quaternary.

Regarding the current vegetation formations, they are the mesophilic species, Agrostis tenuis, sometimes dominant complex associations of Poa pratensis, Lolium perennial Festuca valesiaca and so on. This formation occupies almost exclusively, natural pastures and hayfields in the western basin (Lucasesti-Păltinoasa-Ilisesti).

Another formation is that of xerophyte vegetation in association with Festuca valesiaca, dominant in complex with species of Poa bulbosa, Poa pratensis and local Bothriocloa ischaemum, Larex humili and so on. They are identify with the relief of Cuesta, in the central depression as well as some receiving basins (eg Frumoasa, Vatav, Podeni, Bunesti). The reason of presence of xerophyte formations is due to the driest microclimate in central of Liteni depression, the support being pedological (chernozem cambic and cernoziomoide / SRCS1980).

On the plains and portions with hydromorphic excess, grass carpet is dominated by associations of clorophyceae, cyohophiaceae (Myrophillum spicatum, Ceratophyllum submersum) and species of Potamogeton, Lemna, and others.

On contact with alluvial plains of the slopes, the topography of aprons and coluviosol soil type, has developed a mesophilic and mezohidrofila plant association, with species of Poa pratensis, Festuca pratensis, Agropiron repens, Argostis stolonifera and local clusters of maximum Glyceria and Carex.

Marsh vegetation and ponds, especially in the meadow Somuz, a p. Granita and a p. Strambul consists of associative species of: Phragmites australis, Fyph augustifolia, Schaenoplectus lacustris, Glyceria maxima, Agrostis stolonifera.

A special place is occupied by plant formations among the "Frumoasa flora reserve" on the left side of the river of the same name and located in the north of the basin (crossed by D.N. Suceava-Vatra Dornei). It consists of several relics and rare species, for example: Arenaria graminifolia, Centaurea leucophaea or Hyaciuthella marschalliana.

The western part of the basin at piedmont unit limit (Iliesti area - Ciprian Porumbescu) deforestation by approx. 100-150 years and played aside, it is characterized by the appearance in place of the previous forest vegetation of some species such as

Gypsophila muralis, Guaphalium oliginosum, Spergularia rubra, Trifolium Arve and Settings glauca.

Most of the arable land is represented by the agricultural space (70%). Here, in place of the old plants of steppe vegetation are grown for grain and textiles (flax and hemp) in fields which have been identified cyamus species of Centaurea, Cirsium Arve, Fugapynum Convolvulus, Matricaria odorless and others.

An emblematic geobotany formation for this area is the forest. Located to the west and south-western extremity of the basin, they are comprised of Querqus robur, local and Querqus petraea and Prunus avium and the forest floor meet grassy species such as Brochyodium silvaticum, Stellaria holosteea, Carex pilosa, Convolaria majalis and so on.

Paleobotanical and paleoclimatic reconstructions based on pollen analysis represented an important stage for deciphering the paleo-geographic evolution of soil shell from marginal zone of the Suceava plateau with miocene unit in the West.

Quaternary period and particularly the last part, Pleistocene, is considered as responsible in the current configuration of the landscape. During the Pleistocene glacial maximum expansion in Eastern Europe had Nipru glaciations. Its limit wsa found at approx. 250-300 km north of the studied area and the glaciers Calimani and Rodna were at a distance of 100 km.

During the Quaternary climatic oscillations is one of the many transformations occurring at the surface causes the Earth's crust.

Interpretation of a sporopolinice analysis (p.308 and p.200) we used to estimate the periods of evolution that has crossed the region during the late Quaternary.

Lithology, where deposits were made clay samples is clays and clay-dust and is likely deluvial. Nature of clay material preserved pollen grains and spores, attesting the presence of grassy vegetation and trees. The spectrum shows a vegetation of open spaces, wet grassland and afforested with dominant of Compose Caryophylaceelor, Grasses and spores of Ophyoglossum, Batrychicum and inferior muscles, moist lovers.

Samples were also put out a lot of fito-planton by river origin.

Vegetation now installed, highlight an abundance of genera and species. Thus, between certain horizons (40-55 cm and 90-110 cm from Ciprian Porumbescu p.308), we have indications of wet and cold climate, representing the last part of Pleistocel and early Holocene period. It was correlated with dating fossils, the Elephas primigenius, identified on the terrace of 20m v. Moldova, near the south-western basin.

Two interglacial with indications of warmer climates are some of the intervals 20-35 and 70-85 cm, from the same profile p. 308. Percent of 6% of the Pinus genus, at the level of 70-85 cm, indicating a propagation of Pinus sylvestris and 18% are due Cryptograms Dryopterix thelypteris's. Ulmus genera and Ilia, also indicate a warming period. Fewer than 100cm may still contain elements that would indicate a cooling period.

If studied and analyzed samples from p. 200 (Dl. Buzi-o a reverse surface of Cuesta), the cold phase is controlled at 75-110cm level, which ranks the marginal forest zone, from the time that the proof is predominant criofil genera: Picea (14%), Pinus (5.3%) and Abies (7.5%). This level would indicate a cooling phase of the first part of the Holocene climate. Next sample (110-135cm) indicate a warmer climate, so an inter-stage.

A horizon that is showing the entire cold climate is 28-50cm. Here, Picea genus is common (5%), indicating a cooler climate.

In the sample below 140 cm (135-150) the material was sterile, probably due to the reshuffling of the Pleistocene or even spent Sarmatian.

Based on the results we did parallelization forest area and the forest has gone through these phases: the pin (from the Palaeolithic to the present and lasted approx. 9000 years), spruce stage (the Preboreal-Boreal, with duration of approx. 4000 years), and hornbeam phase (which lasted until subboreal) and last, phase beech (of subatlantic growing and today).

Postglacianul or Holocene is the last part of the Quaternary and it is characterized, first, by a warming climate. Polinice elements of genres Ulmus, Tilia, Juglans but others prove it. The period corresponds to the duration-Subboreal Atlantic.

Keeping in good condition elements polinice, shows that the deposits were made did not suffer major reshuffle.

Climatic oscillations occurred throughout the Quaternary vibrant, joins, with implications for other processes in altering the geographical landscape, as well as tectonic and neo-tectonic movements.

CONCLUSIONS

Researches of this nature, although less discussed, are of great relevance for understanding the evolution of land, grafted into a geo-morphological processes underlying on lithology and their profitable use (acceptance of current economic thinking).

Knowledge and deciphering all the components of relief, soil, vegetation, lithology, ground water, and so on through mapping and returns repeatedly, followed by representative sample for the intended purpose, always accompanied us and helped in finding the same configuration as a region highly in many complex environmental issues.

The categories of uses and their way of recovery was the pragmatic part related to immediate and agronomic land.

Restoring the old parts of species and vegetation associations pleistocene-holocene climate indicator was due to pollen and spores analysis, identified the deposit of soil formation in the laboratory and pertinent analyzed at Geological Institute of Bucharest.

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SUSTENABILITATEA PEDOLOGICĂ ŞI SIGURANȚA RECOLTELOR AGRICOLE ÎN PERIOADA ACTUALĂ

THE PEDOLOGICAL SUSTAINABILITY AND CROPS SAFETY NOWADAYS

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Keywords: pedological sustainabiliy, geo-agricultural space, pretability crops

REZUMAT

Problematica alimentară şi siguranța recoltelor, în zilele actuale, este strâns legată de sustenabilitatea resurselor de soluri. Lucrarea îşi propune aducerea în atenția specialiştilor şi nu numai, a problemei primordiale pentru agricultură – siguranța alimentară prin sustenabilitatea resurselor edafice-soluri. Prezentarea globala dar şi la nivel național, a fondului pedologic agricol, ca bază de susținere a calității, cantității şi stabilității recoltelor, este exemplificată prin componența resurselor, pretabilitatea acestora la diferite folosințe şi culturi, deopotrivă măsuri de prevenire şi combatere la procesele de degradare.

ABSTRACT

Food and crop safety issues nowadays, is closely related to the sustainability of soil resources. This paper aims to bring in attention of field specialists and not only, the importance of primordial agriculture issues - food quality through sustainability of pedo-logical resources. National and global reports of agricultural pedological fund as a basis of sustaining the quality, quantity and yield stability is illustrated by the component resources, their utility to different usages and cultures, both measures of prevention and control of degradation processes.

INTRODUCTION

This paper has proposed a brief presentation of the most important problems in agriculture and thus food, based on soil fertility potential at world level. Distribution of the main types of soils on the continents is discussed and its availability to provide food for millions of people. There are not omitted the current confrontation with the degradation processes, such as aridization, erosion and pollution.

MATERIAL AND METHOD

The research conducted meant, basically, going through what was known in the domain. It took into account, also, the growing interest for agriculture in new conditions created in Romania, but the lack of information found on acquiring accurate knowledge about soil - its features and functions for the agricultural industry.

It was determined and increased dryness process tends, in recent times, caused by a large disturbances climate. The beginning of the latitudes temperate process in areas of increased risk taking (M. Mediterranean basin countries, Maghreb, Middle East, Caspicei area, etc..) brought us to reconsider the situation of existing information. How to respond to new situations and how previous research can be implemented in future agronomic practice? It was one question that we put it. What we will complete mapping of impact affected lands? How we present detailed maps of land to the professionals and not only regard as indispensable to the industry? There will still be part of the soil material agricultural technologies?

All such questions were the starting point soil maps and legends, both nationally and regionally or globally. Examples: "soil map of Romania and the stairway 1/1.000.000 1/500.000," 1/200.000 soil maps, "Agro-ecosystems map", "The preliminary sketch of soil moisture regions in Romania" with supplements, as data USDA, "Soil-word memory of the FAO", "Carte mondiale des sols – légende révisée" Soil of Iran "," Carte des sols d'Algérie". Regarding our country, it was use the taxonomy system SRTS-2003, ICPA, compatible with systems as FAO-UNESCO and USD-Soil taxonomy.

It was taking into account the concept of sustainable agriculture, conservation methods and specific traditions of work. It was appreciate the danger of reducing dependence on chemization agriculture. The rewards have found it to be double, environmental and financial terms.

Aridization and degradation of soil cover, with all ensuing consequences are reflected in the yields obtained. For Romania have made several statements about the impact of environmental components, including soil characteristics of the new process (eg salinization-alkalization, erosion, agro technology, etc.).

Production evaluation was done through a real bonitation and underappreciated as L.18/1991. Some projects were useful, more recently developed, abandoned and forgotten today, in which were found valuable information about soil and its protection means (I.F. systems, Bucharest- Arges-Danube and Siret- Baragan channels).

RESULTS AND DISCUSSIONS

The pedological situation fund to support the agricultural process, regional, or continental code is as follows:

- African continent is a massive and homogeneous unit in terms of geo-structural and environmental conditions and pedological default fund. Equally we appreciate the human component.

Supporting a population of about 500 million can be made from an area of more than 30 million km² in size and occupied lands for farming are about 225 million ha. Reported number of people that means instead of from 0.4 to 0.5 ha, a case may seem happy but the poor quality of soils and their distribution to more than 10% of the population actually suffer from malnutrition.

If subsoil resources are extremely well represented at the continental level, the soils that provide food resources are heterogeneous as fertility, lack of necessary nutrients, hence their use for a limited range of crops, many traditional export only.

The majority pedological content of the black continent countries is represented by: calcisols (CL), leptosols (LP), oxisols (OX), arenosols (AR), ferralsols (FR) and local intrazonal of fluvisols (FL) and salsodisols (SAL).

The specific conditions of soil, in a barren uniform environment, determined monoculture practice in many countries of the continent.

- Asian Continent, including here the lands of Near and Middle East. The continent is covered in very large proportion by leptosols (LP). Highly populated countries with such soils are: Iran, most of the territory and Iraq, especially in its northern part.

Asian countries in the world's most populous, China and India, are occupied by cambisols (CM). All the territory of the two major Asian countries that comprise one third of world population as representative of soil types, unprecedented: acrisol (AC) and vertisol (VS). China is actually mostly occupied by leptosols and acrisols.

Amelioration process is suitable for agriculture, with a variety of cultures. Vertisol occupies the largest area of the Deccan plateau, in India and are fully grown. On it is obtained stable agricultural production due to related features, in particular, their chemical composition. They are known as regional "regur".

- Central America and Mexico, is a region dominated pedo-geographical by Luvisols (LV), Nitisols (NT) + Andosols (AN), Acrisols + Plintisols +Alisols (AC + PT + AL). It is an area with high population concentration (about 150-200 million people) and where every year or at short intervals climate and tectonic events occur (the most recent being Hurricane "Katrina" -2005 and the earthquake in Haiti - 2010.

Their agricultural suitability is specific to the Central American and Caribbean region (field crops, tropical and shrubs trees).

- South American continent, in terms of momentary agricultural sustainability, there are some items which need to be taken into account, namely:

- The northern Andean area and the countries have similar soil conditions to the countries from Central America and Mexico.

- South America centre occupied mostly of the Brazilian state is a vast arid plateau with the conditions given and here is the most extensive river basin in the world: the Amazon.

- South of the River Parana, on the territories Argentina and Uruguay extend the most fertile area of the continent, namely La Plata plains continued by Pampa. Here, the longitudinal development of an area lying kastanozeoms (KZ) and chernozems (CZ), highly fertile soils that provide focus of the South American agriculture.

For an area of 18 million km² correspond approximately 300 million inhabitants, of who half are in the Brazilian state. Brazilian agriculture is practiced in its land without a special fertility potential but that is suitable for a variety of tropical crops, coffee plantations are basic.

- The continent of Australia, with an area of 7.6 million km2 and a population of about 24 million people has limited land resources, both as pedo-geographical areas and in terms of quality. Most of the Australian desert is occupied by arenosols (AR) and coastal areas by acrisols (AC), leptosols (LP), luvisols (LV) and cambisols (CM). Western Zone (W.A.Perth) is the area of planosols (PL). Vertisols (VS) form large areas in eastern and central-east side, from north to south.

At the centre of Australia is carrying out a large territory with salsodisol-solonceac (SC) and solonet (SN) and everything that belongs to alkaline and the extreme south, bordering the island of Tasmania.

From these soils, with moderate agricultural potential and high agricultural technologies, Australia gets about 16 million tonnes of wheat annually, there are also extended vineyard, fruit and citrus crops in the south and east and occupied significant areas for development of pasture livestock (sheep, 2nd place in the world and is still in 2nd place and the growth of cattle).

- The European continent, benefiting from its eastern to the most fertile soils: chernozems, faeozems, kastanozioms, grizioms. However, its properties and attributes ensure the stability and continuation of agricultural crops in conditions of maximum security. The first, cover the south central part of Russian Plain, Ukraine, Moldova, southern and eastern Romania, northern Bulgaria and can be extended through the Pannonia Plain (Vienna Basin).

Grizioms, limits the Russian eastern plain area, stopped by the west by the Romanian Carpathians. Kastanozioms, former Romanian balan soil classification, a band formed around Black Sea (Ukraine, Moldova and Romania), and new maximum extension being in Dobrogea.

With appropriate agricultural technology and irrigation intake (IRI), the yields on these soils meet the costs of operating assets is the most important resource for countries in this part of the continent.

Southern Europe – Mediterranean where dominated are calcisols (CL), it is most vulnerable to desertification process. Arid weak regime is the biggest threat to the preservation of pedological fund. The south land's of the continent (Portugal, Spain, southern France, Italy, Greece, M. Adriatic coastal countries, Anatolia, etc..) are affected by prolonged drought, with dry soil control section, several consecutive months of the year. Edaphic volume of many soils decreased significantly, increased erosion and humus mineralization, leading to degradation of topsoil. He began the radicalization uses both crop agro-horticultural.

Continent	**Million total area„ha"**	**Land used for agriculture mill. „ha"**	**% from chapter 3**	**Land used for agriculture mill. „ha"**	**% From Chapter 5**
ASIA (excluding Russia and former Soviet countries)	2.760	1.683	61	700	88
EUROPA (excluding Russia and former Soviet countries)	492	443	90	150	88
AFRICA	3.026	1.089	36	160	32
NORTH AMERICA	2.151	1.784	83	240	53
SOUTH AMERICA	2.055	1.726	84	80	21
AUSTRALIA-OCEANIA	895	123	16	20	16
Former Soviet Union	2.242	1.569	70	237	15

*Data: FAO

CONCLUSIONS

The period we traverse that is related, in agronomic terms, support the increase of pedological processes degradation, soil, the only resource that provides food for humans. Aridization topsoil and increased mineralization led to the loss of many traits of fertility, so harvest and stability. Soils, a major component of terrestrial ecosystems, as presented at the continental level, we are able to get an idea how will the situation of agriculture, regional or global.

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CUANTIFICAREA IMPACTULUI PIERDERILOR DE NUTRIENTI PROVENITI DIN AGRICULTURĂ ÎN PUNCTUL EXPERIMENTAL PERIENI - VASLUI

QUANTIFYING THE IMPACT OF NUTRIENT LOSSES FROM AGRICULTURE IN THE EXPERIMENTAL POINT PERIENI – VASLUI

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Key words: nutrient losses, upstream, downstream

ABSTRACT

Pentru a cuantifica impactul pierderilor de nutrienți proveniți din agricultură asupra mediului, in punctul experimental Perieni, au fost făcute, în anul 2009, două profile pedologice, unul în aval şi celălalt în amonte față de parcele standard pentru controlul scurgerilor. Pentru stabilirea nivelului de aprovizionare cu elemente nutritive s-au prelevat probe de sol din partea din amonte si aval al parcelelor standard pentru controlul scurgerilor de elemente nutritive.

To quantify the impact of nutrient losses from agriculture on the environment, in Perieni experimental point were made two soil profiles, in 2009, one downstream and one upstream of the standard plots for controlling the leakage. Soil samples were taken from the upstream and downstream of the standard plots to establish the nutrient supply level.

INTRODUCTION

Applying fertilizer without a scientific system based on knowledge of physiology and biochemistry of plants, soil conditions, agricultural chemistry and genetics does not guarantee high and stable crop or soil fertility maintenance.

The main macronutrients with an important role in plant nutrition are humus, nitrogen, phosphorus and potassium and the essential trace elements are Fe, Mn, Cu, Zn.

The manner in which these elements are lost:

- Losses through the soil eroded, contributing to the movement of these elements on the slopes and deposition in floodplains or in reservoirs, according to the erosive power transmission units, with solid material transported;
- Loss of elements with water leaking from the surface soil. These losses are directly proportional to the solubility and quantity of the element in soil;
- Movement of these elements in the soil profile through the water infiltrates into the soil.

MATERIALS AND METHODS

Study on nutrient losses was made to standard plots for control leakage located on the left side of the Tarnii Valley BH. Ten plots have the following dimensions:
- Eight have 100 sqm. (4x25).
- Two plots, 7 and 8, have 150 sqm. (4x37,5).

The plots were planted with these crops:
- The 1st plot of 100 sqm. was planted with wheat;
- The 2nd plot of 100 sqm. was planted with corn;
- The 3th plot of 100 sqm. was planted with bromus in second year of vegetation;
- The 4th plot of 100 sqm. was planted with beans;
- The 5th plot of 100 sqm. was planted with soybeans;
- The 6th and 7th plots of100 and respectively 150 sqm remain as permanent black field;
- The 8th plot of 150 sqm. was planted with wheat;
- The 9th (maize) and 10th (wheat), each have 100 square meters., being grown in rotation for two years.

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RESULTS AND DISCUTIONS

To quantify the impact of nutrient losses from agriculture on the environment, in Perieni experimental point were made two soil profiles, in 2009, one downstream and one upstream of the standard plots for controlling the leakage. Analytical results are presented in Tables 1 and 2.

Name and general conditions of formation of profiles:

Soil name: cambic moderately eroded chernozem, LP / LP, on the loess
Location: Perieni municipal territory, Tarnii Valley, Sc: 1:5000 longitude: latitude

General conditions of formation:

Relief: Plateau Barlad, slope 5-6%
Parent rock: loess
Groundwater Depth:> 10 m;
Characteristic vegetation: herbaceous vegetation xerophyte.

To determine the level of nutrient supply were sampled from upstream and downstream of the plots of 100 sqm and for the plots to 150 sqm the samples were collected from the middle part, analytical results are presented in Table 3.

Table 3 shows that:
- pH - weak acid with values between 5.17 and 6.33 indicating the presence of a moderate soil;
- Humus content varies between 2.58 and 4.15% soil of plots situating at a medium level of supply;
- The values of nitrogen content varies between 0.17 and 0.36% indicating a mid-supply in this element;
- Level of supply is very low for phosphorus on unfertilized crops, of 5.89 to 8.38, the low and medium for black fields, from 12.92 to 25.15, and good for fertilized crops, 44.89 to 84.71 ppm;
- The supply of potassium is good;
- Hydrolytic acidity, Ah is an index of soil acidity which comprises a important fraction of total soil acidity and neutralized by amendments which leads to a neutral pH;
- The degree of saturation at pH = 7, VAh, correlated with the pH is an index of appreciation of the need to correct acidic soil reaction by the amendment. VAh values vary between 76.5 and 90.6% considering the existence an mezobazic land on plots.

Table 1

Analytical data on the main chemical features of the profile in the downstream area of the standard plots, 2009, Perieni

Horizon	pH	N (%)	P ppm	K ppm	Cond. MicroS/cm	Total content of salts, mg/100 g sol	Humus %
Ap1 0-10 cm	6.23	0.23	12.92	165.00	134.3	46	4.02
Ap 2h 10-26 cm	6.45	0.21	7.33	165.00	101.9	35	3.24
Am 26-40 cm	6.69	0.24	3.14	165.00	85.6	29	2.46
AB 40-52 cm	6.57	0.15	3.66	163.33	83.3	28	1.44
Bw1 2 52-73 cm	6.68	0.14	5.59	150.00	111.2	38	1.26
Bw2 73-90 cm	7.11	0.14	11.00	126.66	119.7	41	0.96
Cca 90-103 cm	8.11	0.11	25.15	105.00	189.8	65	0.94

Table 2

Analytical data on the main chemical features of the profile in the upstream area of the standard plots, 2009, Perieni

Horizon	pH	N (%)	P ppm	K ppm	Cond microS/cm	Total content of salts, mg/100 g sol	Humus
Aț 0-2 cm	6.42	0.45	42.09	256.66	177.8	60	-
Am 2-35 cm	6.31	0.31	11.00	340.00	124.8	42	4.75
AB 35-44 cm	6.43	0.21	4.19	160.00	176.8	60	2.19
Bw 1 44-62 cm	7.42	0.18	6.46	156.66	1747.1	59	2.22
Cca 1(b) 62-72 cm	8.10	0.16	19.56	128.33	167.2	57	1.38

Table 3

Analytical data on the supply level of nutrients in the downstream and upstream areas of the standard plots for erosion control, 2009, Perieni

Plots	Crop	Location	pH	Nt (%)	P-AL ppm	K -AL ppm	Cond. MicroS/cm	Continut total de săruri mg/100 g sol (val.cond.x0.34)	Humus (%)	SB me/100 g sol	Ah me/100 g sol	T me/100 g sol	VAh %	Cu ppm	Zn ppm	Fe ppm	Mn ppm
1	Wheat	Upstream	5.71	0.36	54.15	133.33	133.2	45	3.59	22.37	6.22	28.59	78.3	1.66	18.04	76.96	78.36
		Downstream	5.25	0.22	55.89	210.00	176.7	60	3.60	20.13	5.72	25.85	77.9	1.30	17.50	67.72	80.06
2	Maize	Upstream	5.17	0.22	65.15	138.33	140.5	48	3.63	22.78	6.18	28.96	78.7	1.34	12.78	59.58	73.12
		Downstream	5.30	0.27	63.23	135.00	130.5	44	3.47	20.75	5.68	26.42	78.5	1.36	16.32	67.98	66.78
3	Bromus	Upstream	5.68	0.27	61.31	125.00	79.2	27	3.34	23.39	5.72	29.11	80.4	1.22	16.18	62.52	67.82
		Downstream	5.54	0.24	52.40	133.33	74.8	25	3.36	20.75	5.76	26.50	78.3	1.23	22.26	66.66	67.26
4	Beans	Upstream	5.36	0.26	44.89	130.00	137.5	47	3.17	21.76	6.01	27.77	78.4	1.30	11.24	66.90	70.44
		Downstream	5.77	0.23	44.89	148.33	118.8	40	4.15	24.21	4.47	28.67	84.4	1.11	14.94	64.66	64.84
5	Soybeans	Upstream	5.21	0.22	84.71	133.33	143.8	49	3.12	22.58	6.47	29.05	77.7	1.11	17.80	64.14	82.56
		Downstream	5.28	0.23	48.21	145.00	117.9	40	3.72	20.54	6.30	26.84	76.5	1.17	16.56	68.62	76.56
6	Field 100	Upstream	5.99	0.17	16.59	158.33	77.7	26	2.69	23.39	3.13	26.52	88.2	0.92	8.5	31.40	43.62
		Downstream	5.84	0.24	25.15	173.33	83.1	28	2.58	20.54	3.13	23.67	86.8	0.89	11.52	38.9	45.28
7	Field 150	Upstream	6.32	0.29	12.92	161.66	78.2	27	2.69	22.98	2.75	25.74	89.3	0.93	13.34	28.12	40.34
		Middle	6.33	0.19	14.84	165.00	90.8	31	2.64	23.80	2.46	26.26	90.6	0.76	4.22	20.72	38.50
		Downstream	6.06	0.18	25.15	170.00	86.2	29	2.94	18.91	3.46	22.38	84.5	0.79	10.92	36.60	46.46
8	Wheat 150	Upstream	5.55	0.26	33.88	140.00	110.3	38	3.21	22.58	4.93	27.50	82.1	1.06	18.66	51.26	67.92
		Middle	5.71	0.25	52.40	145.00	99.8	34	3.53	21.97	4.63	26.60	82.6	1.12	7.38	50.02	69.60
		Downstream	5.67	0.27	54.14	155.00	173.4	59	3.36	22.17	5.22	27.39	81.0	1.10	18.44	59.90	61.02
9	Maize unfertilized	Upstream	6.07	0.27	5.89	163.33	78.2	27	3.66	22.78	2.75	25.54	89.2	1.05	5.00	30.84	41.28
		Downstream	5.93	0.26	6.98	175.00	84.8	29	3.40	23.39	3.71	27.11	86.3	1.22	8.26	46.70	47.10
10	Wheat unfertilized	Upstream	6.22	0.30	7.68	168.33	87.9	30	3.60	22.78	2.96	25.74	88.5	1.18	4.07	37.48	48.72
		Downstream	5.97	0.27	8.38	165.00	90.0	32	3.63	21.97	3.55	25.51	86.1	1.28	1.27	45.50	50.94

CONCLUSIONS

- pH - weak acid indicating the presence of a moderate soil;
- the level of supply is medium for humus and nitrogen content in soil; is low for phosphorus content in general and good for fertilized crop; is good level of supply in case of potash.

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IDENTIFICAREA ŞI CARACTERIZAREA RESURSELOR DE SOL DIN TERITORIUL COMUNAL ULMU

IDENTIFICATION AND CHARACTERIZATION OF SOIL RESOURCES FROM ULMU COMMUNAL TERRITORY

NICOLETA BALABAN, MARIA MARINESCU, ROXANA CLUCERESCU

Key words: soil type, communal territory, identification

REZUMAT

În această lucrare, colectivul de autori prezintă câteva aspecte legate de caracterizarea învelişului de sol existent în cadrul Teritoriului Comunal Ulmu. Acest studiu pedologic a fost realizat pentru o cunoaştere cât mai amănunțită a resurselor de sol din regiune, cunoaştere ce este absolut necesară în vederea practicării unei agriculturi durabile şi eficiente.

ABSTRACT

In this paper, authors collective presents some aspects concerning by soil covers characterization existence in Ulmu Communal Territory.These pedologycal studies were realized for a detailed knowledge at soil resources from area, knowledge that is absolutely necessary for practiced of durable and effective agriculture.

INTRODUCTION

In the present socio-economical conjuncture in our country, the agriculture can be one of the elements that could help us to recover from the crisis. But this can only be possible by a rational use and a good knowledge of the soil resources, proper working technologies and a good soil manangement.

For the Ulmu Communal Territory, the soil science and agrochemistry studies realized by OSPA in many stages, and in addition researches regarding the soil quality, environmental pollution, fertilizers' use, the lack of soil legislation etc., enhance an unrational soil exploitation, fertilizers' use without knowing the proper needs, wrong agricultural workings, all this conducting to a considerable soil fertility decrease.

Therefore, this paper aims to present the soils in Ulmu Communal Territory, in order to avoid all this kind of problems.

MATERIALS AND METHOD

The research was made in period 2007-2009, in Ulmu Communal Territory, like continuations of these effectuated by numerous researchers in this region.

Pedologycal studies has been made according with “Pedologycal studies elaboration methodology” produced by I.C.P.A.—Bucharest, and soils type was established according with “Romanian system of soils taxonomy—2003”.

RESULTS AND DISCUSSION

From geographical point of view, Ulmu Communal Territory, is situated in south – west County Braila, bounded north of the commune Surdila Greeks, east of the commune Cireşu, west of Buzau county and Ciocile communal territory in south.

Geologically, like part of the Romanian Plaine, Ulmu Communal Territory is formed and it has evoluted concomitant with this. Surface deposits are represented by loess deposits, fluvial material and sandy aeolian deposits.

Relief is represented by Central Baragan Plaine (Mohreanu Plane – 6645,94 ha) and Calmatui Meadow (2372,41 – 26,31 %). Plaine relief is formed in almost horizontal areas (42,52 %), depression areas (4,74 %) and dune landscape (52, 75 %).

Ulmu Communal Territory has a temperate continental climate (drought), which is characterized by an average annual temperature of 11^{o}C and annual mean rainfall of about 460,5 mm.

In terms of basin Ulmu communal territory is limited in the northern part of Calmatui river basin.

As a result of research achieved and interactions between environment factors (rocks, relief, clime, vegetations, etc) in Ulmu Communal Territory revealed a wide range of soils from classes as: Protisols, Cernisols, Hidrisols and Salsodisols (Table 1).

Table 1

Soil resources of the Ulmu Communal Territory

CLASS	SURFACE		TYPE	SURFACE	
	HA	%		HA	%
Protisols	4448,28	49,32	Aluvisols	943,12	10,45
			Psamosols	3505,16	38,87
Cernisols	3005.70	33,33	Chernozems	3005.70	33,33
Hidrisols		1,04	Gleyosols	93,77	1,04
Salsodisols	1470,6	16,31	Solonchaks	1470,6	16,31
TOTAL - 8924,58 HA					

Protisols class is represented by soils formed in the floodplain area on fluvial materials and in the lowlands on sandy deposits (dune landscape), in a climate with high temperatures and low rainfall quantity. Protisoils class consists in types aluviosols and psamosos.

Type aluviosol subtypes include: sodium saline (174,96 ha – 1,94%) calcaric mollic gleyic (131,82 ha. – 1,46%), calcaric mollic saline (139,23 ha – 1,54%) calcaric saline gleyic (290,83 ha. – 3,22%) saline gleyic mollic (154,38 ha – 1,71%) sodium gleyic mollic (26.80 ha. - 0.30%), soft saline sodium (25,1 ha – 0,28%).

Type psamosol include the following subtypes: mollic (3336,16 ha. – 36,99%) calcaric mollic (81,85 ha – 0,91%), sodium saline mollic (87,15 ha – 0,97%).

Cernisols class is represented by the soils formed under a plain relief, in a climate with high temperatures and low rainfall quantities on loess deposits. This class type is represented by at chernozems at the subtypes: typical (1597,52 ha. – 17,71% 0, calcaric (1228,22 ha. – 13,62%), saline (61,28 ha. - 0.68%), sodium saline (118,68 ha. - 1.32%).

Hidrisols class is represented by the soils formed in floodplain area on fluvial materials, and materials from the plain on lacustrine materials, in a climate with high temperatures and low rainfall, on river or lacustrine materials.

Hidrisols class is represented by gleyic type with subtypes: calcaric (22.48 ha-0, 25%), mollic (65.29 ha. - 0.72%), calcaric mollic (6 ha. – 0,07%).

Salsodisols class is represented by the soils formed in the floodplain from fluvial materials and materials in the plain from lacustrine materials, in a climate with high temperatures and low rainfall quantity on fluvial materials.

Salsodisols class consists in the following types solonchaks, subtypes: solonchaks sodium calcaric mollic (139,71 ha. – 1,55%), solonchaks saline (527.35 ha. - 5.85%), solonchaks calcaric saline (26 ha. - 0.29%), solonchaks calcaric saline mollic (572,99 ha. – 6,35%), solonchaks calcaric saline gleyic (204,55 ha. – 2,27%).

CONCLUSIONS

Ulmu Communal Territory is situated in east extremity of the Romanian Plane and presents a soil cover formed by relative large scale of soils types, jointed in revealed a wide range of soils from classes: Protisols, Cernisols, Hidrisols and Salsodisols. Dominant soils for studied areas were from protisoils classes that occupied over 49,32 % from surface.

Soils from Ulmu Communal Territory, Braila County, formed in conditions of flat terrain (6645,94 ha. – 73,69%) and Meadow (2372,41 ha. – 26,31%), provided a dry temperate continental climate, characterized by high annual average temperature (11^{o}C) and low annual average rainfall (460,5 mm). Soils encountered in the studied territory are of the following classes: Protisoils Class - 4448,28 ha. (49,32 %); Cernisols Class - 3005,7 ha. (33,33 %); Hidrisols Class - 93,77 ha. (1,04 %); Salsodisols Class - 1470,6 ha. (16,31 %).

After analyzing the limiting factors of agricultural production revealed that: 2591,41 ha. (28,73 %) are occupied saline and sodium soils; 1943,95 ha. (21,55 %) are soils with fine texture; 3881,53 ha. (43,04 %) are soils with coarse texture; 154,75 ha. (1,72 %) are soils with moderate alkaline reaction; 13,35 ha. (0,15 %) are occupied by soils with groundwater at very low depth; 50,68 ha. (0,56 %) are occupied by soils with low reserves of humus.

Situation in the Ulmu Communal Territory, soil quality is:

- soils with good quality - 34 ha. (0,38 %);
- soils with medium quality - 3093,87 ha. (34,31 %);
- soils with low quality - 2904,61 ha. (32,21 %);
- soils with very low quality - 1022,86 ha. (11,34 %).

Overall, the soils quality mark of Ulmu Communal Territory, Braila county, is low according with weighted average as the use of "arable", which is 36 points (IV class of quality).

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PIERDERILE DE SOL PRIN EROZIUNE ÎN ZONA PREAJBA DIN JUDEȚUL GORJ, SUB INFLUENȚA FACTORILOR CLIMATICI, ANTROPICI ŞI DE VEGETAȚIE

THE SOIL LOSSES BY EROSION IN PREAJBA ZONE, DISTRICT GORJ, UNDER THE INFLUENCE OF CLIME, HUMAN ACTIVITY AND VEGETATION

BĂLAN MIHAELA

Keywords: soil erosion, soil losses, climatic conditions, runoff, debit divisor

REZUMAT

Lucrarea tratează pierderille de sol prin eroziune în anul experimental 2006, la diferite culturi ca porumb, pajişte naturală şi pajişte semănată, aflate pe pantă de 11 -12%, sub influența precipitatiilor şi a diferitelor doze de îngrăşăminte.

SUMMARY

The present paper deals with soil losses in 2006 with different crops like corn, natural pasture, sown pasture, on a 11-12% slope, under the influence of rainfall and several fertilizer doses.

INTRODUCTION

Within Gorj District the erosion is the limitative factor due to 57.2% of the surface is located on slopes higher than 5% that strongly affects the soil features and its yielding capacity. Of the total surface of Gorj District, of 243,768 ha, the erosion affects 139,027 ha that represents 57%.

The erosion process affects soil properties by its action of detachment, transport and deposition of soil particles to different distances in function of their size and mass.

The detaching and transport of soil particles has as an effect the taking away fertile soil layer and reducing the soil organic matter content and nutrients. Because of soil surface erosion there can be brought to surface the bedrock that is lack in humus and nutrients which is not favorable for plant growth.

MATERIAL AND METHOD

The trial has been located at Experimental Centre for Pastures Preajba – Gorj. The trial has copied the Perieni model, having 3 experiments with three crops (corn, natural pasture and sown pasture), with 3 treatments and three replications, after isolated block method, in order to determine the quantity of eroded soil.

The description of the experiment:

- the plots have had a rectangular shape, with the longer part of 25 m oriented on the length of the slope or perpendicular on the level lines (the direction of runoff) and the short part of 2.5 m, having a surface of 62.5 m^2;
- in order limit the runoffs there were mounted strips of plastic material in a slot between plots;
- each plot tighten in the down side in order to collect the catchments;
- the runoff is collected for each plot by a pipe of plastic material in a cylindrical basin
- in order to reduce the runoff, we have mounted a debit divisor that collects the 49 th part of the runoff.

After every rain, from the collected water in each plot there was taken a sample of 1 liter, after stirring. The sample was analyzed as soil eroded quantity and nutrients.

RESULTS

On the basis of table 1 data there can be emphasized the following:

Within April there fell 83.2 mm rainfall that have conducted to different catchments, in function of culture. This way, the highest water quantities and soil were collected with the three plots with sown pasture, namely 106.26 – 109.36 m^3/ha, respectively, 1.10-1.15 t/ha eroded soil. This fact is due to tillage, rainfall and because crops do not emerged at that time.

With the natural pasture there were collected the lowest water quantities, respectively, 82.99 – 96.18 m^3/ha and 0.14-0.18 t/ha, the natural pasture having a well developed root system that prevented the soil erosion.

With the corn crop there were no runoffs because the crop was not sown at that date.

Within the month of May the rainfalls were of 66.4 mm and they determined the highest runoffs with the corn crop. The quantity on corn plots was of 152.02-153.57 m^3/ha and soil lost was of 1.28-1.30 t/ha. This fact is explained in this month by fresh till soil for drilling and the corn was in its first vegetation phases that favor the soil erosion.

On the contrary, the lowest runoffs were recorded with the natural pasture, namely, 89.19-100.05 m^3/ha, respectively, 0.11-0.14 t/ha the soil losses being 9.3 – 11.81 times lower than with corn.

With the sown pasture the water runoffs were between 103.16-114.79 m^3/ha, with 0.38-0.45 t/ha eroded soil, which means 3.21 – 3.46 times more than with natural pasture and this fact can be explained by low development of the plants with freshly sown pasture.

Within the month of June, the rainfalls were of 139.8 mm that determined the highest runoffs in 2006 with the corn crop, namely, 210.19 – 216.39 m^3/ha, respectively, 1.72-1.79 t/ha eroded soil. This was due to high rainfall and the fact the corn plant were still growing.

With the sown pasture and natural pasture the runoffs were of 151.24-159.78 m^3/ha, respectively, 144.26-154.35 m^3/ha. The soil losses were 0.20-0.27 with the sown pasture and 0.16-0.20 with natural pasture.

The lower soil losses, of 6.63 – 8.60 times recorded with sown pasture and 10.75-8.95 times lower with natural pasture over the corn crop are due high vegetation on the surface unit and the better developed root system that fixed the soil and do not permitted its erosion.

Within the month of July there were recorded 77.8 mm rainfall that have determined runoffs of 90.85-79.89 m^3/ha and soil quantities of 0.29-0.58 t/ha. With this time, also, under the corn crop there were recorded the highest runoffs and eroded soil. Also, the natural pasture has recorded the lowest runoffs and eroded soil. Although the rainfall were half from the previous month the soil losses with the natural pasture were almost the same for June because at the beginning of July the pasture was mowed for the second time and the remaining vegetal mass was poor. Because within the month of July the sown pasture variant was mowed the vegetal mass decreased considerably and it recorded higher losses, of 0.27-0.29 t/ha over the previous month.

Within the month of August there were recorded rainfall of 186.4 mm. The abundant rainfall have determined runoffs of 107.03 – 192.35 m^3/ha that have determined high soil losses of 1.30-1.52 t/ha.

The soil losses have been the highest with the corn crop, too, of 1.42-1.53 t/ha, followed by sown pasture, of 0.60-0.65 t/ha and the natural pasture, of 0.30-0.32 t/ha. This fact is explainable by abundant rainfall and by scarcer vegetal mass due to mowing.

Table 1

The water runoffs and soil losses under different crops in 2006

Treatment	APRIL Rainfall=83.2 mm		MAY Rainfall=66.4 mm		June Rainfall=139.8 mm		July Rainfall=77.8 mm		AUGUST Rainfall=186.4 mm		SEPTEMBER Rainfall=39.4 mm		TOTAL Rainfall=593 mm	
	Runoff m^3/ha	Eroded soil t/ha	Runoff m^3/ha	Eroded soil t/ha	Runoff m^3/ha	Eroded soil t/ha	Runoff m^3/ha	Eroded soil t/ha	Runoff m^3/ha	Eroded soil t/ha	Runoff m^3/ha	Eroded soil t/ha	Runoff m^3/ha	Eroded soil t/ha
Corn $N_0P_0K_0$ Ctrl			153.57	1.30	216.39	1.79	93.85	0.58	192.35	1.52	77.56	0.39	733.72	5.58
Corn $N_{60}P_{60}K_{60}$			152.02	1.28	214.07	1.76	91.52	0.56	188.47	1.47	76.79	0.38	722.87	5.45
Corn $N_{100}P_{90}K_{60}$			153.57	1.30	210.19	1.72	90.75	0.54	186.15	1.42	76.79	0.38	717.45	5.36
Natural pasture $N_0P_0K_0$ Ctrl	96.18	0.18	100.05	0.14	154.35	0.20	59.72	0.18	113.24	0.35	52.74	0.10	576.28	1.15
Natural pasture $N_{60}P_{60}K_{60}$	86.09	0.16	95.40	0.12	147.37	0.18	58.95	0.17	109.36	0.32	51.19	0.09	548.36	1.04
Natural pasture $N_{100}P_{90}K_{60}$	82.99	0.14	89.19	0.11	144.26	0.16	57.40	0.15	107.03	0.30	50.41	0.09	531.28	0.95
Sown pasture $N_0P_0K_0$ Ctrl	109.36	1.15	114.79	0.45	159.78	0.27	79.89	0.29	132.63	0.65	54.29	0.17	650.74	2.98
Sown pasture $N_{60}P_{60}K_{60}$	105.48	1.11	107.03	0.41	155.12	0.23	79.11	0.28	131.08	0.63	53.52	0.16	631.34	2.82
Sown pasture $N_{100}P_{90}K_{60}$	106.26	1.10	103.16	0.38	151.24	0.20	79.11	0.27	129.53	0.60	52.74	0.16	622.04	2.71

Within the month of September there were recorded the lowest rainfall in 2006, of 39.4 mm. In this month there were recorded the lowest runoffs with all three crops and the lowest soil losses. This way, with the corn crop the soil eroded quantities have ranged between 0.38-0.39 t/ha, the lowest soil losses during this year. With the sown pasture, the eroded soil was between 0.16-0.17 t/ha. Yet, with the natural pasture, they were between 0.09-0.10 t/ha.

CONCLUSIONS

During 2006, the highest quantities of eroded soil there were recorded under the corn crop (5.36-5.58 t/ha) in comparison with the natural pasture (0.95-1.15 t/ha) which means 4.85-5.64 times higher (table 1).

This fact can be explained by more leaves per surface unit that attenuates the impact of raindrops allowing the water to infiltrate into the soil, the surplus runoff downward and, on the other hand, the corn was sown at 70 cm between rows the soil being tilled and then hoed in comparison with the other variants were the soil was not disturbed this way.

With the sown pasture the soil losses ranged between 2.71-2.98 t/ha, the most of soil losses being recorded in April and May due to tillage in April and low plant development.

As regard fertilization, there can be noticed that the fertilizers applied at the beginning of the vegetation period have influenced the quantities of eroded soil. The indirect effect of fertilizers is due to their influence on crops vegetal mass developing. This way, the highest soil losses are recorded with the not fertilized variant with all three crops because the soil was less covered against erosion.

The quantity of eroded soil was influenced by rainfall. This way, within the vegetation period, between April-September 2006 there were recorded 593 mm. From the first table there can be observed that the highest soil losses were recorded when fell the highest rainfall in a month, for instance, in August, when there fell 186.4 mm rainfall, with corn, the soil losses ranged between 1.42-1.52 t/ha with the sown pasture between 0.60-0.65 t/ha and with the natural pasture between 0.30-0.35 t/ha.

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RECOMANDĂRI DE FERTILIZARE PENTRU DIFERITE CULTURI PE UN CERNOZIOM TIPIC DIN VALEA STANCIULUI – DOLJ

FERTILIZATION RECOMMENDATIONS FOR SEVERAL FIELD CROPS ON A TYPICAL CHERNOZEM FROM VALEA STANCIULUI – DOLJ

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Keywords: soil, fertilizers, wheat, corn, soybean, oilseed rape, sunflower

REZUMAT

De pe o suprafaţ a de 250 ha de teren arabil, aparţ inând Centrotrans s.r.l., situată în zona localităţ ii Valea Stanciului, Judeţ ul Dolj, împărţ ită în 23 de parcele agrochimice omogene, au fost recoltate probe de sol pe adâncimea 0-20 cm. S-a făcut analiza chimică a acestora. Recomandările de fertilizare a culturilor de grâu, porumb, soia, rapiţ ă ş i floarea soarelui ş i calculul dozelor de îngrăş ăminte s-a făcut după metodologia acceptată în ţ ara noastră.

ABSTRACT

There have been made soil analysis with samples taken from 0-20 cm depth from Centrotrans s.r.l. company from Valea Stanciului – Dolj; the surface was split in 23 homogenous plots. The fertilization recommendations have been calculated after actual methodology in Romania, for the following crops: wheat, corn, soybean, oilseed rape and sunflower.

INTRODUCTION

One of the major tasks of teachers from Faculty of Agriculture Craiova is to advise farmers in order to apply the most suitable technologies in function of the soil nutrient supplying, expected yields, endowment, etc. The recommendations take account of the soil fertility preservation, too. The present research is according with these requirements.

MATERIAL AND METHOD

The soil agrochemical analysis and the interpretation of results have been made according with the methods elaborated by the Institute for Pedology and Agrochemistry Bucharest (ICPA) and well known specialists (Borlan Z., 1973; Obrejeanu G., 1964; ICPA, 1980, 1981).

The calculus of the fertilizer doses and their recommendations for applying has been made according methods used in Romania (Hera C., 1980; Vintilă Irina, 1984; Rusu M., 2010).

RESULTS AND DISCUSSIONS

The soil data are written in the first table and the ones on fertilizer doses for different crops are written in the second and third tables.

Table 1

The results of soil analyses of samples from Valea Stanciului

plot	pH		Humus %		Available P, ppm		Available K, ppm	
	Value	Apprec.	Value	Apprec.	Value	Apprec.	Value	Apprec.
1	7.01	N	2.97	B	34.84	M	458	E
2	7.18	N	3.24	B	35.36	M	496	E
3	6.93	N	3.07	B	11.44	S	452	E
4	6.94	N	3.02	B	9.91	S	470	E
5	6.97	N	3.04	B	7.80	FS	455	E
6	7.07	N	3.03	B	10.45	S	398	FB
7	6.84	N	2.99	B	7.83	FS	476	E
8	6.80	N	3.18	B	8.32	S	407	E
9	6.88	N	3.29	B	10.44	S	420	E
10	6.67	SA	2.91	M	24.44	M	442	E
11	6.51	SA	3.11	B	15.08	S	454	E
12	6.97	N	3.08	B	22.36	M	438	E
13	6.52	SA	2.99	M	26.08	M	356	FB
14	7.53	SAC	2.96	B	32.76	M	446	E
15	6.95	N	2.94	B	7.82	FS	418	E
16	6.69	N	3.11	B	9.88	S	692	E
17	6.71	SA	3.00	B	40.56	B	4116	E
18	6.77	SA	2.80	M	58.24	B	398	FB
19	6.76	SA	2.61	M	8.85	S	508	E
20	6.60	SA	3.08	B	6.25	FS	474	E
21	6.61	SA	3.17	B	17.68	S	484	E
22	6.64	SA	2.98	B	31.72	M	407	E
23	6.65	SA	3.46	B	29.64	M	602	E

Legend: N – neutral reaction M – average supply
SA – low acid reaction B – good supply
SAC – low alkaline reaction FB – very good supply
FS – very low supply E – excessive supply
S – low supply Apprec. – appreciation

Beside the soil supplying degree by nutrients (table 1), for the calculus of fertilizer doses there must be known the specific consumption of nutrients for harvest.

Crops	kg active ingredient/tone of main yield		
	N	P_2O_5	K_2O
Winter wheat, 1t grains + 1.3 t straw	26.5	13.7	16.4
Corn grains, 1t kernels + 1.6 t stalks	27.5	12.5	16.5
Sunflower, 1t seeds + 3 t stems	36.5	17.5	50.0
Oilseed rape, 1t seeds + 3 t stems	51.5	36.0	44.0
Soybean for oil, 1t beans + 1.5 t stalks	70.0	22.5	34.0

Within tables 2 and 3 the plots were assigned as follows:

- for nitrogen (N) A=all plots excepting 19 and 23
- for phosphorus (P) B= plots 3, 4, 6, 9 and 16, C= plots 10, 11, 12, 13 and 21, D= plots 14, 22, and 23, M=plots 17 and 18, N= plots 5, 7, 8, 15, 19 and 20.

Table 2

The recommended fertilizer doses for oilseed rape, sunflower and soybean

a.i.	P	Planned yield, t/ha											
		Oilseed rape				Sunflower				Soybean			
		2	3	4	5	2	3	4	5	2	3	4	5
N	19	100	160	200	220	65	93	112	126	18	44	60	69
	23	82	140	175	202	59	87	106	121	3	30	46	56
	A	90	150	185	2110	61	89	109	123	10	36	52	61
P_2O_5	1.2	79	173	259	333	37	84	126	163	9	48	76	100
	B	184	282	370	442	89	136	178	215	71	110	138	161
	C	140	230	300	390	67	114	155	215	34	73	103	124
	D	94	190	278	350	46	93	135	172	14	54	82	105
	M	45	1123	209	284	113	60	102	139	-	41	68	92
	N	193	288	375	450	94	141	182	220	80	125	150	175

a.i. – active ingredient; P – plots;

Table 3

Recommended fertilizer doses for winter wheat and corn crops

a.i.	P	Expected yield, t/ha												
		Winter wheat							Corn for grains					
		2	3	4	5	6	7	8	3	4	5	6	7	8
N	19	57	86	109	127	142	154	1165	56	86	113	138	160	181
	23	47	76	99	1117	132	144	155	42	72	100	1124	147	167
	A	52	81	103	121	136	148	159	48	78	1106	130	153	173
P_2O_5	1.2	-	6	31	51	68	83	95	-	19	34	47	58	67
	B	39	70	95	115	133	147	159	48	67	82	95	1106	115
	C	5	36	61	81	99	106	125	26	45	61	74	85	93
	D	-	14	39	59	76	84	103	8	27	42	55	67	75
	M	-	-	15	35	52	67	79	-	-	14	27	38	47
	N	48	79	104	124	142	156	168	56	72	87	100	111	120

a.i. – active ingredient; P – plots;

CONCLUSIONS

1. The analyzed surface is relatively even as regard the supplying degree by N (humus) and potassium as well as regard the pH yet uneven as phosphorus supplying.
2. The soil reaction is neutral (52%) or low alkaline (43%) of surface, optimal for plant growth; 83% of the surface is well supplied and 17% is average supplied by nitrogen (humus); 87% of the surface is excessively supplied and 13% is well supplied by available potassium; 17% of the surface is low supplied, 39% is low supplied, 35% is average supplied and 9% is well supplied by phosphorus.
3. Generally, the soil is considered fertile and lucrative. There can be obtained yields of 2t/ha corn without fertilizers and 2t/ha wheat with low doses of NP. For all crops, including the high consuming ones (oilseed rape, soybean, sunflower) and for all expected yields there is no need for potassium fertilizers due to high content of the soil.

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STUDIUL SOLURILOR DIN PERIMETRUL OCOLULUI SILVIC GURAHONȚ, JUDEȚUL ARAD

STUDY OF SOILS AROUND GURAHONȚ FOREST ARAD DEPARTMENT

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REZUMAT

Această lucrare prezintă caracterizarea principalelor tipuri de soluri din jurul Ocolului silvic Gurahonț, județul Arad. Cercetările au fost făcute între anii 2006 şi 2009 şi analizele au fost efectuate în laboratoarele O.J.S.P.A Arad. Scopul cercetărilor este identificarea principalelor tipuri de soluri şi stabilirea favorabilității solurilor pentru fiecare folosință şi pentru fiecare cultură în parte.

ABSTRACT

This paper presents the characteristics of the main soil types around Gurahonț forest, Arad department. The researches were made between 2006-2009 and the analyses were made in O.J.S.P.A laboratories in Arad. The purpose of the researches is to identify the main soil types and to establish after, the soil's favorability for each utilization and each crop separately.

INTRODUCTION

Soil plays many roles, natural resource, support and room for many activities, but most important is its role in crop production.

MATERIALS AND METHODS

To achieve the objectives of the research methods used were specific to the pedological: pedological mapping, morphological description, expeditious determinations in the field, laboratory analysis, data processing soil, etc.. Thus, the perimeter being investigated based on data recently obtained by direct observation in the field and processed in the laboratory have identified a total of 10 genetic types of soil.

The profiles were located in areas representative of the area searched so that it can be described most representative types and subtypes. For profiles, samples were collected on pedogenesis horizons, both in natural setting (unchanged) and the amended settlement.

Soil Sampling in natural setting (unchanged), to characterize certain physical characteristics and hydro-cylinder was made known volume of metal in soil moisture and momentary cartons (special made) for its micromorphological characterization

.RESULTS AND DISCUSSIONS

Soil survey was done in the study of the resort complex in this respect is amplasându the characteristic points, the main soil profile. In addition, where it is deemed necessary, and control sections were performed.

Situation number profiles centrally located in each main UP is presented in the following table.

Tabelul 1

Main pofiles statement placed in each UP.

Unitatea de producție		Suprafața (ha)	Profile executate	
Nr.	**Denumire**		**No.**	**Ha/profile**
I	**Zimbru**	**2600,5**	**-**	**-**
II	**Honțişor**	**2492,9**	**1**	**2492,9**
III	**Iacobini**	**2881,1**	**3**	**960,4**
IV	**Mădrigeşti**	**3297,2**	**2**	**1648,6**
V	**Moma-Biharia**	**2810,0**	**5**	**562,0**
VI	**Găina-Gorgana**	**3592,1**	**8**	**449,0**
TOTAL		**17673,8**		

The main soil types are defined in the Forestry Gurahont played in the following table.

Tabelul 2

The main soil types identified in the Forest Gurahont

Unități taxonomice			Suprafața (ha)
Clasa de sol	**Tipul de sol**	**Subtipul**	
Protisoluri	Litosol	Tipic	80,7
		Total litosol	**80,7**
	Aluviosol	Gleic	1,6
		Total aluviosol	**1,6**
TOTAL PROTISOLURI			**82,3**
Cambisoluri	Eutricambosol	Tipic	7943,9
		Molic	530,9
		Litic	389,3
		Total eutricambosol	**8864,1**
	Districambosol	Tipic	27,0
		Litic	578,9
		Total districambosol	**605,9**
TOTAL CAMBISOLURI			**9470**
Luvisoluri	Preluvosol	Tipic	1235,4
		Molic	192,9
		Litic	127,9
		Total preluvosol	**1556,2**
	Luvosol	Tipic	3788,5
		Litic	710,7
		Stagnogleic	214,5
		Albic	831,1
		Total luvosol	**6959,2**

TOTAL LUVISOLURI			**8515,4**
Spodisoluri	Prepodzol	Tipic	168,8
		Litic	78,4
		Total prepodzol	**247,2**
	Podzol	Litic	172,9
		Total podzol	**172,9**
TOTAL SPODISOLURI			**420,1**
TOTAL GENERAL			**17246,0**

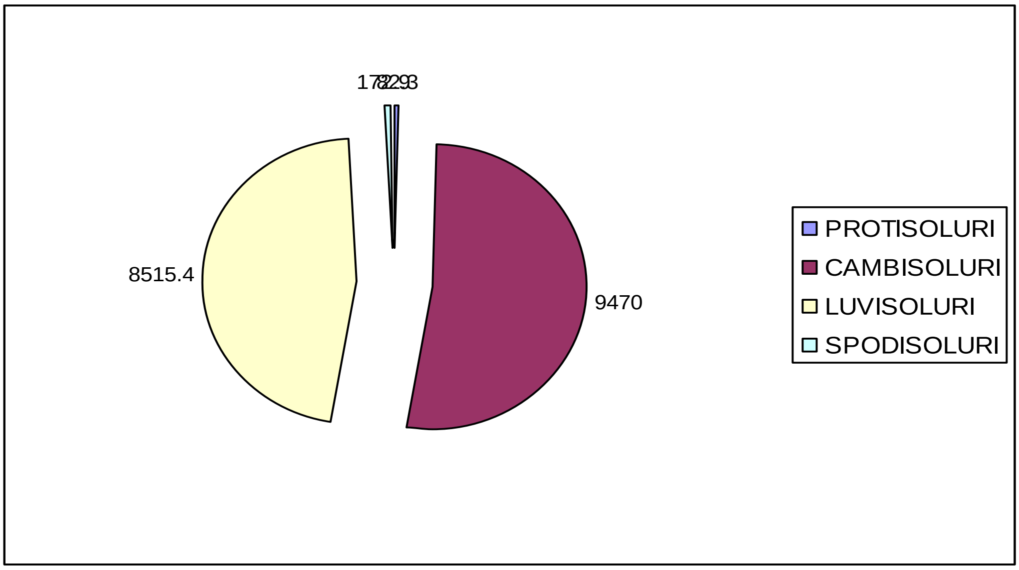

Fig. 1 Graphical representation of the distribution of the main classes of soils Gurahont Forest

From the table above we can say that the most common type of soil is eutricambosolul occupying an area of 8864.1 hectares and the soil occupying the lowest weight is aluviosol Gurahont Forest with an area of 1.6 hectares.

CONCLUSIONS

Soil survey was done in the study of the resort complex in this respect is amplasându the characteristic points, the main soil profile. In addition, where it is deemed necessary, and control sections were performed.

The most common type of soil is eutricambosolul occupying an area of 8864.1 hectares and the soil occupying the lowest weight is aluviosol Gurahont Forest with an area of 1.6 hectares.

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CARACTERIZAREA STAȚIUNILOR FORESTIERE DIN PERIMETRUL OCOLULUI SILVIC GURAHONȚ, JUDEȚUL ARAD

CARACTERIZATION OF FORESTRY STATION AROUND GURAHONȚ FOREST ARAD DEPARTMENT

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REZUMAT

Această lucrare prezintă caracterizarea principalelor tipuri de soluri din jurul Ocolului silvic Gurahonț, județul Arad.

Zona geografică în care se află Ocolul Silvic Gurahonț se află în depresiunea Gura Almaş pe versanții râului Crişul Alb, între comunele Dieci, Almaş, Pleşcuța, cuprinzând baza văilor şi pâraielor de pe ambii versanți din această zonă. Versantul drept este situat în partea sudică a Munților Codru Moma, cu vârful Momuța la o altitudine de 930 m.

Ca unități geomorfologice predomină versanții ondulați cu înclinări majoritare cuprinse între 16-30˚ (67%) urmat de cele peste 31˚ (27%) şi peste 40˚ (1%).

ABSTRACT

This paper presents the characteristics of the main soil types around Gurahonț forest, Arad department.

Geographical area in which the Forestry Department is Gurahonț slopes Almas River Mouth Basin White River, between municipalities dioceses, Almas, Pleşcuța, including the valleys and streams on both slopes in this area. Right side is located in the southern mountains Foreign Moma Momuța pointing at an altitude of 930 m.

Geomorphological units that dominate the slopes with inclinations curled between 16-30 ˚ majority (67%) followed by those over 31 ˚ (27%) and over 40 ˚ (1%).

INTRODUCTION

Geographical area in which the Forest Department is Gurahont slopes Almas River Mouth basin White Crişul between municipalities Dieci, Almas, Plesca, including the valleys and rivers on both sides of this area. Right side is located in the southern mountains Woods Moma Momuța pointing at an altitude of 930 m.

MATERIAL AND METHODS

Description amenajişti parceling was performed by engineers in 2005, by covering the whole area of the forest and recording the features of the resort and stand. Field data collection was done in accordance with instructions and technical norms in force.

Description parceling mapping was performed with the stationary medium scale, picking up information on: floor vegetation, geology, geomorphology, soil, climate and vegetation.

Determination of the taxatorice the stands was made by measurements of the sample squares evenly distributed within each unit amenajistice so determined to characterize the values that stand. In exploitable stands, in order to achieve greater accuracy were performed by market inventory of 500 m sample and the full inventory stands with areas of less than 3 hectares or low consistency.

Data processing and preparation of records and plans of arrangement, with the exception of plans for afforestation and forest dynamics were executed on the electronic computer, where software developed by the design of ICAS, the Territorial Computing Center Timisoara, Third variant a.

RESULTS AND DISCUSSIONS

Characterization Unit Production I (Zimbru)

Dominant forest sites in this production unit are of a kind FD3 occupying an area of 2338.2 hectares, followed by FD2 type resorts that occupy an area of 225.1 hectares (Figure 1).

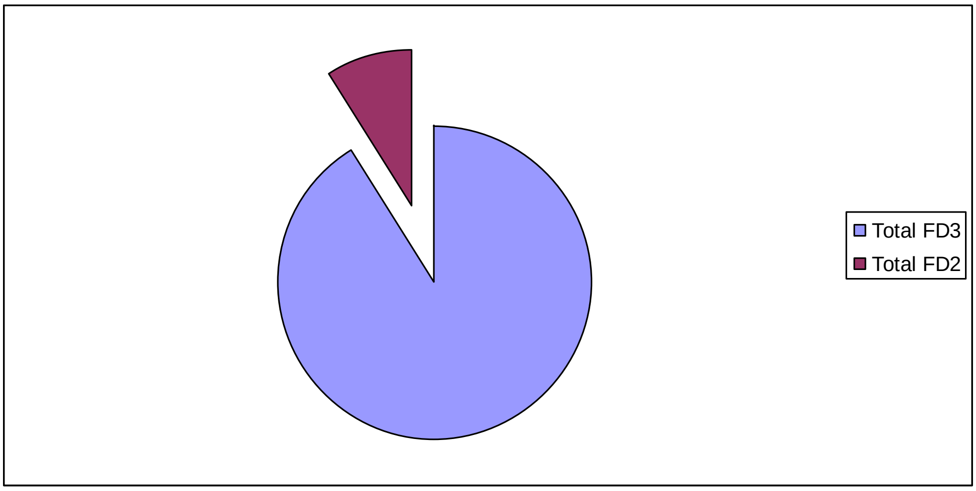

Fig. 1 Graphical representation of forest sites spread over areas of the UP

Characterization Unit Production **II (Honţişor)**

Dominant forest sites in this production unit are of a kind FD3 CAE were identified over an area of 2288.4 hectares, followed by resorts FD2 type identified an area of 144.8 hectares (Figure 2).

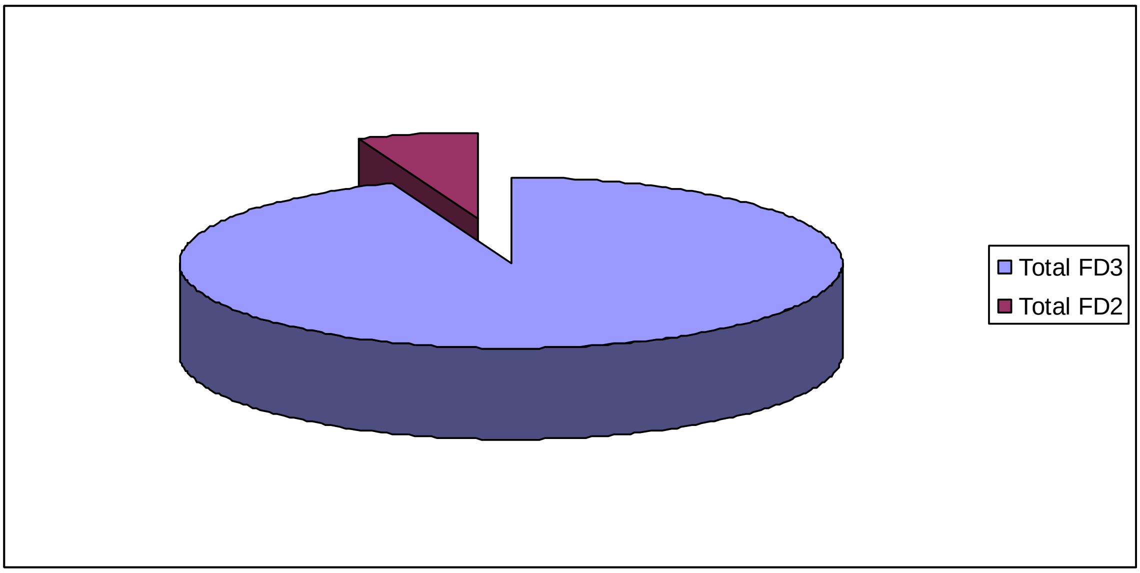

Fig. nr. 2 Graphical representation of forest sites spread over areas of the UP

Characterization Unit Production **III (Iacobini)**

Forest sites identified in the production of this unit were: FD3 type resorts on an area of 2584.3 hectares and FD2 type resorts on an area of 46.8 hectares (Figure 3).

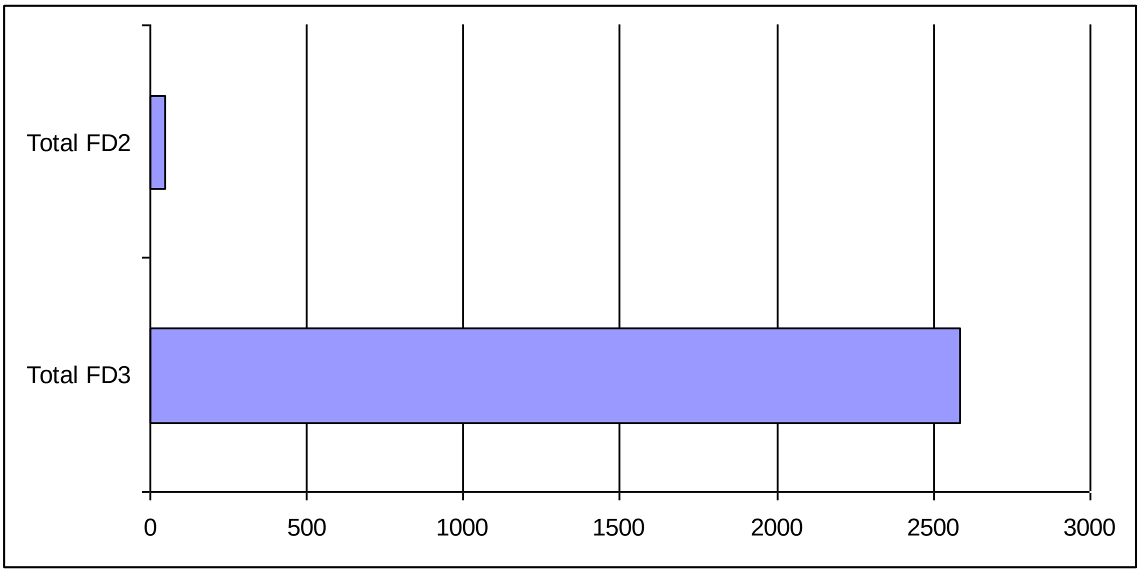

Fig. nr. 3 Graphical representation of forest sites spread over areas of the UP

Characterization Unit Production **IV (Mădrigeşti)**

Resort forest types identified in this production unit are of a kind FD3 an area of 3189.3 hectares and FD2 type on a surface of 50.6 hectares (Figure 4)

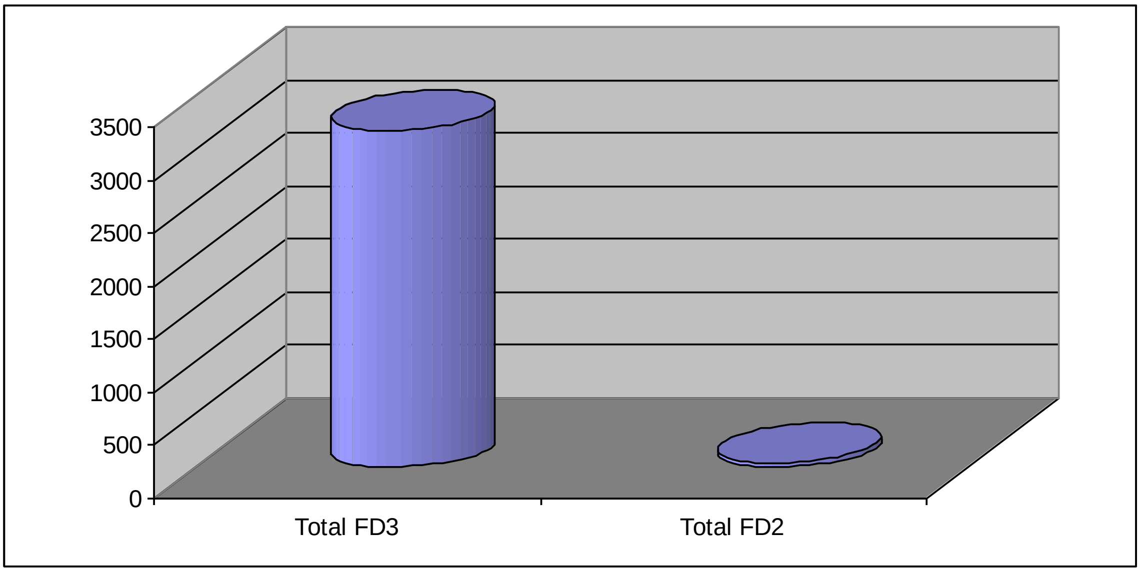

Fig. nr. 4 Graphical representation of forest sites spread over areas of the UP

Characterization Unit Production **V (Moma-Biharia)**

And in terms of forest resorts we can say the same things as in the soil, that production in this facility meet all types of forest resorts Forestry entire surface (Figure 5).

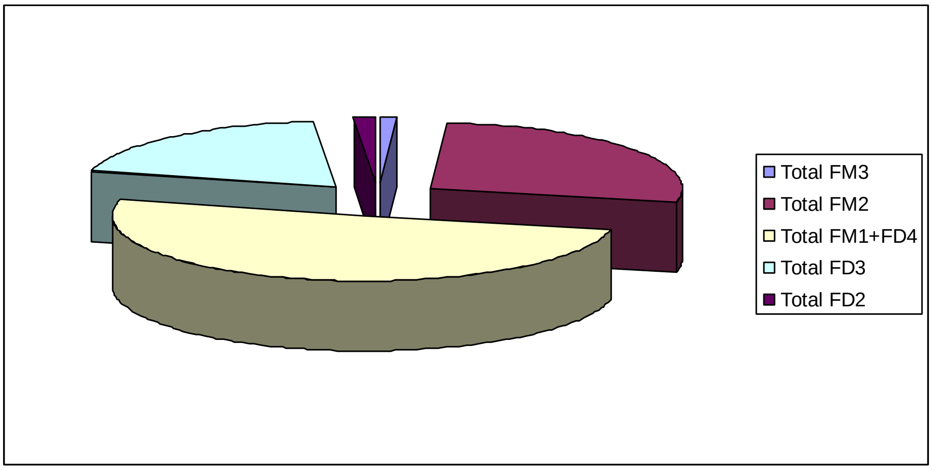

Fig. nr. 5 Graphical representation of forest sites spread over areas of the UP

Characterization Unit Production **VI (Găina-Gorgana)**
Of forest resorts that production unit are the type FM1 + FD4 resorts, followed by resorts and the type FD3 FD2 type whose surfaces are shown in Figure 6.

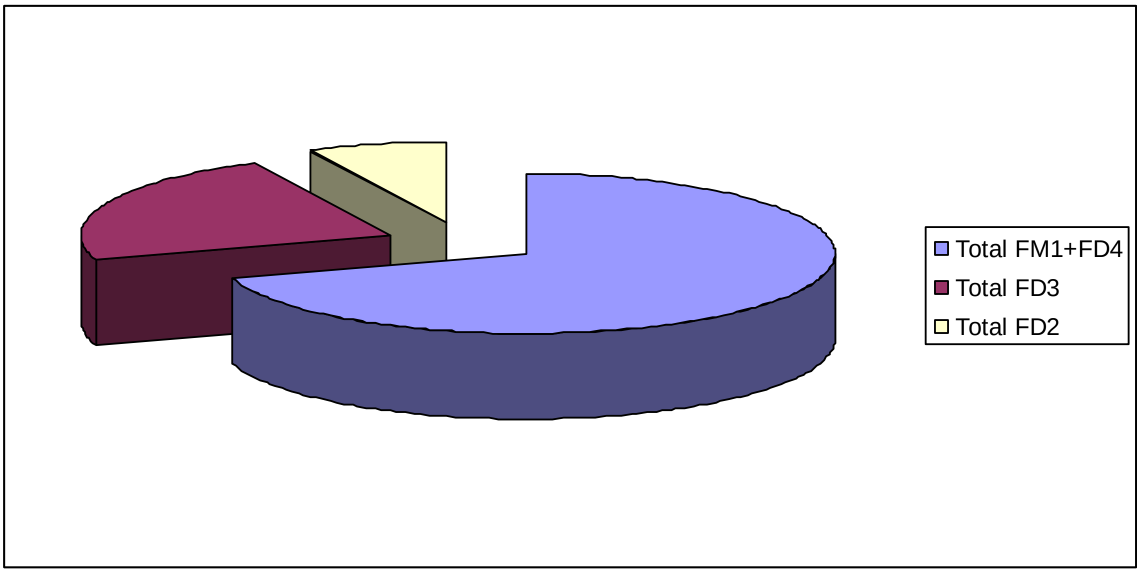

Fig. nr. 6 Graphical representation of forest sites spread over areas of the UP
Codes forest sites are shown in the table below.

Tabelul 1

Fitoclimatice floors call list and classification of forest sites

Floor	Token	Type of station
Floor mountain spruce stands **(FM_3)**	2.3.3.1.	Mountain spruce stands on soils with small volume edaphic Oxalis-Dentaria
Floor mountain blends **(FM_2)**	3.3.1.1.	Mountain podzolic soil mixtures edaphic small volume, with Vaccinium and other acidophilous
	3.3.2.1.	Mountain podzolic soil mixtures and edaphic criptopodzolice small volume or Calamagrostis Luzula
	3.3.2.2.	Mountain podzolic soil mixtures or criptopodzolice edaphic medium volume with Festuca and Calamagrostis
	3.3.3.1.	Mountain soil mixtures edaphic small volume, dental or acidophilous asperula
	3.3.3.2.	Mountain soil mixtures with volume asperula edaphic medium-dental

Floor-premontan the beech mountain **(FM_1+FD_4)**	4.1.2.0.	Mountain-beech premontan of the rocks and excessive erosion
	4.3.1.1.	Podzolic soils the beech Premontan volume small edaphic Vaccinium
	4.3.2.2.	Mountain-beech forests on acid soils premontan of the mull and edaphic medium volume
	4.3.3.1.	Mountain-beech premontan of soils with low-medium volume with Luzula edaphic-Calamagrostis
	4.3.3.2.	Mountain-podzolic soils the beech premontan volume edaphic medium with Festuca
	4.4.1.0.	Mountain soils the beech-premontan edaphic small volume asperula-dental
	4.4.2.0.	Mountain soils the beech-premontan volume asperula edaphic Middle-dental
	4.4.3.0.	Mountain soils the beech-premontan edaphic large volume asperula-dental
Hills of sessile oak floor, beech and beech-goruneto **(FD_3)**	5.1.1.2.	Sessile oak on the rocky and hilly excessive erosion
	5.1.3.1.	Sessile oak hills of podzolic soils with small volume Cytisus-Genista edaphic
	5.1.3.2.	Sessile oak hilly soils of podzolic type mesophilic flora and grasses
	5.1.4.2.	Sessile oak hilly stagnogleice podzolic soils with Carex roots
	5.1.4.3.	Sessile oak hilly stagnogleice podzolic soils with Carex roots
	5.1.5.2.	Sessile oak hills of podzolic soils with low to medium volume medium edaphic
	5.1.5.3.	Sessile oak hilly soils with large volume Asarum-Stellaria edaphic
	5.2.3.1.	Podzolic soils hilly beech edaphic small volume Vaccinium-Luzula
	5.2.3.2.	Hilly soils of beech edaphic medium volume with Festuca
	5.2.4.1.	Hilly beech forests on soils with low volume edaphic
	5.2.4.2.	Beech forests on hilly land with medium-volume asperula-Asarum edaphic
	5.2.4.3.	Beech forests on hilly land with large volume asperula-Asarum edaphic
	5.2.5.3.	Goruneto-beech hilly soils in the alluvial floodplain humifere moderately low
Cvercete hilly floor and traces of the hill **(FD_2)**	6.1.1.2.	Cvercete on rocky hills of excessive erosion and
	6.1.3.1.	Podzolic soils cvercete hilly edaphic small volume plants mezoxerofite acidophilous
	6.1.3.2.	Podzolic soils cvercete hilly volume mujlociu edaphic grasses mezoxerofite
	6.1.4.2.	Podzolic soils cvercete hilly stagnogley edaphic medium volume
	6.1.5.2.	Hilly cvercete
	6.1.5.3.	Cvercete hilly, with traces of beech hill without large volume edaphic
	6.2.1.2.	Hilly beech, beech lower limit, rocks and excessive erosion
	6.2.3.1.	Hilly beech, lower limit, podzolic
	6.2.3.2.	Lower limit of beech hilly podzolic

	6.2.5.2.	Cvercete hilly beech lower limit of the soil volume with asperula edaphic medium-Asarum
	6.2.5.3.	Cvercete hilly beech lower limit of the soil volume than edaphic
	6.2.6.4.	Gleyic cvercete hilly soils in the high meadow

CONCLUSIONS

Stationary conditions of the district diversity is reflected in the existence of 54 types of forest, some identifying lower surfaces. 23 forest types have been identified in 2-3 types of resorts.

Dominant forest sites in this production unit are of a kind FD3 occupying an area of 2338.2 hectares, followed by FD2 type resorts that occupy an area of 225.1 hectares

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EFECTUL POLIELECTROLITULUI CARBOXILIC "PONILIT GT1" ASUPRA STRUCTURII SOLULUI LA CULTURA DE PORUMB

THE EFFECT OF CARBOXYLIC POLYELECTROLYTE „PONILIT GT1" ON SOIL STRUCTURE AT MAIZE CROP

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Keywords: soil structure, hydric stability, soil tillage.

ABSTRACT

The main objective of this study consists in testing the effect produced by carboxylic polyelectrolyte Ponilit GT1 on water stable aggregate. The solutions of Ponilit GT1 was applied to surface of a cambic chernozem with a clay loamy texture, from Didactical Station of USAMV Iaș i, Ezãreni Farm, 6,6 – 6,9 pH units, 33 – 34 % clay content, at three different doses: 0.3%, 0.1% and control. Changes in structural parameters such: water stable aggregate, mean weight diameter, wet aggregate stability were determined. Cambic chernozem soil structure development was evaluated by comparing the values of structural parameters treated with carboxylic polyelectrolyte with those untreated. The results of our study indicated that synthetic polymer had a significant effect on structural development and on structural parameters. The results obtained at 0.3% and 0.1% doses indicate increasing of water stable aggregate with values between 19 – 29% on horizon 0 – 2 cm comparative with the control, and increasing in mean weight diameter with 9.5% at 0.1% doses and 15% at 0.3% doses. The application of synthetic polymer Ponilit GT1, creates favorable conditions for seeds germination. From the point of view of climatic conditions, the area where the experience is located is characterized by annual average values between 529 – 550 mm precipitation and mean multiannual temperatures between 9.2 – 9.4 ^{o} C.

INTRODUCTION

The presence or absence of water stable aggregate on soil surface, tends to an immediate effect on crust formation and on increasing hydric erosion of soils [11]. Soils shows at the surface an amounted percent of water stable aggregate, have a good resistance to hydric and aeolian erosion, comparative with the soil where the percent of unstable aggregate is sizable [7]. Synthetic polymers added to different soils to improve soils physical, chemical and biological properties, have been studied by many researchers [6.8.4.5.], and the use of these polymers is known in the last 60 years by several works already accessible [1.2]. Synthetic polymers added to soil as soil conditioners improve soil physical properties, are important for plant growth and increases soils resistance against disruptive forces and erosion [9]. The laboratory researches and experimental practice extraordinary rich, could not maintain this enthusiasm to the level of the beginning because this produces were to expensive, the effect on soils it wasn't know, neither for plant growth and neither on human by alimentation. After 1980 years, the interest of these soil conditioners, called hydrogels, increased again because of low prices and for their remarkable quality: were ecological, untoxic and some of them biodegradable. The uses of small quantities of synthetic polymers per hectare contributed to a suggestive decreasing of costs, the interest of plant grower for these kind of produces could be enhanced [13].

METHODS

The experience is monofactorial, A X B type, is set up in split plots design in three repetitions. The plot covered surface was 18 m ^{2}. The experimental variants were:

Factor A: tillage systems

a_1 – ploughed at 30 cm + Lemmkeen cultivator
a_2 – ploughed with paraplow + vertical rotary harrow
a_3 - ploughed with paraplow + horizontal rotary harrow
a_4 - ploughed with chisel
a_5 – tillage only with disk harrow

Factor B: macromolecular compounds

b_1 - control
b_2 - soil treated with 0.1% polymer a.i./ha
b_3 - soil treated with 0.3% polymer a.i./ha.

These experiments carried out, during 2006-2008, studied maleic polyelectrolyte Ponilit GT1, with an content of 27.7% (7,2 kg/ha) active ingredients in first year and 17% (11,7 kg/ha) active ingredients in second year. To ensure that the treatment will be effective, before the application of synthetic polymer, the soil is watered approximate 2 cm thickness. The amount of solution that would be treated was 2000 l/water/ ha, applied by hand. The control variant was watered too. To dignify the effect of the synthetic polymer on soil structure and indirectly on physical and chemical properties of soil, were collected samples from 0 – 2 cm depth.

The determinations performed and the methods used are: the distribution and stability of structural macroaggregates according the Tiulin Eriksson procedure (wet sieving methods), dry sieving method was attained by using a sieve set with 10, 5, 3, 2, 1, 0,5 and 0,25 mm diameter.

RESULTS

Physical and chemical properties and structural parameters of cambic chernozem from Ezãreni Farm cultivated with maize crop were studied and given in table 1. The experiment was set up on a cambic chernozem with a clay loamy texture, has a high clay content 43,8%, a mean humus content (3.4 – 3.6%), is well supplied with mobile potassium and moderately with phosphorus and nitrogen, with values of hydric stability between 53.55 – 58.30 %, with mean weight diameter between 3.27 – 3.79 mm.

The results of the researches carried out in the field demonstrated that the soil treated with carboxylic polyelectrolyte Ponilit GT1 improve soils structure. Analytical data shown in table 2 concerning the improvement of soil structure by treatment with maleic polyelectrolyte Ponilit GT1, registered significant increases of hydrostabile macroaggregates content, the effect being both for conservation and for restoration of soil peculiarities

Table 1

Physical and chemical properties and structural parameters of cambic chernozem studied

Physical and chemical properties	
Texture	clay loamy
pH	6,7
Humus (%)	3,4-3,6
Coarse sand (2-0,2 mm)	3,0
Fine sand (0,2-0,002 mm)	22,9
Silt (0,02-0,002 mm)	30,3

Clay (<0.002 mm)	43,8
Bulk density (g/cm^3)	1,06-1,14
Hydric stability (%)	53,55-58,30
Total porosity (%v/v)	59,1

The control variant registered the smallest hydric stability values which are represented by values between 53.55% at disk harrow and 58.30% for ploughed at 30 cm. From the point of view of concentration in both years, the biggest mean values of hydrostability were registered at the doses of 0.3% polymer a.i/ha, with the minimum limits registered by disk harrow (69.20), paraplow (70.35 – 70.70%) and chisel (71.25%) and maximal to variant ploughed at 30 cm (74.65%). The values of **hydric stability** registered at 0.1% doses polymer a.i./ha are higher with 18.3 – 20.3% toward the control variant and lower with 9.6 – 10.4% from 0.3% doses.

From the analysis of influence of tillage system on hydric stability have been found remarks between conventional and unconventional tillage, in both years, ploughed at 30 cm registered, regard paraplow, chisel and disk harrow, higher limits with 3.4 – 5.0 % at control variant, 3.2 – 5.3% to 0.1% concentration and 3.9 – 6.1% to 0.3% concentration. According the appreciation classes [10] of structural hydrostability of soil, it was observed an oscillation of the values registered from an fragmentary soil at control variant, to an structured soil, at 0,3% polymers a.i/ha

The statistical analysis of mean values of hydric stability, have shown that the indicator registered higher values between 19% and 29% to 0.1% and 0.3% concentration regard the control variant (55.2%), the difference is treated to be significant. It may be observe that the variants where the prepare of seed germination has been done with rotarry harrow, the values of hydric stability of structural aggregates are lower, aspect that can be demonstrated statistically. The results registered, confirm the beneficial effect of Ponilit GT1 on increasing hydric stability and improving soil structure quality.

At the maize crop, the values of **mean weight diameter (MWD)**, increased with the increasing of synthetic polymer doses, having obtained maximal values in classical tillage system, where regard the control variant (4.64 mm) the limits of MWD reached 4.82 mm (0.1% polymer a.i./ha) and 4.97 mm (0.3% polymer a.i./ha), the minimum values have been registered at the chisel and paraplow variants, which represents 3.62 – 3.68 mm (0.1% polymer a.i./ha) and 3.70 – 3.81 (0.3% polymer a.i./ha), comparative with control variants (3.27 – 3.36).

Table 2

The influence of synthetic polymers on soil structure indicators of Ezăreni – Iaş i cambic chernozem, cultivated with maize, mean values 2006 – 2008

Tillage system	Doses (% polymer a.i./ha)	Wet aggregate stability	Significance (%)	Mean weight diameter	Significance (%)
Ploughed at 30 cm	Control	58,30	100,0	4,64	100
	0,1%	69,05	118,40 xxx	4,82	103,9xxx
	0,3%	74,65	128,00 xxx	4,97	107,1xxx
Paraplow + Vertical rotarry harrow	Control	54,55	100,0	3,33	100
	0,1%	65,10	119,30 xxx	3,62	108,9xxx
	0,3%	70,70	129,60 xxx	3,70	111,1xxx
Paraplow + horizontal rotarry	Control	54,90	100,0	3,27	100
	0,1%	64,95	118,30 xxx	3,64	111,4xxx
	0,3%	70,35	128,10 xxx	3,78	115,6xxx

harrow					
Chisel+ horizontal rotarry harrow	Control	54,70	100,0	3,36	100
	0,1%	65,80	120,30 ^{xxx}	3,68	109,5^{xxx}
	0,3%	71,25	130,30 ^{xxx}	3,81	113,4^{xxx}
Disk harrow	Control	53,55	100,0	3,79	100
	0,1%	63,65	118,90 ^{xxx}	4,03	106,2^{xxx}
	0,3%	69,20	129,20 ^{xxx}	4,18	110,1^{xxx}

The disk rotarry variant registered transitional values between ploughed at 30 cm and chisel and paraplow variants, obtaining increments once the rate of synthetic polymer applied increase.

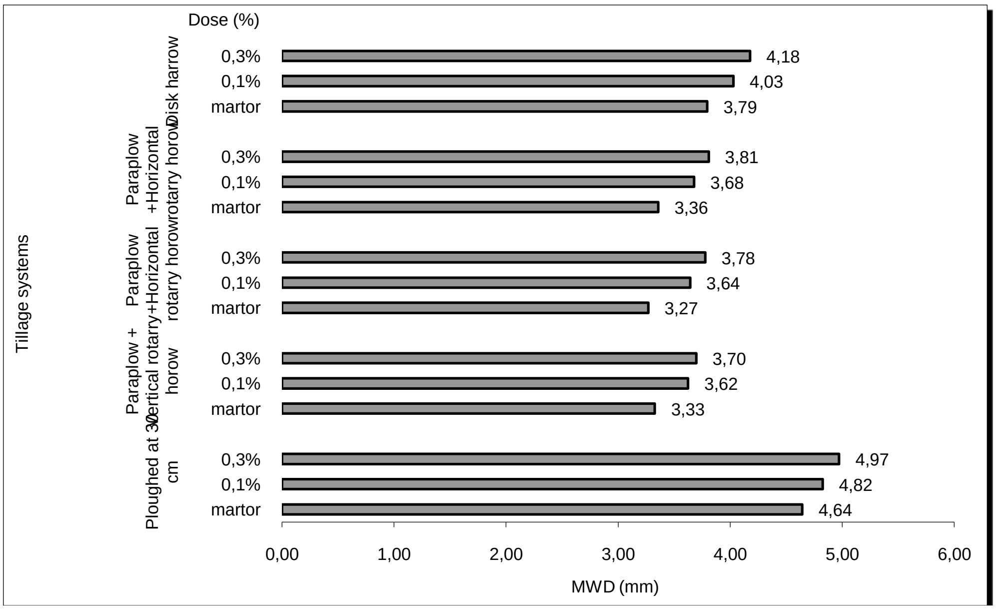

Figure 1. „Mean weight diameter to maize crop, mean values 2006 – 2008”

From the point of view of concentration the smallest values were obtained at 0.1% polymer a.i. /ha, having provided regard control variants, by 4% at ploughed at 30 cm, 6.2% at disk harrow variant and 9 – 11% at chisel and paraplow variants. Increasing the dose of carboxylic polyelectrolyte Ponilit GT1 at 0.3%, the values have registered increments regard control variant, approximately 7% at ploughed at 30 cm, 10% at rotarry harrow, 13% at chisel and 11 – 15% at paraplow.

The statistical analysis shows significant negative differences in variants treated with 0.1% and 0.3% doses polymer a.i./ha comparative with control variant.

CONCLUSIONS

The following conclusions are specified regarding the improvement of soil structure with carboxylic polyelectrolyte Ponilit GT1 applied to maize crop, mean values of 2006 – 2008:

1. The results registered confirm the beneficial effect of Ponilit GT1 on increasing hydric stability and improving soil structure.
2. The mean values of 2006 – 2008 shows increasing of hydric stability from 53.55 – 58.3% in control variant till 63.65 – 69.05% at 0.1% concentration, respectively 69.2 – 74.65% at 0.3% concentration.
3. Mean weigh diameter shows the smallest values at 0.1% concentration, having obtained increasing regard control variant by 4% to ploughed at 30 cm, 6.2% to disk harrow variant and 9 – 11% to chisel and paraplow variant.

4. Increasing the doses of carboxylic polyelectrolyte to 0.3% the values registered increases regard control variant, about 7% to ploughed at 30 cm, 10% to rotarry harrow variant, 13% to chisel variant and 11 -15% to paraplow variant.

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INFLUENȚA LUCRĂRILOR PROFUNDE ASUPRA REZISTENȚEI LA PENETRARE ALE SOLULUI DIN PLANTAȚIILE POMICOLE

INFLUENCE OF DEEP TILLAGE ON RESISTANCE TO PENETRATION IN A FRUIT GROWING PLANTATION

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Key words: deep tillage, resistance to penetration,

REZUMAT

Pe un planosol tipic s-au realizat 4 sisteme de pregătire a terenului în vederea înființării plantației de pomi: a_1 – arat la 23 cm; a_2 – scarificat la 45 cm, cu distanța dintre piesele active de 1 m; a_3 – desfundat la 40 cm, cu întoarcerea completă a brazdei; a_4 – desfundat la 50 cm, cu întoarcerea parțială a brazdei. În cadrul fiecărei variante s-au separat trei zone de trafic mecanic: b_1 – zona slab tasată (pe axul rândului de pomi); b_2 – zona mediu tasată (mijlocul intervalului dintre rândurile de pomi); b_3 – zona puternic tasată (pe urma călcată de roțile tractoarelor si maşinilor agricole).

După 15 ani de la înființarea plantației pomicole in cele patru variante de pregătire a terenului (a_1 – a_4) şi pe cele trei zone de trafic tehnologic (b_1 – b_3) s-au înregistrat modificări ale rezistenț ei la penetrare.

ABSTRACT

Four soil management systems have been used in establishing a fruit growing plantation. These treatments were: a_1 – 23 cm ploughing; a_2 – 45 cm loosening with a 1 m interval between the active parts of the loosening machine; a_3 – 40 cm ploughing with complete furrow inverting; a_4 – 50 cm ploughing with partial furrow inverting. Within each of the above four treatments, 3 areas differently affected by mechanical traffic were separated: b_1 – no traffic area; b_2 – between wheels area; b_3 – under wheels area.

Even 15 years science establishment of the orchard, the influence of the four treatments (a_1–a_4) and of the 3 areas (b_1–b_3) on resistance to penetration was registered. Resistance to penetration was significantly different within the three traffic zones down to the 50–60 cm depth.

INTRODUCTION

Plum tree orchards occupy more than 50% of the area in Romania. They are located especially in the hilly region of this country with heavy-clay soil showing a high degree of pedogenetic compacting. In order to improve the loosening state of these soil more than one soil management systems for tree growth and fruiting were obtained for the 50 cm deep plowing treatment. The positive effects initially achieved for the soil properties decreased during a 2–3 year period elapsed form the soil works performing (Iancu et al. 1986, Iancu and Negoita, 1998). However such effects were not investigated after a longer period. One of the causes responsible for the physical state worsening in these soils supporting intensive orchards is the mechanical traffic used in orchards maintenance.

In this paper some results on the effects of the soil systems for tree planting, mechanical traffic and interaction between these two orchard management characteristics after a long-term (15 years) period on some physical soil properties in plum trees are presented.

The research in this field made a lot of authors like: Canarache A. (1980), Iancu M. et al. (1986), Colibaşi I. et al. (1989), Iancu M. (1998) et al.

MATERIAL AND METHODS

The research made in the plum orchard from Colibasi farm of ICDP Pitesti-Maracineni, on a typical planosoil with a slope by 0.3-0.6%. The soil had over the 0–20 cm depth a 42.1% clay content, a 1.28 $g \cdot cm^{-3}$ bulk density, a 6.03 $mm \cdot h^{-1}$ saturated hydraulic conductivity and a 1.12 % humus content, and over the 20–60 cm depth the above soil properties had the following values 52.6 % clay content, 1.35 $g \cdot cm^{-3}$ bulk density, 1.32 $mm \cdot h^{-1}$ saturated hydraulic conductivity and 0.70 % humus content. Annual average precipitation, temperature and potential evapotranspiration were: 700 mm, 10ºC and 662 mm (Weather Station from Pitesti).

To establish the corresponding system to prepare the land for orchard founding is been organized a bifactorial experience as it follows:

Factor A: Soil-preparing system:

a_1 – ploughing at 23 cm depth;

a_2 – deep loosening at 45 cm with a 1 m distance between the active parts of the loosening machine;

a_3 – deep ploughing at 40 cm depth with total soil turnover;

a_4 – deep ploughing at 50 cm depth with partial soil turnover.

Factor B: mechanical traffic zone:

b_1 – no mechanical traffic zone (on the axis of fruit tree row);

b_2 – between wheels zone (the area between fruit tree rows);

b_3 – under wheels zone (the wheels traces provided by tractors and agricultural machine).

Thus, it was achieved a bifactorial experience to evidence the residual effects of soil initial works and technological traffic after 15 years from orchard founding.

The land was maintained continuously to become overgrown with grass, mowed between rows and as dead-fallow on the rows. Rows axle is situated around 12-15 cm comparatively with soil level from the part becoming overgrown with grass.

Resistance to penetration was also measured under field conditions using a static Penetrograph (Florescu) over the 0-60 cm depth. Resistance to penetration determinate two periods in May and July at different soil moisture.

The experimental data were statistical analyzed by using Student *test*.

RESULTS AND DISCUSSIONS

Penetration resistance in field was determined in two periods, May and July, at different moisture contents. Penetration resistance values after 15 years since the establishment of orchards, comparatively with initial data are higher, even weak tamping area where is no mechanical traffic because the soil was seated in time.

The average on the three areas of technological traffic the values of penetration resistance determined in the field, in May, are very low (from 3.8 $kgf \cdot cm^{-2}$ in a_1 to 6.0 $kgf \cdot cm^{-2}$ in a_4) at 0-10 cm depth, low (21.3 $kgf \cdot cm^{-2}$ to 24.5 $kgf \cdot cm^{-2}$) and middle at 10-20 cm depths. At 0-20 cm depth are distinct significant differences, at 20-40 cm of significant differences and insignificant differences at other depths (Table 1 and 2).

On the low soil compression area, the penetration resistance has very low values at a depth of 0-10 cm, from 0 in the variant with tillage at 23 cm to 1.5 $kgf \cdot cm^{-2}$ in the variant deep ploughing at 40 cm, at 10-20 cm depth is 5.3 and 5.7 $kgf \cdot cm^{-2}$ in a_1 and a_2, 7.2 and 7.9 $kgf \cdot cm^{-2}$ in a_3 and a_4. At the other depths are middle values which tend to increase in inferior part. On the middle soil compression area at 0-10 cm depth, the penetration resistance is very low (4.0 to 3.1 $kgf \cdot cm^{-2}$) at 10-20 cm depth, is small (18.6 to 24.8 $kgf \cdot cm^{-2}$) and middle at the other depths. In the area with high soil compression caused by agricultural machines, the penetration resistance is low from 10.3 kgf·cm^{-2} in a_1 to 15.8 kgf·cm^{-2} in a_4 at 0-10 cm depth, at the other depths is middle.

Table 1

Penetration resistance in function with lands preparation and maintenance in fruit growing plantation (kgf·cm^{-2})

Variant	Depth, cm	b_1 – no mechanical traffic zone	b_2 – between wheels zone	b_3 – under wheels zone	**DL 5% (Tukey Test)**
May					
a_1 – 23 cm depth ploughing	0–10	0.0	1.0	10.3	3.3
	10–20	5.3	21.6	38.8	4.2
	20–30	21.0	42.9	46.6	4.4
	30–40	35.8	46.7	47.1	3.3
	40–50	43.1	47.3	47.2	1.8
	50–60	45.6	47.3	47.3	1.4
a_2 – 45 cm depth loosening	0–10	0.2	1.2	15.0	3.3
	10–20	5.7	18.6	39.7	4.2
	20–30	21.4	41.3	46.6	4.4
	30–40	36.3	47.0	47.3	3.3
	40–50	45.0	47.3	47.4	1.8
	50–60	47.0	47.3	47.4	1.4
a_3 – 40 cm depth ploughing	0–10	1.5	3.1	12.2	3.3
	10–20	7.2	24.8	40.1	4.2
	20–30	26.7	43.0	46.4	4.4
	30–40	37.5	46.8	47.3	3.3
	40–50	44.2	47.4	47.5	1.8
	50–60	46.7	47.3	47.5	1.4
a_4 – 50 cm depth ploughing	0–10	0.2	1.9	15.8	3.3
	10–20	7.9	22.9	42.8	4.2
	20–30	28.0	42.4	46.7	4.4
	30–40	41.7	46.6	46.9	3.3
	40–50	46.0	47.2	47.0	1.8
	50–60	47.0	47.3	47.2	1.4

Table 2

The influence of factor A on the penetration resistance (kgf·cm^{-2})

Depth, cm	**Humidity %**	**a_1 – 23 cm depth ploughing**	a_2 – 45 cm depth loosening	a_3 – 40 cm depth ploughing	a_4 – 50 cm depth ploughing	DL 5% (Tukey Test)	Fisher Test
0–10	26,34	**3,8a**	**5,4b**	**5,6b**	**6,0b**	**1,5**	**
10–20	21,97	**21,9ab**	**21,3a**	**24,0bc**	**24,5c**	**2,2**	**
20–30	22,62	**36,8a**	**36,5a**	**38,7a**	**39,0a**	**2,5**	*
30–40	23,25	**43,2a**	**43,5a**	**43,9ab**	**45,1b**	**1,8**	*
40–50	29,59	**45,9a**	**46,6a**	**46,3a**	**46,7a**	**1,0**	**ns**
50–60	21,58	**46,7a**	**47,3a**	**47,2a**	**47,2a**	**0,8**	**ns**

ns – not significant (p < 95 %);
* – significant (95 % < p < 99 %);
** – very significant (p > 99 %).

The average on the four variants of land management of the penetration resistance on the axis of fruit tree row is very low (0.5 and 6.5 kgf·cm^{-2}) at 0-20 cm depth and is low (24.3 kgf·cm^{-2}) at 20-30 cm and at other depths middle. The area between fruit tree rows is very small (1.8 kgf·cm^{-2}) at 0-10 cm depth, low on 10-20 cm and middle to other depths. On the wheels traces provided by tractors and agricultural machine, the penetration resistance is low at 0-10 cm and middle in depth. From a statistical viewpoint are distinct significant differences to 50 cm (Table 3).

Table 3

The influence of factor B on the penetration resistance (kgf·cm^{-2})

Depth, cm	b_1 – no mechanical traffic zone	b_2 – between wheels zone	b_3 – under wheels zone	DL 5% (Tukey Test)	Fisher Test
0–10	**0.5a**	**1.8b**	**13.3c**	**1.6**	**
10–20	**6.5a**	**22.0b**	**40.4c**	**2.1**	**
20–30	**24.3a**	**42.4b**	**46.6c**	**2.2**	**
30–40	**37.8a**	**46.8b**	**47.2b**	**1.7**	**
40–50	**44.6a**	**47.3b**	**47.3b**	**0.9**	**
50–60	**46.6a**	**47.3a**	**47.3a**	**0.7**	*

ns – not significant (p < 95 %);
*** – significant (95 % < p < 99 %);**
**** – very significant (p > 99 %).**

In the variant with tillage at 23 cm, the penetration resistances on the axis of the row of trees are very low on superior part, low and middle in the medium and inferior part. In the middle of the lines are very low values at 0-10 cm depth, low at 10-20 cm and middle in other depths. On the pressed area by agricultural machines, the penetration resistance is small (10.3 kgf·cm^{-2}) at 0-10 cm depth and middle on the other depths. On the variant deep loosening at 45 cm, deep ploughing at 40 cm and 50 cm is kept the same trend, but the values are higher.

The values of penetration resistance determined in the field, in July, the mean over the three areas of technological traffic are medium throughout the depth, with lower values at the surface, without significant differences between the four variants of land management (Table 4 and 5).

Table 4

Penetration resistance in function with lands preparation and maintenance in fruit growing plantation (kgf·cm^{-2})

Variant	Depth, cm	b_1 – no mechanical traffic zone	b_2 – between wheels zone	b_3 – under wheels zone	**DL 5% (Tukey Test)**
July					
a_1 – 23 cm depth ploughing	0–10	20.8	42.1	45.2	7.3
	10–20	35.3	45.9	46.4	4.2
	20–30	41.1	46.8	46.6	2.7
	30–40	43.5	46.9	46.8	1.6
	40–50	46.1	46.9	46.8	0.5
	50–60	46.8	46.9	46.8	0.2
a_2 – 45 cm depth loosening	0–10	23.8	36.6	44.3	7.3
	10–20	40.2	43.7	46.6	4.2
	20–30	46.0	45.5	46.8	2.7
	30–40	46.4	45.8	46.8	1.6
	40–50	46.7	46.7	46.8	0.5
	50–60	46.7	46.7	46.8	0.2
a_3 – 40 cm depth ploughing	0–10	20.9	40.5	42.0	7.3
	10–20	37.0	44.8	45.8	4.2
	20–30	43.1	46.2	46.4	2.7
	30–40	45.9	46.7	46.8	1.6
	40–50	46.7	46.6	46.8	0.5
	50–60	46.8	46.8	46.8	0.2
a_4 – 50 cm depth ploughing	0–10	24.6	39.0	42.3	7.3
	10–20	37.1	44.7	45.2	4.2
	20–30	42.1	45.9	46.2	2.7

	30–40	45.8	46.7	46.8	1.6
	40–50	46.5	46.7	46.8	0.5
	50–60	46.8	46.8	46.8	0.2

On the low soil compression area, the penetration resistance has low values (20.8 to 24.6 kgf·cm^{-2}) at 0-10 cm depth and middle on the other depths. On the middle and high soil compression area, the penetration resistance is middle on all depths, with lower values at 0-10 cm depth between rows.

The average on the four variants of land management of the penetration resistance on the axis of fruit tree row is low (22.5) at 0-10 cm depth and the middle at the other depths. On the area between fruit tree rows and the wheels traces provided by tractors and agricultural machine, the penetration resistance is middle on all depths, with the lower values at the surface. Up to 40 cm depth are significant and distinct significant differences at 40-50 cm (Table 6).

The variant with tillage at 23 cm, the penetration resistance on the axis of the row of trees is low (20.8 kgf·cm^{-2}) at 0-10 cm and middle on the other depths. In the middle of rows and on the pressed area by agricultural machines is middle on all the depths, with lower values at the superior part of the profile. The same trend is maintained also in the other three variants.

Differences between the values of penetration resistance determined in May to those determined in July are explained by the fact that was made at different soil humidity's.

Table 5

The influence of factor A on the penetration resistance (kgf·cm^{-2})

Depth, cm	**Humidity %**	**a_1 – 23 cm depth ploughing**	a_2 – 45 cm depth loosening	a_3 – 40 cm depth ploughing	a_4 – 50 cm depth ploughing	DL 5% (Tukey Test)	Fisher Test
0–10	13.39	**36.0a**	**34.9a**	**34.5a**	**35.3a**	**3.9**	**ns**
10–20	14.80	**42.6a**	**43.5a**	**42.5a**	**42.3a**	**2.7**	**ns**
20–30	16.06	**44.9a**	**46.1a**	**45.2a**	**44.7a**	**1.7**	**ns**
30–40	15.87	**45.7a**	**46.3a**	**46.5a**	**46.5a**	**1.1**	**ns**
40–50	18.52	**46.6a**	**46.7a**	**46.7a**	**46.7a**	**0.3**	**ns**
50–60	20.33	**46.8a**	**46.8a**	**46.8a**	**46.8a**	**0.2**	**ns**

ns – not significant (p < 95 %);
*** – significant (95 % < p < 99 %);**
**** – very significant (p > 99 %).**

Table 6

The influence of factor B on the penetration resistance (kgf·cm^{-2})

Depth, cm	b_1 – no mechanical traffic zone	b_2 – between wheels zone	b_3 – under wheels zone	DL 5% (Tukey Test)	Fisher Test
0–10	**22.5a**	**39.6b**	**43.5c**	**3.7**	******
10–20	**37.4a**	**44.8b**	**46.0b**	**2.7**	******
20–30	**43.1a**	**46.1b**	**46.5b**	**1.7**	******
30–40	**45.4a**	**46.5ab**	**46.8b**	**1.1**	******
40–50	**46.5a**	**46.7a**	**46.8a**	**0.3**	*****
50–60	**46.8a**	**46.8a**	**46.8a**	**0.2**	**ns**

ns – not significant (p < 95 %);
*** – significant (95 % < p < 99 %);**
**** – very significant (p > 99 %)**

CONCLUSIONS

The data presented show that the changes induced by the variant with deep loosening at 45 cm, deep ploughing at 40 cm and at 50 cm comparing to the variant with ploughing at 23 cm can be highlighted and after 15 years of work done to prepare the ground for establishment of orchard.

On the axis of trees row, the penetration resistance values are small and very small, which allows good root system development. In areas affected by the mechanical traffic, carried out with tractors and agricultural machines, compared to unaffected areas has been registered a significant increase in penetration resistance.

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THE SEPARATION OF SOME POLYMER WASTE AND ITS IDENTIFICATION WITH THE HELP OF IR SPECTROSCOPY

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ABSTRACT

Plastics are materials made from polymers, capable of acquiring, under heating, the shape that is given to them and of maintaining that shape after cooling. Considering the quantity in which they are produced they rank in the first place among the polymer-based materials. They are characterized by a high mechanical endurance, low density, high chemical stability, thermal insulating and electro-insulating properties. The polymers with special properties represent the starting point for obtaining a wide range of new materials, which can be used in various fields of activity. To identify the structure, we measured the absorption spectra in infrared with the help of a FT-IR Perkin Elmer Spectrum BX spectrometer. We performed the identification by comparing the absorption spectra obtained for the analyzed samples to spectra from the database of the instrument. Even if the samples look completely different because of the aging process, the absorption spectra in IR show the same absorption drops and bands, suggesting that the structural modifications due to the aging phenomenon have only slightly affected the chemical structure of the polymers.

INTRODUCTION

Plastics are made of easily accessible, raw materials and various items can be easily made of them. All these advantages have determined their use in different branches of national economies and technologies in everyday’s life. In the case of blends of plastics and contaminated (hazardous) waste, the energy required for separation, cleaning and reprocessing rises to a level that makes this procedure economically inefficient. Also, sometimes the recycled materials are of a weaker quality and because of that they find fewer applications. In the case of mechanical recycling, a great importance is given to the separation of plastic waste, which can be performed mechanically or by hand, so as to sort out plastics from other materials (glass, steel, aluminium, rubber, etc.) [1-6].

The polymeric materials are then identified [4] and sorted according to various types and pressed so as to be easily transported to mechanical recycling units. The separation of different plastics can be done on the basis of differences in properties such as [4-7]: conductivity, magnetic properties, size, density, melting temperature, thermo-mechanical properties – for example, embrittlement at low temperatures, superficial properties (triboelectric or the moisturising degree), colour, solubility, spectroscopic properties.

MATERIALS AND METHOD

To select the methyl polymethacrylate samples and differentiate it from other polymeric materials I carried out a series of trials on the behaviour of the material under flame heating. The polyolefins were first to be excluded because they tend to melt and drip. To exclude the vinyl polyclorure I applied the test of burning without oxygen. To this purpose, I introduced fragments of polymeric materials in a test tube and I gradually heated the sample on a gas bulb.

The resulting gases were washed off the walls of the test tube with the help of a wash bottle. I introduced a drop of methyl orange into the resulting solution. If the solution turned red, the sample was excluded. The red colouring was due to the formation of chlorhydric acid by the decomposition of the vinyl polyclorure. To identify the structure, I measured the absorption spectra in infrared with the help of a FT-IR Perkin Elmer Spectrum BX spectrometer. To make quick and easy measurements I used an ATR with a diamond window on the surface of which I pressed the sample of unknown polymeric material. I realised that the intensity of the absorption drops depends on the contact between the analysed sample and the diamond window of the measuring device. Thus, I carried out between 4 and 9 measurements for each sample, choosing the spectrum in which the absorption intensity was the highest. I performed the identification by comparing the obtained absorption spectra for the analysed samples to spectra from the data base of the device. The finely ground plastics, sorted by granulometric fractions were treated in a pyrolysis installation. The operation is performed under continuous cooling with liquid nitrogen to avoid heating and melting the polymeric material. On the other hand, the cooling with liquid nitrogen makes the polymers fragile and they become brittle at negative temperatures.

To draw solid conclusions about the influence of the particles size on the chemical recycling process I acquired PMMA waste sorted according to granulometric size from the company S.C. Astar. The size of the granules ranged from 300 to 500 μm and less than 300 μm respectively.

RESULTS AND DISCUSSIONS

I performed the identification by comparing the absorption spectra obtained for the analysed samples to spectra from the data base of the device. The obtained spectra are shown in figures 1-7.

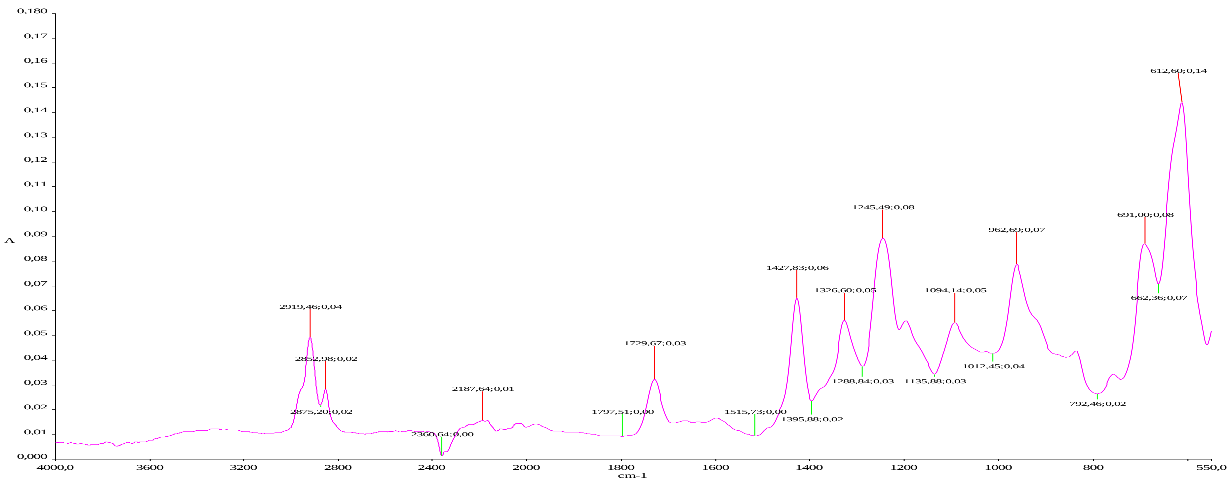

Figure 1. FT-IR spectrum of a PVC sample.

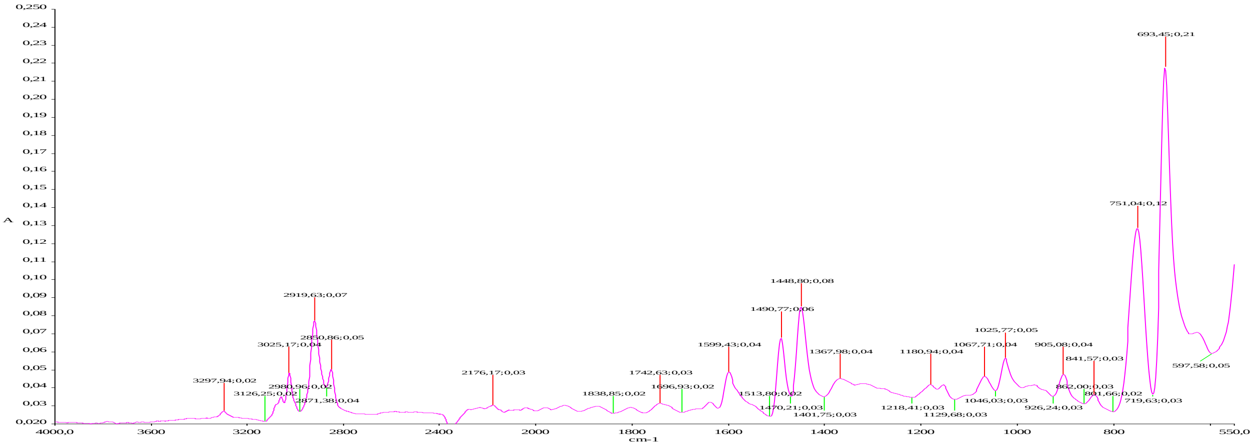

Figure 2. FT-IR spectrum of a polystyrene sample

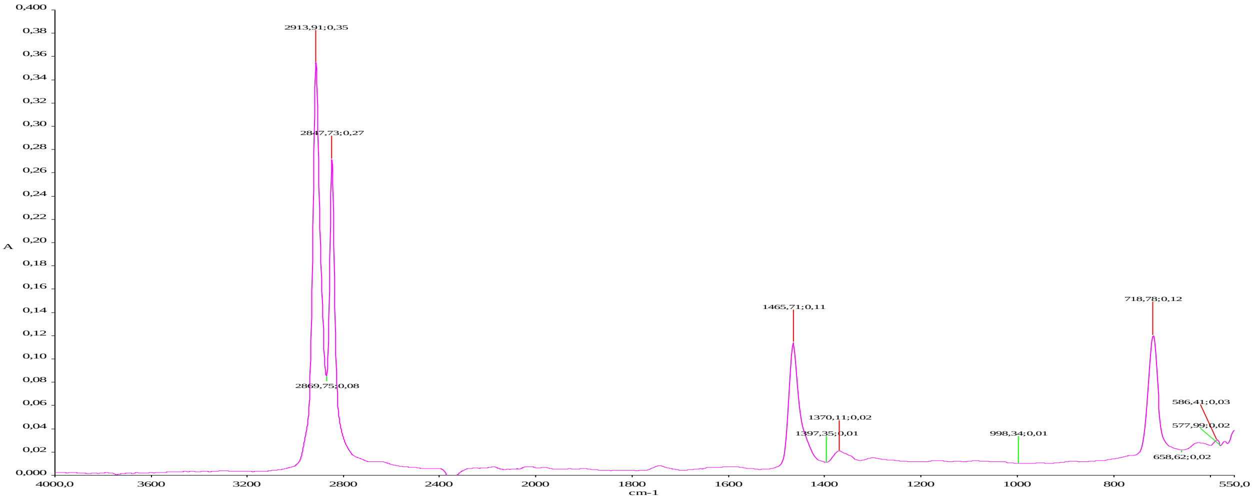

Figure 3. FT-IR spectrum of a high density polyethylene sample

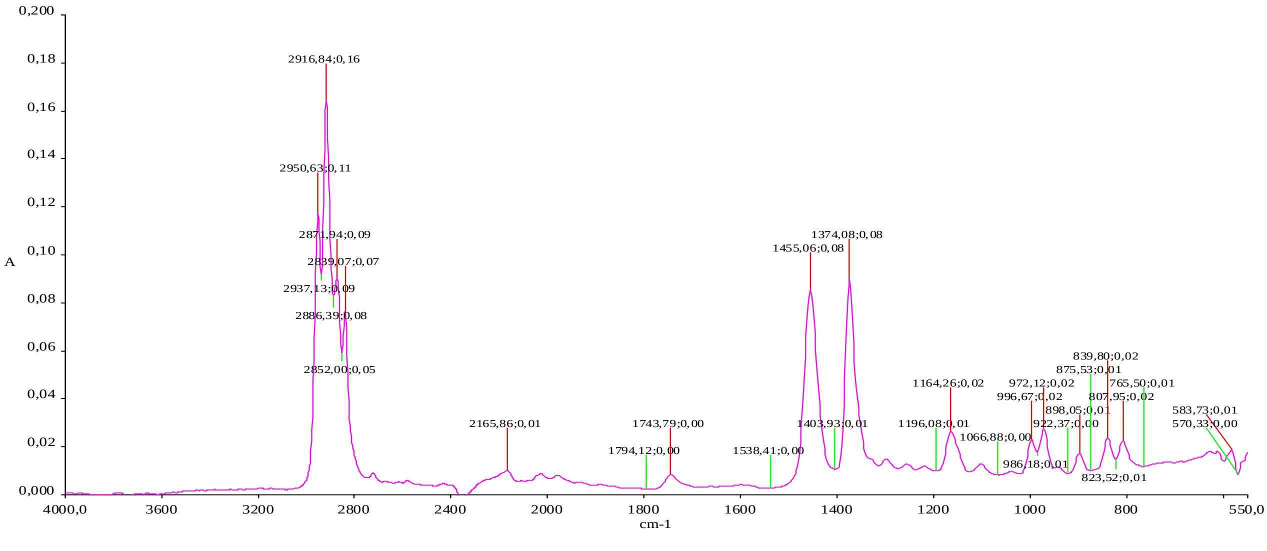

Figure 4. IR spectrum of an isotactic polypropylene sample

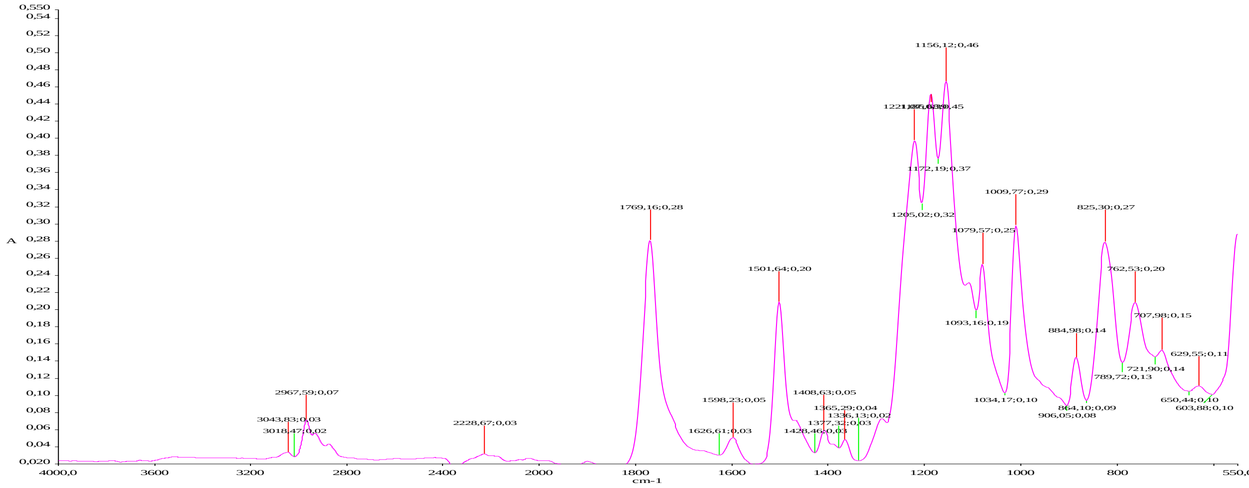

Figure 5. FT-IR spectrum of a polycarbonate sample

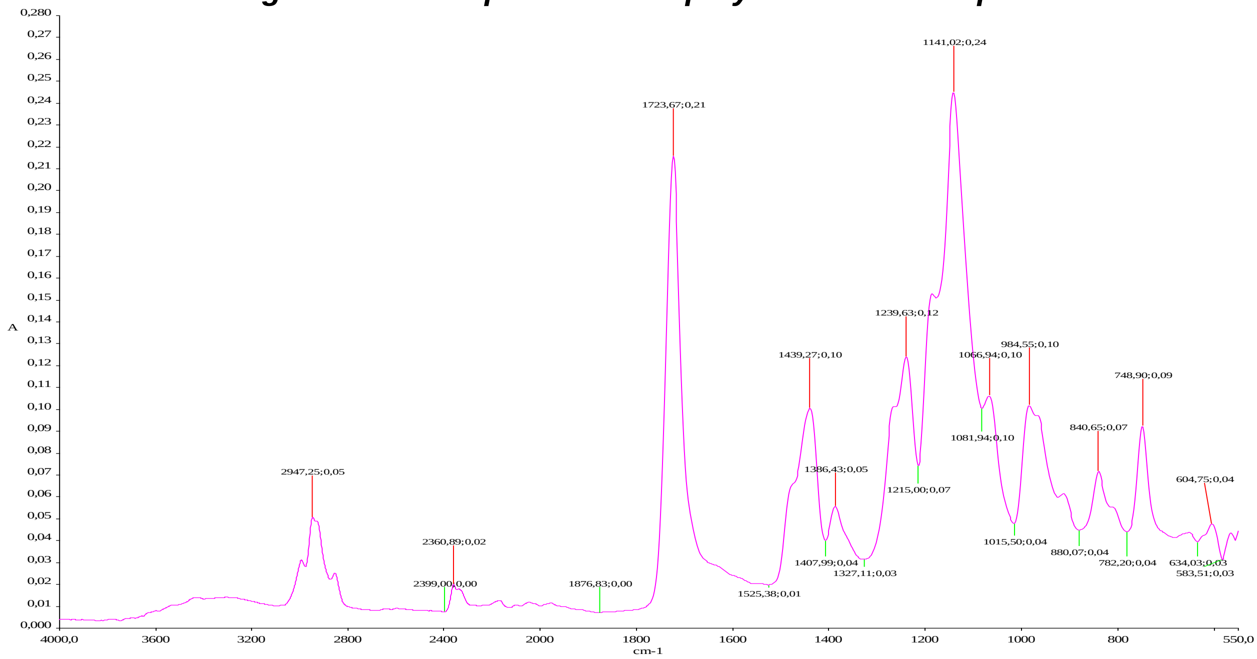

***Figure* 6. FT-IR spectrum of a PMMA sample from the plexiglas plate**

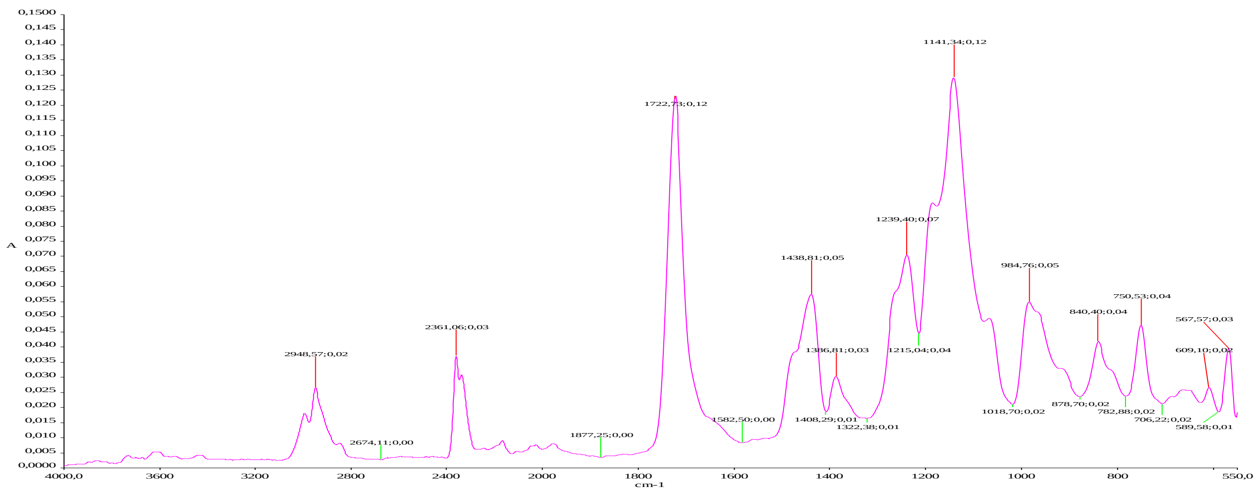

Figure 7. FT-IR spectrum of a sample of new methyl polymethacrylate (powder)

I selected the methyl polymethacrylate waste on the basis of the absorption spectra in IR. This waste consists of a Plexiglas plate (PMMA) over 20 years old. Owing to aging processes the plate has a semitransparent brown colour. The brown colour is due to degradation products. In terms of aspect, the Plexiglas waste looks more like waste identified as polycarbonate. It seems that the aging phenomena in the case of Plexiglas didn't impact on its mechanical properties, considering that it is less brittle than new Plexiglas plates.

For comparison I also used a powder of new PMMA. To highlight the impurities in the polymeric material resulted from the aging process I measured the absorption spectra in infrared both for a sample from the plexiglas plate (figure 6) and for the sample of new PMMA powder (figure 7).

Even if the samples look completely different because of the aging process the absorption spectra in IR show the same drops and absorption bands, which suggests that the structural changes due to the aging process had little impact on the chemical structure of the polymethacrylate from the plate. As a consequence, we can obtain methyl methacrylate with appropriate properties through thermal degradation.

Following the pyrolysis experiments in which I had used fine PMMA powder at 450^0 C, I noticed that the granules in the reactor melted and, in time, form an apparently fluid mass.

As the process goes on one can notice the PMMA in the pyrolysis bowl turn dark and brown. This change in colour is due to the formation of intermediate degradation products, which stick to the reactor and adhere to its surface.

The amount of carbon-based waste that results is relatively big. I calculated the efficiency of the process and I reached the conclusion that when a finely grounded polymeric material was used the efficiency dropped to 90-94%. I also noticed that the MMA vaporisation happens at a higher speed in this case than when the polymethacrylate is torn into bits, because the PMMA fragments don't form a compact mass, as it happens in the case of granules.

As the impurities in the methyl methacrylate sample, obtained by the pyrolysis of old PMMA waste, have higher retention times than the methyl methacrylate (and, consequently, vaporise harder), in order to obtain a purer methyl methacrylate through pyrolysis processes, the heating was interrupted in a series of experiments when the quantity of condensed vapours dropped significantly and the formed liquid began to change its colour because of impurities. Most of the specialist studies indicate the temperature of 450^oC as the best temperature to pyrolyse PMMA.

With a view to reducing the energy consumption that was required by the process, I ran a series of tests related to the reduction of the pyrolysis temperature. The tests relied on the fact that the PMMA decomposition temperature is less than 400^oC. At the temperature of 300^oC I ran a series of pyrolysis tests, using fragments of PMMA waste. The efficiency of the pyrolysis process dropped in this case because a higher quantity of carbon compounds was formed, up to 78%. In the case of pyrolysis temperatures higher than 450^oC, the quantity of solid waste dropped, but a series of gaseous pyrolysis products formed, which didn't condense during the condensation stage.

To assess the purity of the methyl methacrylate obtained in this way, the FT-IR spectra of two MMA samples are recorded; one obtained through thermal degradation of new PMMA granules and another one obtained through the thermal degradation of the PMMA fragments from the plexiglas plate. The spectra are shown in diagrams 8 and 9.

For comparison, the spectrum of a commercial methyl methacrylate is recorded under the same conditions. In the case of these samples, hydroquinone wasn't added so as to inhibit the polymerisation, instead, the product was analysed without any addition (Figure 10).

These spectra are compared to an IR spectrum from the data base of the National Institute of Standards and Technology's – NIST of the United States of America (Figure 11) [9]. The aspect of the absorption spectra differs from the spectra obtained in the set of measurements shown in [8, 11] by the lack of absorption drops/bands due to impurities.

Also, the absorption drops are better outlined and, by comparing the spectra of the MMA samples obtained through pyrolysis to the commercial MMA spectrum, we can notice that the main drops are similar in the three samples. The drops corresponding to the impurities are less outlined and less extended, suggesting a decrease in the concentration of the impurities.

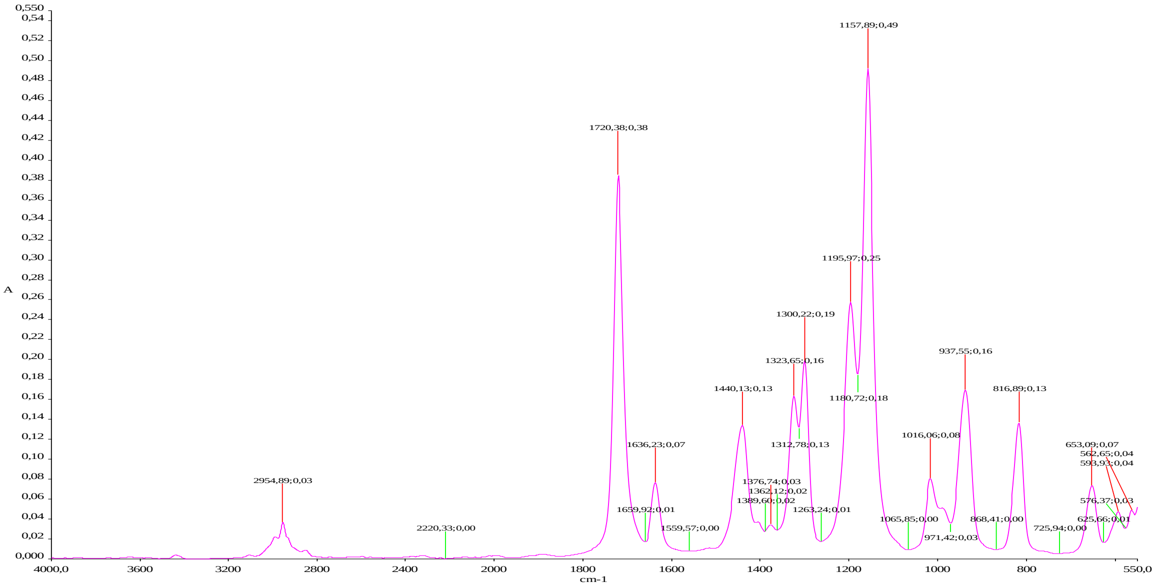

Figure 8. FT-IR spectrum of a MMA sample obtained through thermal degradation of PMMA powder

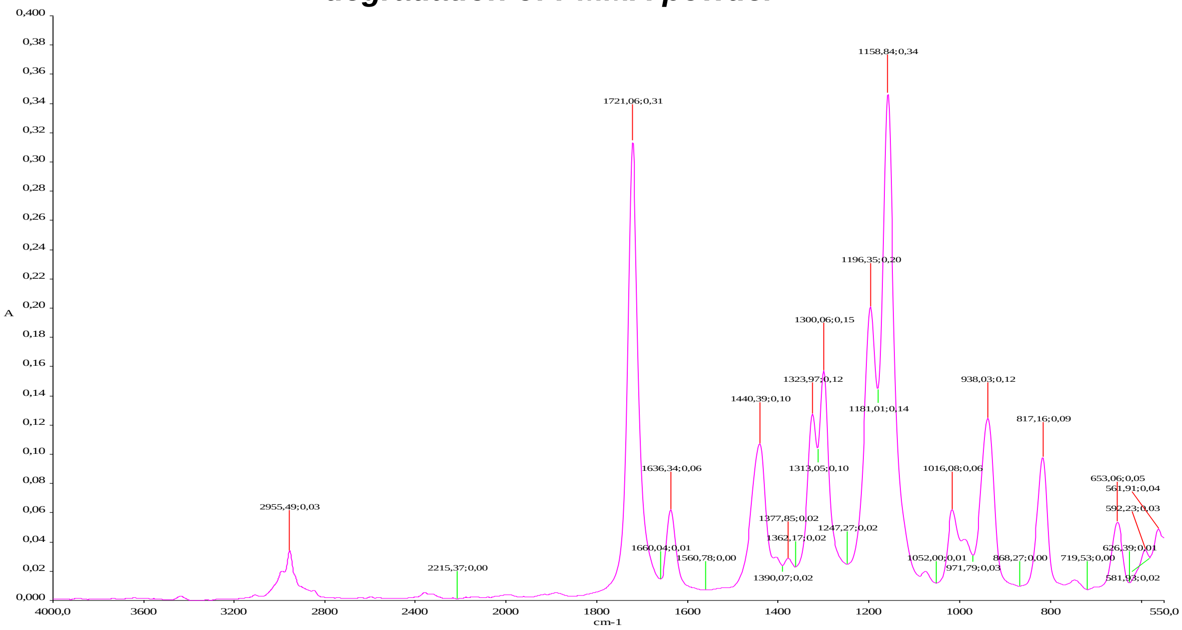

Figure 9. FT-IR spectrum of a MMA sample obtained through the thermal degradation of a plexiglas plate

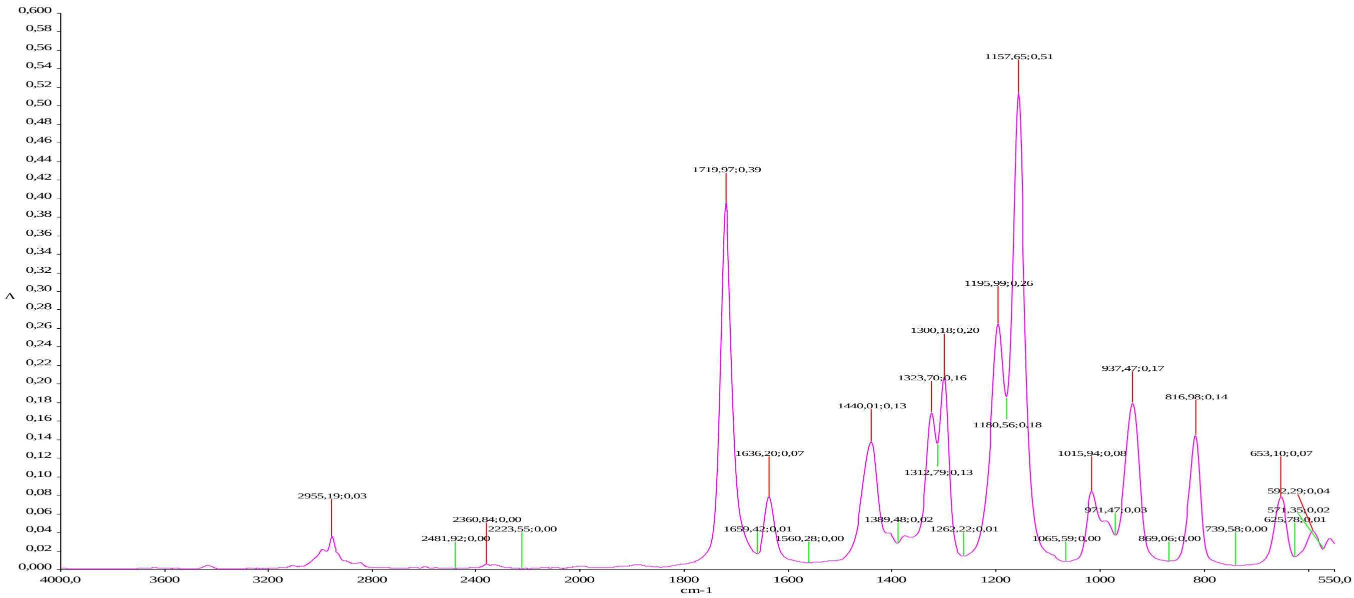

Figure 10. FT-IR spectrum of a commercial MMA sample

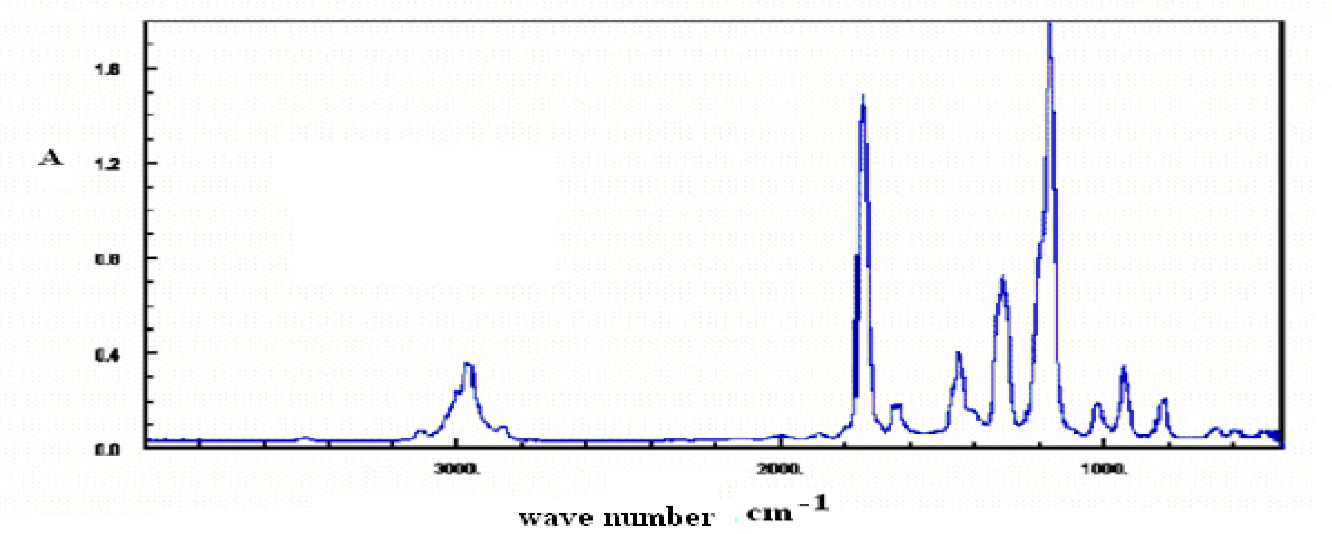

Figure 11. IR absorption spectrum of methyl methacrylate from the NIST database [123]

In Table 1 are presented awards to some of the absorption peaks. The IR absorption spectra can be seen that all samples have the same peaks / main absorption bands, there is a clear correlation between the spectra MMA commercial and MMA obtaining by the chemical recycling.

Table 1. Assignment of absorption peaks MMA-COM, MMA-PMMA, MMA- waste [120]

Functional Group	MMA-COM	MMA-PMMA	MMA- waste
	Wavelengths [cm^{-1}]		
Carbonyl bond C=O	1746	1724	1726
Double bond C=C	1638	1638	1639.2
Double bond C=C	940	941	942
Ethyl $–CH_2–$	1444	1438	1437
Oxymethyl–O–CH3	2964	2955,4	2955,4
Methyl – CH_3	1329	1326	1326
C-CO, O-C-C, C-C-C	1272-1147	1272-1147	1272-1147

Red-shift of the absorption peaks to higher wavelengths, where MMA obtained by pyrolysis of waste PMMA, can be explained by polymer formation during the determination and the presence of impurities. Existing impurities, did not significantly alter the spectra obtained, therefore, we assume that they are not in large quantities.

CONCLUSIONS

With the help of IR spectroscopy a series of polymer waste have been separated and identified. The PMMA polymers have been subjected to pyrolysis with a view to degrading and recuperating the methyl methacrylate monomers. The best degradation temperature has been decided to be 450^{o}C, the temperature chosen by other authors as well. At this temperature the maximum efficiency is reached in a liquid pyrolysis product.

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COMPORTAREA SORGULUI LA DIFERITE VARIANTE DE TRATAMENT DIN CADRUL CÂMPULUI EXPERIMENTAL LACU SARAT, BRĂILA

THE BEHAVIOUR OF SORGHUM CROP UNDER DIFFERENT TREATMENTS FROM THE LACU SARAT TRIAL PLOT, BRAILA

COTEȚ VALENTINA

Keywords: trial plot, sorghum, treatment variant, yields

REZUMAT

Din punct de vedere al toleranței, se ştie că sorgul este o plantă cu toleranță mijlocie la salinitate. În cadrul cercetărilor întreprinse în câmpul experimental Lacu Sărat, în primul an al cercetărilor, sorgul a fost inclus în structura de culturi alături de porumb, floarea soarelui şi iarbă de Sudan. Câmpul experimental Lacu Sărat, este amplasat pe un cernoziom slab-moderat salinizat, într-un areal depresionar în care se acumulează apele freatice din zonele periferice înalte, fenomen care a determinat şi manifestarea proceselor de degradare a solurilor prin sărăturare şi exces periodic de apă.

Scopul principal al cercetărilor a fost acela de a urmări influența unor măsuri agrofitotehnice asupra solului şi producției la principalele culturi de câmp în condițiile câmpului experimental Lacu Sărat, iar în lucrarea de față se prezintă comportamentul sorgului.

ABSTRACT

In terms of tolerance, it is known that sorghum is a plant with medium tolerance to salinity. In the framework of the researches from trial plot Lacu Sărat, in the first year, sorghum was included in the composition of crops together with maize, sunflower and Sudan herb. Trial plot Lacu Sarat is located on slightly-moderately salinized chernozem, in a depresionary area which accumulates groundwaters from neighbouring higher areas, this phenomenon also being the cause of soil degradation processes by salinization and recurrent waterlogging.

The main purpose of the research was to pursue the influence of agrophytotechnical measures on soil and yields for the main field crops in the trial plot Lacu Sarat, and, in this paper, the interest was focused on the behaviour of the sorghum.

INTRODUCTION

Sorghum belongs to the Gramineae family and includes 31 annual and perennial species. Cultivated sorghum belongs to *Sorghum vulgare* Pers., synonimus to *Sorghum bicolor*, is the main bread cereal in Africa, India, China, Middle East, Egypt. According to its use, it is classified in four groups: grain sorghum (*Sorghum bicolor* var. eusorghum), sorghum for beson (*Sorghum bicolor* var. technicum), sweet sorghum (*Sorghum bicolor* var. saccharatum) and sorghum for forage (*Sorghum bicolor* var. sudanense), (Muntean et al., 2003). Sorghum has multiple uses: feeding, starch, sugar, alcohol, beer, vinegar, and in the last period in the production of biofuels, as well as for obtaining brooms, cellulose, and others.

Sorghum originated from East Africa, therefore, being a plant of tropical origin, it is more resistant to drought than maize, easily supporting drought and heat (temperatures of 38 - 40^{0}C). It has a strong root system, the stem and leaves being covered with a layer of bloom (wax), which greatly reduces transpiration. In our country, sorghum is grown in the maize area, effectively exploiting the sandy, salt, eroded soils, with pH values between 4.5 to 4.8. In the early stages of vegetation, it has a slow growth rate, which requires the cultivation of sorghum plants after crops that leave the ground clear of weeds, such as cereal straw, or weeding crops: corn, sunflower, potato. After sorghum, only spring crops could be used, because sorghum deplete soil water and nutrients.

Due to the fact that sorghum is a plant with a moderate agricultural tolerance to salinity (Sandu et al., 1986), it was included in the crop rotation together with maize, sunflower, Sudan herb and all of these were sown in trial plot Lacu Sarat - Braila.

MATERIAL AND METHODS

Lacu Sarat trial plot is sited in a depresionary area which accumulates ground waters from neighbouring higher areas, this phenomenon also being the cause of soil degradation processes by salinization and recurrent water excess. Surface deposits are made of loess and the texture varies from loamy-sandy to loamy-clayey. On the bottom of the valley, where the trial plot is sited, ground waters reach levels of less than 2 m and in some parts less than 1 m depth. The soil is a chernozem, slightly-moderately salinized (SRTS, 2003). As far as climate is concerned, the trial plot is sited in the dry steppe (Bogdan, 1999), characterized by hot and dry summers, with a mean multiannual temperature of 10.9^{0}C, precipitations of 452 mm annually, potential evapotranspiration of 705 mm and a climatic water deficit of 345 mm (Braila Weather Facility).

The natural conditions of the trial plot were the basis for the layout for several treatments: horizontal drainage, deep loosening, ameliorative irrigation, organic fertilization, chemical fertilization, soil tillage with soil material inverting, soil tillage without soil material inverting (paraplaw), mulching and amendment (tab. 1).

Table 1

Improvements applied to Lacu Sarat trial plot, Braila

Treatment variants	Treatments										
	Drainage			Deep loosening	Ameliorative irrigation	Fertilization		Soil tillage		Mulching	Amendment
	high intense (20 m)	moderately intense (40 m)	no drainage			organic	chemical	with soil material inverting	without soil material inverting (paraplaw)		
V_1	✓			✓	✓	✓	✓		✓		✓
V_2	✓			✓	✓		✓		✓		✓
V_3	✓			✓	✓		✓	✓			✓
V_4	✓				✓		✓		✓		✓
V_5	✓			✓			✓		✓		✓
V_6	✓			✓			✓		✓	✓	✓
V_7		✓		✓	✓		✓		✓		✓
V_8			✓	✓	✓		✓		✓		✓
V_{8a} (B)			✓				✓	✓			

After applying ameliorative technologies, the trial plot was cultivated with the following crops: maize, sunflower, sorghum and Sudan herb. The four crops were sown perpendicular, so that each crop goes through the eight plots with treatments.

It has to be said that all technological components (plant species, fertilization, sowing, weed control) were of ameliorative nature.

Provided that this paper only presents Sudan herb behaviour, the technological cultivation characteristics are as follows:

- seedbed preparation was carried out by plowing with U 650 together with PP 30-3;
- disc harrowing with U 650 and HG 3.4 twice (the second time coupled harrows);
- local cultivar Fundulea 32 was used;
- sowing was done at the temperature of 12-14^{0}C at the sowing depth of 6 - 8 cm, with a density of 250.000 germinable seeds/ha, and the interrow distance of 70 cm;
- fertilization was achieved by application of 600 kg/ha ammonium sulphate, which provided 100 kg N/ha for variant V_2 - V_{8a} and 100 kg/ha ammonium sulphate providing 20 kg N/ha in V_1 area, where manure was applied (60 t/ha dry manure) for the seedbed preparation;
- weed control was achieved by application of 3 kg/ha Argezin 75 to soil preparation, Oltisan Extra 1 l/ha in phase of 3-4 leaves of dicotyledonous weeds and mechanical weeding;
- sorghum seeds were treated with Furadan 25 l/t, and, in order to combat aphids, 2-3 treatments with Sinoratox 2 l/ha were used in the moment of larvae emergence;
- harvesting was done manually by variant, a 15% seed moisture, wax-ripening season (Coteţ, 2008).

RESULTS AND DISCUSSIONS

The production results for the studied sorghum crop trial plot in the first agricultural years ranged between 4366 kg/ha in case variant V_1, were the manure was applied and with the most improvement methods and 2736 kg/ha for V_{8a} considered the benchmark variant (fig. 1).

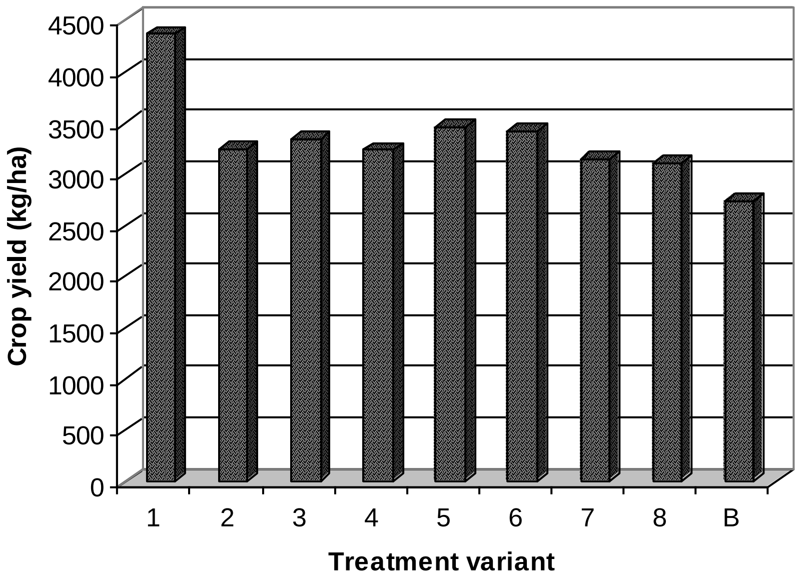

Figure 1. Yield obtained on treatment variants for sorghum crop

The obtained yields are presented both in absolute and in relative values (% of the benchmark treatment = 100), which in the trial context can be considered V_{8a} (*no drainage + chemical fertilization + soil tillage with soil material inverting + amendment*) which undergone the least ameliorative tillage, the actual benchmark (*with no improvement*) treatment missing (Coteţ, 2008).

The results obtained in the experimental variants with sorghum , are characterized by relatively modest yields, 114-126%, excepting the first variant, with a relative yield of 160% (fig. 2).

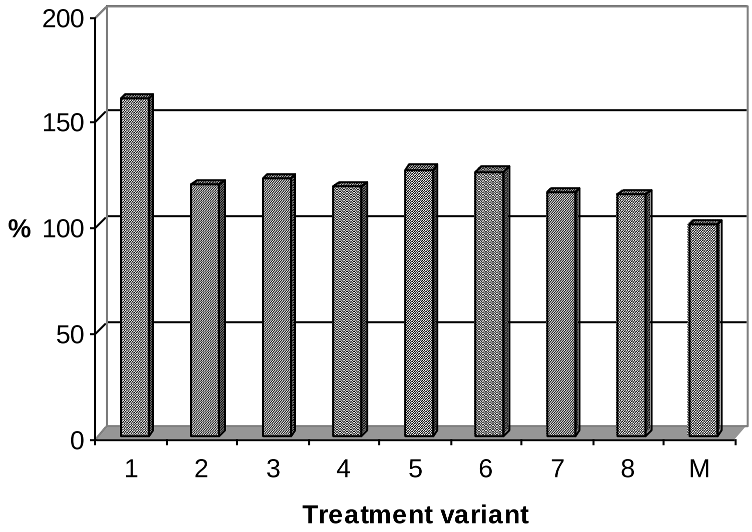

Figure 2. Variation of mean relative sorghum yield (M = 100) under different treatments

CONCLUSIONS

1. Being an agronomic plant with a medium tolerance to salinity, sorghum, was included in a crop rotation the composition of crops with maize, sunflower, and Sudan herb and they were sowed in the trial plot Lacu Sarat, Braila.

2. Sorghum with maize, sunflower and Sudan herb has reacted favourably to most variants of treatment with relatively moderate yields and the best yields were obtained for variants with the distance between drains being 20 m.

3. The best production was obtained in the variant V_1 (*Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Organic fertilization + Chemical fertilization + Paraplaw + Amendment*), and the lowest production was obtained in the variant V_8 (*No drainage + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplaw + Amendment*).

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CERCETĂRI PRIVIND INFLUENȚA ASOLAMENTULUI ASUPRA INDICATORILOR AGROCHIMICI AI SOLULUI DIN CÂMPUL EXPERIMENTAL STUPINI, JUDEȚUL BRAŞOV

THE INFLUENCE OF CROP ROTATION ON SOIL AGROCHEMICAL INDICATORS FOR EXPERIMENTAL FIELD STUPINI, BRASOV COUNTY

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Keywords: asolament, sol, indicatori agrochimici

REZUMAT

Lucrarea prezintă rezultatele obținute în câmpul experimental Stupini, județul Braşov, în cei doi ani de experimentare. În câmpul experimental, a fost organizat un asolament, cu 15 variante diferite, alcătuit din culturi specifice pentru această zonă, pentru a stabili influența asolamentului asupra indicatorilor de calitate ai solului. Probele de sol au fost recoltate în trei repetiții, în 15 variante. Această lucrare prezintă valoarea mediilor indicatorilor agrochimici din fiecare variantă pentru trei perioade diferite: primăvara anului 2008 (înainte de înființarea câmpului experimental), toamna anului 2008 (după primul ciclu experimental) şi toamna anului 2009 (după al doilea ciclu experimental).

Analiza rezultatelor duce la concluzia că solamentul propus este bine stabilit, solul având o evoluție pozitivă.

ABSTRACT

The paper presents the results obtained in the experimental field Stupini, Brasov county, in the two years of experiments. In the experimental field, a crop rotation has been organized, in 15 different variants, consisting of specific crops for this area, in order to establish the influence of crop rotation on soil quality indicators. Soil samples were collected in three repetitions, in the 15 variants. This paper presents the averages value for agrochemical indicators from each variant for three different periods: spring 2008 (before establishing the experiments), autumn 2008 (after the first experimental cycle) and autumn 2009 (after the second experimental cycle).

The analysis of the results led to the conclusion that the proposed crop rotation is well established, the soil having a positive development.

INTRODUCTION

Sustainability of crop systems is measured by their ability to maintain a certain level of production for medium and long time periods, and being consistent with the environment. Researches developed in 2008-2010 monitored the behavior of mixtures of grasses with perennial pulses, as a technological solution to reach the agroclimax state on lands with monoculture after 1990, especially grasses, silo maize, potatoes and sugar beet, thus responding to the desire for sustainable management of biological resources according to the European research area. For the agroclimax resettlement status, depending on the agroecological region, there are several guidelines, classified by different criteria, most common being that of the amount of waste biomass participating to the humification process, the amount of fixed nitrogen from the atmosphere and the speed of mineralization processes, considered the main stages of resettlement status agroclimax (Cloțan et al, 2010).

This paper highlights the influence of the crop rotation on chemical indicators of soil quality after two experimental years.

MATERIAL AND METHOD

The observations were done in the experimental field Stupini, located in Brasov Depression, on the territory of the National Institute of Research and Development for Potato and Sugar Beet, Brasov.

The studied area is situated in the transition area between the Mediterranean climate and continental climate, with average annual temperatures of 7.7^{0}C and low average annual rainfall ranging from 548.0 - 635.2 mm.

The experimental field area was divided into 15 variants, with 4 repetitions, in a rotation, including specific crop, supporting the development of production systems.

A crop rotation was selected for this area, consisting of a complex mixture of grasses with perennial pulses, potato, spring two-row barley, sugar beet and silo maize. In order to restore and preserve the state of soil quality, sown grassland (temporary), consisting of grasses with perennial pulses, were chosen for several reasons: they have high ecological plasticity, they ensure high yields and constant production of forage, they have flexibility in exploitation (grazing, mowing, mixed), they increase soil nitrogen through symbiotic fixation, and organic matter through crop residues remaining in soil, they protect soil against water and wind erosion, they have a benefic effect on the soil physic-chemical properties.

Also, the temporary grassland, consisting of perennial grasses with pulses, well used, prevents the weeds by reducing the soil seed reserve and ensuring the control of pests and diseases.

The experimental field was organized following this scheme:

Group Ist

Variants	**1st year**	**2nd year**	**3r^{d} year**
V1 -	grasses with perennial pulses	potato	spring two-row barley
V2 -	potato	spring two-row barley	sugar beet
V3 -	spring two-row barley	sugar beet	silo maize
V4 -	sugar beet	silo maize	grasses with perennial pulses
V5 -	silo maize	grasses with perennial pulses	potato

Group IInd

Variants	**1st year**	**2nd year**	**3r^{d} year**
V6 -	grasses with perennial pulses	grasses with perennial pulses	potato
V7 -	grasses with perennial pulses	potato	spring two-row barley
V8 -	grasses with perennial pulses	spring two-row barley	sugar beet
V9 -	grasses with perennial pulses	sugar beet	silo maize
V10 -	grasses with perennial pulses	silo maize	grasses with perennial pulses

Group IIIrd

Variants	**1st year**	**2nd year**	**3r^{d} year**
V11 -	grasses with perennial pulses	grasses with perennial pulses	grasses with perennial pulses
V12 -	grasses with perennial pulses	grasses with perennial pulses	potato
V13 -	grasses with perennial pulses	grasses with perennial pulses	spring two-row barley
V14 -	grasses with perennial pulses	grasses with perennial pulses	sugar beet
V15 -	grasses with perennial pulses	grasses with perennial pulses	silo maize

The soil of the experimental field is a cambic Phaeozem, formed on alluvio-proluvial deposits, carbonaceous stratified, with a very large edaphic volume, and a favourable physical state, slightly compacted for the depth between 13-25 cm (plough sole). It has a high content of organic matter, 4.98% in the first 50 cm, and the supply of N, P and K is good.

To maintain soil fertility, it should be fertilized with organic and mineral fertilizers. Taking into account the soil reaction in the first 20 cm soil (pH = 6.5), the application of some fertilizers that do not acidify the soil is recommended.

The field was fertilized with 100 kg/ha NPK compound fertilizers, active substance, in 2008, and 50 kg/ha NPK the same form in 2009.

In order to identify changes that occur in the soil after cultivation following the above experimental scheme, main agrochemical soil indicators were monitored: soil reaction, organic matter content, total nitrogen content, available phosphorus and potassium content, after the first and second experimental year. The evolution of the structure indicators after each experimental cycle was monitored also.

In the present paper, only evolution of the agrochemical indicators is presented, the evolution of the physical indicators being the subject of another paper.

Soil profile characterization, soil data collection, data analysis and interpretation were done according to existing methodologies (MESP, 1987; SRTS, 2003).

RESULTS AND DISCUSSIONS

During the two years of experimentation, the main agrochemical indicators were monitored: soil reaction, organic matter content, total nitrogen content, available phosphorus and potassium content.

Soil samples were collected in three repetitions, in the 15 crop variants and for each variant, average values from spring 2008, before the establishment of the experimental field, autumn 2008, after the first experimental cycle and autumn of 2009 after second experimental cycle are presented.

Soil reaction (pH). After the first experimental cycle, it could be noticed a slight decrease in the reaction in almost all experimental variants. If at the begining pH was slightly acid, with values ranging between 5.80 - 6.15, a slight decrease from 6.15 to 5.84, in the same class could be noticed at the end of the first year.

The exception is the first variant, (crop – potatoes), with an increase of the reaction from 5.87 to 6.15. Soil reaction is a labile property of the soil, which changes rapidly as a result of weather changes or current management practices.

In 2009, after the second year of cultivation, slight downward trend of the reaction isb maintained for all the experimental variants, no matter what is the crop. Fertilizer with nitrogen have contributed to this trend of the reaction (fig. 1).

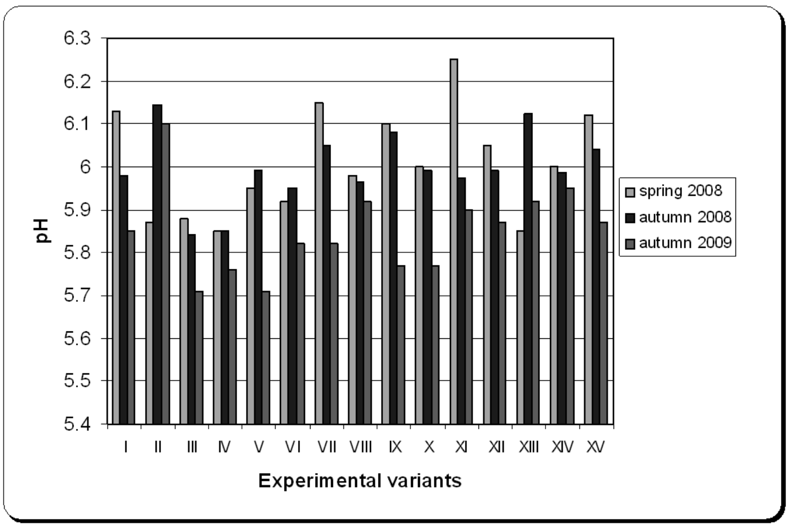

Figure 1 Soil reaction in the experimental field Stupini

Total nitrogen content (Nt%). At the begining of the experiment, the soil was medium supplied, total nitrogen content having values between 0.198 and 0.204%, excepting that I variant with a value of 0.204%. After the first experimental cycle, it could be noticed an increase of total nitrogen content to values ranged between 0.207 - 0.186%. Overall, there is a slight increase in total N content in soil from its original status, without going into a higher class of soil nitrogen supply.

In 2009, after the second experimental cycle, there is a uniform decrease in total nitrogen content, passing into a lower class - small. This decrease can be due to the reduction of fertilizer with nitrogen dose administered in 2009, respectively 50 kg N/ha and to the export by plant, since the intake of fresh organic matter represented in particular by roots rezidues left by the grasses with perennial pulses, even it was high, it was not mineralized in order to enter in the nitrogen cycle (fig. 2).

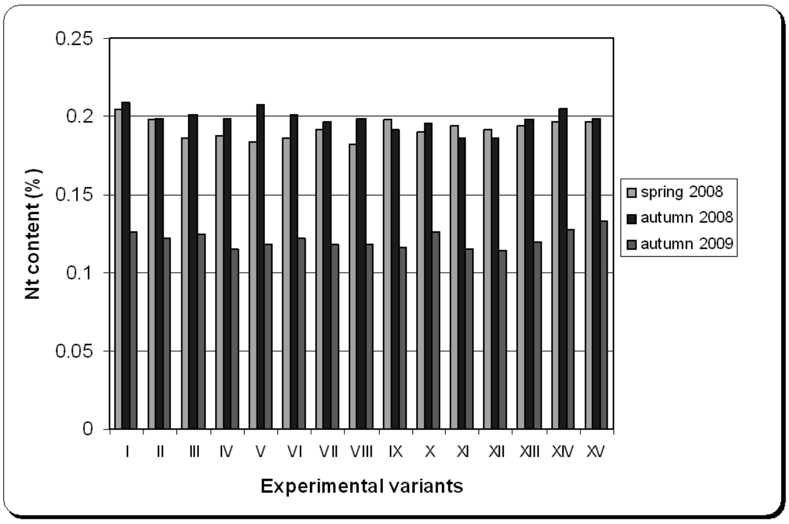

Figure 2 Nt (%) content in the experimental field Stupini

Organic matter (Ct*1.72, %). The soil is medium supplied with humus, with a variation depending on crop from 3.90 to 5.28%. After the first year of cultivation, there is a slight increase in organic matter content, without going into a higher class of supply.

In 2009, the content of organic matter is quite uniform for the entire field, with lower values than autumn of 2008. Reducing the dose of fertilizers lead to a consumption of soil organic matter reserves by plants. Another causes are the rate of mineralization of organic matter present, the increased mineralization caused by soil tillage and soil mobilization at the surface (fig. 3).

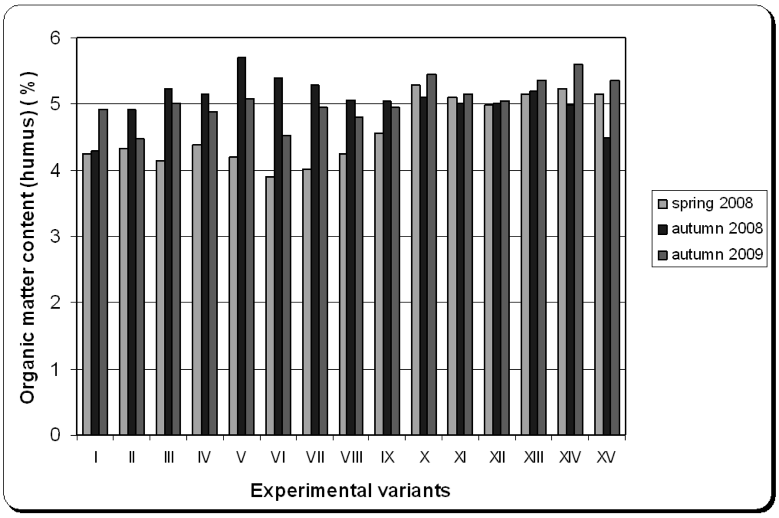

Figure 3 Organic matter content (humus) (%) in the experimental field Stupini

Available phosphorus (P_{AL}, ppm). The soil was good - medium supplied with available phosphorus at the begining of the experiment. After the first year of cultivation, there is a slight decrease in available phosphorus content, excepting the second variant, cultivated with potatoes, where the amount was of 65 ppm.

The weak decrease of phosphorus content is due to the phosphorus export by plant and to the insufficient fertilization with phosphorus, soil requiring larger quantities of such fertilizer. 2009 brings an increase in available phosphorus content, maintaining the same class of assessment.

Although the doses of fertilizer were reduced, phosphorus solubisation degree is lower, and it was hardly released in the soil (fig. 4).

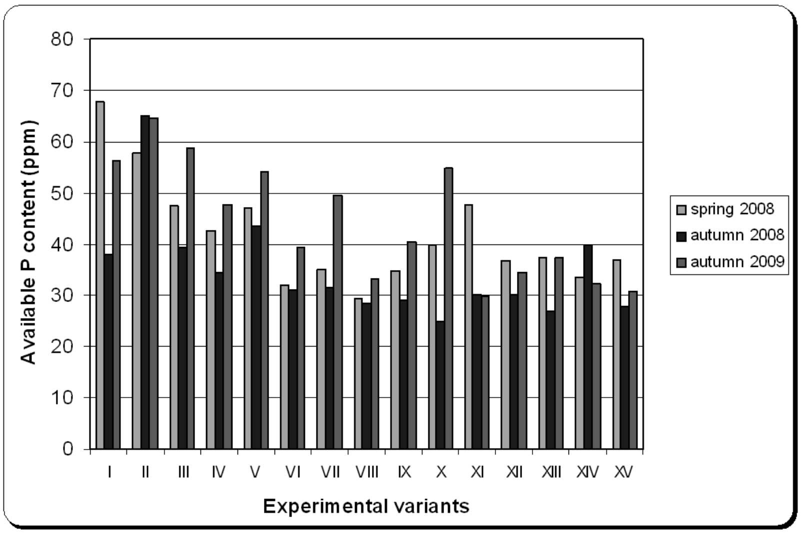

Figure 4 Available P (ppm) content in the experimental field Stupini

Available potassium (K_{AL}, ppm). In the initial state, the soil was medium supplied with K. There is an increasing amount of available K, at the upper range, after the first year of experiment, with values ranging from 112.5 to 127.0 ppm, excepting variants V (silo maize), where the phosphorus content decreases to 95.5 ppm and II (potato), where the available potassium content increased to 210 ppm. In 2009, a decrease of potassium content below 100 ppm could be observed in almost all experimental variants (fig. 5).

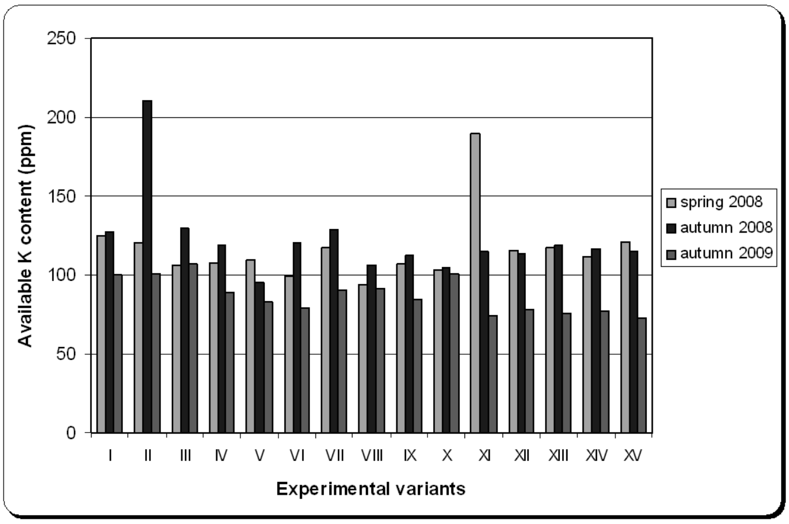

Figure 5 Available K (ppm) content in the experimental field Stupini

CONCLUSIONS

After two experimental cycles, the following conclusions could be developed:

- Soil reaction has a slight downward trend in all experimental variants, no matter the crop rotation, but still keeping the soil in weak acid class. This downward trend could be also a response to nitrogen fertilizers.
- In the second year of cultivation, the nitrogen content decreases uniformly, and with the soil supply with nitrogen is low. This decrease could be explained by the reduction of nitrogen fertilizer dose administered, but also to its massive acquisition by plants.
- In the second year of research, organic matter content across the entire field decreases, the values are lower than those from autumn of 2008, due to ingestion of soil organic matter provided by the plant and the current rate of mineralization.
- After two years of experiments, available phosphorus content increases, due to the lower solubility of phosphorus.
- Available potassium content in the second year of research, decreased below 100 ppm in almost all experimental variants.
- Introduction of mixture grasses with perennial pulses in the rotation may be an appropriate solution in maintaining and improving soil quality for a long term.

ACKNOWLEDGEMENTS

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ÎNGRĂŞĂMINTE ORGANO-MINERALE PE SUPORT DE LIGNIT, SURSA ECOLOGICĂ DE FERTILIZARE ECHILIBRATĂ A CULTURILOR ÎN AGRICULTURA DURABILĂ

ORGANOMINERAL FERTILIZERS ON THE LIGNITE SUPPORT – ECOLOGICAL SOURCES OF BALANCED FERTILIZATION OF CROPS IN SUSTAINABLE AGRICULTURE

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Key words: humates, nutrients, lignite, fertilizers

ABSTRACT

Obținerea unor producții mari pe solurile cu conținut redus de humus necesită fertilizarea sistematică cu îngrăşăminte organice care să asigure refacerea rezervei de humus a solului.

Întrucât îngrăşămintele organice sunt insuficiente, iar cele chimice clasice produc în timp şi poluarea chimică a solului şi a unor ape freatice, în ultimii ani a luat o mare amploare, îndeosebi în țările cu agricultură avansată, producerea industrială a îngrăşămintelor humice pe suport de lignit, leonardit şi turbă. Aceşti cărbuni inferiori cu capacitate calorică mică însă cu conținuturi importante de acizi humici facilitează producerea unor îngrăşăminte cu efecte fertilizante superioare şi costuri relativ mai reduse decât cele chimice clasice.

În România, pe baza unui sortiment de îngrăşăminte humice pe suport de lignit obținute în cercetările efectuate de Institutul Național de Cercetare – Dezvoltare pentru Pedologie, Agrochimie şi Protecția Mediului, Bucureşti, s-a realizat în cadrul unui proiect RELANSIN în colaborare cu SNLO Tg. Jiu o instalație de producere a acestor îngrăşăminte cu o capacitate de peste 7000 tone/an care a intrat în funcțiune din anul 2008.

În lucrare se prezintă însuşirile unor îngrăşăminte organominerale noi cu conținuturi superioare de acizi humici, eficiența economică a acestora şi posibilitățile de sporire a producției vegetale pe solurile cu conținuturi reduse de humus.

Obtain high yields on soils with low humus requires systematic fertilization with organic fertilizers to ensure restoration of the reserve of soil humus.

Since organic fertilizers are insufficient, and the classical chemical production in time and chemical pollution of soil and groundwater in recent years has taken a large, particularly in countries with advanced agriculture, industrial production of humic fertilizers on lignite support, leonardit and peat. These inferior coal capacity caloric content but with little significant humic acids facilitates the production of fertilizer effects of fertilizers and higher costs relatively lower than those of classical chemical.
In Romania, based on a range of humic fertilizers on lignite support from research conducted by National Research - Development Institute for Soil Science, Agrochemistry and Environmental Protection, Bucharest, was made in a RELANSIN project, in collaboration with SNLO Tg. Jiu a production of these fertilizers with a capacity of over 7000 tonnes / year, which came into service in 2008.

In the paper presented the characteristics of some new organomineral fertilizers with high contents of humic acids, the economic efficiency of these and possibilities to increase crop production on soils with low humus content.

INTRODUCTION

Interest from humic fertilizer production and use has increased in recent years within the focus of scientific research in different countries for the prevention of pollution with chemical fertilizers.

The obtained knowledge on the properties of humic acids and their importance in defining the multiple proprieties of soil led to the idea to use the low-grade coals (brown coal, lignite, to leonardite, peat) which contain high amounts of humic acids as organic (humic) and organomineral fertilizers.

Today in many countries: America, Japan, China, Israel, Spain, Russia, are many companies that produce humic fertilizers on industrial level.

Given the fact that these fertilizers are used on land growing by technologies including actions to improve plant nutrition in environmental conditions may be estimated that fertilization with humic fertilizer is evolving as a new global strategy.

The research to produce humic organo-mineral fertilizers is relative new in Romania. This research started four decades ago (Dorneanu et al., 1971; Rogoz et al, 1972) and it was continued till now withim the framework of some interdiciplinary supported by manny scientific researches institution, universities and factories.

These fertilizers were created to ameliorate the soils with low humus content (sandy, luvic, erodeal soils).

At present, there are 6 types of humic fertilizers on lignite support which can produse, in a pilot installation more than 7000 t fertilizers per year, put into operation in 2008, built at Tg. Jiu by the National Research-Development Institute for Soil Science and Environmental Protection – ICPA, Bucharest, in cooperation with National Lignite Society, Oltenia, Tg Jiu, within the framework of the Relansin project, 2003-2005.

At the same time with the starting of this installation function, at present being in the final (and modernization) stage, a real base has been created to extend the production of fertilizers on lignite support in Romania (Dorneanu et al, 2008).

The opportunity to obtain the organo-mineral fertilizers from lingite in Romaia due to the important lignite reserves in Romania, in the large missing exploitations of Oltenia, with organic matter (OM) content of 60.54-69,52%; humic acids SiO_2 14,98-39,46% (AH); 24,94-38,62% (Dorneanu Emilia et al., 2002; Davidoiu et al., 2008).

After entering in function on the instalation mentioned to create an opportunity to develop research for the production of more refined new fertilizers with superior compositions and qualities.

In this paper to presents a range of four organomineral fertilizers on lignite support granulated with potassium humates in successive layers.

MATERIALS AND METHODS

Organomineral fertilizers on lignite support treated in this paper are technology mixtures of lignite powder rich in humic acids with urea or urea and ammonium phosphates granules in successive layers according to the principles mentioned in Fig. 1

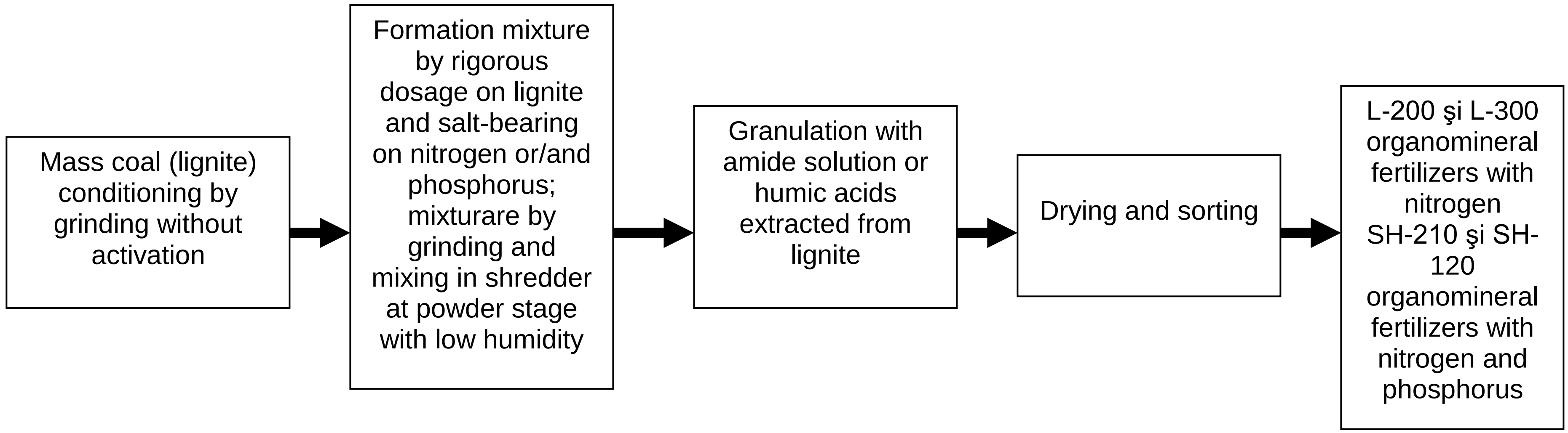


Fig. 1 – General technological scheme for organomineral fertilizers on lignite support in the form of technology mixtures with nitrogen-bearing salts or nitrogen and phosphorus (Dorneanu et al. 2010)

- All products mentioned in reports specific fertilizer dosed entering the shredder, crushed and mixed in the powder state in low humidity conditions;
- Follow granular successive layers with amide solution or humic acids extracted from lignite;
- After granulating, drying, sorting and packing by bagging.

They obtained two types of fertilizers:

- organomineral fertilizers on lignite support granulated in succesive layers with urea solution (Table 2.1);
- organomineral fertilizers on lignite support granulated in succesive layers with humic acids extracted from lignite in form of potassium humates (Table 2.2).

The first class of organo-mineral fertilizers named L-200 L-300, SH-210 SH-120 containing humic acid in natural form of lignite and are granulated in succesive layers with urea solution. They were the target on pilot installation construction.

A second class of organomineral fertilizer nominated L-200 HK, L-300 HK and SH-120 HK granulated with humates potassium containing humic acids both in natural and of potassium humates form representing a significant share in humate mass.

Differences in the composition of the two types of fertilizer shown in Tables 2.1. and 2.2. are significant, content of lignite was substantially reduced in fertilizers composition granulated successively with potassium humate and increased nutrient content.

Table 2.1

Composition and characteristics of organomineral fertilizers on lignite support granulated in successive layers with urea solution, made from installation in SNLO Tg. Jiu approved for use in Romanian agriculture

No.	Specification	UM	L-200	L-300	Super H-210	Super H-120
1.	**Composition**					
1.1	Lignite	%	47.0	35.0	40.2	54.5
1.2	Humic acids	%	16.0	10.0	17.0	22.7
1.3	Nitrogen (Nt)	%	22.0	28.0	20.55	9.15
1.4	Phosphorus (P_2O_5)	%	-	-	9.75	16.50
1.5	Potash (K_2O)	%	0.255	0.197	0.226	0.307
2.	**Properties**					
2.1	Cation exchange capacity	me/100 g	48.0	35.8	41.0	55.7
2.2	pH in aqueous suspension	-	4.50	4.80	6.20	6.40
2.3	Apparent density	g/cm3	0.738	0.707	0.720	0.813
2.5	Grain size (1-5 mm)	%	82.0	86.0	79.3	88.6

Tabelul 2.2

Composition and characteristics of new organomineral fertilizers granulated in successive layers with potassium humate, which is pending approval and will be manufactured in the SNLO Tg. Jiu upgraded installation

No.	Specification	UM	L-200 HK	L-300 HK	Super H-210 HK	Super H-120 HK
1	**Composition**					
1.1	Lignite	%	27.0	15.2	20.2	34.2
1.2	Humic acids	%	29.9	24.3	28.5	26.4
1.3	Nitrogen (Nt)	%	23.49	29.21	21.97	10.47
1.4	Phosphorus (P_2O_5)	%	-	-	9.75	16.50
1.5	Potash (K_2O)	%	2.80	2.80	2.80	2.80
2	**Properties**					
2.1	Cation exchange capacity	me/100 g	96.3	75.2	70.3	83.9
2.2	pH in aqueous suspension	-	4.70	4.90	6.25	6.38
2.3	Apparent density	g/cm^3	0.823	0.782	0.801	0.852
2.4	Grain size (1-5 mm)	%	89.9	92.3	88.9	93.5

High quality of granular fertilizer in successive layers of potassium humate due positive effects of this product contained in the granules of fertilizer.

For granulation used potassium humat solution containing 60 g/l dry substances ≤ 80% humic acids.

Qualitative features of potassium humate were determined with a special device purchased by ICPA using a standard solution on humic acids provided by International Society of Humic Substances (IHSS) in the U.S.A.

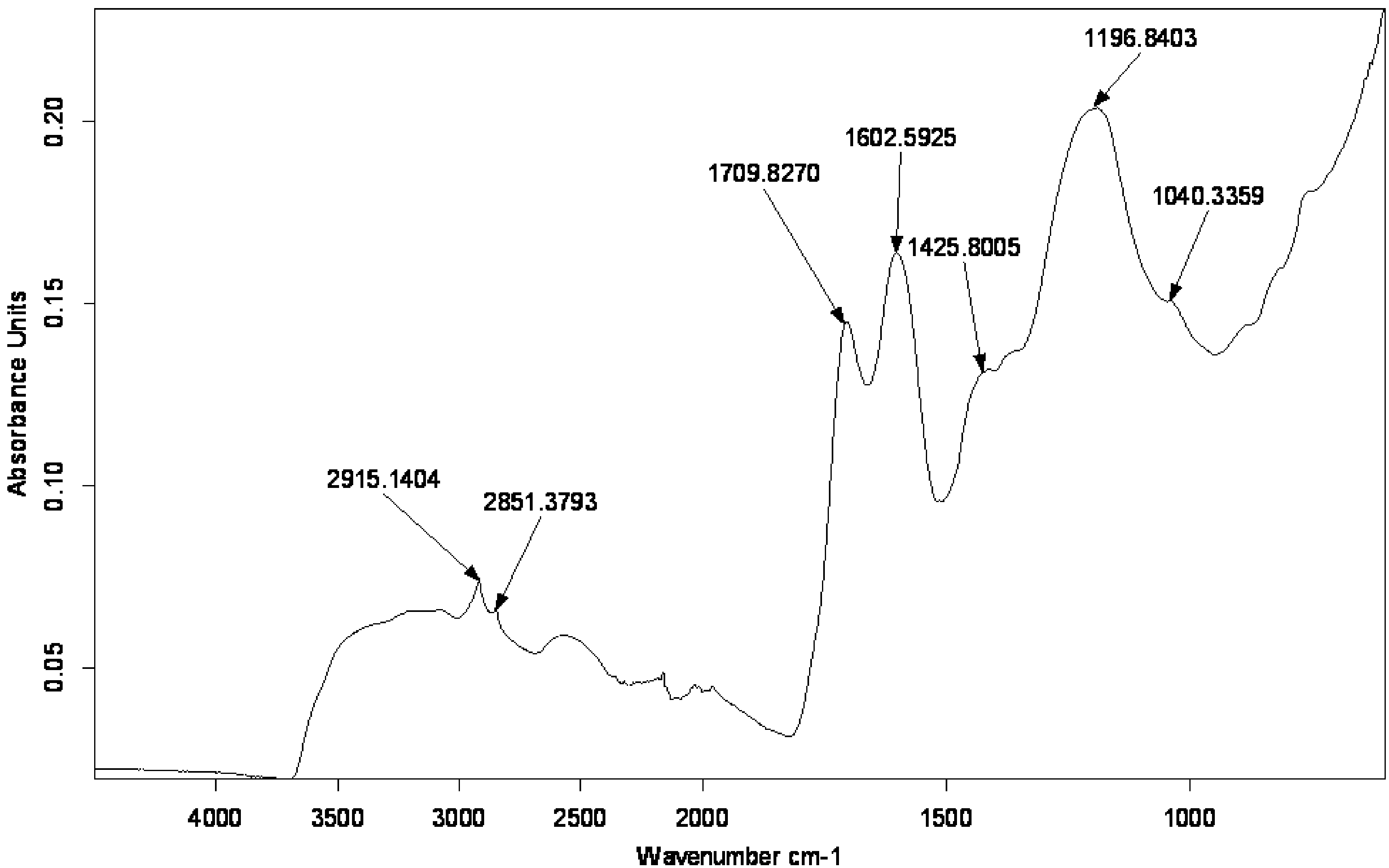
The results are presented in Table 3 and in graphs Fig. 3.1 and 3.2.

Spectral characterization of the samples was done with the FTIR Vertex 70 machine. equipped with DATR (with diamond). in the spectral range 4000 – 600 cm^{-1}. with a resolution of 4 cm^{-1}.
Spectra were corrected for water vapor and CO_2.
Results obtained from spectrophotometric determination of humic acids (unstandardized method):

FTIR characterization of humic acids from sample P1

Wave number. cm-1	**Assignment**	**Characterisation**	**Standard***	**P1**
2920	antisymmetric CH2	-	2915.1	2938.5
2850	symmetric CH2	-	2851.4	2851.4
1720-1707	C=O stretch of COOH or COOR	Free organic acids. Carboxylic acids. aromatic esters	1709.8	1704.0
1650-1600	Aromatic C=C stretching and/or asymmetric C-O stretch in COO-	aromatic or aliphatic carboxylates	1602.6	1602.6
1426	Symmetric C-O stretch from COO- or stretch and OH deformation (COOH)	Carboxylate/Carboxylic structures (humic acids)	1425.8	1414.2
1265 (approximately)	C-O stretching of phenolic OH and/or arylmethylethers	Indicative of lignin backbone	1196.8	1222.9
1080-1030	Combination of C-O stretching and O-H deformation	Polysaccharides. alcohols and carbohydrates	1040.3	1031.6

* standard provided by the International Humic Substance Society – IHSS SUA
** P_{1} - potassium humate;



C:\INCERCARI_PROBE_FTIR_aparat_COmparatii\23.03.2010\AH etalon SUA.0	Acid humic etalon IS 1404 H5	Acid humic etalon SUA	23/03/2010

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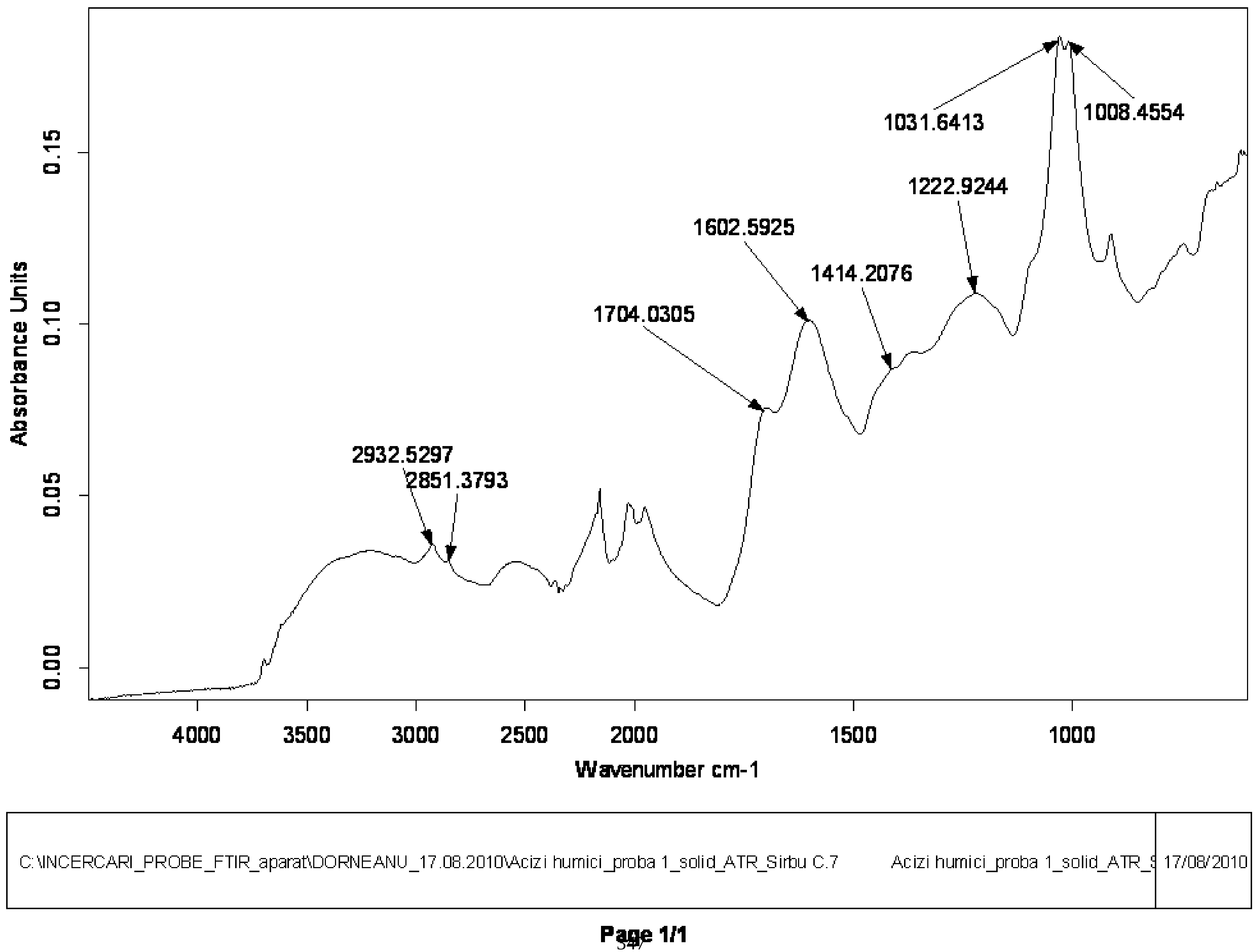
Absorbance Units
0.00
0.05
0.10
0.15
Wavenumber cm-1
4000
3500
3000
2500
2000
1500
1000
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2851.3793
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1602.5925
1414.2076
1222.9244
1031.6413
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Spectral characterization potassium humate sample have equal to or less differentiated values from the standard. Obtained characteristics demonstrate that extracts of humic acids from lignite constitute an important source of production of humic fertilizer types.

RESULTS AND DISCUSSION

Organomineral fertilizers on lignite support granulated successively with urea solution which was also the objective of constitute the pilot installation in Targu Jiu in program Relansin, have been tested a great number of years on different soil types achieving effective results (and Dorneanu et al. 2008).

To highlight the effectiveness and efficiency shown in Table 4 the results of irrigated maize on psamosol of Development Research Centre for Plant Culture on Sands, Dăbuleni – Dolj, considering the sandy soil type of soil is conventionally considered most suitable for testing the effects of fertilization with different types of fertilizers.

Table 3.1

Yield increases obtained with organomineral fertilizer granulated with urea solution applied to maize HF-420 grown on psamosol (sandy soil) irrigated on Development Research Centre for Plant Culture on Sands, Dăbuleni-Dolj

Dose of fertilization: N-200; P_2O_5 -100; K_2O-100 kg/ha

No.	Variants	Average production of grains (on 5 years)	Yield increases			
		kg/ha	kg/ha	% to		kg grains/ kg fertilizer (N-P_2O_5-K_2O)
				M_1	M_2	
1	Unfertilized (M1)	2808	-	100.0	-	-
2	Urea.TSP*. Potash salt (M2)	5290	2482	188.4	100.0	6.2
3	L-200. TSP* Potash salt	6210	3402	221.1	117.4	8.5
4	L-300.TSP* Potash salt	6136	3328	218.5	115.9	8.32
5	SH-210 Potash salt	6353	3545	226.2	120.0	8.86
6	SH-120. Urea Potash salt	6359	3587	227.7	120.8	8.96
	DL 5%		620			
	1%		900			
	0.1%		1180			

Table 3.2. presents the results of effectiveness testing the H-200 HK and SH-120 HK fertilizers compared with L-200 and SH-120 fertilizers applied to maize grown on luvisol albic (podzolic). Modest doses were applied to highlight the minimum effects of these fertilizer between 500 kg physical product / ha and 191-280 kg active substance in which items were included both NPK and humic acids.

Yield increases from unfertilized variant were higher by 23.0 to 71.1% for distinguishing significant for the granular fertilizer with potassium humate. Analytical data from preliminary tests shows a significant efficacy.

Table 3.2

The effectiveness of L-200 and SH-120 organomineral fertilizers applied comparatively with L-200HK and SH-120HK on maize on luvisol albic (podzolic) in Development and Research Horticultural Station Tg Jiu - Gorj

No.	Types of fertilizers	Quantity applied			**Average production of grains (on 2 years)** kg/ha	Yield increases		
		physical product kg/ha	Active substances %/100 kg	Total on 500 kg physical product kg/ha		kg/ha	%	kg/kg s.a.
1	Martor nefertilizat	-	-	-	2600	-	100.0	-
2	L-200	500	22.0+0+0.25+16.0=38.2	191.0	3200	600	123.0	3.14
3	L-200HK	500	23.5+0+2.8+29.9=56.2	281.0	3700	1100	142.3	3.92
4	SH-120	500	9.2+16.5+0.3+22.7=48.6	243.0	4280	1680	164.6	6.91
5	SH-120HK	500	10.5+16.5+2.8+26.4=56.2	281.0	4450	1850	171.1	6.60
DL	5%					370		
	1%					518		
	0.1%					703		

The effectiveness of organomineral fertilizers on lignite support is due to their special properties of humic acids of inferior coal: huminic acid and fulvic acid with similar properties to those in soils.

By their characteristics, organomineral fertilizer have effects of enhanced plant nutrition, of improvement of soil fertility properties and prevent a significant degree of pollution of soil by fertilization.

Because potting humic compounds and salts with nutrient in organomineral matrix which increases the adsorption and cation exchange capacity of the soil, these fertilizers are the main feature high mobility of the elements that contain them, either through solubility, either through constant change in ion form on elements of humațes with other ions in soil solution and by partial mineralization.

Because of carboxyl functional groups (-COOH), phenolic hydroxyl (-OH), carbonyl (> C = O) and metoxylilic (-OCH3), humic acids can bind different metal ions in soil solution (B, Fe, Cu, Mo, Zn), giving rise to chelates with important role in plant nutrition and soil fertility status.

In more recent research has found that agents humic chelates act as physiologically active substances, they can enter the plant roots and are transported to the leaves. Between supply soil solution with humic chelating agents and their absorption by plants was identified the existence of a perfect parallelism quantitatively.

Research conducted proving the effectiveness of humic acids and humic chelates in germination and vegetative growth stimulation. It shows a strong increase of the root system.

Humic acids compounds with metal ions (Ca, Mg, Fe, Al) are insoluble in water, formed precipitates - film or micro accumulation on place training. As a result of humic acids from organomineral fertilizers on lignite support, contributes to formation of main binder of colloidal particle of agglutination of clay minerals, fine dust and sand.

Thus, by the participation of the humic acids in the formation and cementing of the micro aggregates and macro aggregates, hard coal organomineral fertilizers contribute greatly to the development of the soil structure. This correlates with the increase of porosity in a favorable ratio between the non capillary space available for rainfall or irrigation water infiltration and capillary space which holds large amounts of resisting water - equivalent to 3-5 times the total weight of organic matter (humus).

Humic acids have a high chemical stability, they are mineralized slowly in a long time due to clay-humic complexing which increases the resistance of the humic substances to decomposition by microorganisms. As a result, through repeated fertilization, each year, their partly accumulate in the soil.

By their characteristics, the humic acids enhance the plant nutrition, improve the soil fertility characteristics and prevent the soil pollution.

CONCLUSIONS

1. On the basis of presented data, it may be estimated that the organo-mineral fertilizers on lignite support, due to their content in humates. have a series of specific properties that impart them higher fertilization qualities as compared to the classical chemical fertilizers;

2. Incorporation into organo-mineral matrix with humates ensures the assimilation of nutrients at a higher proportion than by applying chemical fertilizers. and the soil chemical pollution degree is significantly reduced;

3. Use of fertilizers on lignite support presents the advantages that they can economic efficient use, under higher conditions a significant part of the more than 4 miliard tones of coals with humic acids existent in Romania and they can ensure a humic fertilization of an important land area of the more than 7 million ha of humus deficient soils.

4. An essential economic advantage of production of organo-mineral fertilizers on lignite support is represented by the lower energy consumption and production costs, having in view the contribution of active ingredient in coal which are less than costs of the chemical fertilizers with 22-25%.

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REZULTATE PRIVIND TOLERANŢA LA AGENŢII DE DĂUNARE A UNOR HIBRIZI DE PORUMB EXPERIMENTAŢI ÎN CONDIŢIILE SOLURILOR NISIPOASE

RESULTS ON THE TOLERANCE OF AGENTS PEST UNDER MAIZE HYBRIDS EXPERIMENTAL IN SANDY SOILS CONDITIONS

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CCDCPN Dabuleni

Cuvinte cheie: patogen, atac, frecvenţă, fiziologie, productivitate
Keywords: disease, attack frequency, physiology, productivity

REZUMAT

Protecţia plantelor este una din activităţile agricole care prezintă un risc important pentru menţinerea terenului în bune condiţii pentru agricultură şi mediu. Riscul major derivă în primul rând din utilizarea pesticidelor. Din acest motiv, legislaţia europeană în domeniul agriculturii are, printre alte scopuri, şi pe acela de limitare a folosirii produselor chimice de protecţia plantelor (pesticide) şi de încurajare a dezvoltării şi utilizării de produse şi metode cu acţiune predominant ecologică pentru atingerea obiectivelor *agriculturii durabile.* Utilizarea de hibrizi şi soiuri de plante rezistente constituie o metodă ideală şi pe deplin ecologică, creându-se o barieră naturală în faţa agresiunii patogenilor şi dăunătorilor, fără consecinţe negative asupra mediului ambiant. În acest sens, cercetările efectuate în perioada 2007-2010 au avut ca scop comportarea unor hibrizi de porumb la atacul unor agenţi de dăunare identificaţi la această cultură în condiţiile solurilor nisipoase. Rezultatele obţinute evidentiază un grad de atac de 1,5-21%, produs de *Fusarium moniliforme,* un grad de atac produs de *Fusarium graminearum* de 0-12% şi un grad de atac de 0-27% produs de *Ustilago maydis.* S-a semnalat o frecvenţă a atacului produs de *Rhopalosiphum maydis* cuprinsă între 4,8-17,3% şi o frecvenţă a atacului produs de *Ostrinia nubilalis* de 9-60,5%. În funcţie de lungimea cavităţilor produse de dăunător pe tulpină şi ştiulete, 50-80% din numărul total de hibrizi de porumb studiaţi anual s-au remarcat ca toleranţi la atacul produs de *Ostrinia nubilalis.* Producţia de boabe înregistrată la 5 hibrizi (Olt, Olimpius, Danubius, Milcov si DK 5143), care s-au dovedit a fi cei mai rezistenţi la atacul agenţilor de dăunare, a fost cuprinsă între 7589-8434 kg/ha.

ABSTRACT

Plant protection is one of the agricultural activities which pose a significant risk to maintain land in good agricultural and environmental conditions. The major risk derives mainly from the use of pesticides. For this reason, EU legislation in the field of agriculture has, among other purposes, and that limiting the use of plant protection chemicals (pesticides) and to encourage the development and use of products and acting predominantly organic methods for achieving the objectives of sustainable agriculture . Use of resistant hybrids and varieties of plants is an ideal method and fully organic, creating a natural barrier to the aggression of pathogens and pests, without negative consequences on the environment. In this regard, research conducted during 2007-2010 were aimed at the behavior of maize hybrids to the attack to identify the pest of this crop in sandy soil conditions. The results reveal a degree of attack from 1.5 to 21%, produced *by Fusarium moniliforme*, a degree of attack of *Fusarium graminearum* by 0-12% and 0-27% degree of attack produced by Ustilago maydis. There were reports of frequency of attack of *Rhopalosiphum maydis* from 4.8 to 17.3% and a frequency of attack of 9 to 60.5% of

Ostrinia nubilalis. Depending on the length of the cavities produced the pest by cob and strain, 50-80% of the total annual studied maize hybrids were tolerant noted that the attack of *Ostrinia nubilalis*. Grain yield recorded at five hybrids (Olt, Olimpius, Danubius, Milcov, DK 5143), which proved to be most resistant to pest attack, ranged from 7589-8434 kg / ha.

INTRODUCTION

In order to protect the environment, many researches are targeted today more by the selection and use of plant genotypes resistant to a wide range of pests (Baicu and Săvescu, 1986, Copândean Ana, Cabulea I. 2004). Although of particular importance in plant protection, often characteristic of varieties resistant to pests has been overlooked, the implementation status of crop protection focusing primarily on preventive measures and, especially, on the curative control. After dynamic equilibrium in an ecosystem / agrosistem is based on the complementarity of genes bodies located in different ecological zones, (Gander Aurel, Buzatu Constantin Butnaru, Gallia, 2008). Effects of climate change have a significant impact on agriculture, droughts became more frequent, with negative effects on agroecosystems, especially highlighted the uneven distribution of populations of harmful organisms. Also to achieve an efficient system of agriculture in the south of Romania and to promote sustainable agriculture, plant genotypes have found those who adapt more easily thermo-hydric stress conditions existing in different ecological zones in the South. In this context to the CCDCPN Dabuleni have initiated research on the identification of the pest in maize in order to develop integrated control systems with minimal environmental impact.

MATERIAL AND METHOD

The research was conducted in CCDCPN Dabuleni in 2007-2010, the Sectoral Programme 241 "Development of integrated control systems with minimal environmental impact” in partnership with ICDPP Bucharest and INCDCSZ Brasov. The experiments were located on a small fertiltate psamosol with, characterized by a humus content of 0.38% to 0.65%, and a pH_{H2O} = 6.7 to 7.3, under irrigation and aimed to identify agents damaging and then verify the functionality of integrated control systems with minimal environmental impact on maize on sandy soils located in southern Oltenia. Observations were made on maize hybrids in the study of comparative culture of competition in 2007-2010. Were tested 15 maize hybrids in 2007, 10 maize hybrids in 2008, 20 maize hybrids in 2009, and 5 maize hybrids in 2010, the experiences of being located by randomized block method. We determined the degree of attack of pathogens, frequency and intensity, appreciating each hybrid behavior after the scale Ga (%), proposed by Ionescu C. et al. 1989: 0 = FR (very resistat), 1-10 = R (resistant), 11-25 = MR (medium resistant), 26-50 = S (sensitive), 51-100 = FS (very sensitive). It was established tolerance of maize hybrids produced by *Ostrinia nubilalis* attack after the relationship proposed by Barbulescu Al.. and Cosmin O., 1997: cavity length ≤ 50% (average cavity - minimum cavity). Physiological determinations were made during the formation of maize grain using the apparatus LCpro + Portable Photosynthesis System. The results were calculated and interpreted in terms of statistical and mathematical functions using analysis of variance.

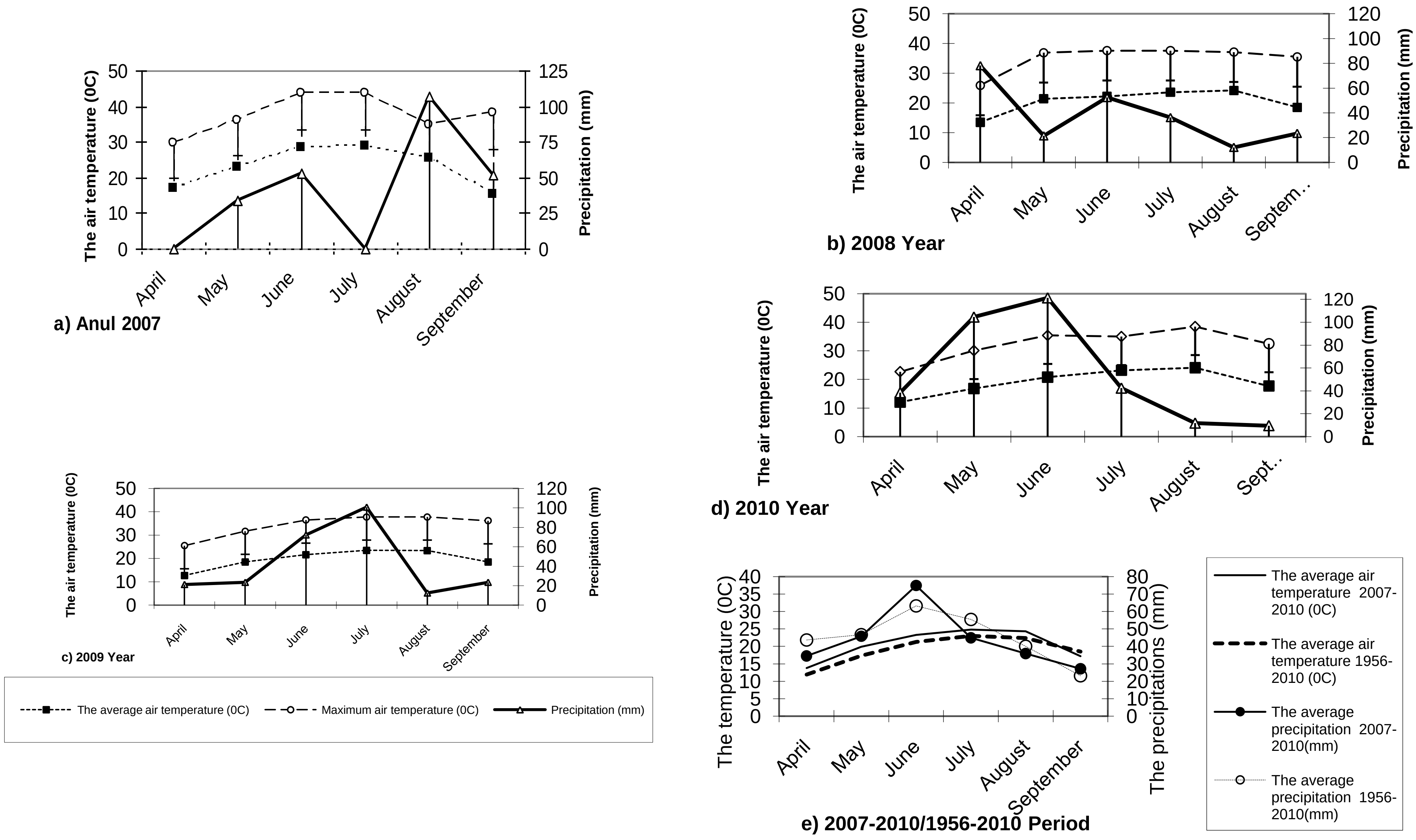

Fig. 1(a,b,c,d,e) Air temperature and precipitation recorded at weather station has CCDCPN Dabuleni

RESULTS AND DISCUSSIONS

Analysis multi-year and study years of climatic factors play a role in plant growth and development, such as temperature and precipitation (Fig. 1), highlighted the uneven nature of their distribution and intensity. Warmer temperatures in air, maximum 38 to 43.50 ^{0}C, associated with lack of rain in July corresponding phases bellows - panicle - flourished on maize, decreasing the amount of pollen and fertilization capacity of pollen, which led to achieve the lowest production in 2007. The analysis of climatic conditions during July and August, the period coinciding with the development of training and maturation phenophase grain is found that they were deficient in all study years. Compared to the 1956-2010 annual average, starting with July and August in the 2007-2010 study period were recorded average air temperatures from 1.8 to 1.90 ^{0}C higher and lower amounts of precipitation with 4,1 - 10.6 mm, which leads us to find these genotypes of plants are more resistant to environmental conditions.

Observations made from cobs reported symptoms of infection with *Fusarium moniliforme* in all years, maximum value of the degree of attack of 21% recorded in 2007 and 1.5% in 2010 (Fig. 2). The attack showed the grain, they breaking maturity during the pink coloring, which is then covered with a white mycelium that contains the fungus conidia. *Fusarium graminearum* infection occurred in the months from July to August causing disease in some maize hybrids as the stems and cobs rot. The infection was located to silk emergence on internodes and roots that have rotted, bone is broken. Also whole cobs attacked plants were covered with a white mycelium with shades of pink and have entered a process of decay. Determinations regarding the degree of attack produced by *Fusarium graminearum* differentiated values show the degree of attack (Ga=0-12%), depending on the year and hybrid (Fig. 3). Observations on *Ustilago maydis* infection (common pitch maize) have reported their presence since August, in the form of tumors that have appeared on all aerial organs of the plant (Fig. 4). They had different shapes and sizes containing a powdery mass of spores. The literature indicates that the most damaging attack on the cobs and stalks. Infections occur on plant parts growth and in meristems plant, and the rain and wind greatly influences the spread of spores. The maize hybrids experienced in the period 2007-2010, the degree of attack produced by Ustilago maydis ranged from 0-27%.

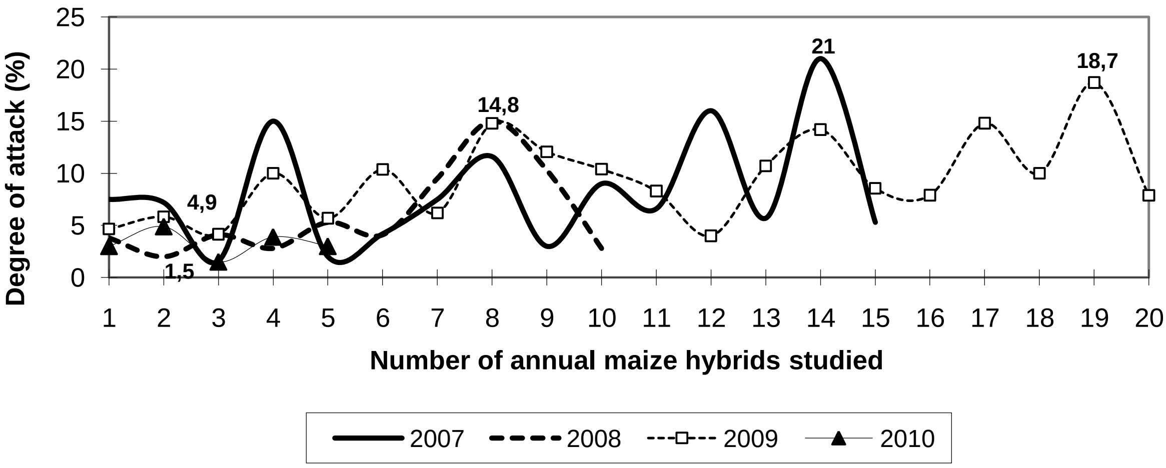

Fig. 2 The degree of attack produced by *Fusarium moniliforme* on maize hybrids experience on sandy soils

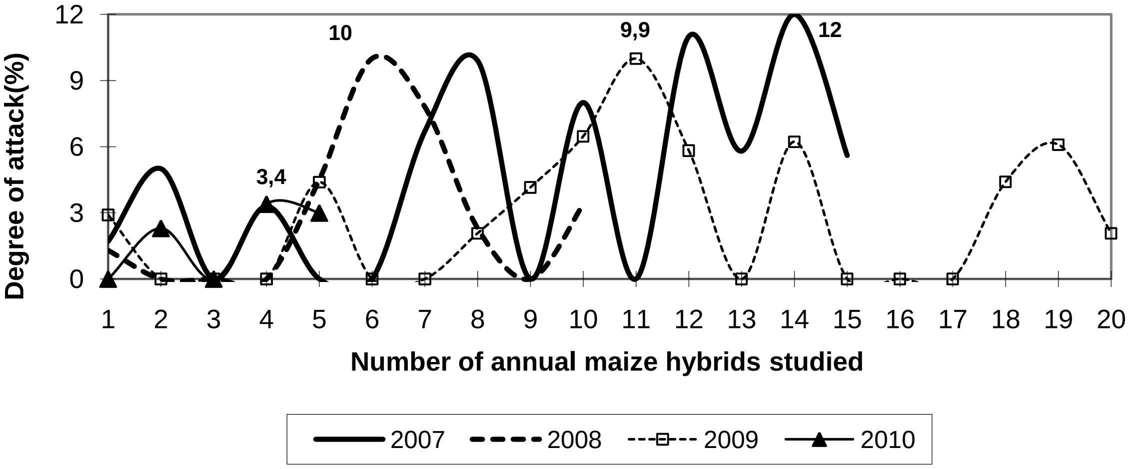

Fig. 3 The degree of attack produced by *Fusarium graminearum* on maize hybrids experience on sandy soils

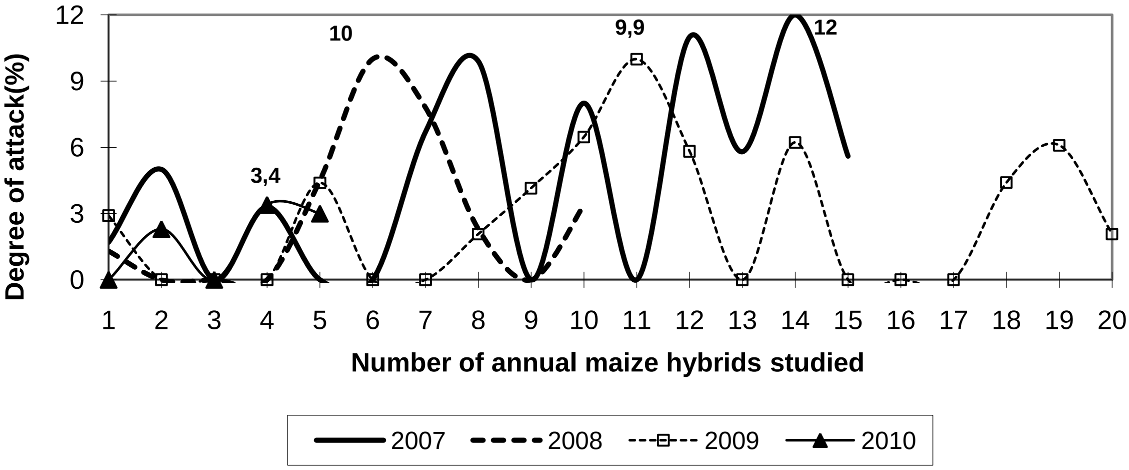

Fig. 4.The degree of attack produced by *Ustilago maydis* on maize hybrids experience on sandy soils

Results on the frequency produced by *Ostrinia nubilalis* attack on the cob and maize stalk (Fig. 5), highlights range from 18.3% to 36.9% in 2007, values of 35.1% to 60.5% in year 2008, values from 9.6% to 32.6% in 2009 and range from 11.7% to 18.3% in 2010. Analyzing the tolerance of maize hybrids to attack produced by *Ostrinia nubilalis*, depending on the size of the galleries average and minimum harmful products, it appears that a percentage of 50-80% were tolerant (Fig. 6). There is a positive correlation between the frequency and tolerance hybrid attack. Between 2008 and 2010 vegetation period of maize, in grain formation stage was recorded on leaves, stem and cob attack product by leaves lice product (Rhopalosiphum maidis), whose frequency ranged from 4.8 - 12.5% in 2008 and 9.3% to 17.3% in 2010 (Fig. 7).

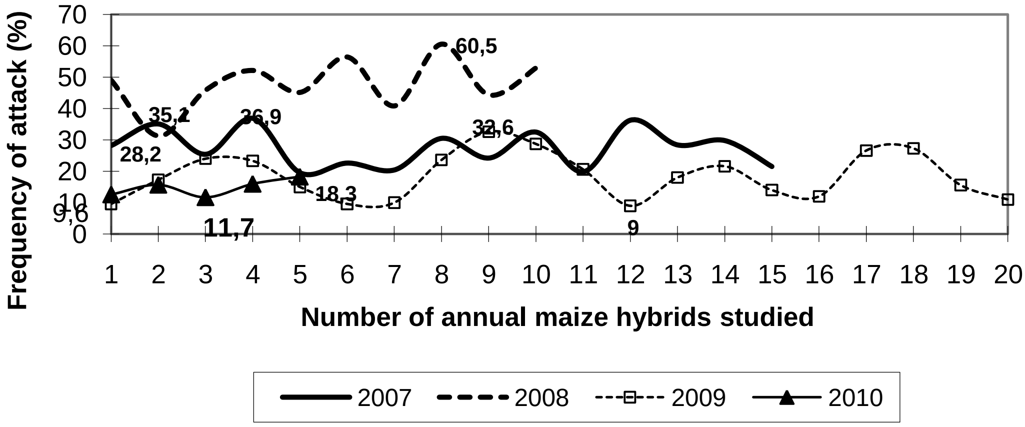

Fig. 5. Frequency of attack produced by *Ostrinia nubilalis* on maize hybrids experience on sandy soils

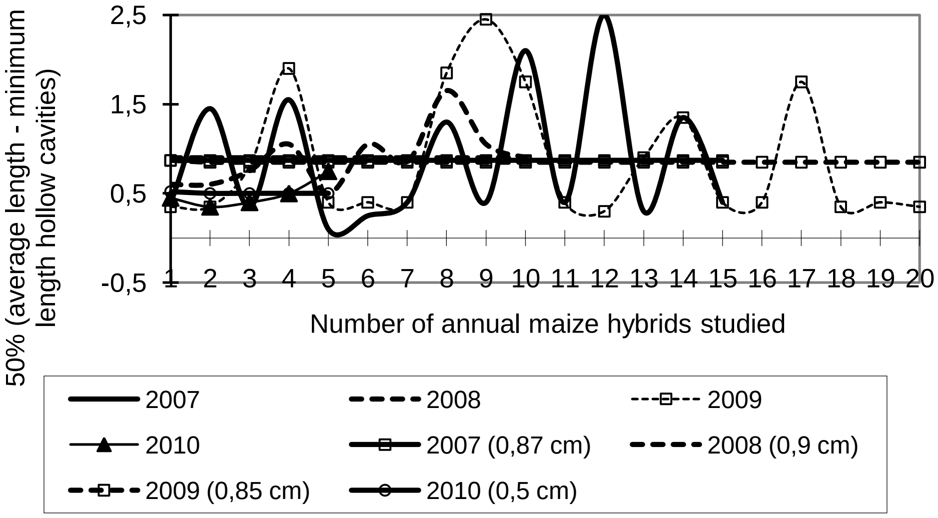

Fig.6. Tolerance of maize hybrids experience on sandy soils to the attack of *Ostrinia nubilalis*

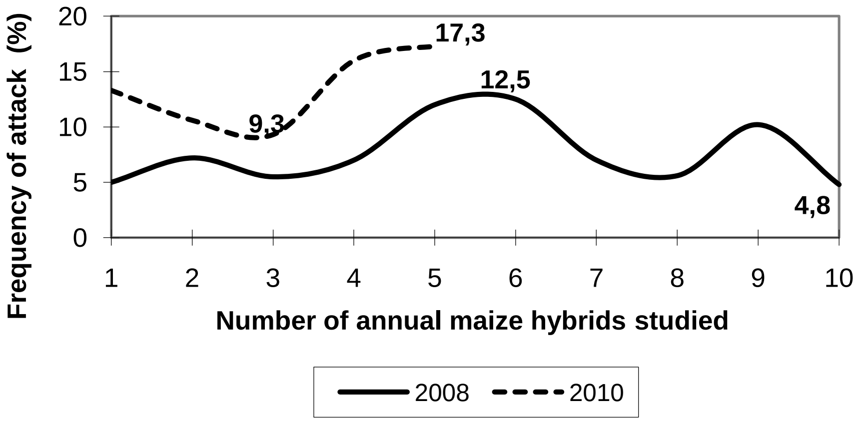

Fig. 7. Frequency of attack produced by *Rhopalosiphum maydis* on maize hybrids experience on sandy soils

Some maize hybrids experienced during 2007-2010 were the best behaved, in terms of tolerance to the damaging agents Olimpius and Olt hybrids (Fig. 8). The results obtained from these hybrids show a degree of attack produced by *Fusarium moniliforme* between 2.4% to 3.8%, a degree of attack produced by *Fusarium graminearum* between 1.45% to 1.9%, a degree of product review *Ustilago maydis* range from 0 to 1.9% and a frequency of attack of *Ostrinia nubilalis* with values in the range 11.1% to 15.4%.

Analyzing the evolution of diurnal photosynthesis and perspiration processes maize hybrids are in the grain formation stage (Table 1) there is a maximum absorption of CO_2 in the plant at 15 hour to hybrid Olt (36.21 μmol CO_2 $m^{-2}s^{-1}$) with a loss of large amounts of water (5.02 mmol H_2O $m^{-2}s^{-1}$). Functional relationship between the degree of pathogen attack (average attack of *Fusarium moniliforme*, *Fusarium graminearum, Ustilago maydis*) and the process of photosynthesis (daytime average) of the plant is given by a polynomial function of degree 2, and stresses a negative correlation (Fig. 9). It notes the reduction process of photosynthesis with increasing attack by pathogens.

Production results recorded at harvest highlights the most productive hybrid Olt (8434 kg/ha), with the lowest standard deviation (σ = 403.1 kg) compared to the yields achieved in the years of experimentation, followed by the Olimpius hybrid with 7964 kg/ha and a standard deviation of 366.8 kg. Analyzing the relationship between the degree of attack by pathogens and grain yield achieved there is a very significant negative correlation (Fig. 10).

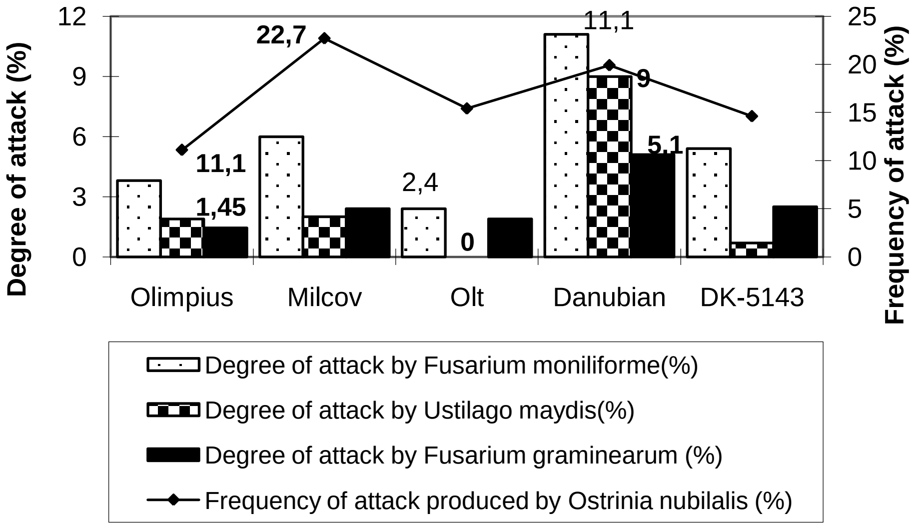

Fig. 8 The behavior maize hybrids to study of the pest attack

Table 1

Diurnal evolution of physiological processe recorded in the training phase grain maize hybrids experience on sandy soils in terms of 2010

No.	Hybrid	Photosynthesis (μmol CO_2 $m^{-2}s^{-1}$)			Perspiration (mmol H_2O $m^{-2}s^{-1}$)		
		hour 9	hour 12	hour 15	hour 9	hour 12	hour 15
1	Olimpius	13,54	17,37	12,55	1,41	2,48	1,48
2	Milcov	15,32	32,05	15,72	1,33	3,04	1,36
3	Olt	22,29	29,85	36,21	2,03	4,28	5,02
4	Danubian	23,95	14,98	10,13	2,36	1,38	1,72
5	DK-5143	21,49	17,35	22,64	1,31	1,85	5,82
Air temperature ^{0}C		27,7-28	31,5-37	35,7-39	27,7-28	31,5-37	35,7-39

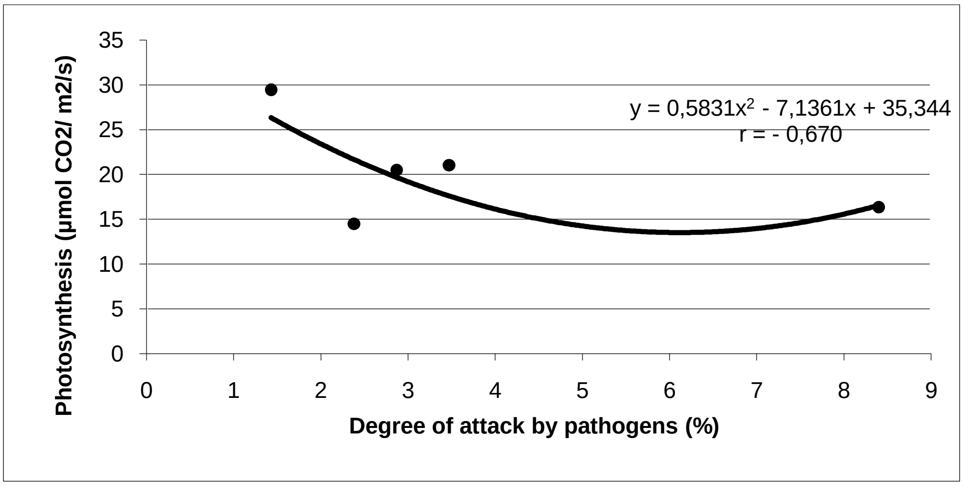

Fig. 9 The correlation between the degree of attack produced by infection with pathogens and the process of photosynthesis

Table 2

Production results recorded in some maize hybrids grown on sandy soils

No.	Hybrid	Photosynthesis (µmol CO2/ m2/s)	Grain yield				Significance
			Standard deviation (σ)	kg/ha	%	± kg/ha from control	
1	Olimpius	14,48	366,8	7964	101	101	-
2	Milcov	21,03	1515,1	7632	97	-231	-
3	Olt	29,45	403,1	8434	107	569	-
4	Danubian	16,35	1029,5	7696	98	-167	-
5	DK-5143	20.49	1687,1	7589	96	-274	-
Average yield hybrids				7863	100	Mt.	

DL 5% = 857 kg/ha
DL 1% = 1209 kg/ha
DL 0,1% =1678 kg/ha

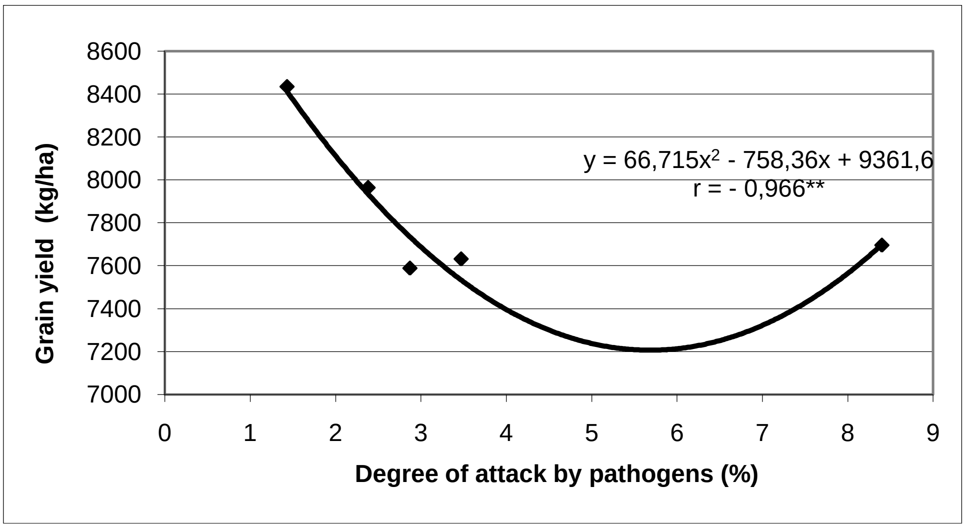

Fig. 10 The correlation between the degree of attack produced by infection with pathogens and grain yield

CONCLUSIONS

1. The hybrids of maize on sandy soils experienced during 2007-2010 was reported a degree of attack from 1.5 to 21%, produced by *Fusarium moniliforme*, a degree of attack of *Fusarium graminearum* by 0-12% and a degree of attack 0-27% of product *Ustilago maydis*.

2. Among the pests, the maize crop *Rhopalosiphum maydis* were identified with a frequency of attacks between 4.8% to 17.3% and *Ostrinia nubilalis* attack with a frequency of 9% to 60.5%, which approx. 50-80% of hybrids were tolerant.

3. Some maize hybrids experienced during 2007-2010 were the best behaved, in terms of tolerance to the damaging agents, hybrids Olt and Olimpius.

4. Production results recorded at harvest underlines the high productivity of hybrid maize Olt (8434 kg / ha), with the lowest standard deviation (σ = 403.1 kg) compared to the yields achieved in the years of experimentation and hybrid Olimpius with 7964 kg/ha and a standard deviation of 366.8 kg.

5. The correlation coefficient r = -0.966 shows a very close functional relationship between the degree of attack of pathogens and production of grains made from corn.

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CERCETĂRI PRIVIND INFLUENȚA APLICĂRII TRATAMENTULUI FITOSANITAR LA CULTURA DE FLOAREA SOARELUI AMPLASATĂ ÎN CONDIȚIILE SOLURILOR NISIPOASE

RESEARCH THE INFLUENCE OF TREATMENT PLANT APPLICATION ON SUNFLOWER CULTURE LOCATED IN SANDY SOILS CONDITIONS

RETA DRAGHICI
CCDCPN Dăbuleni

Cuvinte cheie: fungicide, patogeni, grad de atac, productie
Keywords: fungicides, pathogens, degree attack, yield

REZUMAT

Floarea-soarelui, este o plantă agricolă cu sensibilitate ridicată la atacul diferitelor microorganisme patogene (virusuri, micoplasme, bacterii, ciuperci), agenți biotici de dăunare care pot constitui un important factor limitativ al producției şi al posibilităților de extindere a culturii pe anumite arii geografice. Cercetările efectuate în perioada 2008-2010 la cultura de floarea soarelui au vizat prevenirea şi combaterea agenților patogeni, prin testarea unor fungicide sistemice şi de contact, aplicate la hibridul Performer amplasat pe solurile nisipoase, în condiții de irigare. Rezultatele obținute prin aplicarea în faza de 6-8 frunze ale plantei de floarea soarelui a unuia dintre produsele Rovral 500SC – 1l/ha, Shavit F7 1,5WP – 2 kg/ha sau Topsin 500SC – 1,4 l/ha, arată că s-au realizat cele mai bune rezultate privind prevenirea infecției plantei cu *Plasmopara helianthi,* comparativ cu martorul netratat în care s-a înregistrat un grad de atac de 5,9%. Tratamentul în vegetație cu unul din produsele cu Rovral 500SC – 1l/ha sau Shavit F7 1,5WP – 2 kg/ha a determinat şi reducerea gradului de atac produs de infecția cu *Botrythis cinerea* de la 7,25% la 2,05-2,9%*,* reducerea gradului de atac produs de infecția cu *Phoma oleraceae* de la 10,7% la 3,5-5,25% şi reducerea gradului de atac produs de infecția cu *Puccinia helianthi* de la 27,5% la 5-10,9%*.* Producția de semințe realizată prin aplicarea acestor tratamente a fost de 2470-2587 kg/ha, depăşind martorul netratat cu diferențe de producție distinct semnificative de 616-733 kg/ha.

ABSTRACT

Sunflower is an agricultural plant with high sensitivity to attack various pathogens (viruses, mycoplasma, bacteria, fungi), the damaging biotic agents that may be an important limiting factor of production and the possibilities of extending the culture in certain geographical areas. Research conducted in 2008-2010 in sunflower targeted prevention and control of pathogens by testing of systemic and contact fungicides applied in hybrid Performer located on sandy soils, under irrigation. The results obtained with the 6-8 leaf stage of sunflower plant of any product Rovral 500SC - 1l/ha, Shavit F7 WP 1.5 - 2 kg / ha or Topsin 500SC - 1.4 l / ha, showing that have achieved the best results on the prevention of infection with *Plasmopara helianthi* plant, compared to untreated control which saw a 5.9% degree of attack. Treatment of the vegetation with of any product Rovral 500SC – 1l/ha or Shavit F7 1,5WP - 2 kg / ha resulted and the reduction in degree of attack product by *Botrythis cinerea* infection from 7.25% to 2.05 to 2 , 9%, reducing the degree of attack *Phoma Oleraceae* infection from 17,9% to 3.5 to 5.25% and reducing the degree of attack of *Puccinia helianthi* infection from 27.5% to 5-10 , 9%. Seed production achieved by applying these treatments was 2470-2587 kg / ha, exceeding the untreated control with significant differences separate production 616-733 kg / ha.

INTRODUCTION

The spectacular increase in areas planted with sunflower in recent years due to the possibility for growers to establish crops to the market structure, involvement in cultivation of oil plants and grant greater stability of sunflower production, due to greater tolerance its drought. The economic importance of culture is the quality of sunflower oil with high content of oleic acid, less saturated and more resistant to oxidative changes during refining, storage and frying. This is the best oil for food safety. There is now a major concern for non-food uses of vegetable oils, including sunflower, in particular to obtain biofuels, so that the European Commission Directive COM 2003/30/EC (EC 2003) was expected to replace the classical fuel biological rate of 5.75%, to 2010 (Maria Păcureanu-Joita, Vranceanu V., D. Stanciu, 2007). The potential production of hybrids is diminished by the physical and chemical properties of soil less favorable that sunflower spread lately and because of humidity, which does not make in some years the plant requirements, except under conditions irrigation. An important factor in increasing production is the focus of this culture in the most environmentally favorable (Țerbea, M. et al.,1995, Vranceanu, A.V. 2000). Research on improvement have led to the production of sunflower hybrids with resistance to pathogens (Dumitraş Lucretia, Shesan Tatiana, 1998, Păcureanu-Joita, Maria, 1998). Results obtained in plant protection have stressed sunflower plant tolerance to pathogens according to the treatment plant, hybrid technology and Conditions (Iliescu H., et al., 1988).

In this direction the CCDCPN Dabuleni were initiated research on combating pathogens in sunflower seeds to increase production.

MATERIAL AND METHOD

The research was conducted in 2008-2010 at CCDCPN Dabuleni within 241 Sectoral Programme "Development of integrated control systems with minimal environmental impact in partnership with ICDPP Bucharest and INCDCSZ Brasov and targeted control of pathogens in flower crops sun. Experience has been placed on a psamosol with reduced natural fertility, characterized by humus content = 0.37% to 0.56%, Nt = 0.003% to 0.0038%, P = 23 ppm to 31 ppm, K = 18-37 ppm 6.1 to 7.2 ppm and pH_{H2O} = 6,1-7,2, under irrigation. In order to develop the functional model handbags prevention and control of pathogens in sunflower have been tested and verified four plant products, with contact and systemic action, the hybrid Performer. We determined the degree of attack of pathogens, frequency and intensity and the results were calculated and interpreted in terms of statistical and mathematical functions using analysis of variance.

RESULTS AND DISCUSSIONS

The analysis of climatic conditions of the weather station CCDCPN Dăbuleni (Fig. 1) show an evident increase in monthly average temperatures from 0.1 to 1.6^{0}C over the period April to August, compared with annual average, optimal temperatures for growth and development of sunflower plants. The literature shows that in the interval from sunrise until the appearance of inflorescence, the plant grows well at 15-16°C, and during flowering and seed formation is needed moderate temperatures, 18-24 ° C, temperatures that was recorded in the study area. With a maximum water consumption between inflorescence emergence and seed formation, from 12.1 to 59.8 mm rainfall recorded in July and August were insufficient normal course of plant metabolism, requiring application of 3-6 watering with 350 m^3 water / ha.

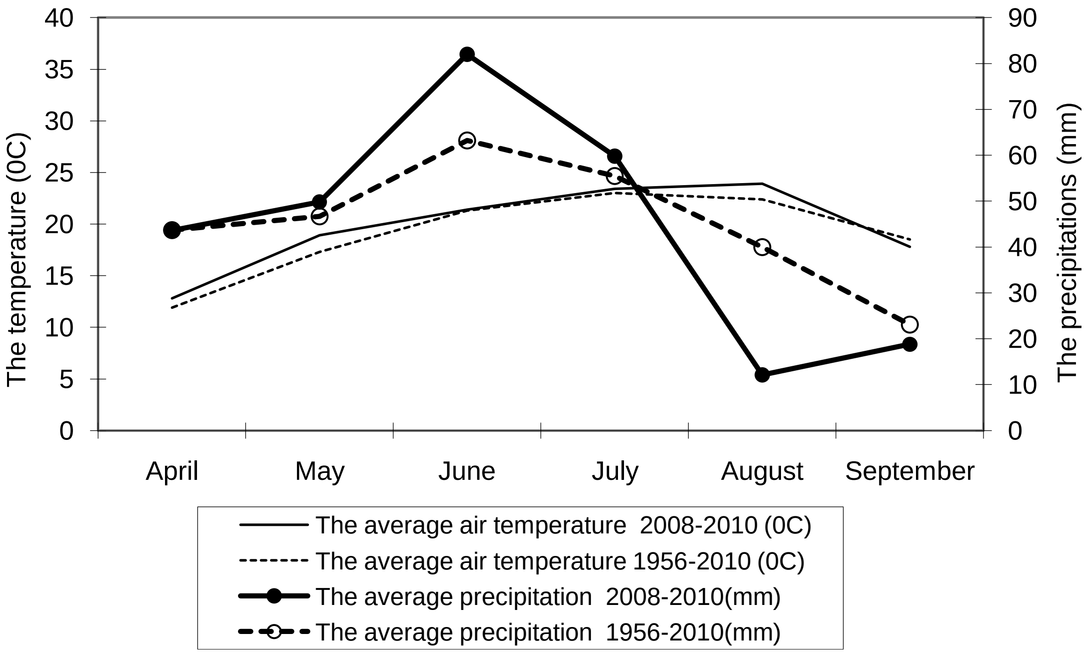

Fig. 1. Air temperature and precipitation recorded at weather station has CCDCPN Dabuleni

The results obtained on the behavior of sunflower plants to attack by pathogens identified in 2008-2010, under the influence of various chemical treatments, highlights the differential results from the untreated control. The best results in preventing infection with *Plasmopara helianthi* were obtained by applying the 6-8 leaf stage of the crop of one of the products Rovral 500SC - 1l/ha, Shavit F7 WP 1.5 - 2 kg / ha and Topsin 500SC - 1.4 l / ha, (Fig. 2).

Applying a treatment with Rovral 500SC - 1l/ha, is very effective action on the infection of sunflower plants *Botrythis cinerea*, (fig. 3). It notes the downward trend in the degree of attack of this pathogen by 5.2% compared to untreated control. The coefficient of determination R^2= 0.7033 emphasizes the influence of 70% the treatment on *Botrythis cinerea* infection.

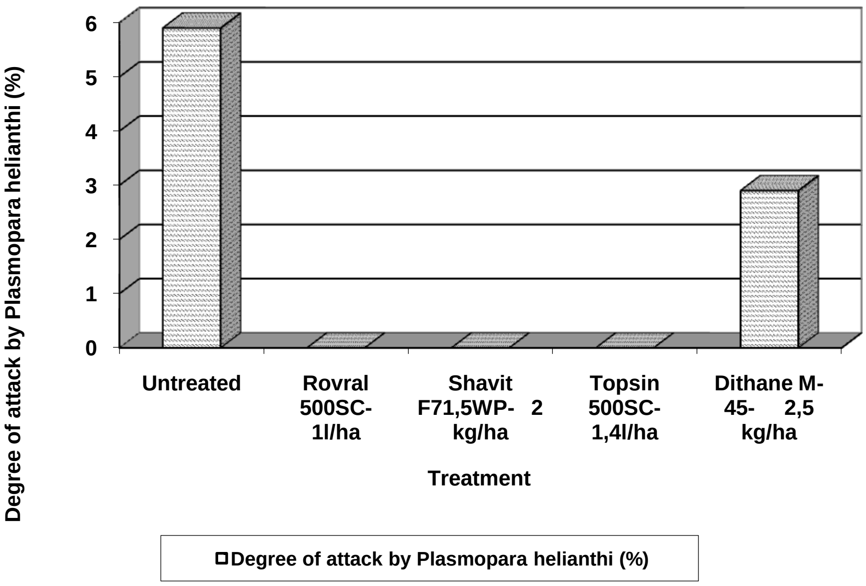

Fig 2 Influence the treatment plant on the degree of attack on sunflower by Plasmopara helianthi

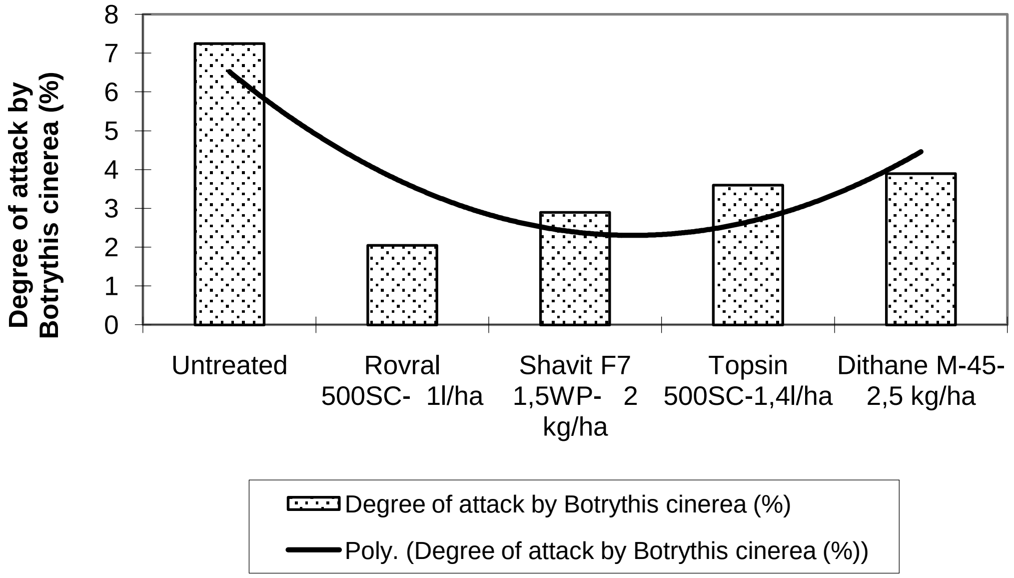

Fig.3. Influence the treatment plant on the degree of attack on sunflower by Botrytis cinerea

Functional relationship between the analyzed factors, namely the treatment plant and the degree of attack of *Puccinia helianthi* and *Phoma oleraceae*, a report shows a correlation of 0.83 - 0.89 and influence of 70-80%, calculated according to mathematical functions (Fig. 4;5). The degree of attack produced by *Phoma oleraceae* ranged between 3.5% to 17.9% and was produced by *Puccinia helianthi* between 5% to 27.5%, with best results emphasizing the application of product Rovral 500SC - 1l/ha. Mode of action of the pathogen 500SC Rovral product is very complex. Generally refers to inhibiting an enzyme complex that blocks many cellular functions. The product has a preventive action, curative and partly eradicativă. Sunflower plants also showed a good attitude in terms of infection pathogens: *Botrythis cinerea, Phoma oleraceae* and *Puccinia helianthi*, and in variants which treatments were performed Shavit F7 WP 1.5 - 2 kg / ha Topsin 500SC - 1.4 l / ha, the degree of attack ranged from 2.9 to 10.9%. The two products are contact and systemic fungicidal action and is absorbed by plants through leaves and roots, having a good preventive and curative effect against a broad spectrum of pathogens. Of the four chemicals tested application of fungicide Dithane M-45 - 2.5 kg / ha, had the weakest effect on the degree of attack by pathogens in sunflower.

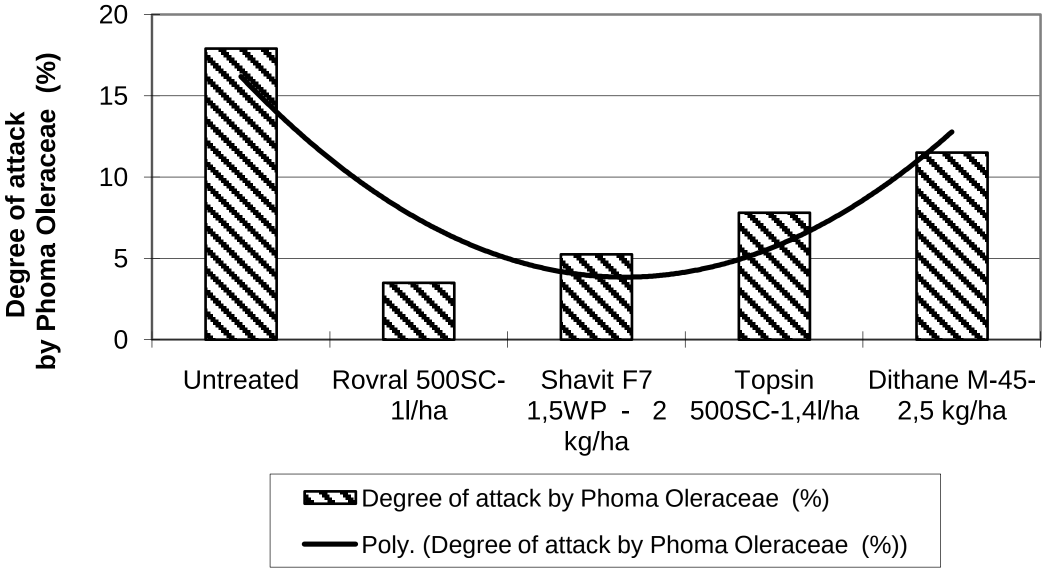

Fig 4 Influence the treatment plant on the degree of attack on sunflower by Phoma oleraceae

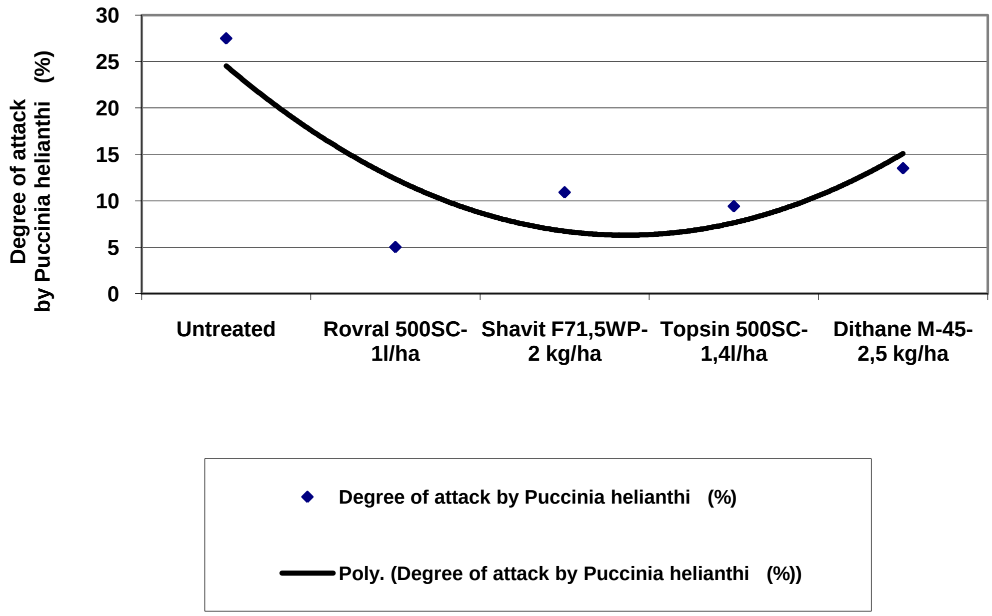

Fig. 5. Influence the treatment plant on the degree of attack on sunflower by Puccinia helianthi

In terms of production results obtained (Fig. 6) compared with untreated control, which was carried 1854 kg/ha, there were significant distinct differences production of 616-733 kg / ha by applying one treatment in growth of products Rovral 500SC, at a dose of 1 l/ha or Shavit F7 1.5 WP , at a dose of 2 kg / ha. The treatment withTopsin 500SC in a dose of 1.4 l / ha, resulted in a significant production differences compared to the same witness. Graphical representation with second-degree polynomial function emphasizes the relationship between production and the treatment applied to the sunflower plant.

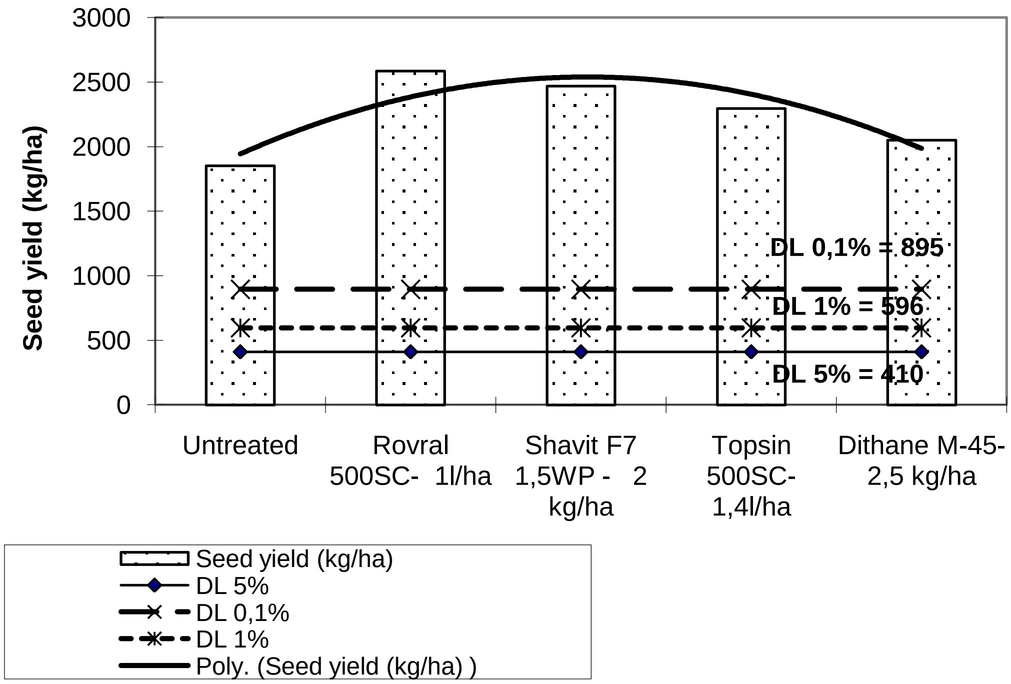

Fig. 6. Influence the treatment plant on the seed yield on sunflower

CONCLUSIONS

1. The best results in preventing infection with *Plasmopara helianthi* were obtained by applying the 6-8 leaf stage of the crop of one of the products Rovral 500SC - 1l/ha, Shavit F7 WP 1.5 - 2 kg / ha and Topsin 500SC -1.4 l/ha.

2. The coefficient of determination R^2= 0.7033 emphasizes 70% the influence of treatment on *Botrythis cinerea* infection, the best results occurring by applying Rovral 500SC-1l/ha.

3. Functional relationship between the analyzed factors, namely the treatment plant and the degree of attack of *Puccinia helianthi* and *Phoma oleraceae*, a report shows a correlation of 0.83 to 0.89 and influence of 70-80%, calculated according to mathematical functions

4. The treatment in the vegetation with of any Rovral 500SC, in doses of 1 l / ha or Shavit F7 1.5 WP, at a dose of 2 kg / ha resulted in record production differences between 616-733 kg / ha, significantly distinct compared to untreated control.

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BONITAREA TERENULUI LA NIVEL DE FERMA UTILIZAND TEHNOLOGIE SIG

LAND EVALUATION AT FARM LEVEL USING GIS TECHNIQUES

SORINA DUMITRU, VICTORIA MOCANU, PETRU IGNAT, ALINA GHERGHINA, ION SECELEANU

Keywords: Geographic Information Systems, land evaluation, farm level.

REZUMAT

Sistemele Informatice Geografice constituie un instrument util în managementul solurilor şi terenurilor. În lucrarea de față, a fost evaluată calitatea solurilor pe suprafața unei ferme, prin evaluarea favorabilității terenurilor la anumite culturi şi a pretabilității lor la diferite folosințe, utilizând metodologia de bonitare a unui teren şi tehnică de tip SIG. Ferma este localizată pe teritoriul administrat de S.C. GRIVCO S.A. (comuna Băneasa, Giurgiu), pe o suprafață de 2387,07 ha, pe trei sectoare situate pe diferite forme de relief. S-a calculat nota de bonitare separat pentru fiecare unitate cartografică de sol (asimilat cu un teritoriu ecologic omogen), pentru o serie de culturi şi folosințe, iar rezultatele au fost ponderate pentru a obține notele de bonitare la nivel de bloc fizic. Este calculată o notă medie ponderată de bonitare atât pe întreaga suprafață, cât şi defalcat pe cele trei sectoare, în regim irigat şi neirigat. La final, pe baza bonitării şi se fac recomandări privind cele mai potrivite lucrări agricole care să permită utilizarea terenurilor respective la capacitate maximă.

ABSTRACT

The Geographic Information Systems constitutes an useful tool in soil and land management. In this paper, land evaluation on a farm level has been done, by assessing land favourability for some crops and their pretability to different land uses, using land evaluation methodology and GIS techniques. The farm is located on the territory managed by S.C. GRIVCO S.A. (Băneasa commune, Giurgiu county), having an area of 2387.07 ha, distributed on three sectors covering different local land forms. The agricultural land evaluation rate has been computed separately, for each soil map unit (homogeneous from ecological point of view), for several crops and land uses, the results being weighted in order to obtain the agricultural land evaluation rates at LPIS unit level. Finally, both a weighted agricultural land evaluation rate for the whole area, and for each sector are computed, in irrigated and nonirrigated conditions. Based on these rates, the most appropriate recommendations for agricultural tillage are done in order to allow the optimal uses of these terrains.

INTRODUCTION

The application is developed for a farm located on the territory managed by S.C. GRIVCO S.A. (Băneasa commune, Giurgiu county), having an area of 2387.07 ha. The studied area is distributed on three sectors covering different local land forms: floodplain, slope and a terrace. The largest area is located on the Danube floodplain, while 656 ha are located on a terrace of Burnas Plain.

The whole farm is situated in the dammed unit Gostinu-Greaca-Argeşel, part of the Danube Plain, where damming and draining works started from 1928 and finished in 1964-

1965. The land has been affected by waterlogging after damming and draining, due to the poor internal drainage of some soils (with medium heavy – heavy texture), due to the infiltration from Danube, from groundwater and from rainfall, as well as due to the failure of drainage network. As a consequence, patchy yields have been obtained. Therefore, some measures for partial redevelopment have been done, leading to a decrease of above limitations (Seceleanu et al., 2010).

The soil survey and sampling have been done for all three different sectors. The soil cover is relatively uniform, due to specific local natural conditions (topographical, climatic, anthropic). Three main classes have been identified: Chernozems, Gleysols and Fluvisols, and 19 soil types, corresponding to simple homogenous ecological territories TEO.

MATERIAL AND METHOD

The soil survey is done according to the Methodology of Pedological Studies Assessment (ICPA, 1987). The soil type and subtype are classified according to the "Romanian System for Soil Taxonomy (SRTS)" (Florea & Munteanu, 2003). In order to describe the soil cover, 13 soil profiles have been sampled and analysed, from the field and from the Greaca dammed unit. Sampling has been done for 3-5 depths (disturbed and undisturbed samples), according to the Methodology of Pedological Studies Assessment (ICPA, 1987).

The land evaluation rates are computed taking into account some ecological factors: landslides, land slope and aspect, annual average precipitations corrected according to land slope, groundwater depth, soil texture for toplayer, gleyization, salinization, useful edaphic volume, total porosity, inundability, soil pollution (according to the Methodology of Pedological Studies Assessment, ICPA, 1987).

The input data used for the assessment of land evaluation are as follows:

- soil map for farm area at the scale 1:10 000;
- physical blocks (LPIS) map for farm area at the scale 1:10 000;
- topographical map for the study area at the scale 1:25 000;
- ortophotoplans;
- soil survey studies.

The soil map has been digitized on-screen, using as background the soil map and topographical map for the farm area. The physical blocks LPIS have been developed using as background the topographical map and local ortophotoplans.

The methodology aimed firstly land evaluation, in order to assess the land favourability to some crops and its pretability to different land uses. Land evaluation has been done based on information from soil survey studies and maps for the farm area. The soil favourability for some crops has been done following the next steps (Dumitru, 2010):

- a centralized database has been developed;
- the soil and physical block maps have been digitized;
- information for soil, climatic and terrain parameters taken into account for land evaluation marks have been picked up from the field;
- the soil profiles from soil mapping studies have been identified for each soil polygon (soil map unit);
- the land evaluation mark has been computed for each soil map unit (considered as homogenous area), using Excel program, each soil polygon being analysed and stored in a specific sheet. The land evaluation marks have been computed for different crops and land uses.
- the land evaluation marks for each soil map unit have been exported in a .txt file, which has been joined to the soil map;

- the soil map and the physical map have been overlapped and the soil components have been assigned for each physical block, as well as their ratio. The output files have been exported as .dbf files;
- land evaluation marks for different crops and land uses have been computed at physical block level by weighting land evaluation marks for soil units using .dbf files;
- the output data has been exported in a .txt file, joined to the physical blocks in order to be graphical represented.

Land evaluation in natural conditions has been assessed based on some synthetic biophysical parameters, converted in indicators for ecological characterization of soil or ecopedological indicators, according to the Methodology of Pedological Studies Assessment (ICPA, 1987), volumes I and III. The land evaluation (or favourability) classes are described in table 1.

Table 1

Classes for crop favourability – land use pretability

Class	Land rating (points)
I	81 – 100
II	61 – 80
III	41 – 60
IV	21 – 40
V	1 – 20

The potential yields for main crops are assessed by multiplying the land evaluation mark and the equivalent yield (expressed in kg) for a point of land evaluation mark (according to the methodological norms of Regulation 26/20.06.1994), as shown in table 2.

Table 2

Potential yields for different crops

Crop	Yield (expressed in kg/point)		Crop	Yield (expressed in kg/point)
wheat	40		sun flower	16
barley	45		sugarbeat	280
maize	52			

RESULTS AND DISCUSSIONS

The soil map, as well as the physical blocks map, have been digitized (fig. 1), highlighting the main soil classes and soil types of the area: Chernozems (vermic chernozems; calcaric chernozems, phreatic wet; gleyic chernozems and gleyic chernozems strongly mudded, for the flood plain sector and cambic chernozems; clayley chernozems and clayley phaeozioms for terrace), Gleysols (gleysols), and Fluvisols (alluviosols).

The land evaluation rates are then computed taking into account the different ecological factors (according to the Methodology of Pedological Studies Assessment, ICPA, 1987) for each soil map unit (table 3).

After computing the land evaluation rating for each soil map unit, output data have been exported in a .txt or .dbf file, and linked (using the *join* command) to the soil map (fig. 2a). By overlapping the soil and physical blocks layers, another layer has been obtained, with smaller polygons described by information from both layers. The percent of each soil type for each physical block is assessed, in order to compute the weighted land evaluation mark for each crop and land use for each physical block (fig. 2b).

The land evaluation mark for each crop and land use have been weighted in order to compute a land evaluation mark for each sector (floodplain, terrace, and slope), as well as a medium mark for the entire farm area.

Table 3

Land evaluation rates for crop favorability – landuse pretability for GRIVCO farm

Landuses / Crops / Soil Unit	Wheat	Barley	Maize	Sunflower	Potato	Sugarbeat	Soya	Pasture	Vegetable	Arable
US1	65	65	72	72	51	65	58	58	72	69
US2	66	66	81	73	47	66	59	65	65	73
US3	65	72	72	72	40	51	58	65	63	68
US4	81	81	81	81	52	73	73	80	72	80
US5	65	65	65	65	41	52	58	64	65	64
US6	65	65	65	65	41	52	58	64	65	64
US7	65	65	65	65	41	52	58	64	65	64
US8	52	52	52	52	34	43	47	64	47	53
US9	35	41	39	39	18	32	31	65	36	34
US10	35	41	39	39	18	32	31	65	36	34
US11	35	41	39	39	18	32	31	65	36	34
US12	35	33	31	31	16	33	28	58	29	30
US13	26	26	44	36	17	30	30	48	29	28
US14	39	39	32	32	23	23	29	58	36	34
US15	39	39	28	32	21	21	29	64	36	33
US16	31	31	28	29	21	21	24	52	33	29
US17	39	39	28	32	21	21	29	64	36	33
US18	39	39	28	32	21	21	29	64	36	33
US19	22	26	22	25	21	18	16	38	28	23

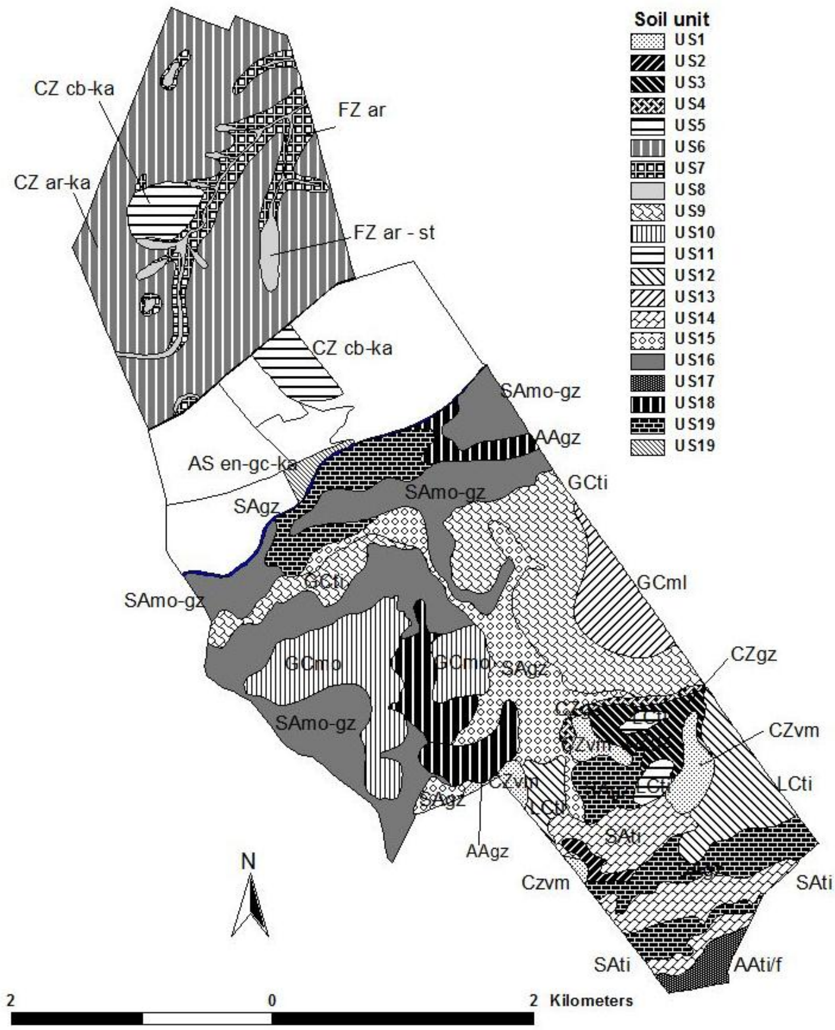

Figure 1. Soil map for Grivco farm.

The average weighted for pretability to arable is 42.00 for the entire farm, 34.02 for floodplain area, 63.20 for terrace, and 54.00 for slope area.

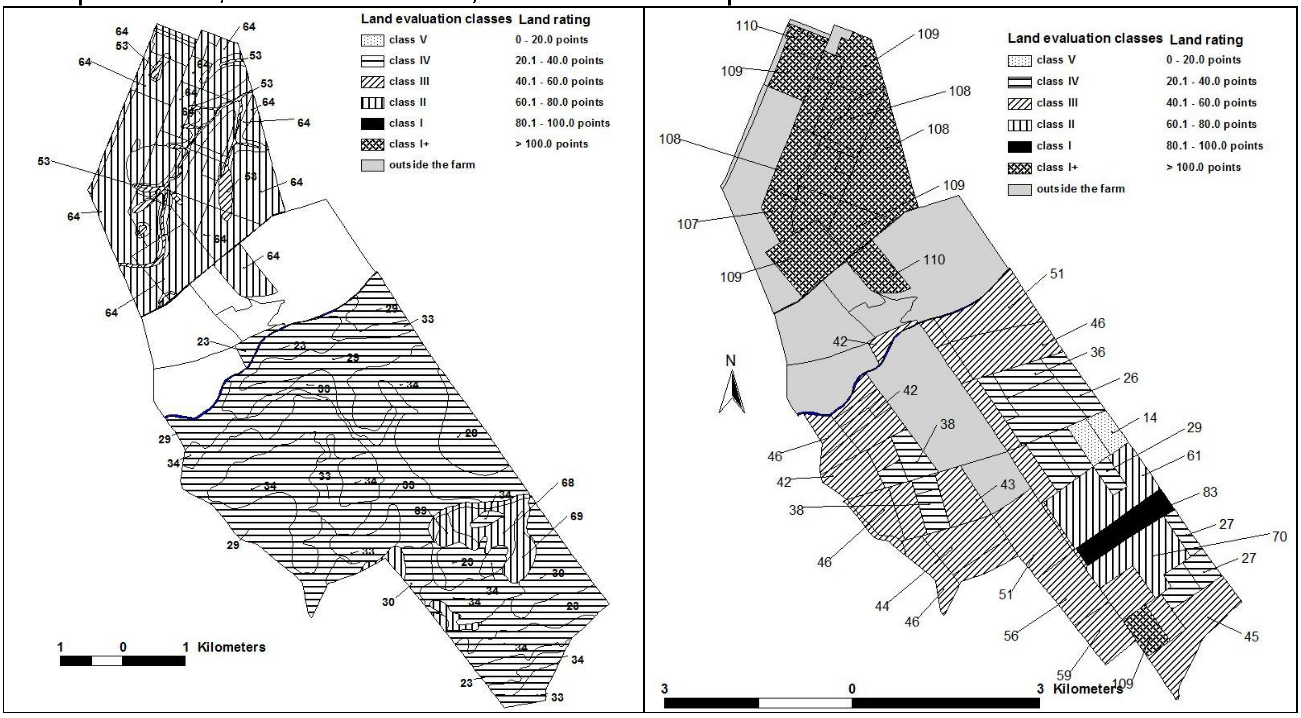

Figure 2. Land evaluation rating for soils from Grivco farm in a) natural conditions at soil unit level; b) irrigation at physical block level.

Finally, some recommendations are developed for each land evaluation class for the entire studied area (Seceleanu et al., 2010):

The lands from the second class occupy an area of 737.18 ha (30.88%), especially on the terrace, being characterised by low limitations due to soil texture and temporary waterlogging. For better results in their management, it has to avoid repeated crossings by agricultural machinery and to change the ploughing depth in order to prevent the hardpan, as well as to apply measures for ameliorative fertilization.

The lands from the third class occupy an area of 48.23 ha (2.02%), being characterised by moderate limitations due to water excess from groundwater table (Q), low humus content (h), and gleysation (g). Additionally to the recommendations for the first class, the drainage could be sometimes necessary.

The lands from the fourth class occupy an area of 1601.66 ha (67.10%), being characterised by severe limitations due to water excess from grounwater table (Q), gleysation (g), heavy texture (C) and inundability due to infiltration from Danube. The proper management regards the drainage for soils from depressionary areas, the deepening and clogging of main and secondary draining channels, the impermeabilization of protection dam for Danube, the changes of ploughing depth in order to prevent the hardpan, the ameliorative fertilization.

CONCLUSIONS

The application aimed to assess the soil quality, land favourability to specific crops and its pretability to different land uses, using the methodology for land evaluation at a farm level and GIS technics.

The farm area cover an area of 2387.07 ha, on three different local land forms: floodplain, slopes and terrace. The terrain has been affected by waterlogging after damming and draining, but several improvement measures have been done in order to decrease these limitations.

The soil survey study and maps have been done according to the Methodology of Pedological Studies Assessment (ICPA, 1987), and the soil types and subtypes have been classified according to the "Romanian System for Soil Taxonomy (SRTS)" (Florea & Munteanu, 2003).

A centralized database has been developed, the soil and physical block maps have been digitized, and information for soil, climatic and terrain parameters that are taken into account for land evaluation marks have been picked up in the field. The soil profiles from soil mapping studies have been identified for each soil polygon (soil map unit), the land evaluation mark has been computed for each soil map unit (considered as homogenous area) in natural conditions and for irrigated areas too, for few crops and land uses, results being weighted in order to calculate the land evaluation marks for different crops and land uses at physical block level, as well as an averaged mark for the entire farm area.

The average land evaluation mark for the entire area is 42.0, meaning that the land is in the third quality class.

The weighted land evaluation mark for the terrace (656 ha) is 63.2, respectively the second quality class; the mark for the lands from slopes is 54.0, respectively the third quality class, while the mark for the floodplain is 34.02, respectively the fourth quality class.

For irrigation conditions, the average land evaluation mark for the entire area is 64.0, respectively the second quality class. The land evaluation mark is increasing for each sector, as following: 109 for terrace (class I+); 93.0 for the slope sector (class I), and 47 for floodplain (class III).

For each soil quality class, both for irrigated and non irrigated regimes, action plans are developed for agricultural tillage allowing the use of those areas at higher capacity. The action plans are regarding the tillage to be used on those lands, and to the crop types.

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CUPLAREA BAZELOR DE DATE LEGATE DE FOLOSINȚA TERENULUI PENTRU LOCALITATEA DABULENI, JUDETUL DOLJ

COUPLING DIFFERENT LAND USES DATABASES FOR DABULENI, DOLJ COUNTY

SORINA DUMITRU, VICTORIA MOCANU, MARIUS EFTENE, VALENTINA COTEȚ, CATALIN SIMOTA

Keywords: FAO-LCCS mehodology, LPIS data base, NUTS5 level, GIS

REZUMAT

Pentru a sprijini un management adecvat şi durabil al resurselor de soluri şi terenuri, sunt accesibile la nivel național mai multe baze de date, precum: baza de date de soluri al Sistemului Informatic Geografic SIGSTAR-200, baza de date punctuale PROFISOL, stratul de utilizarea terenului FAO-LCCS, baza de date a blocurilor fizice LPIS. Obiectivul acestei lucrări îl constituie corelarea lor pentru a facilita accesibilitatea lor pentru utilizatori şi factorii de decizie, pentru a sprijini politicile de soluri şi terenuri la nivel comunal. In acest scop, au fost utilizate tehnici de analiză de tip SIG pentru a suprapune diferite strate de date pentru localitatea Dăbuleni, judetul Dolj. Apoi au fost comparate distribuția utilizării terenului evaluată prin metodologia FAO-LCCS şi atributele privind folosința primară a terenurilor din blocurile fizice LPIS. Se constată că cele două metodologii conduc la rezultate similare în special pentru terenurile agricole. În acest mod, informațiile privind utilizarea terenurilor conform metodologiei FAO-LCCS, al căror regim de utilizare nu este restrictiv, pot fi folosite în studiile la nivel național şi regional.

ABSTRACT

In order to support the sustainable management of soil resources, several soil and land databases are available, such are the soil database from the Geographic Information System SIGSTAR-200, the PROFISOL point database, the FAO-LCCS layer for landuse, the LPIS database for land physical blocks. The aim of this paper is to correlate them in order to facilitate their accesibility for stakeholders and decision makers, to support soil and land policies at NUTS5 level. In this purpose, GIS technics have been used to overlay the different layers for Dabuleni, Dolj county. The distribution of land use assessed by using FAO-LCCS methodology and the attributes for primary land use for LPIS land blocks have been compared. As a conclusion, the two methodologies lead to similar results, especially for agricultural lands. Therefore, the information about land use obtained using FAO-LCCS methodology could be used for national and regional studies, being more accesible than LPIS information from APIA.

INTRODUCTION

As EU member state, starting with 2007, Romania could receive funds from EU agricultural funds, distributed in the form of direct payments related to the farm area. For this purpose, a farmer must meet the following criteria of eligibility: a) the area of the farm has to be greater than 1 ha, and each component plot greater than 0,3 ha; b) all agricultural practices has to be done according to the Good Agriculture and Environment Conditions (GAEC, 2007).

In order to absorb the funds for direct payments, the Romanian government must develop and maintain a management system to ensure strict control of applications and payment of farmers: the Integrated Administration and Control System (IACS), managed by the Agency for Payments and Intervention for Agriculture (APIA). The system is used to manage different funds from EU, such as SAPS (Single Area Payment Scheme), CNDP (complementary national direct payments), LFA (less-favoured areas), etc.

Therefore, the Council Regulation No 1782/2003 designs ICAS as composed by following components:

- a system used to unique identify the farm areas;
- a Land Parcel Identification System (LPIS);
- a control system (administrative, cross-compliance, spot checks and remote sensing checks);
- a payment system;
- a system to identify and register the livestock.

Even before Romania's accession to EU, APIA started a series of activities in order to develop LPIS, based on ortophotoplans. The physical blocks (or land parcels) have been unique identified at national level and a Geographic Information System has been developed. The farmers recorded in the Farm Register their pre-identified land parcels, and received ortophotoplans for these land parcels. The data from the farmers are included in ICAS database, as the parcel area, the land use, etc.

Therefore, the Land Parcel Identification System (LPIS) is based in Romania on ortophotoplans and Physical Blocks. It is estimated that the number of existent physical blocks in Romania is 2-3 million, the estimated average number of physical blocks at NUTS5 level is 821, and the estimated average size is 6 ha per each physical block.

The aim of this study is to correlate the georeferenced soil database SIGSTAR200, based on soil map at the scale 1:200 000, and the land units represented as physical blocks in LPIS. Another purpose is also to correlate the information about land use from LPIS database and from Land Cover Classification System (LCCS) database.

MATERIAL AND METHOD

The materials used in this study are as following:

- the soil map at the scale 1:200 000 from SIGSTAR200;
- the administrative units map at NUTS5 level;
- the Terrain Digital Model SRTM90;
- the physical blocks LPIS map;
- the land use FAO-LCCS map.

The methodology aimed to develop a comprehensive and unitary description of soil resources for each physical block, following the next steps:

- a centralized database with all the needed maps has been done;
- the boundary of each commune has been cut from the administrative map;
- using „crop" ArcView function, the commune area has been cropped from the soil layer, physical blocks LPIS layer, as well as from FAO-LCCS layer;
- the distribution of land use according FAO-LCCS methodology and the characteristics of primary land use of physical block LPIS (regarding soil cover) are compared.
- after overlapping the soil layer with the physical block layer, for each physical block a specific soil type is assigned. The assignation has been done by expert judgement, for each block several parameters, as: land use and dominant soil types for that specific block and from neighbouring, as well as the SRTM90, being taken into account, excepting the case when the soil unit is completely integrated inside a physical block.

- If it is not possible to assign to each block a single soil type, several soil types are assigned to that map unit according to their percentage of the block area.

The proposed methodology has been applied to several communes (NUTS5 level) from different land forms (mountain and plain areas).

RESULTS AND DISCUSSIONS

In this paper, only the results for a NUTS5 locality, Dăbuleni, Dolj county, from a plain area, are discussed.

After overlapping and cropping the NUTS5 area, the two layers for land use have been compared. In figure 1, the land use distribution assessed using FAO-LCCS methodology (based on remote sensing images from 2000) and the main (or primary) land use of physical blocks LPIS are presented.

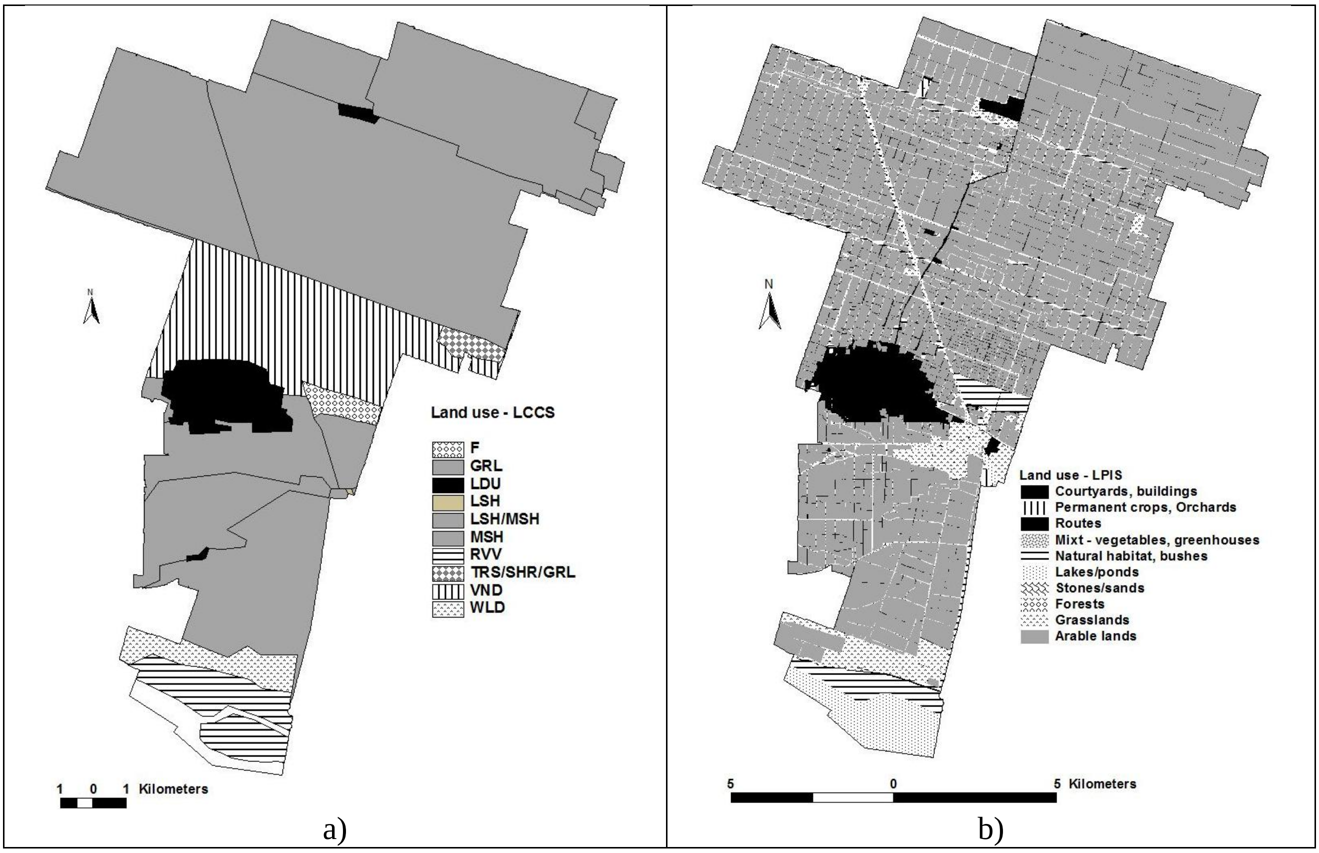

Figure 1. Distribution of land according to a) FAO-LCCS methodology; b) information for physical blocks from LPIS system. Dăbuleni, Dolj county (plain area)

As a conclusion, the two figures highlight similar results for land use classification, using both methodologies. There are some differences, due to the different scale of information – LPIS system being developed at a more detailed level. The main differences appear for non-agricultural land uses (forests, stony areas). Therefore, the information on land use provided by FAO-LCCS methodology could be used for studies at national and regional level, being more accessible and available for end-users, while the information from LPIS system is restrictive.

Another aim of the application was the correlation between the soil layer and LPIS information. Therefore, the soil layer and the physical blocks layer have been overlapped and, for each physical block, a specific soil type is assigned. The assignation has been done by expert judgement, for each block several parameters, as: land use and dominant soil types for that specific block and from neighbouring, as well as the SRTM90, being taken into account, excepting the case when the soil unit is completely integrated inside a physical block.

For the mountain area, where the boundaries of physical blocks are determined by natural limits, the correlation allows the increase of information level for soil map, by taking into account the information about land use, especially for non-agricultural areas (by assigning specific soils for forests, permanent grasslands, etc.).

For the plain area, the boundaries for physical blocks are due both to natural conditions (limits of natural land forms), and to anthropic limitations (routes, irrigation channels, drains, dams, etc.). For this reason, there are situations when it is not possible to assign a single soil type or soil association for each physical block (fig. 2).

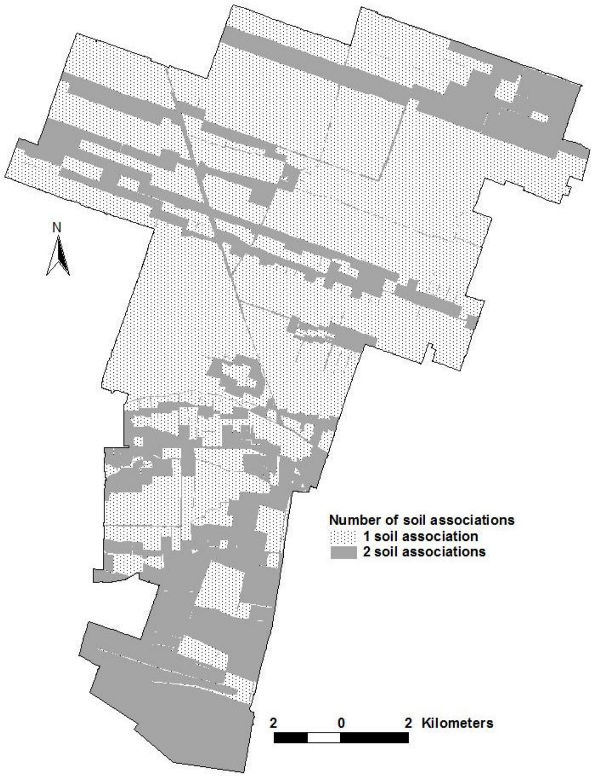

Figure 2. Number of soil associations assigned to each physical block for Dăbuleni (Dolj).

Therefore, by coupling the two layers, a map with the main (or dominant) soil association (fig. 3a) and one with the secondary soil association have been obtained.

CONCLUSIONS

The aim of the application at NUTS5 level was the correlation between georeferenced soil database at the scale 1:200 000, and the land units represented as physical blocks in IACS system. The proposed methodology has been applied for several localities from different relief forms, in this paper only the results for a plain locality (Dăbuleni, Dolj county) being described.

To achieve this objective, GIS tools have been used to overlay information from different layers (soil map, SRTM30, land use map, LPIS map). After overlapping the layers and cropping the locality area, the distribution of land use assessed using FAO-LCCS methodology and the attributes regarding the first land use from LPIS physical blocks is compared. The conclusion is that the two methodologies lead to similar results, the greatest differences being for non agricultural land-use (forests, rocks). Therefore, information about land use according FAO-LCCS methodology, having a unrestricted procedure, could be used in studies at national and regional levels.

There are several differences between the two studied localities, due to different location. In mountain area, the physical blocks boundaries have natural breaks, leading to a split of soil polygons taking into account the land use. Another conclusion, the details of soil map for the map units at the boundaries of the land use units (forest/grassland, grassland/arable land, etc.). For this area, for each physical block there is only one soil unit from soil map.

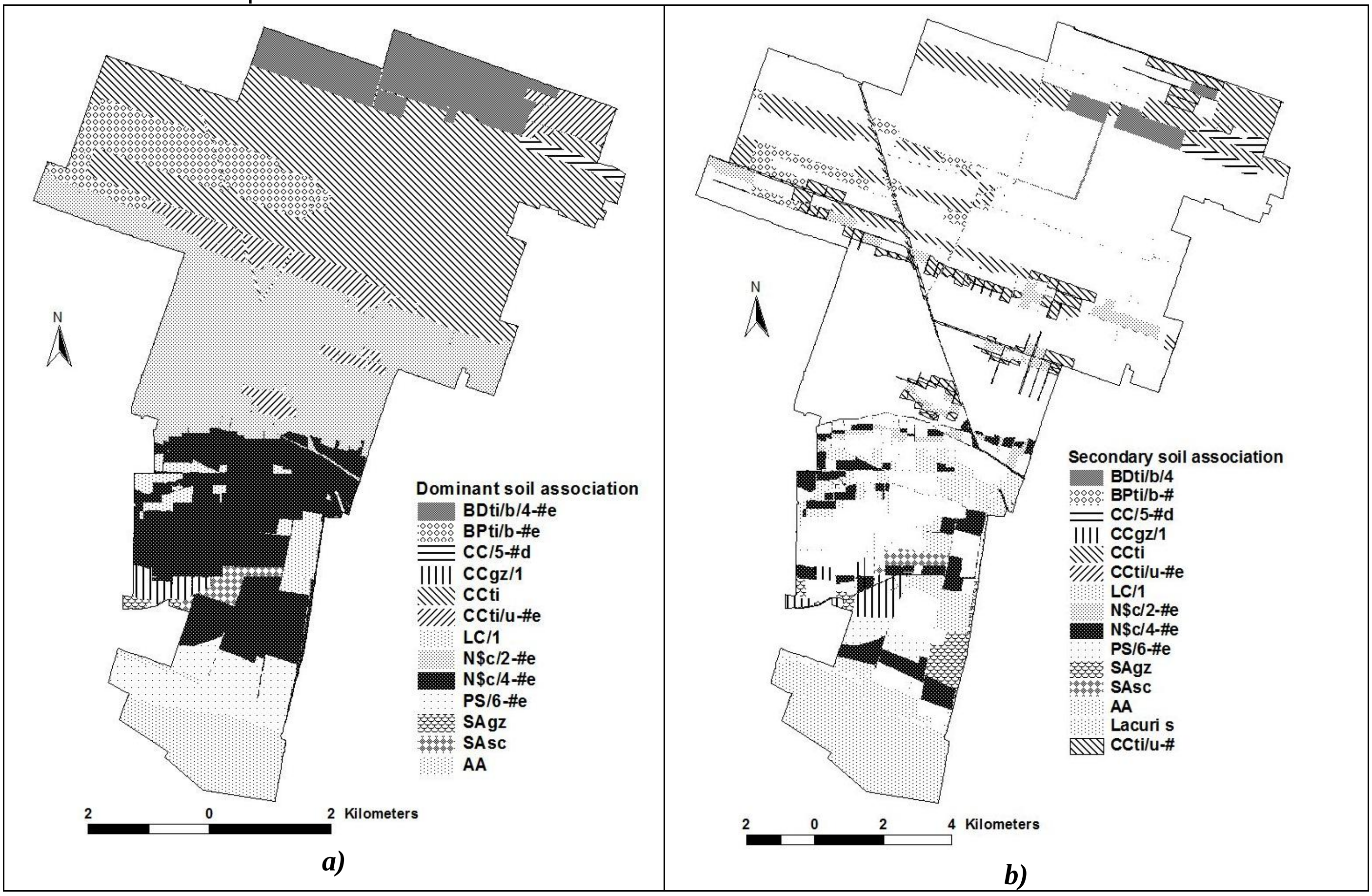

Figure 3. The a) dominant and b) secondary soil association for each physical block for Dăbuleni (Dolj).

For the plain area, the physical block boundaries are delineated both by natural land elements, and by anthropic limitations (routes, channels of irrigation, dams, etc.). For this reason, there is not possible to associate only one soil type (association) to a single physical block.

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INFLUENŢA MATERIALULUI PARENTAL ASUPRA CALITĂŢII ARGILEI EUTRICAMBOSOLURILOR ÎNTÂLNITE ÎN PERIMETRELE AGRICOLE DIN ROMÂNIA

INFLUENCE OF PARENT MATERIAL ON THE CLAY QUALITY FROM EUTRICAMBOSOLS OCCURRING IN THE AGRICULTURAL AREAS OF ROMANIA

M. EFTENE, C. CRĂCIUN

Keywords: parent material, clay, clay minerals, eutricambosol

REZUMAT

Lucrarea prezintă unele aspecte privind compoziţia mineralogică a 25 de profile aparţinând tipului de sol eutricambosol din perimetrele agricole ale României. Au fost prezentate rezultatele difracţiei razelor X privind compoziţia mineralogică pentru fiecare orizont genetic în parte. Rezultatele arată prezenţa illitului, smectitului şi a caolinitului, subliniind natura predominant smectitică a argilei din solurile investigate.

Relaţiile stabilite între conţinutul fiecărui mineral argilos din materialul parental şi orizontul de suprafaţă sunt directe, subliniind influenţa materialului parental asupra mineralogiei argilei din aceste soluri.

A fost observată o tendinţă de scădere a raportului smectit/illit în orizontul de suprafaţă ce poate fi atribuită unor cauze naturale (alterarea mai puternică a micelor şi felspaţilor, biocumularea) şi unor cauze antropice (fertilizarea cu K).

ABSTRACT

The paper presents some aspects concerning the clay mineralogical composition of a number of 25 profiles of eutricambosols from agricultural areas of Romania. The X-ray results concerning the mineralogical composition of the clay fraction (<2μ) are presented for each genetic horizon of these soils. These results, show the presence of illite, smectite and kaolinite, pointing out the nature predominant smectitic of the clay from the investigated soils.

The established relationships between the contents of each clay mineral from the clay of parent material and of surface horizon are direct pointing out the influence of parent material on the clay mineralogy of these soils.

An observed decrease trend of the smectite/illite ratio in the surface horizons could be ascribed to some natural causes (stronger alteration of the micas and feldspars, bioaccumulation) and artificial causes (K fertilization).

INTRODUCTION

At the colloidal level of soil (fraction bellow 2μ) the clay quality expressed by its mineralogical composition is strongly influenced by two groups of factors: a group connected by the parent material characteristics and a group by the pedogenesis.

The variation on the soil profile of the clay from the quantitative and qualitative point of view is influenced by the ratio of intensities and results of activity of the two groups of factors.

The purpose of this paper is to present some aspects regarding to the influence of parent material on the clay mineralogical composition from some soils belonging to eutricambosol type from Romania.

MATERIAL AND METHODS

The clay fraction below 2μ from the genetic horizons of a number of 25 eutricambosols profile, from mineralogical point of view was studied. The clay separation was made by using the pipette method (Crăciun & Gâţă, 1986).

The clay mineralogical composition was established with the help of X-ray diffraction method, the interpretation of the results being after Brindley and Brown (1980).

The evaluations concerning the parent material influence on the clay mineralogy of these soils were made by the attempts to correlate certain mineralogical parameters (the same parameters) obtained at the level of two principal horizons of the soil profiles, surface horizons and the deepest horizons considered as belonging to parent materials.

The different types of correlation were used (linear, polynomial, logarithmic, exponential, power).

RESULTS AND DISCUSSIONS

In the table 1, the mineralogical composition of the clay fraction (<2μ) from genetic horizons of the investigated soils are presented. The values from this table represent in the majority of cases the average values.

Table 1

Compoziţia mineralogică medie a argilei din orizonturile eutricambosolurilor studiate

Soil profile	A horizon			Bv horizon			C horizon		
	S	I	K	S	I	K	S	I	K
Arad	61	33	6	63	32	5	64	30	6
Bacova	51	43	6	60	36	4	55	40	5
Batâr	42	50	8	47	45	8	51	41	8
Botorca	38	59	3	42	54	4			
Brăişoru	66	28	6	68	26	6	72	23	5
Ciumechiu	50	44	6	61	34	5	65	29	6
Curtici	28	67	5	42	53	5	56	39	5
Drăgăşani	59	37	4	74	24	3	75	23	2
Izvoarele (Alba)	54	41	5	71	23	6	72	24	4
Lădeşti	70	27	3	71	26	3	72	25	3
Lugoj	57	33	10	40	50	10	41	49	10
M. Suceviţa	55	41	4	55	41	4	66	32	2
Mândra	53	44	3	53	44	3	50	46	4
Nepos	33	62	5	37	59	4	40	56	4
Pischia	57	36	7	51	44	6	65	30	5
Recaş	60	34	6	63	31	6	68	28	4
Sălaj	53	37	10	62	32	6	59	33	8
Salonta	26	66	8	42	52	6	53	42	5
Seleuş	62	32	6	71	24	5	78	16	6
Sfârnaş	56	38	6	62	34	4	68	26	6
Tileagd	41	48	11	48	40	12	52	36	12
Turu Lung	30	59	11	40	50	10	43	47	10
Valea lui Mihai	27	68	5	34	62	4	43	52	5
Vârterju-Fărcaş	52	43	2	63	32	5			
Zalău	54	40	6	63	32	5	56	39	5

Legend
S – smectite clay content
I – illite clay content
K – kaolinite clay content

The identified clay minerals were illite, smectite and kaolinite.

According to the results from the table 1, generally, the mineralogical composition of clay is predominant smectitic.

At the level of the two horizons A and B, the principal component remains smectite, the value of smectite/illite ratio exceeding the unit in the 70% (approximately) from cases. In another cases (roughly 30%) the values of the mentioned ratio are subunit.

At the level of C horizon, the predominance of the smectite is stronger, the value of smectite/illite ratio exceeding the unit in 80% from cases.

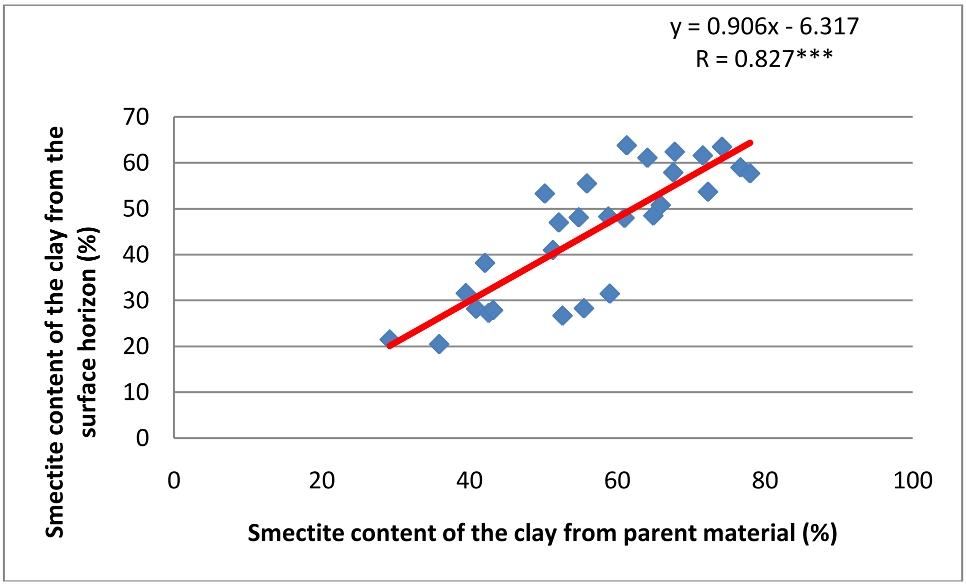

Fig. 1. Relation between the smectite content of the clay from the surface horizon and those from parent material for the eutricambosols

The attempts to correlate the content of each clay mineral from the surface horizons with the contents of the same minerals from the parent material (the deepest horizons) had as results same closed relationships between the used parameters.

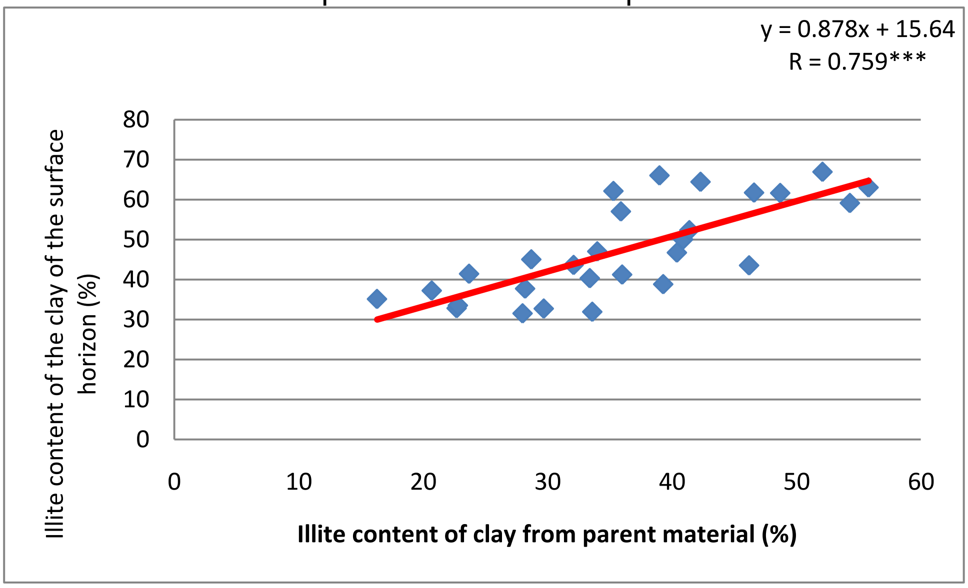

Fig. 2. Relation between the illite content of the clay from the surface horizon and those from parent material for the eutricambosols

Indifferent of correlation mode the results were quite similar. In the figures of this paper we presented only results of linear correlations.

These relationships demonstrate the influence of the parent material on the clay mineralogy of the investigated soils.

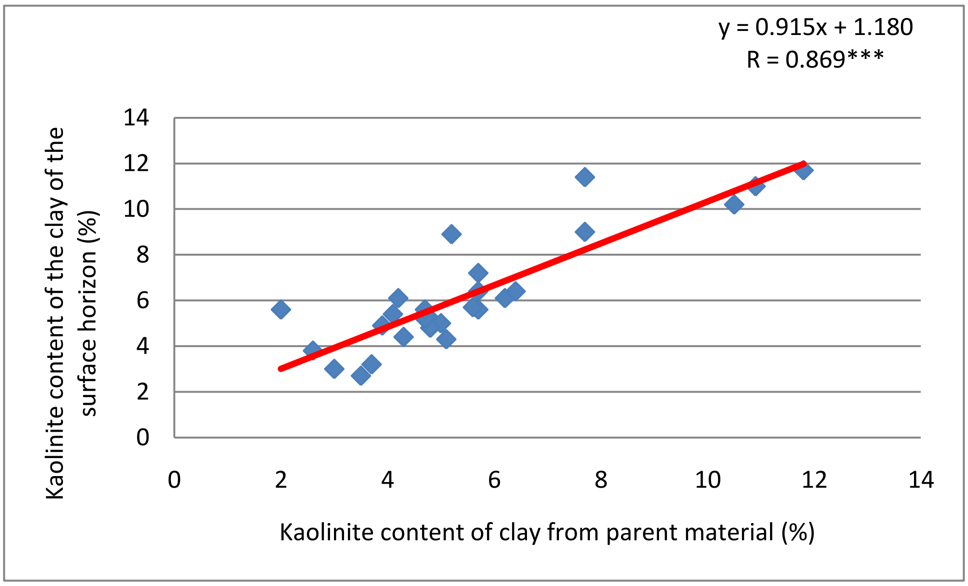

Fig. 3. Relation between the kaolinite content of the clay from the surface horizon and those from parent material for the eutricambosols

In the figure 1 the established direct relationship between the smectite content from parent material and from surface horizon is obvious. The data correlate very significant.

A similar relationship between the illite content from parent material and from surface horizon can be observed in the figure 2.

In the case of kaolinite the established relationship is similar with smectite and illite (figure 3).

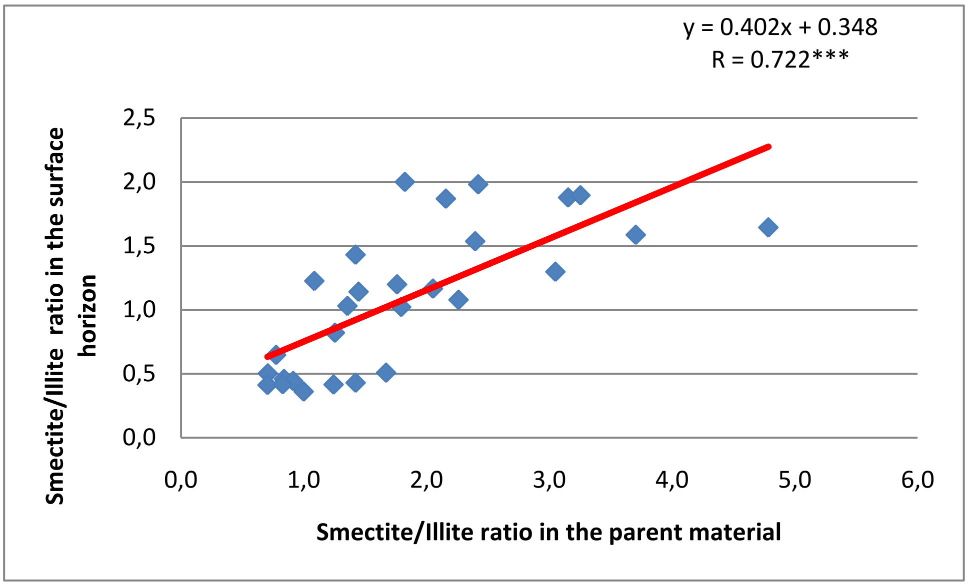

Fig. 4. Relation between smectite/illite ratios from surface horizon and parent material

The results from figure 1, 2 and 3 demonstrate very clear influence of the parent material of the quality of the clay of investigated soils. In all cases relationships is direct linear and very significant.

In a context of the same significance a small difference between the three minerals can be observed. This small difference refers to the absolute values of correlation coefficient which decrease in order kaolinite (r=0.869***) > smectite (r=827***) > illite (r=759***). As a speculation, we could say that this order could suggest the fact that the illite could be the clay mineral which is affected by some quantitative variation in the surface horizon.

In the figure 4 a linear positive relationship can be observed that the smectite/illite ratio values from the surface horizons correlate direct and positive with the values of the same ratio at the level of parent material. This relationship is an additional argument for the influence of parent material on the clay mineralogy.

It is very important to point out the difference concerning the values interval of the smectite/illite ratio at the two levels of the profile, which can be observed in figure 4. Thus in the parent material this interval is 0.8 – 5.0, while in the surface horizon is 0.4 – 2. This difference suggests that in the surface horizon there is an increase trend of the illite content. Such of trend was observed for another soil types too (e.g. chernozems – Crăciun, 2000) and was ascribed to natural causes (stronger alteration of micas and feldspars in the surface, preferential migration of the smectite, bioaccumulation) and anthropic causes (K fertilization).

CONCLUSIONS

1. The identified clay minerals from the clay fraction of the investigated eutricambosols are illite, smectite and kaolinite.
2. The mineralogical composition of the clay fraction of the investigated eutricambosols in the majority of cases (70-80 %) is predominant smectitic.
3. The established relationships between the contents of each clay mineral from the clay from parent material and from surface horizon are linear and positive. This relationship demonstrates the influence of the parent material on the clay mineralogy from surface horizons.
4. In spite of a similar influence on the smectite/illite ratio, values of this ratio tend to decrease in the surface horizon, due to an increase of illite content. This trend can be ascribed to some natural causes (stronger alteration of the micas and feldspar, bioaccumulation) and anthropic causes (K fertilization).

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INFLUENȚA ARGILEI DIN UNELE PERIMETRE POMICOLE ASUPRA ANUMITOR INDICI BIOMETRICI

THE INFLUENCE OF THE CLAY FROM THE SOILS OF SOME FRUIT GROWING AREAS ON CERTAIN BIOMETRIC INDICATORS

M. EFTENE, C. CRĂCIUN

Keywords: clay, clay minerals, biometric index

REZUMAT

Compoziția mineralogică a argilei solurilor din diferite plantații de măr este în general predominant smectitică. Smectitul este însoțit de illit şi de caolinit.

Relațiile stabilite între anumiți indici biometrici cum ar fi trunchiul de vârstă convențională (CTA-30) şi indicele de distribuție radiculară şi anumiți parametrii ce exprimă cantitatea şi calitatea argilei evidențiază influența argilei asupra creşterii şi dezvoltării anumitor specii pomicole (de ex. mărul).

ABSTRACT

The mineralogical composition of the clay from soils located in different apple tree plantations is generally, predominant smectitic. Smectite is accompanied by illite and subordinate kaolinite.

The established relationships between certain biometric indices as conventional trunk age (CTA-30) and root distribution index (RDI) on the side and some parameters which express the clay quantity and quality point out the influence of the clay on the growth and development of certain fruit growing species (e.g. apple tree).

INTRODUCTION

The biometric indicators can be considered as indices which express certain necessities from the edaphic and climatic point of view, of the cultivated plants. These indicators are influenced by the ecopedological conditions and by the amelioration measures of these conditions.

As component of the edaphic environment, the clay could be an important factor which influences such of indicators, especially in the case of cultivated plants whose root volume explores a zone located at a depth where the organic matter content is much lower in comparison with the surface horizon. It is case of fruit tree species.

The paper is an attempt to make evident a possible relation between soil clay fraction and certain biometric indicators.

MATERIALS AND METHODS

A number of 27 soil samples, drawn from 25-60 cm depth interval from the mineralogical point of view were studied.

The soils are located in apple tree plantations, situated in different fruit growing areas of Romania.

The mineralogical composition of the clay fraction below 2µ separated from soil (Crăciun and Gâță, 1986) was carried out by X ray diffraction. The X-ray results were interpreted after Brindley and Brown, 1980.

As biometric indicators were chosen conventional trunk age (CTA-30) and root distribution index (RDI), indicators that were elaborated and tested by Voiculescu (1999) as sensitivity degree to ecopedological condition changes in plantations located throughout the sequence of natural conditions of Romania.

The values of the two biometric indices were obtained from data base of fruit-growing group from our institute.

The details concerning the formulas, of the two biometric indices and obtained proceedings can be found in Voiculescu (1999).

The assessments concerning the influence of the clay on these two biometric indices were made by some correlations between values of biometric indicators and some parameters which express the quantity and quality of the clay.

RESULTS AND DISCUSSIONS

In the table 1 the mineralogical composition of the clay fraction below 2µ from the investigated soil samples are presented, together the values of the two biometric indices.

The identified clay minerals were illite, smectite and kaolinite. The clay mineralogical composition is generally, predominant smectitic (exception 4 cases)

Table 1

Mineralogical composition from the investigated soil samples

Nr	Localization	RDI	CTA -30	C	Ic	Sc	Kc	Is	Ss	Cs	S/I
1	Lucieni - Hârtieşti		10.3	53.7	30.2	66.4	3.3	16.2	35.7	1.8	2.2
2	Poienița - Bălileşti		35.8	7.4	56.3	37.4	7	4.2	2.8	0.5	0.7
3	Slănic Aninoasa		25.8	19.6	42.4	45.6	12.4	8.3	8.9	2.4	1.1
4	Şuici		33.5	29.9	44.8	48.2	6.5	13.4	14.4	1.9	1.1
5	Cepari	3.7	21.8	40.3	27.6	69.1	3.3	11.1	27.8	1.3	2.5
6	Cepari	5.57	22.4	46.6	29.2	66.2	4.9	13.6	30.8	2.3	2.3
7	Tigveni	3.8	23.4	31.3	40	55.2	4.2	12.5	17.3	1.3	1.4
8	Milcoiu	4.4	20.4	9.2	32.6	62.2	5.1	3.0	5.7	0.5	1.9
9	Olăneşti	4.66	27.1	22.3	44	46.5	9.9	9.8	10.4	2.2	1.1
10	Lupsa Brateni		21.9	55.4	33.9	56.6	9.3	18.8	31.4	5.2	1.7
11	Ilovaț	5.99	37.9	34.5	41.9	53.1	5.1	14.5	18.3	1.8	1.3
12	Izvoru Bârzei	5.95	24.4	52.2	33.6	63.8	3.6	17.5	33.3	1.9	1.9
13	Buciumeni	4.85	23.7	56	34.7	60.8	4.6	19.4	34.0	2.6	1.8
14	Drăghici	4.49	30	21.3	36.7	57.2	6.5	7.8	12.2	1.4	1.6
15	Corveanca - Breaza	4.53	21.7	47	34.6	62.6	2.7	16.3	29.4	1.3	1.8
16	Starichi	5.01	37	35.8	50.4	45.3	4.3	18.0	16.2	1.5	0.9
17	Cândeşti Verneşti	4.5	34.8	49.2	41.1	55.3	3.5	20.2	27.2	1.7	1.3
18	Cicârlău	5.21	30.5	28.3	46.2	42.4	11.6	13.1	12.0	3.3	0.9
19	Şonecuța Mare		13.8	68.7	29.1	66.9	4.6	20.0	46.0	3.2	2.3
20	Drăghici	3.62	22	25.8	33.4	50.2	10.6	8.6	13.0	2.7	1.5
21	Drăghici	2.22	28.8	26	24.2	73.2	3.3	6.3	19.0	0.9	3.0
22	Drăghici	4.3	26.8	38.9	27.1	65.2	8.2	10.5	25.4	3.2	2.4
23	Valea Calului		20.1	14.1	17.6	73.7	8.5	2.5	10.4	1.2	4.2
24	Milcoiu	2.81	10.8	29.1	38.2	58.3	3.5	11.1	17.0	1.0	1.5
25	Sighetul Marmației		26.1	31.6	55.7	33.3	11.3	17.6	10.5	3.6	0.6
26	Sighetul Marmației		20	29.8	58.8	29.4	12.4	17.5	8.8	3.7	0.5
27	Voineşti Cetate	3.08	8.9	21.1	38.8	58.1	3	8.2	12.3	0.6	1.5

Legend

RDI – root distribution index
CTA-30 – conventional trunk age
C – clay content
S/I – smectite/illite ratio
Ic – clay illite content
Sc – clay smectite content
Kc – clay kaolinite content
Is – soil illite content
Ss – soil smectite content
Ks – soil kaolinite content

In this table it can be observed that the clay content is very variable.

Conventional trunk age (CTA-30)

This biometric indicator puts in line the trunk of the trees with different age to a certain age (30 years). In this way this index removes the age influence permitting the comparison of the trees with different ages.

The significance of this indicator is given by the increase of its value with the increase of favourability of ecopedological conditions (table 2).

Table 2

Interpretation of CTA-30 values for apple-mother plant very vigorous (Voiculescu, 1999)

Optimum	Moderate	Critic
>33	33-20	<20

The attempt to correlate this parameter with the soil clay content given insignificant results.

Significant results were obtained in the cases when we used the contents of the principal components of the clay (illite and smectite), though the relations of two clay minerals with biometric indicator are opposite. Thus the relationship between illite clay content with CTA-30 is positive (fig. 1), while the relation of the same biometric indicator with the smectite clay content is negative (fig. 2).

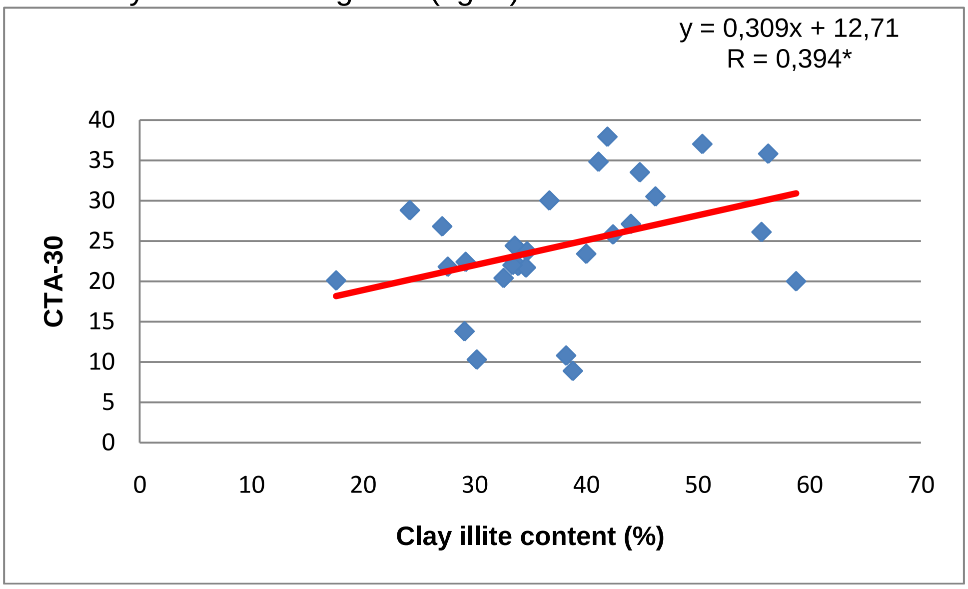

Fig. 1. Relation between CTA-30 and the illite content of the clay

The decrease of the smectite/illite ratio has as effect a decrease of CTA-30 value, relationship being after a polynomial equation (fig. 3). This decrease could note standstill trend.

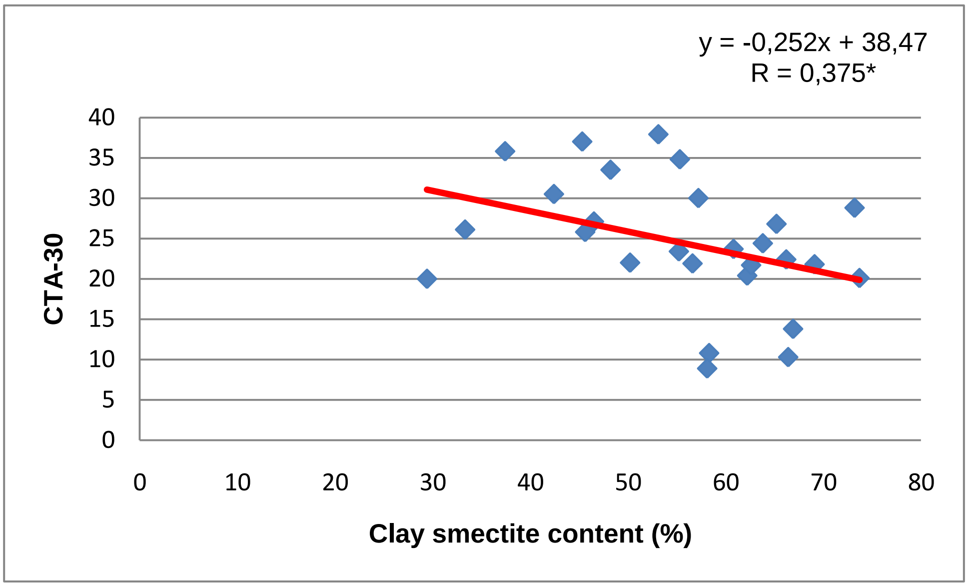

Fig. 2. Relation between CTA-30 and the smectite content of the clay

The results suggest that CTA-30 appears more closely related to the clay quality than clay quantity. The value of this biometric indicator tends to increase with the increase of the illite clay content and or of illite/smectite ratio from the values which express a critic ecopedological condition (<20) to values which express a optimum ecopedological condition (>33).

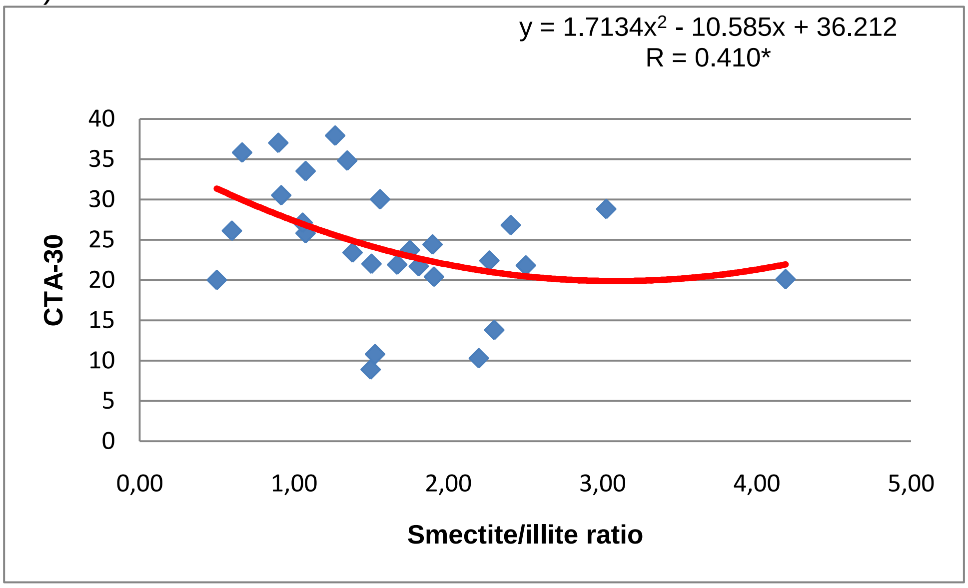

Fig. 3. Relation between CTA-30 and smectite/illite ratio

Root distribution index (RDI)

This indicator expresses the relations between soil properties and root system distribution, using frequency and surface (area) of root section. RDI express through a unique value the rooted type of a soil profile, because it contains all information regarding the root system distribution.

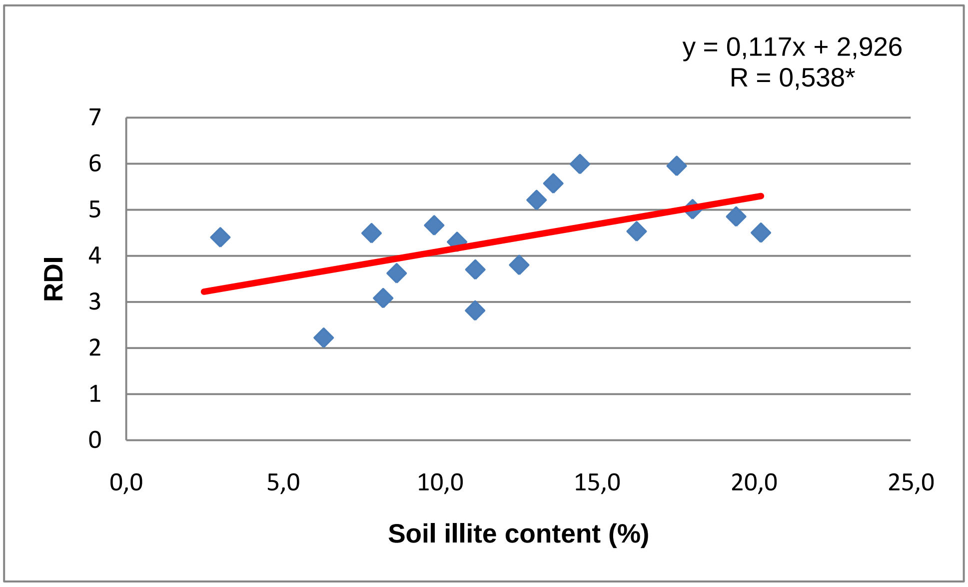

Fig. 4. Relation between RDI and the illite content of the clay

The significance of this biometric indicator is given by its values for the three types of rooted: normal rooted 3 – 5; superficial rooted <3; deeply rooted >5. These limits are used for the vigorous mother plant (Voiculescu, 1999).

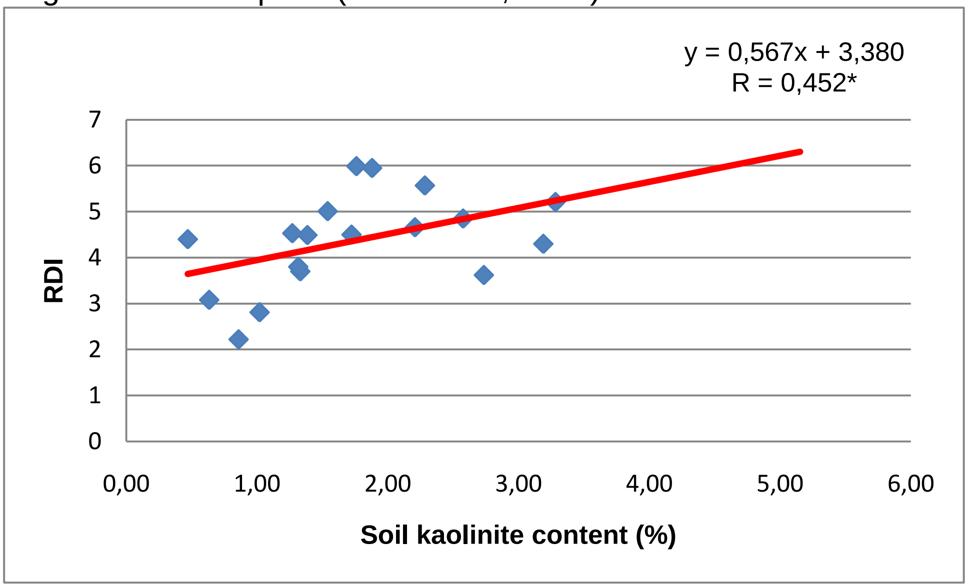

Fig. 5. Relation between RDI and the kaolinite content of the clay

In similar mode of the former indicator, the result of the correlation of RDI values with soil clay content is insignificant. In addition, correlation results of RDI with clay smectite content are insignificant.

Significant results were obtained in the cases in which for such correlations, the content of illite soil content (fig. 4) and kaolinite soil content (fig. 5) are used. In the both cases the relation is positive.

Surprising appear insignificant results of correlations in the case of smectites, minerals with strong implication in soil volume changes, which condition the air and water regime of the edaphic environment.

Air porosity is an additional indicator for the characterization of soil air and water regime conditions (Voiculescu, 1999).

The results of the former researches (Crăciun, 2000) demonstrate that between air porosity and the clay smectite content and also soil smectite content there is always a negative relationship (the results are significant).

If we take into consideration crystal dimensions of the clay minerals it must be point out that the particle size decreases in order kaolinite>illite>smectite.

In this context, the direct relationships between RDI and the contents of kaolinite and illite considered in the light of air porosity, which influences the root distribution system, appear normal. These relations could be explained on the basis of implication of the big sized particle (through their setting mode) in optimization of the air and water regime conditions.

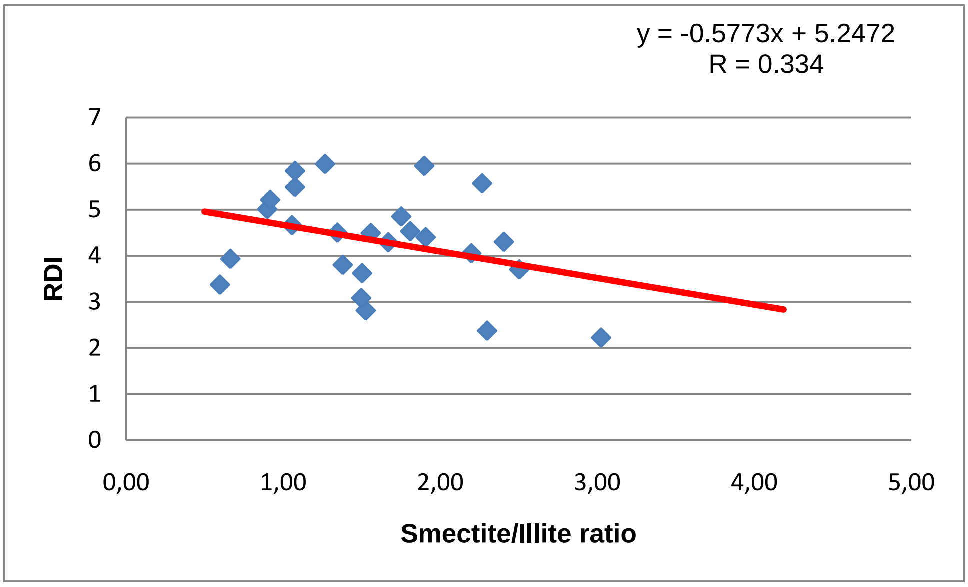

Fig. 6. Relation between RDI and smectite/illite ratio

In the figure 6 the negative relation between RDI and smectite/illite ratio is presented. In spite of the fact that the results are not significant, the decrease trend of RDI values with the smectite predominance in soil is very clear. This could explain why the soils rich in smectitic clay (vertisols) are not recommendable for fruit growing plantations.

"Vertization" (process leading to the development of vertisols), a process due to the clay quantity and quality can become am important determining factor for the growth and extension of the root system. More, through the shrinking – swelling process of the soil, "vertization" can determine through scissoring the destruction of some components of the root system.

CONCLUSIONS

1. The identified clay minerals in the clay fraction of soils located in different apple tree plantations are illite, smectite and kaolinite.
2. In the investigated soils, with rare exceptions, the mineralogical composition of the clay is predominantly smectitic.
3. The established relationships between certain biometric indices as CTA-30 and RDI and the parameters which express the quantity and quality of the clay are the analytical proves for the clay influence on growth and evolution of the fruit-growing species (e.g. apple tree).
4. According to these relations the values of biometric indices is influenced by the soil illite content (RDI) or by the clay illite content (CTA-30). The basis of this relations is the potassium implication on the growth and development of the fruit – growing species (e.g. apple tree).

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ZONE PUTERNIC POLUATE CU METALE GRELE

HOT AREAS POLLUTED WITH HEAVY METALS

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Key words: soil pollution, heavy metals, impact.

REZUMAT

În România, poluarea solurilor cu metale grele a afectat aproximativ 200000 ha localizate în special în apropierea uzinelor metalurgice. Cele mai întinse suprafeţ e sunt localizate în apropiere de Copş a Mică, Zlatna, Baia Mare, Neferal-Acumulatorul, etc.

Informaţ ii privind zonele afectate cu metale grele cum sunt identificarea acestora ş i caracterizarea din punct de vedere al proprietăţ ilor solului, al conţ inutului poluanţ ilor, istoria, etc. sunt necesare pentru a construi ş i a evalua strategiile de remediere corespunzătoare.

Lucrarea prezintă stabilirea impactului emisiilor cu metale grele (Pb, Cu, Zn, Cd) asupra solului aflat în apropierea a două zone industriale, metalurgice: SOMETRA Copş a Mică (judeţ ul Sibiu) ş i Neferal-Acumulatorul (lângă Bucureş ti).

Probele de sol au fost recoltate din diferite puncte ale acestor zone poluate, pe adâncimea 0–20 cm, ş i la diferite distanţ e ş i direcţ ii faţ ă de sursele de poluare.

Au fost elaborate hărţ i cu suprafeţ ele de sol poluate din siturile contaminate Copş a Mică ş i Neferal-Acumulatorul. S-a identificat ş i s-a evaluat gradul de poluare al solurilor în acord cu clasele de încărcare cu metale grele (forme totale) ş i cu pragurile de alertă ş i de intervenţ ie.

S-a stabilit că poluarea solurilor cu metale grele a afectat aproximativ 8400 ha dintr-o suprafaţ ă studiată de 8500 ha la Copş a Mică.

Pb, Cu ş i Zn au afectat solul pe o supratafaţ ă de 1300 ha în zona Neferal-Acumulatorul.

ABSTRACT

Within Romania, heavy metals soil pollution affected about 200000 ha located mainly around the metallurgic plants. The largest areas are placed close by Copsa Mica, Zlatna, Baia Mare, Neferal-Acumulatorul, etc.

The information about heavy metals contaminated areas: identification and characterization (soil properties, content of pollutants, history etc.) are needed to construct and evaluate the proper remediation strategies.

The assessment of the impact of some heavy metals (Pb, Cu, Zn, Cd) emissions upon soil in the vicinity of two metallurgical areas: SOMETRA Copsa Mica (Sibiu county) and Neferal – Acumulatorul (near Bucharest) are presented.

Soil samples have been collected (0-20 cm) in different points in these polluted areas, varying with the distance and the direction from the factories.

The pollution soils maps of the contaminated Copsa Mica and Neferal-Acumulatorul sites were elaborated for Pb, Cu, Zn and Cd. The identification and the evaluation of the polluted soils degrees were carried out according both with loading classes of heavy metals content (total forms) and values exceeding the alert and intervention thresholds.

Heavy metals soil pollution affected about 8400ha, from a total studied area of 8500ha in Copsa Mica.
Pb, Cu and Zn soil pollution affected about 1300ha placed around Neferal-Acumulatorul area.

INTRODUCTION

As the human induced aggression on soil increased, under the demographic explosion context, the concern of national and international organizations also increased to identify and characterize the soil degradation processes and, implicitly, to apply a set of measures for establishing the rules for protection and reclamation of soil cover.

MATERIAL AND METHODS

Romania, as a participant in the world-wide effort to this goal, has established the Agricultural Soil Quality Monitoring System as a component part of the National Environmental Quality Monitoring System (NEQMS), the National Research and Development Institute for Soil Science, Agrochemistry and Environment Protection (ICPA) Bucharest being responsible for soils. [1]

Therefore, the research works were performed at three levels:
Level I – fixed grid to identify the areas with soils having various degradation degrees, etc.
Level II – the detailed investigations to identify the causes of soil degradation processes, etc.
Level III – more detailed research, proportion of pollution processes, evolution, remediation measures, etc.

In Romania, the most aggressive industrial pollution types is pollution with heavy metals. The largest areas are placed close by Copsa Mica, Zlatna, Baia Mare, Neferal-Acumulatorul.

Our study refers at two hot areas: Copsa Mica and Neferal-Acumulatorul.

The pollution sources for these affected areas are: S.C. SOMETRA S.A. Copsa Mica – located in Sibiu county, cod NUTS RO126 and respectively, S.C. NEFERAL S.A., near Bucharest, cod NUTS RO322. The main activity of these two factories is non-ferrous metallurgy and the soil pollution type is with heavy metals: Cu, Zn, Pb and Cd for Copsa Mica area and Pb, Cu and Zn for Neferal-Acumulatorul area.

Soil samples were air – dried and ground to pass a < 0,25 mm sieve. Heavy metals contents were determined in hydrochloric solution (0,5N) using an open – tube digestion method with acid mixture HNO_3 – $HClO_4$-H_2SO_4. [3]

For quality control three replicates of LGS quality control material (LGCQC 3004) were included in batch of samples analyzed.

The F-AAS measurements (GBS Scientific Equip. Pty. Ltd., Australia) were performed with an AVANTA 932 AA System.

As calibration standards, 5 multi-element solutions in HCl (0,5N) containing Pb, Cu, Zn, Cd were prepared from mono-element standard solution of 1000 $mg \cdot kg^{-1}$ Pb, Cu, Zn, Cd (CertiPUR, Merck).

To identify the contaminated sites, the size of areas and the degree of soils pollution, the values of heavy metals concentrations in soil must be in accordance with references values (Table 1) and taking account of available scientific data on soil characteristics and homogeneity. [2]

Table 1

References values for some heavy metals (total forms) concentration in soil (Romanian Ordinance Ministry No. 756/1997 official Gazette of Romania, I Part, No. 303/1997)

	Pb	Zn	Cu	Cd
	(mg·kg^{-1} d.w.)			
N.C. (Normal Content)	<20	<100	<20	<1
Alert threshold				
• Sensitive utilizations type	50	300	100	3
• Less sensitive utilizations type	250	700	250	5
Intervention threshold				
• Sensitive utilizations type	100	600	200	5
• Less sensitive utilizations type	1000	1500	500	10
Loading Classes				
• Low	21–40	101–150	21–40	1.1–2.0
• Moderate	41–100	151–300	41–100	2.1–3.0
• High	101–300	301–700	101–200	3.1–7.0
• Very high	301–1000	701–1500	201–400	7.1–20.0
• Excessive	>1000	>1500	>400	>20

RESULTS AND DISCUSSIONS

Soil samples have been collected (0-20 cm) in different points in these polluted areas, varying with the distance and the direction from the sources. The identification and the evaluation of the polluted soils degrees were carried out according both with loading classes (low, moderate, high, very high, excessive) of heavy metals content (total forms) and values exceeding the alert and intervention thresholds.

The total contents of heavy metals in some soils in Copș a Mică area exceed the alert and intervention thresholds, special for Pb, Cd and Zn.

Heavy metals soil pollution affected about 8400 ha, from a total studied area of 8500 ha. (Table 2)

Table 2

Distribution of areas polluted with heavy metals (Copsa Mica)

Loading	Areas (ha) affected by pollution with:			
Classes	**Cd**	**Cu**	**Pb**	**Zn**
Low	125	4562	22	57
Moderate	247	992	2410	2517
High	5920	32	5642	5412
Very high	1510	–	335	422
Excessive	–	–	–	–
Total	**7802**	**5586**	**8409**	**8408**

Taking into account the size of the polluted surfaces, Cd has been considered the most pollutant (1500 ha very high polluted) followed, less and gradually, by Zn (422 ha very high polluted), Pb (335 ha very high polluted) and Cu (32 ha high polluted).

Pb, Cu, and Zn soil pollution affected about 1300 ha placed around Neferal-Acumulatorul area. The largest soil surface (245 ha) is high polluted with Pb, 73 ha are very high polluted and 3 ha excessively polluted. (Table 3)

The pollution soils maps of the contaminated Copș a Mică and Neferal-Acumulatorul sites were elaborated for Pb, Cu, Zn and Cd.
(Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7)

Table 3

Distribution of areas polluted with heavy metals (Neferal – Acumulatorul)

Loading Classes	Areas (ha) affected by pollution with:		
	Pb	**Cu**	**Zn**
Low	–	578	100
Moderate	965	173	48.5
High	245	49	2
Very high	73	2	1
Excessive	3	2	0.5
Total	**1286**	**804**	**152**

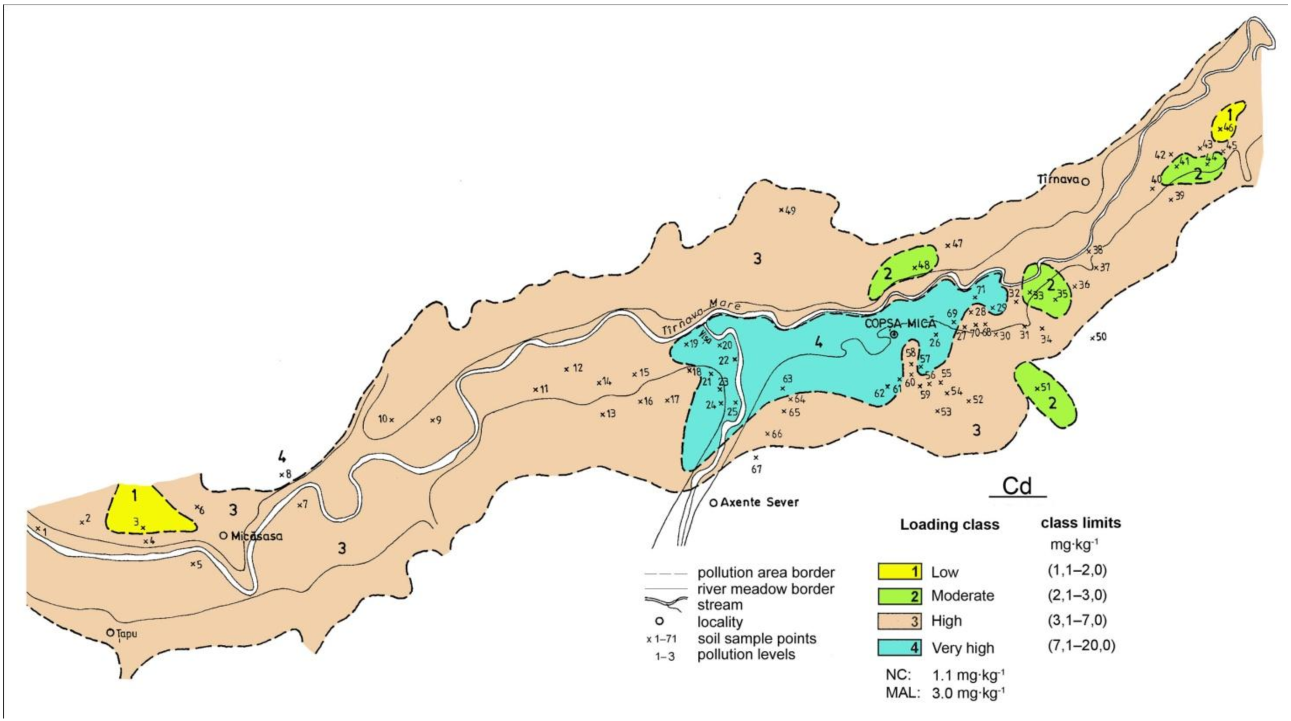

Figure 1. The soil surfaces affected with Cd within Copsa Mica area

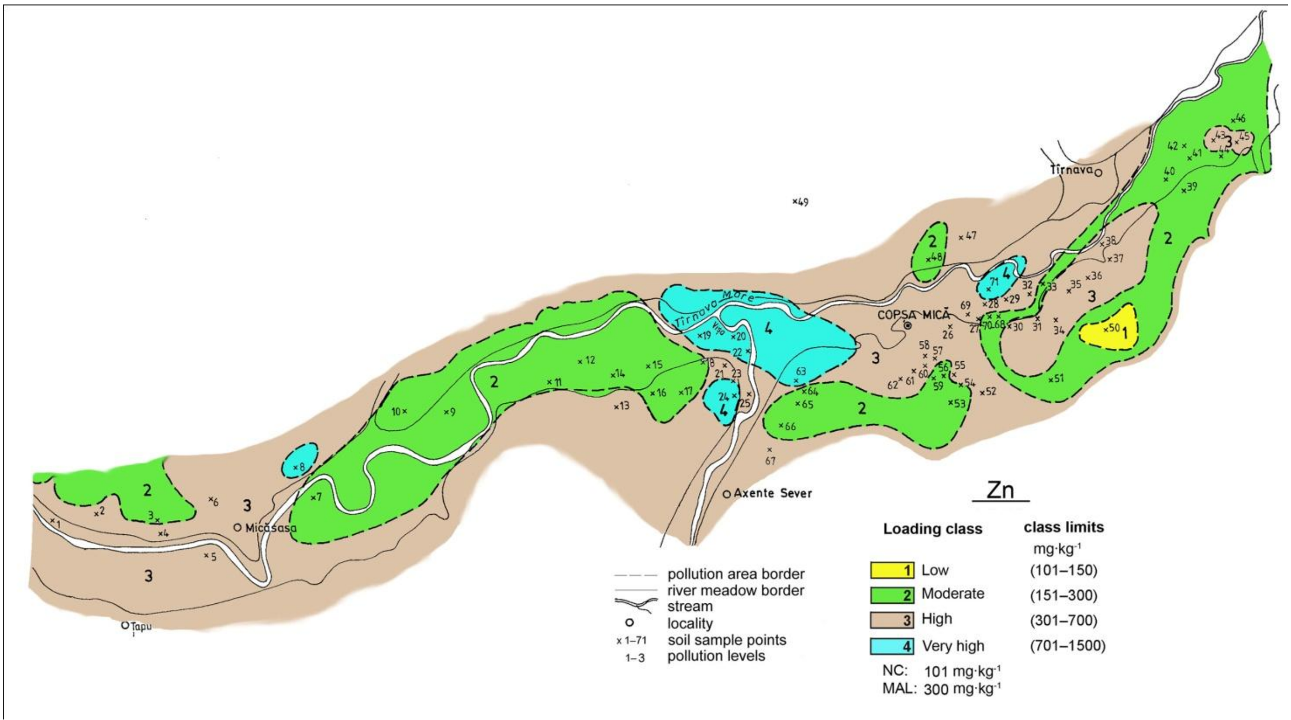

Figure 2. The soil surfaces affected with Zn within Copsa Mica area

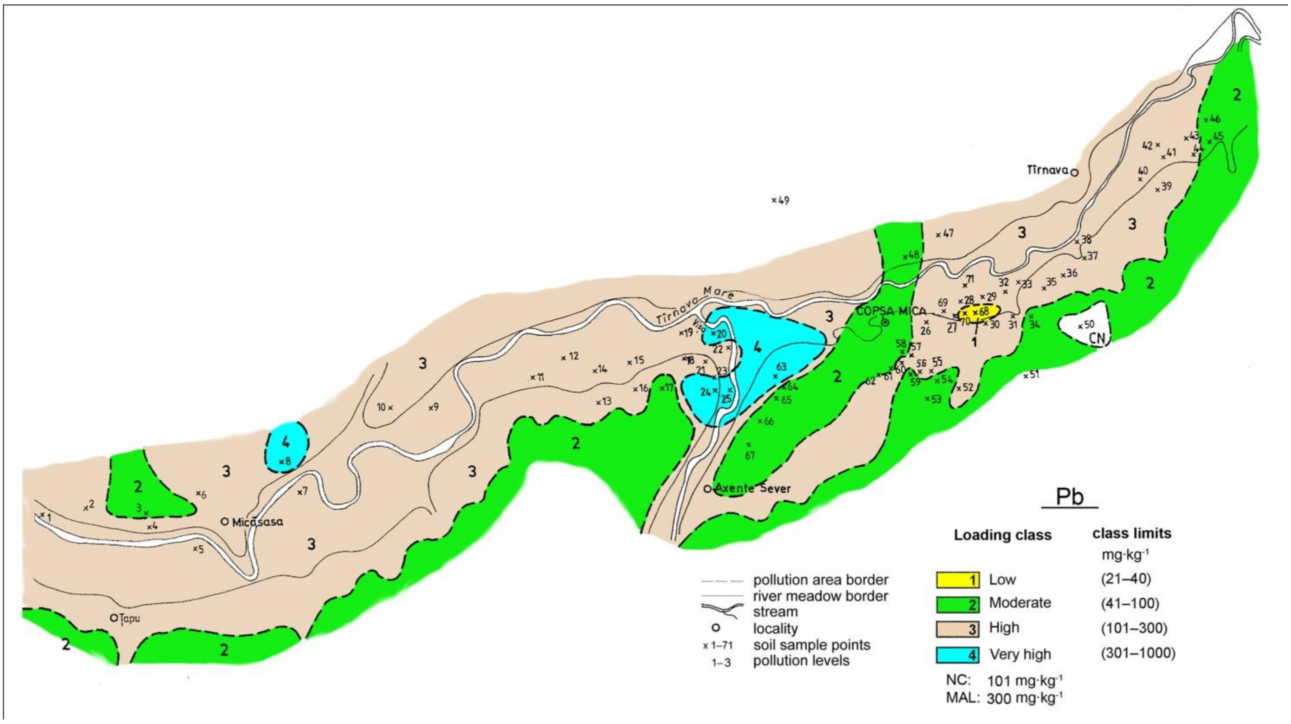

Figure 3. The soil surfaces affected with Pb within Copsa Mica area

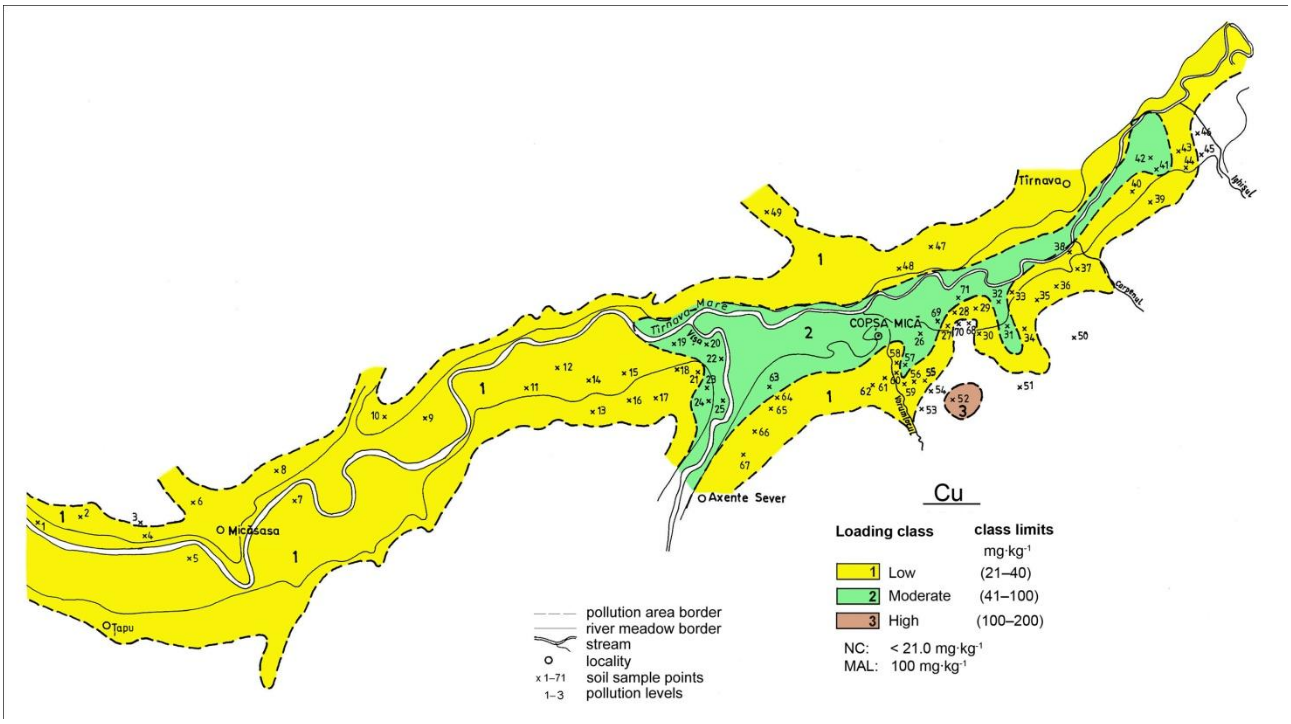

Figure 4. The soil surfaces affected with Cu within Copsa Mica area

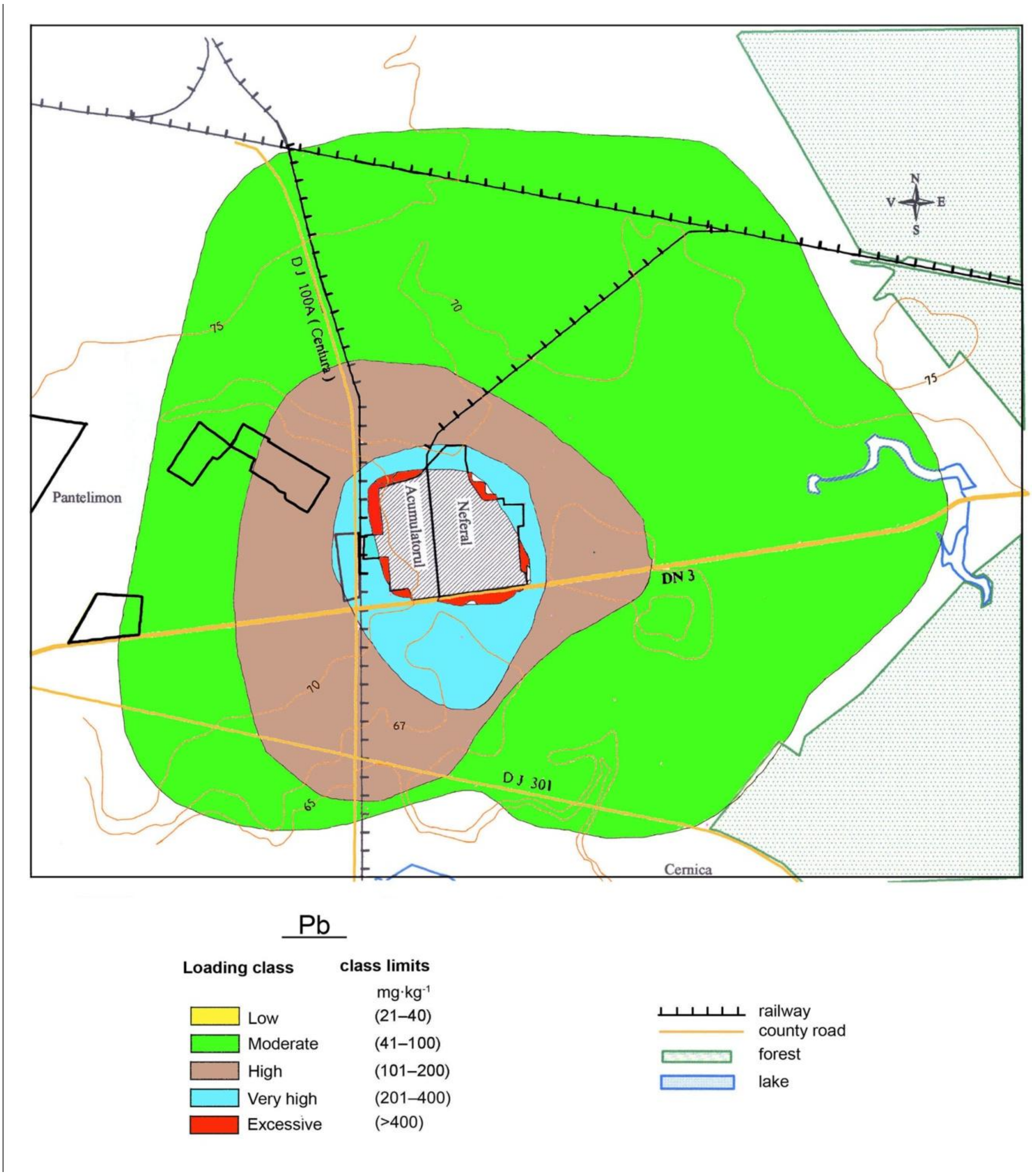

Figure 5. The soil surfaces affected with Pb within Neferal-Acumulatorul area

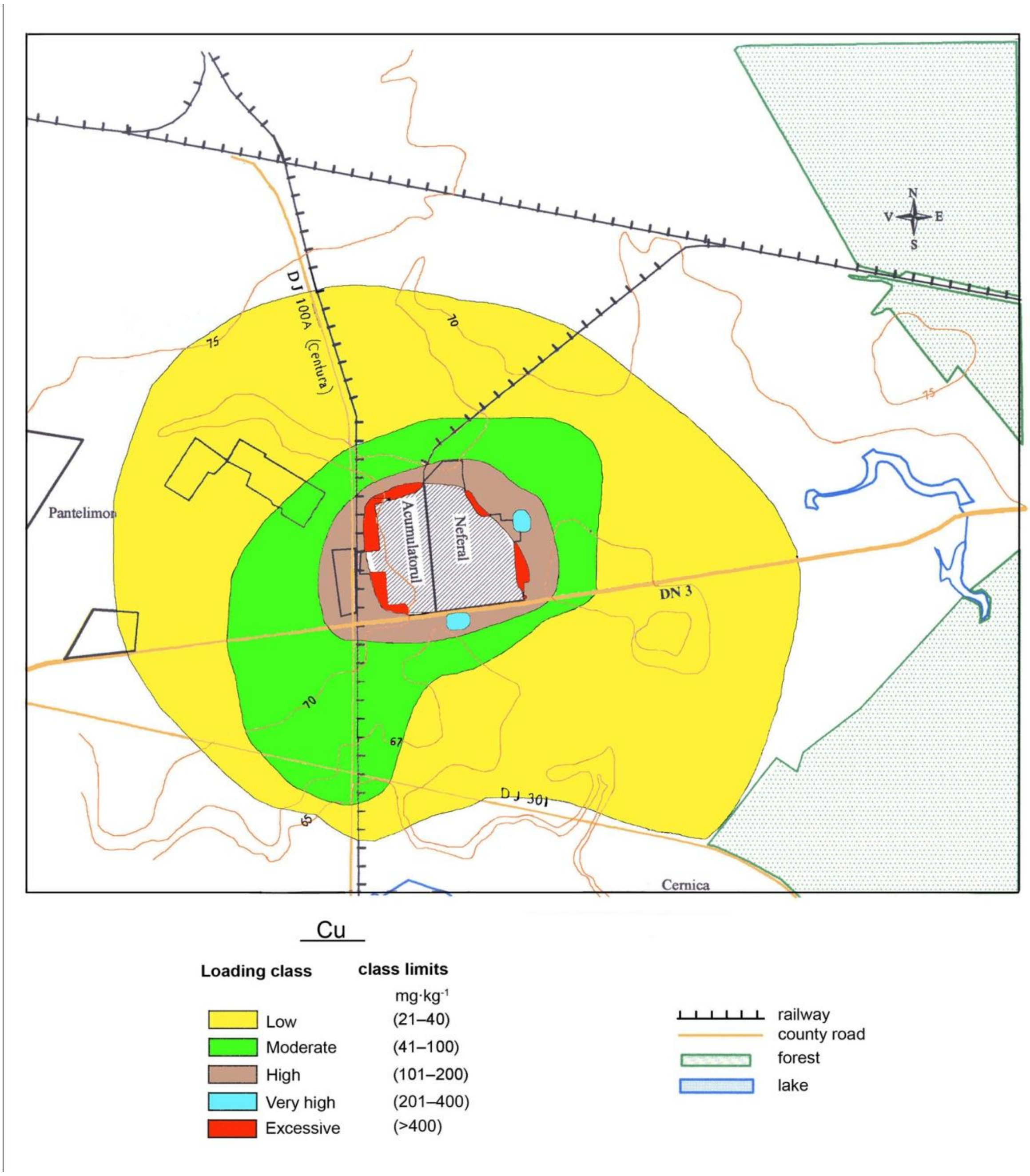

Figure 6. The soil surfaces affected with Cu within Neferal-Acumulatorul area

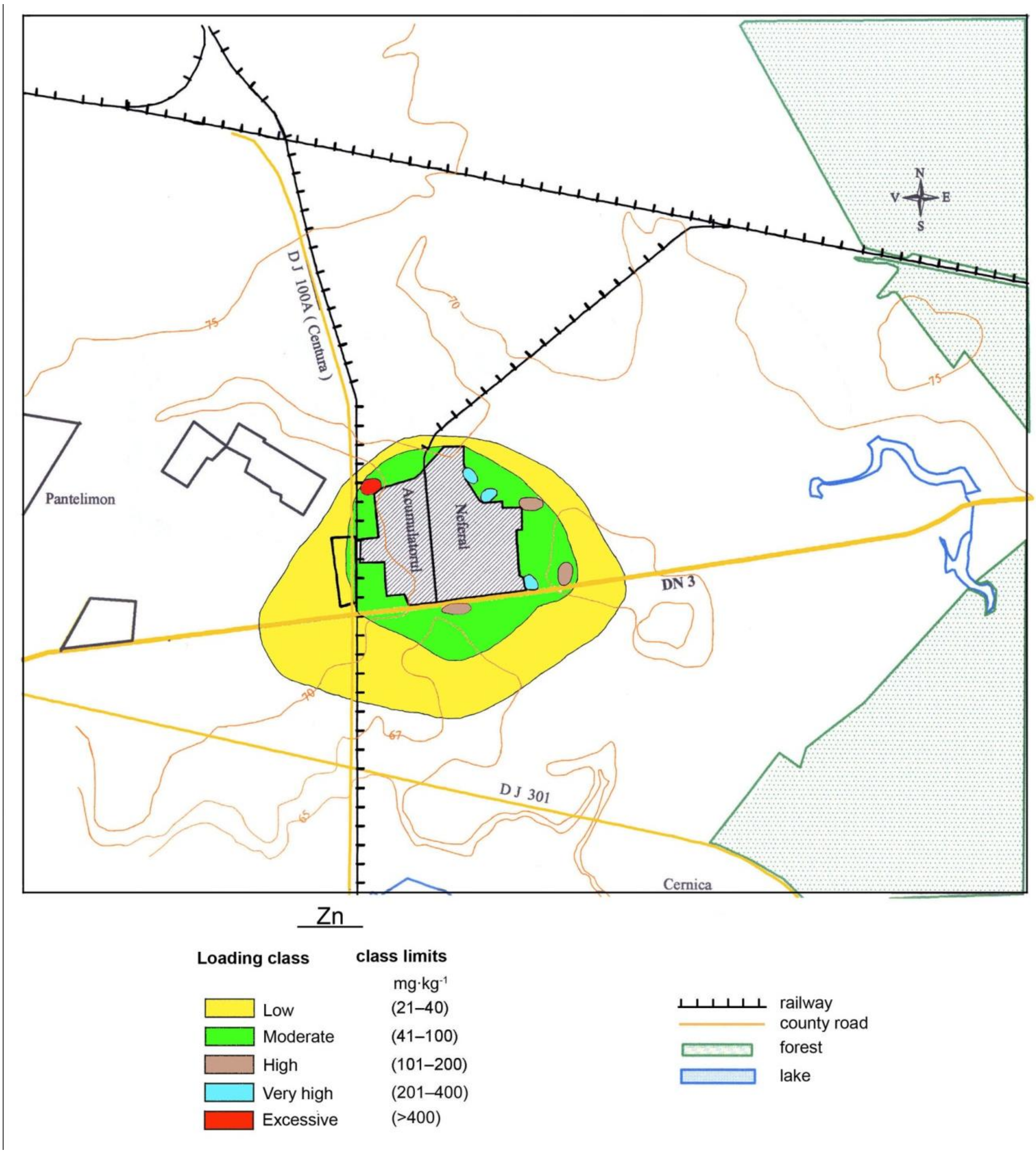

Figure 7. The soil surfaces affected with Zn within Neferal-Acumulatorul area

CONCLUSIONS

1. High values of the heavy metals concentrations (Cu, Pb, Zn, Cd) were detected in the areas affected by the non-ferrous metalurgy: Copsa Mică and Neferal – Acumulatorul
2. High variability of range of metals contents within one site and between the two sites have been established.
3. The total contents of heavy metals in some soils in Copș a Mică area exceed the alert and intervention thresholds, special for Cd, Zn and Pb.
   Heavy metals soil pollution affected about 8400 ha, from a total studied area of 8500 ha.
4. Pb, Cu and Zn pollution affected about 1300 ha placed around Neferal-Acumulatorul area.

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INDICATORI AI PEDODIVERSITĂŢII ÎN CÂMPIA BĂRĂGANULUI CENTRAL

INDICATORS OF PEDODIVERSITY IN THE CENTRAL BĂRĂGAN PLAIN

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Keywords: spatial pedodiversity, indicators, soil cover, Central Baragan Plain

REZUMAT

Conceptul de pedodiversitate se referă atât la modul de formare a solurilor (diversitate genetică), cât şi la modelele diferite de dispunere a lor în teritoriu (diversitate spaţială) şi reflectă atât modul geometric de distribuţie în teritoriu a solurilor cât şi deosebirile calitative dintre solurile componente ale învelişului de sol (Florea, 2009). Învelişul de sol al Câmpiei Bărăganului Central a fost analizat din punct de vedere morfometric, fiind calculaţi şi interpretaţi următorii indicatori ai pedodiversităţii: variabilitatea, ponderea solurilor, indicele topopedogeografic, mărimea arealelor, suprafaţa medie şi indicele de complexitate. Valorile acestor indicatori au fost calculate pe baza hărţii solurilor la scara 1:200.000 şi reflectă influenţa factorilor pedogenetici în formarea solurilor.

În Câmpia Bărăganului Central, la nivel de clasă de sol, predomină clasa cernisoluri, cu 87,76 %, urmată de clasele protisoluri, cu 10,81%, salsodisoluri, cu 1,03%, hidrisoluri, cu 0,24% şi antrisoluri, cu 0,15%.

ABSTRACT

The concept of pedodiversity refers both to the formation of soils (genetic diversity) and to the different patterns in territory (spatial diversity) and reflect the qualitative differences between the components of the soil cover (Florea, 1997, 2009).

The soil cover of the Central Plain Baragan was analyzed from morphometric point of view. Have been calculated and interpreted the following pedodiversity indicators: variability, weight, topo-pedo-geographical index, size, mean area and complexity index. The values of these indicators were calculated on the basis of soil map scale 1:200.000 and reflect the influence of pedogenetic factors in soil formation.

In the Central Baragan Plain the soil class of Cernisols prevails, with 87.76%, followed by Protisols, with 10.81%, *Salsodisols (*1.03%*), Hydrisols, (*0.24%*) and Antrisols (*0.15%).

INTRODUCTION

Pedodiversity express quantitatively differences between the soils patterns distribution, and refers to the soil type, the surface occupied in territory and the mode of distribution. The concept of pedodiversity refers both to the soils formation (genetic diversity) and to the different patterns in territory (spatial diversity) and reflects the qualitative differences between the components of the soil cover (Florea, 1997, 2009).

Genetic pedodiversity analyzes the soils formation and the indicators expressing the state of development of the soil cover (Demeter and Geanana, 2001).

Spatial pedodiversity indicates the complexity of the soil cover, soil differences (contrast) and the pedogeographical heterogeneity, which are important features of the soil cover assemblage (Florea, 1997).

The purpose of this paper is to briefly describe the indicators which characterize the spatial pedodiversity in the Central Baragan Plain.

The Central Baragan Plain is situated in the south-east part of the country, in the eastern part of the Romanian Plain and overlaps the Ialomita-Calmatui interfluve. The floodplains of these two rivers represent the southern and the northern limits of the plain.

On the northern part of the plain is developed an Aeolian relief, with large waving areas and elongated Aeolian depressions. On the central and the southern part, the plain incline very slow to the Ialomita meadow and many microdepressionary areas are present.

The parent materials of the soils are loess and loess-like deposits which are covered, in the north part of the plain, with aeolian reworked sands.

The climate is temperate continental with a big degree of continentally, and is characterized by: medium annual temperature less than 10,5° C in the west part (10,4° C) and more than this value in the eastern part of the plain (10,6° C); the July temperatures vary from 22,4° C to the west and 22,7° C to the east, and the January temperatures vary from -3,1° C to the west and -3,2° C to the east. Medium annual precipitations are between 450 and 500 mm (the values decrease from the west to the east).

Natural spontaneous vegetation of the Central Baragan Plain is characteristic to the steppe area; now, the natural vegetation has been replaced by agricultural lands (Gherghina et. .al, *in press*).

MATERIAL AND METHODS

The soil cover of the Central Baragan Plain was analyzed from morphometric point of view. The following indicators have been calculated and interpreted: the soil variability, the soil percentage, topo-pedo-geographical index, size, mean area and complexity index. The values of these indicators have been calculated using the formulas listed in Table 1, based on soil map scale 1:200.000.

Table 1

Formulas of the pedodiversity indicators

No.	Indicator	Formula
1	Soil variability	The number of soil units
2	Soil percentage	Ps =Sa/S x 100
3	Topo-pedo-geographical index	$Itp = \frac{\text{Azonal soils (\%, km}^2\text{)}}{\text{Zonal soils (\%, km}^2\text{)}}$
4	Mean area	Sn =∑Si/h
5	Complexity index	$Ic = \frac{n}{S(\mathrm{km}^2)}$

The symbols significance in the formulas is as follows:

- Sa - the surface of each soil unit
- S - total area of the plain
- Si - the area of each soil polygon
- h - the number of areas from a soil unit
- n - the total number of soil areas.

The soil names were given in agreement with the World Reference Base for Soil Resources (IUSSISRIC-FAO, 2006).

RESULTS AND DISCUSSIONS

Soil variability, defined by the number of soil units in a territory, has value 38 for the Central Baragan Plain, divided as follows: 27 units in the field interfluve and 11 units in the Ialomita meadow (Fig. 2, Table 2).

The *soil percentage* is calculated by dividing the area of a soil polygon to the total area of the plain.

In the Central Baragan Plain as soil class level, predominant are Cernisols, with 87.76%, followed by Protisols, with 10.81%, Salsodisols, with 1.03%, Hydrisols, by 0.24% and Antrisols, with 0.15% (Fig. 1).

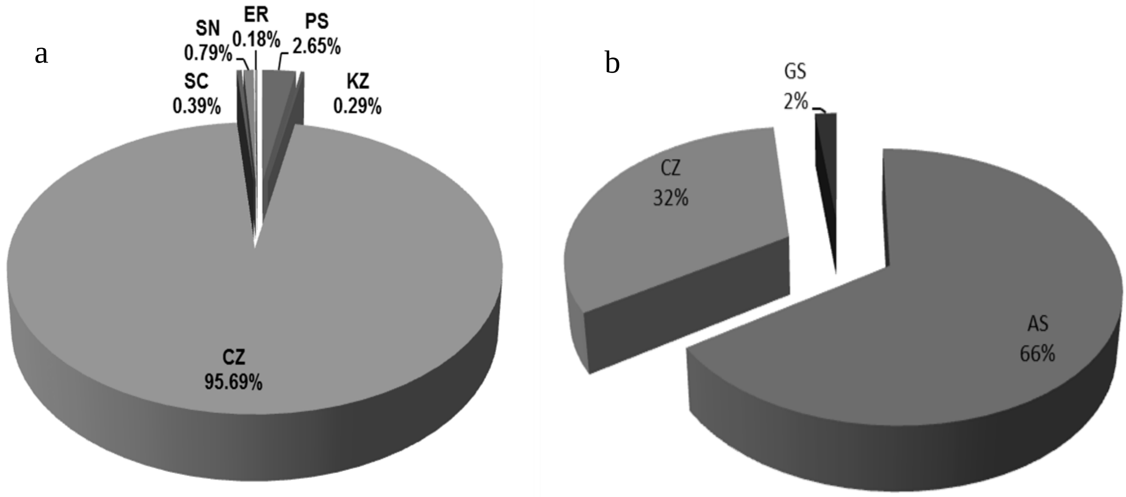

Fig.1. Percentage share of soil types: a) on the field interfluve and b) on Ialomita meadow

On the field interfluve, the prevalent soil types are Chernozems, with 95.69% followed by Arenosols with 2.65%, Solonetz with 0.79%, Solonchaks, 0.39 % Kastanozems with 0.29%, and eroded Regosols with 0.18%. On the Ialomita meadow prevalent are Fluvisols (66%), followed by fluvic Chernozems (32%) and Gleysols (2%).

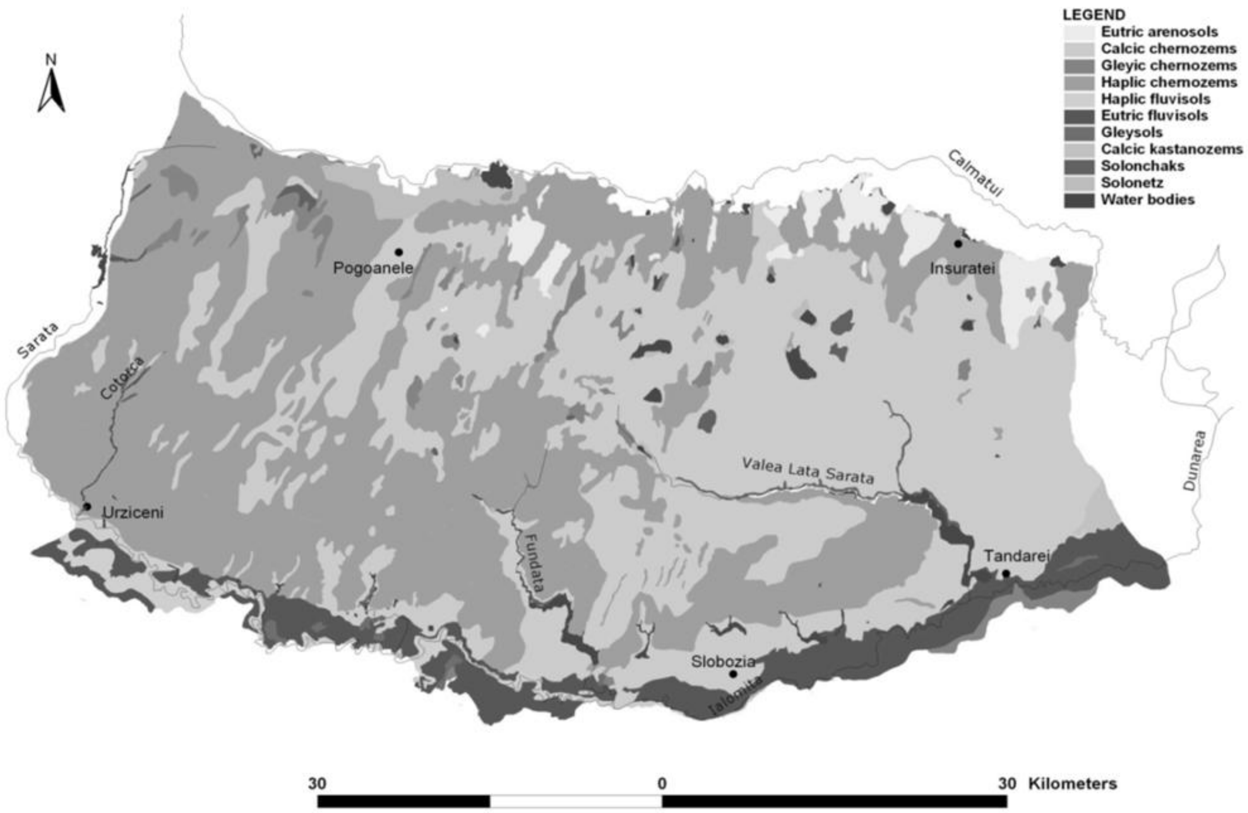

Fig. 2. The soil map of the Central Bărăgan Plain

Table 2

Numerical features of the soil units

No.	Soil units	Area		Areal number	Mean area km^2
		km^2	%		
1	Eutric Arenosols and cambic Chernozems	83.83	2.50	15	5.59
2	Eutric Arenosols and Sands	5.21	0.16	2	2.60
3	Calcaro-calcic Kastanozems	9.78	0.29	1	9.78
4	Calcaro-calcic Chernozems	74.63	2.22	14	5.33
5	Calcaro-calcic Chernozems (on aeolian relief)	11.24	0.34	1	11.24
6	Calcaro-calcic Chernozems (vermic)	247.84	7.39	10	24.78
7	Calcic Chernozems (vermic)	735.42	21.92	35	21.01
8	Calcic Chernozems with shallow groundwater	442.49	13.19	56	7.90
9	Calcic Chernozems and haplic Chernozems, on aeolian relief	52.27	1.56	5	10.45
10	Calcic Chernozems and haplic Chernozems, with shallow groundwater (on aeolian relief)	44.52	1.33	2	22.26
11	Calcic Chernozems (eroded phase)	25.84	0.77	14	1.85
12	Haplic Chernozems	545.63	16.26	39	13.99
13	Haplic Chernozems with shallow groundwater	520.76	15.52	21	24.80
14	Cambic Chernozems (on aeolian relief)	242.73	7.24	24	10.11
15	Haplic Chernozems, with shallow groundwater (on aeolian relief)	43.48	1.30	8	5.44
16	Haplic Chernozems, eutric and haplic Arenosols (eroded phase)	11.10	0.33	1	11.10
17	Gleyic - Haplic chernozems	51.87	1.55	8	6.48
18	Haplic Chernozems and luvic Chernozems (in microdepressions)	11.76	0.35	28	0.42
19	Haplic Chernozems and luvic Chernozems with shallow groundwater (in microdepressions)	12.41	0.37	14	0.89
20	Gleyic Chernozems	105.65	3.15	64	1.65
21	Gleyic-salic Chernozems	20.12	0.60	16	1.26
22	Hyposodic Chernozems	10.36	0.31	9	1.15
23	Haplic Solonchaks and endosalic Solonetz	13.14	0.39	41	0.32
24	Haplic Solonetz	0.81	0.02	20	0.04
25	Haplic Solonetz and haplic Solonchaks	2.94	0.09	14	0.21
26	Haplic Solonetz	22.86	0.68	20	1.14
27	Haplic Regosols	5.97	0.18	10	0.60
28	Water bodies	6.62			
29	Bogs	3.64			
	Total field interfluve	**3364.92**	**86.80**	**492**	**6.82**
1	Haplic Fluvisols	64.68	12.95	10	6.47
2	Haplic – gleyic Fluvisols	0.26	0.05	4	0.07
3	Haplic - salic Fluvisols	0.37	0.07	1	0.37
4	Eutric Fluvisols	139.91	28.02	23	6.08
5	Gleyic Fluvisols	96.69	19.36	25	3.87
6	Salic Fluvisols	25.84	5.17	9	2.87
7	Calcaro-calcic - fluvic Chernozems	9.76	1.95	2	4.88
8	Gleyic-fluvic chernozems	122.88	24.61	22	5.58
9	Hyposalic-fluvic chernozems	19.82	3.97	7	2.83
10	Hyposalic-fluvic - gleyic chernozems	10.08	2.02	2	5.04
11	Fluvic gleysols	9.10	1.82	8	1.14

12	Water bodies	0.56			
	Total meadow	**499.95**	**12.92**	**113**	**4.42**
	Total	**3864.87**	**100**	**625**	**6.39**

Calcic Chernozems occupies the largest area (735.42 km^2), respectively 21.92%, followed by haplic Chernozem (545.63 km^2), with 16.26% and haplic Chernozem with shallow groundwater (520.76 km^2), with 15.52%. The smallest polygons are occupied by haplic Solonetz (0.81 km^2), with 0.002% and haplic Solonetz associated with haplic Solonchaks (2.94 km^2), with 0.09% (Fig. 2).

In the Ialomita meadow haplic Fluvisols occupy the largest area (139.91 km^2), with 28.02%, followed by gleyic-fluvic chernozem (122.88 km^2), with 24.61%. Haplic-gleyic Fluvisols unit has the smaller area (0.26 km^2), with 0.05%, followed by haplic-salic Fluvisols (0.37 km^2), with 0.07%.

The *mean area is* the ratio between the amount of each soil polygon included in a soil unit and the number of polygons.

In the Central Baragan Plain the mean area of the soil units is 6.39 km^2. On the field interfluve the value is slightly higher, 6.82 km^2 respectively, due to reduced variability of pedogenetic factors, while in the Ialomita Meadow, which presents more varied conditions, the mean area is 4.42 km^2.

Topo-pedo-geographical index (Itp) is the ratio between the area occupied with zonal soils and the area occupied with azonal soils. The reference value of the topo-pedo-geographical index is 1. Up to this value, the azonal soils prevail in a territory (Florea et.al., 1996).

The azonal soils whose formation is determined by local conditions (rocks, excess moisture, slope, age), are represented by Arenosols, Gleysols, Solonchaks, Solonetz and also by gleyic, salic and eroded soil types. Chernozem formed on aeolian deposits and those formed on microdepressions (haplic and luvic Chernozems) are also included in the same category.

The zonal soils are determined by bioclimatic conditions and are represented by Kastanozems and calcic and haplic Chernozems.

For the soil cover of the Central Baragan Plain (interfluvial area), Itp = 778.11 / 2576.56 = 0.3, which means that the zonal soils are prevalent.

On Mohreanu Field the value Itp is 0.23. The zonal soils are represented here by calcaro-calcic and calcic chernozem (both vermic), and the azonal soils are represented by cambic chernozems formed on aeolian deposits.

Itp has the lowest values on the Amara Field (0.05), Urziceni Field (0.10) and Tataru Field (0.14). These subunits have the highest degree of homogeneity of environmental conditions.

The maximum value of Itp is recorded in the Pogoanele Field, respectively 0.69 and is due to the effects of the shallow groundwater (3-5 m) and to diversity of parental materials, respectively aeolian sand in the northern part of the field, sandy loess in the central part and loess deposits in the south. The presence of microdepressions, also, determines the formation of azonal soils.

The complexity index is calculated as ratio between the number of soil polygons and the total area of a territory, and expresses the variety of the soil cover.

In the Central Baragan Plain, the complexity index is equal to 0.16, indicating a reduced complexity of the soil cover. The complexity slightly increases on the Ialomita meadow, to 0.23, and decreases to 0.15 on the interfluve.

CONCLUSIONS

5. On the Central Baragan Plain the chernozems are prevalent (more than 90% of the plain area), and calcic and haplic subtypes are the most developed ones.
6. They are associated on the central part of the plain, with solonchaks, solonetz and gleyic chernozems, as azonal soils, which formation is caused by the shallow groundwater and by the presence of the depressionary areas.
7. The highest degrees of homogeneity of environmental conditions have Amara, Urziceni and Tataru Fields.
8. The great variety of pedological factors in the Pogoanele Field leads to the development of azonal soils, as is reflected in the value of the topo-pedo-geographical index (0.69).
9. The value of the complexity index indicates a reduced complexity of the soil cover in the Central Baragan Plain.

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CERCETĂRI PRIVIND EFECTUL SISTEMELOR TEHNOLOGICE ASUPRA GRADULUI DE TASARE AL PRELUVOSOLULUI ROŞCAT DE LA S.D. BANU MĂRĂCINE, LA CULTURA DE PORUMB BOABE

RESEARCHES ON THE EFFECT OF TECHNOLOGICAL SYSTEMS ON THE COMPACTION DEGREE OF THE REDDISH PRELUVOSOIL FROM D.E.S. BANU MARACINE WITH THE CORN CROP

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Key words: compaction degree, reddish preluvosoil, texture

REZUMAT

Lucrarea prezintă influența sistemelor de lucrare a solului, asupra gradului de tasare al tipului de sol preluvosol roşcat, la cultura de porumb boabe. Gradul de tasare este un indicator complex care include atât densitatea aparentă cât şi porozitatea totală în corelație cu textura. A fost determinat sub diferite lucrări aplicate solului: arătură adâncă, arătură superficială, discuit şi semănat direct.

ABSTRACT

The paper presents the influence of tillage on the compaction degree of reddish preluvosoil with the corn crop. The compaction degree is a complex indicator that includes the bulk density and the total porosity in relation with the texture. The treatments were: deep plow, shallow plow, disc and direct drill.

INTRODUCTION

Tillage have complex effects on physical, chemical and biological features of soil. The main objective of tillage is creating life conditions for plants.

The influence of tillage on soil preserving is related with: soil structure, humus content, bulk density, porosity, water regime, nutrients, soil biota.

MATERIAL AND METHOD

Within 2006-2007 period, on the reddish preluvosoil from D.E.S. Banu Maracine there was set up an experiment with corn that researched the influence of some physical features of this kind of soil.

The D.E.S. Banu Maracine is located at the souther limit of Getic Plateau being part of the low hilly zone of Oltenia.

The reddish preluvosoil where the experiment took place has the following soil profile: Ao-AB-Bt_1-Bt_2-C.

This kind of soil is compacted at the soil surface, the bulk density being of 1.36 g/cm^3 into Ao horizon, the total porosity is of 49% and the penetration resistance of 32 kgf/cm^2. It has an average to low humus content of 2.52% within the first horizon and under 1.0% in the B horizons.

The total nitrogen content is of 0.131% within the first horizon and it strongly decreases under 0.056% in the inferior horizons that indicates an average supplying to low. The soil reaction is low acid, the pH value being between 6.06 and 6.47.

Generally, there can be appreciated that the reddish preluvosoil is average supplied by humus and nutrients.

The experiment was stationary and comprised the following variants:

-V_1 (Ctrl) – deep plow (21-25 cm) + disc harrow;

- V_2 – shallow plow (13-17 cm);

- V_3 – disc harrow (2 passes);

- V_4 – direct drill (no-tillage).

The compaction degree (CD%) was calculated with the following formula:

CD = MNP – TP/MNP x 100; [% v/v]

where: MNP – minimal needed porosity that vary in function of the soil clay content (after Stanga) and is calculated with the following formula:

MNP = 45 + 0.163 x A

TP – total porosity, in % v/v

A – clay content < 0.002 mm within the studied soil layer [% g/g];

The interpretation scale of the compaction degree is presented in the table 1 of which there results that the zero value separates the loosened soil from the compacted ones.

Table 1.

Classes of values of the compaction degree (I.C.P.A., 1987, vol 3)

Specification	Values
Extremelly low (very loosened soil)	Under – 17
Very low (moderatelly loosened soil)	- 17….- 10
Low (low loosened soil)	- 9….0
Average (low compacted soil)	1….10
High (moderately compacted soil)	11….18
Very high (very compacted soil)	Over 18

RESULTS AND DISCUSSIONS

The results from 2006 demonstrates that with the corn crop the deep plow loosens the soil best, followed by the shallow plow and disc harrow. The value of the compaction degree on 0-10 cm depth with the deep plow indicates a moderatelly loosened soil. With the shallow plow and disc harrow one the value of the compaction degree has been of -8.5% that means low loosened soil. With the direct drill variant we have the same low loosened soil, too, the value of the compaction degree being of -2.2%.

On the 10-20 cm depth the values of the compaction degree show a low loosened soil with V_1, V_2 and V_4 variants and with the disc harrow variant a low compacted soil (1.8%).

On the 20-40 cm depth with the V_1 variant there is maintained the influence of the deep plow, the soil being low loosened while with the other variants the soil becomes low compacted. Under 40 cm depth the soil is low compacted with all variants.

During the vegetation period till harvesting the compaction has encountered light increases, the values of the compaction degree recorded under 20 cm depth showing a soil low to moderately compacted.

On the 0-10 cm depth the soil becomes low loosened with all variants and on 10-20 cm depth there is still the influence of the deep plow, the soil being low loosened while with the other variants is low compacted. With the disc harrowed variant the soil becomes moderatelly compacted under 40 cm depth (Table 2, fig. 1)

Table 2.

Soil tillage influence on the degree of compaction (CD,%) in maize crop for grains (2006)

Phenophase	Depth (cm)	Variant			
		V_1 Deep plow	V_2 Shallow plow	V_3 Disc harrow	V_4 No till
5-6 leaves (June 2006)	0-10	-10,6	- 8,5	- 8,5	- 2,2
	10-20	- 4,3	- 0,2	1,8	- 0,2
	20-40	- 0,2	5,9	7,9	1,8
	40-60	7,9	7,9	10,0	7,9
Grain formation	0-10	- 6,4	- 4,3	- 4,3	- 0,2
	10-20	- 4,3	- 2,2	1,8	- 0,2
	20-40	0,2	3,8	7,9	3,8
	40-60	7,9	7,9	12,o	7,0
Harvest (october)	0-10	- 2,2	- 2,2	- 0,2	- 0,2
	10-20	- 0,2	1,8	6,0	1,8
	20-40	5,9	7,9	10,0	5,9
	40-60	10,0	10,0	12,0	10,0

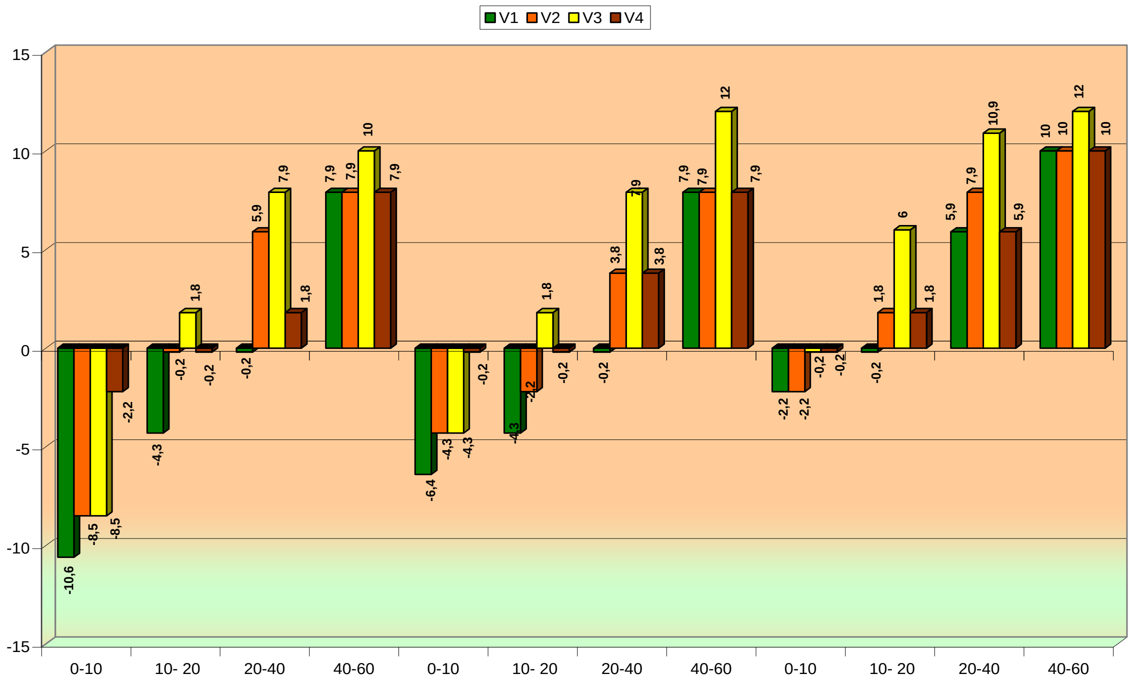

Fig. 1. Soil tillage influence on the degree of compaction (CD,%) in maize crop for grains (2006)

Table 3.

Soil tillage influence on the degree of compaction (CD,%) in maize crop for grains (2007)

Phenophase	Depth (cm)	Variant			
		V_1 Deep plow	V_2 Shallow plow	V_3 Disc harrow	V_4 No till
5-6 leaves (June 2006)	0-10	- 6,4	- 4,3	- 4,3	- 2,2
	10-20	- 4,3	- 2,2	1,8	1,8
	20-40	3,8	7,9	10,0	5,9
	40-60	7,9	12,0	12,0	10,0
Grain formation	0-10	- 4,3	- 2,2	- 2,2	- 0,2
	10-20	- 0,2	- 0,2	3,9	1,8
	20-40	3,8	5,9	10,0	5,9
	40-60	7,9	14,1	14,1	10,0
Harvest (october)	0-10	- 2,2	- 0,2	- 0,2	- 0,2
	10-20	- 0,2	1,8	6,0	3,9
	20-40	5,9	5,9	12,0	5,9
	40-60	10,0	10,0	14,1	10,0

The determinations from 2007, June, indicates a compaction on the tillage depth in function of the tillage applied.

In this way, on 0-10 cm depth, with all variants, the values of the compaction degree indicate a low loosened soil. On 10-20 cm depth the soil maintains low loosened only with the variants where deep plow was made and shallow plow while with the disc harrowed and no till the soil became low compacted.

On the 20-40 cm depth the soil is still low compacted with all treatments. With shallow plow, disc harrow and no till the soil become moderatelly compacted on 40-60 cm depth being still low compacted with the deep plow variant.

After the corn vegetation period the soil is low loosened on 0-10 cm with all variants. It is still low loosened with 10-20 cm depth only with deep plow while the all other variants become low compacted.

Under 20 cm depth the soil is still low compacted with all variants excepting disc harrow variant where the soil became moderatelly compacted (Table 3, fig. 2).

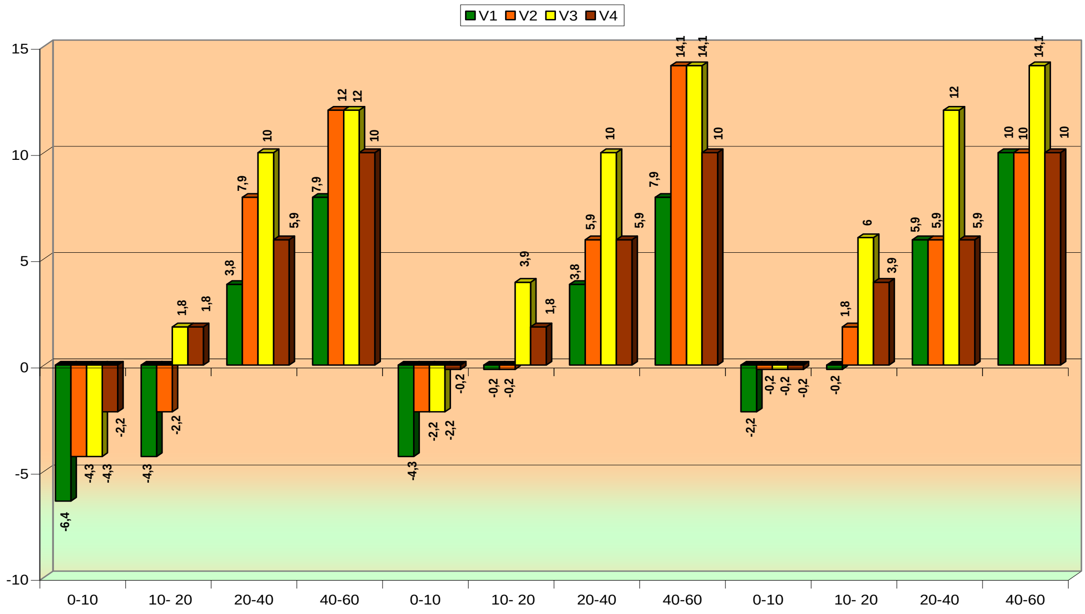

Fig. 2. Soil tillage influence on the degree of compaction (CD,%) in maize crop for grains (2007)

CONCLUSIONS

- within the vegetation period there was observed a compaction of soil in function of the tillage on depth;
- with the first variant where the soil was deep plowed there was noticed a loosening on the first two depths;
- with the disc harrowed variant the soil has recorded the highest compaction due to the passing of the machinery and due to the depth of this tillage;
- with the direct drilled variant the soil has recorded the slighest compaction both on depth and while the corn vegetation period.

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MONITORIZAREA PIERDERILOR DE ELEMENTE NUTRITIVE PRIN SCURGERI LICHIDE SI SOLIDE IN PARCELE STANDARD PENTRU CONTROLUL EROZIUNII ÎN PUNCTUL EXPERIMENTAL PREAJBA – GORJ ÎN ANUL 2009

THE MONITORING OF NUTRIENT LOSSES BY RUNOFF, ON STANDARD PLOTS FOR EROSION CONTROL, IN THE EXPERIMENTAL POINT PREAJBA – GORJ, 2009

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Key words: erosion, standard plots, maize, grass

REZUMAT

În anul 2009, în punctul experimental Preajba – Gorj, s-a realizat monitorizarea pierderilor de elemente nutritive prin scurgeri lichide si solide în parcele standard pentru controlul eroziunii, Experiențele au fost amplasate pe luvosolul de la Preajba-Gorj si au cuprins 9 variante în 5 repetiții.

În urma cercetărilor efectuate se constată că pierderile totale de sol în perioada de observație sunt cuprinse între 0,82-1,66 t/ha, mai scăzute la pajiştea naturală şi semănată şi mai ridicate la cultura de porumb.

Având în vedere scurgerile de sol pe 4 luni de observație se poate aprecia că într-un an de zile, pierderile de sol pot atinge valori cuprinse între 3,3 – 3,5 t/ha pe pajiştea naturală şi semănată şi 6,24 – 6,44 t/ha la cultura de porumb

ABSTRACT

In 2009, in the experimental point Preajba - Gorj, was performed a monitoring of nutrient losses by runoff, on standard plots for erosion control.
The experiment, with 9 variants in 5 replicates, was located on the Preajba Gorj Luvisol.
Following research finds that the total loss of soil in the observation period ranged from 0.82 to 1.66 t/ ha: lower in the natural and seeded grassland and higher in the maize plots.
Given soil loss on the four months of observation it can be appreciated that in a year soil losses can reach values between 3.3 - 3,5 t/ha on the natural and seeded grass and 6.24 - 6.44 t/ha for the maize plots.

INTRODUCTION

Data from the National System of Soil Quality Monitoring (inventory made by INCDPAPM – ICPA Bucharest in collaboration with OSPA from 41 counties and other research units) showed that about 12 million hectares of agricultural land, of which about 7.5 million ha of arable land are affected by one or more restrictive factors (water deficit, erosion, acidity, small reserves of humus) which lead to deterioration of the soil characteristics and its functions.

In order to study thoroughly the degradation of soil quality was performed a monitoring of nutrient losses by liquid and solid leakage on standard plots for erosion control. The experiment was set in the experimental point Preajba - Gorj, in 2009.

MATHERIALS AND METODS

The experiment, with 9 variants in 5 replicates, was located on the Preajba Gorj Luvisol. The 9 experimental plots, with a 5% slope, included the following cultures and treatments:

1. unfertilized natural grass;
2. natural grass fertilized with N138;
3. natural grass fertilized with N162P81K100;
4. unfertilized seeded grass;
5. seeded grass fertilized with N138;
6. seeded grass fertilized with N162P81K100;
7. unfertilized maize;
8. maize fertilized with N138;
9. maize fertilized with N162P81K100.

Each experimental plot had 100 sq m area (4/25 m). To avoid the influence of leakage from one plot to another, each plot was bordered by means of plastic plates, with dimensions of 5000/250/50, which were introduced into the soil to a depth of 100 m.

In the downstream part of the plot was build a system consisting of a triangle of concrete with a collector tube that drains in a collecting vessel. At the end of the collector tube was installed a dividing plate with seven openings. Each opening has been divided into 7 parts so that the drain collected will represent only the 49^{th} part of the total amount of liquid and solid leakage from the 100 sq. m plot.

RESULTS AND DISCUSSIONS

The upstream and downstream of the experimental plots were soil sampled. The chemical characteristics of the soils are presented in Table 1.

Monthly in the sumps was collected the 49th part of the total amount of liquid and solid leakage from the plot. The suspensions were filtered in the laboratory. The filter paper retained the eroded soil and the soil that was carried along by the water. The soil was weighed in the laboratory and soil loss was calculated per plot and then reported to the hectare. The results obtained in this way are listed in Tables 2-5 for June, July, August and October.

In June the total rainfall was 69.2 mm: on June 6^{th} – 15,2 mm, on June 15^{th} – 17.3 mm, on June 21^{st} – 11.4 mm and on June 24^{th} – 20.3 mm. There were collected different amounts of water and soil depending on the plants cultivated on the plots. (Table 2)

The largest amounts of water and soil collected were recorded in the three variants cultivated with maize: from 3.48 to 3.72 m^3/ha water and 0.41 to 0.43 t/ha. The maize crop was seeded at 70 cm distance between rows. Because of the use of the hoeing machine the soil was easily carried along by the water from the rainfall.

The smallest losses of water and soil were recorded on the natural grass: 1.80 to 2.16 m^3 water/ha and 0.21 t/ha eroded soil. The natural grass has a well developed root system which secures the soil and prevents the erosion of it.

Table 1

Analytical data of the soil samples

Plot	Variant	Sampling point	pH	Nt (%)	P ppm	K ppm	Cu DTPA ppm	Zn DTPA ppm	Fe DTPA ppm	Mn DTPA ppm
Maize										
P7	Unfertilized	Upstream	4,94	0,25	5,94	81,66	0,77	0,61	58,94	84,78
	Unfertilized	Downstream	5,17	0,24	5,94	62,5	0,64	0,52	60,16	44,90
P9	N162P81K100	Upstream	4,65	0,19	29,00	83,33	0,90	0,60	74,92	97,82
	N162P81K100	Downstream	4,87	0,23	36,16	125,0	0,79	0,74	89,08	63,76
P8	N138	Upstream	4,95	0,22	24,28	125,0	0,70	0,61	68,66	82,52
	N138	Downstream	4,85	0,21	29,00	98,33	0,50	0,49	77,20	59,96
Seeded grass										
P4	Unfertilized	Upstream	5,08	0,23	16,07	100,8	0,75	0,76	51,52	71,02
	Unfertilized	Downstream	5,15	0,21	25,50	51,66	0,57	0,58	67,74	42,26
P6	N162P81K100	Upstream	5,33	0,23	11,88	80,00	0,68	0,45	50,28	60,82
	N162P81K100	Downstream	5,11	0,27	4,89	48,33	0,56	0,41	59,18	51,58
P5	N138	Upstream	5,24	0,35	11,88	62,50	0,67	0,51	56,72	65,04
	N138	Downstream	5,11	0,25	10,83	59,17	0,51	0,48	56,76	49,88
Natural grass										
P1	Unfertilized	Upstream	5,10	0,30	37,73	56,66	0,52	0,82	82,68	31,22
	Unfertilized	Downstream	5,33	0,27	11,88	46,66	0,95	0,66	112,2	38,26
P3	N162P81K100	Upstream	5,19	0,33	5,94	81,66	0,62	0,55	59,90	30,88
	N162P81K100	Downstream	5,17	0,29	17,82	32,50	0,70	0,53	75,08	40,48
P2	N138	Upstream	5,01	0,35	25,50	66,66	0,60	0,65	75,20	36,56
	N138	Downstream	5,17	0,23	10,83	32,50	0,92	0,69	82,46	35,64

Smaller losses of water and soil (1.80 to 2.40 m^3/ha and 0.20 to 0.24 t/ha) are also recorded on the seeded grass.

In July the total rainfall was 50.8 mm: on July 11^{th} – 19.1 mm, on July 12^{th} – 13.2 mm, on July 19^{th} – 18.5 mm. The amounts of water and soil which were collected are listed in Table 3. Again, the largest amounts of losses were recorded on the plots cultivated with maize.

In August the total rainfall was 41.1 mm and in October 46.5 mm. The liquid and solid losses from the experimental plots follow the same pattern as they did in June and July. (Tables 4 and 5)

In September there were no liquid and solid losses as there was no precipitation.

Table 2

Water and soil losses in June, 2009

Variant	Liquid leakages		Solid leakages		Rainfall
	l/plot	m^3/ha	g/plot	t/ha	
Maize NPK	6,2	3,72	43,2	0,43	08.06 – 15,2 mm, 15.06. – 17,3 mm, 21.06. – 11,4 mm, 24.04 – 20,3 mm. Total 64,2 mm iunie
Maize N	5,8	3,48	42,4	0,42	
Maize control	5,9	3,54	41,9	0,41	
Natural grass NPK	3,1	1,88	21,1	0,21	
Natural grass N	3,6	2,16	21,3	0,21	
Natural grass control	3,0	1,80	21,4	0,21	
Seeded grass NPK	3,0	1,80	23,1	0,23	
Seeded grass N	3,2	1,92	24,4	0,24	
Seeded grass control	4,0	2,40	21,1	0,20	

Table 3

Water and soil losses in July, 2009

Variant	Liquid leakages		Solid leakages		Rainfall
	l/plot	m^3/ha	g/plot	t/ha	
Maize NPK	5,70	1,14	44,70	0,44	11.07 – 19,1 mm, 12,07 – 13,2 mm, 19.07 – 18,5 mm. Total 50,8 mm
Maize N	4,64	0,93	44,20	0,43	
Maize control	4,80	0,96	43,50	0,42	
Natural grass NPK	2,95	0,59	24,00	0,23	
Natural grass N	2,60	0,52	24,50	0,24	
Natural grass control	2,75	0,55	23,55	0,23	
Seeded grass NPK	2,10	0,42	21,60	0,21	
Seeded grass N	3,20	0,64	22,50	0,22	
Seeded grass control	2,90	0,58	22,10	0,21	

The different doses of fertilizers used do not affect the solid or liquid leakage from the experimental plots.

Summing up the values from Tables 2-5 we obtain the total amount of soil loss recorded during the observation period June to October 2009. The results are listed in Table 6.

The rainfall in the four months of observation were 202.6 mm (2026 m^3/ha). The volume of water that leaked down the slope varies between 1.96 m^3/ha at the green plots and 4.74 m^3/ha at the maize plots.

Table 4

Water and soil losses in August, 2009

Variant	Liquid leakages		Solid leakages		Rainfall
	l/plot	m^3/ha	g/plot	t/ha	
Maize NPK	5,15	1,03	48,30	0,48	5.08 – 10,9 mm, 8.08 – 11,6 mm, 24.08 – 18,6 mm Total 41,1 mm
Maize N	4,67	0,93	42,65	0,42	
Maize control	2,12	0,44	43,70	0,43	
Natural grass NPK	3,85	0,77	20,06	0,20	
Natural grass N	1,85	0,37	22,30	0,22	
Natural grass control	2,36	0,44	22,50	0,22	
Seeded grass NPK	2,2	0,44	21,90	0,21	
Seeded grass N	1,72	0,34	21,75	0,21	
Seeded grass control	2,3	0,46	20,65	0,20	

Table 5

Water and soil losses in October, 2009

Variant	Liquid leakages		Solid leakages		Rainfall
	l/plot	m^3/ha	g/plot	t/ha	
Maize NPK	6,65	1,33	31,8	0,31	03.10-10,1 mm, 14.10 – 19 mm, 20.10. – 17,4 mm Total 46,5 mm
Maize N	3,28	0,66	30,7	0,30	
Maize control	4,21	0,85	30,4	0,30	
Natural grass NPK	3,48	0,70	20,1	0,20	
Natural grass N	1,34	0,27	20,6	0,21	
Natural grass control	2,17	0,44	22,4	0,22	
Seeded grass NPK	3,05	0,61	20,2	0,20	
Seeded grass N	1,73	0,34	20,7	0,21	
Seeded grass control	3,06	0,62	20,8	0,21	

Table 6

Total amount of water and soil losses in 2009

Variant	Liquid leakages		Solid leakages		Rainfall
	l/plot	m^3/ha	g/plot	t/ha	
Maize NPK	23,70	4,74	168,00	0,31	Iunie – 64,2 mm Iulie – 50,8 mm August – 41,1 mm Oct – 46,5 mm Total 202,6 mm
Maize N	18,39	3,68	159,95	0,30	
Maize control	17,11	3,43	159,50	0,30	
Natural grass NPK	13,38	2,68	85,20	0,20	
Natural grass N	9,39	1,88	88,70	0,21	
Natural grass control	10,28	3,94	89,85	0,22	
Seeded grass NPK	10,45	2,09	86,80	0,20	
Seeded grass N	9,85	1,96	89,35	0,21	
Seeded grass control	12,26	2,46	85,75	0,21	

CONCLUSIONS

- The total soil losses during the observation period varies between 0.82 and 1.66 t/ha – smaller at the green plots and larger at the maize plots. The natural grass has a well developed root system which secures the soil and prevents the erosion of it.
- It can be appreciated that in a year, soil losses can reach values between 3.3 and 3.5 t/ha for the natural and seeded grass plots and 6.24 – 6.44 t/ha for maize plots. The soil losses remove from the agricultural lands large amounts of nitrogen, phosphorus, potassium and organic matter, essential elements for crop development.

ACKNOWLEDGEMENTS

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CERCETĂRI PRIVIND OPTIMIZAREA SPAȚIULUI DE NUTRIȚIE LA TUTUN (TIPUL VIRGINIA) CULTIVAT PE PSAMOSOLURILE DIN STÂNGA JIULUI

RESEARCH CONCERNING THE NUTRITIONAL PLANTING SPACE FOR TOBACCO (VIRGINIA TYPE) CULTIVATED ON SANDY SOILS FROM THE LEFT SIDE OF THE JIU RIVIER

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Keywords: sandy soils, tobacco, density, quality, fertilization

REZUMAT

Tutunul se numără printre culturile recomandate a se cultiva pe terenurile nisipoase deoarece aduce venituri mari la hectar şi necesită cantități mici de îngrăşăminte. Este o plantă tehnică de mare valoare economică. Se foloseşte pentru fumat deoarece prezintă acțiune narcotică pentru organism. Frunzele de tutun recoltate la maturitatea tehnologică (industrială) constituie materia primă pentru fabricarea țigărilor, a tutunului pentru pipă, tutun pentru masticat şi prizat. Nicotina poate fi folosită ca insecticid. În cazul tutunului densitatea plantelor prezintă un factor de mare importanță pentru a realiza randamente ridicate la hectar şi de înaltă calitate. Distanța dintre rânduri şi între plante pe rând este stabilită în funcție de soi, de calitatea dorită şi de fertilitatea naturală a solurilor pe care se cultivă. Cu toate aceste avantaje, ar trebui să continue campania împotriva fumatului.

ABSTRACT

Tobacco is among the recommended crops grown on sandy soils because it brings higher income per hectare and require small amounts of fertilizer. It is a high economic value crops. Smoking is used for the body because they have a narcotic action. Tobacco leaves harvested at technological maturity (industrial) is raw material for the manufacture of cigars, cigarettes, pipe tobacco, snuff tobacco and mastic. Nicotine can be used as an insecticide. Tobacco plant has a density factor of great importance to achieve high yields per hectare and high quality. The distance between rows and between plants in the row is set according to variety, desired quality and natural fertility of soils that are cultivated. With all these advantages, we should continue the campaign against smoking.

MATERIAL AND METHODS

The purpose of the research was to determine the best planting distance between plants row and between rows of plants on two categories of land leveled terrain and unleveled terrain.

To achieve these objectives on the typical plain sandy soils from the left side of the Jiu river was made an experiment with three factors, as follow:

A factor – land shape with two graduations:

a_1 – plan terrain and unleveled

a_2 – leveled terrain with bilon field before planting.

B factor - distance between plants on a row with two graduations:

b_1 - 40 cm between plants and

b_2 - 50 cm between plants.

C factor - distance between rows with three graduations:

c_1 - 70 cm,
c_2 - 80 cm,
c_3 - 90 cm.

The result thus 2 x 2 x 3 = 12 x 4 repetitions = 48 variants of experimental plots. Tobacco seedlings were planted on his hips of the billon field in the second decade of May of each year. For fertilization was used mineral fertilized level of N60P60K85.

Protective curtain has two rows. As biological material we use NC - 55 tobacco variety, Virginia type.

RESULTS AND DISCUSSIONS

The influence of A factor (land shape) - table 1.

On the unleveled terrain was registered a production of 2,376 kg/ha and on the modeled terrain with billon field before planting a production closer than the previous of 2,303 kg/ha. Output gap of only 73 kg/ha, is insignificant. That means the additional expenditure is not justified.

Table 1

The unilateral influence of A factor (land shape) to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

A factor	Production			Signification
	kg/ha	%	± / Mt.	
a_1 – unleveled terrain	2,376	100	Mt.	-
a_2 – leveled terrain	2,303	96.93	- 73	-

DL 5 % = 286.6 kg/ha
DL 1 % = 540.0 kg/ha
DL 0.1 % = 1205.1 kg/ha

The influence of B factor (distance between plants on a row) - table 2.

When the planting distance between plants was 40 cm, the output production was 2,475 kg/ha. By increasing the distance between plants at 50 cm on line, production decreased with 271 kg/ha, being 2,204 kg/ha due to reduced density. The minus production is significant statistically point of view.

Table 2

The unilateral influence of B factor (distance between plants on a row (to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

B factor	Production			Signification
	kg/ha	%	± / Mt.	
b_1 – 40 cm	2,475	100	Mt.	-
b_2 – 50 cm	2,204	89.05	- 271	0

DL 5% = 213.7 kg/ha
DL 1% = 326.6 kg/ha
DL 0.1 % = 542.1 kg/ha

The influence of C factor (distance between rows) - table 3.

The greatest production of dried leaves of tobacco, 2,507 kg/ha was obtained in the distance option of planting between rows of plants of 70 cm. By increasing the distance between rows at 80 cm the plant production decreased with 105 kg/ha, being 2,402 kg/ha.

In the third variation, the distance between rows was 90 cm and the yield was lowest from the all variants of 2,109 kg/ha. Note that planting distance of 70 cm between rows has made significant production increases from 80 cm distance between rows and distinct significantly from 90 cm distance between rows.

Table 3

The unilateral influence of C factor (distance between rows) to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

C factor	Production			Signification
	kg/ha	%	$\pm$ / Mt.	
c_1 - 70 cm	2,507	100	Mt.	-
c_2 - 80 cm	2,402	95.81	- 105	-
c_3 - 90 cm	2,109	84.12	- 398	0 0

DL 5 % = 265.1 kg/ha
DL 1 % = 356.2 kg/ha
DL 0.1 % = 469.3 kg/ha

The influence of the factors interaction A x B - table 4.

Most valuable dried tobacco leaf production was obtained in combination a_1b_1 (unleveled terrain 40 cm between plants per row) of 2,562 kg/ha and the lowest production of 2,189 kg/ha was obtained in combination a_1b_2 (unleveled terrain and 50 cm between plants per row).

In other combinations yields were 2,389 kg/ha (a_2b_1) and 2,218 kg/ha (a_2b_2). Related to the witness the harvests are insignificant differences for the combination a_2b_1 and significant differences for a_1b_2 and a_2b_2 combinations. The yield differences varied between -173 kg/ha to -373 kg/ha.

Table 4

The influence of the interaction of factors A x B to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

Factors		Production			Signification
A	B	kg/ha	%	$\pm$ / Mt.	
a_1 –unleveled terrain	b_1 – 40 cm	2,562	100	Mt.	-
	b_2 – 50 cm	2,189	85.44	- 373	0
a_2 – leveled terrain	b_1 – 40 cm	2,389	93.25	- 173	-
	b_2 – 50 cm	2,218	86.57	- 344	0

DL 5 % = 342 kg/ha
DL 1 % = 518 kg/ha
DL 0.1 % = 841 kg/ha

The influence of the factors interaction A x C - table 5.

The best results were obtained in combinations a_1c_1 (unleveled terrain and 70 cm between rows of plants), with a production of 2,561 kg/ha, a_1c_2 (unleveled terrain and 80 cm between rows), with a production of 2,501 kg/ha and a_2c_1 (leveled terrain and 70 cm between rows), with a production of 2,453 kg/ha.

Table 5

The influence of the interaction of factors A x C to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

Factors		Production			Signification
A	C	kg/ha	%	$\pm$ / Mt.	
a_1-unleveled terrain	c_1 - 70 cm	2,561	100	Mt.	-
	c_2 - 80 cm	2,501	97.66	- 60	-
	c_3 - 90 cm	2,065	80.63	- 496	0 0
a_2 – leveled terrain	c_1 - 70 cm	2,453	95.78	- 108	-
	c_2 - 80 cm	2,303	89.92	- 258	-
	c_3 - 90 cm	2,154	84.11	- 407	0

DL 5 % = 348.2 kg/ha
DL 1 % = 473.5 kg/ha
DL 0.1 % = 642.3 kg/ha

The decreases of productions are statistically assured in two cases where they are significant. The other three combinations of production differences are insignificant related to the witness. Production differences range from -60 kg/ha to -496 kg/ha.

The influence of the factors interaction B x C - table 6

The best production of dry tobacco leaves was obtained in combination b_1c_1 (40 cm between plants per line and 70 cm between rows of plants) of 2,680 kg/ha and lowest production in combination b_2c_3 (50 cm between plants per row and 90 cm between rows) of 1,993 cm. In two cases the downs of production in comparison with the witness are insignificant, in one case the difference is significant and in one case the difference is distinct significant.

The production differences range from -160 kg / ha to -687 kg/ha.

Analyzing the result we have established a positive correlation between density and tobacco production.

Table 6

The influence of the interaction of factors B x C to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

Factors		Production			Signification
B	C	kg/ha	%	± / Mt.	
b_1 – 40 cm	c_1 - 70 cm	2,680	100	Mt.	-
	c_2 - 80 cm	2,520	94.03	- 160	-
	c_3 - 90 cm	2,225	83.02	- 455	0
b_2 – 50 cm	c_1 - 70 cm	2,334	87.09	- 346	-
	c_2 - 80 cm	2,283	85.19	- 397	0
	c_3 - 90 cm	1,993	74.37	- 687	0 0 0

DL 5 % = 380.5 kg/ha
DL 1 % = 521.2 kg/ha
DL 0,1 % = 704.1 kg/ha

The influence of the factors interaction A x B x C - table 7

Analyzing the influence of the three factors interaction (modeling terrain, distance between plants on line and distances between rows of plants) has results that the best yields were achieved in combination $a_1b_1c_1$ (unleveled terrain at 40 cm distance between

Table 7

The influence of the interaction of factors A x B x C to the dry leaves production on tobacco (Virginia type) cultivated on sandy soils from the left side of the Jiu river (Average 2007 – 2009)

Factor			Production			Signification
A	B	C	kg/ha	%	± / Mt.	
a_1 – unleveled terrain	b_1 - 40 cm	c_1 - 70 cm	2,792	100	Mt.	-
		c_2 - 80 cm	2,715	97.24	- 77	-
		c_3 - 90 cm	2,180	78.08	- 612	0
	b_2 - 50 cm	c_1 - 70 cm	2,331	83.49	- 461	0
		c_2 - 80 cm	2,287	81.91	- 505	0
		c_3 - 90 cm	1,950	69.84	- 842	0 0
a_2 – leveled terrain	b_1 - 40 cm	c_1 - 70 cm	2,569	92.01	- 223	-
		c_2 - 80 cm	2,326	83.31	- 466	0
		c_3 - 90 cm	2,271	81.34	- 521	0
	b_2 - 50 cm	c_1 - 70 cm	2,338	83.74	- 454	-
		c_2 - 80 cm	2,280	81.66	- 512	0
		c_3 - 90 cm	2,037	72.82	- 755	0 0

DL 5 % = 460.3 kg/ha
DL 1 % = 631.1 kg/ha
DL 0.1 % = 875.1 kg/ha

plants on line and at a distance of 70 cm between rows of plants), where he obtained a production of 2,792 kg/ha of dried tobacco leaves.

On the second place has follow the combinations of $a_1b_1c_2$ (unleveled terrain, 40 cm between plants per row and 80 cm between rows*)* and $a_2b_1c_1$ (unleveled terrain, 40 cm between plants per row and 70 cm between rows), with a production of 2,715 kg/ha respectively of 2,569 kg/ha.

The lowest production occurred in $a_1b_2c_3$ combinations (unleveled terrain at a distance of 50 cm between plants on line and at a distance of 90 cm between rows of plants) and $a_2b_2c_3$ (modeled terrain at 50 cm distance between plants on line and at a distance of 90 cm between rows of plants), which gave 1,950 kg/ha and respectively 2,037 kg/ha.

In most variants dried tobacco leaf production is about 2.3 to 2.4 t/ha.

Between the maximum production of 2,792 kg / ha and minimum production of 2037 kg / ha is an amplitude of 836 kg/ha of tobacco dry leaves (Virginia type).

CONCLUSIONS

As in other crops, at tobacco must be respected the optimum density recommended because excessive increase of density causes a decrease in plant production. The planting distances are determined by force's tobacco varieties by their growing period, the natural fertility of soils which are grown and quality sought by culture.

The type of Virginia tobacco and high consumption, and tobacco for cigars, are planted at greater distances. In determining the planting density should be taken into account the size angle of leaves formed on the stem inserted.

Dry leaf tobacco production on the unleveled terrain was 2,376 kg/ha and the shaped land of 2,303 kg/ha. Output gap of only 73 kg/ha was insignificant statistically point of view. That additional expenditure, annually required, is not justified.

If planting distances are 40 cm between plants per row, the output produced was 2,475 kg/ha. By increasing the distance between plants on line, production decreased with 271 kg/ha, being of 2,204 kg/ha due the reduced density. The minus production is significant. The biggest production of dried leaves of tobacco of 2,507kg/ha was obtained in the alternative planting distance between rows of plants was 70 cm.

The best results were achieved in combination $a_1b_1c_1$ (unleveled terrain at 40 cm distance between plants on line and at a distance of 80 cm between rows of plants), where we obtained an output of 2,841 kg/ha of dry leaves tobacco. On the second place were follow the combinations of $a_1b_1c_2$ (unleveled terrain, 40 cm between plants per row and 90 cm between rows) and $a_2b_1c_1$ (modeled terrain, 40 cm between plants per row and 80 cm between rows), with production of 2,773 kg/ha, and respectively 2,610 kg/ha.

The lowest production occurred in $a_1b_2c_3$ combinations (unleveled terrain at a distance of 50 cm between plants on line and at a distance of 90 cm between rows of plants) and $a_2b_2c_3$ (leveled terrain at 50 cm distance between plants on line and at a distance of 90 cm between rows of plants), which gave 2,005 kg/ha and respectively 2,075 kg/ha. In most variants of dried tobacco leaf production is about 2.3 to 2.4 t/ha.

For tobacco crops on the sandy soils is recommended to plant in unleveled terrain because the land shape increase the surface of water evaporation and also increase the production costs for making this work. Distance between plants on line to be 40 cm and between rows of plants 80 cm.

Much attention will be paid care work (weed control, especially by using herbicides). A particular problem raised by the VMT (tobacco mosaic virus). All the virus plants will be removed immediately from chain to not contaminate other tobacco plants.

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EVALUAREA SOLURILOR DIN BALTA BORCEA PENTRU AGRICULTURA ORGANICĂ

SOIL EVALUATION FOR ORGANIC AGRICULTURE FROM BALTA BORCEA AREA

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REZUMAT

Conversia solurilor de la agricultura convențională către agricultura organică necesită evaluarea principlalelor însuşiri ale solurilor care pot produce perturbări asupra dezoltării plantelor şi asupra calității producției.

Astfel, în utilizarea solurilor pentru agricultura organică conținutul în anumite elemente potențial poluatoare trebuie să fie sub limita maxima admisibilă. Cercetările au fost efectuate în anul 2009 în incinta îndiguită Balta Borcea pentru conversia unei suprafețe de 500 de ha de păşune către agricultura organică.

În urma analizelor efectuate conținutul Aluviosolurilor din perimetrul cercetat în metale grele si pesticide se afla sub limita maxima admisibila ceea ce nu impune restrictii in utilizarea acestora pentru agricultura organică.

ABSTRACT

The land conversion from conventional agriculture to organic farming requires assessment of the main soil properties that can determine disturbances on plants growth and the yield quality.

Thus, organic farming land use in certain potentially polluting content must be below the maximum allowable. Research was carried out in 2009 of Balta Borcea area to convert 500 hectares of pasture to organic agriculture.

In the analysis performed in the investigated area, Fluvisols content of heavy metals and pesticides are below the maximum allowable which does not impose restrictions on their use for organic farming.

INTRODUCTION

Awareness of natural resource damage issues, nitrates and pesticides water pollution, soil and agricultural products, destruction of ecosystems and biological diversity loss the local conditions by intensive technologies in agriculture have led to a different technological approach to agriculture - sustainability.

In a summary we can say that this type of farming accounts for more and more systems that aim to obtain indefinite safety, environmental protection, biodiversity conservation and quality of life.

Soil is probably one of the most important - yet overlooked - natural resources. It is essential for life on earth that nourishes the plants, which in turn provide food and oxygen to humans and animals.

Farmers in the ecological system complies the soil with by carefully monitoring what get from and it adds and how their activities affect fertility and composition.

Leading practices used by farmers in the ecological system to maintain and improve soil health include:

• adoption of various crop rotation to break pest and disease cycles, the recovery time and leave the soil to add nutrients useful, legumes, such as clover, "fixed" atmospheric nitrogen into the soil;

• use of organic fertilizers based manure - to improve soil structure and prevent erosion;

• strict restriction of the use of artificial fertilizers and chemical pesticides - to avoid long-term changes in soil chemistry and the increasing reliance of such products;

• sowing of crops used as green manure covering the soil after harvest - to prevent soil erosion and nutrient loss.

MATERIAL AND METHOD

From a climate perspective studied area is characterized by average annual temperature of 11.3 ^{0}C. Absolute maximum temperature in summer can reach 40.0 ^{0}C and absolute minimum temperature up to at least -30.0 ^{0}C. The sum of daily average temperatures during the growing season of crop plants is 3226.7 ^{0}C, are favorable to all crops with high thermic requirements.

Annual average rainfall of 402-427 mm. Compared to the average values, but variations are quite large, which justifies the need for irrigation and agro-technical measures to maintain soil water.

Such depressions collect water areas at the expense of positive areas, the levees, where the signals and a loss by infiltration, silting due to coarse texture.

Groundwater occurs at varying depths depending on microrelief forms, seasonal and annual fluctuations of the Danube and Borcea.

Depth to groundwater occurs varies between 1.0 to 1.5 m in areas of former lake depressions and the ridges appear as 2.5 to 4.0 m.

The soil samples were collected at two depths (0-20 and 20-40 cm) and were carried out in a wide range of physical-chemical properties (pH, organic carbon, heavy metals content, organochlorine pesticides etc.).

RESULTS AND DISCUSSIONS

Stage and intensity of soil formation process in soils from Balta Ialomitei is in close contact with nature and the material texture and depth of alluvial groundwater, the sequence and extent of oxidation-reduction cycles etc.

Soil formation is slower levees composed of coarse materials, sands and becoming more active on flat terrain and depressions, covered with silt and fine to medium texture, respectively clay-loam to clay.

Under the influence of these particular floodplain, soils developed are Hydrisoils and Protisoils class.

The soil coverage from Balta Borcea area is represented by: Fluvisols, Mollic Fluvisols, Mollic Gleyic Fluvisols, Mollic Gleysol (Figure 1).

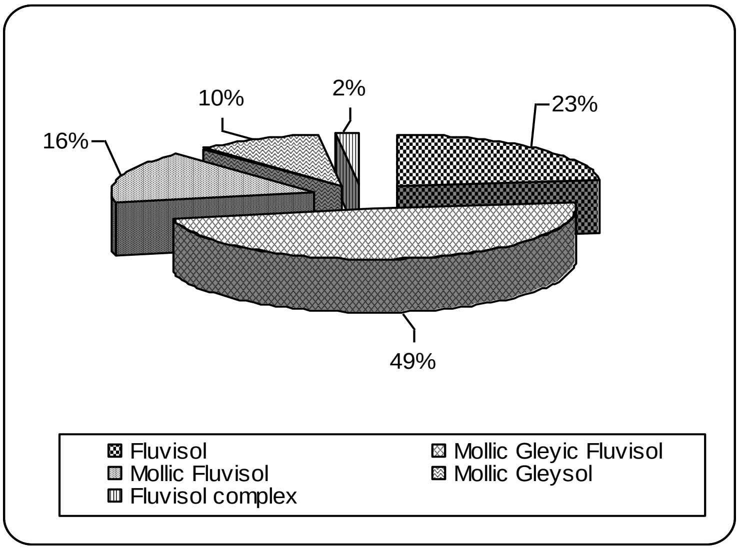

Fig. 1 The soil distribution of Balta Borcea area

The research was conducted at Agrofam Group Fetesti and aimed at the possibilities of conversion two pastures in sustainable farming system.

For each soil samples were taken at two depths 0-20 and 20-40 cm and determined the main physico-chemical properties and the presence of polluting substances (heavy metals, pesticides), substances that could prevent the conversion of these pastures.

Pasture 1

The main physical characteristics

The bulk density recorded values in the 0-20 cm depth range from 1.13 to 1.19 g/cm^3 (extremely small - very small), which shows that the top soil is loose.

On the second depth 20-40 cm may notice an increase in values, these fluctuating between 1.27 g/cm^3 (very small) and 1.45 g/cm^3 (low).

Total porosity values are inversely correlated with the bulk density. Thus, the first deep they were very large, ranging from 51.3 to 56.3%. At 20-40 cm lower values, ranging between 45.5 and 49.6% (medium-large).

Analyzing the penetration resistance can appreciate that the loose surface soil becomes compact with increasing of the depth, with values ranging between 14 and 41 kgf/cm^2.

The main chemical characteristics

Regarding the chemical characteristics, soil reaction was slightly alkaline in all cases, the values recorded being 7.8 to 8.4.

Humus content in all points studied was low-middle range of variation is between 1.95 to 3.0%.

In terms of supply nutritional elements status can be seen that middle ground is supplied with nitrogen (0.153 to 0.250%), phosphorus (24-33 ppm) and potassium (155-200 ppm).

Pasture 2

The main physical characteristics

The bulk density values were very low (1.18 and 1.28 g/cm^3), where the first depth and the depth of 20-40 cm is an increase of them, from 1.34 to 1.45 g/cm^3 (low).

Total porosity values are very large of depth 0-20 cm (50.1 to 56.1%), after which they decrease became medium-large (from 41.3 to 48.2%).

In terms of penetration resistance that was low in the upper - middle (15-34 kgf/cm^2), while at 20-40 cm depth values ranged from 26-41 kgf/cm^2, which shows a medium penetration resistance.

The main chemical characteristics

Soil reaction showed values between 7.91 to 8.25, being slightly alkaline at all points on both depths studied.

The soil is moderately poorly supplied with humus, the maximum value recorded being 3.21% in 0-20 cm depth, then decreases with the depth (1.50% at 20-40 cm).

In terms of macro supply status can be seen that the soil has a moderate to high nitrogen content (0.150 to 0.300%), phosphorus (32-61 ppm) and potassium (153-289 ppm).

With regard to determining the degree of metal loading, the results obtained can be seen that the heavy metal content of soil is within the normal range, below the reference values, light exceedances were recorded at Cu, Zn and Pb, without however be exceeded these reference values (Tables 1 and 2).

Table 1

Total heavy metal contents determined in soil samples

Sample	Depth (cm)	Cu	Zn	Pb	Cd	Mn	Co	Ni
		mg/kg						
1	0-20	29	223	15	0.61	500	14.4	41
	20-40	26	72	15	0.24	491	10.3	40
2	0-20	19	80	18	0.44	488	8.3	34
	20-40	24	118	20	0.54	526	10.8	46
3	0-20	27	81	13	0.61	653	16.4	42
	20-40	24	121	16	-	590	10.3	34
4	0-20	32	77	29	0.40	607	12.0	42
	20-40	32	204	28	0.56	626	11.7	47
5	0-20	34	106	20	0.40	613	13.2	48
	20-40	40	105	33	0.51	704	14.3	56
6	0-20	31	95	29	-	604	11.1	49
	20-40	34	90	17	-	623	15.1	54
7	0-20	41	142	25	0.64	624	15.3	51
	20-40	43	108	24	0.20	624	13.4	53
8	0-20	35	84	28	0.45	560	13.2	52
	20-40	35	149	27	0.39	522	11.4	51
9	0-20	27	73	21	0.40	583	9.6	36
	20-40	24	70	15	0.53	535	10.2	35
10	0-20	28	67	17	-	637	6.8	36
	20-40	29	72	17	0.44	627	8.3	32

Table 2

Reference values for traces of chemical elements in the soil
-inorganic compounds-

(mg/kg s.u.)

Traces elements	Normal Values	Thresholds alert \ Types of use	Thresholds for intervention \ Types of use
		Sensitive	*Sensitive*
Metals			
Cadmium	1	3	5
Cobalt	15	30	50
Copper	20	100	200
Manganese	900	1500	2500
Nickel	20	75	150
Lead	20	50	100
Zinc	100	300	600

(SRTS 2003)

Measurement of organochlorine insecticides (HCH and DDT) showed that the degree of soil loading in the investigated area is below the benchmark two depths (0-20 and 20-40 cm), reference thresholds being met.

The highest load levels of organochlorine insecticides were sample no. 3 the depth of 20-40 cm (0.012 mg / kg) and DDT in the highest values were sample no. 5 on the depth of 0-10 cm (0.057 mg / kg) (Table 3).

However soil concentrations of organochlorine insecticides studied is below the reference threshold (Table 4).

Table 3

Organochlorine insecticide content (mg/kg) in soil samples

Sample	Depth (cm)	α HCH	γ HCH	β HCH	δ HCH	total HCH	pp' DDE	op'DDD	op'DDT	pp'DDD	pp'DD	total DDT
1	0-20	0.001	0.009	und.	und.	0.010	0.015	und.	0.003	0.001	0.004	0.023
	20-40	und.	0.004	und.	und.	0.004	0.008	und.	und.	und.	0.006	0.014
2	0-20	0.001	0.008	und.	und.	0.009	0.004	und.	0.001	0.001	0.002	0.008
	20-40	0.002	0.006	und.	und.	0.008	0.004	und.	und.	und.	0.006	0.010
3	0-20	0.001	0.008	und.	und.	0.009	0.030	und.	0.006	0.002	0.016	0.054
	20-40	0.002	0.010	und.	und.	0.012	0.012	und.	0.002	0.001	0.022	0.037
4	0-20	0.001	0.008	und.	und.	0.009	0.006	und.	und.	und.	0.002	0.008
	20-40	und.	0.006	und.	und.	0.006	0.008	und.	0.001	0.001	0.004	0.014
5	0-20	0.001	0.011	und.	und.	0.012	0.031	und.	0.007	0.002	0.017	0.057
	20-40	0.002	0.008	und.	und.	0.010	0.015	und.	0.001	0.001	0.006	0.023
6	0-20	0.001	0.006	und.	und.	0.007	0.020	und.	0.003	0.001	0.006	0.030
	20-40	0.001	0.006	und.	und.	0.007	0.024	und.	0.002	0.002	0.006	0.034
7	0-20	0.001	0.003	und.	und.	0.004	0.019	und.	0.005	0.001	0.004	0.029
	20-40	0.002	0.003	und.	und.	0.005	0.012	und.	0.002	0.001	0.006	0.021
8	0-20	und.	0.002	und.	und.	0.002	0.017	und.	0.003	0.001	0.006	0.027
	20-40	0.001	0.004	und.	und.	0.005	0.020	und.	0.002	0.002	0.008	0.032
9	0-20	0.001	0.003	und.	und.	0.004	0.003	und.	und.	und.	0.001	0.004
	20-40	0.004	0.004	und.	und.	0.008	0.008	und.	0.001	0.001	0.008	0.018
10	0-20	und.	0.001	und.	und.	0.001	0.009	und.	und.	und.	0.002	0.011
	20-40	und.	0.002	und.	und.	0.002	0.004	und.	und.	und.	0.006	0.010

und. - undetectable

Table 4

Organochlorine pesticides and triazines

(mg/kg s.u.)

Traces of pollutant	Normal Values	Thresholds alert \ Types of use		Thresholds for intervention \ Types of use	
		Sensitive	*Less sensitive*	*Sensitive*	*Less sensitive*
I. Organochlorine pesticides					
Σ DDT	<0.15	0.5	1.5	1	4
DDT	<0.05	0.25	0.75	0.5	2
DDE	<0.05	0.25	0.75	0.5	2
DDD	<0.05	0.25	0.75	0.5	2
HCH	<0.005	0.25	0.75	0.5	2
α – HCH	<0.002	0.1	0.3	0.2	0.8
β – HCH	<0.001	0.05	0.15	0.1	0.4
γ – HCH	<0.001	0.02	0.05	0.05	0.2
δ – HCH	<0.001	0.05	0.15	0.1	0.4
Total organochlorine pesticides	<0.2	1	2	2	5
II. Triazines					
Total triazine	<0.1	1	2	2	5

(SRTS 2003)

CONCLUSIONS

Formation and evolution of land reclaimed from the Balta Borcea area is very much influenced by the nature and composition of alluvial materials deposited during the flood of the Danube and Borcea arm.

Soil mapping performed inside the Balta Borcea area led to the identification of soil types: Fluvisols, Mollic Fluvisols, Mollic Gleyic Fluvisols, Mollic Gleysol.

Soil analysis is a good physical condition, both depths, the reaction is moderately alkaline, humus content is low to moderate, and the degree of nutrient supply is also medium.

Soil heavy metal content is within normal limits, mild exceedances were recorded for Cu, Zn and Pb, but no reference values are exceeded.

Also, organoclourate insecticides content is below the reference value, the two depths, the highest value was 0.012 mg/kg and DDT 0.057 mg/kg.

Thus, laden with heavy metals and organochlorine insecticides is not a limiting factor to convert these lands to organic agriculture.

In the selection and adaptation of technology based systems and soil properties should be assessed against raising requirement, especially as far as possible to reduce the intensity of his work.

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MAIN PROPERTIES OF THE PSAMOSOILS ON THE LEFT SIDE OF JIU

DRD. ING. GHEORGHE IOSIF

ABSTRACT

The sandy area on the left side of Jiu spreads out from North Craiova to the Danube meadow, covering an area of aproximately 80 000 hectars.

There is a high variety of natural conditions originating the emergence of the psalmosoils on the left side of Jiu, which explains the presence of such a large amount of psalmosoil units in the mentioned area.

The climate in the studied area is characterized by 10-110C average temperatures on a yearly frequent base, and by multiple yearly frequency medium rain showers of 450-550 mm. It is most interesting to note that the highest temperatures on sandy terrains were registered at Timburesti, going up to even 60^0C. However the largest amount of rain showers normally fall during spring, in the months of February (34.29 mm) till May (58.55 mm), the lowest would fall during the summer months.

The layer of sand reaches a width ranging from 1-2 m up to tens of meters. The natural vegetation in the sandy area finds poorer development conditions, therefore it brings out to the surface or leaves in the soil only small amounts of organic residues, because of it the sandy soils are poorest in organic substances.

In the sandy area on the left side of Jiu, the dominant soils are: molic psamosoils , eutritic psamosoils and gleic psamosoils.

The molic psamosoils are frequent in most of the areas between the dunes, where the conditions for the development of the plants are relatively better, so that these soils are to some amount richer in humus (around 1 %) and better supplied with nutrient elements. They have a slightly higher fertility.

Eutritic psamosoils are encountered on the upper side of the dunes where the conditions for plant development are harsh. Because of this aspect, such soils are very poor in humus (approximately 0.5 %) and in nutrient elements, consequently they have a low natural fertility.

The gleic psamosoils are found in the area of deeper dunes, with phreatic water at low depths, which can ascend up to the soil surface through capillary rise. The presence of humidity on the soil profile determines internal processes of reduction, therefore the soils exhibit grey-blue stains. If humidity is kept under control, they have a good fertility.

In order to be used for agriculture, the sandy soils need radical improvement measures.

– Properties of the soil/terrain units.

The following types of sandy soil units can be encountered on the left side of the Jiu river:

-molic psamosoils
-eurtitic psamosoils
-gleic psamosoils

1 -U.S1 – Molic psamosoils

They spread in the area inter dunes where the vegetation has developed more due to the high humidity leaving a greater quantity of organic residues on the sand surface.

Due to the high humidity the decomposition process has been more intense causing them to have a higher content of clay, by comparison to the eutritic psamosoils.

In order to characterize this soil, the morphological description together with the analytic data of a profile situated in the S.D.E. Timburesti will be used (Profile n.1)

A– The morphologic description of the soil profile.

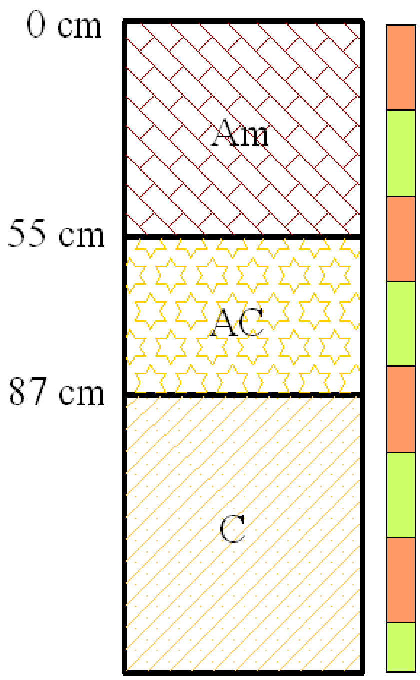
-Am horizon:: 0- 55 cm width, dark brown color
(10 YR 3/3), in humid state, and grey-brown color (10 YR 5/3) in dray state; sandy-lut like texture; gromeulare structure, very rotten; leach like; mellow; frequent filamentary roots; gradual passage. –
-AC Horizon: 55 – 87 cm width; dark yellow brown color
(10 YR 3,1/4) in humid state, color light yellow brown,
(10 YR 4,5/4) in humid state; sandy–lut like texture, unstructured, leach like; compressed medium, scattered filamentary roots; gradual passage.
-***C Horizon*** : under 87 cm thickness: color light yellow brown (10 YR 6/3) in humid state and light yellow (10 YR 7/3) in dry state; sandy texture, structured; leach like; compressed medium; moist.

B-Description of the physic mechanic properties (table 1)

The interpretation of the lab analysis shows that the soil has a very high quantity of rough sand, 69,4% in the horizon C, and varies on the profile, getting up to 66,1 % in the Am horizon.

The content of fine sand varies on the profile from 15, 4 % in the first horizon, and 18,3 % in the horizon C. The content of dust decreases from 9,3 % in Am horizon up to 5,8 % in the C horizon.

The content of clay is also quite low ranging from 9,2% in the Am horizon and 6,5% in the C horizon. Depending on the determined granulometric fractions, the soil texture is sandy –lut like on the whole profile.



PROFIL Nr. 1

The apparent density shows values that increase on a depth basis from 1,37 grams/cm^3 in the first horizon reaching up to 1,50 grams/ cm^3 in the C horizon.

The density grows from 2,61 on the soil surface up to 2,65 grams/ cm^3 in depth, due to the quantity of organic residues, considerably higher on the surface.

These values determine o lower porosity, varying on the profile from 48% on the soil surface up to 44% in depth, which shows that the soil is strongly compressed.

Table 1

– Main physico mechanical properties of the psalmosoil

Horizon	Depth -cm-	Granulometric Composition%				Cls. Tex-ture	Da	D	Pt
		Rough Sand 2-0,2 mm	Fine Sand 0,2-0.02 mm	Dust 0.02-0,002 mm	Clay < 0,002 mm		gr/ cm^3		
Am	0-55	66,1	15,4	93	9,2	NL	1,37	2,61	48
Ac	55-87	67,2	16	8,1	8,7	NL	1,46	2,63	45
C	Sub 87	69,4	18,3	5,8	6,5	NL	1,50	2,65	44

C-Hydro physical properties. (table 2)

The hydro physical indicators show low values, which correlate very well with the humus and the clay content. The higrospicity content (CH) has high values in the first two horizons (1,8 %) and very low in the C horizon, of only 0,7 %.

The fading ratio (CO) being calculated in reference of the degree of hidroscopecity, shows the same profile variation from 2,8 % in Am horizon, up to 1,9 % in the C horizon. The equivalent of humidity (EU), determined in the lab through the configuration method, shows us that this it decreases from 6,2 % in the first horizon up to only 4,8 % in the last horizon.

The capacity for useful water has values 3,4 % in the Am horizon and 2,9 % in the C horizon.

Table 2

- Main hydrophysic properties of the molic psamosoil

Horizon	Depth -cm-	CH %	CO %	EU %	CU %
Am	0-55	1,8	2,8	6,2	3,4
Ac	55-87	1,7	2,6	5,4	2,8
C	Under 87	0,7	1,9	4,8	2,9

D- Chemical properties. (table 3)

The data obtained from the lab analysis show a much lower content of organic mater much more reduced in depth (0,34 %) than on the surface (1,60 %).

The content of total nitrogen (Nt) is week, pending in the profile area from 0,070% in the first horizon up to 0,028 % in the C horizon. The content of mobile phosphor ($P_2 O_5$) decreases from 7,1 in the Am horizon up to 3,2 mg/100 gr. soil. The content of potassium is much higher compared to the nitrogen, in the first horizon where a concentration of 11,1 mg/100 gr. soil is being registered.

The pH value being 6,2 on the surface and 6,9 in depth, shows us that the soil reaction is slightly acid. The sum of the cations retained by the colloidal complex is low. The total capacity of cationic exchange has values between 9,3 and 5,7 me/100gr. soil.

The saturation degree in base (V%) ranges between 89 and 91%.

To conclude, the molic psamosoil has a relation to the water and to the salty air, poor in colloidal complex, poorly supplied with humus and nutrient elements, thus having a low fertility.

For this reason a series of measures for its improvement need to be taken such as: soil loosening, humus and clay enrichment, adding organic and chemical fertilizers. Watering is required in order to complete the humidity deficit.

Table 3

- Main chemical properties of the molic psamosoil -

Horizon	Depth -cm-	Humus %	Nt %	P_2O_5	K_2O	pH	SH	SB	T	V %
				mg/100 gr. soil		(H_2O)	me/100 gr. soil			
Am	0-55	1,60	0,070	7,1	11,1	6,2	1,0	8,3	93	89
Ac	55-87	0,85	0,039	5,4	6,3	6,7	0,6	6,7	7,3	91
C	Sub 87	0,34	0,028	3,2	4,5	6,9	0,5	5,2	5,7	91

2 -U.S.2 Eutric psamosoil

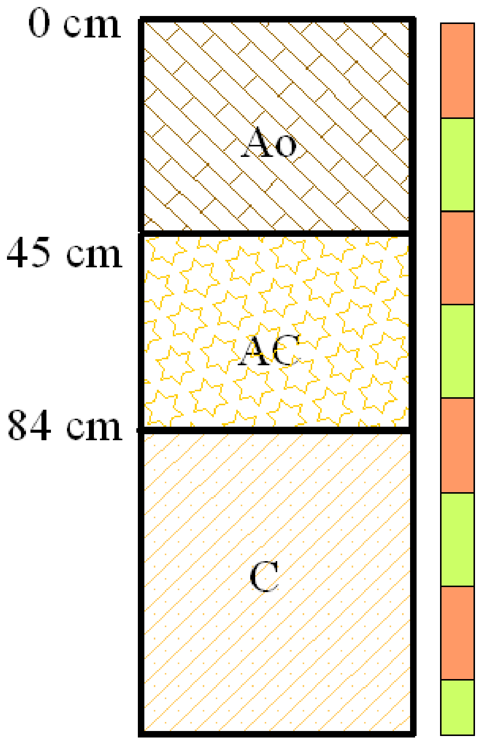
Can be encountered on top of the dunes and in some modeled zones. Its main properties consist of a low developed profile and a rough texture, low structured, with a low acid up to quite acid reaction, and a low content of humus. In order to present the properties of this soil a morphological orientation and the analytical data of a profile found within SDE Tamburesti has been used, this is situated in on top of a high dune (profile n. 2). –

A– Morphologial description of the soil profile.

- *Ao Horizon*: 0- 45 cm depth, dark brown color (10 YR 4/3), in humid state and grey brown color (10 YR 5/3) in dry state; unstructured or mono-granular; leach like; loose; frequent filamentary roots ; frequent sand grains with a diameter of over 1 mm ; low colloidal particles on the sand grain surface; gradual passage.

AC Horizon: 46 – 84 cm depth; dark brown yellow color (10 YR 4/4) in humid state, color yellow brown, (10 YR 5/6), in dry state; sandy-clay texture; unstructured, leach like, dense environment towards loose, filamentary roots; rare sinclectic material; weak colloidal shells on the sand grains surface; gradual passage.

-C *Horizon*: under 84 cm depth, color yellow (10 YR 5/6) in humid state and whitish color, (10 YR 7/6) in dry state, sandy texture, unstructured, leach like, loose, frequent sand grains of quartz with a big diameter; rare skeleton like material of a small diameter.



PROFIL Nr. 2

B. – Description of the physical mechanical properties of the eutritic psamosoils (table 4).

Interpreting the lab analysis we can observe that the soil has a very high content of harsh sand of 73,0 % in the horizon C and decreases up to 70,5 % in horizon A_O.

The fine sand content varies on the profile from 17,2 % in horizon Ao up to 18,2 % in horizon C. The content of dust decreases from 6,6 % on the surface, up to 3,6 % in depth.

Also the content of clay varies on the surface, where it has been registered also 5,7 % up to 5,2 % in horizon C.

The granulometric composition determines the sandy-clay soil texture in the first two horizons, and sandy in the last horizon.

The apparent density shows values between 1,46 gr/cm^3 on the surface and 1,51 gr/cm^3 in depth.

The density increases from 2,62 in horizon Ao up to 2,64 in horizon C.

The makes the final soil porosity to be contained between 44 - 43 %.

Table 4

– Main physico mechanic properties of the eutric psamosoils

Horizon	Depth -cm-	Granulometric composition%				Cls. Tex-ture-	Da	D	Pt %
		Gros. sand 2-0,2 mm	Fine sand 0,2-0,02 mm	Dust 0,02-0,002 mm	Clay < 0,002 mm		gr/ mcm^3		
Ao	0-46	705	172	66	57	NL	1,46	2,62	44
AC	46-84	716	179	51	54	NL	1,49	2,63	44
C	Sub 84	730	182	36	52	N	1,51	2,64	43

C. – Description of the hydro physical properties (table 5)

The hydro physic indicators present low values which correlate very well with the clay content.

The hydroscopic rate has values between 0,7 % in horizon Ao and 0,5% in horizon C.

The fading rate (CO %) has lower values compared to the previous soil, varying from 1,7% on the surface up to 1,5 % in depth.

The equivalent of humidity (EU) also has low values, compared to the first soil, therefore its value decreases from 4,1% in the first horizon up to 3,5 % in depth.

The water retention capacity is low, the value of the capacity for the useful water being comprised between 2,4 % in horizon Ao and 2 % in horizon C.

Table 5

- Main hydrophisical properties of the eutritic psamosoils–

Horizon	Depth -cm-	CH %	CO %	EU %	CU %
Ao	0-46	7	17	41	24
AC	46-84	6	16	38	22
C	Sub 84	0,5	15	35	20

D. – Description of the chemical properties of the eutritic psamosoils (table 6).

This soil compared to the previous one is provided with a lower quantity of organic substances the humus content being comprised between 0.52 % on the surface, and 0.25 % in depth.

The content of total nitrogen (Nt %) is also low and wiggles on the profile from 0.044% in horizon Ao up to 0.020 % in horizon C.

The content of noble phosphorus is contained between 3.5 and 2.7 mg/100 gr. soil.

The content of potassium (K_2 O) decreases from 5.4 mg/100 gr. Soil and 4.2 mg/100 gr. soil. The soil reaction is low acid.

The contained Ph-ul ranges between 6.1 and 6.9, the sum of the changeable bases varies on the profile from 3.9 in the first horizon up to 3.2 me /100 gr. soil in horizon C.

The total capacity of cationic exchange has values contained between 5.8 me/100 gr. soil. in horizon Ao and 3.6 me /100 gr. soil in horizon C.

The saturation ratio in base (V%) is contained between 78 and 88 %.

Table 6

- Main chemical properties of the eutric psamosoil–

Horizon	**Depth -cm-**	**Humus %**	**Nt %**	P_2O_5	K_2O	**pH**	**SH**	**SB**	**T**	**V %**
				mg/100 gr. soil		**(H_2O)**	**me/100 gr. soil**			
Ao	0- 46	52	44	35	54	61	11	39	50	78
AC	46-84	37	29	31	51	66	7	35	42	83
C	sub 84	25	20	27	42	69	4	32	36	88

3 -U.S.3. Gleic psamosoil

It spreads in the low inter dunes with a ground water at low depth 1 – 1,5 meters. Due to the ground water raising up to the profile base, intense process of anaerobreez have been registered, determining the passage of the composites from an oxidized from to a reduced one.

The presence of iron oxides (Fe si Mn), under a reduced form, imprints a grey-black color to the sand. During the last years in the sandy zone on the left side of Jiu, especially on the south side, there has been an increase in the ground water level.

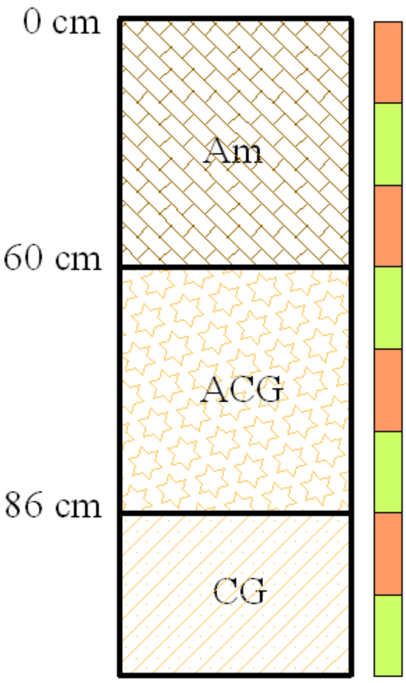
This has caused water to come up on the surface of some of the area inter dunes, also a phenomenon of long term puddle has been registered.

This puddle phenomenon has led to the destruction of the living plants, trees, thus some terrains have been taken out of the agricultural use. In this zone also the gleic psamosoils can be met. The gleic psamosoils are characterized by a high degree of fine particles: dust and clay and by a low content of rough sand.

In order to present the morphological properties of this soil a profile situated in the locality Piscul Sadovei has been used.

A– Morphological description of the soil profile.

- Am Horizon: 0- 60 cm width, color dark brown (10 YR 4/2), in dry state; sandy-clay texture; unstructured or granular structure very rotten structure, leach like, loose, very frequent roots; rare thin roots; grey-blue stains; frequent coprolites and chevrotains; gradual passage.



PROFIL Nr. 3

- Horizon ACG: 60–86 cm width; dark brown color (10 YR 4/3) with frequent grey-blue stains, (5 YR 3/1, sandy-clay texture; unstructured, leach like, compact medium, frequent roots, chevrotains and coprolites, frequent grey-blue stains; concentrations of iron oxides and manganese under reduced forms, humid, gradual passage.

- CG Horizon : below 86 cm thickness; dark blue color (5 YR 2/2) in humid state; sandy-clay texture; unstructured, leach like, compact environment, frequent sand grains with a high diameter, reduced quantities of iron oxide and manganese congestions; high humidity.

Physic - mechanical properties (table 7)

The gleic psamosoil has the lowest content in harsh sand compared to the previous soils, only 54.5 % on the surface and higher in depth.

The fine sand content is close to those of the other two soils, varying from 16.2 % in horizon Am and 17,5 % in horizon CG.

The dust content is much higher, reaching up to 14,7 % on the soil surface, 8,7 % in depth.

Also the clay content has values superior to the two previous ones, being contained between 14,6 % in the first horizon and 10,1 % in horizon CG.

The presented granulometric composition imprints a sandy clay texture to the sand in the first two horizons and a sandy-clay one in the CG horizon.

The apparent density increases from the surface (1.35 gr/cm^3) towards depths up to 1.51 gr/cm^3 . The same way the density increases in depth reaching up to 2.68 gr/cm^3.

The total porosity shows that the soil is much more compressed in depth than on the surface.

Table 7

– Main physic mechanical properties of the gleic psamosoils -

Horizon	Depth -cm-	Glanurometric composition %				Cls. Texture-	Da	D	Pt %
		Gros. Sand 2-0,2 mm	Fine sand 0,2-0,02 mm	Dust 0,02-0,002 mm	Clay < 0,002 mm		gr/ cm^3		
Am	0-60	545	162	147	146	LN	135	261	49
ACG	60-86	568	180	114	138	LN	144	264	46
CG	Sub 86	637	175	87	101	NL	1,51	268	44

C. – Description of the hydro physical properties (table 8)

The hydroscopic rate has values between 2.9 % in the surface horizon and1.6 % in the depth horizon.

The fading quotient decreases on the profile from 4.5 % in horizon Am up to 3.1 % in horizon CG.

The equivalent of humidity decreases on the profile from 11.6 % on the surface up to 7.5 % in depth.

The water capacity shows values between 7.1 % and 4.4 %.

Table 8

- Main hydro physic properties of the gleic psamosoils –

Horizon	Depth -cm-	CH %	CO %	EU %	CU %
Am	0-60	29	45	116	71
ACG	60-86	27	43	92	49
CG	Sub 86	16	31	75	44

D. – Description of the chemical properties (table 9)

The content of organic waste is higher than in the other two mentioned soils, the humus percentage reaches up to 1.85 %.

The total nitrogen has higher values giving the soil a higher fertility compared to the other two ones.

The content of mobile phosphorus is close to the one in the molic psamosoil, varying from 7.4 % in horizon Am up to 3.1 % in horizon CG.

The potassium has values between 12.3 mg/100 gr. soil and 7.9 mg/100 gr. soil,
The soil pH varies between 7.1 and 7.4 giving the soil a neutral reaction.

The hydrolytic acidity is contained between 0.98 me/100 gr. soil in the first horizon and in depth 0.67 me/100 gr. soil.

The sum of the exchangeable bases registers a decrease from 11.62 me /100 gr. soil in horizon Am up to 0.64 me/100 gr. soil.

The total capacity of cationic exchange (T) me/100 gr. soil ranges on the profile from 12.60 me /100 gr. soil up to 8.64 me/100 gr. soil.

The degree of saturation in the bases reaches even up to 100 % in depth.

Table 9

-Main chemical properties of the gleic psamosoil -

Horizon	Depth -cm-	Humus %	Nt %	P_2O_5	K_2O	pH	SH	SB	T	V %
				mg/100 gr. soil		(H_2O)	me/100 gr. soil			
Am	0- 60	185	94	74	123	71	98	1162	1260	92
ACG	60-86	115	62	62	108	72	67	987	1054	93
CG	sub 86	46	30	31	79	74	-	864	864	100

General Conclusions and recommendations for production

The sandy area on the left side of Jiu spreads from North Craiova to the Danube meadow, occupying a surface of approximately 80 000 hectares.

The natural conditions for the formation of the psamosoils on the left side of Jiu are quite varied, for that reason many units of psamosoils can be met in the studied area. The physical structure of the studied area is generally represented by dunes and inter dunes.

The dunes are oriented in the West-Est direction and can have height of 8-12 m.

The inter dunes are broad and have different height from one zone to the other.

In these inter dunes also areas with a high degree of humidity may be met especially during humid times.

On top of the higher dunes and especially during the times when no vegetation occupies them (in spring) the process of wind deflation (wind blow) can be met.

The clima of the studied area is characterized by annual medium temperatures of 10-11^{0}C and by medium annual rainfalls of 450-550 mm. To note that the highest temperatures on sandy terrains on the soil surface have been established at Timburesti, up to even 60^{0}C. The highest number of rainfalls is typical for spring, during the months of February (34.29 mm) till May (58.55 mm), and the lowest during the summer months. Due to the high temperatures and the low rainfalls, the sandy zones strongly require implementation of watering measures.

The sand bed reaches a thickness ranging from 1-2 m up to tens of meters. The natural vegetation in the sandy area finds poorer conditions for development, resulting in small quantities and residues of organic waists being brought up to the soil surface, which cause the sandy soils to be the poorest in organic substances.

In the sandy area on the left side of Jiu the dominant soils are the molic psamosoils, the eutric psamosoils, and the gleic psamosoils.

The molic psamosoils are encountered in the majority of the inter dunes where the conditions of plant development are relatively better, these soils are slightly richer in humus (around 1%) while being better provided with nutrient elements. They also have more natural fertility.

The eutritic psamosoils are met in the superior side of the dunes where conditions for the plant development are tough. For this reason, the soils are very poor in humus (approximately 0.5 %) and in nutrient elements, and they have a low natural fertility.

The gleic psamosoils are met in the deeper dune zone, with a water ground water at a smaller depth, that can raise up to the soil surface through capillary ascension.

The presence of humidity in the soil profile leads to a process of internal reduction, as a consequence these soils show grey – blue stains. They have a good fertility, if the humidity excess is being controlled.

In order to be used for the agriculture, the sandy soils need some radical improvement measures, among which we mention:

-fighting wind deflation, by placing protective windbreaks;

-using “para sands” (fences);

-through plant growth organized as guarding bands;

-by applying the humidification for sand fixation, used mainly in the spring till the plant start seeding in.

All these protection means need to be executed perpendicular on the direction of the dominant winds breeze.

Since the sands and the sandy soils are very poor in humus and colloidal complex, they have a very low fertility. The low fertility is determined by the fact that these soils do not retain water.

In order to increase their productive capacity the application of the natural fertilizer is recommended. In order to be efficient the manure, needs to be buried at a depth of 30-

40 cm, where its mineralization is slower (since it does not have much air) and where it can create a layer for water retention.

Since the sandy soils have a very low capacity of water retention, the mineral fertilizers need to be applied in small doses and repeated at shorter stretches, so that the greatest part of these fertilizers gets to be used by plants in the nutrition process.

The sandy soils do not allow a modern and economically efficient agriculture to be run unless watering is also added. Since they have very high water penetrability, the sands require watering rules in very small quantities and repeated at small time spans, so that the water is used efficiently by the plants.

The sandy soil are easy to be cultivate and since they have a middle harsh texture or harsh-middle one are considered warm soils, for this reason especially early plants are recommended to be cultivated on them.

Here are few among the plants specific for the sandy area: tobacco, early potato, water melon, vine, rye, some species of fruity trees, the peach, the apricot.

If watered and fertilized, the sandy soils can allow the cultivation of any type of agricultural plants.

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STUDIUL FACTORILOR LIMITATIVI AI FERTILITĂȚII SOLURILOR DIN PERIMETRUL LOCALITĂȚII SÂNANDREI, JUDEȚUL TIMIŞ

STUDY OF LIMITING FACTOR IN FIELD SOIL FERTILITY AROUND SÂNANDREI LOCALITY, TIMIŞ DEPARTEMENT

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Key words: Salted, texture, compactness, unevenness, excess moisture.

REZUMAT

Prezenta lucrare reprezintă un studiu ameliorativ al fertilității solurilor din perimetrul localității Sânandrei.

Diferitele tipuri şi grupe de tipuri genetice de soluri existente azi în cadrul perimetrului cercetat sunt rezultatul acțiunilor în timp şi spațiu a complexului de factori pedogenetici (roca subiacentă, relief, climă, vegetație, hidrografie, hidrologie, faună) la care se adaugă influențele determinate de acțiunile omului începând cu lucrările de desecare şi drenaj până la agricultura intensivă de astăzi.

Solurile formate în aceste condiții sunt într-un stadiu relativ recent de solificare ca urmare a faptului că au ieşit de puțină vreme de sub ape. Procesul de solificare este relativ recent, iar direcția lor de evoluție este dictată în cea mai mare masură de formele de microrelief pe care le ocupă şi implicit de nivelul apelor freatice pe profil, precum şi de natura rocilor parentale.

ABSTRACT

This paper is a study of soil fertility improvement methods in Sânandrei locality.

The different types and groups of genetic soil types existing today in the perimeter are the result of the actions sought in time and space complex pedogenetici factors (underlying rock, landscape, climate, vegetation, hydrography, hydrology, fauna) plus the influences caused by human actions from draining and drainage works to intensive agriculture today.

Soils formed in these conditions are a relatively recent stage of soil formation as a result of having little time out of the water. The process of soil formation is relatively recent and their direction of development is dictated largely by the microrelief forms they occupy and thus the groundwater level in the profile, and the nature of parental rocks.

INTRODUCTION

Sânandrei commune administrative territory is situated in the north-northwest at about 15 km county of Timis Timisoara city and is crossed from south to north national highway road Timisoara, Arad and Timisoara County Sânandrei-Caran-Baile Calacea .

Based on Land Registry axistent the local council of the commune Sânandrei were extracted and the total surface uses, resulting in the following:

-arable: 6976,00ha	-forests: -
-meadows: 1044,00ha	-water-
-hayfields: 364,00ha	-neproductiv: 359,00ha
-vineyards: -	-roads: 50,00ha
-orchards: 6,61ha	
total agicol:8390,61ha	total general: 8800,00ha

MATERIALS AND METHODS

To achieve the objectives were used domain-specific research methods pedology: pedological mapping, morphological description, expedited determinations in the field, laboratory information processing soil, etc..

Thus the perimeter researched on newly available data obtained by direct observation in the field and processed in the laboratory have identified a total of 10 genetic types of soil.

The profiles were located in areas representative of the area searched so that it can be described most representative soil types and subtypes. For profiles, samples were collected on pedogenetice horizons, both natural settlement (unchanged) and the amended settlement.

Soil Sampling in natural settlement (unchanged), to characterize certain physical characteristics and hydro-cylinder was the metal of known volume, the momentary soil moisture and in cardboard boxes (especially made) to characterize its micromorphology.

Sampling the settlement as to characterize physico-chemical and biological part, was in bags, each genetic horizon.

Also for the determination of specific chemical indices were agrochemical samples (processing layer). Research conditions ecopedologice and morphological description of soil was investigated after "the Romanian system of soil taxonomy (2003), completed and / or modified by" development methodology soil studies "(volumes I, II, III) developed by ICPA Bucharest in 1987.

Testing and other laboratory determinations were performed in Soil and Agrochemical Studies Office Timisoara, and the University of Agricultural Sciences and Veterinary Medicine of Banat Timisoara, where national rules and standards approved by the Standards Association of Romania (ASRO).

RESULTS AND DISCUSSION

- **LIMITATIONS DUE TO SOIL SARATURARII**

The term "Saraturi" defines a soil whose fertility is strongly affected by the high content of soluble Saraturi the profile of this natriului exchangeable in colloidal complex, this water table located at shallow mineralized. The term includes the features mentioned soil AGROPRODUCT reported mainly in agricultural work, as well as the behavior of agricultural plants, their production capacity.

Saline and alkali soils are those soils which shows are only slightly soluble salts, chlorides, sulfates, carbonates, accumulated on the surface (saline soils) or only a high sodium content adsorbed in colloidal complex (alkali soils) or soils both soluble and exchangeable sodium (alkali salt).

Findings alcalizarii salinisation and soil is based on the intensity of the salinity (S) and / or alkalization (a) and the depth to which they manifest.

2. DUE TO OTHER LIMITATIONS OF SOIL CHEMICAL CHARACTERISTICS

The soil has a series of attributes defined and studied which served and serve both to specify the genetic classification and parametric entities and to study the influence exerted on plant growth.

Among the fundamental attributes of soil chemical characteristics distinguish these soil: soil reaction, humus reserve and the carbon content, its intrinsic attributes that influence the growth and fruiting plants directly in direct relationship to how participation and intensity of phenomena.

2.1. Limitations due to acidity

Soil reaction, indicating that express conditions that occur in biochemical processes in soil is the limiting factor is 58.28% of the investigated area due to low pH values.
2.2. Limitations due to alkali and alkaline soil
In this category of limitations are limitations due to low pH level (pH 7.9 to 8.4) on an area of 781.57 ha 9.30% respectively.

3. LIMITATIONS DUE TO RESERVE HUMUS

The content of soil organic matter humus that is one of the defining qualities of the state's fertility. As humus vegetation factor acts directly as the main reservoir for plant nutrition. As the soil is rich in humus and it is quality, the more the potential of production is higher and vice versa.

With regard to plant more demanding requirements from the humus content are vegetables, followed by hemp, sugar beet, potato, sunflower, alfalfa, clover, corn, flax, etc.. According to the above, reserves of humus is the limiting factor is about 42.67% of the area. In this sense, within the perimeter have investigated these types of limitations were identified:

- Moderate limitations due to low reserves of humus (medium and fine textured soils in AP), an area of 323.24 hectares, respectively 3.84%
- Limitations due to low moderate humus reserve an area of 3263.08 ha 38.83% respectively.

4. LIMITATIONS DUE TO THE CONTENT OF CaCO3

- They differ on these categories of limitations:
- Limitations due to extremely severe CaCO3 content on an area of 79.28 ha, 0.44% respectively
- Limitations due to moderate CaCO3 content, an area of 60.70 ha 0,72%
- Limitations due to low CaCO3 content, an area of 297.41 hectares, respectively 3.54%

5. LIMITATIONS DUE TO PHYSICAL PROPERTIES OF SOIL

Hydro and soil physical attributes which determine the limits within which the soil physical phenomena occurring physicochemical and nutritional support that plant cellular environment, where polydispersity combines three phases: solid, liquid and gaseous soil, and intermediate stages between them, resulting from biological activity and physico-chemical alteration, leakage, clotting, respiration, assimilation, decomposition, mineralization, etc..
Among the physical and hydro that influence productive capacity include: soil texture, soil and lift the volume low.

6. TEXTURE AND COMPOSITION GRANULOMETRY

Defined by the ratio of particles of different sizes that participate in soil composition and distribution of hydroxyapatite on the profile of the different proportions of particles.
Texture plays an important role in ensuring the conditions for plant growth and fruition as any of the other attributes of the soil texture factor is related to or determined, although the fundamental characteristics of the soil, extending or limiting their productive capacity.

7. LIMITATIONS DUE TO FINE TEXTURE

Fine textured soils, clay (AL, AA, AF) and lutoargiloasa (TN, TT, TP) have a low permeability and high water retention capacity.
Although soils are rich in humus and a high retention capacity for other nutrients, yet plants do not always find optimal conditions for growth and development because of water and air regimuluiantagonist.

8. LIMITATIONS DUE TO GRADE OF ROLLERS

Compactness of the soil are the property of opposing forces that tend to open up the particles that compose it mechanically.

Compactness of the soil's composition is related to reaching the maximum grain size of clay soil structure without also being influenced by water content, humus and the nature of adsorbed cations.

Compaction effects are consequential effects of soil nutrient and hydrologic regime. To address these shortcomings by loosening required repeated actions aiming at depths deeper horizons compact depth.

9. LIMITATIONS DUE TO EROSION OR SLIDING

In terms of slope land have been found on these types of limitations:
- Severe limitations due to slope land area of 220.51 hectares respectively 2.62%
- Moderate limitations due to slope land area of 410.85 hectares respectively 4.88%
- Limitations due to low slope land area of 158.76 ha, 3.30% respectively.

10. EROSION SURFACE, INCLUDING EROSION HAZARD

In terms of erosion hazard of erosion that distinguish these categories of limitations:
- Limitations due to moderate erosion surface area of 380.47 hectares, respectively 4.52%
- Limitations due to reduced erosion of the surface area of 315.27 ha, 3.76% respectively.

11. LIMITATIONS DUE TO LAND uniformity

Relief, the degree of irregularity or directly influence both processes and pedogenesis mecanizabilitatea land or the possibility that it can be worked with farm machinery or the need for measures to smoothen, modeling, etc..

12. LIMITATIONS DUE TO EXCESSIVE MOISTURE

Excess soil moisture can be caused by water from precipitation, groundwater or water from leaking lateral external and internal conditions of a defective drainage. Excess water is manifested as follows:
- Morphology, hereby glei horizon (Gr) or pseudogleic (W)
- Physically, the water content exceeds field capacity or water content at suction of 0.33 atm., In this case the volume of air dropping below 10% pore space
- Chemical, because the values of pH and redox potential of the soil.

Support crops without reducing excess water production a short period of time. Ameliorative measures proposed will focus first remove the causes that produce excess moisture and then fight the consequences that it had excess water on the soil.

13. LIMITATIONS DUE TO EXCESSIVE MOISTURE STALLED

Studies undertaken in our country have shown that high rainfall in 1969, 1971, 1982, 1987, or in some rainy periods of the year, may be considered stagnant without the excess moisture so they can be the sole cause.

In reality, there may be a cause of excess moisture stagnant but rather a contest of favorable circumstances in which this phenomenon. Among these circumstances or circumstances as:
- The presence of a clay soil for more
- Orographic, namely the existence of forms microdepresionare
- This UNPR impermeable layers
- The use of heavy agricultural machinery uncritically insufficient land sbicite.

14. LIMITATIONS DUE flooding by the outpouring

Land with these limitations are located in flood plains of rivers in the area. They differ on these categories of limitations:
- Limitations due to severe flooding in the flood area of 224.11 hectares, respectively 2.66%

15. LIMITATIONS DUE TO CLIMATE

- In this category of limitations are:
- Limitations due to reduced climate, an area of 220.51 ha, 4.59% respectively.

16. LIMITATIONS DUE TO MOISTURE DEFICIT

- Within the perimeter of limitations investigated involved the following categories:
- Limitations due to severe moisture deficit in the area of 17.38 ha, 0.20% respectively

- Limitations due to severe moisture deficit, with an area of 188.23 hectares, respectively 2.24%

- - Limitations due to moderate moisture deficit area 4971.13 hectares, 59.16% respectively.

CONCLUSIONS

As environmental factor influencing plant physiology both directly and indirectly through its many and indispensable functions for the conservation of soil productive potential amount of Ca CO3 have investigated the perimeter total values (range 0-50 cm) that not exceed 12% fact which can be considered the ecological conditions it is optimal for most crops.

The characteristics of constituents, the momentum in the soil and its surface, soil humus content is one of the fundamental characteristics of its fertility status. Humus quality depends primarily on the state of that reaction in base saturation of soil.

Outcome of the dowry (lithologic) and complex physical and climatic factors and soil features in development to diverse natural or influenced by humans, soil reaction and base saturation in, present in the area investigated a variety of favorability expressed by coefficients bonitare .

As a physical attribute of stability, the composition size or soil texture (Ind. 23) present in the investigated area vary widely. Under the current methodology involved both directly by bonitare texture coefficients environmental favorability, and indirectly in the correction of some indicators such as reserves of humus or on groundwater depth.

Due to the natural ecological potential good overall situation is still unsatisfactory soils, most soils are affected by the existence of one or more factors limiting or restrictive.

Also, the use of land is not always the most appropriate sustainable management of the land (simple rotation wheat-corn, monoculture, the abandonment of marginal land and even the productive, etc.).

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EVALUAREA AGROCHIMICĂ ŞI BONITAREA TERENURILOR DIN AREALELE “GARA BRAZI” ŞI “PLOIEŞTI TRIAJ” (JUDEȚUL PRAHOVA)

AGROCHEMICAL AND LAND EVALUATIONS OF AREAS "GARA BRAZI" AND "PLOIESTI TRIAJ” (PRAHOVA COUNTY)

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Cuvinte cheie: evaluare agrochimică, bonitare, note de bonitare
Key words: agrochemical and land evaluations, evaluation note

REZUMAT

Evaluarea agrochimică s-a realizat pentru stabilirea condițiilor inițiale privitoare la calitatea solurilor din două suprafețe de teren, cu mărimea de 3,300 ha şi 2,195 ha, amplasate lângă două bataluri cu reziduuri petroliere, denumite „Gara Brazi” şi „Ploieşti Triaj” (județul Prahova). Pe aceste amplasamente urmează să se constituie organizarea de şantier pentru uzinele care vor procesa reziduurile petroliere din batale. În vederea comparării cu un sol din afara zonelor de influență a batalelor, s-a analizat un profil din situl Stejarul, situat la 6,7 km vest de batalul Brazi şi 10,3 km sud-vest de batalul Ploieşti-Triaj.

Evaluarea agrochimică a suprafețelor de teren pe care vor fi organizările de şantier şi bonitarea terenurilor agricole au fost făcute pentru stabilirea claselor de favorabilitate pentru folosințe şi culturi, pe baza notelor de bonitare. De asemenea, s-a realizat încadrarea terenurilor agricole în clase de calitate pentru diferite folosințe (arabil, păşuni, fânețe, livadă, vie). În acest context, solul reconstruit, după închiderea şantierelor, pregătit pentru însămânțare poate fi cultivat, pentru început, cu plante ierboase din familia graminee. La recoltare, acestea vor fi introduse sub brazdă, ca îngrăşământ verde.

Dacă terenul se va lua în cultură, este necesar ca, după 1-2 ani de cultivare a “îngrăşămintelor verzi”, să se efectueze o cartare agrochimică şi să se stabilească necesarul optim de îngrăşăminte organice şi/sau minerale, în acord cu natura plantelor şi cu recolta scontată a se obține.

ABSTRACT

Agrochemical evaluation was performed to determine the initial conditions regarding the soil quality in two areas of land, with a size of 3,300 ha and 2,195 ha, located near two pits with oil residue, called "Gara Brazi" and "Ploieşti Triaj” (Prahova County). On these sites will be a holding site for factories that will process the oil residues of the pits. In order to compare with a soil, from outside of influence zones of oil residues, a soil profile was examined in „Stejaru” site, located at 6,7 km west of pit “Brazi” and at 10,3 km southwest of pit "Ploieşti Triaj”.

Agrochemical and land evaluations were made to establish the suitability for use classes and crops based on the evaluation notes. Also, was done the separation of agricultural land in class quality for different uses (arable, pasture, meadow, orchard and vineyard). In this context, soil rebuilt, after the closing of sites, prepared for planting can be cultivated, initially, with herbaceous plants (cereal crops and grasses of the legume family. At harvest, the plants will be placed under the turf, as green manure.

If the land will be taken into culture, it is necessary that after 1-2 years of cultivation of "green manure" to make an agrochemical mapping to determine the optimal requirements of organic fertilizers and/or minerals, in harmony with nature of plants and the expect harvest.

INTRODUCTION

Areas investigated in terms of agrochemical characteristics are located south of Ploiesti, around the oil refinery "Petrobrazi.

In these areas by eliminating the initial effects of pollution and restoration of ecosystems it is possible to implement the concept of sustainable development, which in terms of soil science represents the optimization of soil fertility functions (Anca-Rovena Voiculescu, 2005). So, agrochemical evaluation was performed to determine the initial conditions regarding the soil quality. After that, land evaluation was made to establish the suitability for use classes and crops.

Agricultural land evaluation is required for zoning of agricultural production, to determine the productive potential of land for increasing the value of land resources.

MATERIAL AND METHOD

Collected soil samples from profiles, on the pedogenetic horizons and medium agro-samples were analyzed physically and chemically.

The main chemical properties determined on soil samples were: soil reaction (determined potentiometrically in aqueous suspension), humus content (Walkley and Black method), contents of total nitrogen (Kjeldahl method), and content in mobile forms of phosphorus and potassium acetate-soluble solution of ammonium lactate at pH 3,7, (Egner-Riehm-Domingo method).

The chemical parameter as soil reaction and the total content of soluble salts (conductometric method), hydrolitical acidity (Ah), sum of exchangeable bases base (SEB), cation exchange capacity (CEC), saturation degree (V), were also determined according to the ICPA methodology (1986).

Fitting of soil taxonomic units was made according to the Romanian System of Soil Taxonomy (SRTS, 2003).

Land evaluation was performed to determine the current status of land considered in terms of their agricultural production capacity.

For this purpose, evaluation notes for crops and uses were calculated based on ecopedological indicators (Soil Survey Methodology, 1987). After that, the land was distributed in suitability and quality classes.

At the land evaluation for natural conditions, each indicators of evaluation participate in establishing the note by a factor ranging between 0 and 1.

Note of evaluation is obtained by multiplying with 100 the product of coefficients indicators directly involved in this calculation and can not be more than 100 points. Establishing quality classes for different land uses (pasture, arable, orchard, vineyard, etc.) is governed by Order MAPAM no. 223/2002.

Thus, for arable land use category, the natural note of evaluation used for quality classes, is the arithmetic mean of evaluation notes for the eight standard cultures with the largest area of distribution (wheat, barley, maize, sunflower, sugar beet, potatoes, soybeans and peas).

For orchard use category, the arithmetic mean of evaluation notes is for species: apple, pear, cherry and plum. For vine use category is the arithmetic average of vine evaluation notes for wine and table grape, and for pasture and meadow uses categories are used the evaluation notes obtained for these uses.

Were established ten classes of favorability, and crop uses, including 10 points each class. Favorability increases with the number of evaluation points, from 0 to 100.

Quality classes of land are established, also, by the evaluation notes. Each quality class includes 20 (points) note of evaluation.

Series quality classes in descending order of notes (points) of evaluation looks like this: class I: 81-100 points, class II: 61-80 points, class III: from 41 to 60 points, class IV: 21-40 points and class V: 0-20 points.

RESULTS AND DISCUSSIONS

Chemical characteristics of the profile control from the site "Stejaru"

Soil profile has a slightly alkaline reaction, with values ranging between 7.65 and 8.23 pH units (table 1).

Total cation exchange capacity (T-NH_4) is medium in Ap, Am and A/C horizons, (values between 27.67 and 23.85 me/100 g) and low to very lower in the rest of profile (values between 16.22 and 9.54 g me/100). Soil contains calcium carbonate throughout the profile and it is saturated with bases (V_{Ah} = 100%).

The total content of soluble salts shows that soil profile is non-saline because the values obtained are between 38 and 54 mg/100 g soil and are well below the threshold of the beginning of salinisation (100 mg/100g soil).

Humus content is low with values of 2.04 to 2.46% in At and Am horizons and very small (1.08) in A/C horizon and the reserves of humus, in the 0-50 cm depth, is medium with123, 3 t/ha (table 2).

Providing *total nitrogen* (Nt %) is medium-high with values from 0.246 to 0.348%, the *mobile phosphorus* (P_{AL}) is very small (4-5 mg/kg) and the *mobile potassium* is, also, medium-high (140-233 mg/kg).

Table 1

Reaction, cation exchange capacity and the total content of soluble salts in soil samples collected from control profile "Stejaru"

Localization Soit type	Horizon	Depth cm	pH_{H_2O}	T-NH_4 me/100 g soil	V_{Ah} %	Total content of soluble salts mg/100 g soil
Control profile "Stejaru" Calcaric-gleyic chernozem (CZ-ka-gc)	Ap	0-18	7.65	27.67	100	42
	Am	18-35	7.72	24.80	100	38
	A/C	35-52	7.92	23.85	100	38
	Ck_1Go	52-78	8.05	16.22	100	41
	Ck_2Go	78-105	8.15	12.40	100	54
	Ck_3Go	105-144	8.23	9.54	100	49

Table 2

The contents of humus, total nitrogen, phosphorus and potassium mobile phone of soil samples collected from control profile "Stejaru"

Localization Soit type	Horizon	Depth cm	Humus	N_{total}	P_{AL}	K_{AL}
			%		mg/kg	
Control profile "Stejaru" Calcaric-gleyic chernozem (CZ ka gc)	Ap	0-18	2.46	0.348	4	233
	Am	18-35	2.04	0.246	5	140
	A/C	35-52	1.08			

Agrochemical characterization of soil at the site "Gara Brazi"

The soil in the studied plots has a slightly acid reaction in both horizons. For the surface horizon values were between 6.00 and 6.55 pH units with an average of 6.29 pH units. In the 20-40 cm horizon values were slightly higher and ranged between 6.20 and 6.88 pH units with an average of 6.48 pH units (table 3).

The amount of *exchangeable bases (SB)* is from medium to high with an average of 21.49 and respectively 22.95 me/100 g soil for both horizons.

Hydrolytic acidity (Ah) is very low to low with an average of 2.64 me/100 g soil in 0-20 cm horizon and 2.10 g me/100 in 20-40 cm soil horizon.

Cation exchange capacity (T) is from medium to high values with an average 24.13 g me/100 g soil in upper horizon, respectively 25.05 g me/100 g soil in 20-40 cm.

After *the degree of base saturation* values (V_{Ah}) the soil is in eubasic-mesobasic and mesobasic average value in the horizon 0-20 cm (V=88.8%) and eubasic in the 20-40 cm horizon (V=91, 3%).

The total content of soluble salts show that the soil is non-saline, with values from 19 mg/100 g soil to 45 mg/100 g soil; these values are well below the starting threshold of 100 mg/100 g soil salinisation.

Table 3

Reaction, cation exchange capacity and the total content of soluble salts of the agrochemical soil samples collected from "Gara Brazi"

Localization	Depth cm	pH_{H_2O}	SB	Ah	T=SB+Ah	V_{Ah}	Total content of soluble salts
			me/100 g soil			%	mg/100 g soil
S1	0-20	6.55	28.14	1.92	30.06	93.6	45
	20-40	6.88	27.12	1.46	28.59	94.9	36
S2	0-20	6.35	21.22	2.13	23.35	90.9	39
	20-40	6.53	20.41	1.96	22.37	91.2	31
S3	0-20	6.47	21.42	2.13	23.55	91.0	21
	20-40	6.60	22.65	1.71	24.36	93.0	25
S4	0-20	6.21	18.98	3.42	22.40	84.7	19
	20-40	6.20	19.80	2.46	22.26	88.9	25
S5	0-20	6.13	19.39	3.09	22.48	86.3	20
	20-40	6.37	19.59	3.34	22.93	85.4	19
S5	0-20	6.00	19.80	3.13	22.93	86.3	22
	20-40	6.33	28.14	1.67	29.81	94.4	36

Humus content is low for a fine-textured soil horizon with averages of 2.68% and 2.18% (table 4).

Providing *total nitrogen* (Nt%) is medium, with mean values of 0.163 and 0.152% on horizons, the *mobile phosphorus* (P_{AL}) is very small (8 and 5 mg/kg mean values on horizons) and the *mobile potassium* (K_{AL}) is medium, with mean values of 181 mg/kg and 152 mg/kg on horizons.

Tabel 4

The contents of humus, total nitrogen, phosphorus and potassium of the agrochemical soil samples collected from "Gara Brazi"

Localization	Depth cm	Humus	N_{total}	P_{AL}	K_{AL}
		%		mg/kg	
S1	0-20	3.12	0.159	10	267
	20-40	2.10	0.160	3	151
S2	0-20	2.52	0.175	9	170
	20-40	2.04	0.158	5	138
S3	0-20	2.94	0.163	9	161
	20-40	2.82	0.148	7	161
S4	0-20	1.80	0.136	5	140
	20-40	1.74	0.159	5	159
S5	0-20	2.94	0.181	6	172
	20-40	2.58	0.154	4	140
S5	0-20	2.76	0.162	7	177
	20-40	1.80	0.131	7	159

Agrochemical characterization of soil at the site " Ploieşti Triaj "

Soi has a slightly acid reaction with very similar values in both horizons. Thus, the reaction surface horizon had an average of 6.58 units (pH values between 6.35 and 6.85 units), and 20-40 cm horizons averaged 6.53 units (pH 6.36 and 6.87 units), (table 5).

Table 5

Reaction, cation exchange capacity and the total content of soluble salts of the agrochemical soil samples collected from " Ploieşti Triaj "

Localization	Depth	pH_{H_2O}	SB	Ah	T=SB+Ah	V_{Ah}	Total content of soluble salts
	cm		me/100 g soil			%	mg/100 g soil
S7	0-20 20-40	6.63 6.70	23.05 23.26	2.13 1.71	25.18 24.97	91.5 93.1	20 23
S8	0-20 20-40	6.85 6.87	29.16 24.89	1.67 1.67	30.83 26.55	94.6 93.7	22 24
S9	0-20 20-40	6.50 6.59	20.41 20.00	2.42 1.92	22.83 21.92	89.4 91.2	22 21
S10	0-20 20-40	6.35 6.36	21.83 21.22	2.80 2.96	24.63 24.18	88.6 87.7	19 19

The sum of exchangeable bases (SB) is from medium to high in the surface horizon with an average of 23.61 me/100 g and medium with an average of 22.34 me/100 g soil in 20-40 cm.

Tabel 6

The contents of humus, total nitrogen, phosphorus and potassium of the agrochemical soil samples collected from " Ploieşti Triaj "

Localization	Depth	Humus	N_{total}	P_{AL}	K_{AL}
	cm	%		mg/kg	
S7	0-20 20-40	2.82 2.40	0.182 0.177	2 2	149 140
S8	0-20 20-40	3.06 3.00	0.177 0.176	3 2	170 140
S9	0-20 20-40	2.76 2.40	0.128 0.156	2 2	130 109
S10	0-20 20-40	3.48 3.12	0.178 0.163	2 2	140 119

Hydrolytic acidity (Ah) is from very low to low, with an average of 2.25 me/100 g soil and 2.07 me/100 g soil in the two horizons.

Cation exchange capacity (T) is medium to high with an average of 25.87 me/100 g soil in upper horizon, respectively 24.41 me/100 g soil in 20-40 cm.

After the *degree of base saturation values* (V_{Ah}) the soil is mesobasic-eubasic and as average is eubasic (V = 91.0% in the horizon 0-20 cm and 91.3% in horizon 20-40 cm).

The total content of soluble salts show that the soil is non-saline, with values ranging from 19 to 24 mg/100g soil which are well below the starting threshold of 100 mg/100 g soil salinization.

Humus content is medium in both horizons with averages of 3.03% and 2.73%.

Providing *total nitrogen* (Nt%) is medium with mean values of 0.166 and 0.168% horizons, the mobile phosphorus (P_{AL}) is extremely low (2 mg/kg mean value in both horizons) and the mobile potassium (K_{AL}) is medium to low horizons with averages of 147 and 127 mg/kg (table 6).

Land evaluation

Agricultural land evaluation is a complex action research and a quantitative assessment of the main conditions which determine the growth and fruiting plants, establishing the degree of favorability of these conditions for each use and culture (as a field may be negative for certain uses and crops but positive for others), (Puiu St., 2001). Expression of suitability for different crops is calculated by using the notes of evaluation.

To calculate the evaluation notes some indicators are used, known as indicators of evaluation.

Land evaluation on control site "Stejaru"

The indicators used for the natural lend evaluation were: soil texture in the the top 20 cm (loamy), soil gleysation degree (moderate gleysation), groundwater depth and soil reaction (pH) in the upper horizon (weakly alkaline). To these indicators have occurred some changes printed of different soil and land characteristics in the area.

Evaluation notes, more than 80 points, were obtained (table 7) for pasture, apple, pear, plum, apricot, peach, sugar beet, linseed and alfalfa; higher evaluation notes of 70 points were obtained for meadow, cherry, wheat, barley, beans, potatoes, soybeans, peas, beans, hemp, clover and vegetables, for vine-wine and vine-table grapes were obtained 65 evaluation points.

Thus, corn, sugar beet, apple, pear, plum with 81 points of evaluation and pastures with 90 points of evaluation are into class II of favorability. Wheat, barley, sunflower, soybeans, peas, beans and cherry with 73 points of evaluation are into class III of favorability, while the vine-wine and vine-table grapes by 65 points of evaluation are into class IV of favorability.

For arable land the arithmetic average of 8 crops, was 75 points of evaluation and is in class III of favorability (tables 8 and 9).

Uses quality classes are given in table 10. Thus, arable land (75 points of evaluation), orchard (79 points), vine (65 points) and meadow (72 points) are in class II of quality. The use of pasture with 90 points is in the first class quality.

Land evaluation on site "Gara Brazi"

To this location were taken into account the following indicators of evaluation: average annual temperature (10.4°C), annual average rainfall (608 mm) soil texture in the top 20 cm (clayey loam), ground water depth greater than 10 m; total porosity in restrictive horizon (small) total content $CaCO_3$ (medium) reaction (pH) in the upper horizon (weak acid), degree of base saturation (eubasic), edaphic volume (high), reserves of humus in the 0-50 cm depth (medium).

Evaluation notes (table 7), greater than 80 points, were obtained for pasture, apple, plum, pear, vine-wine, vine-table grape, linseed, showing a good productive potential of these crops. Thus, apple, plum (81 points), pear and cherry (90 points) correspond to class II of favorability.

Higher evaluation notes of 70 points, in class III of the favorability, were obtained for wheat, barley, maize, beans, soybeans, peas, beans, hemp, and over 60 points evaluation notes (class IV of favorability) were obtained from meadow, sugar beet, vegetables and hackled flax. The lowest notes of evaluation were obtained in clover (58 points) and potato (59 points), indicating a low production potential (table 7).

Evaluation notes and classes of suitability for orchard, vineyard, pasture and meadow are shown in Table 8.

For vineyard and pasture land use were obtained 81 points, placing in class II of favorability, and meadow with 65 points, coming in fourth class to favorability (table 9).

In case of arable land use the arithmetic mean for the 8 cultures was resulting in 70 points of evaluation, corresponding to class IV of favorability; meadow with 65 points fall into class II of quality and for orchard, vineyard and pasture, the 81 points correspond to first class quality.

Land evaluation on site "Ploieşti Triaj"

For this location have been considered the indicators used above, such as soil texture in the top 20 cm (clay), soil reaction (pH) in the upper horizon (slightly acidic), the degree of base saturation (saturated base), edaphic volume (high).

Evaluation notes greater than 80 points were obtained for pasture, apple, plum, pear, cherry, apricot, peach, vine-wine vine-table grape, linseed, alfalfa (table 7).

Higher evaluation notes of 70 points (class III of favorability) were obtained for wheat, barley, maize, beans, beets, soybeans, peas-beans; evaluation notes of 65 points were obtained for meadow and vegetables. The lowest notes of evaluation were obtained from potato (66 points-class IV of favorability (table 8).

For arable land use the arithmetic mean of the evaluation notes the 8 cultures was 72 points, resulting class III of favorability.

Apple, pear, cherry with 81 points and plum with 90 points fall in the class II of favorability. Arithmetic average of evaluation notes was 83 points of evaluation so the class of favorability is the second (table 9).

For vineyard and pasture land use were obtained 81 points of evaluation, placing in the second class of favorability, and meadow with 65 points, in fourth class of favorability.

Quality classes are shown in table 10. Thus, the arable land with 72 points of evaluation and meadow with 65 points falls by in the second class of quality. Orchard land use (83 points), vineyard and pasture (81 points) fall in first class quality.

CONCLUSIONS

- The calcaric-gleyic chernozem from Stejaru has a slightly alkaline reaction, a low of humus, a medium content of total nitrogen and very small supply of mobile phosphorus and potassium. Soil is non-saline and it is eubasic due to the presence of calcium carbonate in all horizons.
- Analytical data of soil samples from "Gara Brazi", lead to the conclusions that soil reaction is weakly acid, low humus content, medium total nitrogen content, mobile phosphorus supply very poor and a medium potassium supply. The soil has a medium cation exchange capacity, low hydrolytic acidity, being considered as mesobasic, in terms of the degree of base saturation. Low and very low content of soluble salts show that the soil is non-saline.
- Typical chernozem in Ploieşti Triaj has a slightly acid reaction, a medium content of humus and total nitrogen; phosphorus supplies are small and medium for potassium mobile. Soil is non-saline, has a low hydrolytic acidity, a medium cation exchange capacity and mesobasic degree of base saturation.
- Evaluation notes for crops and agricultural uses in natural conditions for all three soils are between 65 and 90 points. Favorability classes for arable vary between II and IV the predominant class being III.

- Favorability classes under natural conditions for orchard, vineyard, pasture and meadow are between II and IV, class II being the predominant one.
- In descending order of favorability, soils are in class I for pasture, vineyard and orchard, and in class II for arable land and meadow.
- After the ecological reconstruction of soil and land and after the soil cultivation, first with plants used as green fertilizer, there are no restrictions on use of land for agricultural purposes.

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Table 7

Evaluation notes for crops and agricultural uses under natural conditions

Identification	PS	FN	MR	PR	PN	CV	CS	PC	LV	VV	VM	VN	GR	OR	PB	FS	CT	SF	SO	MF	IU	IF	CN	LU	TR	LG	AR
Brazi	**81**	**65**	81	81	90	73	73	73	**81**	81	81	**81**	73	73	73	73	59	66	73	73	81	66	73	81	58	65	**70**
Triaj	**81**	**65**	81	81	90	81	81	81	**83**	81	81	**81**	73	73	73	73	66	73	73	73	81	73	73	81	58	65	**72**
Stejaru	**90**	**72**	81	81	81	73	81	81	**79**	65	65	**65**	73	73	81	73	73	81	73	73	81	81	73	81	73	72	**75**

PS – pasture (păşuni); FN – meadow (fânețe); MR – apple (măr); PR – pear (păr); PN – plum (prun); CV – cherry (cireş, vişin); CS – apricot (cais); PC – peach (piersic); **LV – orchard (livadă);** VV – vine-wine(vie, vin); VM – vine-table grape (vie, struguri de masă); **VN – vine (vie);** GR – wheat (grâu); OR – barley (orz); PB – corn (porumb); FS – sun flower (floarea soarelui); CT – potato (cartof); SF – sugar beet (sfeclă de zahăr); SO – soybean (soia); MF – pea (mazăre); IU – linseed (in ulei); IN – hackled flax (in fuior); CN – hemp (cânepă); LU – alfalfa (lucernă); TR – glover (trifoi); LG – vegetables (legume); **AR – arable land (arabil)**

Table 8

Classes of favorability – ARABLE LAND

Identification	GR		OR		PB		FS		CT		SZ		SO		MF		ARABIL	
	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class
Brazi	73	III	73	III	73	III	73	III	59	V	66	IV	73	III	73	III	70	IV
Triaj	73	III	73	III	73	III	73	III	66	IV	73	III	73	III	73	III	72	III
Stejaru	73	III	73	III	81	II	73	III	73	III	81	II	73	III	73	III	75	III

GR – wheat (grâu); OR – barley (orz); PB – corn (porumb); FS – sun flower (floarea soarelui); CT – potato (cartof); SF – sugar beet (sfeclă de zahăr); SO – soybean (soia); MF – pea (mazăre)

Table 9

Classes of favorability – ORCHARD LIVADĂ (LV), VINE VIE (VN), PASTURE PĂŞUNE (PS), MEADOW FÂNEAȚĂ (FN)

Identification	MR		PR		PN		CV		LV		VV		VM		VN		PS		FN	
	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class
Brazi	81	II	81	II	90	II	73	III	81	II	81	II	81	II	**81**	**II**	81	II	**65**	**IV**
Triaj	81	II	81	II	90	II	81	II	73	II	81	II	81	II	**81**	**II**	81	II	**65**	**IV**
Stejaru	81	II	81	II	81	II	73	III	79	III	65	IV	65	IV	**65**	**II**	90	II	**72**	**III**

Tabelul 10

Quality classes

Identification	Arable		Orchard		Vine		Pasture		Meadow	
	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class
Brazi	70	II	81	I	81	I	81	I	65	II
Triaj	72	II	83	I	81	I	81	I	65	II
Stejaru	75	II	79	II	65	II	90	I	72	II

EVOLUŢIA PROPRIETĂŢILOR CHIMICE ŞI MICROBIOLOGICE ALE SOLULUI LA UN AN DUPĂ APLICAREA TEHNOLOGIILOR DE ELECTRO- ŞI BIOREMEDIERE A SOLURILOR POLUATE CU COMPUŞI ORGANICI

SOME SOIL CHEMICAL AND MICROBIOLOGICAL PROPERTIES EVOLUTION A YEAR AFTER ELECTRO- AND BIO-REMEDIATION TECHNIQUES WERE APPLIED ON SOILS POLLUTED WITH ORGANIC COMPOUNDS

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Keywords: organic compounds soil pollution, soil bio-remediation, bacterial inoculum, soil electro-kinetic remediation

ABSTRACT

Soil agro-chemical and microbiological parameters were studied a year after bio-remediation accelerated by bacterial inoculum and electro-kinetic remediation techniques were applied on experimental lots polluted with organic compounds. The decreasing tendency of the organic carbon content was confirmed, the main goal of the researches carried on. The total nitrogen contents present the most constant an important decrease, by almost half, because of the nitrates lposs from the system and vegetation uptake. Mobile phosphorus contents also decrease, mostly on the lot on which bio-remediation was experimented, so do the mobile potassium ones. Soil reaction has a very slightly decreasing tendency due to soluble salts presence and soil solution ionic equilibrium altering by the loss of important nitrate quantities.
In the bio-remediation experiment the total number of microorganisms has a slight variation as compared to the previous year values. In the electro-kinetic remediation experiment the total number of bacteria decreased, sometimes very much.

REZUMAT

Au fost studiaţi parametrii agrochimici şi microbiologici ai solului la un an după aplicarea tehnologiilor de bioremediere accelerată prin inocul bacterian şi remediere electrocinetică pe loturi experimentale poluate cu compuşi organici. A fost confirmată tendinţa de scădere a conţinutului de carbon organic, principalul scop al cercetărilor desfăşurate. Scăderea conţinutului de azot total a fost cea mai importantă şi consecventă, cu aproape 50%, datoriăt migrării nitraţilor în adâncimea solului şi consumului de către plante. Scade şi conţinutul de fosfor mobil, mai ales în lotul unde s-a experimentat bioremedierea, la fel şi conţinutul de potasiu mobil. Reacţia solului are o foarte slabă tendinţă de scădere, din cauza conţinutului de săruri şi modificării echilibrului chimic prin pierderea unor cantităţi importante de nitraţi.
În experimentul de bioremediere numărul total de microorganisme variază foarte puţin în comparaţie cu valorile anului precedent. În experimentul electrocinetic, numărul total de bacterii a scăzut, uneori foarte mult.

INTRODUCTION

The oil contaminated fields problems are getting more important lately, from the practical, scientific, and political point of view, at a national and international scale, and constitute a major concern of the European Union. The inherited contamination represents, in the last few years, a critical soil pollution category, because of the pollutant persistence in soil an groundwater on one hand, and because is more difficult to manage or to solve than a new pollution on the other hand. The present paper was elaborated in the frame of a project which aims to develop management tools of the health estate of certain areas and assist strategic and tactic decisions taking depending on it.

Choosing the technological decontamination variants has to take into account risk management, feasibility, technical applicability, cost/benefit ratio, environment, social, and economical impact.

In-situ treatments insignificantly expose the working personnel and the environment to subsequent contaminations and the costs are lower as compared to the *ex-situ* techniques.

Three experiments have been carried out in the frame of a dedicated project: electro-remediation in 2008, bio-remediation accelerated by bacterial inoculum in 2009, and again electro-remediation, in 2009, on the same lot as the 2008 experiment.

The bio-remediation process accelerated by bacterial inoculum had a 40-70% efficiency after 130 days from the treatment application. After 360 days, the total THP concentrations were 100-200 mg-kg, so the terrain can be used for civilian building (Ana, 2010).

In the 2008 electro-remediation experiment a 45-55% efficiency was obtained after 200 hours of treatment (Anicăi, 2010).

MATERIAL AND METHODS

A bio-remediation technology accelerated by bacterial inoculum has been applied on a former Petroleum Park, at Sfinții Voievozi, Dâmbovița County (Figure 1).

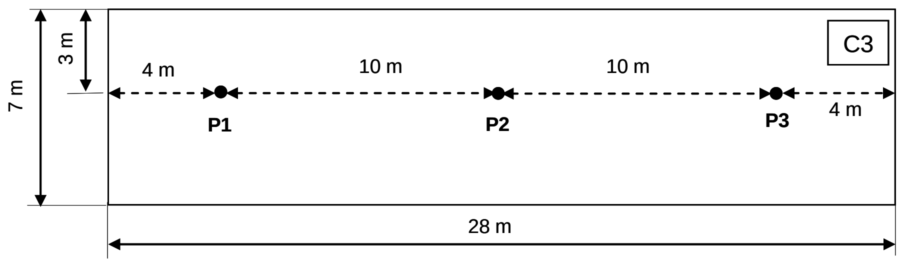

Figure 1 Detailed sketch of the *in-situ* bio-remediation area and the sampling points (P1, P2, and P3)

The electro-kinetic remediation experiment was organized on the same lot as the 2008 electro-remediation experiment and differed ferom it by adding two electrodes, the collecting point (C) and a purging one (Figure 2).

The evolution of the soil chemical and microbiological properties has been studied, by sampling and laboratory analyses carried out at different time intervals.

The locations where the experiments were carried on are former petroleum parks, partly disposed of, with a limited working surface, and the remained land is characterized by a high pollution level because of the presence of petroleum products transport pipes systems. The soil is polluted with significant oil quantities proceeded from accidental pollutions, leaking from both tanks and cracked pipes.

In the bio-remediation experiment accelerated by bacterial inoculum the experimental area was first delimited an the terrain was prepared, by homogenizing the soil profile on 0-70 cm depth and samples were taken from the 0-25 cm horizon. The land was minerally fertilized and a 15-20% humidity was maintained during the whole treatment. Bacterial inoculum was applied and the soil was aerated. The treatment was applied as long as 80 days and the agrochemical and microbiological parameters evolution was monitored for 120 days. The sampling points were P1, P2, and P3 (Figure 1) and sampling was carried on in May, 3, 15, and 27, June 12 and 26, July 9 and 16, and September 2. Macro-elements (organic carbon, total nitrogen, mobile phosphorus and potassium) contents were determined in the laboratory, as well as the soil reaction and its salt contents. Microbiological determinations were also carried on. Adequate standardized analytical methodology was respected.

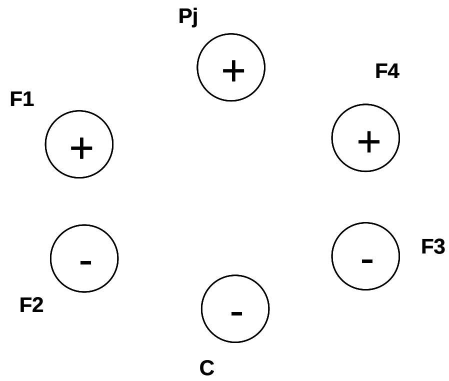

Figure 2 The location of electrodes in the electro-kinetic remediation experimental field

In the electro-kinetic remediation experiment the electrodes were inserted in porous ceramics (F1-F4, Figure 2) and PVC tubes (Pj and C). The polarity of the electrodes is shown in Figure 2. The tubes were inserted in 2 m deep pits. The cathodes (F3, F4, and C) were made of stainless steel and the anodes (F1, F4, and Pj) from graphite.

The electric voltage varied much, approximately between 10 and 100 V. So did the current intensity, approximately between 1-2 and 26 A. The samples were collected two days before the beginning of the experiment, 4 days (96 hours) and 7 days (168 hours) from the beginning of the experiment. After 7 days the treatment ceased. Bacteria were applied, at each sampling point, two days before the end of the experiment.

A year after both experiments ended, a new sampling was carried on, in both experimental lots, from the very same points.

Macro-elements (organic carbon, total nitrogen, mobile phosphorus and potassium) contents were determined in the laboratory, in both experiments, on all the collected samples, as well as the soil reaction and its salt contents. Microbiological determinations were also carried on. Adequate standardized analytical methodology was respected.

The 2010 analytical data were compared to the 2009 in order to asses the variation of agrochemical an microbiological properties evolution a year after the remediation treatments.

RESEARCH RESULTS

Agrochemical properties of the soil samples taken a year after the bio-remediation accelerated by bacterial inoculum treatment

As compared to the experiment monitoring period, in 2009, the organic carbon contents register important decreases, of 12 and 26%, in P1, respectively P2 (Table 1).

Table 1

Organic carbon contents evolution in the sampling points of the bio-remediation accelerated by bacterial inoculum experiment

Sampling moment / Sampling point	2009								2009 Average values	2010
	May 3	May 15	May 27	June 12	June 26	July 9	July 16	September 9		
P1	2.47	2.47	3.38	4.04	3.27	3.86	4.56	3.10	3.39	2.99
P2	1.98	3.41	2.37	3.45	2.82	3.31	4.21	3.93	3.18	3.20
P3	1.53	1.98	3.20	2.71	3.90	2.12	1.77	5.95	2.90	2.16

The total nitrogen contents register very important decreases, of over 40% (Table 2) and shift from the average supply interval to the low one. The situation is not satisfactory from the agrochemical soil properties point of view but the fact is important because it reflects the diminution of nitrates contents which had alarmingly high values (up to 400 mg/kg) in 2009 and brought about environmental impact issues of the remediation technology. The problem is not solved yet, as the high nitrates quantities, once in the groundwater, continue to represent an environment threat.

Table 2

Total nitrogen contents evolution in the sampling points of the bio-remediation accelerated by bacterial inoculum experiment

Sampling moment / Sampling point	2009								2009 Average values	2010
	May 3	May 15	May 27	June 12	June 26	July 9	July 16	September 9		
P1	0.166	0.108	0.168	0.214	0.192	0.174	0.237	0.195	0.182	0.108
P2	0.152	0.150	0.158	0.236	0.172	0.202	0.218	0.165	0.182	0.102
P3	0.125	0.191	0.179	0.218	0.243	0.150	0.134	0.242	0.185	0.104

The mobile phosphorus contents substantially decrease, by 54-61%, as compared to 2009 (Table 3). One of the causes is the export to the spontaneous vegetation grown as the terrain was de-polluted. The values continue to belong to the very large content interval, which ensures an important supply for plant nutrition.

The mobile potassium values (Table 4) decrease by 26-45%, down from the high to the average content interval. As in the case of the phosphorus, the decrease is brought about by the spontaneous vegetation consumption.

The soil reaction (pH_{H_2O}) tends to be more alkaline in 2010 as compared to 2009 (Table 5), the increases are very low though, up to 9%. The previous status is maintained, practically, and the soluble salts content limits the terrain using options after decontamination.

Table 3

Mobile phosphorus contents evolution in the sampling points of the bio-remediation accelerated by bacterial inoculum experiment

Sampling moment / Sampling point	2009								2009 Average values	2010
	May 3	May 15	May 27	June 12	June 26	July 9	July 16	September 9		
P1	81	102	157	287	279	164	275	148	187	85
P2	66	277	160	282	201	169	222	128	188	72
P3	88	164	135	285	396	105	127	293	199	91

Table 4

Mobile potassium contents evolution in the sampling points of the bio-remediation accelerated by bacterial inoculum experiment

Sampling moment / Sampling point	2009								2009 Average values	2010
	May 3	May 15	May 27	June 12	June 26	July 9	July 16	September 9		
P1	269	251	310	315	202	224	358	244	271	201
P2	219	328	215	242	244	258	258	210	247	152
P3	212	337	241	303	336	218	208	338	274	152

Table 5

The soil reaction evolution in the sampling points of the bio-remediation accelerated by bacterial inoculum experiment

Sampling moment / Sampling point	2009								2009 Average values	2010
	May 3	May 15	May 27	June 12	June 26	July 9	July 16	September 9		
P1	7.97	7.50	7.50	7.68	7.30	7.25	7.50	7.56	7.53	8.23
P2	7.90	7.85	7.50	7.50	7.70	8.11	7.55	7.76	7.73	8.17
P3	7.80	7.80	7.45	7.40	7.40	7.66	7.51	7.65	7.58	8.00

Agrochemical properties of the soil samples taken a year after the electro-kinetic remediation treatment

As compared to the average values registered at the end of the electro-kinetic treatment, in 2009, the organic carbon contents decreased by 31 and 28% at the anodes (Table 6) and increased by 13% at one of the cathodes. In C point, connected in series with the cathodes, an increasing tendency becomes manifest, highlighting the polluting compound migration in this direction.

The total nitrogen contents diminish by approximately half, at all the electrodes, as compared to the samples collected in 2009 (Table 7), and shift from the average values interval to the low values one (ICPA, 1987). The decrease is brought about by the consumption of the spontaneous vegetation as the remediation process advances and by the loss of nitrates from the system.

The mobile phosphorus contents (Table 8) presented a strong decreasing tendency, with different values, from 15 to 72%, as compared to 2009.

Table 6

Organic carbon contents evolution in the sampling points of the 2009 electro-remediation experiment

Sampling moment / Sampling point	September 2009			2009 Average	2010	% 2010 as compared to 2009
	2	9	11			
F1 (+)	5.95	4.59	5.22	3.62	31	31
F2 (-)	7.55	5.01	5.64	4.80	21	21
F3 (-)	3.69	3.20	3.06	3.76	-13	-13
F4 (+)	6.26	6.23	5.57	4.32	28	28
Cl (-)	2.16	3.03	7.45	3.90	7	7
Pj (+)	2.96	1.72	4.52	3.62	-18	-18

Table 7

Total nitrogen contents evolution in the sampling points of the 2009 electro-remediation experiment

Sampling moment / Sampling point	September 2009			2009 Average	2010	% 2010 as compared to 2009
	2	9	11			
F1 (+)	0.230	0.182	0.224	0.212	0.116	45
F2 (-)	0.288	0.198	0.212	0.233	0.110	53
F3 (-)	0.281	0.143	0.139	0.187	0.112	40
F4 (+)	0.281	0.256	0.241	0.259	0.112	57
Cl (-)	0.122	0.132	0.271	0.175	0.118	33
Pj (+)	0.215	0.241	0.218	0.224	0.119	47

The mobile potassium contents (Table 9) also decrease, by less than the phosphorus ones, namely 6 up to 23%, in the soil samples collected in 2010 as compared to those collected in 2009. In two sampling points, a cathode (F3) and the point connected in series with the cathodes the values didn't practically change.

Table 8

Total mobile phosphorus contents[2] evolution in the sampling points of the 2009 electro-remediation experiment

Sampling moment / Sampling point	September 2009			2009 Average	2010	% 2010 as compared to 2009
	2	9	11			
F1 (+)	28	24	53	35	16	53
F2 (-)	41	40	62	48	27	44
F3 (-)	24	32	23	26	7	72
F4 (+)	35	33	43	37	17	55
Cl (-)	14	12	27	18	15	15
Pj (+)	28	29	37	31	18	42

Table 9

Total mobile potassium content[s] evolution in the sampling points of the 2009 electro-remediation experiment

Sampling moment / Sampling point	September 2009			2009 Average	2010	% 2010 as compared to 2009
	2	9	11			
F1 (+)	204	224	271	233	179	23
F2 (-)	358	311	314	328	272	17
F3 (-)	204	204	191	200	201	-1
F4 (+)	244	255	249	249	234	6
Cl (-)	164	204	177	181	179	1
Pj (+)	282	308	300	297	234	21

Table 10

Soil reaction evolution in the sampling points of the 2009 electro-remediation experiment

Sampling moment / Sampling point	September 2009			2009 Average	2010	% 2010 as compared to 2009
	2	9	11			
F1 (+)	7.85	7.65	F1	7.75	8.32	-7
F2 (-)	7.42	7.63	F2	7.53	8.04	-7
F3 (-)	7.88	7.97	F3	7.93	8.55	-8
F4 (+)	7.75	7.86	F4	7.81	8.36	-7
Cl (-)	7.96	7.75	C1	7.86	8.40	-7
Pj (+)	8.00	8.01	PJ	8.01	8.32	-4

[2] The values are recalculated depending on the pH

Microbiological properties of the soil samples taken a year after the bio-remediation accelerated by bacterial inoculum treatment

Table 11 presents the quantitative results of the bacterial micro flora. A small variation of the total microorganisms number is noticed, respectively bacteria, in 2009 as compared to 2010. It decreases in the P1 point and it slightly increases in P2 and P3.

Table 11

Quantitative determinations and taxonomic variety in the soil samples collected from the bio-remediation accelerated by bacterial inoculum experiment a year after the beginning of the treatment

Sampling point	***TBN x 10^6 cfu/g dry soil***				***Bacterial species and kinds identified (in their frequency order)***
	R1	***R2***	***R3***	***Average***	
P1	*41.51*	*46.26*	*48.63*	*45.47*	*Pseudomonas sp., Bacillus megaterium, Arthrobacter globiformis*
P2	*43.37*	*54.21*	*49.39*	*48.99*	*Pseudomonas sp., Bacillus cereus sp mycoides, Arthrobacter citreus, Mycobacterium roseum, bacillus megaterium*
P3	*51.16*	*41.86*	*45.34*	*46.12*	*Pseudomonas sp., Bacillus megaterium, Arthrobacter globiformis, Mycobacterium roseum, Arthrobacter citreus*

Table 12

Quantitative determinations and taxonomic variety in the soil samples collected from the electro-kinetic remediation experiment a year after the treatment

Sampling point	***TBN x 10^6 cfu/g dry soil***				***Bacterial species and kinds identified (in their frequency order)***
	R1	**R2**	**R3**	**Average**	
Pj	64.197	58.02	53.09	58.44	*Pseudomonas sp., Arthrobacter globiformis, Arthrobacter citreus, Bacillus megaterium, Bacillus cereus*
CL	19.42	25.14	28.57	24.38	*Pseudomonas sp., Bacillus megaterium, Arthrobacter citreus*
F1	46.15	37.17	41.02	41.45	*Pseudomonas sp., Bacillus cereus sp. mycoides, Arthrobacter citreus, Arthrobacter globiformis, Mycobacterium roseum*
F2	59.66	58.36	50.58	56.20	*Pseudomonas sp., Bacillus cereus sp. mycoides, Arthrobacter citreus*
F3	44.75	49.87	47.31	47.31	*Arthrobacter citreus, Pseudomonas sp., Bacillus cereus, Bacillus megaterium*
F4	59.49	51.89	50.63	54.00	*Pseudomonas sp., Arthrobacter citreus, Bacillus megaterium, Arthrobacter globiformis*

In the electro-kinetic remediation experiment a major decrease of the bacteria number was noticed in the collecting pit C as compared to the 2009 samples (Table 12). An increase of the bacteria number was identified at the F1, F2, F3, and Pj pits and a decrease at the F4 pit.

CONCLUSIONS

A year after applying bio- and electro-kinetic remediation technologies on lots polluted with organic compounds the organic carbon content decreasing tendency is confirmed, which is the main goal of the experiments.

The total nitrogen contents present the most uniform and important decrease, by approximately half, due to nitrates elimination from the system and consumption by the spontaneous vegetation.

The mobile phosphorus contents also decrease, more on the bio-remediation experimental filed, and so do the mobile potassium ones.

The soil reaction has a very slight increasing tendency, because of the soluble salts presence and ionic equilibrium alteration by the loss of large nitrates quantities.

Small variations of the total microorganisms numbers have been noticed.

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NVENTARIEREA TERENURURILOR AGRICOLE DIN ROMANIA AFECTATE DE DIFERITE PROCESE DE POLUARE ȘI DE DEGRADARE

INVENTORY OF ROMANIAN AGRICULTURAL LAND AFFECTED BY DIFFERENT POLLUTION AND DEGRADATION PROCESSES

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Key words: agricultural land, soil pollution, degradation

ABSTRACT

In the Romanian agricultural soil monitoring in Romania has also made an inventory of pollution and degraded lands. Revealing pollution was carried out according to index 28 from MESP and SRTS, which includes 20 types of soil pollution (pollution because of industrial activity, acidification, salinization, water excess, nutrient deficiency, compaction, sealing, slope processes). The degree of damage was assessed on five classes from low to excessively affect.

The land affected by industrial pollution totals 410,121 hectares, of which 88.8% are affected by airborne substances (364,348 ha). The largest areas at the country level are affected by the nitrogen deficiency (8,235,983ha), the phosphorus deficiency (7,951,188 ha), potassium deficiency (5,735,309) and organic matter (6,942,038 ha).

Also, important areas are affected by the acidity on 4,939,521 ha, of which 18% are strong affected.

At the regional level, the most affected areas belong to the North-East region, followed by Center and Western regions.

REZUMAT

In cadrul monitorizării solurilor agricole din Romania s-a realizat și inventarierea terenurilor agricole afectate de diferite procese de poluare și degradare. Evidențierea poluării, respectiv degradarii terenurilor s-a realizat conform indicatorului 28 din MESP și SRTS, care cuprinde 20 de tipuri de poluare a solului (poluarea datorită diferitelor activități industriale, acidifiere, salinizare, excesul de apă, deficitul de elemente nutritive, compactarea solului, procese de pantă). Gradul de afectare a fost apreciat pe cinci clase, de la slab la excesiv afectat.

Terenurile afectate de poluarea industrială totalizează 410.121 ha, din care 88,8 % sunt afectate de substanțe purtate de vant (364.348 ha). Cele mai mari suprafețe la nivel național sunt afectate de deficiența de azot (8.235.983 ha), de fosfor (7.951.188), de potasiu (5,735,309) și de humus total (6.942.038).

De asemenea, importante suprafețe sunt afectate de acidifiere pe 4939521 ha, din care 18% sunt puternic afectate.

La nivel regional, cele mai afectate regiuni sunt Regiunea Nord Est, regiunea Centru și cea de Vest.

INTRODUCTION

Soil is a vital non-renewable resources providing essential support to ecosystems and to human life and society (Morvan et al., 2008).

The communication of the European Commission '' Towards a Thematic Strategy for Soil Protection'' identifies eight threats to Europe's soils: soil erosion, decline in soil organic matter, soil contamination, soil sealing, soil compaction, decline in soil biodiversity, soil salinisation and landslides (European Commission, 2002, 2006a,b; Van-Camp et al., 2004, quoted by Morvan et al., 2008).

In Romania, 61, 7 % of the soils are used for agriculture (INS, 2008). The area of arable lands represents more than 39 % of Romania's territory, including more than 95 % of the potential arable use as compared with 44 % all over the world. Therefore, Romania is one of the countries where the resources of increasing the arable area are practically exhausted (Dumitru et al., 2003) and need much attention the use and the management of the land. According to Carstea, 1998, (quoted by Carstea, 2001), only 27% of total agricultural land of Romania is without serious limitations.

In this paper are presented an inventory of agricultural soil affected by a series of degradations and pollution processes.

MATERIALS AND METHODS

In the agricultural soil monitoring in Romania has also made an inventory of degraded land. Revealing pollution was carried out according to index 28 from MESP (Canarache et al., 1987) and SRTS (Florea&Munteanu, 2003) and the degree of damage was assessed on five classes from low to excessively affect. Soil degradation and pollution situation at the country level was developed based on the situation at the county level provided by the County Offices of Pedological and Agrochemistry during the 2003-2008 periods.

RESULTS AND DISCUSSIONS

Pressures of various factors on the status of soil quality in Romania related by the application of fertilizers, amendments, plant protection products are not existing, because only 40% of total agricultural land was mineral fertilised and the average amount of NPK applied were 72 kg/ha at the country level in 2009. The total area of manure fertilised was 569.531 ha (MADR, 2010, quoted by Dumitru et al., 2010). However, these amounts are much lower than the crop needs, so they consume ground reserve.

Compared with EU countries, Romania is not far from the situation to be "saturated" with plant protection products, the average consumption in our country per hectare of arable land has decreased from 1.18 kg / ha in 1999 to 0.44 kg a.s./ ha in 2009 (MADR, 2010, quoted by Dumitru et al., 2010). Actual amounts applied per hectare were higher, taking into account that not all cultures in the different periods have been treated.

Soil quality is affected in various degrees of pollution from various industrial and agricultural activities, as derived from data obtained by partial inventory conducted in 2003-2008

The table 1 shows the areas affected by various processes of pollution and degradation on the country level.

Code. 01. Pollution of land by the mining industry, gravel pits, quarries. Among such forms of pollution, the worst is the destruction on large areas of soil caused by mining-to-date for the extraction of coal (lignite).

Following the loss of fertile soil layer, disappearing various agricultural and forestry uses. After preliminary data at the country level are affected 24,432 ha, of which 23,640 are excessive affected. The largest areas there are in the Gorj (12,093 ha), Cluj (3,915 ha) and Mehedinti (2,.315 ha) counties.

At the region's levels the most affected are the South-West (over 60% of the affected area) and North-West (19% of the affected area) regions.

Large areas are affected by gravel (about 1,500 ha), which deepen the beds of water, causing groundwater levels decrease, and therefore, reducing water supplies in neighboring areas, and soil disturbance by the deposition of extracted materials.

Code 02. Pollution because of spoils, dumps, ponds, tailings from the flotation deposits, deposits of rubbish etc.

Expanding the industrial and domestic waste raises special problems, both by land occupation of important areas, as well as for the human and animal health. Ponds in operation may affect the surrounding land for retention dams breaking, contamination with heavy metals, cyanide on flotation, with other elements in excess. So do the same ponds in conservation (eg Balan Mina – Fagul Cetății pond from Harghita County - where the animals grazing under conditions of soil pollution with heavy metals).

The preliminary inventory shows that this type of pollution affects 6.639 ha in 35 counties, of which 5773 ha are excessive affected. The largest areas are recorded in the West (23.2%), North-East (20.5%), North-West (19.7%).

Code 03. Pollution by waste and inorganic residues (minerals, inorganic materials, including heavy metals, salts, acids, bases) from industry (including extractive industry).

It is estimated that this type of pollution affects 844 ha, of which 360 ha are excessive affected, mostly in counties with active mining, steel and non-ferrous metallurgy industry. At the region's level the largest areas are in South-West (30%), South-East (27.4%), North-West (13.6%), Western (12.9%) regions.

Code 04. Pollution with airborne substances (hydrocarbons, ammonia, sulfur doxid chlorides, fluorides, nitrogen oxides, lead compounds, etc.).

This occurs around industrial sources such as non-ferrous metallurgy plants (Romplumb Firiza SA, Phoenix Baia Mare, Sometra Copşa Mica, Galati, Hunedoara steel mills etc.). Some effects are found even after the plant activity was stopped (ex. Ampellum Zlatna SA).

Also, large areas are affected by emissions from the plants that produce fertilizers, pesticides, petroleum refining, as in Bacau County, where 104,755 ha of agricultural land are low-moderately affected.

In the case of non-ferrous metallurgy industry (Baia Mare, Copșa Mică, Zlatna) were affected in varying degrees by heavy metal contents and the sulfur dioxide emission, 198,624 ha.

Another type of airborne pollution is produced by cement and binders plants, which in addition to air pollution cover plant with dust that contain calcium, which in the presence of water forming calcium hydroxide that cause the disorders of the foliar apparatus.

In total there are affected by airborne pollution 364.348 ha of which 49.081 ha are strong-excessive affected and 99.494 ha are moderate affected. Over 87.3% of the affected areas are located in the Center (43%), North-East (28.8%) and South-West (15.5%) regions

Code 05. Pollution with radioactive materials. According to preliminary data, in total are affected by this type of pollution 566 ha, of which 66 ha are excessively affected. This type of pollution is found in Arad, Bacau, Brasov, Harghita, Suceava counties. The largest areas are located in Brasov county (500 ha).

Code 06. Pollution with waste and organic residues from food and textiles industry **affects 348 ha of which 287 ha are excessive.** The largest areas are located in Caras-Severin (150 ha) and Galati (101 ha) counties.

Code 07. Pollution with waste and agricultural and forestry residues is reported on 1140 ha, of which 83% of land are very strong-excessively affected. The largest areas (626 ha) there are in Bacau County.

Code 08. Pollution with livestock waste affects in different degrees 4.973 ha, of which 1097 ha are moderately-strong affected. At the region level, 89.5% of the reported surface is located in North-Eastern region.

Code 09. Pollution from human waste was reported only in four counties (Alba, Arad, Bacau, Hunedoara), on 733 ha, of which 33 ha are excessively polluted.

Table 1

The inventory of Romanian soil affected by different types of pollution

Code/ Type	**Area (ha) and *degree of damage***					
	low	**moderate**	**strong**	**very strong**	**excessive**	**Total**
01. Pollution of land by the mining industry, gravel pits, quarries	2	16	255	519	23640	**24432**
02. Pollution because of spoils, dumps, ponds, tailings from the flotation deposits, deposits of rubbish etc	247	63	236	320	5773	**6639**
03. Pollution by waste and inorganic residues (minerals, inorganic materials, including heavy metals, salts, acids, bases) from industry	10	217	207	50	360	**844**
04. Pollution with airborne substances	215737	99494	29436	18030	1615	**364348**
05. Pollution with radioactive materials		500			66	**566**
06. *Pollution with waste and organic residues from food and textiles industry*	13	19	12	17	287	**348**
07. Pollution with waste and agricultural and forestry residues	37	65	90	642	306	**1140**
08. Pollution with livestock waste	2883	993	363	265	469	**4973**
09. Pollution from human waste		689	11		33	**733**
10. Pollution by erosion and landslides	944.763	1.013.854	749420	454150	210729	**3372916**
11. Pollution by salinization	264163	80639	52488	36867	50678	**484835**
12. Pollution by acidification.	1766295	1926886	716794	186023	18132	**4614130**
13. Pollution by excess of water	640738	1075063	420208	199479	185785	**2521273**
14. Pollution by excess or deficiency of nutrient elements and organic matter						
14a. Pollution by nitrogen deficiency	1181560	3578047	2709484	485794	281098	**8235983**
14 b. Pollution by phosphorus deficiency	1486152	2168292	2287670	1582906	4216168	**7951188**
14c. Pollution by potassium deficiency	2161977	1754881	1176752	437248	204451	**5735309**
14d. Pollution by organic matter deficiency	1972141	2565965	1200413	781525	421994	**6942038**
15. Pollution by compaction	543371	544556	251268	125555	88526	**1553276**
16. Pollution caused by sediments due to erosion	4088	2389	4808	1178	836	**13299**
17. Pollution by pesticides	1058	650	224	77	67	**2076**
18. Pollution by pathogen contaminants		505			117	**617**
19. Pollution by salted water (from oil extraction)	952	497	408	205	592	**2654**
20. Oil pollution		473	248	5	25	**751**

*The same area can be affected by one or more type of soil pollutions

Code 10. Pollution by erosion and landslides is found on 3.372.916 ha, of which very strong-excessively affected are 664.879 ha. Over 33.5% (1.129.652 ha) of the reported area is located in North-Eastern region. The large areas affected by erosion and landslides are found also in South-East (20.4% - 689 410 ha), Center (440,745 ha), West (329,238 ha), North-West (316.809 ha) regions.

Code 11. Pollution by salinization. According to preliminary data, in total are affected 484.835 ha. Over 70 % of total area is low-moderate affected. The largest areas affected by salinization are found in South-East (40% - 193.776 ha), North-East (33% - 160.760) regions.

Code 12. Pollution by acidification. Over 30% of agricultural land is affected by acidification, of which 80 % are in the low-moderate range. At the region level, the largest areas are reported in the Center (25%), (North-East (20%) and North-West (18%) regions.

***Code 13. Pollution by* excess of water** is found on 2.521.273 ha (17% of total agricultural land), of which 17% of land is strong-excessive affected. The most affect areas are located in the North-East region (30%).

Code 14. Pollution by excess or deficiency of nutrient elements and organic matter

- pollution by nitrogen deficiency affects 8.235.983 ha
- pollution by phosphorus deficiency affects 7951188 ha
- pollution by potassium deficiency affects 5.735.309 ha
- pollution by organic matter deficiency 6.942.038 ha

The largest were reported in the North-East, West and South-East regions.

Code 15. Pollution by compaction affects 1553276 ha. The most affected areas were reported in West (32%), North East (29%) and South (15%) regions.

Code 16. Pollution caused by sediments due to erosion (silting) is reported in eight counties on 13.299 ha. About 85% of the affected are is located in the North-East Region (11.293 ha).

Code 17. Pollution by pesticides is reported in a few counties and totaling 2.076 ha, of which 1986 ha in Bacau County, around Chimcomplex, in general, is weak and moderate pollution.

Code 18. Pollution by pathogen contaminants is reported only in four counties, on 617 ha, of which 505 ha are moderately affected.

Code 19. Pollution by salted water (from oil extraction or associated with oil pollution). This type of pollution disturb the ecological balance of soil and groundwater on 2.654 ha, and very strong on 1.205 ha.

The most important reported areas are located in South (30, 3%), South-West (29, 1%) and Northeast (27, 9%) regions.

Code 20. Oil pollution. Physical processes that occur due to oil extraction activities disturb the layer of fertile soil in operation parks (excavated areas, road network, electricity grid, pressure pipes and underground or above ground cables, etc.).

In the five counties (Bacau, Covasna, Gorj, Prahova and Timis) were affected 751 ha, of which 278 ha are strongly -excessive affected.

CONCLUSIONS

This inventory reflects the results of pedological reports have been made during 2003-2008 period.

The largest areas at the country level are affected by the nitrogen deficiency (8,235,983ha), the phosphorus deficiency (7,951,188 ha), potassium deficiency (5,735,309) and organic matter deficiency (6,942,038 ha).

Also, important areas are affected by acidification (4,614,130 ha) and erosion and landslide (3.372.916 ha).

At the regional level, the most affected areas belong to the North-East region, followed by Center and Western regions.

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EFECTUL FERTILIZARII ORGANO-MINERALE ASUPRA PRODUCTIEI DE MERE PE UN PRELUVOSOL TIPIC

THE EFEFCT OF ORGANO-MINERAL FERTILIZATION ON THE APPLE PRODUCTION ON A TYPICAL PRELUVOSOIL

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Key words: soil, fertilization, mineral elements, apples

REZUMAT

Mărul cultivat, adaptat climatului temperat în care s-a format, este un hibrid interspecific natural rezultat din încrucişarea spontană consecutivă a mai multor specii. Este specia pomicolă care se situează printre primele locuri ca producţie în pomicultura mondială. Aceasta se datorează, în primul rând, rolului deosebit pe care îl au merele în alimentaţia omului, atât în stare proaspătă cât şi sub diferite preparate. În stare proaspătă, merele conţin importante cantităţi de zaharuri, acizi organici, substanţe pectice, substanţe tanoide, proteine, vitamine, săruri minerale, etc. Pentru industria alimentară, merele constituie o materie primă cu pondere mare, fiind utilizate la prepararea marmeladelor, compoturilor, sucurilor, a fructelor uscate şi în fabricarea băuturilor alcolice. Existenţa a peste 10.000 de soiuri de măr pe glob, cu coacere eşalonată, asigură consumul de fructe proaspete pe o mare perioadă a anului şi în special în timpul iernii, când posibilităţile de asigurare a organismului uman cu vitamine este destul de redus.

Datele statistice, cu privire la răspândirea mărului pe glob şi în ţara noastră, demonstrează că acestă specie pomicolă ocupă primul loc între speciile cultivate în climatul temperat. Solul şi clima ţării noastre oferă condiţii dintre cele mai favorabile culturii mărului, realizând producţii cantitativ şi calitativ superioară.

ABSTRACT

The cultivated apple, adapted to the temperate climate where it is found, is a natural inter-specific hybrid of consecutive spontaneous crossing between several species. It is the fruit tree species that covers the first places in terms of fruit production worldwide. This is first due to the special part that apples play in human nutrition, as both fresh and prepared food. Fresh apples contain important amounts of sugars, organic acids, pectic substances, tanoid substances, proteins, vitamins, mineral salts, etc. For the food industry, apples represent the raw matter for a number of products, such as marmelade, juices, dry fuit and alcoholic beverages. The existance of over 10,000 apple varieties with different ripening periods ensures the consumption of fresh fruits throughout the whole year and especially in winter time, when the possibilities for the human organism to acquire the necessary vitamins are rather reduced.

Statistic data on the apple spread worldwide and in our country prove that this tree species occupies the first place among cultivated species in the temperate climate. The soil and climate of our country provide the most favourable conditions for the apple crop, thus achieving superior qualitative and quantitative productions.

INTRODUCTION

The special biologic diversity of our country, as well as the modification of ownership and management forms of agricultural land and their dynamics have led to serious confusion in practising crop technologies and thus to obtaining agricultural and horticultural productions below the biologic potential of varieties and the productive capacity of soils. This is a severe situation that should not have been reached 20 years after the Revolution.

In this context, the present paper has aimed at approaching an area that nature and man have endowed with priceless gifts. Since ancient times, village inhabitants where the research was conducted have engaged in agriculture, fruit tree growing and animal husbandry, in a place where geography joins history in a harmonious way, which is the area of the village Suceag, Cluj county. This area exhibits a varied hilly area, with plain lands and moderadely sloping ones. Soils, which are typical preluvosoils of the area, display an extremely varied parental material, in terms of origin, mineral composition, texture, as it is rich in $CaCO_3$ (loess, loess deposits, limestone, clay, loam, gravel). In terms of fertility, these soils are generally considered to be having good natural fertility.

Regardless of the manner of employment, their natural fertility can be significantly enhanced, following a complete agrochemical study, according to correct agrochemical measures that are matched by appropriate plant crop technologies.

The present paper relies on rigorous experiments in a classical apple tree plantation, on a typical (brown argiloilluvial) preluvosoil in the Cluj Hills area, under differentiated fertilization systems, both mineral and organic, on Jonathan and Golden apple varieties.

MATERIAL AND METHOD

The experiment was conducted under conditions similar to those used for apple production in a hill region, over three experimental years on a typical (brown argiloilluvial) preluvosoil on the former Fruit farm n. 11, Suceag (within the former IAS Baciu), in the north-western part of Cluj-Napoca, north of the Nadas valley and included within the Somes platform, namely the Cluj hills subunit. The surface of the area where the former farm was located exhibits a significantly diverse relief, with small plateaux of 500-600 meters in altitude, deep valleys, high sloping processes caused by surface erosions, but especially landslides. Some landslides are quite severe, others are less visible and have become small uneven platforms. In order to fight erosion and landslides, series investments were made before the Revolution, to set fruit tree plantations organised in farms, where correct agriculture is practised, involving ecologic fruit production, of the best quantity and quality, that are required for exportation.

The experiment covered a period of three years (2005-2008) and was conceived as polifactorial on a private lot of 8.6 ha classical orchard, comprising 2040 trees (that was recovered by its rightful owners), pursuing two factors and was placed according to the randomized block design, with three repetitions per year and the following graduations:

Factor A: apple variety with graduations

a_1 – Jonathan;

a_2 - Golden;

Factor B: level of fertilization with graduations

b_0 – 0N + 0 P_2O_5 + 0 K_2O (kg s.a./ha)+ 0 t/ha stable manure (Unfertilized control);

b_1 – 100N + 70 P_2O_5 + 80 K_2O (kg s.a./ha)+ 30 t/ha stable manure, once every 3 years;

b_2 – 0N + 0 P_2O_5 + 0 K_2O (kg s.a./ha)+ 30 t/ha stable manure, applied once every 3 years;

In the case of polifactorial experiments with two factors, the first with two graduations and the second with three graduations, a number of 6 variants resulted (table 1). For each variant, 5 trees were considered, in 3 repetitions, thus resulting 15 trees per variant and repetition annually. The levels of fertilizers set in the experiment were the real ones that the rightful owner of the orchard used to employ during the time of the research. The stable manure employed in fruit tree fertilization was produced in the private household, involved with animal husbandry and in particular dairy cattle. Mineral fertilizers were also purchased by the owner through local subsidies.

The tree plantation under study is classical for both Jonathan and Golden apple varieties, grafted by means of an M 11 graft and planted 7 meters apart between rows and 6 meters per row, thus displaying 238 trees/ha. The type of crown selected adapts well to the lot and favours the optimum development of trees and a balanced display of framing, able to obtain productions of approximately 300, up to 400 kg/tree, in the case of a classical plantations, in full ripening potential.

Varieties under study were the ones in the plantation, as they are the most widespread in the area and the country alike, for their high production potential and tasty fruits sought after for consumption, both as fresh fruits and as different processed products.

In order to achieve the objectives set, in the autumn, namely the month of October, organic fertilizers were applied (solely in the autumn of 2005, once every 3 years) and chemical phosphorus and potassium fertilizers (applied every autumn), according to the doses in the experimental variants.

The soil fertilizer incorporation was performed by means of the autumn ploughing at a 20-25 cm depth with a PP 2-30 plough in an aggregate with U 445 DT.

The fertilization of lots with nitrogen fertilizers was conducted in the spring, namely March, using ammonium nitrate for the production of each year, according to doses in the experimental variants.

The soil incorporation of chemical nitrogen fertilizers was conducted immediately following the application, with a GDP 2.5 harrow at a 15-18 cm depth.

The practice of tree cutting operations was conducted during the growing interval.

Maintenance work, during the vegetation period, aimed at weed control, soil aeration and disease and weed control, in order to maintain the leafage clean for a longer period of time.

Weed and pest control was conducted in time, according to their emergence in the plantation, with pesticides, either in a fungicide-insecticide mixture, either by themselves, according to the degree of the attack and the crop year, starting with March-April, until July 20-25, when the last spraying is applied, right before harvesting. This time span is highly necessary to perform the necessary growing interval of approximately 45-50 days, from the last spraying until harvesting, to eliminate the toxic effect of pesticides employed on apple fruits.

Apple harvesting was performed manually before reaching consumption maturity, as their ripening occurs after picking, during transportation and storage.

The determination of production was conducted by weighing each variant, according to quality classes (extra, 1st quality, 2nd quality and others), calculating the average per variant and tree and showing the ratio of the apple production per surface unit (hectare).

In order to establish the necessary fertilizer for trees, agrochemical studies were conducted as follows:

Agrochemical soil analyses were conducted according to ICPA methodology for agrochemistry laboratories „Methodology for agrochemical soil analysis to establish the amendment and fertilizer requirement" I.C.P.A. 1981.

The chemical analysis of the main mineral elements in plants, was conducted according to ICPA methodology for agrochemistry laboratories „Plant analysis to assess the mineral nutrition state", ICPA 1980.

RESULTS AND DISCUSSIONS

The statistical processing of the average apple productions for the experimental period (2005-2008) allow for an assessment of the effects of organo-mineral fertilization for the two apple varieties under study (Jonathan and Golden) in the pedo-climatic area of the Cluj Hills (table 1, fig. 1).

Production results contained in the present paper certify the significant effect of the two fertilization system, thus proving that complex mineral fertilization on an organic fund has determined the highest production results on a typical preluvosoil specific for the area, in low rainfall conditions and high temperatures, during the growing period. First, those production results are relevant when the complex (NPK) mineral combination on an organic support (applied once every 3 years) shows high doses in optimum balanced ratios between nutrients, compared to the manure fertilized variant, once every 3 years.

Average fruit productions, during the three years after study, in Jonathan and Golden varieties, were inferior to their genetic potential, which expresses the negative effects of the last climate imbalances, which has determined a low level of easily soluble nutritive ions in the soil solution, made available to trees in the maximum consumption phases for fruit formation. These unwanted climatic phenomena that intervened in the experimental period, have not allowed for an emphasis of the productivity and quality traits of apple varieties under analysis.

Compared to the distinctively significant effects of fertilization systems relying on the organo-mineral interaction of nutrients, one-sided manure fertilizations show the limiting effect of these interventions through diminished fruit productions, as well as their inability to satisfy the normal production levels on a multi-annual basis, especially in the case of very dry climatic years, such as the ones under study.

The organic support provided through the application of stable manure once every 3 years in 30 t/ha doses, provides the favourable and meliorating agrochemical environment of the soil's physico-chemical traits, alongside the complementary application of mineral fertilizers, determines a higher bioavailability of nutrients and their better capitalization by fruit trees, when humidity and soil conditions are the optimal ones.

Table 1

The effect of organo-mineral fertilization on the average fruit production of the Jonathan and Golden apple varieties in the Cluj Hills area (2005-2008 period)

N.	Variety	Fertilization variant	Average production (t/ha)	%	**Difference**	Significance
1	Jonathan	V0 – 0N+ $0P_2O_5$+ $0K_2O$ (kg s.a./ha)+ 0t/ha stable manure (Control)	4,67	100,0	0,00	Mt.
2		V1 – 100N+ $70P_2O_5$+$80K_2O$ (kg s.a./ha)+ 30t/ha manure very 3 years	10,67	228,6	6,00	**
3		V2 – 0N+ $0P_2O_5$+ $0K_2O$ (kg s.a./ha)+ 30t/ha manure every 3 years	6,67	142,9	2,00	*
4	Golden	V0- 0N+ $0P_2O_5$+ $0K_2O$ (kg s.a./ha)+ 0t/ha stable manure (Control)	6,00	100,0	0,00	Mt.
5		V1 – 100N+ $70P_2O_5$+$80K_2O$ (kg s.a./ha)+ 30t/ha manure every 3 years	12,00	200,0	6,00	**
6		V2 – 0N+ $0P_2O_5$+ $0K_2O$ (kg s.a./ha)+ 30t/ha manure every 3 years	9,67	161,1	3,67	*

DL (p 5%) 3,72
DL (p 1%) 5,41
DL (p 0,1%) 8,12

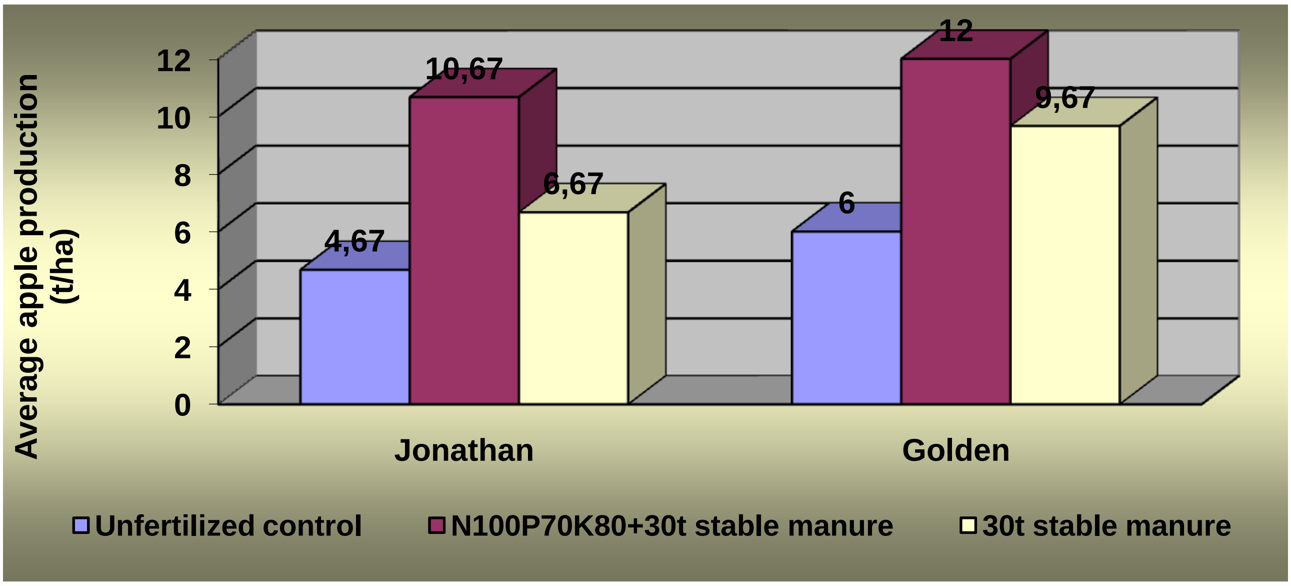

Fig. 1. Interaction of the organo-mineral fertilization level and the variety on the average fruit production in apple fruit varieties Jonathan and Golden, cultivated in the Cluj Hills area on a typical preluvosoil

The complex approach of the efficiency of the organo-mineral fertilization systems for the apple crop in the representative soils of the Cluj Hills area, exhibiting different fertilization and productive capacity levels, requires for a rigorous study and control of the evolution of these basic soil traits on a qualitative level and establishing risk domains. Solutions of one-sided fertilization, either mineral or organic, may determine impact states, as well as limited nutrient supply states compared to the organo-mineral fertilization system, able to exert a meliorating influence on the soil, on its buffering capacity, a context that shows an important agrochemical aspect regarding the application of complementary mineral fertilization on the apple crop of the area, on an appropriate organic substratum provided to the soil by means of periodical organic fertilizations.

CONCLUSIONS AND RECOMMENDATIONS

- The typical preluvosoil (brown argiloilluvial one), characteristic to the Cluj Hills area that is favourable to fruit tree plantations by means of the application of a differentiated organo-mineral fertilization system, on an organic substratum provided once every 3 years, essentially modifies its chemism and provides the high nutrient requirements for fruit trees in the area;
- Organic fertilization, applied periodically, on cultivated fruit trees exerts a positive and sustainable influence, by modifying the extreme soil reaction, where it is possible to occur, by neutralizing it, the raw humus content, the nutritive element regimen, the alkalinization of the adsorptive complex of the soil and implicitly the soil's physico-chemical traits;
- Organo-mineral fertilization, which is the most compatible with biologic and nutrition requirements of the apple, enhances the bioavailability regimen in the case of soil nutritive elements on an organic background and meliorates the unwanted soil reaction, maintains and enhances soil fertility in fruit tree plantations;
- It is increasingly recommended for soils with limited fertilization and productive capacity levels, that natural fertilizers should be employed as basic fertilizers. The rational employment of plant and animal residues can contribute to the increase of the organic matter content in the soils and the organic matter content in the soils and the nutritive

reserves for plants supplemented with mineral fertilizers where specific and global consumption requirements of cultivated tree species;

- As organic fertilizers exhibit an actual input of essential fertilizing elements with a multiannual effect for a series of crops and technologies through direct application or in interaction with mineral fertilizers. In order to set rational fertilization systems, one should envision the direct inputs of these fertilizers in the soil, or the remnant ones in the years following application;
- Low fruit production values in the Jonathan and Golden fruit varieties under crop in the area for the experimental period can be explained as follows:

a. the negative influence of climatic changes in the area is apparent, as well as the dry unfavourable climate, especially on soil nutrient availability of tree roots during the growth stage, when the maximum nutrient consumption occurs in apple ripening plantations;

b. economically, the number of animals raised in the area in a household system is continuously decreasing and implicitly, the quantity of natural fertilizers is increasingly reduced, which determines the application of insufficient stable manure doses for ripening fruit tree plantations, on the one hand. On the other, the buying power of producers for chemical fertilizers has significantly decreased in the last period;

- Presently, there is an increased requirement and a special interest granted to conservative agriculture that allows for a more efficient management of plant residues and natural resources, thus providing for the long-term, a sustainable employment of the land, preventing soil and agriecosystem degradation and thus obtaining superior plant products within food safety and security parameters.

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EVALUAREA STĂRII DE EROZIUNE A SOLULUI PE TERENURILE AGRICOLE DINTR-UN SUBBAZIN HIDROGRAFIC AL RÂULUI ARGEŞ

THE EVALUATION OF THE SOIL EROSION ON AGRICULTURAL LAND IN A HYDROGRAPHIC SUB-BASIN OF THE RIVER ARGES

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Key words: erosion, cartogram, indicators, degradation, risk.

REZUMAT

În lucrare se prezintă o analiză a procesului de eroziune a solului în subbazinul hidrografic Cicăneşti. Această vale este afluent al râului Argeş. Studiul are ca scop final întocmirea unor cartograme care să prezinte o prognoză a pierderilor de sol prin eroziune. Datele statistice cuprid: poziția unităților omogene din punct de vedere al factorilor declanşatori ai eroziunii, reprezentarea pantei terenului, a categoriilor de folosință, a unităților de sol, a gradului de afectare a terenului prin eroziune în suprafață, a claselor de pericol de eroziune în suprafață. Interpretarea datelor obținute s-a făcut prin calculul indicatorilor grupați în următoarele categorii: de stare şi de risc.

SUMMARY

The paper is an analysis of the erosion process of the soil, a Cicanesti hydrographic sub-bassin. This valley is a tributary of the Arges river. The study is aimed at drawing up cartogram to submit an estimate of soil loss by erosion.

Statistics include: the position of the homogenous unities regarding the starting factors of the erosion, the representation of the inclination angle of the ground, of the categories of using, of the soil unities, of the degree of the ground affection by erosion of the surface, of the danger classes for the surface.

Status indicators for surface erosion and risk indicators were used in order to read the obtained data, indicators grouped into the following categories: state or present status of degradation, impact on productivity and risk.

INTRODUCTION

Soil degradation has started when men started agriculture, but now its extension and impact to environment have become alarming. The effects are seen in the reduction of production capacity of echo systems, in the changes of global climate and environment, in deterioration of food resources of humanity, in disruption of economic growth (UNEP 1982).

The research concerns the idea of an effort both human and financial so that this dynamic process could be reduced.

MATERIAL AND METHOD

The research method is based on mapping the soil erosion. For each erosion unit researches and notes have been made in the terrain book as follows: the erosion form produced by water and action intensity, form, descent and exposure of relief, lithological bed and soil. For setting the units limits many factors have been taken into account: the change of erosion grades, the flank forms and their inclination, soil color which is a valuable indicator regarding the surfaces and terrain usage. When one of the above elements has changed a new erosion unit has been set.

Setting the danger grades for surface erosion has been done following the methodology established by ICPA in 1987, according to estimated soil losses (t/ha*year). Estimation and notes on erosion have been done following the ICPA rules, according to the horizon depth cleared by erosion.

Based on data gathered from field and on erosion unit maps (or situation plans), in order to estimate how erosion will evolve in the future, the potential erosion on the entire bed has been calculated based on universal Equation of surface erosion. To do this the erosion units which had the same soil type, usage and approximately same flanks inclination and length have been marked, then the potential erosion has been calculated for the respective group of units.

For correct interpretation of the data collected, the status and risk indicators for surface erosion have been used ; these status indicators proposed by M. Motoc and A. Vatau – 1992, are grouped in the following categories : of current status of degradation, of impact on productivity and of risk.

RESULTS AND DISCUSSIONS

Cicăneşti Valley is the largest valley on the right side of the river, others are quite short and west-east orientation. This valley is but a north-westerly direction - south-east. All these valleys have slopes of steep slope on the right (cuesta front) and those on the left side with gentle slopes and smooth.

Banesti creek known as the creek has Cicăneştilor 38Km2 and S = L = 13Km.

Characterizing the soil cover Cicăneşti valley is the result of interaction between the processes of pedogenesis denudation and processes, which carries an unstable and differentiated from one place to another, depending on the value of slope and vegetation coverage and less on the nature of the rocks texture in the studied area, which is maintained generally in medium and coarse.

An additional variation in the coating of soil, water brings a different action, both in intensity and the nature of it.

Microrelief variety of conditioning soil cover important differences, differences that occur on very short distances so that they could not only delineate strictly homogeneous soil units, most are complex soils with 2-3 percent participation in various areas such.

Rainfall has been studied very carefully, looking at average annual rainfall, maximum and minimum quantities fallen during the year, rainfall regime, mainly of the rains that can cause leakage and erosion.

Sudden melting of snow very strongly influence the erosion process, particularly when the phenomenon occurs in the deep frozen soil conditions or saturated with water to the saturation capacity.

The study highlighted the uses and vegetation that characterize the main plant associations studied basin. Herbaceous or woody vegetation is the most important factor of protection and soil conservation for sloping land.

Vegetable shell (both cultivated and spontaneous vegetation), species differ both in productivity and as a component depending on the relief, microrelief, texture, pH, soil water mode and of course, due to human influence.

Agricultural land, which otherwise particularly interested to study, are located near human settlements on the hills meet meadows, pastures, orchards and meadows terrace and gardens.

In order to make the erosion map, erosion intensity was depicted by colors and the nature or kind dominant erosion by conventional signs. The erosion units were grouped thus achieving a final map of the erosion. Erosion class is shown in colors, generally the more intense the color is the stronger is the erosion. Soil losses cartograms (fig.1) were drawn from this study and classes of erosion hazard in the area (fig.2). Classes with the loss of soil, characterizes land not subject of erosion and few affected by erosion, land moderate, strong, strong or excessively affected by erosion. Classes of erosion considers an absent threat to soil losses estimated of 1≤ t / (ha * year), low risk to loss of 2-8 t / (ha * year), moderate risk to loss of 9-16 t / (ha * year), risk of large losses 17-30 t / (ha * year) and a very high risk of soil loss of ≥ 31 t / (ha * year).

Calculation of state indicators of soil erosion began with the calculation of potential soil loss, weighted average, the use, achieving the following results:

Potential erosion, average by usage:
Subbasin of Cicăneşti Valley:
E_{mp} / P = 9,79 t/ha*year
E_{mp} / F = 1,01 t/ha*year
E_{mp} / L = 6,47 t/ha*year
E_{mp}/ Cicăneşti Valley = 5,68 t/ha*year

Flanks erosion status: Cicăneşti Valley: 43,00%

Erosion status by erosion classes:
Small erosion class 2-8 t/ha*year: Sub-basin of Cicăneşti Valley: 61,75%
Moderate erosion class 9-16 t/ha*year: Sub-basin of Cicăneşti Valley: 24,46%
High erosion class 17-30 t/ha*year: Sub-basin of Cicăneşti Valley: 13,79%
Very high erosion class >=31t/ha*year: Sub-basin of Cicăneşti Valley: 0%

Erosion status of agrarian field: Cicăneşti Valley: 16,08%

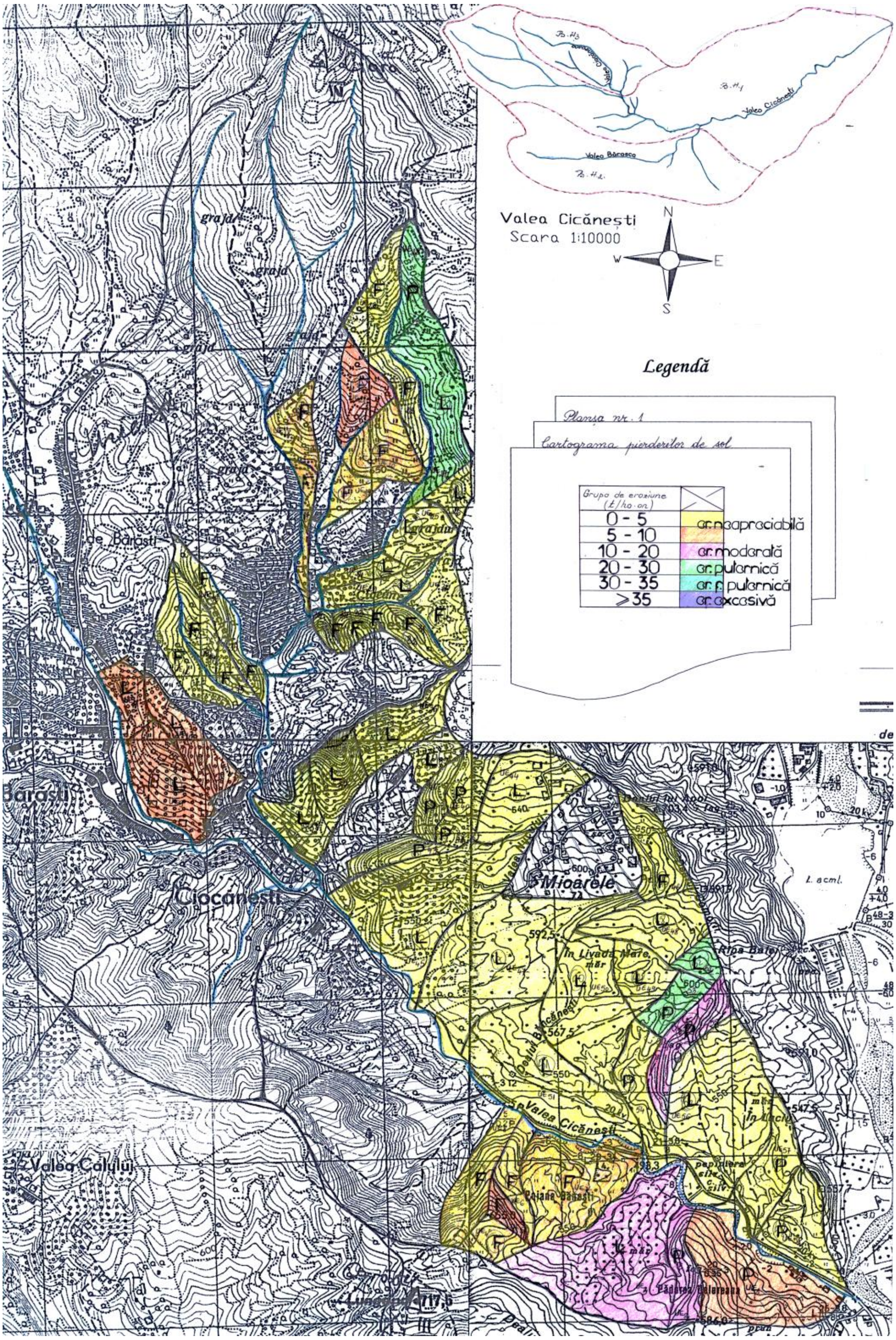

Fig. 1. Soil losses cartogram

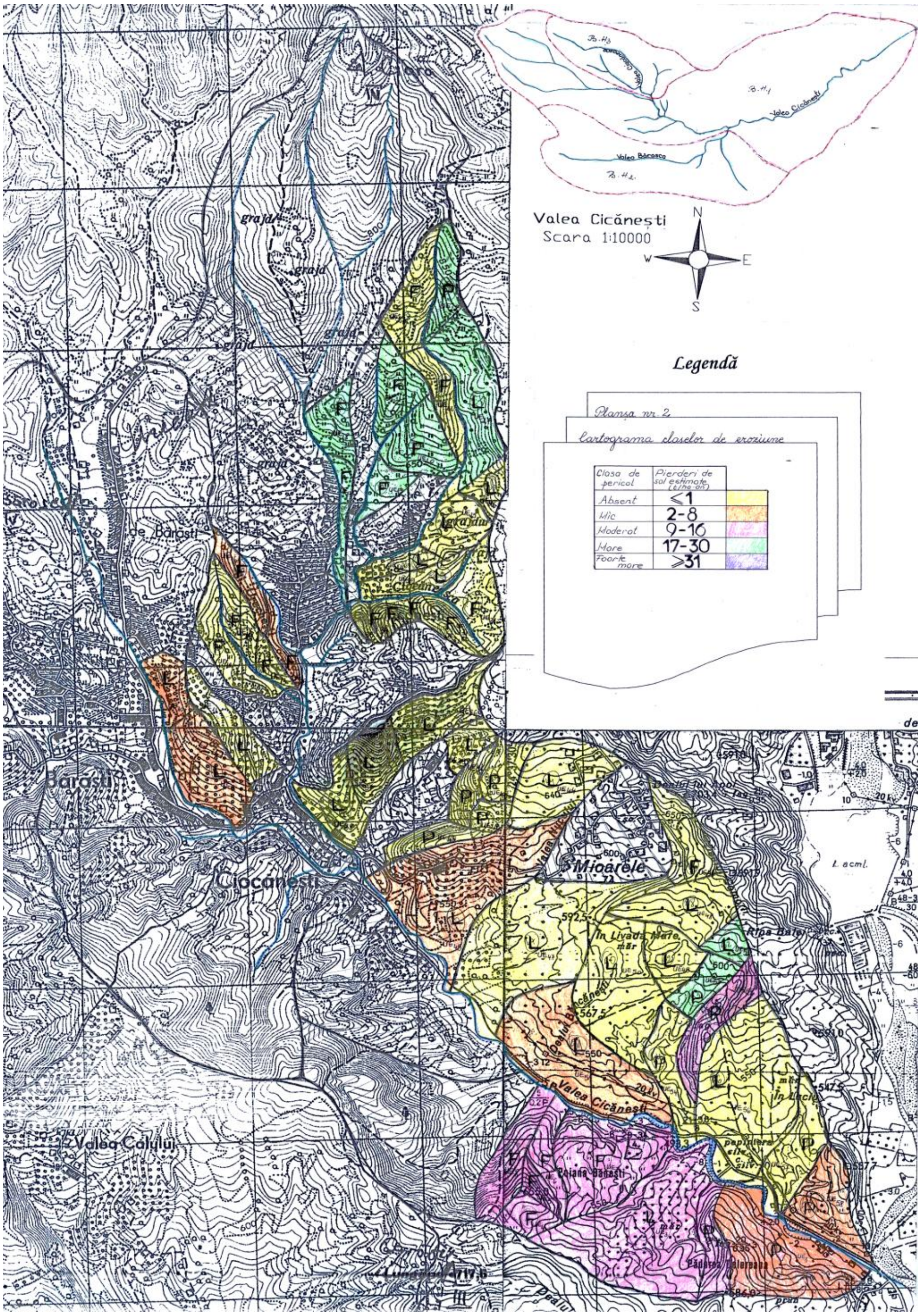

Fig. 2. Cartogram classes of erosion by soil units (US)

Table 1

Situation of agricultural land affected by erosion, by category of use

Land use	Low erosion		Moderate erosion		Strong erosion		Very strong erosion		Excessive erosion		Overall (ha)
	Surf. Ha	%	Surf. Ha	%	Surf. Ha	%	Surf. Ha	%	Surf. Ha	%	
Subbasin of Cicăneşti Valley											
Pasture(P)	116,20	13,06	23,80	2,68	15,30	1,72	-	-	-	-	155,30
Grassland(F)	206,60	23,22	15,80	1,77	-	-	-	-	-	-	222,40
Orchard (L)	423,90	47,64	57,60	6,47	30,60	3,44	-	-	-	-	512,10
OVERALL	**746,70**	**83,92**	**97,20**	**10,92**	**45,90**	**5,16**	**-**	**-**	**-**	**-**	**889,90**

Table 2

Allocation of land to erosion potential classes t / (ha * year) as an indicator 187-ICPA

Land use	Absent ≤ 1		Small 2 – 8		Moderate 9 -16		Large 17 – 30		Very large ≥ 31		Overall (ha)
	Surf. Ha	%	Surf. Ha	%	Surf. Ha	%	Surf. Ha	%	Surf. Ha	%	
Subbasin of Cicăneşti Valley											
Pasture (P)	57,20	6,43	59,00	6,63	23,80	2,68	15,30	1,72	-	-	155,30
Grassland(F)	206,60	23,22	15,80	1,77	-	-	-	-	-	-	222,40
Orchard (L)	293,20	32,95	130,70	14,69	57,60	6,47	30,60	3,44	-	-	512,10
OVERALL	**557,00**	**62,60**	**205,50**	**23,09**	**81,40**	**9,15**	**45,90**	**5,16**	**-**	**-**	**889,80**

CONCLUSIONS

The subbasin Cicăneşti Valley, erosion occurs on slopes with different intensities, depending on the value of the slopes.

Currently, this basin is characterized by a surface erosion unappreciated. It highlights so that soil erosion control works carried out have achieved the purpose for which they were designed.

The subbasin Cicăneşti Valley, a small percentage, 5.16% of land occupied by strong erosion.

These are areas in which they appear apple orchards and productions that give very low due to generally low temperatures, rain and white frost not least because of falling trees during the flowering season.

These soil units are very poorly supplied with mobile phosphorus.

The catchment area studied, due to weather patterns, there is a limitation of range of the crop. Therefore, uses the most suitable for the soils on the slopes are grassland and orchard. Fane, because the retention of its functions and reduction of water flow rate, setting the ground slopes with slopes greater protect against erosion. As irrational grazing has resulted in places in the nakedness of rock or landslides solifluxion furrows are recommended to install existing meadows and pastures, areas on a rotating (EU 53).

Farmers in the region and experts from the Institute of Fruit Mărăcineni found that as regards the use of orchard, plum is best suited to the climatic conditions in the area. Soil is low and very low on mobile phosphorus which may be an issue that apple orchards (age 20 years) did not manufacture, although the trees are well developed. In this case we recommend intensive orchards fertilized with phosphate fertilizers in particular. Researchers from the Institute Mărăcineni fruit, experienced new varieties of fruit in this area, originating in the care of trees while local farmers.

The strong erosion erosion units is recommended in addition to the maintenance of carpet grass compact complex anti-erosion measures ravine and gullies fighting that

began to form their attachments woody vegetation. High acidity of some soils in the territory, the amendment requires measures with limestone.
It should be noted that to curb landslide that occurred in previous years, there was excess water drain generator slip and was fixing to plant trees (acacia and walnut) speaking of slipping and ravines of detachment. In addition, improved and gleyzation effect by draining excess water erosion characteristic of some units. Cicăneşti valley leak adjustment was made in the floodplain, where flood appeared.

In most fruit growing plantations located on slopes with large space between lines the land has not enough grass, which resulted in a weak anti-erosion protection for those lands.

In the current socio-economic creating layers of analysis and forecasting of erosion is justified in terms of speed of obtaining the information, and speed of solutions.

Increased accuracy of such research will be conducted with the diversification of methods of obtaining the basic data by photogrammetry, tele-detection.

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REACȚIA SOLULUI CA FACTOR LIMITATIV AL FERTILITĂȚII STAGNOSOLULUI TIPIC DE LA BENCECUL DE JOS, JUDEȚUL TIMIŞ ŞI IMPLICAȚIILE ACESTUIA ASUPRA VEGETAȚIEI DE PAJIŞTI

THE SOIL REACTION AS FERTILITY LIMITATIVE FACTOR OF THE STAGNIC CAMBISOLS FROM BENCECU DE JOS – TIMIŞ AND ITS IMPLICATIONS ON GRASSLAND VEGETATION

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ABSTRACT

The grassland production is determined both by natural ecological factors and human intervention, which can direct and correct the available ecological offer.

The detailed knowledge of the productive and technological features of each part of the territories, both under the aspect of actual capacities and features and under the aspect of real possibilities of positive change of them, assures for each agricultural producer and for the decision organisms an work instrument for application of certain technical procedures or for taking some economical and social measures which finally will lead to the complete and efficient utilization of the financial resources.

The soil reaction represents an ecological indicator with major importance, able to express the conditions where the biochemical life processes of soil are develop, conditions which determine the unbiased possibilities of plant growth and fructification.

The paper has as purpose to determinate the values of pH in order to establish the fertilizer and amendment type necessary to improve the chemical properties of soil as well as the fodder value of the grassland vegetation established on the typical stagnosoil from Bencecu de Jos.

From the viewpoint of grassland vegetation, it is of interest the superficial soil layer of the lithosphere or the layer in course of formation, until the medium limit of root extension in depth.

The soil samples had been sampled from a principal soil profile of the grassland within the perimeter of Bencecu de Jos. The determination of pH values was made by electrometric methods using the electronic pH-meter.

By laboratory analysis was found that the pH values of the typical stagnosoil from Bencecu de Jos are comprised between 5.3 – 5.55, the soil reaction being moderate acid.

In the soils with acid reaction are growing acidophile plants like: *Nardus stricta, Deschampsia caespitosa, Rumex acetosella* etc.

The stagnant gleyzation processes had a great influence on pH values, generating moderate acid reaction of the stagnosoil. The moderate acid reaction accompanied also by stagnant gleyzation processes made that grassland vegetation be dominated by the following species: *Nardus stricta, Deschampsia caespitosa, Rumex acetosella* etc.

The stagnosoil has a low fertility especially because of deficient aero-hydric regime. To improve the properties of this soil there are necessary profound loosening works, scarification work, ploughing with the subsoiler, works for water excess elimination, organic and mineral fertilizer application.

INTRODUCTION

The soil reaction represents an ecological indicator with major importance, able to express the conditions where the biochemical life processes of soil are develop, conditions which determine the unbiased possibilities of plant growth and fructification.

The paper has as purpose to determinate the values of pH in order to establish the fertilizer and amendment type necessary to improve the chemical properties of soil as well as the fodder value of the grassland vegetation established on the typical stagnosoil from Bencecu de Jos.

MATERIAL AND METHODS:

Soil reaction (pH) was determined using the potentiometer method with combined electrode from glass and calomel in water suspension at the soil/water report of 1/2.5.

RESEARCH RESULTS

STAGNIC CAMBISOILS FROM BENCECU DE JOS

Morphologic features

AoW - 0-30 cm, average loam clay, light grey, presents frequently greenish and rusty spots, sub-angular polyhedral, medium porous, medium compact, presents iron-manganese concretions.

BtW - 30-90 cm, average loam clay, mottled, prismatic structure, fine porous, plastic, adhesive.

C - 90-130 cm, average loam clay, yellow brownish, medium compact, medium porous.

Soil taxonomic unit is typical stagnosoil, medium compact, medium porous, on medium clays, average loam clay/ average loam clay.

Coarse sand has oscillatory values as is following: in AoW horizon the value is 13.6%, in BW horizon the value is 4.9%, and in the horizon C the value is increasing to 18.1%. The fine sand represents different values on the entire profile as is following: AoW has 32.9%, in the horizon BW the value is 30.7% and the horizon C the value decreases to 29.4%. The dust has the following values: AoW horizon has the value of 15.5%, the horizon BW has the greatest value of 29.7%, and the horizon C presents the value of 21.1%. The most important component of the granular fraction, the clay presents oscillatory values, respectively in the horizon AoW – 38.0%, in BW horizon – 34.7% and in the horizon C the value is decreasing to 31.2%.

After the study of the triangular diagram of the texture there was determined the texture that is the loam clay type on the entire profile.

Soil reaction is moderate acid presenting the next values: in AoW horizon – 5.30%, in the horizon BW – 5.40% and in the horizon C – 5.55.

The humus content is very variable from medium having values of 5.47% in the horizon AoW, to low in the horizon Bw with 2.38% and C with the value of 1.83%.

The phosphorus content (P) is extremely low in the horizon Aow with values of 3.9 ppm and very low in the horizons B with 2.38 ppm and C with 5.7 ppm.

The potassium content (K) is lower presenting the next values: in the horizon AoW – 80 ppm, in the horizon BW - 74 ppm and in the horizon C – 68 ppm.

The changeable hydrogen (SH) values are oscillating from 6.94me/100 g soil in the horizon AoW to 4.62 me/100 g soil in the horizon BW, decreasing to 3.17 me/100 g soil in the horizon C.

The physical and chemical proprirty of Stagnic cambisol from Bencecu de Jos

HORIZONS	*AoW*	*BW*	*C*
Depths (cm)	0-30	30-90	90-130
Coarse sand (2.0-0.2 mm)%	13.6	4.9	18.1
Fine sand (0.2-0.02 mm)%	32.9	30.7	29.4
Dust (0.02-0.002 mm)%	15.5	29.7	21.2
Clay 2 (under 0.002 mm)%	38.0	34.7	21.2
TEXTURE	**TT**	**TT**	**LL**
pH in (H_2O)	5.30	5.40	5.55
Humus (%)	5.47	2.38	1.83
P mobil (ppm)	3.9	4.6	5.7
K mobil (ppm)	80	74	68
Changeable hydrogen (SH me 100 g /sol)	6.94	4.62	3.17
Exchange bases (SB me 100 g/sol)	25.64	20.3	17.11
Cationic exchange capacity (T me 100 g/sol)	32.68	24.92	20.28
Saturation degree in bases (V%)	78.69	81.46	84.36

The sum of the exchangeable bases (SB) is medium having values of 25.54 me/100 g soil in the horizon AoW, 20.3 me/100 g soil in the horizon BW and 17.11 me/100 g soil in the horizon C.

The cationic exchange capacity (T) is medium on the entire profile presenting the next values: in the AoW horizon the value is 32.68 me/100 g soil, in the horizon BW the value is 24.94 me/100 g soil and in the horizon C the value is 20.28 me/100 g soil.

The saturation degree in bases (V%) has oscillatory values, respectively: 68.69% in the horizon AoW, 81.46% in the horizon BW and 84.36% in the horizon C, so we can consider this as being a moderate alkaline soil.

CONCLUSIONS

By laboratory analysis was found that the pH values of the typical stagnosoil from Bencecu de Jos are comprised between 5.3 – 5.55, the soil reaction being moderate acid.

In the soils with acid reaction are growing acidophilic plants as: *Nardus stricta, Deschampsia caespitosa, Rumex acetosella* etc.

The stagnant gleyzation processes had a great influence on pH values, generating moderate acid reaction of the stagnosoil. The moderate acid reaction accompanied also by stagnant gleyzation processes made that grassland vegetation be dominated by the following species: *Nardus stricta, Deschampsia caespitosa, Rumex acetosella* etc.

The stagnosoil has a low fertility especially because of deficient aero-hydric regime. To improve the properties of this soil there are necessary profound loosening works, scarification work, ploughing with the subsoiler, works for water excess elimination, organic and mineral fertilizer application.

In the conditions of a moderate acid reaction of this soil type, for the improvement of the grassland quality there is recommended the correction of the soil acidity together with the elimination of the water excess, which can be realised with some natural materials that are containing $CaCO_3$ (lime, dolomite, calcareous tufa, shale) or products that are originating from their processing (caustic lime or hydrated lime) and with different industrial wastes (kilnkerites, residual $CaCO_3$) and the grassland overseeding with plants species tolerant to the moderate acid soil reaction (*Festuca*, *Agrostis*).

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THE NEW METHODS FOR MEASURING SOIL TEXTURE
METODĂ NOUĂ DE DETERMINARE A TEXTURII SOLULUI

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***Keywords:* laser diffraction, soil physical properties, soil texture, particle size distribution**

REZUMAT

Textura solului reprezintă una din principalele însuşiri ale solurilor deoarece influențează foarte multe proprietăți din sol, aplicarea tehnologiilor agricole, creşterea şi dezvoltarea plantelor. Cercetările efectuate au urmărit stabilirea unei metodologii de lucru pentru determinarea texturii solurilor cu ajutorul analizorului de particule pe baza de laser. Comparativ cu metoda clasică de măsurare a fracțiunilor granulometrice prin cernere si sedimentare difracția bazată pe laser oferă o serie de avantaje cum sunt: timpul scurt de măsurare, calibrare simplă a aparatului, o bună precizie şi un interval mare de determinare a fractiunilor granulometrice.

ABSTRACT

Soil texture is one of the most main soil physical properties because has influences many other soil properties and development plant growth. Research followed the establishment of methodology for determinate soil texture by measuring diameter particle size distribution (clay, silt and sand) with the Laser Particle Sizer analysette 22.

Compared with the "classical" measurement processes such as sieving or sedimentation, laser diffraction offers valuable advantages such as, short analysis times, good reproducibility and precision, simple calibration, a large measuring range and high flexibility.

Analytical instruments based on laser diffraction for determination of particle size distribution use the physical principle of the scattering of electromagnetic waves.

MATERIAL AND METHODS

The physical and physicochemical proprieties of soil decide about plant growth and development and strongly influence the formation of the state of environment (Horabik and Walkzak, 2002). Particle size distribution affects many physical, chemical soil properties and processes taking place in soil.

The measurements were conducted on soil samples coming from profiles of reddish preluvosoil from south-east Bucharest area. To determine the particle size distribution were collected 30 soil samples of 15 profiles on two depths 0-20 cm and 20-40 cm. Particle size distribution of the studied soil samples, measured by sedimentation methods and the measurements of particle size distribution by means of laser diffraction methods were performed with Laser Particle Sizer analysette 22 which measures particles in a wide range from 0.3 µm to 300 µm. The soil sample preparation procedure included adding Na hexametaphosphate solution for a good dispersion a sand, silt and clay particles.

All soils samples had less than 2% organic matter, so no pretreatment to remove organic matter was using and not has carbonated content.

The design consists of a laser beam directed through a measuring cell to a detector. A dispersion module transports the particles to the measuring cell and through the laser beam. The light scattered proportionally to the particle size is projected by a lens onto a detector. The particle size distribution can be calculated from the distribution of scattered light with the help of complex mathematics.

RESULTS AND DISCUSSIONS

Following the determinations of grain size analysis using Laser Particle Sizer device analysette 22 percent were obtained in general similar to the classic method. There are differences in determining the fractions of dust that all the samples was recorded a higher percentage of dust to the detriment of the fractions of clay and sand. To get the real results have been carried out on different amounts of soil and 1 g, 3g, 5 g and 10 g. After performing several tests to determine soil texture using a laser amount of soil was chosen for analysis soil samples of 3 g.

As a result, a volume distribution based on the equivalent diameter of the laser diffraction and sedimentation method are obtained following values:

Table 1

Particle size distribution of studied soil samples measured by sedimentation methods and laser diffraction with Laser Particle Sizer analysette 22

No	**Depth (cm)**	**Sedimentation method**			**Laser diffraction method**		
		Sand 0.2-0.02	Silt 0.02-0.002	Clay <0.002	Sand 0.2-0.02	Silt 0.02-0.002	Clay <0.002
1	0-20	**36.0**	**32.7**	**30.3**	33,1	37.4	29.5
	20-40	**34.8**	**32.6**	**31.7**	32,4	37.1	30.5
2	0-20	**39.2**	**31.0**	**28.9**	29.5	41.6	28.9
	20-40	**37.8**	**30.4**	**30.9**	28.8	43.5	27.7
3	0-20	**38.7**	**30.6**	**29.5**	34.5	34.3	31.2
	20-40	**36.6**	**29.4**	**33.1**	33.2	35.9	30.9
4	0-20	**35.6**	**29.5**	**33.0**	31.4	38.3	30.3
	20-40	**34.7**	**30.5**	**32.8**	30.5	40.0	29.5
5	0-20	**38.7**	**29.7**	**30.6**	35.5	36.1	28.4
	20-40	**37.5**	**30.4**	**31.1**	34.6	36.3	29.1
6	0-20	**38.4**	**31.4**	**29.3**	29.5	43.2	27.3
	20-40	**36.9**	**32.1**	**30.0**	28.9	42.7	28.4
7	0-20	**36.1**	**31.4**	**31.5**	34.5	35.1	30.4
	20-40	**37.9**	**29.8**	**31.4**	35.0	34.9	30.1
8	0-20	**37.9**	**29.9**	**31.3**	34.5	36.6	28.9
	20-40	**35.7**	**32.1**	**31.3**	33.8	37.4	28.8
9	0-20	**37.5**	**31.4**	**29.9**	29.5	43.1	27.4
	20-40	**36.2**	**31.2**	**31.6**	34.0	36.8	29.2
10	0-20	**35.2**	**29.4**	**34.5**	32.3	36.3	31.4
	20-40	**34.7**	**29.9**	**34.3**	31.7	37.0	31.3
11	0-20	**40.3**	**29.4**	**29.0**	38.6	33.6	27.8
	20-40	**38.1**	**29.8**	**30.9**	36.5	34.5	29.0
12	0-20	**38.1**	**31.4**	**29.4**	35.5	36.1	28.4
	20-40	**36.0**	**33.1**	**29.9**	33.1	38.6	28.3
13	0-20	**44.6**	**23.7**	**29.3**	39.5	33.1	27.4
	20-40	**43.8**	**25.3**	**29.0**	38,7	34.3	27.0
14	0-20	**39.6**	**22.8**	**29.0**	37.1	34.6	28.3
	20-40	**38.9**	**24.1**	**30.5**	35.4	35.7	28.9
15	0-20	**41.5**	**27.4**	**29.3**	38.3	35.8	25.9
	20-40	**36.3**	**24.9**	**37.2**	37.5	25.7	36.8

In the analysis performed by the computer program to interpret the graphic content of samples in the sand, silt and clay percentages identified by Figure 1, 2. The range for each grain size fraction determined by Laser Particle Sizer analysette 22 Compact are as follows: 0.03 µm – 1.0 µm, 1.0 µm-2.0 µm for the clay fraction; 2-3 µm, 3-4 µm, 4-5 µm, 5-10 µm, 10-20 µm intervals for the fraction of silt and 20-50 µm, 50-100 µm, 100-200 µm and 200-300 µm for the sand fraction.

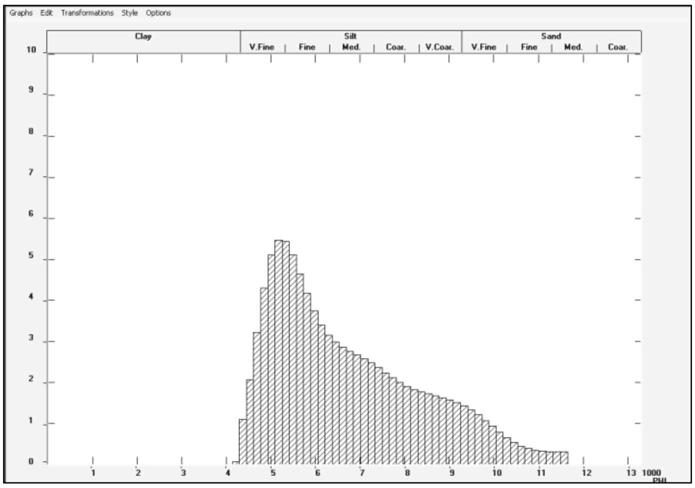

Fig. 1. Graphical representation of the percentages of sand, dust and clay

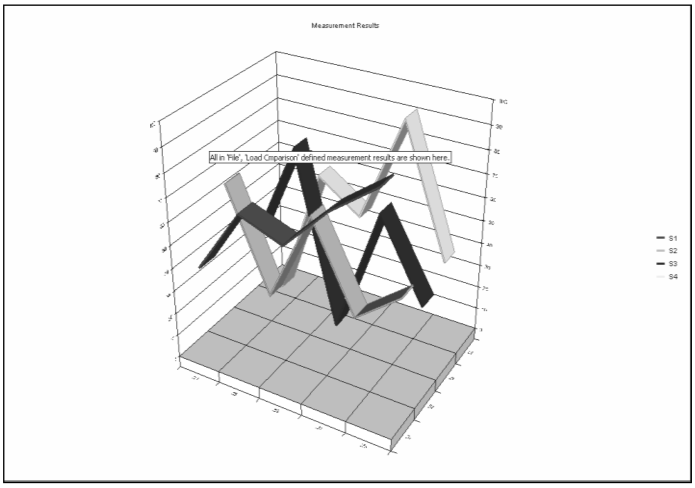

Fig. 2 Three-dimensional graphical representation of the soil samples analyzed by Laser Particle Sizer analysette 22

Although the sample dispersion was made as in the classical method is possible to get errors if you do not shake at the time of sample analysis.

Determinations made by the two methods are similar for the two depths of reddish preluvosoil analyzed in terms of content but of clay, dust and sand there on the amendment changes the classification of the soil textural class.

In all samples analyzed by laser method of dust content in the two depths 0-20 cm and 20-40 cm higher compared with the standard method.

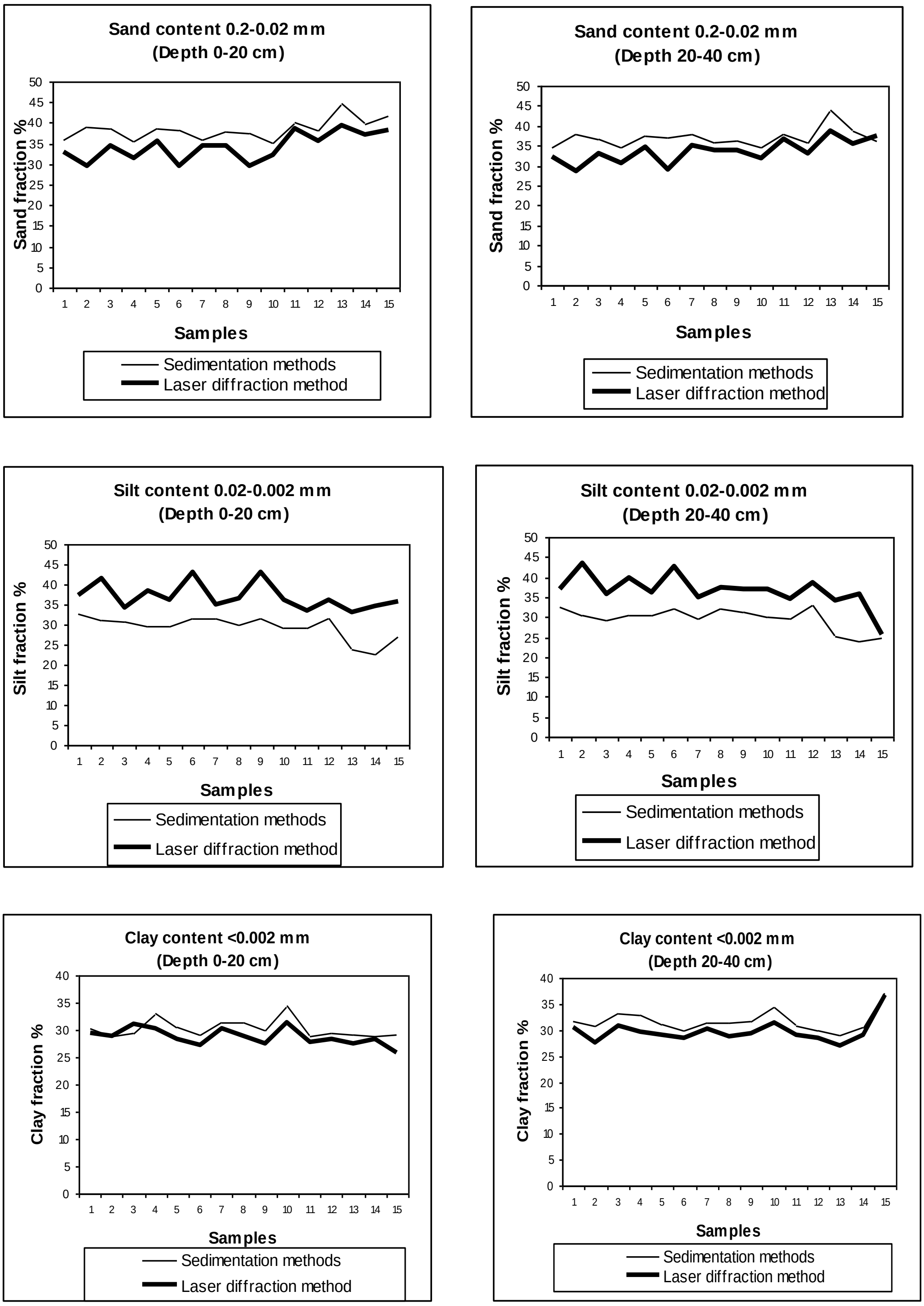

Fig. 3 Comparison of particle size distribution from sedimentation method and laser diffraction

Research carried out to establish a uniform methodology for the determination of particle size distribution in soil fractions by applying laser may offer an exact image of the distribution of particle size fractions in soils if it makes a good dispersion of the aggregates method and elimination of organic matter and carbonates where soil samples have a high content of organic matter and carbonate.

CONCLUSIONS

Measurement of particle size distributions using laser diffraction technology provides a relatively easy and rapid method to determine the volume or weight of particles for a large number of size classes with a great degree of reproducibility on a small sample.

Laser diffraction method can be applied for particle size measurements.

Measurement of particle size distributions using laser diffraction technology provides a relatively easy and rapid method to determine the volume or weight of particles for a large number of size classes with a great degree of reproducibility on a small sample.

For a good correlation between the results obtained are necessary to make several samples of granulometric analysis on several soil types with different textures.

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INFLUENȚA FERTILIZĂRII ECOLOGICE COMPARATIV CU CEA CHIMICĂ LA PILEA CADIEREI

THE INFLUENCE OF THE ECOLOGICAL FERTILIZATION AT THE SPECIES PILEA CADIEREI

MIUȚĂ DONATELA – VICTORINA, VULPE MIHAI

KEY WORDS:Fertilizers,organic, inorganic, Pilea cadaierei

ABSTRACT

This paper presents the effects of organic and inorganic fertilization on the species Pilea cadierei.

Following experiments, we notified a greater effectiveness of organic fertilizer versus chemical fertilizer with a significantly improvement of the main physiological functions of the leaf. Thus, significant increases were obtained for photosynthesis, transpiration, leaf temperature and for the chlorophyll content. Organic fertilization increases the plants natural system of self defense in a natural way, protecting the environment.

Lucrarea de față prezintă efectele fertilizării organice şi anorganice, la specia Pilea Cadierei.

În urma experiențelor, s-a constatat o mai mare eficacitate a fertilizatorului ecologic comparativ cu fertilizatorul chimic prin îmbunătățirea semnificativă a funcțiilor principale ale frunzei. Astfel, s-au obținut creşteri importante în cazul fotosintezei, transpirației, temperaturii frunzei precum şi în cazul conținutului în clorofilă. Fertilizarea organică determină creşterea sistemului natural de autoapărare al plantei într-un mod natural şi atoxic, protejând mediul înconjurător.

INTRODUCTION

Fertilizers either organic or anorganic, are of particular importance in plant development (Witham FH, et. Al. 1971). The organic fertilizers distinguished by the fact Sthat they don't endanger the health of plants, even if not administered with caution, as happens when inorganic fertilizers (Pettersson, et al. 1979).

The organic fertilizers contain large amounts of nutrients that help feed the plant, helps keep microflora, the soil loosening and protect against temperature changes (Bazzaz, F. A., et al. 1979).

Inorganic fertilizers are chemicals whose composition has been adapted to plant needs. Most of them are based on nitrogen, phosphorus and potassium, given the important role they play in plant development (Nicolae I., 2008) .

In this paper we present the results regarding the use of an organic fertilizer, consisting of a plant extract elements superconcentrates, on the species *Pilea cadierei*, without negative impact on the environment.

MATERIAL AND METHODS

The study was conducted in the greenhouses of the Botanical Garden "Alexandru Buia", Craiova Cells on the *Pilea cadierei* species.

Fertilization were carried out during February-April 2010 and included five watering with organic fertilizers and five watering with inorganic fertilizers, on 15 Pilera cadierei plants.

The experience was set up on three variants:

- V1, control variant unfertilized;
- V2, watering with organic fertilizer at a concentration of 0.03%;
- V_3 - watering with chemical fertilizer at a concentration of 0.005%.

The composition of the organic fertilizer comprise: organic nitrogen 18, 72%, organic phosphorus 0.64% organic potasium 7.2%, humic acids, acids crenic, Spirulina, organic carbon 28.31%, silicon, calcium, magnesium, triterpenoid, flavonoid, vitamins, amino acids, with an pH of 4.94.

The composition of the chemical fertilizer is: 6:4:5 NPK, oligoelements 6%, nitrogen4%, phosphorus pentoxide 5%, potassium oxide 0.013%, boron 0.003%, copper 0.021%, iron 0.011%, magnesium 0.0011% , molybdenum 0.0058%.

RESULTS AND DISCUSSIONS

Following determinations made with the cloropyill-meter "Minolta" Spades 502, and ADC bioscientific photosynthesis analyzer (LCI), there were recorded very good results for the variant with organic fertilization (V2), good results for thye variant with inorganic fertilization (V3) and satisfactory results for the control variant (V1) (Table 1).

Table 1

The influence of the organic fertilization on the main physiological processes in the leaves of *Pilea cadierei*

Variants	Photosynthesis rate (µmol/m^2/s)	Active photosynthesis rate (µmol/m^2/s)	Transpiration rate (µmol/m^2/s)	Leaf temperature (^{0}C)	Clorophyl e content (SPAD units)
V_1	1.26	285	0.52	30.44	34.7
V_2	2.18	516	0.90	31.3	40.2
V_3	1.57	387	0.64	30.9	38.9

Regarding the photisynthesis rate the highest value (2.18) has been recorded for the V2 variant, comparative with the V3 variant (1.57) and the control variant V1 (1.26).

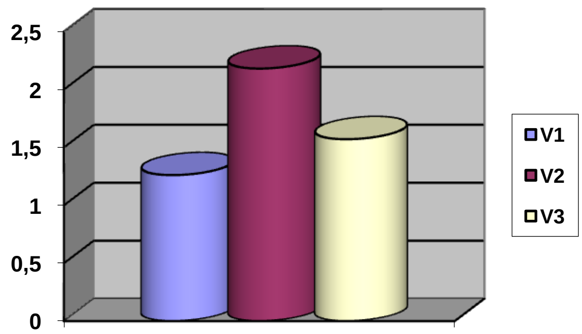

Fig. 1 Photosynthesis rate

The recorded active photosynthesis rate was higher at the V_2 variant (516) than the variant treated with chemical fertilizer V_2 (387) and the untreated control variant V_1 (285).

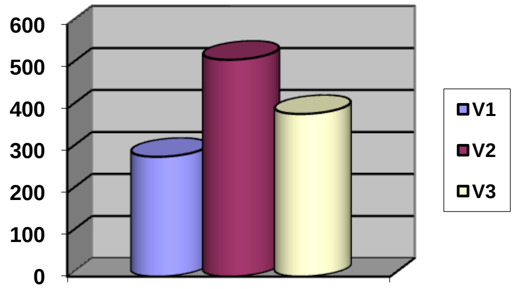

Fig. 2 Active photosynthesis rate

According to the recorded data the transpiration rate, highest value has been recorded at the variant (V_2) treated with organic fertilizer (0.90), and the lowest value has been recorded at the untreated control variant V_1 (0.52).

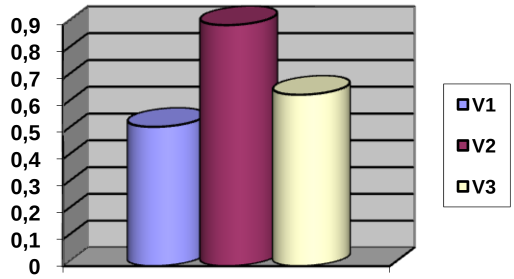

Fig. 3 Transpiration rate

Regarding the leaf temperature and the clorophyle content the highest values has been recorded also for the variant treated with organic fertilizer V_2 follwed by the variant treated with chemical fertilizer V_3 and the control variant V_1.

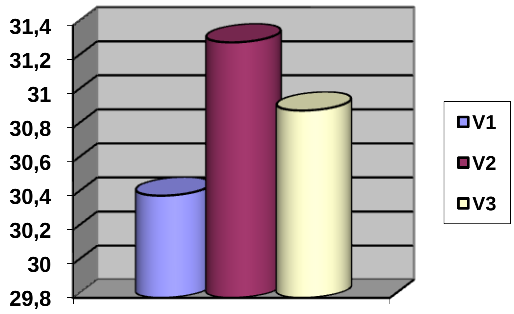

Fig. 4 Leaf temperature

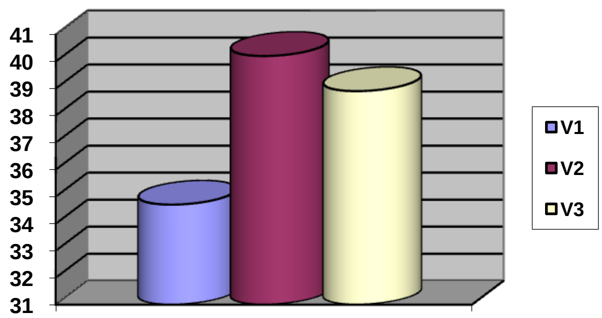

Fig. 5 Clorophyle content

From the recorded data it come out that the variant with organic fertilizer (V2) recorded a much higher rate of photosynthesis, transpiration, photosynthetic active radiation and leaf temperature compared to the chemical fertilizers (V3) that were recorded lower values, as well for the control variant unfertilized, there were recorded very low levels.

Organic fertilizer consisting of organic elements is a source of clean health, protecting and providing a quality environment. He leads, naturally, revitalizing biological plant resistance to changes in temperature, helps to create chlorophyll and play an important role in the process of photosynthesis.

CONCLUSIONS

To significantly enhance plant functions, the best results were obtained from the application of organic fertilizer.

Organic fertilizer made from plant extracts elements act directly on plant metabolism, significantly improving the quality leaves in a naturall way, increasing their natural defense system.

Based on our results we recommend the use of the organic fertilizer for optimum results avoiding negative environmental effects.

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FOSFORUL DIN SOL – O PROBLEMĂ ACTUALĂ

PHOSPHORUS FROM THE SOIL – AN ACTUAL PROBLEM

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REZUMAT

In perioada 27.09 – 01.10. 2010 s-a desfăşurat la Sevillia – Spania, Congresul Internaţional al fosforului, ediţia a VI a. Lucrarea de faţă prezintă principalele secţiuni ale congresului şi problematica abordată.

ABSTRACT

Within 27.09-01.10.2010 there took place in Seville – Spain, the sixth International Congress of Phosphorus. The present paper deals with the main sections of the congress and the issues approached.

INTRODUCTION

The phosphorus is an important element because at high temperatures, in absence of oxygen it reacts with metals forming phosphures.

In some metallic meteorites it was identified a complex phosphure of cobalt and nickel. Within the lithosphere the phosphorus reacts with oxygen as PO_4^{-3} and along with other metals (Ca, Mn, Sr, Fe, Al) forms numerous minerals (Davidescu D., 1979).

The soil content of phosphorus is in function of ore nature of the bedrock. The magmatic rocks contain 0,3-1% P_2O_5, the crystalline ones, 0,2-0,7% P_2O_5 and the sedimentary ones 0,05-0,3% P_2O_5.

The phosphorus from soil is paramount for plant nutrition and it originate in minerals and rocks where the soil formed. It exists into the soil as orthophosphate anion, as organic and mineral compounds or chemically adsorbed by soil colloids.

MATERIAL AND METHOD

Taking account of the paramount importance of phosphorus for plant nutrition as well as the phosphorus losses from the soil, in 27.09.2010 – 01.10.2010 there took place The VI th International Congress of phosphorus in Seville (Spain).

The Congress has had the following sections:

- Global phosphorus flows
- Phosphorus dynamics and cycling
- Phosphorus in water bodies
- Phosphorus mobilization and modeling
- Monitoring phosphorus loss
- Mitigation options

RESULTS AND DISCUSSIONS

The Congress was attended by 146 delegates from 27 countries from 6 continents that presented 152 papers of which 88 papers have been presented in sections and 64 posters.

The papers per countries situation is as follows: Sweden = 21, Spain = 15, Denmark = 14, UK = 12, Ireland = 11, Switzerland = 9, USA = 8, the Netherlands = 6, Romania = 5, Australia = 5, Canada = 5, France = 4, Germany = 4, Portugal = 4, China = 3, Belgium = 3, Indonesia = 2, Finland = 2, Israel = 2, Argentina = 2, Austria = 2, Poland = 2, Norway = 2, Czech Rep. = 1, Greece = 1, Russia = 1, Hungary = 1.

On sections, the number of papers has been distributed as follows:

1. Global phosphorus flows = 10 oral presentation and 3 posters;
2. Phosphorus dynamics and cycling =20 oral presentation and 28 posters;
3. Phosphorus in water bodies 8 oral presentation and 5 posters;
4. Phosphorus mobilization and modeling 27 oral presentation and 18 posters;
5. Monitoring phosphorus loss 6 oral presentation and 8 posters;
6. Mitigation options 14 oral presentation and 5 posters;

The organizing committee was formed of:

- Antonio Delgado – University of Seville
- Fernando Gil Sortes – University of Seville
- Jose Torrent – University of Cordoba

The Scientific Committee for the Joint Meeting IPW 6 – COST Action 869:

- Phil Haygarth (Lancaster University, UK)
- Iggy Liator (Tel Hai College, Israel)
- Wim Chardon (Alterra Waggeningen – the Netherlands)
- Antonio Delgado (University of Seville – Spain)

The Congress has been supported by the following institutions:

- Spanish Ministry of Science and Innovation;
- Junta de Andalusia, Conserje de Innovation, Ciencia y Empressa
- University of Seville
- Fertiberia s.a.
- COST Action 869: Mitigation options for nutrient reduction in surface water and ground waters.

The main issues approached by the 6 sections were:

First section: Global phosphorus flows

- soil organic phosphorus dynamics – pools, actors and processes – Switzerland;
- phosphorus dynamics and impact in water bodies – standing on the shoulders of giants – Ireland;
- using a field scale index to asses phosphorus loss from an agricultural environment – USA;
- phosphorus bioavailability – nothing but a rhyzosphere story – France;
- management of phosphorus in the low input agricultural systems of the West Asia and Africa region;
- modeling field scale phosphorus transfer: model strength and weaknesses, gaps in knowledge and the role of scientists – USA;
- global phosphorus fluxes and the threat to food security – UK;
- modeling approach to estimate P flow and balance at country scale: a case study in France;
- phosphorus flows in the Netherlands: option for more sustainable use;
- an inventory of UK soil phosphorus and the implication for sustainable food production.

Second Section: Phosphorus dynamics and cycling:

- identification and quantification of organic phosphorus forms in soils from fertility experiments – Sweden;
- effect of moisture conditions in rice paddies on phosphorus fractionation in agricultural soils of developing regions of China;
- dynamics of easily soluble and plant available phosphorus in relation to soil, phosphorus status and fertilization rate;
- development and validation of new fertilizers of high bioavailability and reduced nutrient losses: Rhyzosphere controlled fertilizers – France;

- a dynamic model describing phosphate uptake of oilseed rape growing in rhyzotrons – UK;
- response of Zea mays to the residual effect of phosphorus fertilizers in latozolic soil – Indonesia;
- effect of parent materials and land use on soil phosphorus characteristics in Southern Belgium;
- chemical imaging of dissolved phosphorus reveals complex P dynamics in the rhyzosphere of Brassica napus – UK;
- anion exchange resin membranes to asses soil P status following organic and mineral fertilizers in Eastern Canada;

Third section, Phosphorus in water bodies:

- phosphorus dynamics in Buffer strip soils;
- should we focus only on P loads when aiming to reduce eutrophycation in P limited aquatic systems – Finland;
- Predicting phosphorus release following wetland restoration – Denmark;
- B and K erosion as a phosphorus source in a Danish river basin;
- Alternatives to tile for managing formed depressions;
- Do iron (II) phosphates control phosphate solubility in anoxic soils and sediments – Denmark;

Forth section, Phosphorus mobilization and modeling at the field and catchments scales:

- processes involving phosphorus accumulation and losses in undisturbed soil columns – Italy;
- modeling nitrogen and phosphorus transport in a small agricultural stream in Eastern Sweden;
- effects of P fertilizing practices soil P pools temporal variations within a ten year field experiment;
- inter comparation of suspended sediment and phosphorus fluxes and concentrations on two agricultural head water catchments;
- mobilization of slurry injected phosphorus during sequential irrigation and drainage cycles compared to continuous irrigation;
- daily fluctuation of phosphorus and nitrogen concentration based on automatic measurements – Poland;
- sensitivity analysis of the modified ICECREAM model to improve parameterization for Swedish conditions;
- the influence of soil and manure variables on phosphorus leaching from Swedish agricultural soils;
- assessment of phosphorus fertilizing practices in altered wetland soil using uncertainty analysis;
- a new methodology to estimate Phosphorus LEAching from Soils to the Environment (PLEASE) – the Netherlands;
- phosphorus concentration in overland flow from grassland field plots – Northern Ireland;

Sixth section, Mitigation options:

- a web based P index as a mitigation planning tool – Denmark;
- reducing/omitting phosphorus fertilizers inputs to reduce Australian dairy pasture soils phosphorus concentration;
- evaluation of constructed wetlands as mitigation option for phosphorus and sediment – UK.
- In-situ treatment of agricultural drainage water using industrial by products phosphorus sorbing materials – USA;
- Reducing phosphorus runoff from biosolids with water treatment residuals;

- Effectiveness of unfertilized buffer strips in the Netherlands: field study results;
- Operationalising methods for minimizing soil compactions and reducing soil erosion and diffuse pollution risk from wheeling in winter cereals.

CONCLUSIONS

The soil phosphorus is current problem in worldwide agriculture;

- Even though phosphorus is needed to improve yield quality and quantity the runoffs (slopes higher than 5%) can determine the eutrophication of surface waters;
- The International Congress of Phosphorus held in Seville in 27.09 – 01.10.2010 period has analyzed, globally, the phosphorus losses from various soils, its concentration in surface waters and water table, oceans and options to mitigate phosphorus losses.

ACKNOWLEDGEMENTS

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MONITORIZAREA REGIMULUI TERMIC ȘI HIDRIC AL SOLURILOR DIN CÂMPIA TRANILVANIEI

SOIL TEMPERATURE AND MOISTURE MONITORING FROM TRANSYLVANIAN PLAIN

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Keywords: Soil temperature, Soil moisture, GDD, Transylvanian Plain

REZUMAT

Câmpia Transilvaniei este o regiune importantă pentru producţia agricolă. Cu toate acestea, datele limitate legate de soluri şi neadoptarea celor mai bune practici de managment pot împiedica productivitatea terenurilor. Temperatura solurilor din Câmpia Transilvaniei este evaluată utilizând douăzeci de staţii pentru înregistrarea datelor. Temperatura este monitorizată la suprafaţa solului şi la adâncimea de 10, 30 şi 50 cm, iar umiditatea solului este monitorizată la adâncimea de 10 cm. Rezultatele preliminare indică faptul că solurile din Câmpia Transilvaniei au un regim mesic de temperatură. Cu toate acestea, există diferenţe de încălzire şi tendinţe sezoniere de răcire în întreaga Câmpie a Transilvaniei. Acestea au implicaţii importante în recomandările de semănat.

ABSTRACT

The Transylvanian Plain is an important region for agronomic productivity. However, limited soils data and adoption of best management practices hinder land productivity. Soil temperatures of the Transylvanian Plain were evaluated using a set of twenty datalogging stations positioned throughout the plain. Soil temperatures were monitored at the surface and at 10, 30, and 50 cm depths, and soil moisture was monitored at 10 cm. Preliminary results indicate that most soils of the Transylvanian Plain will have a mesic temperature regime. However, differences in seasonal warming and cooling trends across the plain were noted. These have important implications for planting recommendations.

INTRODUCTION

Transylvanian Plain (TP), with an area of approx. 395,000 ha, has a predominantly agricultural character, and in the past, because of the large areas of agricultural land, with fertile soil, produced large quantities of grain, for economic and social needs of the country. Cereal and steppe character (or anthropogenic steppe) of the area, led to widespread of the popular term "plain", as over 30 villages, located in mid-southern region, wears, along with their name, the addition "plain". In time, however, because of rugged terrain, deforestation, fixation of the public lakes on quick slopes and irrational agrotehnics for the crops, large areas of productive agricultural land were turned into degraded land, with reduced productivy or unproductive. After ***Ministry of Agriculture*** and Rural Development of ***Romania*** data, about 1954 hectares of the Transylvanian Plain area, are aside agricultural production and tens of thousands of hectares are with productivity greatly reduced under the normal. Another feature of the TP is that, although it is lower than the surrounding region, no major river valleys, no major roads, do not converge to its center, but it surrounds it on the periphery. So it is a poor area in water resources, avoid by the heavy traffic, and so it partly explains its rural character and layout of cities around the edges (Rusu et al., 2009).

The last research upon the evolution of the climate inside the Carpathian basin, pointed out an increase of the air temperature in the last one hundred years with about 0.7°C. This fact is also shown by the fact that, six of the warmest years of the 20^{th} century were registered in 1990's. Contrary to its name, the TP is not a geographically flat plain, but rather a collection of rolling hills approximately 300 to 450 m above sea level in the south and 550 to 600 m above sea level in the north. Climate of the TP is highly dynamic, ranging from hot summers with high temperatures of >25°C to very cold winters with lows ~-5°C (Climate charts, 2007). The southern TP generally has a xeric moisture regime with steppe vegetation while moisture increases somewhat in the northern TP as an udic moisture regime.

However, near-surface temperatures have often been estimated from air temperatures, with little long term study and virtually no soil temperature data. The goals of this study are to: 1) characterize the soil resources and establish a network of datalogging stations to measure soil temperatures and moisture monitoring across the TP, 2) develop interpolated soil temperature regimes from collected data, 3) evaluate variables such as slope inclination and aspect which impact soil temperatures, and 4) make recommendations to farmers on optimal planting dates for seed germination of local crops.

MATERIAL AND METHOD

Twenty datalogging stations have been deployed across the TP on divergent soil types, slopes, and aspects. The location of each site was recorded using Garmin eTrex Vista (Olathe, KS, USA) handheld GPS units. Ten datalogging stations were installed in March of 2008, with an additional ten stations installed in March of 2009. HOBO Smart Temp (S-TMB-M002) temperature sensors and EC-5 (S-SMC-M005) moisture sensors were connected to HOBO Micro Stations (H21-002) at each site (On-set Computer Corp., Bourne, MA, USA). Additionally, at 10 of the 20 sites, tipping bucket rain gauges (RG3-M) were deployed (On-set Computer Corp., Bourne, MA, USA).

At sites with a tipping bucket rain gauge, the following data were recorded: soil temperature at 10, 30, and 50 cm; soil moisture at 10 cm; surface air temperature; and precipitation. At sites without a tipping bucket rain gauge, the following data were recorded: soil temperature at 10 and 50 cm; soil moisture at 10 cm; and surface air temperature. Data is downloaded from the Micro Stations every two months via laptop computer using HOBOware Pro Software Version 2.3.0 (On-set Computer Corp., Bourne, MA, USA). Table 1 shows the station configuration.

For this study, GDDs were run from approximately day of year (DOY) 110 to 199 to use available data from twenty datalogging stations to evaluate the mid-pollination GDDs of corn cultivars available from DeKalb®. The Baskerville-Emin (BE) and averaging method (AM) were calculated using 24 h temperature values collected at each station (BE-Full and AM-Full) and then recalculated using only the minimum and maximum values for each day (BE-M/M and AM-M/M), giving four different values; (1) BE-Full, (2) BE-M/M, (3) AM-Full, (4) AM-M/M. Baskerville-Emin was calculated using Eq. [1a] for 24 h data and Eq. [1b] for the minimum and maximum of each day. To calculate BE, Eqs. [1c1], [1c2], and[1c3] must be evaluated and the values placed in Eqs. [1a] and [1b] (Baskerville and Emin, 1969). The AM was calculated by Eq. [2] (Arnold, 1960).

$$\text{BE-Full} = \{[W * \text{Cos}(A1)] - [(BT - AVG_F) * ((3.14/2) - A1)]\}/3.14 \qquad [1a]$$

$$BE\text{-}M/M = \{[W * Cos(A2)] – [(BT – AVG_{MM}) * ((3.14/2) – A2)]\}/3.14 \quad [1b]$$
$$A1 = Arcsine\ [(BT – AVG_F)/W] \quad [1c1]$$
$$A2=Arcsine\ [(BT – AVG_{MM})/W] \quad [1c2]$$
$$W = (MT – BT)/2 \quad [1d]$$
$$AMGDD = (MT – BT)/2 \quad [2]$$

Where AVG_F = the average temperature using the full days worth of temperature readings, AVG_{MM} = the average temperature using the minimum and maximum for the day, BT= base temperature, and MT= maximum temperature. The lower threshold was set at 10^oC, and the upper threshold was set at 30^oC, in case either the BT or MT was below or above, respectively. Outside of this temperature range, crop growth is limited.

Table 1

Station configuration in the Transylvanian Plain, Romania

Station number	Station name	Latitude	Elevation, m	Rain gauge
1	Balda (MS)	46.717002	360	No
2	Triteni (CJ)	46.59116	342	No
3	Ludus (MS)	46.497812	293	Yes
4	Band (MS)	46.584881	318	No
5	Jucu (CJ)	46.868676	325	Yes
6	Craiesti (MS)	46.758798	375	No
7	Sillivasu de Campie (BN)	46.781705	463	Yes
8	Dipsa (BN)	46.966299	356	Yes
9	Taga (CJ)	46.975769	316	No
10	Caianu (CJ)	46.790873	469	Yes
11	Cojocna (CJ)	46.748059	604	Yes
12	Unguras (CJ)	47.120853	318	Yes
13	Branistea (BN)	47.17046	291	Yes
14	Voiniceni (MS)	46.60518	377	Yes
15	Zau de Campie (MS)	46.61924	350	Yes
16	Sic (CJ)	46.92737	397	No
17	Nuseni (BN)	47.09947	324	No
18	Matei (BN)	46.984869	352	No
19	Zoreni (BN)	46.893457	487	No
20	Filpisu Mare (MS)	46.746178	410	No

MS = Mureş county; CJ = Cluj county; BN = Bistrița-Năsăud county

In 2009, temperature values were recorded at twenty datalogging stations by two different sensors. Ten stations without rain gauges (rain-) recorded air temperature using a 12-Bit Temperature Smart Sensor, while the other 10 (rain+) have a HOBO® Data Logging Rain Gauge (Onset Computer Corporation, Bourne, MA, USA). At the rain+ stations, temperature was recorded once every hour, while at the rain- stations, temperature was read every 2 min and a 10 min average was recorded. Both temperature sensors are within .5 m of the surface, which removes errors that could occur due to higher elevated air temperatures not accurately describing the vegetative microclimates (Roltsch et al., 1999). The temperature data was processed in Microsoft Access 2007 to produce the minimum, maximum, and average temperature for 110-199 DOY. The temperature values were then moved to Microsoft Excel 2007 to calculate the GDDs, using the above equations.

The accumulated growing degree days (AGDDs) of the four methods were analyzed to find the approximate day of tasseling based on a 694 AGDDs tassel date. The data was analyzed in SAS software (SAS Institute, 2008) using the LSD test to identify any differences between sites located across the TP. Finally, the data was georeferenced to station locations in ArcMap 9.2 (ESRI, Redlands, CA, USA) to create spline interpolation maps showing the GDD trend across the TP.

RESULTS AND DISCUSSIONS

Calculation of soil temperature regime according to the Soil Survey Staff (2006) consists of averaging soil temperatures at 50 cm between summer (June, July, and August) and winter (December, January, and February). The Soil Survey Staff (2006) defines mesic soil temperature as a "mean annual soil temperature that is >8°C, but <15°C where the difference between mean summer and mean winter soil temperatures is more than 6°C at 50 cm or at a densic, lithic, or paralithic contact, whichever is shallower." Year 1 data from sites 1-10 show that all sites have a mean annual soil temperature of ~10°C at 50 cm with more than 6°C variation between summer and winter. Thus, it appears as though mesic is the appropriate soil temperature regime for soils of the TP.

The TP has shown some growing season variability from initial GDDs data. Table 2 shows the LSD results for the DOY that 694 AGDDs were reached at 16 sites. Three sites failed to reach 694 AGDDs by 199 DOY; the last day of data currently available. Site 3 had no air temperature data due to datalogger error.

Table 2

Least significant difference test of the day of year each site reached 694 accumulated growing degree days, Transylvanian Plain, Romania (Haggard et al., 2010)

Site	Mean†
1	189.25
2	189.5
4	184.5
5	188.0
6	180.5
7	190.0
8	190.75
9	183.75
10	189.75
11	187.5
12	188.5
13	184.5
14	190.75
15	184.5
17	185.75
20	181
†LSD = 1.966	

It was found that 694 AGGD were reached at 177 DOY while some sites had not reached the AGDD needed by 199 DOY. As such, sites 6 and 20 would tassel an entire month sooner than sites 8 and 14 on the plain, even with the same planting date. A slice was performed in ArcMap 9.2 (ESRI, 2006) with the same data that was evaluated in SAS using LSD, and split into 6 equal intervals (Fig. 1).

The DOY when each site reached 694 AGDDs for BE-F and AM-F was interpolated using spline and then contours were made using the spline map outputs (Fig. 2 and 3).

Table 3 shows some of the hybrids available from DeKalb® that would be suitable for the TP. The sites that accumulate GDDs faster were placed with hybrids that require more AGDDs to tassel.

Growing degree days could be a very useful resource for farmers in the TP. This study was not intended to definitively determine the AGDDs within the plain, but to serve as a guideline for further research. The BE-Full and AM-Full are thought to be more accurate, since their average is making use of the full dataset of temperature. However, it is more common to see GDDs that have been calculated using minimum and maximum temperatures, due to the availability of data. The LSD test confirmed what the interpolated maps show: Craiesti and Filpisu Mare are the warmest areas based on 2009 summer data, allowing for an earlier planting date and harvest prior to the first killing frost. The ability to increase productivity throughout the plain, would not only be beneficial for the farmers, but also for Romania. By choosing the best hybrid for a certain area, yields could be increased by 620 to 3100 kg ha^{-1} (Roth, 1992). The corn hybrids that were selected (Table 3) were based on GDDs, drydown, drought tolerance, and insect resistance. Irrigation is practically nonexistent in the TP, making drought tolerance a key characteristic. Drydown is an important factor when evaluating corn hybrids in Romania because it becomes too expensive to use drying systems (Purcell, 2005). Roth (1992) suggested using a 10-day range in the relative maturity when comparing hybrids to account for any stress caused by weather events. Such stressful weather events are possible since August has a tendency to be very dry in Romania, limiting summer crop development before the harvest (Roth, 1992). In 2010, field truthing will be conducted in the TP to ascertain the most accurate method of calculating GDDs for the TP.

Corn will be monitored at chosen stations to determine the most accurate GDD calculation based on tasseling and maturity. The fall temperatures will be used to determine the first killing frost across the TP.

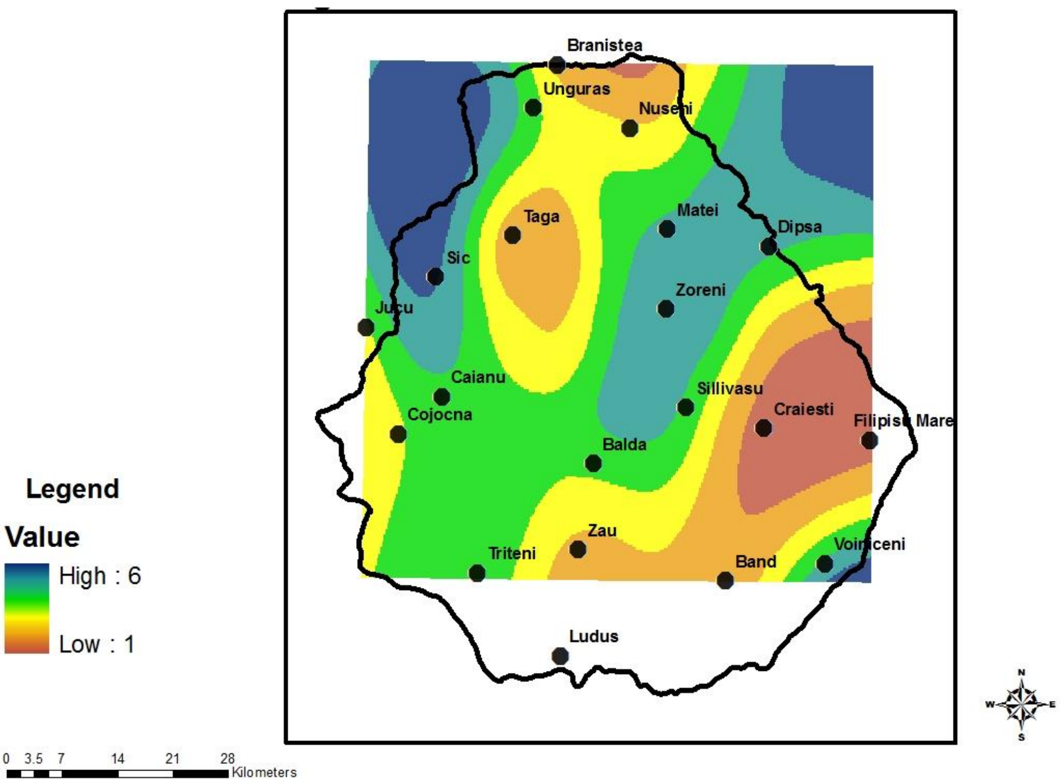

Fig. 1. Sliced spline interpolation of AGDDs using 6 equal interval class breaks, Transylvanian Plain, Romania (Haggard et al., 2010)

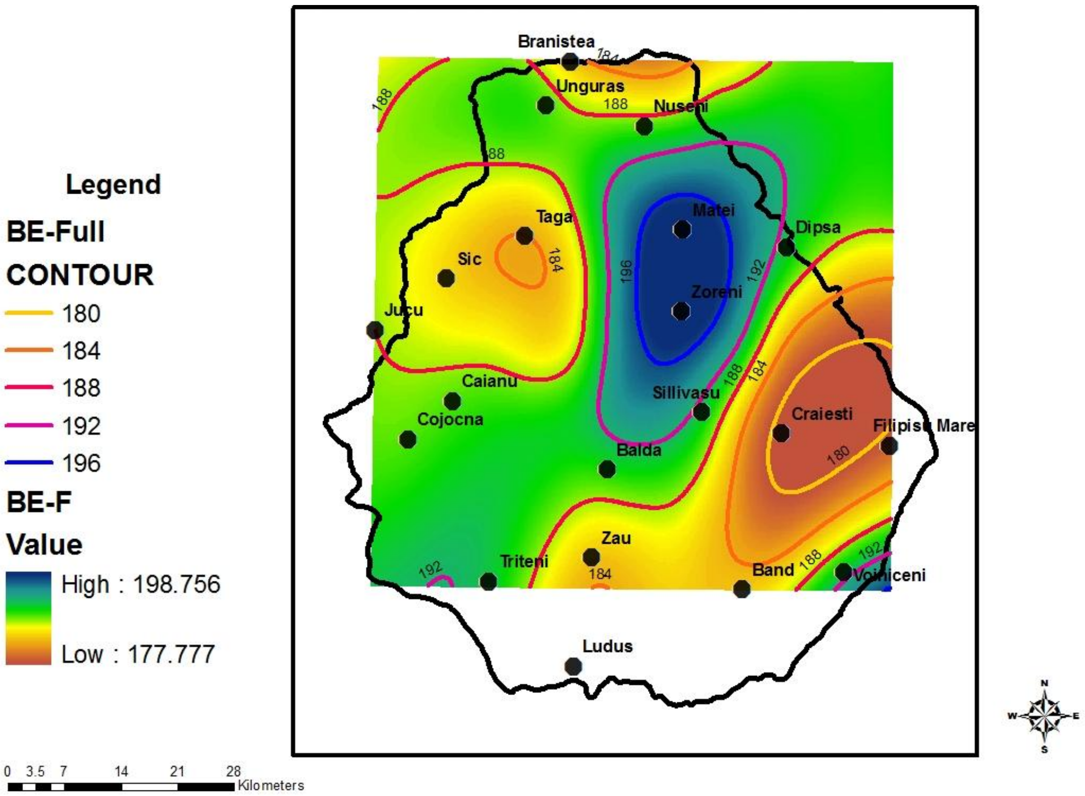

Fig. 2. Spline interpolation of DOY that 694 AGDDs were reached using the BE-Full method, in the Transylvanian Plain, Romania (Haggard et al., 2010)

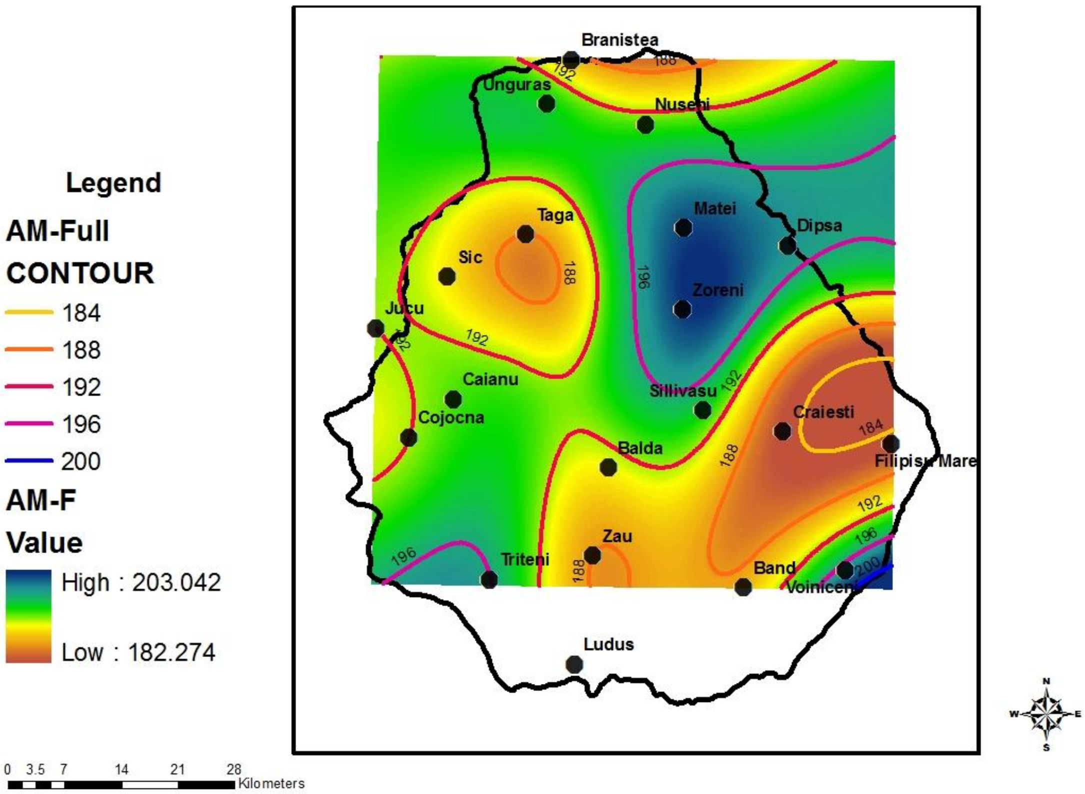

Fig. 3. Spline interpolation of DOY that 694 AGDDs were reached using the AM-Full method, in the Transylvanian Plain, Romania (Haggard et al., 2010)

Table 3

Corn hybrid selection for sites based on drydown and drought tolerance (Haggard et al., 2010)

DeKalb® Hybrid Brand	Site	Drydown†‡	AGDDs- till Tasseling‡	Relative Maturity‡	Drought Tolerance†‡
DKC52-45	6, 20, 4, 9, 13, 15	1	713	102	3
DKC52-59		1	711	102	2
DKC48-37	1, 2, 5, 7, 10, 11, 12, 17	2	679	98	3
DKC42-72	8, 14, 16, 18, 19	2	672	92	2

† Scale: 1-2 = Excellent, 3-4 = Very Good, 5-6 = Good, 7-8 = Fair, 9 = Poor
‡Obtained from 2010 Seed Resource Guide (Monsanto Co., 2009).

CONCLUSIONS

Soil temperatures of the Transylvanian Plain, Romania were evaluated via twenty datalogging stations. Preliminary results from year 2 of the study indicate that the soil temperature regime will be mesic.

Growing degree days are a valuable resource in Romania with the ability to increase crop productivity. Significant differences in air temperatures exist across the TP. These differences need to be acknowledged when choosing the planting date to utilize the full growing season. DeKalb® hybrids were selected based on when 694 AGDDs were obtained at the stations and characteristics that are necessary for corn grown in the TP. Differences in air temperature across the TP are clearly evident in interpolation maps produced in ArcGIS 9.2 for 2009 data. Corn grown in the TP can be more productive with an increased knowledge of GDDs. Romania is known for many traditions, including the practice of farming the same way for generations. However, adoption of contemporary hybrids and agronomic practices holds the potential for increasing productivity on the TP.

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COMPORTAREA CERNOZIOMULUI CAMBIC DIN ZONA COLINARA SLĂNIC-BUZĂU LA ACȚIUNEA FACTORILOR ANTROPICI.

RESEARCH REGARDING THE INFLUENCE OF ANTHROPOGENIC FACTORS ON CAMBIC CHERNOZEMS IN THE SLĂNIC- BUZĂU HILLY AREA

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Cuvinte cheie: cernoyiom cambic, bazin hidrografic, eroziune, conservarea solului
Key words: cambic chernozem, erosion, hzdrographic basin, improvement

SUMMARY

Bazinul hidrografic Slănic de Buzău, unde s-au efectuat studiile, se încadrează în zona Subcarpaților de Curbură, cu dealuri şi depresiuni corespunzătoare morfostructurilor mio-pliocene şi levantin-cuaternare, cu depozite predominant sedimentare, cu climat continental şi cu o bogată varietate de specii de plante. Dintre procesele naturale dăunătoare societății umane, eroziunea şi implicit degradarea solului ca urmare a intervenției antropice, este cea mai complexă, tocmai prin impactul ei, prin areale şi pagube.

Învelişul de sol format sub influența factorilor pedogenetici amintiți mai sus, este alcătuit preponderent din cernisoluri, cel mai răspândit fiind cernoziomul cambic.

Am ales pentru studiu 8 profile de cernoziom cambic, situate în 4 subbazine afluente Slănicului (Valea Tătarului, Valea Mereului, Valea Băieşti şi Valea Balaurului), care au suferit diferite intervenții antropice. La aceste profile au fost analizate, prin comparație, înşuşiri fizice, chimice şi morfologice.

Datele obținute servesc la evaluarea impactului factorului antropic asupra evoluției cernoziomului cambic din zona colinară a județului Buzău.

Slănic of Buzău river basin, where the studies have been carried out is located within the Curbure Sub-Carpathians, with hills and depressions corresponding to the Myo-Pliocene and Levantine Quaternary morphostructures, with predominantly sedimentary deposits, continental climate and a rich variety of plant species.

Among the natural processes harmful to human society, erosion and implicitly soil degradation as a result of the human intervention, is the most complex, just by its impact through areas and damages.

The soil cover, formed under the influence of pedogenetic factors above mentioned, includes predominantly chernisols, the most widespread being cambic chernozem.

In order to carry out the study, we selected 8 profiles of cambic chernozems, located in four sub-watersheds (Valea Tătarului, Valea Mereului, Valea Băieşti and Valea Balaurului) tributary to Slănic river that have suffered various human interventions. For these profiles the physical, chemical and morphological characteristics have been analyzed by comparison. Obtained data serve to assess the impact of anthropogenic factor on the evolution of cambic chernozem in the hilly area of the Buzău county.

1. MATERIAL AND METHOD

The major influence on the coating of soil in hilly area of Buzau county have a process of erosion and landslides. Gradual erosion of surface material determinated washing, part of the genetic horizons are removed, in the worst case prentice materials are updated.

Complexity of pedogenesis and soil degradation in the hills lining Slanic-Buzau, were the subject of a series of studies and research based projects that have complex, integrated river basin planning tributary (Fig. 1). Ameliorative works were executed on dual-action coating of soil degradation processes have reduced and changed in different soil characteristics.

Fig.1 Hidrograpfic basin of Slănic-Buzău area

This paper aims to present the influence of human intervention through the application of ameliorative works on cambic chernozem four tributary watersheds Slanicului: Tătarului Valley, Mereului Valley, Băieşti Valey and Balaurului Valley. The perimeters of these basins have been carried out successive soil mapping before and after execution to capture changes in physical, chemical and morphological characteristics of soils.

In Tatarului Valley, basin were executable bench terraces (Fig. 2) the use land. On the right side of this river basin, where the soil is chernozem cambic were two sections in the deshi agroterasata: PT3 and PT4. The sequence of genetic horizons and their dimensions are shown in Figure 3.

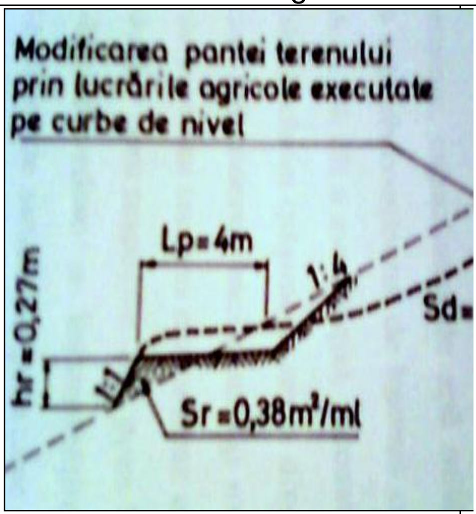

Fig.2 Detaliile de executie a teraselor bancheta din Valea Tatarului

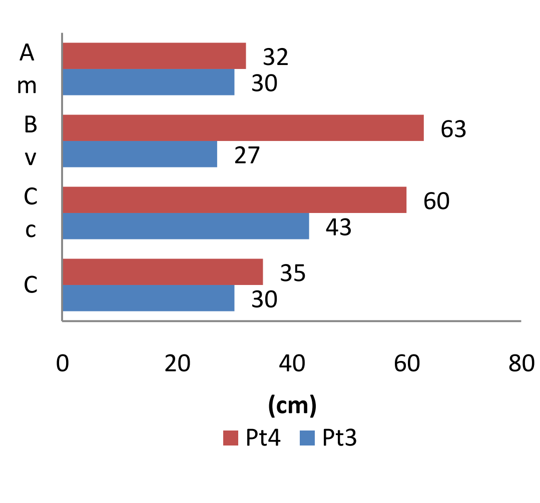

Fig.3 Alcatuirea profilelor de cernoziom cambic (Pt3 si Pt4) din Valea Tatarului

The Mereului Valley, basin have chosen for presentation, a profile on the right side cambic mold equipped with technological paths. Erosion of the job execution details are shown in Figure 4, and studied composition profile in Figure 5.

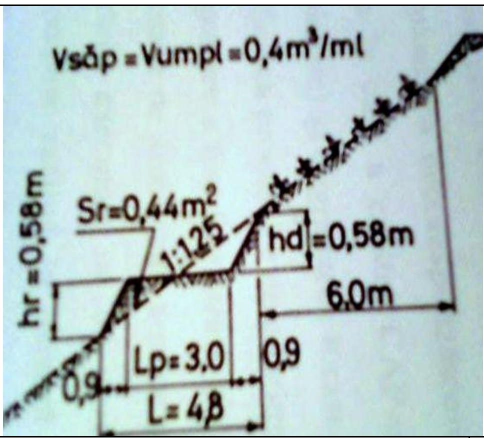

Fig.4 Detaliile de executie a aleilor tehnologice din Valea Mereului

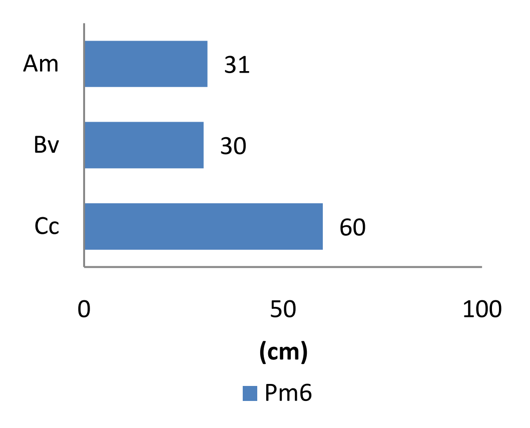

Fig.5 Alcatuirea profilului de cernoziom cambic (Pm6) din Valea Mereului

The River Valley basin have been applied Baiesti agroameliorative protection measures such as erosion of tillage system on the direction of the contour, grassed strip crops, and modeling of green. Improper operation of facilities resulted in the disappearance of some of them (cover crops). On the right side of the river basin area of tillage system on the contour direction (fig. 6), opened three sections, we have chosen for the presentation of two sections of mold cambic (Pb3 and Pb5), the morphological whole which is shown in Figure 7.

Fig.6 Versantul drept al bazinului hidrografic Valea Baiesti

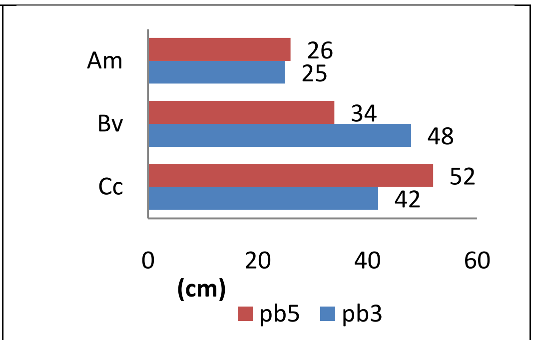

Fig.7 Alcatuirea profilelor de cernoziom cambic (Pb3 si Pb5) din Valea Baesti

The Balaurului Valley basin for the presentation we chose two sections of mold cambic (Pbl5 and Pbl7) located on the left side of the basin, decorated with classical terraces. Ameliorative work of the technical elements and composite profiles are presented in Figures 8 and 9.

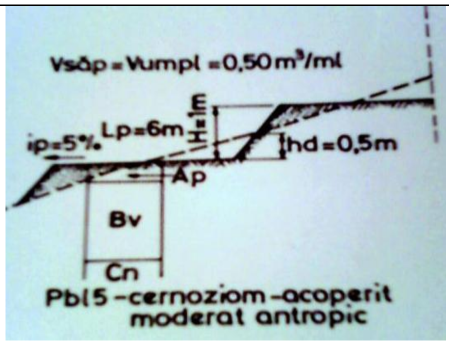

Fig.8 Detaliile de executie a teraselor din Valea Balaurului

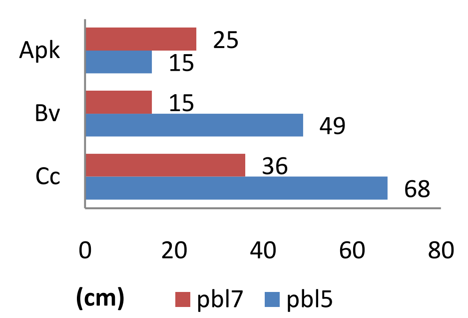

Fig.9 Alcatuirea profilelor de cernoziom cambic (Pbl5 si Pb7) din Valea Balaurului

Physico-chemical characteristics of the soils studied pursued, the 0-40cm depth are clay content (<0.002 mm) into humus, the phosphorus in field water capacity and water capacity useful. All laboratory tests and interpretation of results were done in accordance with the "development methodology soil studies" - ICPA 1987.

2. RESEARCH RESULTS

HIDROGRAPHYC BASIN TATARULUI VALEY

Influence of anthropogenic intervention by agroterasare on cambic chernozem located on the right side of the river basin is analyzed by comparing physical and chemical properties of soil present, with those previous arrangement. Thus were chosen for study soil, three profiles: PT3-located in upper third of the slope, PT4-located in the middle third and PT8-ahead after planning and development.

The data presented in Figure 10 indicates that: soil texture is clayey, the largest percentage of clay is found in the first 40 cm of profile PT3, humus content is low, there is a rise of around 0.3% in the profiles after planning, mobile phosphorus content is low profile before fitting and the PT3 and PT4 middle after fitting, field capacity remains very high after development, the ability is useful to maintain high water.

By agroterasare reduce loss of clay on top of the profile, improves mobile phosphorus content and ability to retain water and useful field

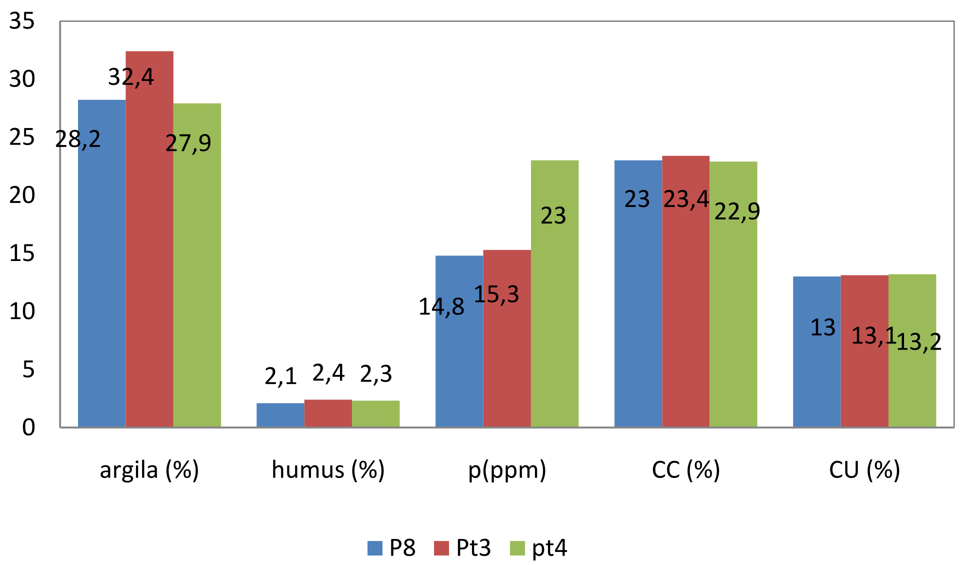

Fig.10 Some physico-chemical attributes of chernozem Cambic analyzed on 0-40 cm depth, the profiles PT3, PT4 and P8 Tatarului Valley

HIDROGRAPHYC BASIN MEREULUI VALEY

Technological paths advantage is that very little occurs on the soil profile and are effective in terms of erosion. Data from PMA analyzed by fitting the profile, were compared with those of the P4 profile open before fitting.

The data analysis presented in Figure 11 indicates that: soil texture is loamy, humus content increased by 0.62% but still remains small, mobile fosfor content increases by about 14 ppm after development, the capacity field of water and is useful medium and maintained at values after fitting.

Technological paths does not change the soil profile, preserving the amount of water needed by plants and lead to a nursery in humus content.

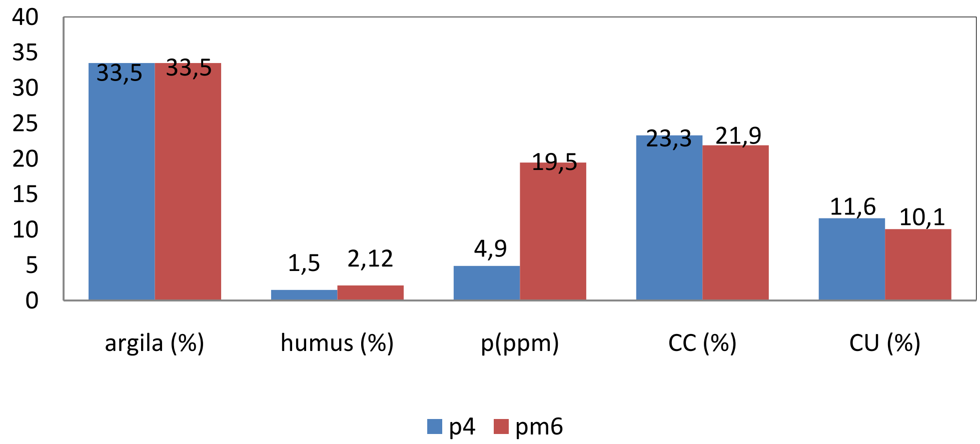

Fig.11 Some physico-chemical attributes of chernozem cambic analyzed on 0-40 cm depth, the profiles P6 and P4, Mereului Valley

HIDROGRAPHYC BASIN BĂIEŞTI VALEY

In the area where agricultural work was performed on the general direction of the contour profiles were chosen two recent projects and Pb5 Pb3. The results were compared with those obtained from profile P1, the soil survey above.

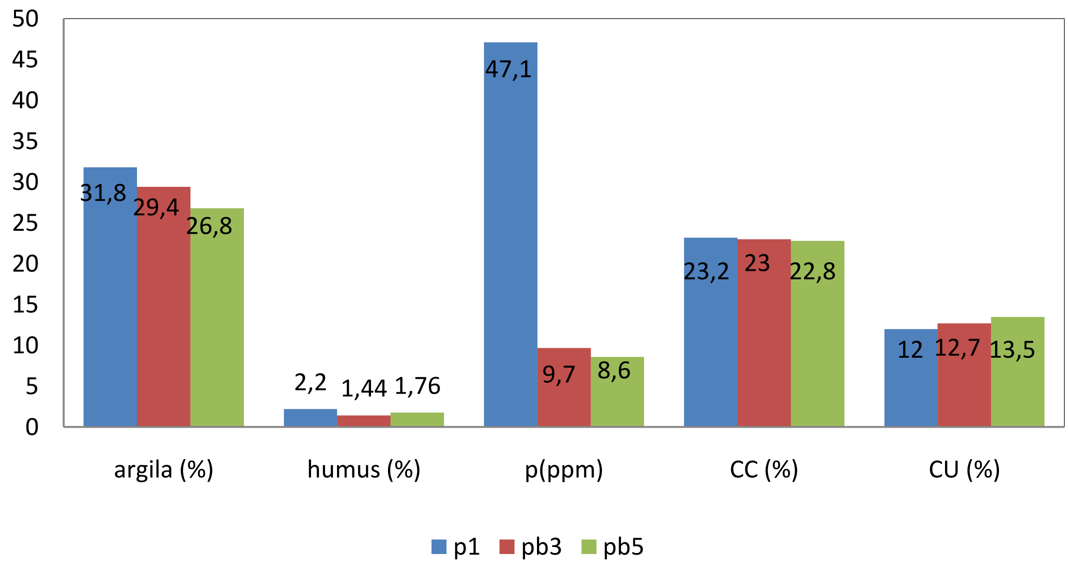

Fig.12 Some physico-chemical attributes of chernozem cambic analyzed on 0-40 cm depth, the profiles P3, P5 and P1, Baiesti Valley

The data presented in figure 12 indicates that: soil texture is clayey, there is a decrease in clay content 2.4% and 5% Pb3 profile to Pb5 profile compared to the original profile, humus content is low and record whereas, a decrease of 0.5% to 0.75%, mobile phosphorus content decreases by about 38 ppm compared to the profiles of our recent initial one; capacity field of water and useful medium should remain.

Ground work on the general direction of the contour and texture preserving useful in soil water. Chemical characteristics of soil conservation requires additional ameliorative works.

HIDROGRAPHYC BASIN BALAURULUI VALEY

Terracing slopes eroded involves a major intervention on the soil profile. We choose presentation two profiles located on the left side of the basin, terrace PBL Platform 7 (fig. 6) and slope 5 PBL.

The data analysis presented in Figure 13 indicates that: the texture is different, the percentage of clay is higher in July due to PBL bring cambic horizon near the surface; capacity field is slightly higher in PBL 7datorated clay content in capacity useful exchange of water is decreasing humus content decreases by about 1%, mobile phosphorus content is maintained at values close.

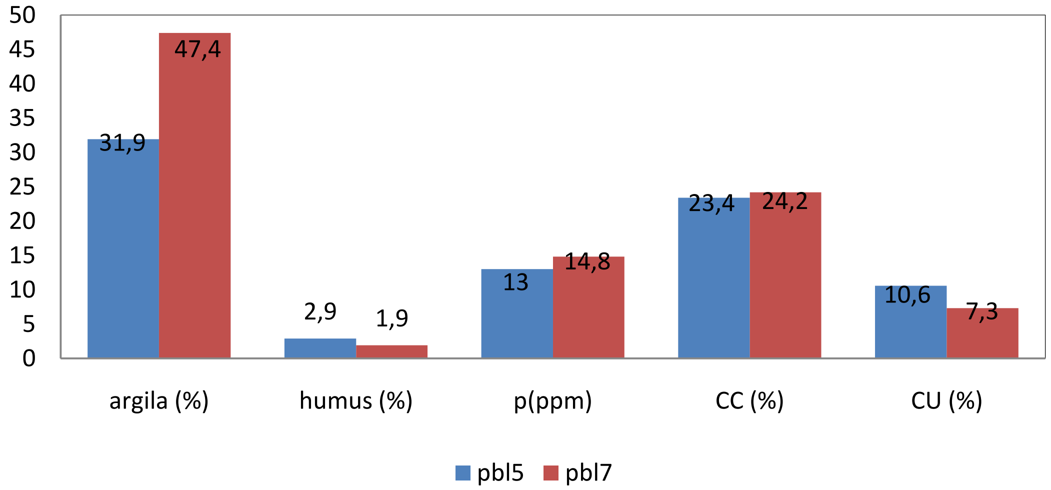

Fig.13 Some physico-chemical attributes of chernozem cambic analyzed the depth of 0-40 cm, and Pbl7 Pbl5 profiles, Balaurului Valley

3. CONCLUSIONS

1. By agroterasare reduced loss of clay on top of the profile, improves mobile phosphorus content and ability to retain water and useful field.
2. Alleys advances were not amended the soil profile, preserving the amount of water needed by plants and lead to a nursery in humus content.
3. Ground work on the general direction of the contour and texture preserving useful in soil water. Chemical characteristics of soil conservation requires additional ameliorative works.
4. Terracing slopes eroded involves a major intervention on the soil profile.
5. By terracing most characteristics of the soil is amended, it requires ameliorative work of recovery.

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STUDIU CU PRIVIRE LA CARACTERIZAREA ÎNVELIŞULUI DE SOL DIN ISLAZUL COMUNEI BOLDUR, JUDEȚUL TIMIŞ

STUDY ON CHARACTERIZATION OF ISLAZ VILLAGE SOIL COVER PINS, TIMIS COUNTY

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U.S.A.M.V.B. Timişoara

Key words: **soils, pastures, study aluviosol, mapping, common Boldur**

REZUMAT

Teritoriul studiat, face parte din marea unitate fizico-geografică „Banato-Crişană” care se desfăşoară în trepte de relief intermediare între Carpații Occidentali şi marginea marii depresiuni Panonice.

Diferitele tipuri şi grupe de tipuri genetice de soluri existente azi în cadrul perimetrului cercetat sunt rezultatul acțiunilor în timp şi spațiu a complexului de factori pedogenetici (roca subiacentă, relief, climă, vegetație, hidrografie, hidrologie, faună) la care se adaugă influențele determinate de acțiunile omului începând cu lucrările de desecare şi drenaj până la agricultura intensivă de astăzi.

În lucrare va fi descris cadrul natural de formare şi evoluție a solurilor din perimetrul cercetat, factorii de pedogeneză care intervin, factorii limitativi ai fertilității şi încadrarea principalelor soluri pe clase, tipuri şi subtipuri.

ABSTRACT

Studied area is part of the great physical and geographical unity "Banato-Crisana" taking place in the relief stage intermediate between the Western Carpathians and Pannonian depressions the sea.

Different types and groups of genetic soil types existing today are the result of the actions investigated the perimeter in time and space complex pedogenetical factors (underlying rock, terrain, climate, vegetation, hydrography, hydrology) plus influences caused by human actions from drainage and drainage works to intensive agriculture today.

The paper will describe the natural formation and evolution of soils from the area studied, pedogenesis factors involved, the limiting factors of soil fertility and classification of the main classes, types and subtypes.

RESEARCH METHODS AND MATERIAL

This paper aims to present a picture of the ground cover of pasture Boldur village, Timis County, productive potential, the limiting factors of fertility and the main problems posed by the exploitation of soil resources in the area studied. Data interpretation and characterization of the natural limiting factors analysis of fertility and agricultural land evaluation were conducted in accordance with drafting Soil" " soil studies (Vol. I, II, III) and the Romanian system " "methodology Taxonomy developed by ICPA Bucharest in 2003.

RESULTS AND DISCUSSION

Natural environment of the area studied. In terms of geomorphology, searched area is part of the great physical and geographical unity "Banato-Cri" taking place in the relief stage intermediate between the Western Carpathians and Pannonian depressions the sea. Under this sector which is investigated area meet the following forms of relief: hill, terrace, plain ramble, meadow.

Forming the edges of large tectonic depressions (the Tisza), unequal immersed in the different compartments were performed independently in diving action, the investigated area is composed of parts with different heights and structures.

The hilly area and border formations are closely related genetic evolution Pannonian Depression, especially in the early stages.

Suitable geological formations mentioned in the land identified and demarcated area investigated and generally found the following major groups of parent materials: clays, clay and fluvial deposits.

Thus, in some clays deposits represented by more or less carbonaceous, clay, clay marnoas and less parental materials were sandy clays that were formed and evolved soils identified in the hilly area and terraces.

To characterize the climate of the perimeter were studied using meteorological data recorded at the meteorological stations Lugoj and Timisoara during 1871-1958, 1958-1985, 1987-1996, 1997-2007.

In terms of rainfall termico studied area has a temperate continental climate. Annual aridity index "of Martonne" is 33.3 (exoreic regime), while annual hydroclimatic index value of 100 was obtained, the characteristic for a balanced hydrological balance.

Hydrography is quite well represented by the river sub-basins of the rivers Cernobora, Pike and its main tributaries Timişana Timişul it receives from the left side in the perimeter studied.

Pedofreatice water levels, is directly dependent on the types of relief and microrelief, the nature and depth horizons hidrogeopedologice, season, amount of precipitation fallen and existing hydro.

Phytogenetic legally belongs to the province of Central Europe geobotany strongly influenced by neighboring southern province geobotany Europe.

Woody vegetation occurs either as isolated patches or as a continuation of forests that are expanding into the south-west and north-east perimeter investigated, largely forest that covered the entire area. However, currently, only those areas where terrain or excess soil moisture in culture have allowed for such land, natural vegetation meet.

Depending on their structure, dominated forests that meet the sky and flasks species as: *Quercus cerris, Q. Petraea, Q. Robur, Q. Pubescens. In association with them is that the most common species: Carpinus betulus, Fraxinus excelsior, Fraxinus angustifolia, Acer campestre, Ulmus Procera, Tilia tomentosa, Cornus mas, Rosa canina, Prunus spinosa, Alnus glutinosa, Corylus avellana*.

Natural grasslands are diverse in terms of flora in each general meeting in mesophilic and mezoxerofile and groundwater in areas closer to the surface and xerophyte mesophilic groups. Meadow of the plain are reduced in size, being composed of species such as: *Lolium perennial valesiaca Festuca, Agrostis tenuis, Dactylis glomerata, Alopecurus pratensis, Lotus corniculatus, Lotus tenuis, Trifolium repens, Medicago lupulina.*

The common species as cultivated pastures: p*erennial Lolium, Dactylis glomerata, Medicago sativa, Trifolium pratense*.

Of hilly grasslands are composed of species that*: pseudovina Festuca, Agrostis tenuis, Poa pratensis, Festuca pratensis, Alopecurus pratensis, Bromus spp, Cynodon dactylon, Lotus corniculatus, Medicago falcata, Trifolium repens, Lotus tenuis, Andropogon ischaemum.*

On the sunny slopes of the common species: Agropyron repens, Rubus caesius, Stipa spp

Soil fauna is represented by various insects, worms and rodents and some digging. Their action refers to the ingestion of mineral and organic substances, mixing and transormarea their deposit dung and organic waste that, the formation of cavities and channels transporting material from one place to another, etc. zoostructurare.

Pedogenesis processes

Different types and groups of genetic soil types existing today are the result of actions in time and space complex pedogenetical factors (underlying rock, terrain, climate, vegetation, hydrography, hydrology, fauna) plus influences caused by human actions from drainage and drainage works to intensive agriculture today.

Soils formed in these conditions are a relatively recent stage of soil formation due to the fact that very recently came under water. The process of soil formation is relatively recent, and their direction of evolution is dictated mostly by the microrelief forms on which they occupy and thus the profile of groundwater level and nature of parent rocks. A particular case is the soils formed, usually by type depression, but on clay rocks represented parental gonflable. These clays in wet periods of swells, increasing its volume more, and during periods of drought and diminishing it gives rise to large polygonal cracks. The interaction of two phenomena in the soil sliding faces are formed. This phenomenon is known as vertisolurilor vertisolaj and specific class.

THE MAIN SOILS OF THE PERIMETER OF PINS, TIMIȘ COUNTY

According to the Romanian System of Soil Taxonomy (SRTS-2003) were investigated in the area identified three classes of soils, three types and 10 subtypes (Table 1).

Table 1.

Classes, types and subtypes of soils in the village pasture

Soil classes	soil type	earth subtype	surface (ha)	%
Protisoluri	**Aluviosol**	**Tipic**	**420**	**50**
		Gleic		
		Vertic		
		Coluvic		
Luvisoluri	**Preluvosol**	**Molic**	**294**	**35**
		Stagnic		
		Vertic		
Pelisoluri	**Vertosol**	**Tipic**	**126**	**15**
		Gleic		
		Stagnic		
TOTAL			**840**	**100**

1. Aluviosol gleyed, sandy clay, medium / medium sandy clay deposits on the river, still at Ohaba Forgaci

Ap - 0-16 cm, and sandy loam texture, brown, grainy structure, excessively porous, weakly compact, moist, gradual transition;

Ao - 16-28 cm-nisiposă loam texture, light brown, grainy structure, excessively porous, weakly compact, moist, gradual transition;

CG2 - 28-40 cm, and sandy loam texture, yellowish brown with purple spots rare, massive structure, weak compact, moist, gradual transition;

Cg3 - 40 - 65 cm, and sandy loam texture, yellowish brown, purple spots, massive structure, normally porous, weakly compact, moist, gradual transition;

IICg3 - 65 - 89 cm, and sandy loam texture, yellowish brown with purple spots, massive structure, normally porous, weakly compact, has bobovine, moist, gradual transition;

IIICg4, 89-124 cm, and sandy loam texture, yellow-rusty, slightly purple, massive, weakly compact, has bobovine, moist, gradual transition;

Table 2

Physical and chemical properties of gleyed aluviosol

Horizons	Ap	Ao	Cg_2	Cg_3	$IICg_3$	$IIICg_4$	Cg_5
Depth (cm)	0-16	16-28	28-40	40-65	65-89	89-124	124-170
Texture	SM	SM	SM	SM	SM	SM	SM
Density (g/cm3)	-	2,65	2,60	2,62	-	-	-
Aprentă Density (g/cm3)	-	1,17	-	1,32	-	-	-
COEFI.He. Wilting (%)	-	4,86	-	5,07	-	-	-
Field capacity (%)	-	17,88	-	17,77	-	-	-
pH (H_2O)	6,35	6,20	6,45	6,60	6,40	6,40	5,40
Humus (%)	1,73	1,11	0,62	0,43	-	-	-
Total N (%)	1,63	1,04	0,59	0,41	-	-	-
Mobile P (ppm)	6,3	5,7	7,5	8,6	12,3	24,2	29,4
Mobile K (ppm)	50	52	38	36	34	36	36
SB base amount me/100gsol	15,60	15,40	16,00	16,50	15,20	12,60	11,40
Grade V, base saturation (%)	84,32	83,15	84,97	86,72	85,20	82,95	69,13
Reserve of humus (0-50 cm	62 t/ha	-	-	-	-	-	-

2.Aluviosol limestone (AS ka) from Jabăr

Ao 0-34 cm, brown-gray (10YR 7 / 2), medium-run glome structure, weak, plastic, adhesive, Epher-vescență strongly silty;

AC 34-63 cm, yellowish brown (10YR 6 / 6), angu-lar polyhedral medium, silty, with strong effervescence;

C 63-90 cm, yellow (10YR 7 / 6), poorly structured, sandy loam with low adhesion.

Table 3

Physical and chemical properties of aluviosol calcaric

Horizons	Ao	Ao1	AC(Go)	CG	C
Depth (cm)	5-15	30-40	55-65	80-90	120-130
Texture	LL	LL	LL	SF	SF
Hygroscopic coefficient (CH %)	6,4	6,6	6,4	5,2	5,1
Wilting coefficient (CO %)	9,60	10,0	9,5	7,8	9,0
pH (H_2O)	8,10	7,95	-	-	-
Humus (%)	3,11	3,18	-	-	-
C : N	12	18	-	-	-
Total N (%)	0,174	0,118	-	-	-
Mobile P (ppm)	5,0	5,0	3,2	2	-
Mobile K (ppm)	320	350	250	200	-

3. Preluvosolul vertic-stagnant environment lutoargilos / argilolutos on medium-fine clays from gonflable Sinersig

Ap = 0-19 cm lutoargiloasă 3.5 in wet, disturbed≤textured medium brown with gray tint, chrome and values by the work of soil structure, strong wet-brittle, weak and poorly adhesive plastic, moderately cohesive dry, loose,.

Atp = 19-34 cm lutoargiloasă ≤textured medium brown color with a few gray 20% reduction and chromium levels 3.5 wet, structure and Tamping disturbed by soil tillage, wet is strongly brittle, plastic and adhesive, cohesive is moderately dry, contains rare roots.

A/Bw4 = 34-53 cm lutoargiloasă textured medium brown-gray color with rust color spots 40% reduction of mid polyhedral structure developed medium, hard, moderately compact, and frequent small pores, and contains rare thin roots.

Btyw5 = 53-71 cm argilolutoasă 50% reduction, with large well developed>texture, color brown marbled purple sphenoid structure, very plastic and adhesive, very tough, very compact, very small pores, hairline cracks, slip covers oblique

Btyw5 = 71-89 cm argilolutoasă 50% reduction, with large well developed>texture, mottled brown color purple sphenoid structure, very plastic, very adhesive, very tough, very compact, very small and frequent pores, hairline cracks, side-slip.

B/Cw4 = 89-120 cm lutoargiloasă medium texture, yellowish brown with rust colored spots 40% reduction, weak medium polyhedral structure, very plastic and very adhesive, hard, very compact, very small pores and frequent , is very weak effervescence points.

C = 120-220 cm, texture lutoargiloasă medium yellow color with spots of rust and reduction of 5-30%, very plastic and adhesive, hard, very compact, very small pores and frequency is weak effervescence.

Table 4

Physical and chemical properties of vertic preluvosolului

Horizons	Ap	Atp	A/Bw$_4$	Btyw$_5$	Btyw$_5$	B/Cw$_4$	C
Depth (cm)	0-19	19-34	34-53	53-71	71-89	89-120	120-190
TEXTURE	TT	TT	TT	AL	AL	TT	TT
Specific Density (g/cm3 D)	2,68	2,70	2,72	2,72	2,72		
Apparent Density (g/cm3 DA)	1,24	1,59	1,48	1,49	1,51		
Degree of compaction (% GT)	-5,5	19,0	11,0	13,7	15,5		
COEFI.He. wilting (CO%)	11,4	11,1	12,2	14,4	14,9		
Field capacity (CC%)	25,2	19,6	22,5	23,7	23,6		
Total capacity (CT%))	43,3	25,8	30,8	30,3	29,5		
pH (in H2O	5,45	5,78	6,33	6,89	7,09	7,43	7,75
Carbonate (CaCO3)						0,16	0,2
Humus (%)	3,26	2,31	1,64				
Humidity%	9,21	15,16	14,32	16,42	16,80	16,72	18,41

4.Vertosolul stagnated lutoargilos / argilolutos on the clay gonflable Boldur

Ap - 0-15 cm, clay-loam texture, brown polyhedral structure subangulară average, moderately developed, less porous, compact, moist, gradual transition;

AoW2 - 15-25 cm, clay-loam texture, brown-spotted purple, medium subangulară polyhedral structure, moderately developed, very small, porous, compact, moist, gradual transition;

A/ByW3 - 25-38 cm, clay-loamy texture, light brown with purple spots, polyhedral angular structure, medium well developed, very porous, very compact, moist, gradual transition;

BtyWs - 38 - 49 cm, silty-clay texture, yellowish brown, spotted purple, prismatic structure with sliding covers, very small porous compact, moist, gradual transition;

Bt2yW4 - 49 - 80 cm, silty-clay texture, yellowish brown, slightly purple, prismatic structure with sliding sides, small porous compact, moist, gradual transition;

Bt3yW5 - 80-115 cm, silty-clay texture, yellowish brown, purple, structure prism, with side-slip, foam bed, very compact, moist, gradual transition;

B/CyW5 - 115-140 cm-silty clay texture, yellowish, dirty purple brown with side sliding, very compact, moist, gradual transition;

CW4 - 140 - 160 cm, clay-loamy texture, dirty yellow, slightly bluish, solid, very compact and moist.

Table 5

Physical and chemical properties of Vertosolului stagnic

Horizons	Ap	AoW$_2$	A/By W$_3$	BtyW	Bt$_2$yW$_4$	Bt$_3$yW$_5$	B/CyWs
Depth (cm)	0-15	15-25	25-38	38-49	49-80	80-115	115-140
Texture	LA	LA	AL	AL	AL	AL	AL
Aprentă Density (g/cm3)	-	1,50	1,51	1,50	1,44	-	-
Total Porosity (%)	-	44	44	44	47	-	-
Degree of compaction	-	-	-	-	-	-	-
Humus (%)	-	12,05	15,89	15,75	16,32	-	-
pH H20	6,30	6,40	6,30	6,20	6,30	6,90	7,35
C:N	2,24	2,26	1,13	-	-	-	-
CaCO3	-	-	-	-	-	-	0,10
P (ppm) height	40,5	23,1	-	-	-	-	-
K (ppm) in AL	126,2	109,6	-	-	-	-	-
Grade V, base saturation (%	79,45	80,59	80,59	81,69	82,63	85,81	-

CONCLUSIONS

In the work conducted on the territory of pins, Timis, was intended to provide a fund of information on climatic resources and the existing soil cover on the pasture land administration,based on the documentation made soil under contract funded by local authorities.

The first part is presented explaining the natural phenomena and processes taking place in the ground and how these phenomena and processes can be influenced by man praticolă production activity. Thus, the above data, the municipality Boldur Timis county in terms of the natural environment following conclusions:

- In terms of geomorphology, searched area is part of the great physical and geographical unity "Banato-Cri" taking place between the intermediate relief stage and the edge of the Western Carpathian Pannonian Depression;
- The land identified and demarcated the area studied were generally found in the following major groups of parent materials: clays, clay and fluvial deposits;
- In terms of rainfall termico studied area has a temperate continental climate. Annual aridity index "of Martonne" is 33.3 (exoreic regime), while annual hydroclimatic index value of 100 was obtained, the characteristic for a balanced hydrological balance;
- Kopen according to the classification of climates, the climate of the village is included in the formula cfbx Boldur;
- In the investigated area is part of south-western river systems, Timis basin, and only slightly Bega River basin;
- According to the Romanian System of Soil Taxonomy (SRTS-2003) were investigated in the area identified three classes of soils (Protisoluri, Luvisols and Pelisoluri) 3 types (aluviosol, Preluvosol, Vetosol) and 10 subtypes.
- Various types and groups of genetic soil types existing today are the result of the actions investigated the perimeter in time and space complex pedogenetical factors (underlying rock, terrain, climate, vegetation, hydrography, hydrology, fauna), plus the influences caused by human actions from drainage and drainage works to intensive agriculture today.

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ASPECTE ALE EXPLOATĂRII INDIVIDUALE A PARCELELOR DE TEREN PE SUPRAFEŢELE AMENAJATE CU LUCRĂRI DE DESECARE-DRENAJ, ÎN BAZINUL HIDROGRAFIC AL RÂULUI MOLDOVA

ASPECTS OF INDIVIDUAL PARCEL WORKING ON MANAGED SURFACES WITH DRAINAGE AND DESICCATION WORKS IN THE HYDROGRAPHIC BASIN OF MOLDOVA RIVER

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Key words: excess humidity, underground drainage, individual land plots, ridge-plough land development

REZUMAT

Pentru valorificarea capacităţii de producţie a terenurilor agricole cu exces de umiditate din bazinul hidrografic al râului Moldova, judeţul Suceava, s-au executat în decursul timpului lucrări de desecare-drenaj pe o suprafaţă de 8761 ha, din care 3059 ha cu lucrări de drenaj subteran, amenajările fiind proiectate în condiţiile exploatării terenurilor agricole pe sectoare de desecare.

Execuţia lucrărilor solului pe parcele individuale şi, în special, a arăturii de bază „la cormană”, după anul 1990, a determinat fragmentarea suprafeţei arabile rezultând, în timp, modelarea terenului în benzi cu coame, cu lăţimi, diferenţe de nivel şi pante transversale variabile. Modificarea adâncimii de pozare a drenurilor absorbante ca urmare a modelării în benzi cu coame şi poziţia diferită a rigolelor faţă de liniile de drenuri a dus la neuniformitatea eliminării excesului de apă, prelungirea acestuia şi apariţia vegetaţiei higrofile, reducerea suprafeţei arabile, diversificarea categoriilor de folosinţă în cadrul unui sector/parcelă de desecare şi diminuarea considerabilă a producţiei agricole.

ABSTRACT

In order to exploit the production capacity of agricultural lands with humidity in excess in the hydrographical basin of Moldova river, Suceava county, there were executed in time draining and desiccation works on a 8761 ha area out of which 3059 ha with underground drainage, the management were designed in conditions of working the agricultural lands on desiccation sectors.

The soil work execution on individual land parcels and, mainly, the basic moldboard plowing after 1990 determined the arable surface fragmentation which resulted in time in modeling the land in ridged strips with variable widths and level differences and transversal slopes. The changing of laying depth of absorbing drains as a consequence of modeling in ridged strips and the different positions of draining ditches compared to the ditch line lead to a non-uniformity in water excess removal, to its extension and to a emergence of hydrophilic vegetation, to a reduction of the arable area, to a diversification of working categories within a desiccation sector/parcel and to a large decrease in agricultural production.

INTRODUCTION

Soil quality is affected, to a bigger or smaller extent, by one or several restrictions, namely: drought, periodical excess of moisture, erosion, land sliding, etc. These restrictions are determined either by natural factors or by the agricultural and industrial anthropic actions which can synergistically act in a negative manner.

Moisture excess is one of the most significant factors which limit soil fertility, being capable of greatly diminishing, and even of completely reducing the productive capacity of soils.

After the implementation of hydroameliorative technologies, one must pay special attention to the exploitation and behavior modality of these technologies, also taking into consideration the new conditions created after the passing to the private property of land.

MATERIAL AND METHOD

The natural conditions of the Baia piedmont field situated in the water basin of the Moldova river, on the middle course (figure 1), favor the appearance and the preservation of the moisture excess in the ground and at the ground surface.

Figure 1 Drainage basin of the Moldova middle river

The alluvial plain of the Moldova river and the terraces under the form of strips, with an average width of 1.5 km, almost parallel to the bed of the Moldova river, with small slopes between 1 and 5%, with plane areas and numerous microdepressions, facilitate water stagnation. The water excess of pluvial and/or phreatic nature and the one caused by the overflows of the water network manifested itself under different forms and intensities, both on horizontal and on inclined lands.

Three drying – drainage systems (Rotopăneşti-Rădăşeni-Fântâna Mare, Drăgoieşti-Berchişeşti, Bogdăneşti-Baia) and the Băişeşti-Dumbrava watering – drying system, with a total dried surface of 8761 ha, of which 2559 ha with underground drainage works, were implemented in the water basin of the Moldova river in Suceava County over the period 1978-1980. The drying works for the Băişeşti-Dumbrava system were consolidated on a surface of 552 ha and a network of underground drainage with a surface of 500 ha was added to this system during the period 1980-1985.

The network of drain channels with a total length of 126.85 km is composed of collection, discharge, interception and other types of drains. The underground drainage network was built for the drainage of the water excess from the ground surface, depending on the nature and intensity of the moisture excess; the underground drainage network is made up of suction and collecting drains with a total length of 1575.12 km.

In order to outline the modeling of the land into ridges, following the individual performance of ground works on land lots, in the context of the private property of land, geometrical leveling land surveys were performed, with an average precision level of the Zeiss Ni-030 type and centimeter surveying rods, the level differences being determined based on two horizons of the level instrument.

In order to determine the functioning modality of the drainage network, we took soil samples, with a hollow water gauge, at thickness scales of 10 cm, up to the depth of 0.80 m. The current water content of the soil was determined for the channels and ridges, the check points being situated at a 50.00 m distance from the other channels that take over the water collected by these drains.

RESULTS AND DISCUSSIONS

Starting with 1991, with the enforcement of Law 18/1991, via the constitution and reconstitution of the property right on the surfaces with drying-drainage works from the water basin of the Moldova river, Suceava County, the arable surface was considerably fragmented into lots comprised between 0.05 and 20.00 ha. Thus, in Rădăşeni commune, with a total surface of 4119 ha, of which 3364 ha agricultural land, with 2257 ha of arable land, 140 ha of hayfields, 560 ha of meadows and 407 ha of orchards, 869 rank 1 lots and 47 050 individual lots for land owners resulted following the enforcement of Law 18 and of its subsequent amendments. From the above data, one can easily infer that the average surface of a lot is 850 m^2. In the “Rît” land sector no. 26 from Rădăşeni commune, with a total surface of 46.2242 ha, with drying-drainage works performed in 1978, 19 rank 1 lots and 82 individual lots resulted. In this land sector, the smallest lot has the surface of 0.0140 reed waters, and the biggest lot is of 15.0533 ha of arable land.

The fragmentation of the arable surface and the execution of works on individual lots led, over time, to the modeling of the land in ridges with variable widths, level differences and transversal slopes, depending on the width of the lots, the use modality and the agricultural equipment employed.

From the analysis of the canal section (figure 2) executed on a dried-drained surface from the Rotopăneşti-Rădăşeni-Fântâna Mare system one may notice that these lots modeled into ridges have different widths, values between 4.40 m and 18.60 m, level differences of 0.01 up to 0.74 m between the channels and the ridges and cross slopes of 0.2% up to 13.40%. These values vary from one year to another and depend greatly on the use modality, the width of the lots and the tools used for the agricultural works.

The modeling of the land into ridges determined the modification of the depth of the collecting drains, in the sense of its diminution along the channel line and its increase in the area of the ridge. This modification, associated with the positioning of the channels at different distances from the lines of the collecting drains, determined a non-uniform elimination of water excess on the surfaces fitted with drying-drainage works.

By analyzing the values of the average water content of the soil at a depth of 0-80 cm (figure 3), in the channel, respectively ridge check points from the canal section presented in figure 2, one may notice a higher amplitude level, as the minimum value of 27.63% was registered on the ridge, in the point P_{18}, and the maximum value, of 34.12% was registered on the channel, in point P_{15}.

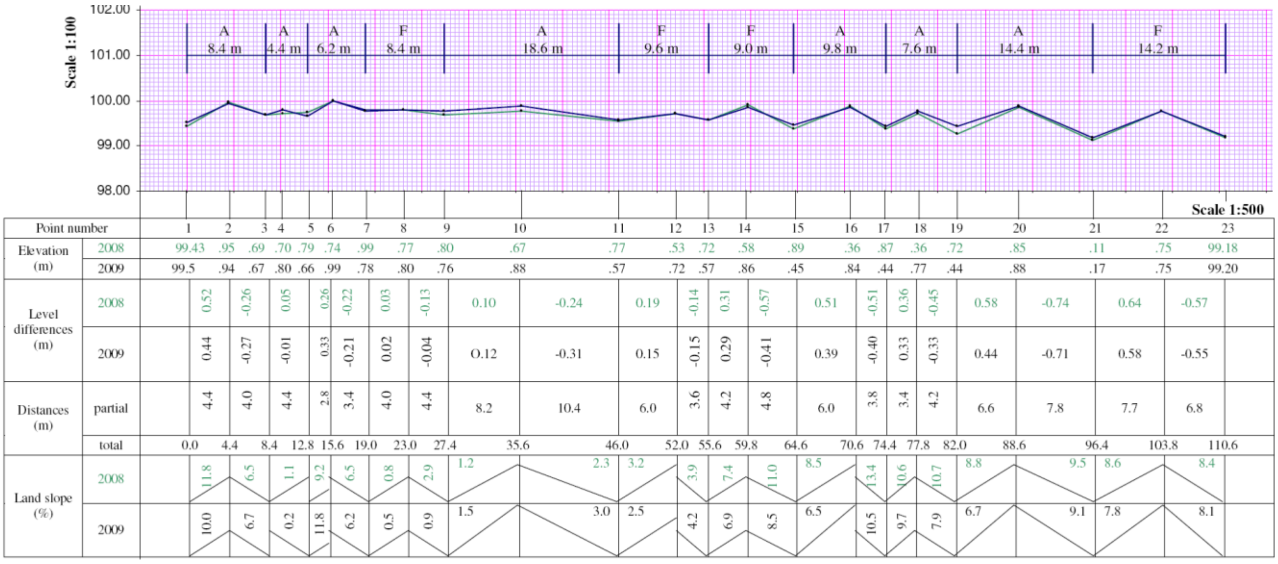

Figure 2 Canal section via individually worked lots, modeled into ridges

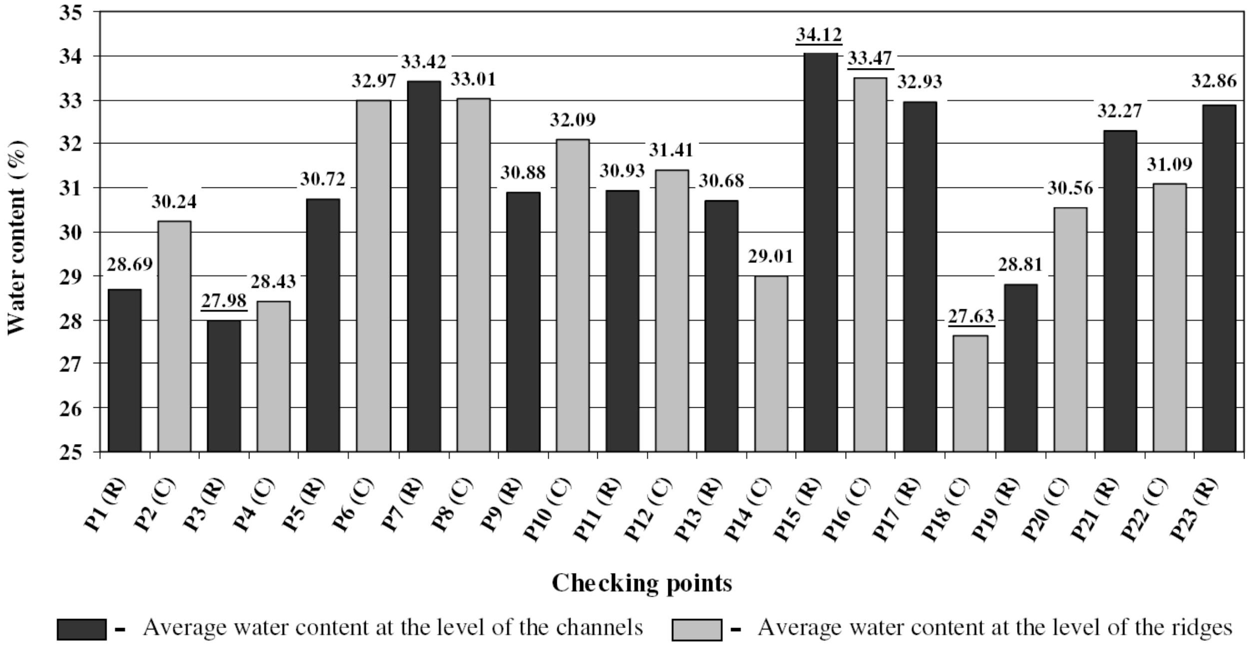

Figure 3 The average water content of the soil in the channel-ridge check points, on a surface fitted with drying-draining works

One may also notice a higher amplitude level of the average water content both on the channels and on the ridges, of 6 percentage units. The values registered on the channels are comprised between 27.98% and 34.12%, and the ones on ridges between 27.63% and 33.47%.

The significant variation of the average water content for the studied section shows that the modeling of the land into ridges of different widths, where the channels do not overlap with the lines of the collecting drains, following ground works on individual lots, does not facilitate the acceleration and drainage of the moisture excess, but, on the contrary, it prolongs the duration of the elimination of the water excess due to the leakage of the water at the ground surface and to its accumulation in the channels that may have appeared at the middle of the distance between the drains.

The lack of uniformity of the water excess is also worsened by the fact that, when the land owners entered into the possession of the surfaces fitted with drying-drainage works, the distance between the lines of the collecting drains and their orientation were not taken into consideration. The individual lots of land are situated perpendicularly, in parallel and in acute angle to the lines of the collecting drains and/or to the drain channels.

Figure 4 presents a canal section on a dried surface with individual lots of land oriented perpendicularly on a sector collecting drain. From the analysis of the canal section one may notice that, in this case too, due to the individual execution of the works, the land was modeled in ridges with widths between 9.0 and 13.0 m, with values of the channel-ridge level difference which vary between 0.211 mm and 0.760 mm and cross slopes from 4.3% to 25.3%.

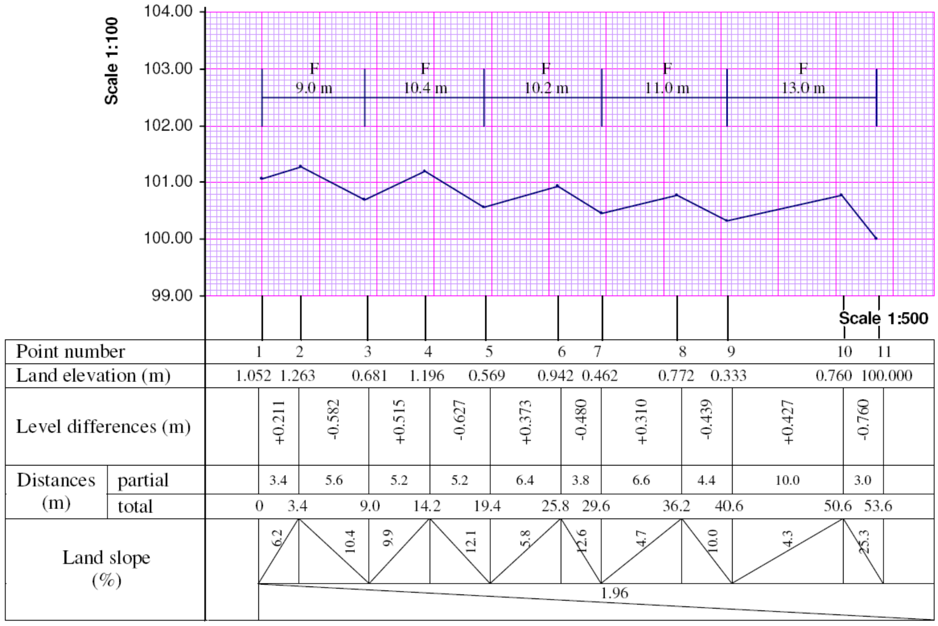

Figure 4 Canal section on individually worked lots, oriented perpendicularly to the sector collecting drain

Due to the fact that the lots are oriented along the level curves and, implicitly, along the channels formed via the individual execution of soil works, there occurs the stagnation of water in channels during heavy rain periods as well as in spring, when the snow melts. This led, in time, to the prolongation of the excess of moisture and to the installation of humidity seeking vegetation (photo 1).

Photo 1 Water stagnation and the onset of humidity seeking vegetation on channels

Through the prolongation of moisture excess and especially during spring, when snow melts, a significant surface from the lands fitted with drying-drainage works has already passed from the arable land to the hayfield category.

Although these lands have an increased production potential, the individual execution of soil works and the fragmentation of the arable surface determined the diminution of production, depending on the width of the lots, by approximately 20-50%, due to the losses produced at the borderline and in the area of the channels (photo 2).

Photo 2 Loss of crops on the line of the ridges

The exploitation of the entire productive potential of these soils and the obtaining of large, constant and uniform productions on the entire surface fitted with drying-drainage works can be done only by using modern agriculture, with advanced technologies on surfaces of at least 2-3 ha, and, ideally, of 20-30 ha.

CONCLUSIONS

1. The individual execution of soil works on lots fitted with drying-drainage works determined, in time, the modeling into ridges, with variable widths, level differences and cross slopes, depending on the width of the lots, the use modality and the equipment employed for the agricultural works.

2. The modeling of the land into ridges, without taking into consideration the lines of collecting drains and drain channels, leads to the non-uniform elimination of water excess from the surfaces fitted with drying-drainage works, to the prolongation of the moisture excess and to the appearance of humidity seeking vegetation.

3. Water stagnation in the area of the channels, especially in spring, for a longer time period, and, implicitly, the delaying and difficult execution of soil works led to the diminution of the arable surface, as some surfaces passed to the category of meadows and hayfields, and to the decrease of agricultural production by approximately 20-50% due to the losses occurred at the level of the channels.

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FOLOSIREA RAȚIONALĂ A APEI DE IRIGAȚIE ÎN SISTEM GOSPODĂRESC, PE TERENURILE ÎN PANTĂ

RATIONAL USE OF IRRIGATION WATER IN A HOUSEHOLD SYSTEM ON SLOPING LANDS

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Keywords: drip irrigation, soil moisture, land slope

REZUMAT

Apa şi asigurarea ei ridică probleme de importanță strategică, de mare complexitate, în timpurile noastre, fiind considerată una din cheile dezvoltării umane durabile. Irigarea prin picurare permite dozarea exactă a cantității de apă necesară în diferite faze de dezvoltare a plantelor, eliminându-se în acest fel pierderile.

Aplicarea irigării prin picurare la culturi amplasate pe terenuri în pantă, cultivate după tehnologia în biloane acoperite cu peliculă neagră, determină creşterea semnificativă a umidității solului doar în interiorul bilonului, în zona de dezvoltare a sistemului radicular al plantelor. Cel mai mare conținut de apă al solului se îregistrează la mijlocul bilonului imediat după aplicarea udării, iar după circa 48 ore acesta este mai mic decât valorile înregistrate la marginea bilonului, datorită consumului de apă al plantelor.

Tehnologia de cultivare pe terenurile în pantă, în biloane acoperite cu peliculă neagră, orientate de-a lungul curbelor de nivel, îmbunătățeşte reținerea şi acumularea apei în sol provenită din precipitații şi diminuează pierderile de sol determinate de eroziunea de suprafață.

ABSTRACT

Water and its provision raise some matters of strategic importance of wide complexity in our time being considered one of the keys in a human sustainable development. The drip irrigation allows an accurate dosage of water quantity in various plat growing stages thus avoiding the losses.

Drip irrigation application in crops placed on sloping lands cultivated according to a technology of earthwork covered with a black layer film determines a significant soil humidity increase only inside the earthwork in the developing area of the root system of plants. The highest soil water content is registered in the middle of the earthwork soon after a wetting application and after about 48 hours it is lower than the values registered at the side of earthwork due to the plant water consumption.

The technology of growing on sloping lands, in earthworks covered with black film, directed along the contour line, improves the rainfall water retention and accumulation in the soil and decreases the soil losses caused by surface erosion.

INTRODUCTION

In its quality of natural, vulnerable and limited renewable resource, water is a crucial element for society, being a decisive factor in maintaining ecologic equilibrium for the existence of life in itself and for all human activities.

Although drip irrigation is relatively recent in Romania, it extended and improved rapidly due to its numerous advantages. The use of the irrigation equipment, installations and systems with drip hose ensures the saving of water and energy via the uniform distribution of water, drop by drop, to an extent and at a frequency adjusted to the needs of the plant, with the possibility of strictly compensating evapotranspiration and thorough control of irrigation norms and their enforcement.

Drip irrigation is the most efficient solution for the irrigation of vegetable crops in greenhouses and in the fields, as well as for the irrigation of flowers, vineyards and trees, being suitable for any type of soil, for uneven lands and for slopes.

MATERIAL AND METHOD

Field observations for water distribution during drip irrigation were performed for vegetables and vineyards situated on slopes (average slope of 15%), grown in ridges covered with a black film, the ridges being oriented along the level curves, at a distance of 1.10 m (figure 1).

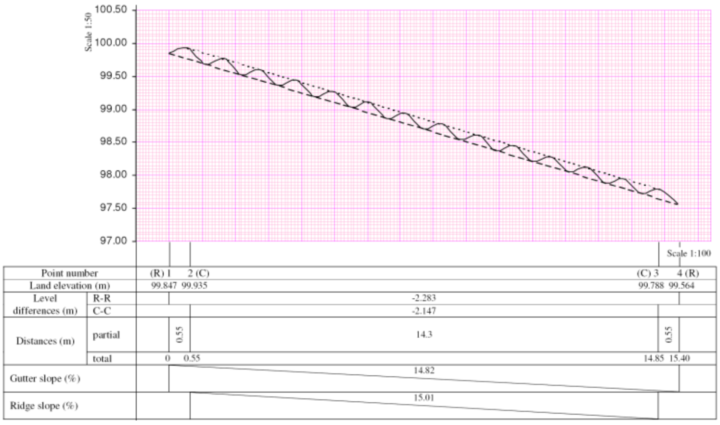


Figure 1 Transversal profile through moldboards

Following the morphological description, the soil was diagnosed as weakly eroded baticalcaric cambic chernozem, the depth of occurrence of calcium carbonate being of 105 cm (photo 1).

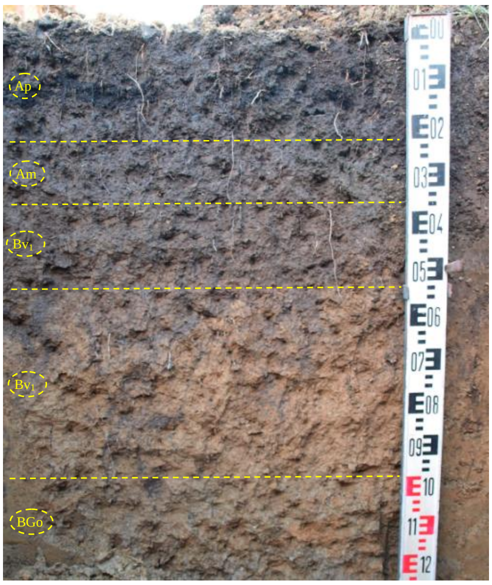


Photo 1 Baticalcaric cambic chernozem with argillaceous texture

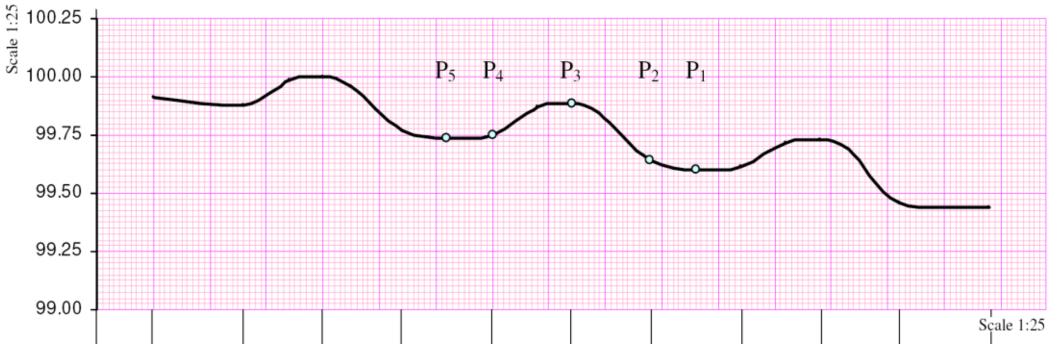
The formation processes of cambic chernozem consisted in the bioaccumulation, argillic alteration, levigation of the calcium carbonate and slight gleying starting with the depth of 102 cm. Bioaccumulation was favored by the abundance of precipitations, and the saturation of the absorption complex with Ca^{2+} ions confers stability to the humic fractions. Argillization consisted in the alteration of the primary minerals after the removal of $CaCO_3$ and the formation of iron hydroxides and oxides which give the horizon a reddish color in comparison with the adjacent horizons. The slight gleying is caused by the lateral circulation of the water.

Cambic chernozem is a soil with a large useful edaphic volume and with an optimum aero-hydric regime. The relatively uniform color of the soil matrix at the depth of 0-100 cm shows the fact the soil is not affected by the excess of stagnating moisture. From an agronomic perspective, the soil does not have major restrictions with regard to the arable. Some limiting physical traits (resistance to plowing, workability, trafficability) caused by the increased content of clay are partially compensated by the glomerular structure and by the humus content, which increases the hydric stability of structural aggregates, prevents the dispersion of soil particles and, implicitly, the formation of crust.

In order to determine the water content of the soil, we took soil samples with the help of a tubular probe on scales of 10 cm, up to the depth of 50 cm, before irrigation, immediately after irrigation, at every 6 hours, at every 24 hours and at every 72 hours after the irrigation.

The water quantity of 5 l/linear meter was applied via the watering band with dripping orifices situated at a 20 cm distance and at an interval of 7 days between the irrigations.

The check points were located at the middle of the channel (P_1 and P_5), at the basis of the ridge downstream (P_2), at the basis of the ridge upstream (P_4) and on the ridge, point P_3 (figure 2).



Point number	1	2	3	4	5	6	7	8	9	10	11
Land elevation (m)	99.909	99.880	100.000	99.711	99.753	99.888	99.639	99.613	99.732	99.458	99.441
Level differences (m)		-0.029	0.120	-0.229	-0.018	0.135	-0.249	-0.026	0.119	-0.274	-0.017
Distances (m) partial		0.40	0.35	0.35	0.40	0.35	0.35	0.40	0.35	0.35	0.40
Distances (m) total	0	0.40	0.75	1.10	1.50	1.85	2.20	2.60	2.75	3.30	3.70
Slope (%)		7.25	34.29	65.43	4.50	38.57	71.14	6.50	34.00	78.29	4.25

Figure 2 Positioning of the sampling points for soil samples

In order to determine the quota of the land surface from the investigated area, we performed precision geometric leveling land surveys via radiation and traversing combined with radiation, based on which we realized the canal sections. The level observations were taken with an average precision level of the Zeiss Ni-030 type and centimeter surveying rods, the level differences being determined based on two horizons of the level instrument.

RESULTS AND DISCUSSIONS

The dynamics of the humidity of the cambic chernozem with smooth texture was established based on the current water content determined before the irrigations, after 6, 24 and 72 hours from the application of drip irrigation.

The variation interval of the water content on the ridge (figure 3), registered before the irrigation, at a depth of 50 cm, is comprised between 21.16% and 28.61%.

The smallest values of the water content, of approximately 21%, are registered at the 0-20 cm depth interval, and the biggest values of the current water content, of approximately 28%, are registered at the 30/50 cm depth interval. The shift between the minimum and maximum water values is achieved gradually, the current water content at a 20-30 cm depth being of 23.74%.

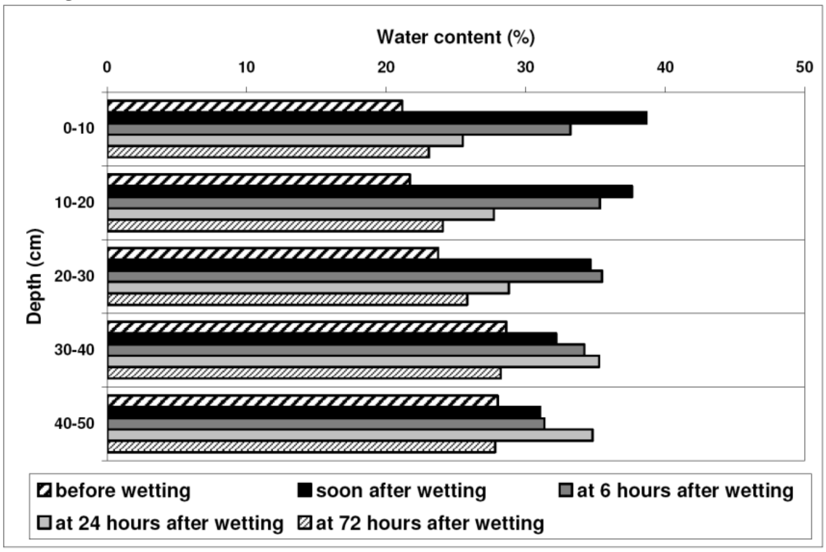


Figure 3 The water content of the soil on depths, determined on the ridge

Despite the fact that, when the drip irrigation is completed, the humidity front crosses the entire soil section on the 0-50 cm interval, in the soil layer of 0-20 cm, one may notice the excess moisture of the soil, the values of the current water content, of 38.66% and, respectively, 37.61% being higher than those of the water capacity in the field. On the 20-50 cm interval, the distribution of the water in the soil is evenly decreasing, the current water content diminishing by 2.97%, 5.44 and, respectively, 6.58% in comparison with the 20-30 cm interval.

6 hours after the irrigation, the variation amplitude of the current water content at a 0-50 cm depth decreased in comparison with the moment the irrigation ceased, from 7.63% to 3.95%. The smallest values of the current water content, of 33.21% and 31.34%, are registered in the soil layers at the 0-10 cm and 4-50 cm depths. The maximum value of the water content in the soil, of approximately 35.50%, is registered at the 10-30 cm depth.

24 hours after the irrigation, the water content at the 0-30 cm depth is close to the water capacity in the field. The descendent forwarding of the humidity front determined the increase of the current water content at the 30-50 cm depth interval, at the value of approximately 35.00%.

72 hours after the irrigation, the water content slightly decreased in the shallow soil layer, at a 0-20 cm depth, following water consumption by the plants. At the 20-50 cm depth, the current water content is close to the water capacity in the field. We consider that the decrease of the water content is due to the lateral forwarding of the humidity front for, on the same depth interval, the current water content rose by approximately 2.5% both in the marginal area of the ridge and at the middle distance between the ridges.

By analyzing the values of the water content of the soil at depths determined at the basis of the ridge (figure 4), we may notice that the biggest amplitude is registered in the 0-20 cm depth interval, as the water content of the soil is 8 % higher than the value determined before the irrigation.

At the 20-50 cm depth interval, we may notice the relative humidity of the water content, for the values register insignificant increases up to 24 hours from the irrigation.

We may also notice that, in the first 20 cm, except for the values determined immediately after irrigation and 6 hours after the irrigation, the water content of the soil is smaller by 5-6 % than the values registered in the 20-50 cm interval, due to the water consumption of the plants.

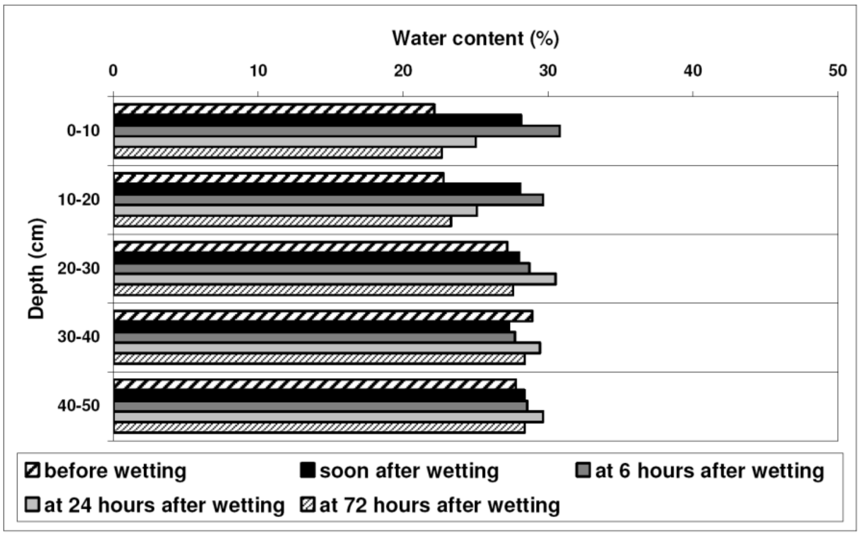


Figure 4 The water content of the soil on depths, determined at the basis of the ridge

At the middle of the distance between the ridges (figure 5), the values of the water content of the soil increase from the soil surface to the depth of 30-40 cm. The smaller values of the current water content of the soil in the first 20 cm are due to the water losses via evapotranspiration, as the area of the channel is not covered with a black film. The biggest values of the water content of the soil were registered in the first 20 cm 24 hours after the irrigation, in the 20-30 cm at 24 and 72 hours after the irrigation, and in the 30-50 cm interval 72 hours after the irrigation.

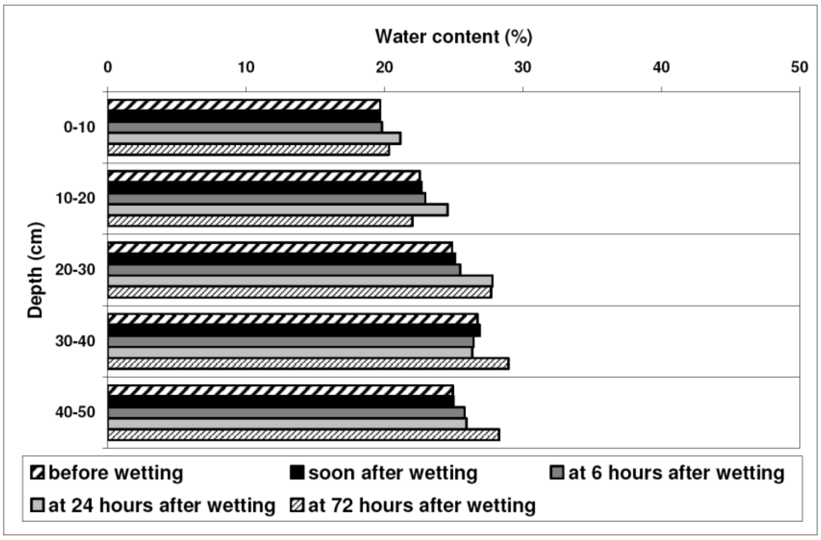


Figure 5 The water content of the soil on depths, determined at the middle of the ridge

From the analysis of the average water content of the soil at the check points (figure 6) it results that, via the application of drip irrigation of 5 l/linear meter, there occurs a significant increase of the water content of the soil only inside the ridge, in the area of the main mass of plant roots, which reflects the controlled and rational use of irrigation water.

By applying drip irrigation, the average water content of the soil increases by approximately 10% at the ridge immediately after irrigation, at the basis of the ridge by approximately 4% 6 hours after the irrigation and by approximately 2% at the middle of the ridge, 72 hours after the completion of irrigation.

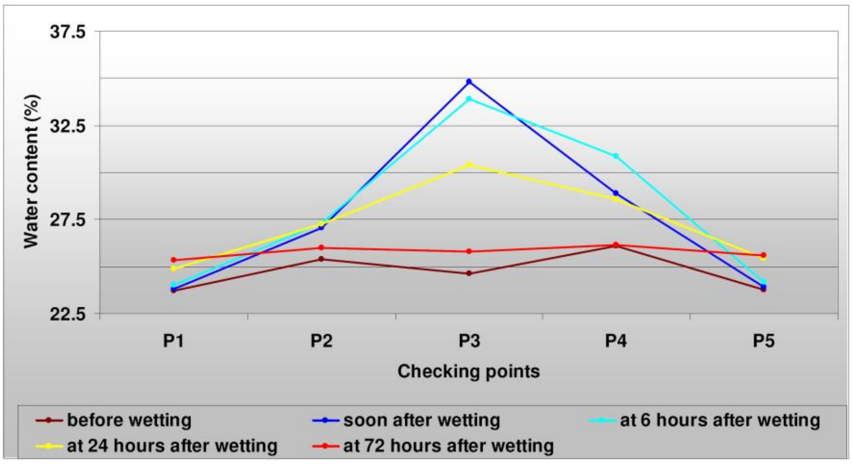


Figure 6 Evolution of the average water content of the soil at the check points

We may also notice higher values of the average water content of the soil in the point at the basis of the ridge, situated upstream from the point located at the basis of the ridge, downstream. This could be explained by the bigger quota of the land in the check point P_4, as well as by the influence of water from abundant precipitations, which is retained between the ridges. This technology of growing on slopes improves the retention and accumulation of water from precipitations in the soil and diminishes the soil losses determined by surface erosion.

CONCLUSIONS

1. The values of the water content in the soil in the point situated on the ridge increase with the depth before irrigation, 24 and 72 hours after the irrigation, and decrease immediately after the irrigation and 6 hours after the completion of the irrigation.
2. The maximum value of the average water content of the soil at the check points was registered immediately after drip irrigation on the ridge, 6 hours after the irrigation in the points situated at the basis of the ridge and 72 hours after the irrigation at the check points situated on the channels.
3. The average water content of the soil 72 hours after the irrigation is relatively even on the entire control section, as a result of the water consumption of the plants and of the lateral forwarding of the humidity front.
4. Drip irrigation determines the significant increase of the water content of the soil only inside the ridge, in the area of the main mass of the plant roots, thus reflecting the controlled and rational use of water.

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CERCETĂRI PRIVIND INFLUENȚA FERTILIZĂRII FOLIARE ASUPRA CONȚINUTULUI DE AZOT LA CULTURA DE PORUMB ŞI DIN SOL

STUDIES CONCERNING THE INFLUENCE OF THE FOLIAR FERTILISATION ON THE NITROGEN CONTENT IN MAIZE PLANT AND SOIL

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Cuvinte cheie: **fertilizare foliară, porumb, azot**
Keywords: **foliar fertilization, maize, nitrogen**

REZUMAT

Lucrarea prezintă rezultate experimentale obținute prin testarea unui nou îngrăşământ foliar şi influența fertilizării foliare asupra conținutului de azot la cultura de porumb şi sol. Cercetările au avut loc in casa de vegetație a INCDPAPM-ICPA Bucureşti (2010), iar solul din experiență a fost cernoziom vermic de Feteşti. Experiența a fost organizată în vase de vegetație de tip Mitscherlich cu capacitate de 20 kg sol. Hibridul de porumb testat în experiență a fost PR38A24. Pentru fiecare variantă de tratament foliar aplicat s-a asigurat un număr de trei repetiții şi o fertilizare în sol de 50mg NPK/kg sol. In aceste condiții, noul tip de îngrăşământ foliar a asigurat creşterea conținutului de N în substanța uscată a plantelor de porumb.

ABSTRACT

The paper presents the experimental results obtained by applying a new foliar fertilizer and the influence of the foliar fertilization on the nitrogen content in maize plant and soil. Research was carried out in the green house by INCDPAPM-ICPA Bucharest (2010) and the soil from experiment was Vermic Chernozems from Fetesti. The experiment was organized in Mitscherlich pots with 20 kg of soil. The tested inbred maize line from experience was: PR38A24. According to the methodology of testing for each variant of treatment a number of three replicates were provided. All the variants received soil fertilization with 50 mg N/kg soil, 50 mg P_2O_5/kg soil and 50 mg K_2O/kg soil, excepting the control unfertilized in soil. In these conditions, the application of new foliar fertilizer assured positive increases of N content in dry matter of maize plant as compared to control unfertilized in soil.

INTRODUCTION

Foliar fertilization is a ordinary practice for additional stimulation and correction of agricultural plant nutrition. The foliar fertilization help to increase photosynthesis as a result of the stimulating process of chlorophyll synthesis, the cell activity of leaves and fastest evacuation of the primary product of the photosynthesis process in the chloroplast. This paper presents experimental results obtained by testing a new foliar fertilizer in maize crop.

MATERIAL AND METHOD

The foliar fertilizers applied in maize crop had in the composition the macro and micro nutrient and physiologically active organic substances witch stimulate of the plant metabolism. The new foliar fertilizer was obtained in the laboratory.

The experiment was organized in Mitscherlich pots with 20 kg of soil. The tested inbride maize line from the experience was: *PR38A24.* According to the methodology of testing for each variant of treatment a number of three replicates were provided. All the variants received soil fertilization with a complex fertilizer type 15-15-15, in doses of 50 to for each nutrient / kg soil, excepting the control unfertilized in soil. Foliar treatments were applied in concentrations of 1%, 0.5% and 0.25%. In these conditions, the application of new foliar fertilizers assured positive increases of the nitrogen content in dry matter of maize plant as compared to control unfertilized in soil. Leaf samples were collected before treatment and 10 days after each treatment. The soil samples were collected before treatment and 3 days after each treatment.

RESULTS AND DISCUSSIONS

The table 1 present the nutrient content in the new foliar fertilizer manufactured with the organic substances of animal nature. Analitical data presented in Table 2 show that the concentrations of nitrogen in soil during the three foliar treatments applied were approximately constant. Analytical data presented in Table 3 show that foliar fertilizer has determined a positive increase of the nitrogen content in dry matter of maize plant as compared with the controls: non-fertilized watered control and fertilized watered control.

In the figure1 is shown the variation of total nitrogen concentration of maize leaves and in soil during three foliar treatments. The largest increases in total nitrogen content of plant dry matter were recorded in variants V3, V4, V5 compared with the controls.

Table 1

The nutrient content in the foliar fertilizer manufactured with organic substance

No. crt.	Components	U.M (g/L)	Concentration determined
1	Total nitrogen	g/L	50,30
2	Ammonia nitrogen	g/L	21,40
3	N-nitric oxide	g/L	25,30
4	Organic nitrogen	g/L	3,60
5	Phosphorus (P_2O_5)	g/L	13,00
6	Potasium (K_2O)	g/L	24,06
7	Iron	g/L	0,59
8	Zinc	g/L	0,31
9	Copper	g/L	0,45
10	Manganese	g/L	0,23

Table 2

Data regarding the influence of foliar fertilizer on nitrogen content in soil of maize crop

Variants	Total nitrogen (%) SOIL			
	Before treatment	After the treatment I	After the treatment II	After the treatment III
(V1)Control*	0,160	0,160	0,160	0,160
(V2)Control**	0,170	0,180	0,180	0,180
V3 (1%)	0,180	0,180	0,180	0,180
V4 (0.5%)	0,170	0,180	0,180	0,180
V5 (0.25%)	0,180	0,180	0,180	0,180

Table 3

Data regarding the influence of foliar fertilizer on nitrogen content in dry matter of maize crop

Variants	Total nitrogen (%) Dry matter			
	Before treatment	After the treatment I	After the treatment II	After the treatment III
(V1)Control*	1,46	1,47	1,52	1,53
(V2)Control**	3,04	3,17	3,09	3,14
V3 (1%)	3,06	3,54	3,60	3,73
V4 (0.5%)	3,05	3,48	3,61	3,72
V5 (0.25%)	3,02	3,42	3,53	3,67

***Nonfertilized watered control**

***Fertilized watered control*

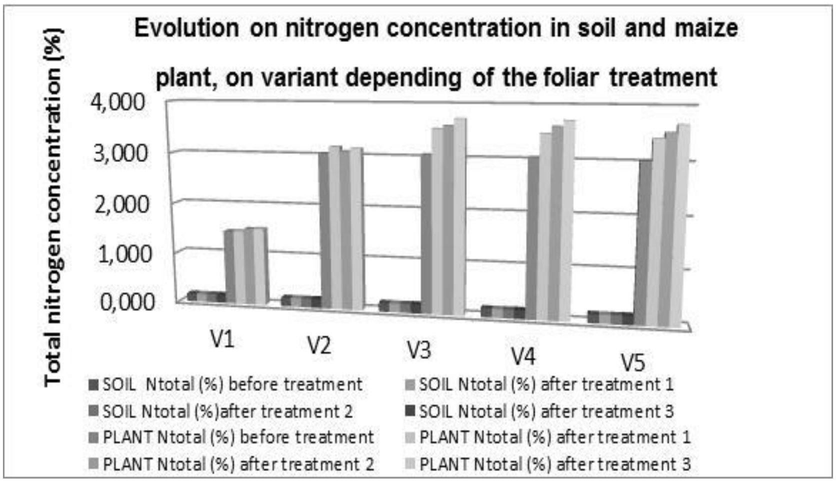

Figure 1. Evolution of total nitrogen concentration in soil and in maize plant (dry matter), on variant depending of the foliar treatments

CONCLUSIONS

The foliar fertilizer tested was determined a significant increase of the total nitrogen content in dry matter of maize plant as compared with the controls: non-fertilized watered control and fertilized watered control.

The organic substance was used in the foliar fertilizer as a source physiologically active witch to stimulate of the plant metabolism.

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VARIAȚIA CONȚINUTULUI ÎN VITAMINA C, CAROTEN ŞI PROTEINĂ ÎN FUNCȚIE DE POPULAȚIA LOCALĂ DE ARDEI IUTE LUATĂ ÎN STUDIU

VARIATION CONTENT IN VITAMIN C, CAROTENE AND PROTEIN DEPENDING ON THE LOCAL POPULATION OF PEPPER IN STUDY

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Keywords: local populations, pepper, biochemistry

REZUMAT

În lucrare este prezentată dependența conținutului în vitamina C, caroten şi proteină din ardeiul iute în funcție de populația locală. Au fost luate în studiu 47 de populații locale de ardei iute, din zona Almăj, situat în partea centrală a Olteniei, unde au fost urmărite o serie de caracteristici şi însuşiri morfologice la aceste plante şi au fost făcute mai multe determinări biochimice şi fiziologice în Laboratorul Central al Facultății de Agricultură din Craiova. Din multitudinea rezultatelor obținute în lucrare sunt prezentate decât 6 populații locale care au fost luate în studiu în câte 3 variante fiecare, urmărindu-se cei trei factori.

ABSTRACT

In the paper content dependence is presented in vitamin C, carotene and protein of paprika depending on the local population. Have been considered in the study of the local population of 47 pepper, Almăj area, located in the central part of Olteniei, where they were pursued a series of morphological characteristics and features of these plants and have been made more physiological and biochemical determinations in the central Laboratory of the Faculty of Agriculture of Craiova.

From the abundance of the results obtained in paper are prezențate than 6 local populations which have been taken in the study in 3 variants each, while pursuing the three factors.

INTRODUCTION

The pepper (*Capsicum annuum* L) originates from Central America and South America. Christopher Columbus found the pepper in Haiti, where it was brought from, to Europe (Ileana Beresiu & collaborators, 1977; Francisco J.B. & collaborators, 2009).

The pepper is grown in Europe for the first time mid way through the 16th Century in Spain and Portugal, followed by Germany, England and Hungary. The pepper reached Romania much later, being brought here by Bulgarian gardeners in the 18th Century. It was fist grown in the south of the country, and was later taken to other more favourable regions (D. Andronicescu & collaborators, 1968).

The fruit of the pepper present a high value as an aliment, due to its elevated content of natural sugars and vitamins and the fact that it is habitually consumed as raw, state in which these components are processed directly, by the human body.

Ascorbic acid is found in large quantities in the fruit of the pepper, this varies according to species, variety or the maturity of the fruit, reaching levels of 139-160mg/100g of raw substance for fruits arriving at technological maturity and 211-300mg/100g of raw substance for fruits arriving at physiological maturity. (Riefschneider, F.J.B, 2000); some species of the Caspicum variety may reach higher levels up to

400mg/100g of raw substance – for the Caspicum frutescens species (V.K. Andryaschenco & collaborators, 1983).

On top of ascorbic acid, the fruits of the pepper contain other vitamins, such as B_1 şi B_2, PP and E. Capsaicin, active component in peppers, give it the hot/chili taste, characteristic to many varieties. The levels of Capsaicin defers according to species and variety, between 0.27-1.12mg/100g of raw substance for hot/chili fruits, and minute quantities for sweet varieties. (A.Mougou & collaborators, 1988)

The high levels of ascorbic acid and capsaicin in the Capsicum variety give it the status of medicinal plant. The human body requires a minimum of 100mg of ascorbic acid daily, which can be easily ensured by a daily intake of pepper in our diet, consumed raw or in salads, and by no means heat-processed.

Elevated levels of capsaicin are characteristic to hot/chili pepper varieties. While in the 70s the consumption of hot/chili peppers was linked to a series of illnesses of the digestive tract and of the blood vessels, recent studies taken place in Australia, Hungary and the USA (countries where the pepper is highly consumed) have reveled that, in truth, the chili pepper prevents cardio-vascular diseases, cures some illnesses of the digestive tract, prevents prostate cancer and type II diabetes. Recently, the chili pepper has started being used in cosmetic products targeting cellulite and has proven to be a great success.

This paper aims to recommend some Romanian varieties of long pepper for raw consumption, according to their levels of ascorbic acid and carotene.

MATERIAL AND METHOD

To demonstrate the importance of paprika biochemical compounds have been taken in the study 47 variants, each variant being represented by a local pupulație which comes from the area of Olteniei. Because the study is more advanced in this paper we present the content in carotene, vitamin C and protein in 6 variations. The experience was located in locality Almăj, organic culture system, comprised of local populations 47 each representing one variant, it having a number of 3 repetitions.

Biochemical Determinations and methods applied have been carried out in the central Laboratory of the Faculty of Agriculture of Craiova in collaboration with the teachers of the Faculty of Horticulture of Craiova and researchers from the research and development Staține Legumicolă Işalnița. The statistical interpretation of the results has been achieved through the analysis of variance (Săulescu N.A 1968).

Biochemical Determinations were made from the fruits of pepper at physiological maturity. For the determination of levels of carotenului of peppers has been used clorofinieni and pigmentary method (Pandia and colab., 2008) was applied in the calculation formula.

Table 1

Quantities of carotene obtained on variants and repetitions of the local populations pepper

Variant	The repetition			S	X
	I	II	III		
V1	3,75	3,60	3,86	11,21	3,73
V2	5,39	5,50	5,29	16,18	5,39
V3	10,08	11,10	9,09	30,27	10,09
V4	0,22	0,30	0,18	0,70	0,23
V5	3,32	3,20	3,43	9,95	3,31
V6	0,58	0,36	0,69	1,63	0,54
S	23,34	24,06	22,54	69,94	

Table 2

Analysis of variance for the local populations of the six pepper

Case variability	SP	GL	$(SP/GL)^{s2}$	Sample F
Total	199,50	17		162,032
Rehearsal	0,198	2		
Variants	196,87	5	39,374	
Error	2,43	10	0,243	

s_{d}^{-} =0,402

Table 3

The significance of the contents in carotene in the 6 variants taken in study

Variant	Carotene Content (mg/dm^2 %)	%	± difference to Mt.	The significance of
V1	3,73	96	- 0,15	-
V2	5,39	139	+ 1,51	XX
V3	10,09	260	+ 6,21	XXX
V4	0,23	6	- 3,65	000
V5	3,31	85	- 0,57	-
V6	0,54	14	- 3,34	000
Media Variant (Mt.)	3,88	100	-	

For the determination of protein content of paprika, was looked crude protein percentage content of which corresponds to a gram of nitrogen.

Table 4

Quantities of protein obtained on variants and repetitions of the local populations pepper

Variant	The repetition			S	X
	I	II	III		
V1	12,31	12,26	12,17	36,74	12,24
V2	15,39	16,60	14,20	46,19	15,39
V3	13,16	14.11	12,20	39,47	13,15
V4	16,76	15,85	17,60	50,21	16,73
V5	15,21	15,60	14,82	45,63	15,21
V6	13,68	13,81	13,41	40,90	13,63
S	86,51	88,23	84,40	259,14	

Table 5

Analysis of variance for the local populations of the six pepper

Case variability	SP	GL	$(SP/GL)^{s2}$	Sample F
Total	48,21	17		15,52
Rehearsal	1,22	2		
Variants	41,63	5	8,32	
Error	5,36	10	10	

s_{d}^{-} = 0,59

Table 6

The significance of the protein content from the 6 variants taken in study

Variant	Protein Content (mg/100g su)	%	± difference to Mt.	The significance of
V1	12,24	85	- 2,15	00
V2	15,39	107	+ 1,00	-
V3	13,15	91	- 1,24	-
V4	16,73	116	+ 2,34	XX
V5	15,21	106	+ 0,82	-
V6	13,63	95	- 0,76	-
Media Variant (Mt.)	14,39	100%		-

DL 5%= 1,31 DL 1%= 1,87 DL 0,1%= 2,70

Determining the content of vitamin C of paprika, was carried out using the method of filtering and titration with potassium iodate.

Table 7

Quantities of vitamin C obtained on variants and repetitions of the local populations pepper

Variant	The repetition			S	X
	I	II	III		
V1	269,28	270,16	268,87	808,31	269,43
V2	318,56	320,06	317,58	956,20	318,73
V3	377,52	380,01	369,18	1126,71	375,57
V4	419,85	420,64	419,16	1259,65	419,88
V5	335,28	338,01	332,15	1005,44	335,14
V6	403,04	401,80	405,12	1209,96	403,32
S	2123,53	2130,68	2112,06	6366,27	

Table 8

Analysis of variance for the local populations of the six pepper

Case variability	SP	GL	$(SP/GL)^{s2}$	Sample F
Total	4,8055	17		1142,85
Rehearsal	0,0008	2		
Variants	4,7963	5	0,96	
Error	0,0084	10	0,00084	

$s_d^- = 0,0024$

Table 9

The significance of the vitamin C content from the 6 variants taken in study

Variant	Vitamin C Content (mg/100g sp)	%	± difference to Mt.	The significance of
V1	269,43	76	- 84,25	00
V2	318,73	90	- 34,95	-
V3	375,57	106	+ 21,89	-
V4	419,88	119	+ 66,20	X
V5	335,14	95	- 18,54	-
V6	403,32	114	+ 49,64	-
Media Variant (Mt.)	353,68	100	-	-

DL 5%=54 DL 1%= 76 DL 0,1%=110

Figure 1. Aspects of time calculations

CONCLUSIONS

- Carotene content in the 6 local variants studied was different, highlighting the V3 and V2 with a high content of carotene.
- Protein that has an important role in the fruits of peppers obtained, but a larger quantity was highlighted to V4.
- Vitamin C highlight most to variant V4, and from the 6 variants taken under study is recommended to be taken in the culture for an ecological agriculture variants V4, V3 and V2.

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METODE NECONVENȚIONALE DE CREŞTERE A CALITĂȚII SOLURILOR DIN SERE

UNCONVENTIONAL METHODS TO IMPROVE THE QUALITY OF GREENHOUSES' SOILS

LAURA PAULETTE, FEODOR FILIPOV, RODICA SIMA, IOANA CĂTINAŞ, MIHAI BUTA

Keywords: soil structure, soil quality, soil structure conditioners.

REZUMAT

Lucrarea tratează încadrarea din punct de vedere taxonomic a solurilor utilizate în spații protejate, sere/solarii, precum şi analiza indicatorilor de calitate a acestor soluri şi măsuri de refacere, respectiv de îmbunătățire a capacității de producție prin utilizarea unor măsuri neconvenționale cum sunt utilizarea condiționatorilor de structură. Prin utilizarea produsului Pervaide, un produs de formulare a unui polimer înalt ne-ionic cu enzime şi biostimulator, la cultura de tomate s-a obținut o îmbunătățire evidență a proprietăților solului, atât în privința proprietăților chimice dar mai ales a stabilității hidrice a agregatelor de sol şi indicilor hidrofizici. Cea mai mare creştere s-a obținut în cazul variantei tratată cu Pervaide 2 l/ha (V_2), fiind varianta care a determinat şi cel mai bun grad de structurare şi alcătuire structurală pe procente de categorii de agregate stabile.

ABSTRACT

The paperwork refers to taxonomy of the soils used in greenhouses and tunnels and also analyzes the soil quality indices and methods to improve the soils' productivity through unconventional methods like using structure conditioners. Using the Pervaide product, a polymer combined with enzymes, to tomatoes culture was obtained an evidential improvement of the chemical properties but mainly of the hydro stability of the soils aggregates and of the hydro-physical indices. The greatest improvement was obtained in variants treated with Pervaide 2l/ha (V_2), being the variant which determined the best structure quality indices (indices consisting in different ratios between groups of water-stable aggregates of specific size).

INTRODUCTION

Due to the deep change of the upper layers of the soils used in protected areas (greenhouses, solariums) the taxonomic framing of these soil types was always difficult and the Romanian System of Soil Taxonomy (SRTS) 2003 solved this problem by introducing a soil class Anthrosols that classifies the intense modified soils due to the anthropogenic activity. A mapping of all soils used in protected areas is imposed for a new taxonomic framing.

The soils used in greenhouses are submitted to deep alterations of their chemical and physical properties, and this claims the necessity of improving their quality status. Due to irrigations, one of the altered soil properties is the soil structure, which has major influence on the optimal conditions of the development of the plants. A good structured soil supplies best conditions of porosity, permeability, cohesion between soil constituents, resistance against exterior mechanical conditions (traficability, friability).

As result of modern techniques, the unconventional methods of improving the soil structural status became more and more common and the use of structure conditioners based on polymers represents one of the most rapid and efficient methods of reconstruction of the soil stability. The structural soil instability affects their physical properties, as hydraulic conductivity and infiltration ratio, processes that represent an important part of the hydrological cycle from the soil (BEN-HUR, 2006). The physical disintegration of the soil structure may be produced by the impact energy of the raindrops or as consequence of the rapid wetting of the soil (AGASSI et al.,1981, MORIN et al.,1981, şi LADO et al.,2004).

A way of increasing the soil structural stability is represented by the use of the structure conditioners, which improve the physical soil properties. The polymers consist of repeated small identical unities (monomers), coupled together in order to form extended chains, of variable length, from several thousands to some millions Daltons. In average they have diameters of 0.5 - 1.0 µm [(SCHAMP et al. 1975), and chains are flexible, with multiple segments, and poly-functional. The polymers are mainly characterized by their molecular weight, molecular conformation (coiled or stretched), type of electric charge, and charge density. These traits determine their adheration to the soil particles, of clay fraction, mainly.

As soil conditioner, Pervaide product helps to the reducing of inlays loose clay soils, and aggregation of the sandy soils. Pervaide also allows the water and oxygen to better reach the plant roots, by reducing the superficial tension between water and soil. The soil conditioned in this way has better water retention properties, weaker compaction, better aeration, and better structure. Pervaide also helps to improve the micro-organisms development and activity, which is necessary for a healthy environment in the soil. Pervaide may be mixed with majority of herbicides and pesticides as lots of fertilizers.

MATERIAL AND METHOD

The analyzed material consists of the soil from the greenhouses of the Universities of the Agricultural Sciences and Veterinary Medicine Cluj – Napoca. It was interpreted from the point of view of the taxonomic framing and behaviour when Pervaide treatment was applied.

The mono-factorial experiment developed on tomato culture with 2 gradations and compared with untreated control, included: V_1 – control, V_2 – Pervaide 2l/ha and V_3 – Pervaide 4l/ha. Pervaide was applied in January when germinative bed was prepared. It was incorporated in soil by chopping with milling machine.

The soil samples were taken by horizons, in order to perform the pedological studies, and from the upper horizon in order to perform analyze of the effect of the Pervaide product. The soil samples were taken after one week of product administration and when the culture was stubbing, in the first half of July (12 July).

RESULTS AND DISCUSSIONS

The studied soil belong to Antrisoils Class, Hortic Anthrosols (ATho) – according to SRTS 2003 system; Hortic Anthrosols (ATho) – according to WRB-SR 1998 system (figure1). The soil is formed on a levelled terrace, on clays predominant parental material and groundwater depth over 10 m.

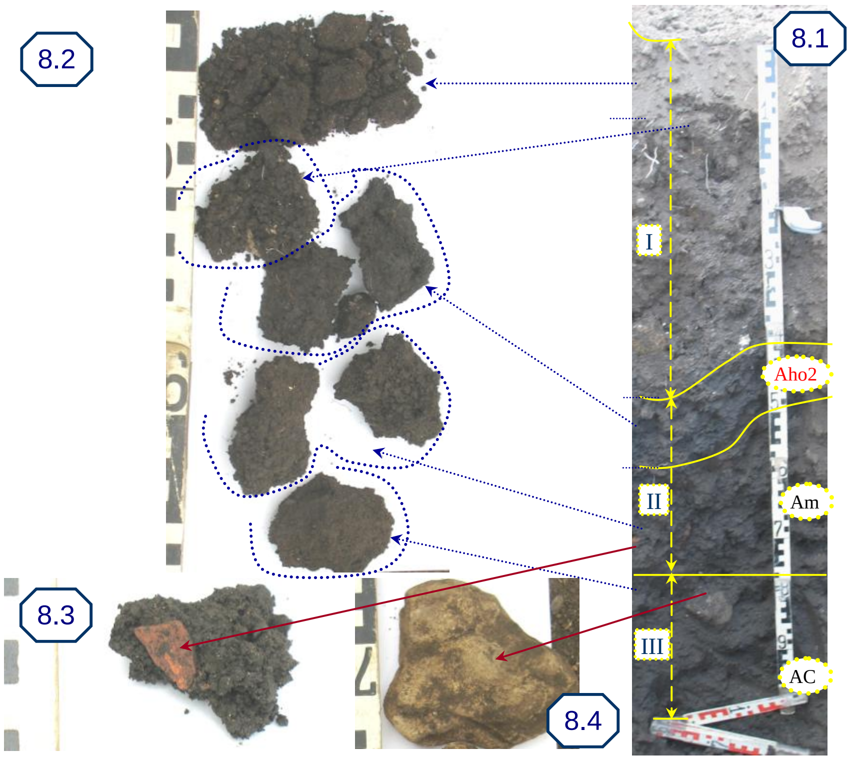

Figure 1. Hortic Anthrosols profile (8.1), soil structure (8.2), garbic materials (8.3 and 8.4)

The soil analyzes for untreated control (table 1) revealed satisfactory chemical properties (neutral reaction, saturation degree in base over 75, high capacity of cationic interspersing, high quantity of humus, middle content of carbonates). The identification of the hydro-physical indices revealed a small value of the coefficient of hygroscopicity (3.44) and coefficient of wilting point, accordingly (5.16) (table 2).

Table 1

The chemical properties of the Hortic Anthrosols, greenhouses USAMV (January 2010)

Variant	Ah	SB	T	V %	pH-ul	Humus	$CaCO_3$
V_1 control	9.08	35.7	44.78	79.72	7.05	10.1	2.44

Table 2.

The hydro physical indices and hydric stability of the peds, Hortic Anthrosols, Cluj-Napoca greenhouses (January 2010)

Variant	Water stability	CH	CO
V_1 control	49.1 Partial structured	3.44	5.16

The determination of the water stability of the aggregates reveals a value of 49.1, partial structured, which is also demonstrated by the lack of aggregates higher than 10 mm and the very low percent of aggregates with sizes of 5 mm (2.85%). A higher stability was recorded in micro-aggregates with sizes smaller than 1 mm, of 12.45% for these of 0.5 mm and 15.4% for these of 0.25 mm, respectively (table 3).

Table3

The percent of aggregates established function of the sizes of the structural aggregates – untreated control V_1

Sieve	g	%
I (5 mm)	0.57	2.85
II (3 mm)	1.00	5
III (2 mm)	0.56	2.8
IV (1 mm)	2.12	10.6
V (0.5 mm)	2.49	12.45
VI (0.25 mm)	3.08	15.4

The administration of the Pervaide produces an emphasized improvement of the soil physical properties, meaning the water stability of the soil aggregates and hydro-physical indices (table 4), until culture stubbing on July.

Table4

The physical and chemical traits of the Hortic Anthrosols USAMV Cluj-Napoca in variants treated with Pervaide

No. crt.	Hydric stability		CH		CO		Humus	
	Jan.	July	Jan.	July	Jan.	July	Jan.	July
V_2	68.4 Well structured	69.8 Well structured	3.34	8.84	5.01	13.26	11.42 Very big	12.45 Very big
V_3	73.95 Well structured	68.0 Well structured	3.45	8.36	5.17	12.54	11.2	12.14 Very big

The immediate effects can be observed in hydric stability of the aggregates, which increases immediate after product administration from 49.1 to 68.4% in variant where 2l/ha was administered and to 73.95% in variant where 4l/ha was administered, respectively.

This soil aggregation determines in time, better water retention and circulation in soil, fact revealed by the values of the wilting point coefficient, which when stubbing recorded much higher values, from 5.01 to 8.84 in V2 and from 5.17 to 12.54 in V3.

When both Pervaide treated variants are compared, we find that the pluses of water stability and other analyzed indicators are equally supplied by both variants. This enable us to state that the administration of 2 l/ha doses determines the improvement of soil properties and administration of a double doses by hectare is not sustainable and economic.

In order to perform a correct characterization of the structural soil status is necessary to indicate both the *degree of aggregation* and *structural composition* by percents of stabile aggregates categories. The difference of structural composition for the same degree of stable aggregation determines or explains fundamental differences of the physical properties of the soil.

Thus, in the same degree of stable aggregation, a too high content of big aggregates (over 5 mm) together with a too low content of small and very small aggregates characterize a soil with rough structure, packed aggregates, with low porosity and strongly cemented (CHIRIȚĂ, 1955).

In order to perform a qualitative estimation of the soil, CHIRIȚĂ suggested the use of some qualitative indices of the structure:

a) the qualitative index 1 (I_1) representing the ratio between the sum of the large aggregates category (I, II and III) and sum of the fine and small aggregates (IV and VI).

$$I_1 = \frac{I + II + III}{IV + V}$$

$$I_1V_1 = \frac{0.57 + 1.0 + 0.56}{2.12 + 2.49} = 0.46 \qquad I_1V_2 = \frac{2.02 + 1.77 + 1.09}{3.33 + 2.62} = 0.82 \qquad I_1V_3 = \frac{1.35 + 1.45 + 0.95}{3.47 + 3.33} = 0.55$$

The calculation of the qualitative index I_1 reveals a low quality in not treated control with reduced degree of aggregation with value of 0.5, and 0.46, respectively, while it has slight higher values when Pervaide was applied in quantity of 4 l/ha, 0.55, respectively and significant higher in variant with 2l/ha where the values of the quality index were double reaching 0.82. It confirms us once again the recommendation to administrate the doses of 2 l/ha as optimal.

b) the qualitative index 2 (I_2) representing the ratio between category IV and sum of the categories V and VI

$$I_2 = \frac{IV}{V + VI}$$

$$I_2V_1 = \frac{2.12}{2.49 + 3.08} = 0.38 \qquad I_2V_2 = \frac{3.10}{2.95 + 3.02} = 0.51 \qquad I_2V_3 = \frac{3.05}{3.70 + 3.39} = 0.39$$

The qualitative index I_2 reveals the same increase of the quality in variant V2 with a value of 0.51 recorded for the index, superior in both control variant and variant where a double dose of structure conditioner was administered, where the values were almost identical, of 0.38 and 0.39, respectively.

These values remain even when culture was stubbing. The values of the indices I_1 and I_2 in treated variants (V2 and V3), calculated on the basis of the ratio between big and small structural aggregates (tables 5 and 6), remained not changed.

Table 5

The percent of stabile aggregates function of the size of the structural aggregates , variants treated with Pervaide – January 2010

Variant	V_2		V_3	
Sieve	g	%	g	%
I (5 mm)	2,02	10,1	3,31	16,55
II (3 mm)	1,77	8,85	1,59	7,95
III (2 mm)	1,09	5,45	0,82	4,1
IV (1 mm)	3,33	16,65	3,10	15,5
V (0,5 mm)	2,62	13,1	2,95	14,75
VI (0,25 mm)	2,85	14,25	3,02	15,1

Table 5

The percent of stabile aggregates function of the size of the structural aggregates , variants treated with Pervaide – July 2010

Variant	V_2		V_3	
Sieve	g	%	g	%
I (5 mm)	1.35	6.75	1.36	6.8
II (3 mm)	1.45	7.25	1.03	5.15
III (2 mm)	0.95	4.75	0.51	2.55
IV (1 mm)	3.47	17.35	3.05	15.25
V (0,5 mm)	3.33	16.65	3.70	18.5
VI (0,25 mm)	3.41	17.05	3.95	19.75

CONCLUSIONS

The administration of the soil conditioners determines an improvement of the structural stability of soil, with immediate effects and, which determines in time a better water retention and circulation in soil.

Analyze of the qualitative indices of the structure shows that the administration of a quantity of 2 l/ha supplies an improvement of the soil properties and administration of a double doses by hectare is not sustainable or economic.

The indices of soil structural quality (*degree of structuration* and *structural composition* by percents of categories of stable aggregates) revealed a stable structuration by all culture vegetation time intervals.

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APRECIEREA STARII DE FERTILITATE A SOLURILOR DIN PERIMETRUL INTERBAZIAL CERNATESTI-MANASIA JUDETUL BUZAU, PRIN CARTARE PEDOLOGICA SI IDENTIFICAREA FACTORILOR NATURALI SAU ANTROPICI CE O LIMITEAZA

ASSESSMENT, BY SOIL SURVEY, OF CONDITION OF SOIL FERTILITY AND IDENTIFICATION OF ITS NATURAL AND HUMAN LIMITING FACTORS IN THE CERNĂTEŞTI-MANASIA INTERBASINAL AREA, BUZĂU COUNTY

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Cuvinte cheie: bazin hidrografic, eroziune, fertilitate, conservarea solului
Key words: erosion, hydrographic basin, fertility, improvement

SUMMARY

Soil survey carried out in the Cernăteşti-Manasia interbasinal area aimed at the identification of soil types, natural and human processes that influenced their genesis as well as the assessment of their actual fertilty condition. The collected data permitted to make the soil map at a 1:10000 scale, for the studied area.

Location of main soil profiles (depending on the modifications of the pedogenetic factors), morphological description and all the laboratory analyses have been carried out according to the ICPA Methodology, Bucharest, 1987.

As a result of the study, four soil types have been identified, namely: Cambic Chernozems on an area of 38.4 hectares, Regosols on an area of 107.1 hectares, Erodosols on an area of 47.9 hectares and Colluvic Alluvosoils on an area of 73.2 hectares, the present land use being pasture and arable land. Within this total mapped area of 266.2 hectares, Erodosols and Colluvic Alluvosoils represents 46%, Regosols 40%, and zonal soil, Cambic Chernozems, only 14%.

Limitative factors of fertility resulted from the land capability study of these agricultural lands, having in view the present uses, are the sheet erosion, land slope, categories of landslides and topsoil texture.

The degradation processes of soils by erosion and landslides, caused by human factors, modified the soil profile in some parts of the studied area, by its transformation from Cambic Chernozems into Erodosols and Colluvic Alluvosoils.

Cartarea pedologica intreprinsa in perimetrul interbazinal Cernatesti-Manasia a urmarit identificarea tipurilor de sol, a proceselor naturale sau antropice care au influentat geneza acestora precum si aprecierea starii lor de fertilitate actuala. Datele culese au permis realizarea cartogramei solurilor la scara 1: 10000, pentru zona studiata.

Amplasarea profilelor principale (functie de modificarile factorilor pedogenetici), descrierea morfologica si toate analizele de laborator s-au facut in conformitate cu "Medodologia de Studii Pedologice˝ elaborata de ICPA Bucuresti, 1987.

In urma studiului efectuat au fost identificate patru tipuri de sol si anume: cernoziom cambic pe o suprafata de 38,4 ha, regosol pe 107,1 ha, erodosol pe 47,9 ha si aluviosol coluvic pe 73,2 ha, cu folosintele agricole actuale pasune si arabil.

Din suprafata totala a perimetrului cartat de 266,2 ha, erodosolul si aluviosolul coluvic ocupa 46%, regosolul 40 % iar solul zonal, cernoziomul cambic numai 14 % . Factorii limitativi de fertilitate rezultati din studiul de pretabilitate al acestor terenuri agricole la folosintele actuale, sunt gradul de eroziune in suprafata, panta terenului, categorii de alunecari de teren si textura in orizontul superior.

Procesele de degradare a solurilor prin eroziune si alunecari, provocate de factorii antropici, au modificat profilul solului in anumite zone din perimetrul studiat, prin transformarea lui in timp, din cernoziom cambic in erodosol sau aluviosol coluvic.

1. MATERIAL AND METHOD

Interbazinal perimeter Cernatesti-Manas, with an area of 266.2 hectares, is located on the right side of the Buzau Slănic. In a study of land area cartogram was made sc. 1: 10 000 (Fig. 1).

Fig.1 An area cartogram studied soils

The area is characterized by a continental climate with average annual rainfall between 600-700 mm and average temperature of 10.50 C. Characteristic Slanicului tributary basins is the phenomenon of thermal inversion, which is the presence of relatively warm areas on the slopes in winter, due to a certain thermal stratifications. As a parent material dominates the clay, alternating with sandstones in various stages of alteration. Current agricultural uses are arable and pasture. They helped to intensify in some areas, degradation by erosion processes and landslides.

Following soil studies conducted within the confines Cernăteşti-Manasia, have identified four types of soil: chernozem, regosol, erodosol and aluviosol (Fig.2)

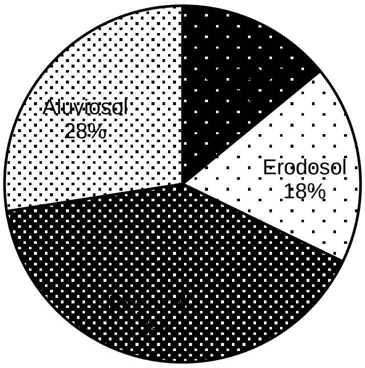

Fig.2 Soil types in the areal interbazinal Cernăteşti-Manasia

Determination of soil fertility factors linitativi area was studied by a suitability study carried out in accordance with "Soil Survey Medodologia ˝ developed by ICPA Bucharest, 1987.

Improving soil fertility status of the area studied, so that should be reflected in economic terms, is possible only through knowledge of the limiting factors and taking action to correct them.

2. REZULTATE OBȚINUTE

The characterised of soils studied

ERODOSOL - Soil occupies an area of 42.9 ha in the upper third of the basin. Current use is pasture, but had previously been arable. Abandonment of farming was due to the fast pace of soil degradation and soil is less efficient economice.Profilul: Bv-Bck-CC-C.

CHERNOZEM - Occupied area of 17.4 ha and the soil is used as pasture. Previous agricultural use vine was subsequently abandoned by the owners of the missing ground economice.profilul means: Am-Bv-B/CC.

REGOSOL - Soil occupies the upper third of the perimeter interbazinal studied in the area of 107.1 ha. It was formed from sandy clays underlying altered stoneware that appear to date in areas of landslides. Soil profile is at-Cn1-NC2.

Aluviosol-coluvic Soil is placed in the lower third of the perimeter area of 72.8 ha studied. Actual usage is arable, the percentage with maize. Soil profile is: Amk-Cn1-Cn2k (Af).

Physical and chemycal characterisation

The current state of soil cover from the perimeter Cernăteşti-Manas can be appreciated through a series of physical and chemical properties. Among them were chosen: clay content (<0.002 mm), humus, total phosphorus and pH values. Working depths are 0-20, 20-40 and 40-60 cm.

Changes in clay (<0.002 mm) to depth of 60 cm, the soils studied is shown in Figure 3. In chernozem drafts, as in regosolul typical clay content increases from surface to the profile, which defines a natural process of soil formation. The dynamics cambic erodisolul erosion of values is decreasing due to advanced, which was brought to the surface horizon cambic with higher clay content compared to parent material.

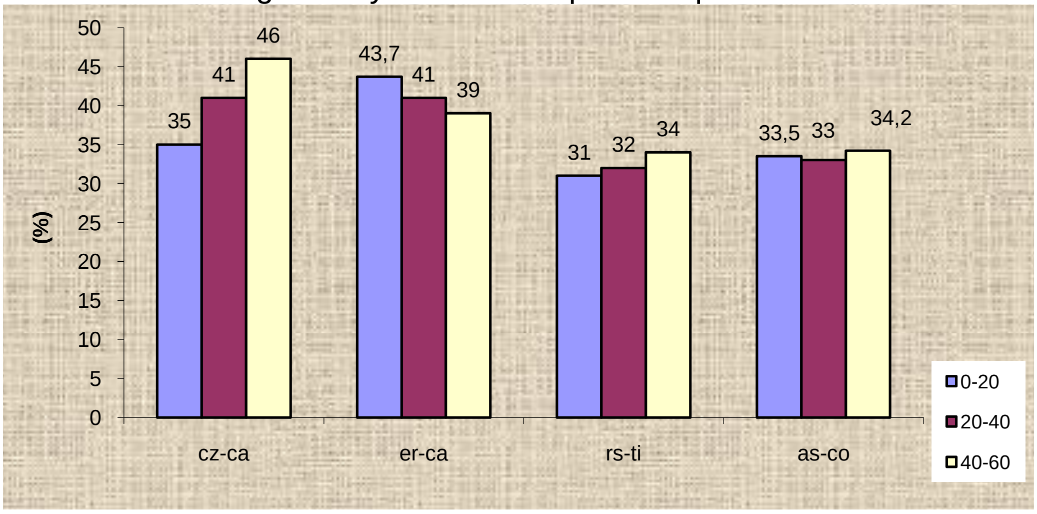

Fig.3 Clay content in 0-60 cm depth, the soils studied

Very low in humus content plays erodosolul cambic (fig. 4) the full depth of study. The greatest value has aluviosol coluvic the first 20 cm, which expresses a humus content in the middle. And presents a dimanică Regosolul chernozem-like, with higher values in the first 40 cm regosol and mold the next 20 cm of the profile.

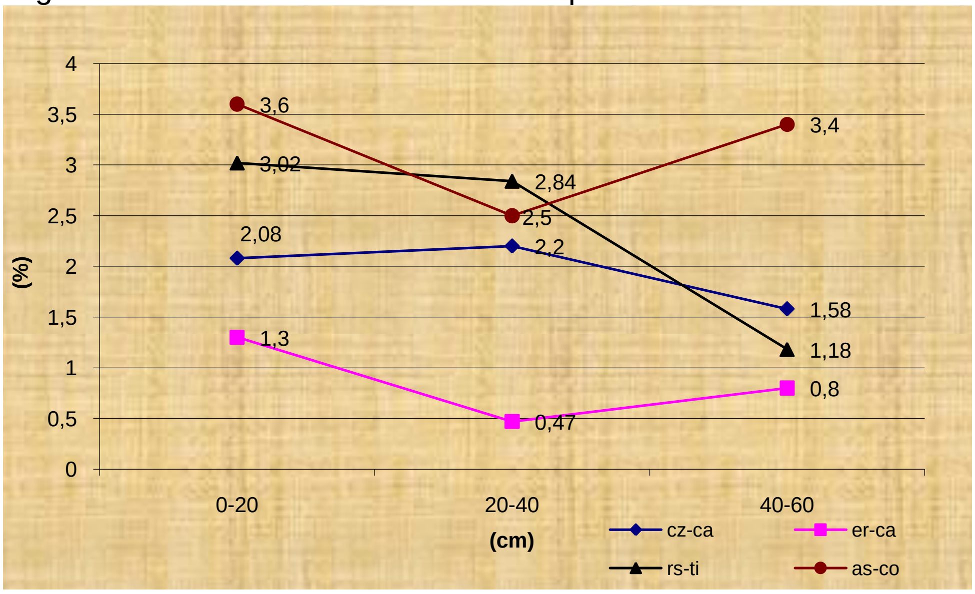

Fig.4. Humus content in the 0-60 cm depth, the soils studied

The highest values of pH on the working depth, it is between 8.7 and 8.9 cambic erodosolul (Figure 5). On other soils the values are between 6.89 and 7.8 which gives a neutral reaction - mildly alkaline.

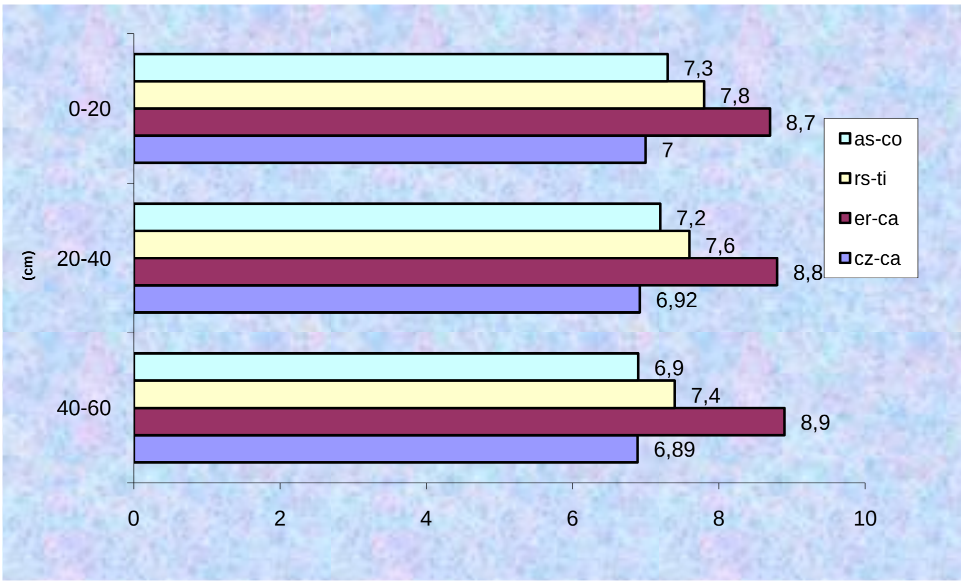

Fig.5 pH values in the 0-60 cm depth, the soils studied

In the first 20 cm, aluviosol coluvic, and typical chernozem regosolul cambic fosfot contained in all middle and cambic erodosolul containing very small. In the next 20 cm, and chernozem coluvic aluviosol cambic total phosphorus contained in the middle, regosolul typically small and very small erodosolul bill. In the next 20 cm cell phosphorus content is low to aluviosol colubic at regosolul typical chernozem and bills of exchange and very small to erodosolul cambic (fig.6)

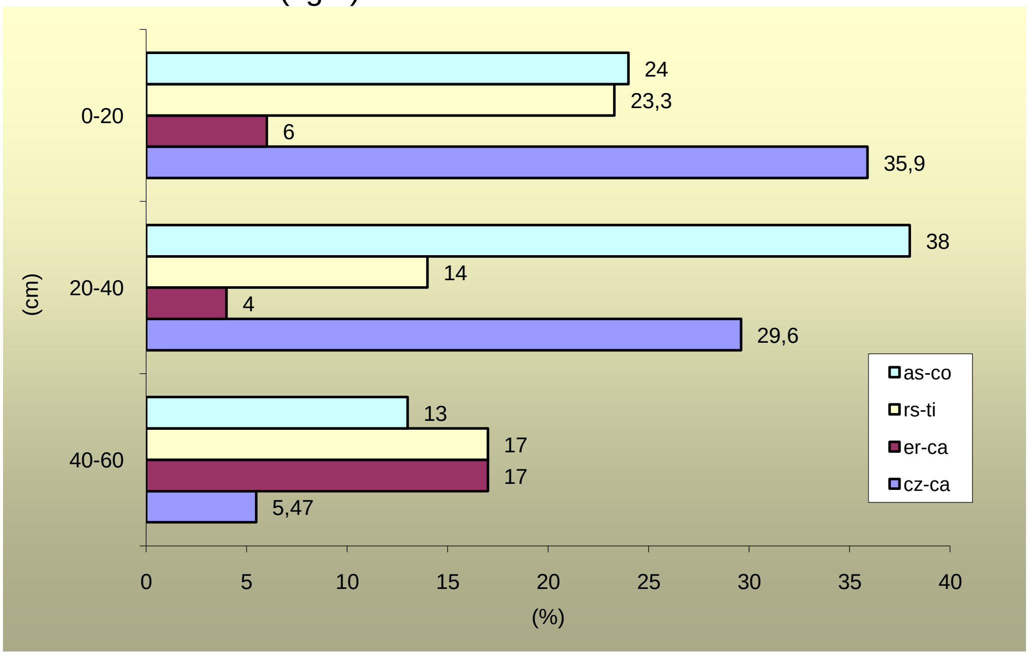

Fig.6 Total P2O5 content in 0-60 cm depth, the soils studied

Factors limiting fertility

From studying the suitability of arable land made for chernozem drafts, bills of exchange and aluviosol erodosolul coluvic they arise as limiting factors of fertiliztate: fine texture, slope, surface erosion, the volume of soil and humus content (Table 1).

Aluviosol coluvic fall within class II of suitability, with the only limiting slope.

Cambic Erodosolul ava is in CALS suitability, has limitations and is all too severe nepretabil the land. Actualăde status of soil degradation is the result of irrational exploitation of the Arabs, in a sloping field Sutu.

Suitability class that fits the bill of exchange is ernoziomul IIIa with moderate limitations for use as arable. Previous use largely influenced by the intensity of erosion damage

Suitability to be classified as arable chernozem drafts, bills of exchange and the aluviosol coluvic.

Table 1

Tipul şi subtipul de sol	Formula unității de teren
Cernoziom cambic	III_{CZ} – $P_3E_3C_2$ – t,h1
Erodosol cambic	V_{ER} – $E_5C_3V_2F_2$ – a,h1
Aluviosol coluvic	II_{AS} – P_2 – l,h3

The limiting factors of soils in the area studied fertilitatae are, on a geological parete retention and erosion, landslides and slope category, on the other hand rational exploitation of agricultural land. As a result, the low economic value of these lands and the owners do not have sufficient funds for their improvement and proper operation.

3. CONCLUSIONS

1. The perimeter of soils interbazinal Cernăteşti-Manasia, identified by the Soil Survey conducted in the area are: mold drafts, erodosol drafts, and aluviosol coluvic regosol typical.
2. Natural processes of degradation that reduced soil fertility in the area are: fluid erosion and landslides.
3. Inadequate exploitation of these soils in farmers intensified their degradation processes.
4. Physical and chemical characteristics emphasize low fertility erodosolului, which was effectively abandoned by its owners.
5. The process degradation is found that the limiting factors of land suitability study year used for agriculture.

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EVOLUTIA PRINCIPALELOR INSUSIRI FIZICE ALE SOLULUI SUB INFLUENTA SISTEMELOR NECONVENTIONALE DE LUCRARE A SOLULUI

THE EVOLUTION OF MAIN SOIL PHYSICAL CHARACTERISTICS AS INFLUENCED BY UNCONVENTIONAL TILLAGE SYSTEMS

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Key words: soil tillage, bulk density, penetration resistance, compactation degree, soil structure, structural stability, qualitative indices of structure, yields

REZUMAT

Proiectul are ca scop dezvoltarea durabila pe teritoriul Romaniei, conservarea solului, apei si carbonului, precum si contracararea efectelor schimbarilor climatice globale. Cercetarile efectuate urmaresc dezvoltarea cunoasterii fundamentale prin cerecetarea aprofundata a unor indicatori ai starii de calitate a solurilor din Campia Moldovei din perspectiva managementului integrat al solului si al apei. Cercetarile efectuate urmaresc cuantificarea influentei tehnologiilor agricole asupra regimului fizic, hidrofizic, termic, nutritiv si biologic al solului, precum si impactul acestor modificari asupra functiilor ecologice, energetice, hidrologice, biogeochimice si respiratorii a solului, in cadrul unor areale specifice Campiei Moldovei.

Cercetările au fost efectuate in cadrul Staţiunii Didactice, Ferma Ezareni a USAMV Iaşi intre anii 2007-2009. Campul experimental este situat in partea de est a Romaniei pe un cernoziom cambic cu textura argilo-lutoasa, pH de 6,8, un continut in humus de 3,7%, cu o fertilitate medie. Solul are o cantitate marere de argila în compozitia sa (38-43%) şi este dificil de lucrat în stare umeda. S-au investigat trei variante de sisteme de lucrare a solului – sistem conventional, sistem minim şi sistem semanat direct – într-o rotatie grau de toamna – rapiţa de toamna. Lucrarea prezinta rezultatele obtinute la cultura garaului de toamna cu privire la influenta sistemelor de lucrarea asupra unor însuşiri fizice ale solului.

Sistemele de lucrare modifică, cel puţin temporar, cateva din proprietăţile structurale ale solului cum ar fi stabilitatea hidrică, distribuţia agregatelor de structură, indicii calitativi şi diametru mediu ponderat. Toate sistemele au avut efecte semnificative asupra proprietăţilor analizate. Rezultatele indica faptul că sistemele de lucarare trebuiesc corelate cu cerintele plantelor, rotatia culturilor şi condiţiile pedoclimatice ale zonei.

ABSTRACT

The project aims the sustainable development in Romania, soil, water and carbon conservation, and counter-balances the effects of global climate change. Research carried out aimed at developing fundamental knowledge through in-depth inquiries of soil quality indicators of Moldavian Plain, regarding integrated management of soil and water. Research carried out also aimed to quantify the influence of agricultural technologies on physic, hydric, thermic, nutrient and biological soil regime, and ecological impact of these changes on ecological, energetically, hydrological, biogeochemical and breathing soil function, in specific areas of Moldavian Plain.

The experiment was conducted at the Didactic Station of the „Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iasi, Ezareni Farm, during *farming years 2007-2009. The experimental site is located in the East part of Romania on a chambic chernozem, with a clay-loamy texture, 6.8 pH units, 3.7 % humus content and a medium level of fertilization. The soil has high clay content (38-43%) and is difficult to till when soil moisture is close to the wilting point (12.2%). We have investigated three variants of soil tillage system – conventional tillage, minimum tillage and no-till – in the crop rotation made of wheat and raps. This paper presents the results obtained in winter wheat growing as concerns the influence of the tillage method on some soil physical characteristics.*

Tillage system modify, at least temporarily, some of the physical properties of soil, such as soil bulk density, penetration resistance, soil porosity and soil structural stability. All the tillage operation was significantly different in heir effects on soil properties. The results indicate that soil tillage systems must be adjusted to plant requirements for crop rotation and to the pedoclimatic conditions of the area.

INTRODUCTION

Soil tillage, besides new and direct effects, good for plant growing technologies, induces in soil long-term residual effects, which act on its physical and physico-mechanical characteristics, by modifying them (Jitareanu G., & al., 1999, Feiza V. and Cesevicius G., 2006). Soil physical characteristics have a major influence on the way of soil functioning within an ecosystem (Carter M., 1996, Fabrizzi K., & al., 2005). Plant growth and development, water regime and soil solution are tightly connected to soil physical and hydrophysical characteristics (Liebig M. & al., 2004, Pagliai M. & al., 2005). Therefore, the implementation of a certain tillage system must be done in concordance with all the aspects that may be influenced or may influence this system (Horn R., & al., 1994, Liebig M. & al., 2004). This requires the detailed knowledge of all elements contributing to soil fertility increase or diminution (Canarache A., 1990, Fabrizzi K. & al., 2005).

MATERIAL AND METHOD

The experiment was conducted at the Didactic Station of the „Ion Ionescu de la Brad” University of Agricultural Sciences and Veterinary Medicine of Iasi, Ezareni Farm, during farming years 2007-2009. The experimental site is located in the East part of Romania on a chambic chernozem, with a clay-loamy texture, 6.8 pH units, 3.7 % humus content and a medium level of fertilization. The soil has high clay content (38-43%) and is difficult to till when soil moisture is close to the wilting point (12.2%). We have investigated three variants of soil tillage system – conventional tillage, minimum tillage and no-till – in the crop rotation made of wheat and raps. This paper presents the results obtained in winter wheat growing as concerns the influence of the tillage method on some soil physical characteristics.

Tillage system modify, at least temporarily, some of the physical properties of soil, such as soil bulk density, penetration resistance, soil porosity and soil structural stability. All the tillage operation was significantly different in heir effects on soil properties.

This paper presents the results obtained in winter wheat growing as concerns the influence of the tillage method on some soil physical and hydrophysical characteristics. We have taken samples at sowing, emergence and on phenological phases typical of each crop, in order to determine soil moisture, bulk density and total aeration, utile and inactive porosity. We have also calculated wilting coefficient, field capacity, available moisture holding capacity, and settling degree. The analysis of distribution and structure hydrostability (SH) of structural macroaggregates was carried out according to Tiulin-Ericson method and certain indicators as mean weigh diameter (MWD), were determined by calculation.

Determinations were carried out at sowing, on vegetation and at harvesting, at three depths (0-10, 10-20 and 20-30 cm). Statistical processing of data was done by means of the analysis of variance.

RESULTS AND DISCUSSION

a. Influence of tillage systems on soil hydrophysical indices

In winter wheat crop, the mean values of field capacity (FC), obtained as average on experiencing years, for each variant, had a diminished variation interval, being comprised between 25.80 % g/g in the upper soil layer at sowing, at the 30 cm ploughed variant, and 22.77% g/g at the disk harrow-tilled variant, at harvesting.

In winter wheat crop, the range of values of field capacity was reduced. High values of field capacity (> 25 % g/g, according to ICPA scale, 1987) were registered only at sowing, at all tillage systems, in the surface layer.

We remarked that the values of field capacity diminished during vegetation period and according to depth, indifferently of tillage system; the values were higher as soil mobilization was more intense. Highest average value for the whole growing season has been reported in NT variant.

Table 1

Influence of soil tillage systems on hydrophysical indices

Soil tillage systems	FC		Available moisture holding capacity	
	% g/g	%	% g/g	%
NT	25.7	100.4	15.3	100.7
CT (M)	25.6	100,0	15.2	100,0
MT	25.4	99.2^{o}	15.0	98.7o

LSD $_{5\%}$ = 0.2 (% g/g)	LSD $_{5\%}$ = 0.2 (% g/g)
LSD $_{1\%}$ = 0.3 (% g/g)	LSD $_{1\%}$ = 0.3 (% g/g)
LSD $_{0,1\%}$= 0.5 (% g/g)	LSD $_{0,1\%}$= 0.5 (% g/g)

The potential water stock allowable to plants was slightly influenced by tillage system, the variation interval being diminished both from system to system and in vegetation or at depth.

Studying the mean values of available moisture holding *capacity (AMHC) in* winter wheat crop, we found out that it diminished during vegetation period and at depth, with different intensity, according to base tillage (*table 1*)..

As the values of the available moisture holding capacity of over 16% , registered especially at sowing, in upper layers, were considered to be “very high” (according to ICPA, 1987), and the ones over 13 % g/g as “high”, it resulted that the tillage system did not worsen this parameter on the soil on which the experiment was conducted.

The statistical interpretation of mean values has shown that NT variant determined an increase in available moisture holding capacity and field capacity at depth of 0-30 cm, but without a statistically insured difference, compared to the control, respectively CT (*table 1*).

b. Influence of tillage systems on indices of soil compaction

The influence of soil tillage on bulk density (BD) and on layers had a special importance; we could therefore, estimate more accurately how loosening or settling degree has influenced plant development and yield level.

During the vegetation period, the bulk density has increased in all variants and at all depths. In all variants, the most settled layers were upper layers, and this phenomenon diminished at depth; the lowest differences of values of the indicator between the two consecutive moments of sampling were signaled at the NT variant.

Statistical processing of obtained data, as an average of analyzed profile (0-30 cm) and during the vegetation period, in three years of experiment, has shown that bulk density had the highest values, with significant differences, compared to the control variant (+1.5%), at the MT variant. In NT system indicator values were lowest (*table 2*).

As the absolute values of bulk density or total porosity could not be adequately interpreted, in order to assess the soil settling condition, because their practical significance was different from a type of soil to another, according to it's texture [1], a complex indicator was calculated, which included bulk density, total porosity, and texture, respectively, degree of compaction (CD).

Studying data obtained in winter wheat crop, we have noticed that the compaction degree had lower values at sowing and in ploughed layer, for each variant increasing according to depth and in same time with vegetation development. Till harvesting, the values of compaction degree are increasing. The ploughed variants with furrow inverting are becoming intensely compacted at depth of 10-20 cm, where differences were the biggest. Soil layers, which were not mobilized through soil tillage, were compacted with the lowest intensity, as results as a initial high values of this index. The values between 1 and 10 indicate a weakly compacted soil, which needs loosening of third emergency (*table 2*). Our results have shown that in a short-term interval, the compactation degree did not change significantly, no matter what tillage system has bean used (*table 2*).

Table 2

Influence of tillage systems on bulk density

Soil tillage systems	BD		CD	
	g/cm^3	%	% v/v	%
MT	1,33	101,5*	4.5	147.9
NT	1,30	99,47	2.6	86.6
CT (M)	1,31	100,0	3.0	100.0

$LSD_{5\%}$= 0,02 g/cm^3
$LSD_{1\%}$= 0,03 g/cm^3
$LSD_{0,1\%}$ = 0,05 g/cm^3

c. Influence of tillage systems on soil porosity

The values of total porosity (TP) decrease from sowing to harvesting in all tillage systems variants. The statistical interpretation of mean values has shown that NT system determined an increase of total porosity at 0-30 cm layer, but without a statistically insured difference compared to the control variant (*table 3*). Aeration porosity (AP) becomes smaller at the same time with depth increasing, in all vegetation stages, in all soil tillage systems. Efficient porosity (EP) was not significantly influenced by depth, growing stages or tillage systems (*table 3*).

Table 3

Influence of tillage systems on soil porosity

Soil tillage systems	TP		EP		AP	
	(% v/v)	%	(% v/v)	%	(% v/v)	%
NT	50.8	100.6	17.3	101.2	11.8	100.9*
CT (M)	50.5	100.0	17.1	100.0	11.7	100.0
MT	49.8^o	98.6	16.0	93.6 ^{o}	11.7	100.0

$LSD_{5\%}$= 0.6 (% v/v)	$LSD_{5\%}$= 0.7 (% v/v)	$LSD_{5\%}$= 0.1 (% v/v)
$LSD_{1\%}$= 0.9 (% v/v)	$LSD_{1\%}$= 1.2 (% v/v)	$LSD_{1\%}$= 0.1 (% v/v)
$LSD_{0.1\%}$ = 1.8 (% v/v)	$LSD_{0.1\%}$ = 2.1 (% v/v)	$LSD_{0.1\%}$ = 0.3 (% v/v)

d. Influence of tillage systems on some indicators of soil structure

The mean weigh diameter (WMD) of structural aggregates has recorded a decreasing in vegetation period on layers 0-10 and 10-20 cm, and a slight increase till harvesting. At the depth of 20-30 cm, where the effect of conservation practices was not felt, the diameter of aggregates has increased constantly till harvesting.

The statistical analysis of mean values has shown that the MT system has favored the intensification of structure formation, finding on this variant aggregates with agronomic value, as effect of accumulation of organic matter at soil surface (*table 4*). Statistical analysis showed that the MWD had the highest values in the MT system and minimum in CT system, but no statistically differences was calculated between each variant and control.

The structure hydrostability (SH), indifferently of the vegetation stage or tillage variant, has increased with depth, having a peak value in the 20-30 cm layer. The tilled variants without furrow inverting had high values of structure hydrostability in upper layers (0-10 and 10-20 cm). In the NT variant it has bean recorded the best structure hydrostability, at depth of 0-30 cm (*table 4*).

The statistical analysis of mean values on profile and for the entire vegetation period has classified the variants according to data presented in table 2, the differences between variants being greater, and the differences compared to the control variant is not statistically significant. The greatest structure hydrostability (SH) on the analyzed profile was determined at the NT variant, due to higher values of the indicator on 20-30 cm layer, in comparison with the same depth for all other treatments. In comparison with the control variant, in both unconventional systems the SH values were higher.

Table 4

Influence of tillage systems on some indicators of soil structure

Soil tillage systems	MWD		SH		AI	
	mm	%	%	%	mm	%
NT	4,72	100,2	72,6	104,2	60,07	108,1
MT	5,12	108,9	70,8	101,6	56,09	100,9
CT (M)	4,70	100,0	69,7	100,0	55,59	100,0

MWD	SH	AI
$LSD_{5\%}$= 0.8 mm	$LSD_{5\%}$= 7,5 (% v/v)	$LSD_{5\%}$= 10.0 (% v/v)
$LSD_{1\%}$= 1.4 mm	$LSD_{1\%}$= 12.5 (% v/v)	$LSD_{1\%}$= 16.5 (% v/v)
$LSD_{0.1\%}$ = 2.5 mm	$LSD_{0.1\%}$ = 23.3 (% v/v)	$LSD_{0.1\%}$ = 30.8 (% v/v)

The analysis of hydrostable aggregates to total percentage has shown that on studied profile, the structural elements from NT variants were more stable at spreading action of water. The values of aggregation index (AI) have increased at depth and during vegetation period at all the variants, excepting the CT variant (below the depth of 10 cm), because of the stress caused by soil continuous settling at this variant, which deteriorate the structure quality with time.

e. The influence of tillage system on winter wheat yield

Modern, intensive, high yielded agriculture places great demand on soil and insufficient knowledge of the way in which soil reacts to this sort of solicitations may have negative consequences, reflected by degradation processes, that tent to destroy their yielding capacity. The elaboration of certain tillage system must have in view the soil conditions, plant and climate which can influence or can be influenced by that system.

Tillage system and level of fertilizer determined difference in crop production, usually being bigger in conventional variants but not always significant statistically.

Table 5

The influence of tillage system on winter wheat yield

Tillage systems	Yield (kg/ha)	%	Difference (kg/ha)	Signification
NT	5210	104,6	226,7	xxx
CT (M)	4983	100,0	-	-
MT	4560	91,51	-423,3	ooo

$LSD_{5\%}$= 65,6 kg/ha
$LSD_{1\%}$= 108,8 kg/ha
$LSD_{0,1\%}$ = 203,3 kg/ha

CONCLUSIONS

Field capacity diminished during vegetation period and according to depth, indifferently of tillage system. The values were higher as soil mobilization was more intense.

The potential moisture capacity available to plants was slightly influenced by soil tillage system, the variation interval of the indicator being diminished both from system to system and on vegetation or depth. Because the values of available moisture holding capacity over 16%, registered at sowing in the upper layers, were very high (ICPA, 1987) and the values over 13 % g/g were high, the tillage system did not worsen this parameter in short term on the soil on which the investigations were carried out.

The bulk density has increased in all variants and according to depth; the highest settling degree was found in upper layers, at all variants; the phenomenon was reduced with depth. Bulk density had the highest values, with significant differences, compared to the control variant (+1.5%), at the MT variant. In NT system indicator values were lowest.

The mean values on the studied profile, between 1 and 10 %v/v, determined at crop harvesting, show that soil was weakly compacted (according to value classes of settling degree I.C.P.A., 1987) and requires loosening of the third emergence; therefore, in a short time interval, the compactation degree is not significantly changed, indifferently of tillage system. A progressive increase in this parameter was registered from sowing to harvesting and according to depth, in all soil tillage variants.

The values of total porositydecrease from sowing to harvesting in all tillage systems variants. The statistical interpretation of mean values has shown that NT system determined an increase of total porosity at 0-30 cm layer, but without a statistically insured difference compared to the control variant. Aeration porosity becomes smaller at the same time with depth increasing, in all vegetation stages, in all soil tillage systems. Efficient porosity was not significantly influenced by depth, growing stages or tillage systems

The MT system has favored the intensification of structure formation, finding on this variant aggregates with agronomic value, as effect of accumulation of organic matter at soil surface. Statistical analysis showed that the mean weigh diameter had the highest values in the MT system and minimum in CT system, but no statistically differences was calculated between each variant and control.

The structure hydrostability (SH), indifferently of the vegetation stage or tillage variant, has increased with depth, having a peak value in the 20-30 cm layer. The tilled variants without furrow inverting had high values of structure hydrostability in upper layers (0-10 and 10-20 cm). In the NT variant it has bean recorded the best structure hydrostability, at depth of 0-30 cm

The analysis of hydrostable aggregates to total percentage has shown that on studied profile, the structural elements from NT variants were more stable at spreading action of water. The values of aggregation index (AI) have increased at depth and during vegetation period at all the variants, excepting the CT variant (below the depth of 10 cm), because of the stress caused by soil continuous settling at this variant, which deteriorate the structure quality with time.

The results indicate that soil tillage systems must be adjusted to plant requirements for crop rotation and to the pedoclimatic conditions of the area. Establishing systems of soil tillage for all components of the crop rotation sequence resulted in a better utilization of the other technological factors, soil water conservation, maintaining soil physical conditions and reduction in fuel consumption.

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DINAMICA AZOTULUI NITRIC DIN SOL LA CULTURA DE GRAU IN FUNCTIE DE IRIGARE, LUCRARILE SOLULUI SI FERTILIZARE

THE DYNAMICS OF THE NITRIC NITROGEN FROM THE SOIL FOR WHEAT CROP FUNCTION OF IRRIGATION, SOIL TILLAGE AND FERTILIZATION

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Key words: nitric nitrogen, soil tillage, fertilizers, irrigation

REZUMAT

În lucrare se prezintă dinamica azotului nitric din solul cernoziomic baticalcaric de la SCDA Caracal la cultura de grâu, la date diferite din timpul perioadei de vegetație.

Dinamica azotului nitric din sol este analizată în funcție de regimul de irigare, lucrările solului şi dozele de azot aplicate.

În concluzie, conținutul de azot nitric din sol la cultura de grâu a înregistrat valori diferite în funcție de data la care s-au recoltat probele de sol şi de tratamentele aplicate, cele mai mici valori înregistrându-se în cazul regimului optim de irigare, urmat de irigarea limitată şi neirigat.

ABSTRACT

The paper presents the dynamics of nitric nitrogen of the baticalcaric chernozem soil from the SCDA Caracal under a wheat crop at different data from the vegetation period.

The dynamics of the soil nitric nitrogen is analyzed function of the irrigation regime, tillage and the nitrogen doses applied on a constant phosphorus background.

As a conclusion, the soil nitric nitrogen content with the wheat crop has recorded different values function of both the taking of soil samples date and the treatments, the lowest quantities being recorded with the optimal irrigation regime followed by the limited irrigation and lack of irrigation.

INTRODUCTION

Fertilizers are the main agrochemical means of quantity and quality modification of crops influencing soil fertility.

The correct use of fertilizers imposes the knowledge of some physical and chemical properties including some phenomena that are triggered in the soil by some substances or elements.

In our country the prognosis of nitrogen fertilizers effect is different function of the soil (through special indexes for nitrogen regime), function of the cultivated plant (necessity and consumption of N), fertilizer type, method and appliance technology and also other important factors for the nitrogen circuit.

“Without nitrogen there is no life”. It is found in quantity of 0,2- 4,5% in the dry substance of the plants (Romulus Mocanu, 2003).

Nitrogen is considered an element of growth. The growth of plants can’t be conceived without the biosynthesis of proteic substances, which can’t take place without nitrogen. Through chlorophyll, nitrogen contributes to the photosynthetic activity.

The main source of nitrogen for the nourishment of the plants is the nitric nitrogen this one being the most accessible and soluble form of nitrogen.

The dynamic of the nitric nitrogen from the soil is influenced by the conditions of the cultivation(fertilization, irrigation, agricultural work), by weather(temperature, humidity) and by the activity of the micro-organisms.

MATERIAL AND METHOD

Through this research we have tried to discover the effect of soil tillage and chemical fertilizers on the nitric nitrogen dynamics for the baticalcaric chernozem soil from SCDA Caracal for wheat crop.

The experiment had the following factors:

A factor – irrigation regime with 3 graduations:
- a_1 – normal irrigation (50% from the active humidity);
- a_2 – limited irrigation (1/2 from the normal irrigation);
- a_3 – lack of irrigation.

B factor – the method of soil tillage with 3 graduations:
- b_1 – ploughing at 18 – 20 cm + harrowing, the preparation of seed layer through 2 soil disking
- b_2 – chisel at 18 – 20 cm + harrowing and 2 soil disking for wheat
- b_3 – chisel at 8 – 10 cm + harrowing and 2 soil disking for wheat

C factor - nitrogen fertilization on a uniform fund of P_{80} with 4 graduations and the following doses:
- c_1 – N_0
- c_2 – N_{50}
- c_3 – N_{100}
- c_4 – N_{150}

The experiment took place acording with the method of subdivised plots.

The phosphorus fertilizers were applied every fall (as superphosphorus simple with 20% P_2O_5) before the ploughing and the nitrogen as ammonium nitrogen with 33,5% N in 2 steps – N_{25} in the fall and the rest in early spring. We cultivated Lovrin 34 with the density of 550 b.g./m^2, at the distance of 12,5 cm between rows, at 5-6cm depth, seed treatment was made with Sumi 8 Plus in dose of 1,5 l/t seed.

The soil were the experiment was located is baticalcaric chernozem that has in the arable layer a moderate acid reaction. This soil can be considered as average supplied with nitrogen and the available phosphorus content is higher that the total nitrogen and is reduced on the soil profile from 44,9 to 20,9 ppm.

The dynamics of nitric nitrogen from the soil was analyzed from November 1, before applying nitrogen doses, continued with 3 more dates which follow different time periods from the appliance of this fertilizers and vegetation phases: December 8 (30 days from the appliance of the first dose), April 25 (30 days from the second dose), and July 28 at wheat harvesting.

RESULTS AND DISCUSSIONS

Function of the irrigation regime, we notice that the medium values of nitric nitrogen were different from one period to another one, being influenced by the irrigation from before.

The smallest values were registred for the normal irrigation regime (50% from the active humidity interval) during the periods of lifting soil samples (8,98 to 17,99 ppm) but also as an average of those (13,44 ppm), than the limited irrigation with values from 10,14 to 21,49 ppm and an average of 16,45 ppm, and in conditions of lack irrigation, the highest values, from 11,35 to 34,58 ppm, the average being of 24,19 ppm.

Function of the basic soil tillage, the content of nitric nitrogen was different, for ploughing, the values of nitric nitrogen wasbetween 10,25 to 24,99 ppm with an average of

18,09 ppm, the highest values (10,82 – 26,75 ppm) were registred for the chisel at 18 – 20 cm with an average of 19,60 ppm and the smallest values were registred for the chisel at 8 – 10 cm, the values of nitric nitrogen varied from 9,40 to 21,66 ppm with an average of 16,39 ppm.

Following the dynamics of fertilizer doses that were applied, the content of nitrogen rose concomitantly with the growth of fertilizer doses, from 5,30 to 13,08 ppm for N_0; from 9,52 to 20,51 ppm, for N_{50}; from 12,12 to 31,78 ppm when we applied N_{100}, and for N_{150} dose, from 13,69 to 34,06 ppm.

The average calculus indicated the same aspect of nitric nitrogen variation of values, a constant growth from the unfertilized variant to the maximum dose of nitrogen (from 9,03 to 25,15 ppm).

The analysis of the irrigation regime function of the soil tillage, nitrogen doses and the periods of lifting the soil samples indicated differences which appear in the dynamics of this type of nitrogen from the soil.

In conditions of normal irrigation, when the basic soil tillage was made with the normal plough, the dynamics of nitric nitrogen in the soil in comparison with the applied doses was different. In conditions of lack of fertilization, the content of nitric nitrogen was reduced and it registered a drop from fall (in November – 4,40 ppm) until harvesting (in july – 2,51 ppm).

The phenomenon was different when we applied nitrogen doses, its content became higher with every phase of analysis and also function of the applied fertilizer doses (from N_{50} to the maximum dose of N_{150}). We noticed a dropping of nitric nitrogen with the growing of wheat plants.

Using the chisel at 18-20 cm as the basic soil tillage the values of nitric nitrogen in the soil were higher no matter the doses of nitrogen that were applied (especially in conditions of lack of fertilization).

Using the chisel at 8-10 cm lead to smaller values of nitric nitrogen in the soil in comparison with the chisel at 18-20cm with some fluctuations function of the applied nitrogen doses.

In conditions of limited irrigations (1/2 from the normal irrigation), the values of nitric nitrogen in the soil registered a small growth for all the factors.

When we used the normal plough at 18-20 cm depth, the content of nitric nitrogen of the soil presented higher values starting with the unfertilized variant (from 6,30 to 22,31 ppm) and continued with the other ones which received bigger doses, for N_{50} from 6,97 to 22,07 ppm, in case of N_{100} from 12,60 to 25,20 ppm and in the case of 150 kg N/ha nitrogen the growth was from 16,56 to 35,83 ppm.

Soil tillage with the chisel at 18-20 cm determined values of nitric nitrogen equal to those obtained in the case of normal ploughing, with the following variations: in case of N0 from 4,45 to 11,55 ppm, for N_{50} from 13,12 to 22,05 ppm, for the dose of N_{100} from 11,00 to 25,86 ppm and for the maximum applied quantity rose from 9,00 to 26,38 ppm.

The use of chisel at 10 cm permitted the accumulation of nitric nitrogen in smaller quantities than the ones accumulated when we used the chisel at 18-20 cm and they were almost equal with those accumulated when we used the plough.

In conditions of lack of irrigation for the wheat crop, the values of nitric nitrogen in the soil were higher than the other variants starting with the unfertilized variant.

The use of plough determined a reduced content of nitric nitrogen in the soil for the unfertilized variant (from 3,38 to 12,34 ppm); when we applied 50 kg of nitrogen we registered values from 5,22 to 27,56 ppm; for N_{100} the values of nitric nitrogen in the soil were from 14,70 to 45,47 ppm; and for N_{150} from 13,91 to 47,12 ppm.

The use of chisel at 18-20 cm lead to the higher content of nitric nitrogen in the soil, values that in case of lack of fertilization varied from 3,65 to 22,97 ppm.

For the variants where we applied fertilizer, the content of nitrogen was: for N_{50} from 9,45 to 37.80 ppm, for N_{100} from 13,65 to 59,42 ppm and for N_{150} from 26,77 to 62,16 ppm.

The use of chisel as basic soil tillage in the fall at depth of 8-10 cm permitted the accumulation of important quantities of nitric nitrogen in the soil, but smaller than those from the previous variant, the registred doses being: for N_0 from 3,02 to 16,83 ppm, for N_{50} from 7,87 to 17,85 ppm, for N_{100} from 18,11 to 59,90 and for N_{150} from 15,25 to 42,92 ppm.

Generally we can appreciate that the chisel, although with variable depth, determined the accumulation of bigger quantities of nitric nitrogen in the soil, which was highlighted by the samples lifted during the vegetation period of wheat crop and by the influence of irrigation regime and nitrogen doses.

Table 1

The values N-NO_3^- and N-NH_4^+ ppm for wheat

Variant	Before applying nitrogen	30 days from the appliance of the first dose of nitrogen	30 days from the appliance of the second dose of nitrogen	Harvesting
$a_1b_2c_1$	9,71	8,27	13,91	11,28
$a_1b_2c_2$	9,58	13,26	13,02	9,71
$a_1b_2c_3$	25,99	24,96	13,91	10,33
$a_1b_2c_4$	21,79	20,21	13,28	7,52
$a_1b_3c_1$	6,43	7,87	9,07	5,02
$a_1b_3c_2$	8,53	13,26	12,86	10,23
$a_1b_3c_3$	10,50	12,60	4,59	3,97
$a_1b_3c_4$	21,52	29,27	18,92	10,16
$a_2b_1c_1$	22,31	6,30	11,55	9,18
$a_2b_1c_2$	18,37	22,07	9,09	6,97
$a_2b_1c_3$	19,81	25,20	17,35	12,60
$a_2b_1c_4$	35,83	24,02	16,56	17,59
$a_2b_2c_1$	11,55	11,02	4,46	4,35
$a_2b_2c_2$	22,05	21,29	15,25	13,12
$a_2b_2c_3$	24,03	25,86	18,40	11,00
$a_2b_2c_4$	26,38	28,08	11,50	9,00
$a_2b_3c_1$	9,45	10,63	6,56	5,35
$a_2b_3c_2$	15,22	18,51	16,56	11,29
$a_2b_3c_3$	27,56	29,02	15,77	10,80
$a_2b_3c_4$	25,33	25,62	19,45	10,47
$a_3b_1c_1$	12,34	6,56	3,41	3,38
$a_3b_1c_2$	27,56	26,41	9,45	5,22
$a_3b_1c_3$	37,14	45,47	26,04	14,70
$a_3b_1c_4$	47,12	57,59	23,93	13,91
$a_3b_2c_1$	22,97	8,66	4,46	3,65
$a_3b_2c_2$	22,71	37,80	13,67	9,45
$a_3b_2c_3$	49,61	59,42	25,77	13,65
$a_3b_2c_4$	60,11	62,16	35,77	26,77
$a_3b_3c_1$	14,70	16,83	14,20	3,02
$a_3b_3c_2$	17,85	11,81	9,72	7,87
$a_3b_3c_3$	59,90	35,96	26,30	18,11
$a_3b_3c_4$	42,92	33,60	15,25	16,51

Conventional signs

A – irrigation regime	B – soil tillage	C – fertilization
a_1 – normal irrigation a_2 – limited irrigation a_3 – lack of irrigation	b_1 – ploughing at 22-25 cm +harrowing b_2 – chisel with 35 cm distance between knives and 22-25 cm depth +harrowing b_3 – chisel with 35 cm distance between knives and 10 cm depth +harrowing	c_1 – N_0 c_2 – N_{50} c_3 – N_{100} c_4 – N_{150} Constant fund of P_{80}

CONCLUSIONS

1.The content of nitric nitrogen in the soil for wheat crop registred different values function of the date of lifting samples and used treatments, the smaller quantities being registred in conditions of normal irrigation, then limited irrigation and lack of irrigation.

2. Function of the soil tillage and in conditions of normal irrigation, the value of nitric nitrogen in the soil was higher for normal ploughing at 18-20 cm, followed by the chisel at 18-20 cm and the smallest when we used the chisel at 8-10 cm +harrowing.

3.Regarding the nitrogen fertilization, the content of nitric nitrogen rose with the growing of fertilizer doses no matter the irrigation regime.

4.The smallest content of nitric nitrogen was registred at harvesting, and in what concerns the fertilization, for the variant without nitrogen.

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STUDIUL AGROCHIMIC AL SOLURILOR – ABORDĂRI DE CONȚINUT ŞI APROFUNDARE

THE AGROCHEMICAL STUDY OF SOILS – CONTENT AND THOROUGH STUDY APPROACHES

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Keywords: mapping, agrochemical studies

REZUMAT

Situația studiilor (cartărilor) agrochimice în țara noastră este marcată de o pregnantă incertitudine bazată pe motivații economico – financiare, dar şi de mentalitate sau neadaptare la noi cerințe. Pentru revigorarea domeniului şi chiar pentru a preveni dispariția acestor preocupări în studiul agrochimic al solurilor se impun măsuri de organizare şi legiferare care pot preveni hazardul şi incertitudinea realizării acestor studii deosebit de utile în menținerea şi sporirea fertilității solurilor din țara noastră. În paralel însă este oportună o revizuire a conținutului acestor studii şi explorarea unor noi aspecte ce necesită abordări şi interpretări novatoare.

Lucrarea de față îşi propune ca pornind de la metodologia actuală a studiilor agrochimice să abordeze îmbunătățirea conținutului acestora şi să evalueze la nivel actual cerințele de conținut şi diseminare în tehnologiile agricole şi horticole.

ABSTRACT

The issue of agrochemical studies (mappings) in our country has undergone an uncertain time due to economic and financial reasons, as well as to considerations related to mentality or inadaptation to new requirements. For the revival of the field and even in order to prevent the dissapearance of these preoccupations within the agrochemical study of soils, there are organzation and legal measures to be undertaken to prevent the hazard and uncertainty of these highly useful studies for the maintanance and enhancement of soil fertility in our country. At the same time, however, it is required to conduct a revision of these studies' content and explore new aspects that demand for innovating approaches and interpretations.

The present paper sets forth from the present methodology of agrochemical studies and aims at approaching the improvement of their content and assess the present level of content requirements and dissemination in agricultural and horticultural technologies.

INTRODUCTION

The uncertainties involved in conducting agrochemical studies-mappings in the field are due to certain factors and conditions outside the system of pedologic and agrochemical studies and reside in economic reasons and legal determinations, as there is no adequate legal basis, alongside mentality-related determinations. Previous achievements in the field of agrochemistry have led to "real agrochemical data bases" at the level of county OSPAs, which are mostly employed in the field of soil quality monitoring, but nevertheless limited in the field of the maintenance or enhancement of soil fertility or ecologic reconstruction of areas degraded by means of different factors (either chemical, physical or biologic) (ICPA, 1998). The assessment of the danger in the unjustified restriction to a minimum of agrochemical studies in the field, we have systematically tackled this special issue throughout the last decade, with an emphasis on their employment and extensive usefulness that may revive this useful agrochemical activity (Rusu, 2006; Rusu et al 2005, Rusu et al 2010).

MATERIAL AND METHOD

The paper aims at assessing methodology in our country compared to the analytical technique and dissemination of agrochemical studies in community countries and suggest innovating content approaches that may enhance the efficiency of the activity (ICPA 1981; Ducarme, 1997).

RESULTS AND DISCUSSIONS

a) Methodology for agrochemical studies in Romania and EU countries:

Agrochemical studies (mappings) in our country are conducted according to a rather thorough methodology, by undergoing several stages (phases), including laboratory activities and mappings (fig. 1).

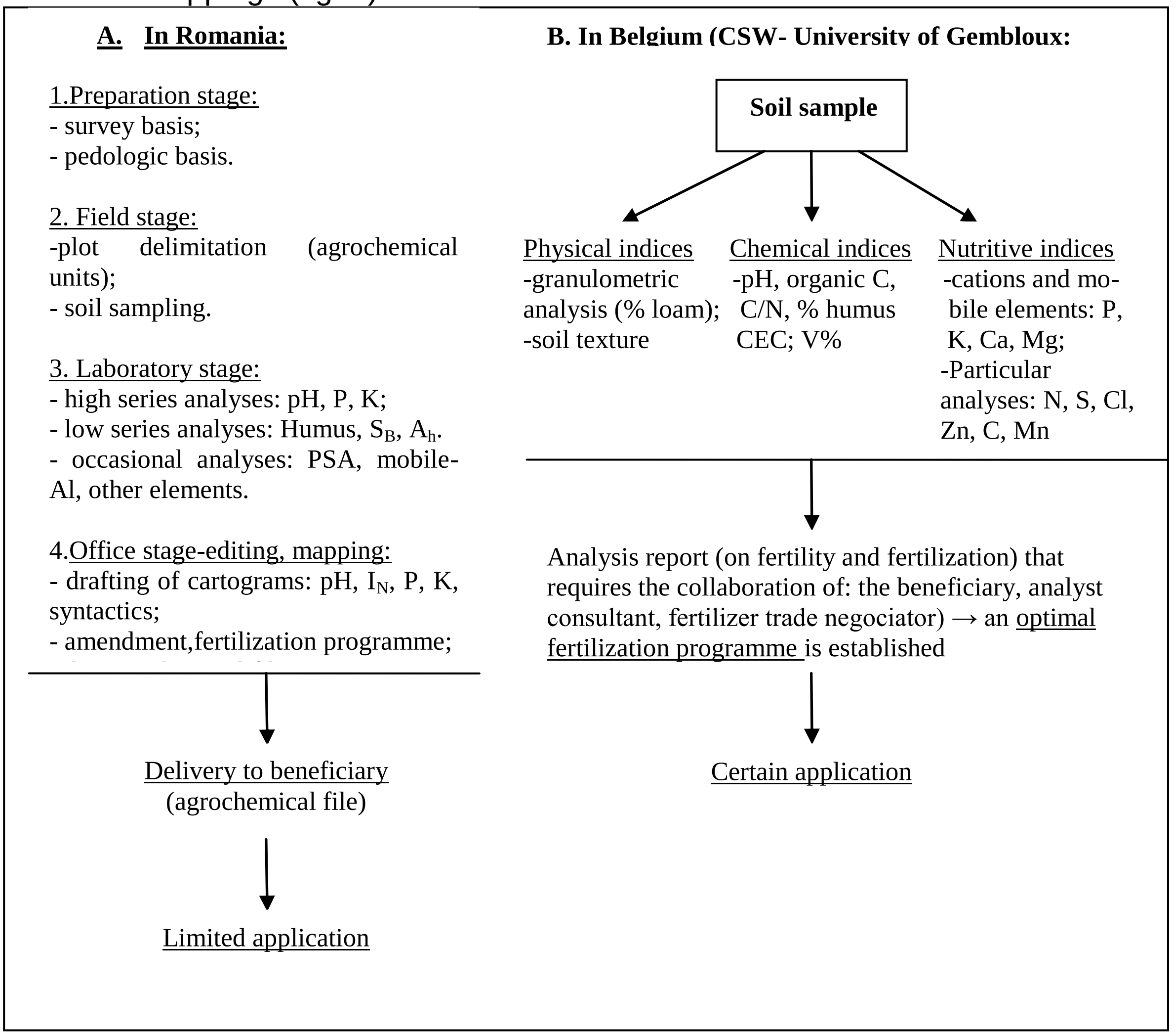

Fig. 1. Organogram of soil agrochemical procedures in Romania and Belgium (CSW) (ICPA 1981; Ducarme 1997; CSW 2008)

Previous activity that is partially comparable has exerted scientific-agrochemical effects in time, as well as practical effects:

A. In Romania

- in the agrochemical field (scientific and methodological):

- several codes for agrochemical mapping were created in counties with an application in agrochemical monitoring;

- a unification of analytical methods was achieved, as well as adequate limits of interpretation for all indicators;

- experimental fields with a part in the improvement and control limited (long-term experiments in the ICCPT network);

-methods for the calculus and diversification of amendment and fertilizer doses;

- deficiencies: reduction of surfaces and n. of analyses, reduced application, modest equipment of OSPA laboratories, lack of inter-laboratory control;

- in fertilization and fertility practice:

- lack of an agrochemical control of the fertilizer market;

- limited application of studies and recommendations;

- uncontrolled fertilization- soil amendments- limited action;

- evolution of degradation processes: acidification, reduction of the organic-C content, dephosphatizing, extension of NO_3^- contaminated areas, as well as heavy metal-contaminated areas (with Pb, Cd, Cu, Zn);

B. In Belgium

- in the agrochemical field (scientific and methodological):

- unitary and collaboration structure of institutions involved (analysis laboratories, university laboratories, farmers' associations, and other professional associations, banks etc)

- generalization of soil chart models (of samples) and advantages;

- analysis methods with comparable procedures and results;

- a generalization of the common analysis (extraction)of exchangeable elements in NH_4OAc+EDTA, at a 4.68 pH;

- compulsory testing of fertilizers in experimental fields;

- harmonizing and correlation of results and interpretations by means of an "inter-laboratory control";

- current promotion of CEC, organic-C (humus, N) and microelement analyses;

- definition of norms for the application of fertilizers;

- alongside the immediate vulgarization of results, campaigns for the information of farmers are organized for the employment of soils analyses;

- creation of computerized "data banks" for the employment of soil analyses by different users and for different purposes;

- connected soil analyses: forest soils, land management, environmental protection; high laboratory equipping;

- in fertilization and fertility practice:

Implementing of agrochemical analysis and control system targets three main directions:

- Application of “maintenance amendment” in order to compensate for calcium losses through leaching and crop “export” (300-600 kg $CaCO_3$/ha/year); the application of lime or lime-magnesium amendments is conducted according to initial acidity (to neutralize) and the value (ability) to neutralize of the amendment (VN)
- Stabilization of the humus content in the soil, considering that annually 1-2 t/ha if the humus reserve are mineralized. Compensated losses (stable manure, plant residues, green fertilizers, “humiferous amendments”
- Mineral fertilization according to 2 criteria: “application of the maintenance dosis” that compensates for the productive consumption and losses of elements and “recovery fertilization” that prevents and corrects nutrition deficiencies.

Differences between the two systems implemented in agrochemical studies (mappings) are extensive and differ mostly in terms of the degree of dissemination and application of soil analyses.

b) Possibilities for the improvement of the content of agrochemical studies and mappings:

For a correct approach in the implementation of improved content issues of agrochemical studies, it is first required to build a legal framework for agrochemistry and pedology activities that would focus on serious activity aiming and valuable and coherent content from preparative and analytical stages onto the result dissemination ones. This revival of the agrochemical activity is necessary as it has been neglected or even abandoned, while EU accession requires for efficient measures in the soil fertility management activity and providing food security. Within a correct and real legal framework, several approaches can be tackled in terms of the content of these studies:

- Re-evaluation of agrochemical interpretation limits according to production and analysis results in long-term experiments:

Interpretation limits regarding the state of reaction and essential nutritive soil supply were achieved on the basis of the correlation of production data in stationary fertilizer experiments alongside the modifications of agrochemical soil indices that support these modifications (ICPA, 1981, 1987). The comparison of these limits with interpretations of the agrochemistry studies in other countries shows a great diversity in setting domains for soil agrochemical characterization (Amar, 2003; Rusu et al 2010). This situation requires for a permanent revision of these limits and their compliance with modifications that intervene as a consequence of the systematic application of fertilizers.

- A more efficient representation of determinations that characterize the carbon cycle and humic balance:

Long-term experiments as practical results of the systematic employment solely of mineral fertilizing inputs prove significant decreases of the organic-C and humus reserves in the soils. In this alternative, the rate of annual modifications (against time T) is proportional to the initial content of the respective organic component (A) and rate of mineralization (rC; rN; rH);

$$\frac{dC}{dT} = A - rC; \; \frac{dN}{dT} = A - rN; \; \frac{dH}{dT} = A - rH.$$

In favourable situations residing in the annual or periodical application (every 2-4 years) of organic fertilizers, even accompanied by complex NP and NPK fertilizations, there is an increase of the organic component even according to an exponential model, due to organic fertilizer doses (G) applied that intervene in the synthesis of the humus (humification) (Borlan, Hera et al 1994; Rusu et al 2005, 2010).

$$\Delta H = \frac{10^{a \cdot \sum G}}{10} - 1$$

These modifications that regularly become apparent and measurable during the effect time of the two alternatives presented in the humic balance, require for a thorough study of organic-C, organic-N and humus regimen, through cyclic or periodical agrochemical studies that allow for the prognosis of the phenomenon and scenarios for intervention and regulation in the soil organic matter content (Kurtinecz and Rusu, 2007; Craioveanu et al, 2007).

- <u>Requirement for the introduction of evaluation and interpretation data for the soils' buffering capacity.</u>

Agrochemical studies conducted in other countries (France, Belgium, Switzerland) determine and interpret the value of the total cationic exchange capacity (CEC of T) as a relevant indicator for the measurement and expression of soil evolution, of the dependent interpretation of classes responsible for the supply of other elements, in their compliance with nature and fertilizer doses, as well as soil tolerance or "vulnerability" to polluting factors (heavy metals, acidification etc). Agrochemical studies-mappings in our country are not similar, although soil science in Romania has brought contributions with respect to representation indicators of components adsorbed in the adsorptive complex (CST, T and V) such as the soils' buffering capacity (T. Saidel 1929-1931; Pavlovschi, Mavrodineanu, 1938; Cernescu, 1963; Florea et al 1964; Borlan et al 1995). Previous contributions of our research staff have employed, in the context of the study and expression of the acidification of certain soils, the S_B/Ah and T/Ah ratios, where the constancy of the T value may truthfully (but indirectly) render the soils' buffering capacity, not solely as a measurement value, but mostly as a term for interpretation and assessment (Rusu et al, 1998; Rusu, 2006).

Thus, determinations of T or CEC; S_B/Ah; T/Ah indicators may support the interpretations of the prognosis on certain agrochemical risk factors, their effect, and clearly, the fundament of prevention and correction measures.

- <u>Approach on the fundament of the differentiation of fertilizer doses:</u>

- In the agrochemical system of our country, the fundament of the differentiation and calculus of nutritive element doses and fertilizers resides in the values of the nutritive consumption/requirement of crops, the soil input in a particular element and coefficients for the employment of the active soil substance and fertilizers (Davidescu D., Velicica Davidescu, 1981; Borlan, Rauta and Hera, 1981; Borlan, Hera et al, 1994).
- Community countries practice certain variants of dosage differentiation that necessarily involve soil analyses to establish fertility classes and values of the specific and global consumption (Cs, Cg) to define "the maintenance dosage" (Amar, 2003; Thomas, 2008).

Fertility class, supply with elements (of agrochemical mappings, studies)	A Very weak	B Weak	C Average	D Good	E Very Good
Factors for the multiplication of the maintenance dosis	2.0	1.5	1	0.5	0

As a "maintenance dosis"

Being thus built, this system for the differentiation of fertilization promotes the type of "moderate doses" and a certain ecologic concept, according to which, the crops are applied quantities of fertilizing elements that strictly compensate for the productive consumption of crops.

Within systems for the differentiation of doses, one can encounter interpretations that rely on the dependency between necessary quantities for crops and the level of nutritive soil supply, but that introduce the quantitative value (s.a./ha) above the "productive consumption doses" surpassing plant requirements and that proves necessary for the maintenance of the respective element in the soil over threshold-values (that differentiates the value of a normal soil supply from that of deficiency).

In making a decision on the selection of differentiate fertilizer doses, one can assess that soil analyses conducted by means of agrochemical studies-mappings support their size, correctness and clearly the beneficial effects in the soil plant system.

<u>c) Possibilities for the diversification of approaches in agrochemical studies-mappings</u>

It can be assessed that upon the creation of the agrochemical studies-mappings system in our country, the essential objectives pursued were restricted, especially to organization and supply activities and subsequently to issues that tackled the fundament of soil amendments and fertilization. Nowadays, requirements although "shadowed by averse mentalities and uncertainties", can extend to the following specific activities:

- Achievement of agrochemical monitoring- integrated part of quality state of the soil (ICPA, 1981; Dumitru et al, 1998);
- Achievement of the integrated management of nutrients and fertility for sustainable agriculture (programmes for amendments-fertilization; definition of agrochemical risk domains);
- Through study on the regimen of the main nutritive elements in the soil and the creation of a functional "data bank" for different beneficiaries within electronic systems of INCDPAPM and county OSPA;
- Thorough study of the organic matter regimen in the soils (SOM) for prognoses and humic balance projects;
- Thorough study of microelement regimen in the soils connected to their application within differentiated fertilization systems;
- Special agrochemical studies of soils degraded by means of polluting factors (nitrates, heavy metals, pesticides etc.) for complying with safety conditions of plant production and food security;
- Diagnosis of negative states of nutrition and fertilization by establishing correct interpretation limits (for macro and microelements).

It is thus clear that alongside theoretical and analytical approaches, it is required to employ agrochemical data towards the maximization of increases and effects, as well as the compliance with environmental protection conditions.

CONCLUSIONS

In order to revive the sector of agrochemical studies and mappings in the soil science field of our country, certain efficient measures and activities are required in the field.

1. Promotion of a favourable legal framework for the development of activities related to the protection and productive employment of soils that would include agrochemical control and monitoring activities, within the reorganization of pedologic and agrochemical activities;
2. Endowment of specialized laboratories in OSPA units at the level required by the complexity of tasks to perform;
3. Content implementation of approaches for the practical employment of analytical results;
4. Practice of activities for processing and thorough study of results in long-term experiments to improve agrochemical methodology nationwide.

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INFLUENTA AGROTEHNICII APLICATE ASUPRA DEZVOLTARII VEGETATIVE SI A PRODUCTIEI DE SEMINTE LA UNELE VARIETATI DE *AMARANTHUS* IN CONDITIILE PODISULUI SOMESAN

AGRO-TECHNIQUE STUDIES ON FOLIAGE AND SEED PRODUCTION OF SOME *AMARANTHUS* CULTIVARS FROM THE SOMESAN PLATEAU CONDITIONS

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***Keywords: Amaranthus* cultivars, seed, biomass**

REZUMAT

Speciile genului *Amaranthus* sunt cultivate ca "pseudocereale" datorită conținutului ridicat al semințelor în carbohidrați, proteine şi grăsimi, comparabil sau chiar superior cerealelor propriu-zise. Lucrarea prezintă dezvoltarea vegetativă a 12 varietăți de *Amaranthus,* în scopul integrării acestora în tehnologiile agricole specifice condiț iilor climatice din Podişul Someşan. Varietăț ile testate sunt: Alegria, Amont, Pleisman, Golden, Mercado, Burgundi, Hopi Red Dye, Chihuahn, Opopeo, MT3 (materialul parental al varietăț ii Amont), Plenitude ș i Intense Purpure. Rezultatele obținute la producția de semințe de *Amaranthus* arată producții foarte semnificativ pozitive la variantele cu desimi de 100.000 pl/ha. Interacțiunea varietatii de *Amaranthus* asupra desimii este mult mai diversificată ca influență asupra producțiilor obținute şi arată, în cazul desimii 70.000 pl/ha, superioritatea variantelor: Alegria, Amont, Golden si Plenitude, iar în cazul desimii 100.000 pl/ha variantele: Amont, Golden, Hopi Red Dye, Plenitude şi Intense Purpure. Influența desimii asupra productivității biomasei varietatilor de *Amaranthus sp*. este asemănătoare productivității de semințe, adică 100.000 pl/ha asigură producții foarte semnificativ pozitive în comparație cu media variantelor.

ABSTRACT

The *Amaranthus* species are cultivated as "pseudo cereals" because of their high content of carbohydrates, proteins and fats, comparable or even superior to cereals. In this backdrop, the present study aims to test the vegetative development of 12 *Amaranthus* cultivars, in order to integrate the research results with the agricultural technologies, adapted to the climatic conditions from Somesan Plateau. The cultivars tested were: Alegria, Amont, Pleisman, Golden, Mercado, Burgundi, Hopi Red Dye, Chihuahn, Opopeo, MT3 (parent material of the cultivar Amont), Plenitude and Intense Purpure. The results obtained in seed production of the *Amaranthus* cultivars shows very significant positive production of variants with densities of 100,000 plants/ha. Interaction of the cultivars of *Amaranthus* upon density is much more diversified on the yields obtained and shows in case of density 70,000 plants/ha superiority of the cultivars: Alegria, Amont, Golden and Plenitude, and in case of 100,000 plants/ha cultivars: Amont, Golden, Hopi Red Dye, Plenitude and Intense Purpure. Influence of variety of *Amaranthus* on biomass production shows the cultivars with the highest productivity as it follows: Plenitude, Alegria, Amont, Intense Purpure. Influence of density on biomass productivity of *Amaranthus* is similar with

the seeds productivity, namely 100,000 plants/ha provides very significant positive production compared with the average of the variants.

INTRODUCTION

Genus Amaranthus contains about 60 species, but only a few cultivated, most are considered weeds. Species cultivated for seeds are (Marin *et al*., 2008; Law-Ogbomo and Ajayi, 2009): *Amaranthus hypochondriacus, Amaranthus cruentus* and *Amaranthus caudatus.* Species cultivated for leaves are: *Amaranthus tricolor, Amaranthus dubius, Amaranthus lividus, Amaranthus creuntus*, *Amaranthus palmeri* and *Amaranthus hybridus* were used by ancient populations in the southern U.S. *Amaranthus retroflexus* is considered one of the most common and dangerous weed.

Amaranthus are species with high value of proteins in seeds. The *Amaranthus* genotype species are cultivated as „pseudo cereals" because of their high content of carbohydrates, proteins and fats, comparable or even superior to cereals themselves (Rusu *et al*., 2009; Toader and Roman, 2009). Seed of *Amaranthus* has a high value in proteins (12-18%) and higher content of lysine. This high content in lysine make *Amaranthus* be used mainly in improving the biological value of processed food. Flour protein value of *Amaranthus* is enhanced when is mixed with cereal flour. When flour of *Amaranthus* is mixed in a ratio of 30:70 with the rice, corn or wheat flour, protein quality (based on casein) increases from 72 to 90, 58 to 81, respectively from 32 to 50. Protein from *Amaranthus* differs from the grain by the fact that 65% is found in germ and 35% in the endosperm, up from 15% in germ and 85% in the endosperm at cereals. *Amaranthus* are annual plants that prefer a warm / temperate climate and multiply by self-pollination. There are a variety of species. Some has the characteristic to tolerate drought, what makes this culture suitable in semi-arid areas, and some species in irrigated areas, as an alternative for farmers that are trying to reduce the cost of irrigation and soil salinization.

Researches conducted currently focuses on three directions: germplasm conservation and utilization, developed and improved technological lines and an increased awareness regarding the qualities of this plant.

MATERIAL AND METHOD

Testing of 12 cultivars of *Amaranthus* for the purpose of their integration in the agricultural technologies of Somesan Plateau, has been done on stagnic argic phaeozem, in the following climatic conditions: annual precipitations value of 523 mm and annual average temperature of 9.4°C. Stagnic argic phaeozem (SRTS, 2003) from the experimental field is loam clay / clay loam soil (45.7 / 55.7% clay), weak acidic (pH 6.02 to 6.42), rich in humus (3.27 to 4.33%) and nutrients. Varieties tested are:

1. Alegria (*Amaranthus cruenthus)*
2. Amont (*Amaranthus cruenthus*)
3. Pleisman (*Amaranthus hypochondriacus x Amaranthus hybridus*)
4. Golden (*Amaranthus hypochondriacus*)
5. Mercado (*Amaranthus hypochondriacus*)
6. Burgundi (*Amaranthus hypochondriacus*)
7. Hopi Red Dye (*Amaranthus hypochondriacus*)
8. Chihuahan (*Amaranthus cruenthus*)
9. Opopeo (*Amaranthus hypochondriacus*)
10. MT3 (*Amaranthus cruenthus,* parent material of the cultivar Amont)
11. Plenitude (*Amaranthus hypochondriacus*)
12. Intense Purpure (*Amaranthus hypochondriacus*)

The study aims to test the vegetative development of *Amaranthus*, in order to integrate it in the agricultural technologies, adaptated to climatic conditions from Somesan

Plateau. Determinations followed the vegetative development of the plants every 15 days, number of leaves, green biomass and seed production. Varieties were cultivated in two types of density: D_1 = 70,000 harvestable plants/ha, D_2 = 100,000 harvestable plants/ha, in 3 repetitions, and experimental plot size was 210 m^2. It was sown at 0.5 cm depth, distance between rows being 70 cm. Experimental data processing was done by ANOVA and Duncan test (Polifact 2010).

RESULTS AND DISCUSSIONS

Vegetative development of *Amaranthus* cultivars determined every 15 days show an increase in height, in terms of Cluj-Napoca, approximate 85-99 centimeters, the increase being faster in the first part of vegetation. Number of leaves per plant reaches, an average, at harvest from 24 to 30 leaves. Green biomass at harvest is 197-317 grams per plant. Related traits were determined in bloom and seed maturity, considering that 50% of seed maturity is achieved after 15 September.

Statistical processing of the results concerning the seed production shows the influence of the cultivated variety on the obtained yields. Influence of variety of *Amaranthus* cultivars on the obtained seed production is shown in Table 1. Duncan Test rank first cultivars: Golden, Plenitude and Amont, indicating that yields are the average of densities, so are smaller than varieties productions grown in D_2. Towards the average experience of 2,530.36 kg/ha, shows very significant positive production for all varieties at density of 100,000 plants/ha, except cultivars Alegria (with positive differences between 193.97 to 581.31 kg/ha). Multiple comparison of variants show the productivity order of the interactions, the most productive being: Golden x D_2, Plenitude x D_2 and Amont x D_2.

Variance analysis for factor density shows very distinct significantly positive differences for all variants for D_2 (100,000 plants/ha, table 2), positive differences being 307.03 kg/ha. Multiple processing with Duncan test classifies density variants in the following order: D_2, D_1.

Table 1

Seeds production of *Amaranthus* cultivars obtained on Stagnic argic phaeozem in Cluj Napoca, 2008-2009

Variant	Production, kg/ha	Production, %	Difference, ±	Significance of differences
Witness (average)	2,530.36	100	0	Witness
V_1 - Alegria	2,425.83 **c**	95.9	-104.53	000
V_2 - Amont	2,670.17 **j**	105.5	139.81	***
V_3 - Pleisman	2,497.17 **g**	98.7	-33.19	000
V_4 - Golden	2,727.17 **k**	107.8	196.81	***
V_5 - Mercado	2,411.00 **b**	95.3	-119.36	000
V_6 - Burgundi	2,511.00 **h**	99.2	-19.36	000
V_7 - Hopi Red Dye	2,549.33 **i**	100.7	18.97	***
V_8 - Chihuahan	2,472.83 **d**	97.7	-57.53	000
V_9 - Opopeo	2,488.83 **f**	98.4	-41.53	000
V_{10} - MT3	2,404.17 **a**	95.0	-126.19	000
V_{11} - Plenitude	2,727.00 **k**	107.8	196.64	***
V_{12} - Intense Purpure	2,479.83 **e**	98.0	-50.53	000

LSD 5%= 6.77 kg/ha, LSD 1% = 9.22 kg/ha, LSD 0.1% = 12.40 kg/ha
* signification positives, ^{0} signification negatives
a, b, c……j, k – classification by Duncan test

Interaction of density variants on productivity of *Amaranthus* cultivars varieties, show for all variants higher production values and positive significance for D_2 variants, compared with the witness - average. Processing with Duncan test classify variants: D_2 x Golden, D_2 x Plenitude, D_2 x Amont, D_2 x Hopi Red Dye etc.

Interaction variety of *Amaranthus* cultivars., upon density is much more diverse, as influence on the obtained yields and shows, at density D_1 (70,000 plants/ha) superiority of the cultivars: Alegria, Amont, Golden and Plenitude, and at D_2 (100,000 plants/ha) cultivars: Amont, Golden, Hopi Red Dye and Intende Purpure.

Table 2

Influence of density of *Amaranthus* cultivars on seeds production obtained on Stagnic argic phaeozem in Cluj-Napoca, 2008-2009

Variant	Production, kg/ha	Production, %	Difference, ±	Significance of differences
Witness (average)	2,530.36	100	0	Witness
D_1, 70,000 plants/ha	2,223.33 **a**	87.9	-307.03	000
D_2, 100,000 plants/ha	2,837.39 **b**	112.1	307.03	***

LSD 5%= 2.35 kg/ha, LSD 1% = 3.19 kg/ha, LSD 0.1% = 4.28 kg/ha
* signification positives, ^{0} signification negatives
a, b – classification by Duncan test

Influence of variety of Amaranthus *cultivars on the biomass production is shown in Table 3, variants with the highest productivity being (e): Plenitude, Alegria, Amont, Intense purpure, production averages are between 25,406 to 26,859.33 kg/ha. The results obtained in biomass production of* Amaranthus *sp., through the interaction between variety and density, compared to the average experience of 22,668.26 kg/ha, variants classified by Duncan test first: Plenitude x D_2, Amont x D_2, Alegria x D_2, Intense Purpure x D_2 (j), with biomass production between 29,847.33 to 31,503.67 kg/ha.*

Table 3

Biomass production of *Amaranthus* cultivars obtained on Stagnic argic phaeozem in Cluj-Napoca, 2008-2009

Variant	Production, kg/ha	Production, %	Difference, ±	Significance of differences
Witness (average)	22,668.26	100	0	Witness
V_1 - Alegria	25,988.67 **e**	114.6	3,320.40	***
V_2 - Amont	25,720.17 **e**	113.5	3,051.90	***
V_3 - Pleisman	16,743.5 **a**	73.9	-5,924.76	000
V_4 - Golden	20,899.83 **bc**	92.2	-1,768.43	0
V_5 - Mercado	19,453.17 **b**	85.8	-3,215.10	000
V_6 - Burgundi	22,153 **cd**	97.7	-515.26	ns
V_7 - Hopi Red Dye	22,673.33 **d**	100	5.07	ns
V_8 - Chihuahan	22,707.5 **d**	100.2	39.24	ns
V_9 - Opopeo	22,855.5 **d**	100.8	187.24	ns
V_{10} - MT3	20,559.17 **b**	90.7	-2,109.10	00
V_{11} - Plenitude	26,859.33 **e**	118.5	4,191.07	***
V_{12} - Intense Purpure	25,406 **e**	112.1	2,737.74	***

LSD 5%= 1,412.41 kg/ha, LSD 1% = 1,924.41 kg/ha, LSD 0.1% = 2,586.01 kg/ha
ns – not significant, * signification positives, ^{0} signification negatives
a, b...d, e – classification by Duncan test

Influence of density (Table 4) on biomass productivity of Amaranthus *cultivars is similar with the seeds productivity, namely, D_2 (100,000 plants/ha) provides very significant positive production compared with the average of the variants.*

The interaction density × cultivars and cultivars x density interaction show similar situations with the results of seeds production. Thus in terms of density, the best combinations (k) are: D_2 x Plenitude, D_2 x Alegria, D_2 x Amont, D_2 x Intense Purpure. At the same time shows that at D_1 best results are: Alegria, Amont, Golden and Plenitude, *and at D_2 the best results are: Amont, Golden, Hopi Red Dye, Plenitude and Intense Purpure.*

Table 4

Influence of density of *Amaranthus* cultivars upon biomass production obtained on Stagnic argic phaeozem in Cluj-Napoca, 2008-2009

Variant	Production, kg/ha	Production, %	Difference, ±	Significance of differences
Witness (average)	22,668.26	100	0	Witness
D_1, 70000 pl/ha	18,832.61 **b**	83.1	-3,835.65	000
D_2, 100000 pl/ha	26,503.92 **a**	116.9	3,835.65	***

LSD 5%= 583.31 kg/ha, LSD 1% = 792.85 kg/ha, LSD 0.1% = 1,061.85 kg/ha
* signification positives, ^{0} signification negatives
a, b – classification by Duncan test

CONCLUSIONS

Results obtained in seeds production of *Amaranthus* cultivars shows an experience average of 2,530.36 kg/ha, towards this ascertaining very significant positive production of variants with densities of 100,000 plants/ha. Interaction of density variants on productivity variants of *Amaranthus* cultivars is classified by the Duncan test as it follows: D_2 x Golden, D_2 x Plenitude, D_2 x Amont, D_2 x Hopi Red Dye etc. Interaction of the variety of *Amaranthus* cultivars upon density is much more diversified on the yields obtained and shows in case of density D_1 (70,000 plants/ha) superiority of the cultivars: Alegria, Amont, Golden and Plenitude, and in case of D_2 (100,000 plants/ha) cultivars: Amont, Golden, Hopi Red Dye, Plenitude and Intense Purpure. Comparison of multiple variants show the productivity order of the variants, the most productive being: Golden x D_2, Plenitude x D_2 and Amont x D_2.

The results obtained in biomass production of *Amaranthus* cultivars towards the average experience of 22,668.26 kg/ha, yields classified by Duncan test, first place are: Plenitude x D_2, Amont x D_2, Alegria x D_2, Plenitude x D_2 (j), with biomass production between 29,847.33 to 31,503.67 kg/ha. Influence of *Amaranthus* cultivars on biomass production shows the variants with the highest productivity as it follows (e): Plenitude, Alegria, Amont, Intense Purpure, average productions are between 25,406 to 26,859.33 kg/ha. Influence of density on biomass productivity of *Amaranthus* cultivars is similar with the seeds productivity, namely D_2 (100,000 plants/ha) provides very significant positive production compared with the average of the variants. The interaction density × cultivars and cultivars x density interaction show similar situations with the results of seeds production. Thus, in terms of density, the best combinations (k) are: D_2 x Plenitude, D_2 x Alegria, D_2 x Amont, D_2 x Intense Purpure. At the same time is found that at D_1 the best results are at: Plenitude, Alegria, Amont and Intense Purpure, and at D_2 the best results are at: Plenitude, Alegria, Amont and Intense Purpure.

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CERCETĂRI PRIVIND IMBURUIENAREA LA TEHNOLOGIA NO TILL

WEED INFESTATION WITH NO – TILL

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Keywords: weeds, no till, plowing.

REZUMAT

Lucrarea de faţ ă prezintă determinarea gradului de îmburuienare, prin metoda numerică într-o experienţ ă desfăş urată la SDE Banu Mărăcine, începând din anul 2007. Am considerat necesar acest lucru deoarece am constatat că, la variantele semănate direct, fără nici o lucrare a solului, spectrul de buruieni s-a schimbat radical. Astfel, speciile predominante la varianta arată au fost: Setaria glauca, Digitaria sanguinalis, Chenopodium album, Amaranthus retroflexus, Xanthium italicum, Cynodon dactylon. La varianta semănată direct am întâlnit specii noi, care nu se găsesc la terenul arat: Crepis foetida, Erigeron canadensis, Trifolium arvense. Singura specie care a rezistat condiţ iilor de sol nelucrat a fost Cynodon dactylon.

ABSTRACT

The abstract in English (max.10 lines) focusing on the results of the research The present paper deals with the determination of weed degree by numerical method with an experiment carried out at Didactical Experimental Station of Banu Maracine since 2007. We have considered this trial in order to asses the changing the weed spektrum with no till in comparison with plowing condition. This way, the most encountered species with plow were: Setaria glauca, Digitaria sanguinalis, Chenopodium album, Amaranthus retroflexus, Xanthium italicum, Cynodon dactylon. With no till variant there were other species: Crepis foetida, Erigeron canadensis, Trifolium arvense. The only species that survived to the new, more compacted soil condition was Cynodon dactylon.

INTRODUCTION

One of nowaday challenge in worldwide agriculture is no tillage. This new technology arose in late 40's, after the World War Two as a response to the fuel crisis. It seems, at the first sight, unbelievable, against our ancestors habits but the results prove that through this technique the soil maintains its fertility and the yields are even higher.

Worldwide, there are cropped under no till about 95 million hectares. The first try to crop without plowing appeared when herbicides were synthesized, as 2,4 D and then paraquat and atrazin. In Europe, the first such researches were made in Great Britain (1955), Holand (1962), Germany (1966), France (1970), etc. (Sprague M. and Triplett G., 1986). The results were different, in general in cooler climates being weaker. Nevertheless, although in many zones there were reported good results, this technique was not spread. In Romania, such researches were, first time, initiated by dr. Nicolae Sarpe at ICCPT Fundulea in 1962 (Dobre M., 2002) and have had good results having yields even bigger than with plowing. The problem is that he is the only researcher who reported good results with notill, all the other researchers obtaining such bad results that they even did not publish them. The explanation can come up from the fact that Mr. Sarpe have used in the front of the drill a tool that tilled the soil on a certain width making, in fact, minimum till yet not no till. But the biggest mistake was the total inconsideration of the residue layer. A researcher even wrote that they took out the residue layer in order to use the conventional drills.

In 1962, the Young brothers were the first in the world who practiced no till in their farms in Kentucky, on 1/3 ha with good results, using paraquat, atrazin and 2,4 D. Thousands of farmers have visited their farm. After this, the machinery factories have adapted to the new trend making no till drills for soybean after wheat as a double crop, directly in stubble. Shirley Philips wanted to demonstrate that no till is not proper but he was convinced by the good results obtained, better than plowing and he became the strongest promoter of this technology and virtually considered as the father of it (Elliot and Colleman, 1988).

In 1973, Philips and Young have published the book „No till farming", the reference book in the world. The surface under no till in USA have increased from 2 milion hectares in 1973 to 20 milion hectares in 1997 yet it represent only 16% from the farmland of this country.

The most important advantages of this system are: less work, higher income, increasing the soil fertility and reduced erosion. The negative effects of the intense and repeated tillage on the humus content, erosion, water infiltration, flora and fauna, losing of the nutrients have conducted to the physical, chemical and biological degradation of the soil which determines lower yields and the decreasing of the soil productivity.

MATERIAL AND METHOD

In order to asses the suitability of no till technology on soil conditions from Central Oltenia we have set up an experiment with several crops and three main technology measures: conventional (plowing), no till with much and no till without mulch layer. There were sown several crops: wheat, barley, oilseed rape, pea, alpha-alpha, sunflower and corn. Winter cereals and oilseed rape were sown in the autumn of 2007 and the spring crops were established in 2008. The reason of cultivating these various crops was to research their residue layer influence on corn crop grown in the following year. After harvesting the crops residues were chopped by machinery, in the autumn of 2008 and left upon soil surface. In the 2009 year there was sown corn and there was researched the influence of various kind of crop residues as mulch layer. In 2010 there was sown corn, again, on all variants, after chopping the corn residues and leaving them on the soil surface. There were made soil moisture analysis, soil bulk density, soil penetration resistance determinations as well as plant height measurements and yield mass per plot. The plot surface was of 5 x 6 m. The drilling was performed by hand, using a narrow hoe in order to prepare the seedbed only on row. The treatments for residue layer type were as follows: V1 – plowed, no plant residue layer; V2 – no till without residue layer; V3 – no till with cereal straw (barley and wheat); V4 – no till with pea residue layer; V5 – no till with sunflower residue layer; V6 – no till with corn residue layer; V7 – no till with cocklebur (*Xanthium italicum*) residue layer; V8 – no till with alpha – alpha residue layer.

RESULTS AND DISCUSSIONS

The first year of experiment, 2007-2008 was used for achieving the needed residue layer on the soil surface. The soil moisture determinations and bulk density at two dates May 25 th and July the sixth) during the vegetation period show irrelevant data, the soil moisture being almost the same with all covered variants excepting the plowed one and the no till bare one which have had extreme values (table 1).

Table 1

The soil moisture with tillage and mulch type experiment at Banu Maracine, in 2009

Treatment		25 May		6 July	
		Soil moisture %	Soil bulk density g/cm^3	Soil moisture %	Soil bulk density g/cm^3
V1 – plowed, no plant residue layer;	0-10 cm	23.2	1.23	25.4	1.35
	10-20 cm	24.5	1.34	26.3	1.45
V2 – no till without residue layer;	0-10 cm	17.3	1.45	19.0	1.48
	10-20 cm	17.5	1.56	19.5	1.50
V3 – no till with cereal straw (barley and wheat);	0-10 cm	20.7	1.40	23.7	1.45
	10-20 cm	21.5	1.50	23.9	1.52
V4 – no till with pea residue layer;	0-10 cm	20.2	1.38	24.2	1.43
	10-20 cm	22.1	1.48	24.5	1.52
V5 – no till with sunflower residue layer;	0-10 cm	21.6	1.38	23.8	1.43
	10-20 cm	22.1	1.50	24.2	1.53
V6 – no till with corn residue layer;	0-10 cm	20.1	1.36	24.1	1.43
	10-20 cm	21.0	1.50	24.5	1.50
V7 – no till with cocklebur residue layer;	0-10 cm	20.2	1.38	23.8	1.40
	10-20 cm	20.5	1.49	24.4	1.52
V8 – no till with alpha – alpha residue layer.	0-10 cm	21.2	1.40	24.1	1.41
	10-20 cm	21.1	1.50	24.5	1.50

There were made weed determinations presented in the table below.

Table 2

Weed infestation for plow variant in comparison with various variants of no till in 2009 at Banu Maracine (25 of May)

Species	Phase/ height (cm)	Biol. cat.	Nr. of weeds/m^2			Average	P%	K%
			Plow	No till without residue	No till with residue			
Erigeron canadensis	B/25	Adc	-	58.2	8.7	22.3	16.5	90
Sysimbrium sophia	D/30	Adc	5.8	7.0	2.0	4.9	3.6	50
Crepis foetida	B/15	Adc	-	27.5	12.5	13.3	9.8	90
Cynodon dactylon	B/15	Pmc	4.1	5.4	4.1	4.5	3.3	70
Xanthium strumarium	B/25	Adc	25.5	13.8	16.2	18.5	13.7	100
Digitaria sanguinalis	B/15	Amc	54.3	-	5.0	19.7	14.6	20
Setaria glauca	B/15	Amc	25.9	-	8.2	11.3	8.3	20
Sonchus arvensis	C/30	Pdc	6.3	14.1	5.9	8.7	6.4	30
Trifolium	D/20	Adc	-	14.4	18.2	10.9	8.0	50

arvense									
Chenopodium album	B/25	Adc	25.7	5.3	8.9	13.3	9.8	90
Amaranthus retroflexus	B/25	Adc	18.5	-	3.7	7.4	5.5	30
Total			166.1	145.7	93.4	135.0	100	

The weeding degree was not high due to herbicides applying. This fact was recorded both for tillage variants and for no till variant. With the tillage treatments the highest average values were recorded by *Xanthium italicum* (cocklebur) a very easy to control species by dicamba herbicides in corn crop. The presence of this weed is because it can not be controlled by Guardian (acetochlor) herbicide. The postemergent applying of Icedin (dicamba + 2,4 D) has solved the problem. Other recorded weeds in tillage variants were: *Digitaria sanguinalis, Chenopodium album and Amaranthus retroflexus.* However, their number did not impede the normal growth of the crop. With the no till variant, due to the changed physical conditions the recorded weeds were almost completely changed, too. In this manner, the upward mentioned species for the loosened soil were replaced within the no till variant by: *Crepis foetida, Trifolium arvense,* and *Erigeron Canadensis.* The only species that survived to the new environment, more compacted was *Cynodon dactylon*. These new species were all killed by the postemergent herbicide Icedin (dicamba + 2,4 D). The herbicides that can be applied to the corn crop in postemergence have a very wide controlling spectrum; they can kill not only dicots like the above species but monocots like *Sorghum halepense* and *Cynodon dactylon* that were menacing the corn crop not long ago. Moreover, the genetically modified corn for using glyphosate can be grown in many countries and despite local quarrels it will be grown all over in the future.

CONCLUSIONS

1. The new environment created by the no till technique determines the changing of the almost all weed spectrum.
2. The species adapted for the loosened soil, *Digitaria sanguinalis, Chenopodium album, Amaranthus retroflexus, Xanthium strumarium, Setaria glauca* are replaced by species that are adapted for more compacted soil as: *Crepis foetida, Trifolium arvense,* and *Erigeron canadensis*.

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FERTILIZANTI EXTRARADICULARI ORGANO-MINERALI EXPERIMENTARI AGROCHIMICE LA FLOAREA SOARELUI

ORGANO - MINERAL FERTILIZER - AGROCHEMICAL EXPERIMENTS ON SUNFLOWER

CARMEN SIRBU, T. CIOROIANU, MONICA DUMITRASCU, DANIELA MIHALACHE, IULIA ANTON, ADRIANA GRIGORE, IOANA OPRICA, C. POHRIB

Cuvinte cheie: substante humice, fertilizanti, foliar, floarea-soarelui
Key words: humic substances, fertilizers, foliar sunflower

REZUMAT

Substantele organice naturale ca acizii humici si fulvici joaca un rol esential in asigurarea fertilitatii solului si nutritia plantelor. Aplicarea foliara sau pe sol a fertilizantilor ce contin substante humice, imbunatateste semnificativ eficienta fertilizantilor clasici si metabolismul plantei.

Aceasta lucrare prezinta o gama de fertilizanti ce contin substante organice intr-o matrice NPK cu microelemente. Aceste substante sunt compusi humici ce au efect de chelatizare si de stimulare a plantei.

Fertilizantii experimentali au fost testati in Casa de vegetatie a I.N.C.D.P.A.P.M. – ICPA Bucuresti pe cultura de floarea-soarelui. Pentru evaluarea eficientei fertilizantilor cu substante humice, acestia au fost testati comparativ cu un martor nefertilizat, doi martori tratati cu fertilizanti certificati ecologic si un ingrasamant foliar clasic.

ABSTRACT

Natural organic substances such as humic and fulvic acids play an essential role in ensuring soil fertility and plant nutrition. Add of products containing humic substances distributed on the soil or foliar (liquid or solid) can dramatically improve the efficiency of conventional fertilizers and plant metabolism.

This paper presents a range of fertilizers containing NPK-type matrix with trace elements and organic substances. These substances are organic compounds from humic class and have the effect of chelating and plant-stimulating.

Experimental fertilizers were tested in the House of vegetation on sunflower. Agrochemical tests were performed compared with an unfertilized control, two certified organic fertilizer and a foliar fertilizer classic.

INTRODUCTION

Add of products containing humic substances distributed on the soil or foliar (liquid or solid) can improve the efficiency of conventional fertilizers and plant metabolism. Humic and fulvic acids, and their salts stimulate both growth and development of plant roots and leaf system. At the same time, foliar fertilizers containing humic compounds enhance metabolism and activity of plant photosynthesis.

Fulvic acid readily complexes with minerals and metals making them available to plant roots and easily absorbable through cell walls. In the Grant Agreement no. 135080/2009 concluded with Competitiveness Grants Scheme (MAPDR) were made agrochemical activities for obtaining and testing of complex nutrient solutions containing natural organic substances with stimulating properties of plant development. I.N.C.D.P.A.P.M. - ICPA - Bucharest, together with the University of Craiova, Faculty of Physics and S.C. Marcoser S.R.L., have conducted experiments that have led to many variants of processes and formulas of fertilizers with the possibility to use classical and organic system of agriculture. These fertilizers were applied extraradicular and agrochemical tested in solarium, in the house of vegetation.

MATERIALS AND METHOD

The research was carried out in the House of vegetation at the I.N.C.D.P.A.P.M. – ICPA Bucuresti during the 2009 year.

Experience with sunflower plants (NEVADA variety) was held in pots, Mitscherlich type, with capacity of 20 kg dry soil. The soil used was of cambic chernozem (Teleorman county). Soil fertilization was made before sowing, with 1000 mg of N, P_2O_5 and K_2O/pot.

For each experimental factor combinations were provided 3 replications, with 3 plants per pot.

Were obtained in the laboratory phase of fertilizer solution (3) containing organic substances with stimulating role, obtained by extraction and separation fulvic and humic acids from lignite.

Extraradicular fertilizers obtained experimentally to realize the agrochemical testing, were:

- NPK type with fulvic acid salts and chelated trace elements – code "Omi 1";
- NK type with humic acid salts and chelated trace elements - code "Omi 2";
- NK type with humic and fulvic acids salts and chelated trace elements - code "Omi 3".

Experimental fertilizers were tested against an unfertilized control leaf (M0), two witnesses, fertilizers certified for use in organic agriculture note "ECO" (ECO 1 and ECO 2) and a classic fertilizer F 111 .

RESULTS AND DISCUSSIONS

The use of extracts of natural substances from lignite, a complex matrix of macro and chelated trace elements, in well established technological conditions, leading to solutions of fertilizers chemically and physically stable.

In table 1 are variants of fertilizer used depending on the type of basic fertilization.

Table 1

Experimental scheme used on the soil with and without the basic fertilization

Agrofond	Type of fertilizer applied
Soil without fertilization (NF)	Without foliar fertilizer - Witness “M0”
	With foliar fertilizer - Witness “ECO 1”
	With foliar fertilizer - Witness “ECO 2”
	With foliar fertilizer - Witness “F111”
	Fertilized with foliar fertilizer “OMI 1”
	Fertilized with foliar fertilizer “OMI 2”
	Fertilized with foliar fertilizer “OMI 3”
Soil with fertilization (FB) NPK 15.15.15 6.7 g /plot	Without foliar fertilizer - Witness “M0”
	With foliar fertilizer - Witness “ECO 1”
	With foliar fertilizer - Witness “ECO 2”
	With foliar fertilizer - Witness “F111”
	Fertilized with foliar fertilizer “OMI 1”
	Fertilized with foliar fertilizer “OMI 2”
	Fertilized with foliar fertilizer “OMI 3”

Statistical processing of data, showed a difference statistically of fertilizer factor in the seed production of sunflower.

We can see in figure 1 that the highest seed productions were obtained on variants with fertilized soil for application OMI 2, F 111 and OMI 1, followed by witnesses certified eco and OMI 3.

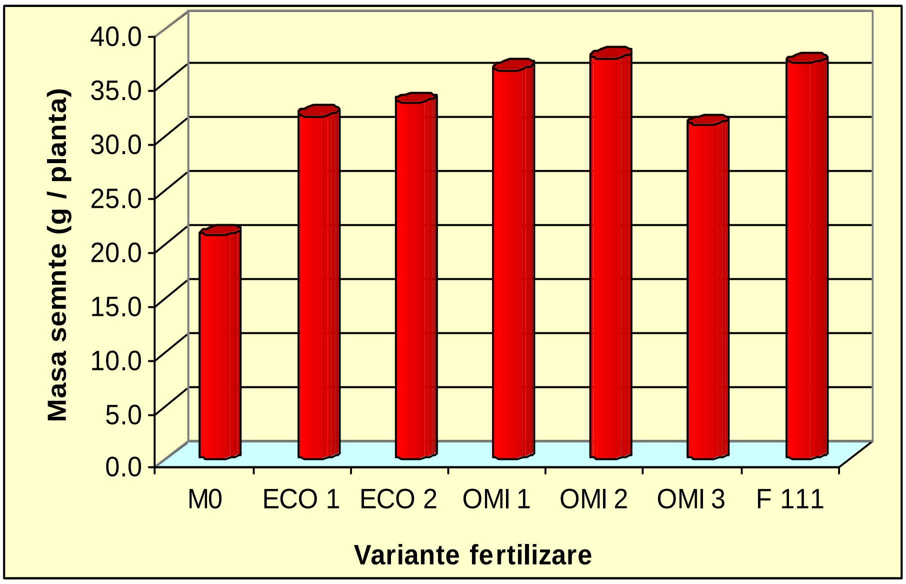

Fig. 1. Evolution of seed mass based on applied fertilization (fertilized soil)

Production increases obtained from witnesses M0 and average provided by the application of "Eco" fertilizers were higher in the case of experimental fertilizer OMI 2, followed by the witness F 111 and OMI 3, OMI 1 (on soil without and with fertilization), figures 2-3.

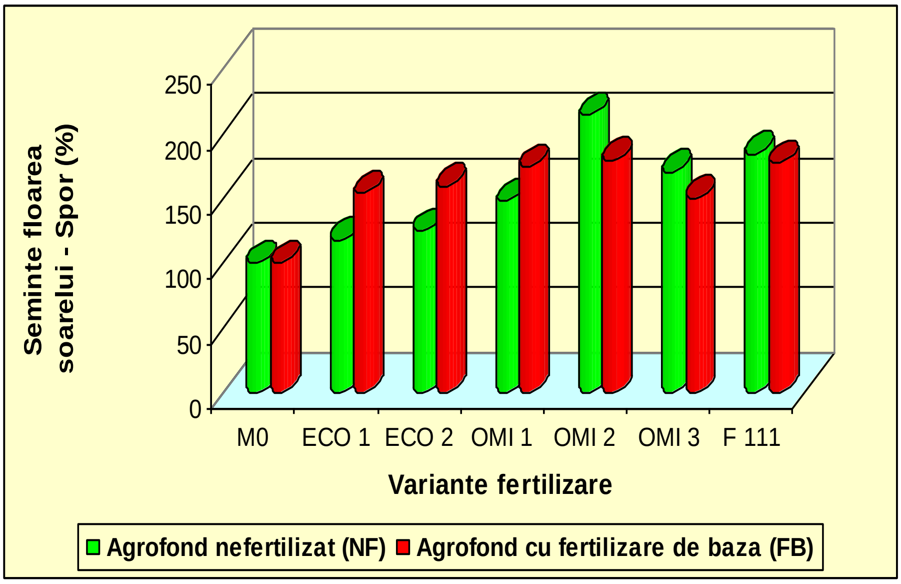

Fig. 2. Evolution of production growth (%) from the witness (M0), depending on applied fertilization (fertilized soil)

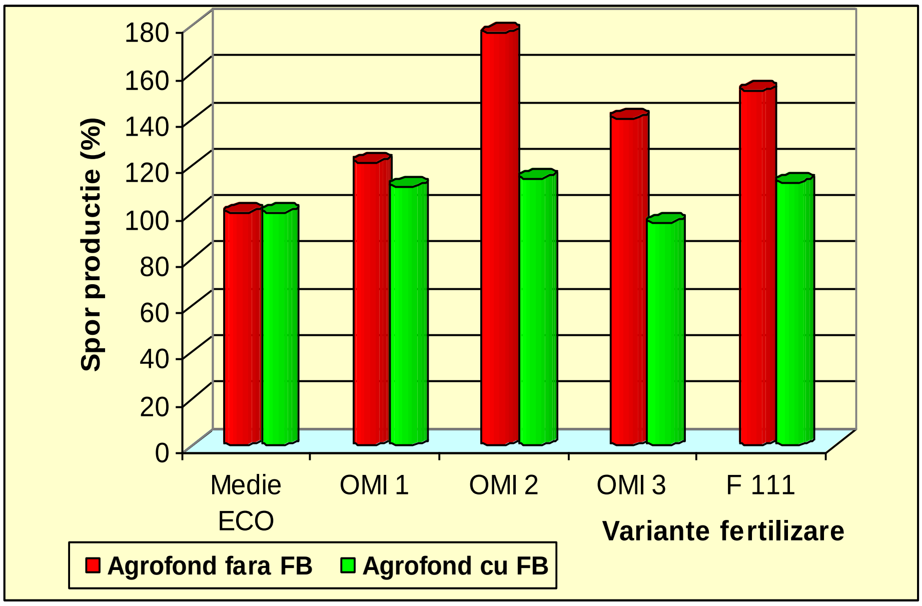

Fig. 3. Evolution of production growth (%) compared to the average values obtained by applying fertilizers certified "eco".

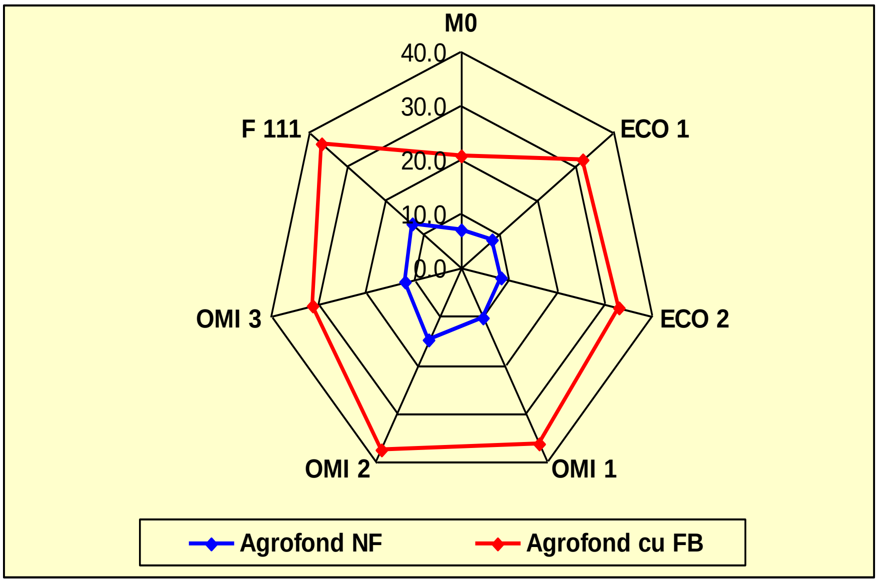

Fig. 4. Evolution of seed production depending on agrofond, with and without basic fertilization

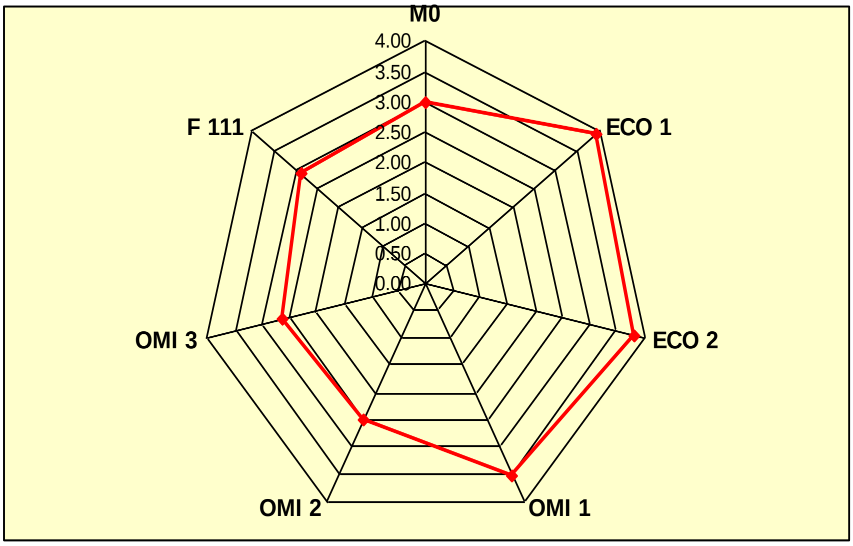

Fig. 5. Evolution of the ratio of seed mass obtained in experiments on soil with or without fertilization

From figures 4 and 5 we can see that ECO products are more effective on soil fertilized unlike products OMI 2 and OMI 3.

CONCLUSIONS

In the experimental work three fertilizers were obtained and characterized physico-chemical with extraradicular application These fertilizers were applied extraradicular and agrochemical tested on sunflower plants in the house of vegetation.

Fertilizers OMI were tested against two witnesses certified for organic agriculture and a classic foliar fertilizer; has been observed that ECO products are more effective on soil fertilized unlike products OMI 2 and OMI 3.

When applying fertilizers on the soil fertilized, the largest amounts of seeds were obtained from OMI 2, followed by F 111, OMI 1, Eco 2, Eco 1, OMI 3 and M0.

When applying fertilizers on unfertilized soil, the largest amounts of seeds were obtained from OMI 2, followed by F 111, OMI 1, Eco 2, Eco 1, OMI 3 and M0.

Fertilizers OMI have a higher production growth on unfertilized soil.

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INFLUENTA SURSEI DE AZOT DIN FERTILIZANTUL COMPLEX LICHID ASUPRA PENETRARII, ABSORBTIEI SI DISTRIBUTIEI POTASIULUI IN FRUNZELE NETRATATE DE FLOAREA SOARELUI DIN SOLUTIA APLICATA PE FRUNZE

THE INFLUENCE OF NITROGEN CHEMICAL SOURCES FROM COMPLEX FOLIAR FERTILISERS ON THE PENETRATION, UPTAKE AND THE DISTRIBUTION OF THE POTASSIUM IN THE UNTEACHED LEAVES OF SUNFLOWER PLANTS FROM THE SOLUTIONS APLIED ON LEAVES

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Key words: potassium, nitrogen, foliar, sunflower, fertilization.

REZUMAT

Lucrarea prezintă date cu privire la cuantificarea influenței sursei chimice cu azot din unele îngrăşăminte complexe foliare (CFF), concentrația de soluții diluata aplicata foliar şi prezența substanței organice (hidrolizat de colagen), la absorbția elementului potasiu prin tegumentele plantelor şi cele de translocare în plantele de floarea-soarelui (Helianthus annuus L).

Soluțiile diluate au fost aplicate doar pe anumite frunze ale plantei de testare, iar determinările de potasiu au fost făcute numai în organe plantelor neatins cu soluții CFF.

Rezultatele obținute au arătat că absorbția elementului potasiu prin tegumentele plantei a fost influențată de sursa de azot din îngrăşământ.

De asemenea, concentrarea şi prezența substanței organice de soluție de CFF au influențat absorbția şi translocarea de potasiu prin tegumentele plantei.

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ABSTRACT

The paper present data regarding the quantification of the influence of: nitrogen chemical sources of some complex foliar fertilizers (CFF), concentration of their diluted solutions and the presence of the organic substance (hydrolyzed of collagens) upon the potassium absorption through the plant teguments and those translocation in the sunflower plants (Helianthus annuus L).

The diluted solutions have been applied only on a part of the plant test leaves, the analytical determinations of potassium, as well as the dry and the fresh weight, have been done only in the tops plant organs untouched with CFF solutions.

The results obtained have revealed that potassium absorption through plant teguments was influenced by the fertilizer nitrogen source.

Also, the concentration and the presence of the organic substance of the CFF solution have influenced the absorption and translocation of potassium through in the plant teguments.

INTRODUCTION

Bioaccessibility increase soil nutrients and other natural sources and increase the productive use of nutrients in crops, accompanied by the reduced impact of pollutant chemical fertilization on the environment, are major objectives of modern agriculture and organic farming. Agricultural research conducted in the Department of

Agrochemistry of the National Research and Development Institute for Soil Science, Agrochemistry and Environmental Protection have shown that achieving of these objectives it is possible in large measure by integrating of agrochemical means of fertilization within the current technologies of plant growing. In this context, nutrient compositions tested in the National Program II, Project No TEHNUFEN. 72201/1.10.2008, applying by plant to stimulate and supplement of plant nutrition, prevention and treatment of nutrients deficiencies or optimize the nutrient content in crops, are means of fertilization with environment protection effects against chemical pollution.

MATERIAL AND METHOD

Experience was held in pots, Mitscherlich type, with capacity of 20 kg dry soil. The soil used was of cambic chernozem (Teleorman county). Soil fertilization was made before sowing, with 500 mg N, P_2O_5 and K_2O/pot. Sunflower plants (NEVADA cultivar), used as a test, were increased to 10 leaves (stage which corresponded with the beginning flowering). For each experimental factor combinations were provided 3 replications, with 3 plants per pot.

The main factors of experiment were:

A - chemical source of N;

B - concentration of diluted solution of foliar fertiliser applied;

C - the presence of collagen.

A Chemical source of N (N is marked isotope) had four variants, which are the following:

1. N-(15N - NH2) + PK + micro, encoded;
2. N-(15N - NO3) + PK + micro, encoded;
3. N-(15N - NH4) + PK + micro, encoded;
4. N-(15N - NH2), encoded.

B. Concentration of diluted solution of fertiliser foliar, consisted of two variants, including:

B1 (1%)	N-(15N - NH2) + PK + micro, encoded a1; N-(15N - NO3) + PK + micro, encoded a2; N-(15N - NH4) + PK + micro, encoded a3; N-(15N - NH2), encoded a4.
B2 (2%).	N-(15N - NH2) + PK + micro, encoded A1; N-(15N - NO3) + PK + micro, encoded A2; N-(15N - NH4) + PK + micro, encoded A3; N-(15N - NH2), encoded A4.

C. The hydrolyzate of collagen, composed of three variants, including:

C1 - H0 (without collagen);

C2 - H1 (1ml/100 ml solution);

C3 - H2 (2 ml/100 ml solution).

Number of pots / experiment = 4 (A) x 2 (B) x 3 (C) = 24 x 3 (replications) = 72 pots.

Application of CFF solutions was done rigorously on the same leaves (in three treatments), which were previously marked, excluding the rest of the plant to application of the CFF solution.

Sampling of plant material for the agrochemical and isotopic determinations was harvested in three days from last treatment leaf (that corresponding with the stage of full flowering plants).

Data obtained from analysis of intact sunflower leaves were corrected with the export and were statistically analyzed.

RESULTS AND DISCUSSIONS

In figure 1 we can see the export of potassium (%) provided by the application of fertilizers to dry mass calculated for untreated leaf at a concentration of foliar fertilizer diluted to 1% (variant b1).

It is noted that, depending on the source of the chemical N (factor A), best results were achieved in variants a1 and a2, as the sum of the three variants of factor C (a1c1 + a1c2 + a1c3).

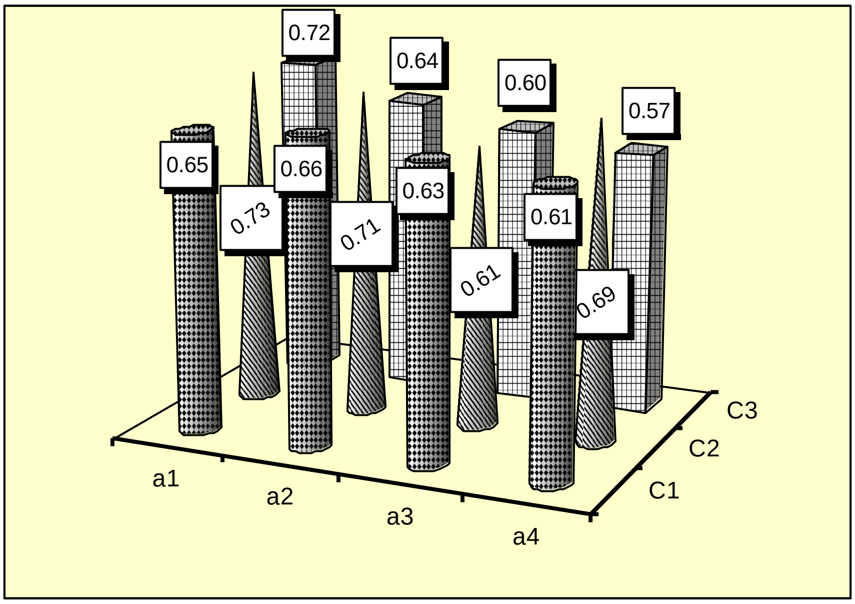

Fig. 1 Influence of nitrogen source and concentration of collagen hydrolyzate in 1% solution applied to leaves of sunflower leaf on the export of potassium (%)

Under the influence of the concentration of applied dilute solutions (B), data show that fertilizer solutions given concentration of 2% led to obtain increased quantities of the export of potassium (%) for all levels of the factor C only A1 version (figure 2).

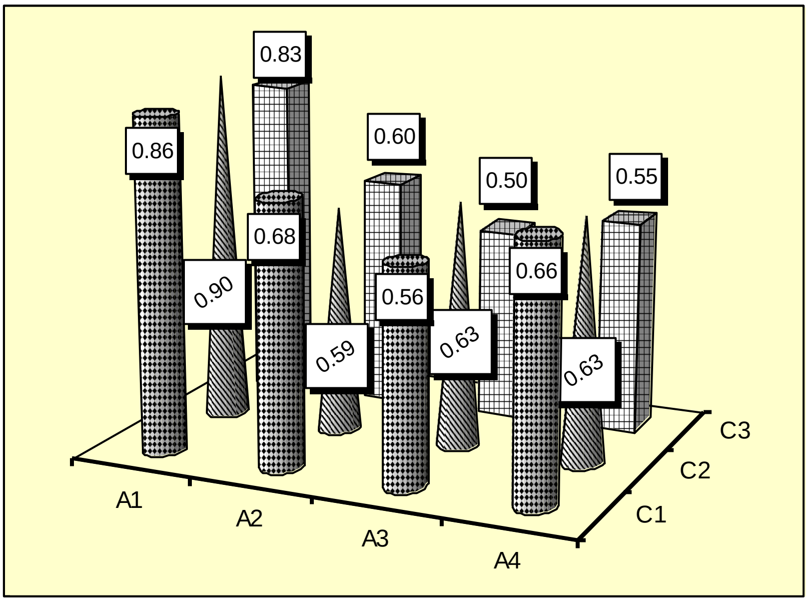

Fig. 2 Influence of nitrogen source and concentration of collagen hydrolyzate in 2% solution applied to leaves of sunflower leaf on the export of potassium (%)

Table 1

Significance of differences between pairs of fertilizers according to the factor C

Number of pair	Pair fertilizer		Test Tukey		
			C1	C2	C3
1	a1	a2	ns	ns	ns
2	a1	a3	ns	ns	ns
3	a1	a4	*	ns	*
4	a1	A1	ns	*	ns
5	a1	A2	ns	ns	ns
6	a1	A3	ns	ns	**
7	a1	A4	*	ns	*
8	a2	a3	ns	ns	ns
9	a2	a4	ns	ns	ns
10	a2	A1	**	*	**
11	a2	A2	ns	ns	ns
12	a2	A3	ns	ns	*
13	a2	A4	ns	ns	ns
14	a3	a4	ns	ns	ns
15	a3	A1	**	**	**
16	a3	A2	ns	ns	ns
17	a3	A3	ns	ns	ns
18	a3	A4	ns	ns	ns
19	a4	A1	**	*	**
20	a4	A2	ns	ns	ns
21	a4	A3	ns	ns	ns
22	a4	A4	ns	ns	ns
23	A1	A2	*	**	**
24	A1	A3	**	**	**
25	A1	A4	**	**	**
26	A2	A3	ns	ns	ns
27	A2	A4	ns	ns	ns
28	A3	A4	ns	ns	ns

Tukey 5% - 4.15% Tukey 1% - 5.4%

By applying the method of multiple comparison (Tukey test), we see that there are significant and significant distinct differences for factor C, table 1.

The results of the ANOVA statistical test show that solution of fertiliser foliar when hydrolyzate of collagen is missing, is not influenced by the factor B (Concentration of diluted solution of fertiliser foliar) but is influenced by the factor A (Chemical source of nitrogen).

Statistical test show that solution of fertiliser foliar when hydrolyzate of collagen is in a concentration of 1 and 2%, is not influenced by the factor B (Concentration of diluted solution of fertiliser foliar) but is influenced by the factor A (Chemical source of nitrogen).

CONCLUSIONS

Under the influence of the first factor (A), the N chemical source, the best results, for concentrations of 1% and 2%, were obtained for a1 and A1 variants except for a1C1 variant, it has a lower value than a2C1 variant.

Pair of fertilizers which have differences statistically for all of three degrees of factor C are: a2 and A1; a3 and A1; a4 and A1; A1 and A2; A1 and A3; A1 and A4.

Statistical differences (export of K) for concentrations of 1% solution exist only for the pair (a1, a4), C1 and C3 variants.

When applying the 2% solution, A1 variant has a higher concetration (significant) towards variants A2, A3, A4.

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INFLUENȚA DIFERITELOR TEHNOLOGII AGRICOLE ASUPRA FERTILITĂȚII SOLULUI ÎN AREALUL DOBROGEA, CONSTANȚA

IMPACT OF DIFFRENT AGRICULTURAL TECHNOLOGIES ON SOIL FERTILITY IN THE AREA DOBROGEA, CONSTANȚA

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Key words: soil, fertility, minimum, tillage, agriculture

ABSTRACT

Agriculture has a major contribution to sustainable economic development through the economic and social opportunities it provides for present and future generations.

Continuous use of traditional tillage system resulted in a gradual harvest increase, but gave rise to some worrying negative phenomena regarding the most important supply of the agricultural production - soil, by its chemical and physical degradation.This paper aims to assess soil degradation processes, based on pedo-transfer rules and is based on of expeditionary studies regarding assessment and characterization of soil fertility, under the practice of various farming systems: conventional tillage and minimum tillage.Studies were carried on in the agricultural area Dobrogea, Constanta.

REZUMAT

Agricultura are o contribuție majoră în dezvoltarea durabilă a economiei prin oportunitățile economice şi sociale pe care le conferă generației actuale şi viitoare.Utilizarea continuă a sistemului clasic de lucrari ale solului a condus la creşterea treptată a produției, dar a determinat apariția unor fenomene negative îngrijorătoare privind cea mai importantă rezervă a producției agricole, solul, prin degradarea fizică şi chimică a acestuia. Lucrarea de față urmăreşte estimarea proceselor degradării solului, pe baza regulilor de pedotransfer şi are la bază studii expediționare privind evaluarea şi caracterizarea stării de fertilitate a solului, în condițiile practicării diferitelor sisteme de agricultură: convențională intensivă şi convențională extensivă .

Studiile s-au efectuat în arealul agricol Dobrogea, Constanța.

INTRODUCTION

The soil cover in Dobrogea presents a variety of genetic and environmental conditions and hence a wide range of suitability for different crops.

After the current System of Soil Taxonomy (SRTS 2003[1]/WRB 1998[2]), Dobrogea shell consists of five classes: [1]Protisols/Fluvisols[2], Cernisols, Hidrysols, Anthrosols, Salsodisols. Soils were formed and evolved mostly on loess that sent favorable physical measures. Almost 80% of the agricultural area is covered with the Cernisols (Kastanozems and Chernozems[2]) with high productive potential, well supplied with nutrients. Constanta is the only county in which are scattered with significant weight such soils. Other classes of soil fertility with low potential, are less widespread and mainly for pasture, vineyards and orchards. The table below (Table 1) represent the soil types that are found on the surface predominantly agricultural of the county, 93.1%.

Table 1

Main soil types in the Constanta county

Main soil types in the Constanta county and the area they occupy [2]	%
Leptosol	0.5
Regosol	6.1
Arenosol	0.6
Fluvisol	4.1
Kastanozem	16.6
Chernozem	62.7
Rendzic Leptosol	2.0
Gleysol	0.3
Solonchaks	0.2
Agriculture lands	6.9

Expeditionary studies on the evaluation and characterization of soil fertility status in the agricultural area Agrotera Agricultural Society

Activity in the area had as its major objective assessment at the impact of conventional agricultural technologies and moderate conservative on the physical, chemical and biological soil properties. General characteristics of the agricultural society area, in terms of geomorphologic unit is that represent part of the southern Dobrogea plateau.

Typical form of relief is tabular plateau.

MATERIAL AND METHOD

Predominant rock is loess (Quaternary) with thicknesses from 0 to over 25 m, located on Mesozoic limestone, also are common Sarmatian and Cretaceous limestone outcrops occurring. Size composition of loess, prevalence is medium, ranging from clay to loamy-clay soils by printing it and who have formed, and that rock.

Litology configuration favored formation of cernisols edaphic volume, usually very high.

Dry climate with hot, dry summers and cold winters, the average temperature of warmest month> 22^0C, maximum rainfall in early summer.

Hydrogeological, the plateau is characterized by deep groundwater (> 10.1 m) which do not affect the profile of soil or vegetation growth. In areas of groundwater irrigation microdepresionare due to artificially high soil profile reaching influence and even lead to excess moisture.

Applied technological work in the four areas (Sole A 326, A 19, A 821, A 25) are: 1 - worked with reversible plough; 2 - worked with chisel; 3 - worked with rotary harrow; 4 – combined; 5 – roller.

RESULTS AND DISCUSSIONS

The data presented showed that the most important limiting factor in the agriculture area is determined by the risk of drought, reduced workability and erosion.

These may be exacerbated by conventional technology systems and technical mistakes that lead to lameness excessive loosening of the soil, the faster mineralization of organic matter in soil, destructuring of structural aggregates. On soils with high native level of fertility and productivity, these two cases are considered major emphasis and / or expanding existing negative processes and the emergence of other possible negative processes. As a general feature of the area, the soils were formed under the action of a single dominant process of pedogenesis: bioaccumulation steppe type (calcium-mull humus type). It has evolved differently depending on which parent rock acted: loess, limestone and colluvial, groundwater or anthropic activity. The area in which the expeditionary studies belonging is covered with chernozem, class Cernisols. Expeditionary studies have been conducted in various agricultural areas, each being characterized by a specific in terms of applied technology. Soil condition was evaluated and characterized in four areas (Sole A 326, A 19) under different agricultural technologies of soil cultivation. Agricultural technologies of soil cultivation in the period 2005-2008 used in the four areas studied are presented in the tables below(table 2).

Table 2

Areal A 19 – 90 ha

Year	2005	2006	2007	2008
Culture	Wheat	Wheat	Turnpit	Sun-flower
Fertilization with mineral N	66-70 Kg s.a. N	66-70 Kg s.a. N	33-34 Kg s.a. N	33-34 Kg s.a. N
Organic fertilization	-	-	-	-
Green fertilisation	-	-	Chopped vegetable	Chopped vegetable
Tillage system	Plowing	Plowing	Plowing	-
	Disc	Disc	Disc	Disc
	Combinator	Combinator	Combinator	Disc
	Sowing	Sowing	Sowing	Sowing
	Herbicide	Herbicide	-	Herbicide
	Roller	Roller	Roller	Roller
Yield (Kg/ha)	5200	4800	2500	1800

Areal A 25 – 84 ha

Year	2005	2006	2007	2008
Culture	Wheat	Coriander	Sun-flower	Spring Barley
Fertilization with mineral N	66-70 Kg s.a. N	33-34 Kg s.a. N	33-34 Kg s.a. N	66-70 Kg s.a. N
Organic fertilization	-	-	-	-
Green fertilization	-	-	-	-
Tillage system	Plowing	Plowing	Plowing	Plowing
	Disc	-	Disc	-
	Combinator	Combinator	Combinator	Combinator
	Sowing	Sowing	Sowing	Sowing
	Herbicide	Herbicide	Herbicide	Herbicide
	Roller	Roller	Roller	Roller
Yield (Kg/ha)	4600	1700	800	3300

• Soils in areas A 19 and A 25 had a medium texture, medium clay (A 19) and powdery clay (A 25). Accumulated relatively high content of dust and sand from 67.0 to 70.1% (A 19) and 67.2 to 69.1% (A 25) throughout the soil profile depth study reveal that there is a risk to enhance natural degradation processes through dissolution, especially in the structural macro- aggregates work under intensive land application. This type of soil degradation now affects large areas in the county of Constanta.

Structural hidrostability of soil aggregates of four agricultural areas has been assessed by the determination of macro-and micro- aggregates stable and unstable that the action of water and structural instability index. Structural hidrostability of macro- aggregates of the 326 area is generally moderate throughout the soil depth profiles analyzed. Structural hidrostability content was higher in surface soil (0-5 cm), with numerical values, however, located at the lower limit of the range of variation and moderate the 5-55 cm depth. Macro-aggregates hidrostability higher content at the soil surface was probably caused by lower

mobilization of soil from agricultural work done in 2008. In this area with a minimum agricultural technology, conventional tillage was omitted tillage with turning the swath. Moderate content of hidrostabillity of macro- aggregates was determined directly by higher clay content of soil in this area. Micro- aggregates content but unstable to water was high and very high throughout the depth of soil profiles analyzed, which leads to the idea that this soil has high susceptibility to dissolution at micro level.
Structural instability index had medium values at the soil surface (0-5 cm) and generally high throughout the depth profile analysis, soil showing a moderate to high risk from micro-dissolution (table 3).

Table 3

Soil structural hydrostability of areal A326

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	s $\bar{x}$	IC
Macrohidrostability (%)									
0 – 5	20	21	23	20	21	1	7	1	17 – 25
5 – 15	14	15	15	14	15	1	4	0	13 – 16
15 – 25	14	16	13	16	15	2	10	1	10 – 19
25 – 35	14	13	13	16	14	1	10	1	10 – 18
35 – 45	13	13	13	13	13	0	0	0	13 – 13
45 - 55	12	13	13	13	13	1	4	0	11 - 14
Dispersion (%)									
0 – 5	10	14	10	10	11	2	18	1	5 – 17
5 – 15	10	14	9	9	11	2	23	1	4 – 17
15 – 25	11	14	9	8	11	3	25	1	3 – 18
25 – 35	12	12	9	8	10	2	20	1	4 – 16
35 – 45	12	12	9	8	10	2	20	1	4 – 16
45 - 55	12	11	9	8	10	2	18	1	5 - 15
Structural instability index (-)									
0 – 5	0.56	0.67	0.43	0.49	0.54	0.10	19.18	0.05	0.24 – 0.84
5 – 15	0.71	0.93	0.63	0.64	0.73	0.14	19.19	0.07	0.32 – 1.14
15 – 25	0.78	0.87	0.69	0.51	0.71	0.15	21.57	0.08	0.26 – 1.16
25 – 35	0.89	0.88	0.69	0.50	0.74	0.18	24.94	0.09	0.20 – 1.28
35 – 45	0.92	0.93	0.70	0.62	0.79	0.16	19.75	0.08	0.34 – 1.25
45 - 55	1.00	0.88	0.64	0.61	0.78	0.19	24.12	0.09	0.23 – 1.33

Structural hidrostability soil in the area A 19 is generally low on the depth of 0-45 cm and 45-55 cm layer moderate, but unaffected by the annual performance of agricultural soil preparation for sowing (table 4). Structural hidrostability content was low in the 0-45 cm layer and medium in the last analysis, the soil present a high risk of dissolution at the macrostructure. Dispersion, respectively micro- aggregates content was unstable to water on the full depth of soil profiles analyzed, thus posing a high risk of soil dissolution at micro level. Structural instability indicator had numerical values, generally over 1.00, very large, a situation which confirms the high susceptibility of this soil physical degradation processes by dismantling the micro-and macrostructural.

Table 4

Soil structural hidrostability in A19 areal

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	s $\bar{x}$	IC
Macrohidrostability (%)									
0 – 5	4	6	6	4	5	1	23	1	2 – 8
5 – 15	7	9	8	7	8	1	12	0	5 – 11
15 – 25	8	9	9	8	9	1	7	0	7 – 10
25 – 35	9	9	9	9	9	0	0	0	9 – 9
35 – 45	10	10	10	10	10	0	0	0	10 – 10

45 - 55	11	12	16	15	14	2	18	1	7 – 20
Dispersion (%)									
0 – 5	9	8	8	10	9	1	11	0	6 – 12
5 – 15	9	9	9	9	9	0	0	0	9 – 9
15 – 25	9	9	9	9	9	0	0	0	9 – 9
25 – 35	9	10	9	9	9	1	5	0	8 – 11
35 – 45	9	11	11	9	10	1	12	1	7 – 13
45 - 55	9	9	11	10	10	1	10	0	7 - 13
Structural instability index (-)									
0 – 5	2.24	1.35	1.31	2.58	1.87	0.64	34.17	0.32	0.00–3.74
5 – 15	1.29	1.02	1.14	1.31	1.19	0.14	11.46	0.07	0.79–1.59
15 – 25	1.12	1.03	1.02	1.29	1.12	0.13	11.21	0.06	0.75–1.48
25 – 35	1.02	1.08	1.05	1.01	1.04	0.03	3.4	0.02	0.95–1.13
35 – 45	0.89	1.12	1.13	0.91	1.01	0.13	1.86	0.07	0.63-1.39
45 - 55	0.84	0.76	0.72	0.69	0.75	0.06	8.64	0.03	0.56 -0.94

These three indicators, which are important in defining the structure-dissolution capacity of the soil are influenced by two factors pedogenetical, size composition, mainly on clay content, and that the humus content, but also by natural factors (weather conditions) and anthropic (tillage).

Specialized studies conducted in the area revealed that, in general, soils from the Constanta area are characterized by a reduced stability of structural aggregates due to natural conditions and pedogenesis factors of these soils.

In this case reduced structural hidrostability of macro-micro- aggregates of soil was determined by the higher prevalence of dust and sand over clay, wich has an important role in the processes of agglutination-cementing soil particles. Furthermore, while conventional farming annually increased the state, determined the structural instability of soil aggregates. It therefore requires the application of reduced tillage systems, eliminating plowing the furrow and return measures for the recovery of soil structural condition, particularly in the active layer.

In area A 821, the soil was characterized by a reduced structural hidrostabilitaty, effect of the natural conditions of soil formation, but also of conventional agricultural technologies for a long time. Macro- aggregate hidrostability content recorded small numerical values below 10%; hidrostabile micro- aggrgates content was higher numeric values 6-9%, structural instability index showed high values over 1.00% on the depth of 0-35 cm and higher than that level (table 5). The recorded numerical values of the indicators, of soil aggregate stability characterization, have clearly revealed the presence of a very high risk of developing destructuring micro-and macrostructural especially in plowed layer.

Table 5

Soil structural hidrostability of areal A 821

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	$s_{\bar{x}}$	IC
Macrohidrostability (%)									
0 – 5	5	4	4	7	5	1	28	1	1 – 9
5 – 15	4	6	4	7	5	2	29	1	1 – 10
15 – 25	6	6	6	7	6	1	8	0	5 – 8
25 – 35	8	7	7	7	7	1	7	0	6 – 9
35 – 45	9	10	9	8	9	1	9	0	7 – 11
45 - 55	9	10	9	9	9	1	5	0	8 - 11
Dispersion (%)									
0 – 5	7	8	6	7	7	1	12	0	5 – 9
5 – 15	8	9	7	8	8	1	10	0	6 – 10
15 – 25	7	8	7	8	8	1	8	0	6 – 9
25 – 35	8	8	8	8	8	0	0	0	8 – 8
35 – 45	7	8	8	8	8	1	6	0	6 – 9

45 - 55	7	8	9	9	8	1	12	0	5 - 11
Structural instability index (-)									
0 – 5	1.36	1.80	1.46	1.02	1.41	0.32	22.77	0.16	0.47– 2.35
5 – 15	1.73	1.64	1.76	1.11	1.56	0.30	19.51	0.15	0.67 – 2.45
15 – 25	1.15	1.16	1.21	1.18	1.18	0.03	2,.5	0.01	1.10 – 1.25
25 – 35	1.02	1.08	1.14	1.19	1.11	0.07	6,65	0.04	0.89 – 1.32
35 – 45	0.75	0.79	0.89	1.16	0.90	0.18	20.57	0.09	0.36 – 1.44
45 - 55	0.78	0.82	0.99	1.01	0.90	0.12	12.99	0.06	0.56 – 1.24

In area A 25 soil has been characterized by reduced soil structural aggregates stability particularly in the first 35 cm, due to both natural conditions of soil formation and action of anthropic factors by conventional agricultural technologies for a long time. Macro-aggregates hidrostability content had low values on the 0-35 cm, below this level, in the affected layers of the soil medium recorded values were close but the lower limit of the variation. Dispersion, respectively micro- aggregate content was unstable to water for the first 5 cm high and very high throughout the depth of soil profiles analyzed. Structural instability index was very high on the top 5 cm, extremely high layer 5-25 cm and below the level recorded numerical values were lower. It can be seen extremely high structural instability of the soil on the depth at which work is carried out by raising and seedbed preparation for seeding (table 6).

Table 6

Soil structural hydrostability of areal A 25

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	$s_{\bar{x}}$	IC
Macrohidrostability (%)									
0 – 5	5	4	5	5	5	1	11	0	3 – 6
5 – 15	5	5	5	5	5	1	11	0	3 – 6
15 – 25	5	6	5	5	6	2	30	1	1 – 12
25 – 35	8	8	9	9	9	1	7	0	7 – 10
35 – 45	10	9	11	12	11	1	12	1	7 – 14
45 - 55	11	10	12	14	12	2	15	1	7 - 17
Dispersion (%)									
0 – 5	9	7	9	9	9	2	18	1	4 – 14
5 – 15	12	14	13	13	13	1	6	0	11–15
15 – 25	12	13	12	13	12	1	11	1	8 – 15
25 – 35	11	11	11	12	11	1	4	0	10–13
35 – 45	11	13	12	13	12	1	8	0	9 – 15
45 - 55	11	15	14	13	13	2	13	1	8 – 18
Structural instability index (-)									
0 – 5	1.81	1.86	1.91	1.89	1.94	0.17	8.75	0.08	1.45 - 2.44
5 – 15	2.39	2.82	2.38	2.50	2.77	0.53	18.99	0.26	1.23 – 4.31
15 – 25	2.39	2.23	2.35	2.57	1.98	0.60	30.17	0.30	0.23 – 3.72
25 – 35	1.38	1.40	1.17	1.42	1.34	0.12	8.65	0.06	1.00 – 1.68
35 – 45	1.10	1.31	1.09	1.13	1.16	0.10	8.91	0.05	0.86 – 1.46
45 - 55	1.01	1.31	1.17	1.09	1.15	0.13	11.17	0.06	0.77 – 1.52

Impact of different agricultural technologies of soil cultivation in the four areas of study was analyzed by determining the two parameters: aparent density (g • cm-3) and degree of compaction (% v / v). Values obtained from determinations made under area A 326 showed the presence of a moderately loose soil on the top 5 cm, slightly loose in the next 10 cm and to the 15 to 25 cm; below this depth is more lax state placements for a total weak soil loose. Bulk density values were very low (averaging 1.13 g • cm-3) by 0-5 cm, small (average 1.27 g • cm-3) on 5-15 cm, medium (average 1 35 g • cm-3) on 15 to 25 cm below the level recorded values are small (average between 1.25 and 1.31 g • cm-3) (table 7). The degree of compaction was in agreement with bulk density, very low in the first 5 cm (mean 14% v / v), less the depth of 5-15 cm (average 4% v / v), middle 15 - 25 cm (average of 3% v / v), below this depth values lower than the lower limit of the field (average of 3% v / v).

Table 7

Soil density in A 326 areal

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	S $\bar{x}$	IC
Aparent density (g·cm^{-3})									
0 – 5	1.12	1.12	1.15	1.14	1.13	0.01	1.32	0.01	1.09 – 1.18
5 – 15	1.27	1.28	1.26	1.27	1.27	0.01	0.64	0.00	1.25 – 1.29
15 – 25	1.34	1.33	1.36	1.35	1.35	0.01	0.96	0.01	1.31 – 1.38
25 – 35	1.31	1.30	1.32	1.31	1.31	0.01	0.62	0.00	1.29 – 1.33
35 – 45	1.28	1.28	1.25	1.26	1.27	0.02	1.18	0.01	1.22 – 1.31
45 – 55	1.27	1.25	1.23	1.24	1.25	0.02	1.37	0.01	1.20 – 1.30
Degree of compaction (%v/v)									
0 – 5	-15	-15	-13	-14	-14	1	-7	0	-17 - -11
5 – 15	-4	-3	-5	-4	-4	1	-20	0	-6 - -2
15 – 25	3	1	4	2	3	1	52	1	-1 – 6
25 – 35	-1	-1	-1	-1	-1	1	-13	1	-3 – 0
35 – 45	-2	-3	-5	-4	-4	1	-37	1	-7 – 0
45 – 55	-3	-5	-6	-6	-5	1	-28	1	-9 - -1

Loose surface soil condition is a negative effect of intensive mobilization by conventional soil tillage. In another way, is clearly highlighted the presence of a slightly compacted layer by performing annual work tillage (15-25 cm). The emergence of anthropic or secondary compaction is a consequence of prolonged application of intensive agricultural system technology (conventional) with the basic work of plowing the furrow and then return to make various secondary works, seedbed preparation for seeding and maintenance of culture growing season. History of agricultural soil cultivation system described above shows that at least the past three years, this area has been applied to a conventional technology, with a clay-loamy texture as ground and this can be a potential cause of secondary compaction. In 2008, no plowing was done with turning the main furrow, there were just two disks , but which may not be performed in optimal conditions of traficability and workability, the results revealing a weak compaction of soil at a depth of 15 cm. Analyzing the status of settlement of the soil sola A 19 (table 8), we can say that: the top 15 cm soil is moderately loose, as this depth is slightly loose soil / tamping.

Bulk density values up to 15 cm are very low, near the lower limit for the first 5 cm (average 1.14 g • cm-3) and the upper limit of the variation in 5-15 cm (average 1.24 g • cm-3), but below this depth, bulk density increases from low values (average values in the range from 1.28 to 1.29 g • cm-3). The degree of compression has very low values (mean 15% v / v) for the first 5 cm, 15-35 cm medium values (values in the range 0-5% v / v) values below 35 cm but the degree of compression is small (values in the range from -4 to -5% v / v). It is clearly observed a weak settlement on 15 -35 cm depth, the effect of the application of conventional agricultural technology systems for a long time who have brought a slightly compact layer at the base of the main plowing, no high risk of developing physical degradation processes by anthropic compaction because on the one reason - granulometric composition of the soil (medium texture), bulk density the other, which is characteristic of land values slightly loose.

In this field, agricultural technology applied in 2008 did not include conducting basic plowing, but two discs were applied, which is recommended to practice in the coming years, given that this soil will require, however, in future, the application of low technology (eliminating plowing furrow basic return) to remove the "hardpan" and possibly a slight recompaction.

Table 8

Soil density in A 19 areal

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	S $\bar{x}$	IC
Aparent density ($g \cdot cm^{-3}$)									
0 – 5	1.16	1.12	1.14	1.13	1.14	0.02	1.50	0.01	1.09 – 1.19
5 – 15	1.27	1.22	1.25	1.21	1.24	0.03	2.23	0.01	1.16 – 1.32
15 – 25	1.37	1.39	1.38	1.40	1.39	0.01	0.93	0.01	1.35 – 1.42
25 – 35	1.36	1.35	1.34	1.36	1.35	0.01	0.71	0.00	1.32 – 1.38
35 – 45	1.27	1.29	1.28	1.29	1.28	0.01	0.75	0.00	1.25 – 1.31
45 – 55	1.27	1.28	1.27	1.28	1.28	0.01	0.73	0.00	1.27 – 1.30
Degree of compaction (%v/v)									
0 – 5	-12	-16	-15	-16	-15	2	-13	1	-20 - -9
5 – 15	-5	-8	-6	-9	-7	2	-26	1	-12 - -2
15 – 25	3	4	4	5	4	1	20	0	2 – 6
25 – 35	2	1	0	2	1	1	77	0	-2 – 4
35 – 45	-5	-4	-4	-4	-4	1	-12	0	-6 - -3
45 – 55	-5	-4	-5	-4	-5	1	-13	0	-6 - -3

The numerical values of the two indicators characterize the status of settlement of the soil (bulk density, degree of compaction) of areal A 821 were at this stage, medium to very small, strongly influenced by the main work of the soil. It is also recognized that these physical indicators have a dynamic nature, accounting for seasonal changes, and multi-annual, under the influence of natural and anthropic factors, especially in agriculture, by the way of tillage (primary tillage with the return of the swath, no return, paraplug, disk, etc..) and work intensity (depth and frequency). Variation in depth of both bulk density and degree of compaction, suggesting that ground was plowed to a maximum of 20-25 cm, 15-25 cm on the two indicators have recorded the highest values being clear presence of a layer compact, well known as the plow sole. Below this depth, the layers that are not affected by current agricultural work (especially at 45-55 cm), loose soil is poor. Bulk density values were very low for the first 5 cm (average 1.14 g • cm-3), small (average 1.20 to 1.31 g • cm-3) on 5-25 cm long and medium enterprises (in average 1.39 g • cm-3) the depth of 25-35 cm (table 9). The degree of compaction is consistent with bulk density values recorded confirming the presence of a moderately loose soil in the first 15 cm (-10 to -14% v / v), low tamping the depth 15-35 cm (0-4% v / v), because below that level to be under loose soil (-5 to -9% v / v).

Table 9

Soil density in A 821 areal

Depth/ indicator	*Observation profile*				*Statistical indicators*				
	P1	**P2**	**P3**	**P4**	$\bar{x}$	**s**	**Cv**	**S $\bar{x}$**	**IC**
Aparent density ($g \cdot cm^{-3}$)									
0 – 5	1.15	1.13	1.14	1.15	1.14	0.01	0.84	0.00	1.11 – 1.17
5 – 15	1.23	1.18	1.17	1.20	1.20	0.03	2.21	0.01	1.12 – 1.27
15 – 25	1.33	1.33	1.30	1.31	1.31	0.02	1.14	0.01	1.27 – 1.36
25 – 35	1.37	1.38	1.37	1.39	1.39	0.01	0.70	0.00	1.35 – 1.41
35 – 45	1.25	1.24	1.26	1.26	1.26	0.01	0.76	0.00	1.22 – 1.28
45 – 55	1.20	1.21	1.22	1.21	1.21	0.01	0.67	0.00	1.19 – 1.23
Degree of compaction (%v/v)									
0 – 5	-13	-15	-14	-13	-14	1	-7	0	-17 - -11
5 – 15	-7	-11	-11	-9	-10	2	-20	1	-15 - -4
15 – 25	0	0	0	0	0	1	-5	0	-2 - 1
25 – 35	3	4	3	6	4	1	35	1	0 – 8
35 – 45	-5	-6	-5	-5	-5	1	-10	0	-7 - -4
45 – 55	-9	-8	-8	-9	-9	1	-7	0	-10 - -7

Application of a long conventional agricultural technologies in this area resulted in poor soil aeration in the first 15 cm, forming a compact layer at 25-35 cm depth slightly, below that level, the affected layers of farm work, overall, is present a moderately loose state settlement. With a fine-textured soil, there is a potential risk of anthropic compaction, which can be prevented by careful monitoring, while the soil is in balance, especially in autumn after harvest, before the soil aeration works . Ground state settlement of the area A 25 was assessed by the same characterization indicators. The numerical values of bulk density were not included in a very wide range, from very small, 1.13, to small, cm-3.·from 1.31 to 1.35 g In the superior layer, at the 0-15 cm depth, the soil is moderately loose, the 15-35 cm soil is slightly loose, so that under this level, in the layers affected by agricultural activities, soil aeration to provide a moderate. The numerical values of the degree of compaction are in agreement with the apparent density of the layer show (0-25 cm) are very small and small -15 -2% v / v) medium at 25-35 cm (mean 2% v / v). Under the numerical values to decrease the degree of compaction in the small, -6% v / v. It can be seen easily form a layer at 25-35 cm depth tamping, the degree of compaction recording medium numerical values (table 10).
The presence of this layer is probably due to compact easily replicate the work carried out by conventional tillage furrow return. It is recommended for future to avoiding "hardpan" to waive at least one period to make major plowing the soil when soil is moderate or low and have no risk of developing high secondary compaction.

Table 10

Soil density in A 25 areal

Depth/ indicator	*Obesrvation profile*				*Statistical indicators*				
	P1	*P2*	*P3*	*P4*	$\bar{x}$	s	Cv	S $\bar{x}$	IC
Aparent density (g·cm^{-3})									
0 – 5	1.12	1.15	1.14	1.12	1.13	0.01	1.32	0.01	1.09 – 1.18
5 – 15	1.21	1.17	1.17	1.21	1.19	0.02	1.94	0.01	1.12 – 1.26
15 – 25	1.32	1.28	1.29	1.33	1.31	0.02	1.82	0.01	1.24 – 1.37
25 – 35	1.38	1.33	1.37	1.33	1.35	0.03	1.94	0.01	1.28 – 1.43
35 – 45	1.24	1.25	1.23	1.22	1.24	0.01	1.05	0.01	1.20 – 1.27
45 – 55	1.25	1.22	1.24	1.22	1.23	0.02	1.22	0.01	1.19 – 1.28
Degree of compaction (%v/v)									
0 – 5	-16	-13	-15	-16	-15	1	-9	1	-19 - -11
5 – 15	-9	-11	-12	-9	-10	2	-15	1	-15 - -6
15 – 25	-1	-3	-3	0	-2	2	-86	1	-6 – 3
25 – 35	5	0	3	0	2	2	92	1	-5 – 9
35 – 45	-7	-6	-8	-9	-8	1	-17	1	-11 - -4
45 – 55	-6	-9	-7	-8	-8	1	-17	1	-11 - -4

Applying conventional agricultural cultivation had a negative impact on the soil of the four areas studied:
• In all areas studied, the top layer show a slight loosening of the soil determined by various secondary works, seedbed preparation for planting, and maintenance of crop growing season;
• In all areas studied soil, at a depth of 15-35 cm, slight compaction were caused by repeated application of conventional processing of agricultural land for sowing;
• In the area of 326 compact layer is easily formed at 15 cm depth, at least the past three years because included technology applied using two disking operations before sowing, possibly in terms of inadequate workability and traficability, which resulted in negative formation of this layer slightly compact;
• In the A19 area, slightly compact layer is formed at 15 cm depth, because the technology applied, at least the past three years, that did not include making repeated disking operation; in 2008 was removed from classical technology conventional plowing, being replaced by disking.

• In the area A 821, at 25 cm depth is now present a compact layer of slightly determined by repeated basic plowing at the same depth; applied agricultural technology for the last three years did not include conducting annual disking operation, so that by the 25 cm soil has a moderate to slightly loose state;
• The situation is similar to area A 25 area, this compact layer is easily observed at 25 cm, applied agricultural technology in the last three years has included conducting annual disking operation, so that the 0-25 cm soil is in an moderate to weak loose;

CONCLUSIONS

• Elimination of conventional plowing furrows in 2008 in areas A 19, A326 brought changes to the content of the soil horizon hidrostabile macro-aggregate : in the area of 326 content of hidrostabile macro-aggregate registered large numerical values show upper horizon (0 -5 cm) compared with those recorded in the area A19, which were in the small field. Below this level and up to 45 cm depth values recorded in the area were moderate in A326 and smaller in the area A 19. This was due to several factors: (a) different size composition of both soils, the presence of a higher content of clay in the soil of the area A 826, recognized as the positive role it plays in the processes of agglutination-cement and formation of soil aggregates, (2) shredding debris and preserve these at the soil surface reduced soil exposure during aggressive factors (3) the plant's root system: area A 326 was cultivated with sunflower, and A 19 was cultivated with weath, which has a root system usually highly branched and developed the first 25 cm.

• Without the area 326, agricultural soils in other areas are expose at high risk of dissolution at the soil layer macrostructure enlighten, determined both by the natural conditions of training, especially anthropic factors.

• In all areas studied large and very large amounts content of unstable micro- aggregate to water (dispersion) clearly indicate a high susceptibility to soil micro-dissolution in the active layer, which could lead in time, if the soil with texture clay-loamy, and the emergence of other negative processes such as compaction and possible clogging pore space especially in the plowing.

• The index of structural instability had in generally large and very large values, in area A 25 reaching even extremely high values. If we follow the applied agricultural technologies in the past three years in areas A 25 and A 821, we can see that they were roughly similar. However very large dispersion - 1,00 on 5-55 cm depth recorded in the area of A 25 determined an higher index of structural instability of the soil at depth 5-25 cm, compared with levels recorded at this level in area A 821. Extreme high value of structural instability in the active soil layer was determined largely by particle size composition of the soil, dust and sand, with low quantity of clay with important role in the formation of structural aggregates.

• High structural instability in the upper soil horizon requires the application of measures for the recovery of soil structural condition: the adoption of agricultural technology protects the soil surface, such as the presence vegetable mulching crops or crop hidden protection covering, by a well-finished surface vegetation cover, reducing periods when the soil is completely uncovered and exposed to the impact of aggressive factors. Also for structural restoration of the horizon shows the recommended replacement and eventually eliminate intensive working of soil, the risk of dissolution is very high in this area where the clay is less weight in comparison with the dust and sand, which does not occur in granulometric fractions formation of structural aggregates.

Application of a long conventional agricultural technologies in this all areals resulted in poor soil aeration in the first 15 cm, forming a compact layer at 25-35 cm depth slightly, below that level, the affected layers of farm work, overall, is also present a moderately loose state settlement.

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CARTAREA ŞI BONITAREA PRELUVOSOLULUI TIPIC, ÎN VEDEREA STABILIRII CLASEI DE FAVORABILITATE PENTRU PAJIŞTEA DIN LOCALITATEA MURANI, JUDEȚUL TIMIŞ

SOIL MAPPING AND SOIL POTENTIAL RATING OF THE TYPICAL PRELUVOSOIL IN ORDER TO ESTABLISH THE FAVORABILITY CLASS OF THE GRASSLAND FROM MURANI, TIMIŞ COUNTRY

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ABSTRACT

The potential rating of the agricultural lands represents the complex operation of profound cognition of plant growth and development and of favorability degree determination of these conditions for each usage and culture (because a land can be favorable to certain usages and plant cultures but unfavorable to others), through a system of technical indicators and potential rating notes (Teaci et al., 1980). As such, the soil potential rating shows how many times a land is better than another, taking into account its fertility expressed by the crops that it provides.

The objective of the soil potential rating is represented by the earth, the land which will be divided so that each land surface taken into consideration is as homogenous as possible under aspect of all environment conditions and vegetation factors.

The paper has as purpose the calculation of soil potential rating notes for the typical preluvosoil within the perimeter of Murani and its framing within the appropriate quality class in order to establish its favorability for grasslands.

The proper soil potential rating consists of parallel development of two works: soil potential rating and vegetation potential rating.

The next is a preparing phase when is necessary to procure and study the topographic maps, the landed cadastral maps, and the scientific publications which provide data about all grasslands that will be classified, as well as any other useful documentation (Horablaga M., Luminița Cojocariu, 2006). After this stage will follow a field phase synonym with grassland potential rating, respectively a careful research of the grasslands in each block and plot, recorded on special sheets. The soil potential rating notes are calculated with the help of certain synthetic indicators obtained by field researches and laboratory analysis.

As a result of laboratory analysis and field research there were calculated the soil potential rating notes, using the elaboration methodology of pedological studies vol. II, III (I.C.P.A. 1987).

The methodology of soil potential rating elaborated by I.C.P.A. is based on parametric definition and determination of the environment actions and vegetation factors which act on plant production increase and also is based on the numerical description of the favorability degree of the factors assembly and of ecological conditions.

This methodology makes use of mathematical methods, objective grounded as much as possible, in order to obtain sure data about the land quality as production mean, related to each type of usage and each plant culture.

MATERIAL AND METHOD:

The potential rating of the agricultural lands represents the complex operation of profound cognition of plant growth and development and of favorability degree determination of these conditions for each usage and culture (because a land can be favorable to certain usages and plant cultures but unfavorable to others), through a system of technical indicators and potential rating notes (Teaci et al., 1980). As such, the soil potential rating shows how many times a land is better than another, taking into account its fertility expressed by the crops that it provides.

RESEARCH RESULTS

Haplic luvisoils from Murani

Morphologic features

Ap - 0 - 10 cm, average loam clay, brown grey very dark (10YR 3/2) in humid state, grained structure , modified by cultivation, low plastic and low adhesive, low loose, presenting thin and rare roots and small pores.

Ao - 10 - 25 cm, average loam clay, dark brown (10YR 3/3) in humid state, polyhedral structure small sub-angular, low plastic, low adhesive low loose, presents thin and rare roots and small pores.

AB - 25 - 40 cm, average loam clay, dark brown (10YR 3/4) in humid state, polyhedral structure small sub-angular, low plastic, low adhesive low loose, presents thin and rare roots and small pores, presents rare punctiform iron-manganese separations.

Bt_1w_1 - 40 - 75 cm, average loam clay, dark brown (10YR 3/2) in humid state, medium developed prismatic structure with clay thin pellicles in humid state and firm in dry state, moderate adhesive, presents bobovines with different dimensions.

Bt_2w_1 - 75 - 135 cm, average loam clay, dark brown (10YR 3/2), with brown spots (7,5 YR 4/4) in humid state, medium developed prismatic structure with clay thin pellicles, firm in dry state, moderate adhesive, moderate plastic, presents bobovines with different dimentions till to the profile base.

BCw_2 - 135 - 145 cm, average loam clay, dark brown (10YR 4/3) in humid state, polyhedral structure sub-angular medium to massive developed, firm in dry state, moderate adhesive, moderate plastic, presents rare croprolites.

$Ccaw_1$ - 145 - 180 cm, average loam clay, darker brown (10YR 4/4) in humid state, polyhedral massive structure, hard in humid state, firm in dry state, moderate adhesive, moderate plastic, presents small veins and small concretions of $CaCO_3$, has powerful effervescence.

Soil taxonomic unit is typical preluvosoil, stagnated-gleyied in depth on silitic clays, average loam clay/ average loam clay.

The physical and chemical propriety of Haplic luvisols from Murani

HORIZONS	*Ap*	*Ao*	*AB*	*Bt_1w_1*	*Bt_2w_1*	*BCw_2*	*$Ccaw_1$*
Depths (cm)	*0-10*	*10-25*	*25-40*	*40-75*	*75-135*	*135-145*	*145-180*
Coarse sand (2.0-0.2 mm)%	*0,2*	*0,3*	*0,6*	*0,4*	*0,9*	*1,9*	*2,3*
Fine sand (0.2-0.02 mm)%	*33,9*	*33,7*	*31,8*	*31,3*	*30,3*	*30,9*	*32,3*
Dust (0.02-0.002 mm)%	*31,6*	*29,3*	*28,8*	*27,5*	*26,9*	*24,9*	*22,4*
Clay 2 (under 0.002 mm)%	*34,3*	*36,7*	*38,8*	*40,8*	*41,9*	*42,3*	*43,0*
TEXTURE	*TT*	*TT*	*TT*	*TT*	*TT*	*TT*	*TT*
Specific density (Dg/cm^3)		*2,53*	*2,54*				
pH (in H_2O)	*5,9*	*6,1*	*6,4*	*6,6*	*7,0*	*7,8*	*8,15*
Humus (%)	*2,48*	*2,36*	*2,20*	*1,80*			
Cationic exchange capacity (T me 100 g/sol)		*25,0*	*26,4*	*27,0*			
Saturation degree in bases (V%)		*74,66*	*81,43*	*84,67*			

The three main granular categories, respectively sand, dust, clay are situating the soil in the class fine textures class, the subclass of medium loam clay. The clay fraction varies from values of 34.3% in the Ap horizon at 42.3 – 43% in the horizon BCw_2 and $Ccaw_1$. After the textural differentiation index (Idt = 1.23), the soil is textural non-differenced. The dust presents the highest percentages in the Ap horizon being 31.6% and decreases progressively to the inferior horizons to 22.4% at the depth over 150 cm. the fine sand is well represented from quantitative point of view being 30.3 – 33.9% with variations from a horizon to another on the entire profile depth. The coarse sand has lower values, the same percentage as the fine sand.

The soil is framing in the textural class “fine textures”, the subclass loam clay non-differenced on the profile.

The specific density is registering an increase from 2.53 g/cm^3 in the Ao horizon at 2.54 g/cm^3 in AB horizon.

The solution of the soil reaction is low acid, pH = 5.9 – 6.6 to the first part of the Bt horizon and neutral with pH = 7 in the second part of this horizon. The leaching to depth of the $CaCO_3$ and its accumulation at the base of the profile has imprinted to the C horizon a moderate alkaline feature (pH = 8.15).

The humus marks a graduated decrease from the surface horizon (2.48%) to depth reaching in the horizon Bt_1w_1 at the value of 1.80%. the values of the humus content are placing this soil between the category of “low humifer soil” and “moderate humifer soil”.

The values of the total cationic exchange capacity varies between 25 – 27 me/100 g soil these being different from an horizon to another depending by the clay and humus content or by the nature of the nature of the respective colloids.

The degree of saturation in bases, important index for the appreciation of the fertility state of the soil presents high values on the entire profile. This soil is considered medium alkaline in the Ao horizon (V = 74.66%) and eubasic (V = 81.43 – 84.67%) in the horizon AB and Bt_1w_1.

Preluvosoils can be cultivated with most of the agricultural plants, on the low inclined or plane land there being recommended cereals and technical crops, and on the versants with great slope are recommended the vine and tree plantations.

For the increase of the productive capacity of the preluvosoils there is recommended the execution of the agricultural works at the proper moment and with good quality, having in view the preservation of humidity in soil, and for a better aeration and permeability.

CONCLUSIONS

After the interpretation of the analytic data there were calculated the evaluation marks for the typical preluvosoil. Thus, this was framed in the third quality class for the grassland from Murani locality, obtaining 72 points. Depending by the soil quality this grassland is framing in the category “good” with a carrying capacity of 1.41 – 1.60 cattle units per hectare.

For the increase of the productive capacity of the typic preluvosoil from Murani locality there is recommended the application of ordganica and mineral fertilisers, the execution of the agricultural works at the proper moment and qualitative, having in view the preservation of humidity in soil, and for a better aeration and permeability.

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BILANȚUL FOSFORULUI DINTR-UN SOL BRUN-ROŞCAT DE LA BANU MĂRĂCINE – CRAIOVA, SUB O CULTURĂ DE GRÂU ŞI PORUMB, FERTILIZATĂ CU DIFERITE TIPURI ŞI DOZE DE ÎNGRĂŞĂMINTE

THE PHOSPHORUS BALANCE IN BROWN-REDDISH SOIL FROM BANU MARACINE – CRAIOVA, UNDER WHEAT AND CORN ROTATION FERTILIZED BY SEVERAL DOSES AND TYPES OF FERTILIZERS

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Keywords: wheat, corn, fertilizers, bringing in and losses of phosphorus

ABSTRACT

The goal of research was to establish the bringing in and losses of phosphorus from soil after 4 years of wheat-corn rotation, on the same surface. The trials comprised 12 treatments in 3 replications: V1 – not fertilized control; V2 – N 120 ammonium nitrate; v3 – N120 urea; V4 – N120 nitrocalcar; V5 – K100 potassium sulphate (K_2SO_4); V6 - 30 t/ha manure once every 2 years, with the following composition: N = 0.41%, P_2O_5 = 0.17%, K_2O = 0.52%, which means N246P138K300; V7 – P72 simple superphosphate; V8 – N120P72 urea; V10 – N120P72 nitrocalcar and superphosphate; V11 – N0P72K100 superphosphate and potassium sulphate; V12 – N246P428K300 manure and superphosphate. The soil phosphorus pool has decreased by 7-27% where no phosphorus fertilizers were applied and it has increased by 16.4% where phosphorus fertilizers were applied.

INTRODUCTION

The soils from Romania are, generally, low and average supplied by phosphorus. After 1990 the amount of fertilizers applied have drastically decreased, especially the phosphorus ones. Researching phosphorus behavior into soil can contribute to the optimization of fertilizer doses.

MATERIAL AND METHOD

Within present experiment there was used Dropia winter wheat variety and Florencia corn hybrid. The soil features are presented in the first table.

Table 1

The features of the brown-reddish soil from Banu Maracine, Craiova

Specification	Horizons				
	A	AB	Bt1	Bt2	C
Depth, cm	0-29	29-42	42-96	96-161	>161
pH, H_2O	6.37	6.47	6.38	6.06	6.14
Humus, %	2.50	1.02	0.70	0.42	0.28
Total nitrogen, %	0.131	0.056	0.038	0.023	-
Available P, ppm	68	109	7	3	1
Available K, ppm	105	85	82	72	61
SH, me/100 g soil	3.0	3.3	4.2	4.4	3.6
SB, me/100 g soil	13.8	14.4	17.2	16.4	15.4
T, me/100 g soil	16.8	17.7	21.4	20.8	19.9
V, %	82.1	81.3	80.3	78.8	81.8

The fertilizer doses and their nature have been presented previously. The soil and plant analyses have been made after official methods from our country (Borlan, Hera, 1973; ASAS, 1980; ASAS – ICPA, 1984). The obtained data have been statistically interpreted (Saulescu, 1967).

The soil phosphorus balance, after 4 years of cropping is:

P final (P-F)= P initial (P-I) + P from fertilizers (P-IN) + P from wheat and corn seeds sown (P-S) + P from humus mineralization (P-H) + P from vegetal debris mineraliztion, especially roots (P-O) – P exported thru harvest (P-R) – P lost by leaching (P-L).

P-F = (P-I + P – IN + P – S + P – H + P – O) – (P – R + P – L).

The bringing in and losses of phosphorus are expressed in ppm; the values of P – IN are written in the fourth table. They results by summing the annual doses of active ingredient and their transformation as P_2O_5/ha in ppm P. The P – S values are calculated knowing that there are used 200 kg seeds/ha, with 0.8% P_2O_5, two times in 4 years; these data are, also, written in the fourth table. The P – H values are calculated knowing that the soil contains 2.3% humus, of which 1%/year is mineralized. The humus contains about 1% P. Of 690 kg humus decayed/ha there results 6.9 kg P/ha which means 2.3 ppm. The values of P – O are calculated knowing that 1 tone of corn seeds or wheat give 1.6 t stalks, respectively, 1.3 t straw and the root mass is about 16% for corn and 70% for wheat of the aerial mass. The wheat and corn roots contain about 0.065% P and 1% from the root mass is mineralized releasing available phosphorus; these data are written in the second and third tables. The P losses by leaching are negligible. The P export along with harvest, P – R, are calculated knowing that the mass of the main harvest and the specific consumption of phosphorus is 11.0 kg P_2O_5/t of grains with corn and 13.7 kg P_2O_5/ t of grains with wheat; these data are written in the second and third tables. From the presented data there can be calculated the theoretic balance of soil P which means the bringing in and losses of soil P. There was determined the soil initial and final P content. This represents the real P balance of soil P.

RESULTS AND DISCUSSIONS

The theoretic and experimental data of soil P are presented within the following tables:

Table 2

The theoretic concentrations of soil phosphorus left into the soil by bacterial decay of organic debris (roots), ppm

Treatment	Corn		Wheat		Total P left into the soil
	Harvest t/ha	P left, ppm	Harvest t/ha	P left, ppm	
V1	3.944	0.0022	3.679	0.0072	0.0376
V2	9.909	0.0054	8.491	0.0167	0.0884
V3	9.915	0.0054	8.291	0.0163	0.0868
V4	9.750	0.0054	7.948	0.0157	0.0844
V5	8.224	0.0045	4.936	0.0097	0.0568
V6	8.473	0.0047	4.797	0.0095	0.0568
V7	8.579	0.0047	5.210	0.0103	0.0600
V8	12.058	0.0066	9.118	0.0180	0.0984
V9	11.995	0.0066	8.933	0.0175	0.0964
V10	11.665	0.0064	8.688	0.0710	0.0940
V11	8.857	0.0049	5.570	0.0110	0.0636
V12	9.416	0.0052	5.030	0.099	0.0151

Table 3

The total exports (losses) of phosphorus from the soil along with the harvest (theoretic)

Treatment	Corn				Wheat				Total exported P along with harvest, ppm
	Yield, kg/ha			Exported P along with harvest, ppm	Yield, kg/ha			Exported P along with harvest, ppm	
	Year 1	Year 3	Total		Year 2	Year 4	Total		
V1	3,353	591	3,944	6.313	1,837	1,842	3,679	7.335	13.648
V2	8,846	1,063	9,909	15.864	4,174	4,174	8,491	16.931	32.795
V3	8,939	976	9,915	15.873	4,226	4,065	8,291	16.532	32.405
V4	8,676	1,074	9,750	15.609	3,926	4,022	7,948	15.848	31.457
V5	7,632	841	8,473	13.564	2,451	2,346	4,797	9.565	23.129
V6	7,341	883	8,244	13.165	2,508	2,428	4,936	9.841	26.006
V7	7,645	934	8,579	13.735	2,932	2,278	5,210	10.387	24.122
V8	10,905	1,153	12,058	17.703	4,582	4,536	9,118	18.181	35.884
V9	10,876	1,077	11,995	19.202	4,515	4,418	8,933	17.811	37.013
V10	10,483	1,182	11,665	18.674	4,257	4,431	8,688	17.324	35.998
V11	7,860	997	8,857	14.180	2,650	2,920	5,570	11.106	25.286
V12	8,503	916	9,419	15.079	2,646	2,384	5,030	10.029	25.108

Table 4

The balance (theoretic) of phosphorus from soil, ppm

Treatment	Entries						Losses	P-F
	P - I	P - IN	P - S	P - H	P - O	Total	P-R	
V1	68.20	-	0.7	9.2	0.0376	78.14	13.65	64.49
V2	68.20	-	0.7	9.2	0.0884	77.99	30.79	45.20
V3	71.24	-	0.7	9.2	0.0868	81.23	32.41	48.82
V4	72.80	-	0.7	9.2	0.0844	82.78	31.46	51.32
V5	71.76	-	0.7	9.2	0.0568	81.72	21.13	58.59
V6	71.29	20.08	0.7	9.2	0.0568	101.33	23.01	78.32
V7	72.28	41.48	0.7	9.2	0.0600	123.72	24.12	99.60
V8	71.84	41.48	0.7	9.2	0.0984	123.32	35.88	87.44
V9	70.08	41.48	0.7	9.2	0.0964	121.55	37.01	84.54
V10	69.68	41.48	0.7	9.2	0.0940	121.15	35.99	85.16
V11	70.84	41.48	0.7	9.2	0.0636	122.28	25.29	96.99
V12	69.88	62.29	0.7	9.2	0.0061	142.08	25.11	116.97

Table 5

The theoretic and experimental balance of phosphorus from soil, ppm

Treatment	P-I	P-F		P_{Al} variation, PF-PI, %	
		Experimental	Theoretic	Experimental	Theoretic
V1	68.20	63.78	64.49	-6.48	-5.44
V2	68.20	49.82	45.20	-26.74	-33.53
V3	71.24	52.13	48.82	-26.83	-31.47
V4	72.80	55.94	51.32	-23.16	-29.51
V5	71.76	60.25	58.59	-16.04	-18.35
V6	71.29	70.33	78.32	-1.35	+9.86
V7	72.28	92.67	99.60	+28.21	+37.80
V8	71.84	83.21	87.44	+15.83	+21.71
V9	70.08	81.55	84.54	+16.37	+20.63
V10	69.68	81.08	85.16	+16.36	+22.21
V11	70.84	90.43	96.99	+27.65	+36.91
V12	69.88	95.78	116.97	+37.06	+67.38

CONCLUSIONS

1. Initially, there existed an even distribution of soil available phosphorus. The difference between the highest and the lowest value has been of 7%. At the end of the experiment the distribution became uneven. Between the highest and the lowest value has been a difference of 87%.
2. Where no phosphorus fertilizers have been applied the soil phosphorus pool has decreased by 7-27% and with the variants where phosphorus fertilizers were applied, it increased by 16.37%.
3. The initial soil phosphorus supplies are enough, even after the experiment for the variants where no phosphorus fertilizer was added, to give sufficient yields.

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VALORIFICAREA ÎN AGRICULTURĂ A COMPOSTULUI OBȚINUT DIN NĂMOL ORĂŞENESC

THE USE OF COMPOSTED SEWAGE SLUDGE IN AGRICULTURE

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Keywords: sewage sludge, fertilization, heavy metals

REZUMAT

Nămolul orăşenesc poate fi considerat o sursă importantă de nutrienți pentru sol. Prin compostarea nămolurilor orăşeneşti sunt eliminați agenții patogeni şi sunt stabilizate metalele grele sub formă de complecşi organo-metalici. Experimentele au fost organizate în câmp, după metoda parcelelor subdivizate, studiind doi factori: factorul A - fertilizarea organică cu nămolul orăşenesc compostat, cu 5 graduări şi factorul B - fertilizarea minerală cu azot şi fosfor, cu 3 graduări. Conținutul de metale grele nu s-a schimbat statistic semnificativ după fertilizarea cu compost obținut din nămol orăşenesc ceea ce arată că poate fi aplicat pe terenurile agricole cu un risc scăzut de acumulare a metalelor grele în sol. Conținutul de plumb din sol a înregistrat o uşoară creştere la doze de compost echivalente cu 300 şi 400 kg N/ ha, dar aceste creşteri nu sunt asigurate statistic.

ABSTRACT

Sewage sludge can be an important source of nutrients for the soil. By composting sewage sludge it is a way to eliminate pathogens and to stabilize metal toxins as organo-metal complexes. The experiments were organized in field as subdivided parcels method, studying the two factors: factor A - organic fertilization with composted sewage sludge, with 5 doses and factor B - mineral fertilization with nitrogen and phosphorus, with 3 doses. The content of heavy metals did not change statistically significantly after fertilization with compost made from sewage sludge which shows that it can be applied on agricultural land with low risk of accumulation of heavy metals in soil. The content of lead in soil encountered a slight increase at high doses of compost equivalent to 300 and 400 kg N/ ha, but this increase is not statistically significant.

INTRODUCTION

Sewage sludge and composted sewage sludge have a significant content of nitrogen, phosphorus and organic matter. Composted sewage sludge could contain an important part of the nitrogen and phosphorous necessary crops.

Sewage sludge often contains a high level of different pollutants like heavy metals, pesticides, PCBs, PAHs, etc., which can induce an phytotoxic effect and sometimes even toxic effect to humans and animals if their values are exceeded in soil or food. It imposes a limitation of polluting elements from sewage sludge, which are distributed on agricultural land. Dried sludge can not be applied to the pasture area if it was not composted. Before sludge application to land, it should be treated biological, chemical or heat stored in the long term, or any other process that ensures a significant diminuation in its fermentation capacity and health hazard. By composting sewage sludge it is a way to eliminate pathogens and to stabilize metal toxins as organo-metal complexes. Usually the main use of composted sewage sludge is as a soil conditioner, mulch or as an organic base with fertiliser amendment.

On soils loaded with 330 mg/kg Zn, 99 mg/kg Cu, 27 mg/kg Ni and 10 mg/kg Cd, the nitrogen fixation by leguminous plants can not be made (Rothamsted, 1986).

MATERIAL AND METHOD

The experiments were organized in field as subdivided parcels method, studying the two factors: factor A - organic fertilization with composted sewage sludge, with 5 doses and factor B - mineral fertilization with nitrogen and phosphorus, with 3 doses.

Before fertilization were determined the total content of heavy metals in compost samples using flame atomic absorption spectrometry.

Processing of experimental data was performed using analysis of variance and Tukey test.

RESULTS AND DISCUSSIONS

The values of total heavy metals content in compost samples did not exceed the maximum limits considering the application of composted sewage sludge on agricultural soils. Copper values ranged between 129 -131 mg/kg (mean 130 mg/kg), zinc values ranged between 1355 -1381 mg/kg (mean 1367 mg/kg), lead values ranged between 76 - 87 mg/kg (mean 80 mg/kg), nickel values ranged between 24 - 31 mg/kg (mean 27 mg/kg), manganese values ranged between 339 - 350 mg/kg (mean 345 mg/kg) and cadmium values ranged between 3.9 - 4.4 mg/kg (mean 4.2 mg/kg). We can appreciate that there are no restrictions on the use of composted sewage sludge on agricultural land, which is an organic fertilizer with a high content of phosphorus and azot. Its application is recommended primarily on lands with low load in microelements.

The heavy metal load of soil did not change statistically significant as a result of fertilization with composted sewage sludge (table 1-4), which means that it can be used as fertilizer with low risk of heavy metal accumulation in soil.

Table 1

Effects of fertilization with compost and mineral fertilization, on total copper content in soil

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a N rate of:				
		100 kg/ha	200 kg/ha	300 kg/ha	400 kg/ha	
	---------- mg / kg ----------					
Unfertilized	15	17	15	17	15	16 A(1)
N_{50} P_{50}	16	15	16	16	15	16 A
N_{100} P_{100}	15	16	15	16	15	15 A
Mean value compost fertilization	15 W(2)	16 W	15 W	16 W	15 W	

(1) or (2) - Values followed by the same letter (a,b,c,... ; or W,X,Y,...) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Sidle and Kardos (1977) advises to take into account the form in which heavy metals are present, as chelated or complexed forms move faster than the cationic forms, and some metals are levigated easier than others, for example Cu> Zn > Cd.

Table 2

Effects of fertilization with compost and mineral fertilization, on total lead content in soil

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a N rate of:				
		100 kg/ha	200 kg/ha	300 kg/ha	400 kg/ha	
	mg / kg					
Unfertilized	7.1	8.3	9.5	7.2	10.8	9.0 A(1)
N_{50} P_{50}	6.8	9.0	8.2	12.7	9.0	9.0 A
N_{100} P_{100}	6.9	11.1	5.5	6.5	5.8	9.0 A
Mean value compost fertilization	7.0 W(2)	9.0 W	8.0 W	9.0 W	9.0 W	

(1) or (2) - Values followed by the same letter (a,b,c,... ; or W,X,Y,...) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

In table 2 can be seen a slight increase of total lead content in soil at high doses of compost equivalent to 300 and 400 kg N/ha, but this increase is not statistically significant.

Table 3

Effects of fertilization with compost and mineral fertilization, on total zinc content in soil

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a N rate of:				
		100 kg/ha	200 kg/ha	300 kg/ha	400 kg/ha	
	mg / kg					
Unfertilized	75	57	106	93	59	78 A(1)
N_{50} P_{50}	69	73	71	54	92	72 A
N_{100} P_{100}	84	109	61	76	74	81 A
Mean value compost fertilization	76 W(2)	80 W	79 W	74 W	75 W	

(1) or (2) - Values followed by the same letter (a,b,c,... ; or W,X,Y,...) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

The highest content of Zn in soil (table 3) it was determined after mixed fertilization with compost equivalent to a nitrogen rate of 100 kg/ ha and mineral fertilizer with $N_{100}P_{100}$.

Table 4

Effects of fertilization with compost and mineral fertilization, on total cadmium content in soil

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a N rate of:				
		100 kg/ha	200 kg/ha	300 kg/ha	400 kg/ha	
	------------------------------ mg / kg ------------------------------					
Unfertilized	0.47	0.55	0.63	0.58	0.52	0.55 A[1]
N_{50} P_{50}	0.45	0.57	0.50	0.48	0.78	0.56 A
N_{100} P_{100}	0.61	0.51	0.54	0.57	0.43	0.53 A
Mean value compost fertilization	0.51 W[2]	0.54 W	0.56 W	0.54 W	0.58 W	

[1] or [2] - Values followed by the same letter (a,b,c,... ; or W,X,Y,...) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Considering the cadmium total content, the higher value was observed in case of mixed fertilization with mineral fertilizer ($N_{50}P_{50}$) and compost dose equivalent to 400 kg/ ha.

CONCLUSIONS

The research shows that soils behave differently to treatment with sewage sludge. To reduce the polluting effect of sewage sludge used in agriculture as fertilizer, it is necessary to apply sludge to suitable land only in certain doses and ensure adequate control of environmental factors. It should be taken into account in determining sewage sludge doses, the cation exchange capacity, the maximum allowable load of heavy metals and duration of sludge application.

Given the many sources of heavy metal load of soil (industrial emissions, chemical fertilizers, irrigation water, industrial waste) and that some sources can not be dismissed as being obligatory links in the production process, it must be limited quantity, applied with sewage sludge and avoid land that has reached 80% of the maximum allowable limit of soil heavy metals.

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UNELE REZULTATE PRIVIND EFECTUL FERTILIZĂRII ORGANO-MINERALE ASUPRA PRODUCȚIEI DE TUBERCULI DE CARTOFI

CERTAIN RESULTS ON THE EFFECT OF ORGANO-MINERAL FERTILIZATION ON POTATO TUBER PRODUCTION

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Keywords: organo-mineral fertilization, productions

REZUMAT

Pentru multe culturi agricole şi horticole inclusiv pentru cartof, îngrăşămintele organice şi formele organo-minerale ale fertilizării, armonizează exigențele nutritive şi ecopedoagrochimice ale acestei plante cu resursele agrochimice ale substratului nutritiv reprezentate prin aport organic ce interacționează cu elementele minerale majore. Încorporarea acestor resurse fertilizante cu suport organic realizează pentru cartof un mediu ecopedoagrochimic optimal prin efectele fertilizante şi nutritive ca şi ameliorativ din punct de vedere fizic, prin structurarea solului în substrat şi reglarea regimului aerohidric.

Lucrarea de față arată efectul unor fertilizări diferențiate organo-minerale, aplicate la cultura cartofului în condițiile unor soluri cu potențial productiv mare din zona Transilvaniei.

ABSTRACT

For many agricultural and horticultural crops, including the potato, organic fertilizers, as well as organo-mineral forms of fertilization provide a harmonization of the nutritive and ecopedoagrochemical requirements of this plant with the agrochemical resources of the nutritive substratum represented by the organic input that interacts with major mineral elements. The incorporation of these fertilizing resources with the organic support provide the potato with an optimal ecopedoagrochemical environment through fertilizing and nutritive effects, as well as meliorating on a physical level, by structuring the soil in the substratum and regulating the aerohydric regime.The present paper shows the effect of differentiated organo-mineral fertilization, applied to the potato crop within the conditions of highly productive soils of the Transylvanian area.

INTRODUCTION

When the issue of the characterisation and support of organic-C and humus accumulation is tackled in modern agrochemistry, a special attention is granted to the view that humified organic matter is the main reservoir and depositary of chemical energy, connected to plants through photosynthesis and its entropy (Lal R., 2002), (Beyer L. et al, 2002). According to this view and connected variants, the humus quantity and quality play major parts in the maintenance and evolution of soil fertility. In the modern assessment of the role of humus and humification in soil evolution, the soil is perceived as a system that aims towards a stationary state by equalizing energy and substance inputs, while the application of fertilizing resources as solely mineral forms and resources interferes with the evolution of fertility through unstable thermodynamic states. However, by introducing organic fertilizing resources the heterogenity increases, while entropy decreases, as well as showing an increase of the support of long-term humification, soil quality, fertility and productivity. This „energetic" concept shows involvement of the soil organic matter with the fertility state, while „balancing" the indices of the humiferous regimen with those showing the increase of soil fertility.

For the practice of fertilization, the employment of organic fertilizers responds to requirements for the improvement of soil fertility and agricultural productivity. Furthermore, it favourably improves nutrient reserves (macro and microelements) devoid of any fossil energetic input, as organic fertilizing resources exhibit a complex nutritive composition that may support nutrition on a yearly, as well as sustainable basis. This effect of fertility support, through the application of organic fertilizers is complemented by the formation of organo-mineral compounds with adsorption and ionic exchange traits, while this enhanced fertilizing level is further enabled by the energizing effect of plastic (organic) substances for the soil's fauna and microflora, for micro organisms, exhibiting positive traits in terms of the aggregation and structuring of basic particles in the soil mass.

MATERIAL AND METHODS

Patterns and variants of field experiments have included differentiated fertilization factors achieved through the employment of organo-mineral fertilizers (with an organic support residing in residual mushroom compost or semi-fermented stable manure alongside complex NP mineral fertilizers). Experiments exhibited patters and variants according to years of study, in order to research objectives set.

- Experiments conducted in 2007: the gleiosoil in Cojocna cultivated with a *Redsec* potato variety has included the following differentiated fertilization variants:

  Organo-mineral fertilization with semi-fermented stable manure and complex NP mineral fertilization:
  - 1. 20t/ha stable manure;
  - 2. 20t/ha stable manure + $N_{40}P_{40}$;
  - 3. 20t/ha stable manure + $N_{80}P_{80}$;
  - 4. 20t/ha stable manure + $N_{120}P_{120}$;
  - 5. 20t/ha stable manure + $N_{160}P_{160}$.

  Organo-mineral fertilization with residual mushroom compost and complex NP mineral fertilization:
  - 1. 20t/ha compost;
  - 2. 20t/ha compost + $N_{40}P_{40}$;
  - 3. 20t/ha compost + $N_{80}P_{80}$;
  - 4. 20t/ha compost + $N_{120}P_{120}$;
  - 5. 20t/ha compost + $N_{160}P_{160}$.

- Experiments conducted in 2008: on the typical Cojocna chernozem cultivated with the *Redsec* potato variety has included the following organo-mineral fertilzation variants:

  Organo-mineral fertilization with semi-fermented stable manure and complex NP mineral fertilization:
  - 1. 20t/ha stable manure;
  - 2. 20t/ha stable manure + $N_{40}P_{40}$;
  - 3. 20t/ha stable manure + $N_{80}P_{80}$;
  - 4. 20t/ha stable manure + $N_{120}P_{120}$;
  - 5. 20t/ha stable manure + $N_{160}P_{160}$.

  Organo-mineral fertilization with residual mushroom compost and complex NP mineral fertilization:
  - 1. 20t/ha compost;
  - 2. 20t/ha compost + $N_{40}P_{40}$;
  - 3. 20t/ha compost + $N_{80}P_{80}$;
  - 4. 20t/ha compost + $N_{120}P_{120}$;
  - 5. 20t/ha compost + $N_{160}P_{160}$.

RESULTS AND DISCUSSIONS

- **Effect of organo-mineral fertilization on tuber production**

The organic component in organo-mineral fertilizing variants for the *Redsec* variety has led to two alternatives– a_1. semi-fermented stable manure and a_2. residual mushroom compost after a year of exploitation of the technology. According to the nature of the organic component, results were differentiated in terms of tuber production, thus certifying the positive fertilizing interaction between the organic resource and the complex mineral one.

➢ **a_1. Effect of organo-mineral fertilization (stable manure + NP) on tuber production**

The application of organo-mineral fertilization in potato and the provision of the organic resource by means of 20t doses of stable manure/ ha determines the highest average productions of tubers (throughout the experimental period), of 33- 37 t/ha, while favourable years show productions of 40-42 t/ha. The effect of organo-mineral interaction in the *Redsec* potato variety proves to be highly significant especially in determining superior quantitative productions (table 1., 2. and fig. 1., 2.).

Table 1.

Production results on the effect of organo-mineral fertilization in potato (year 2007), (*Redsec* variety)

N.	Fertilization variant	Average tuber production				
		t/ha	%	Difference t/ha	Significance of difference	Duncan Test
1	Control + 20t stable manure	39,77	100,0	0,00	Mt.	
2	$N_{40}P_{40}$ + 20t stable manure	40,10	100,8	0,33	-	
3	$N_{80}P_{80}$ + 20t stable manure	41,57	104,5	1,80	***	
4	$N_{120}P_{120}$ + 20t stable manure	41,87	105,3	2,10	***	
5	$N_{160}P_{160}$ + 20t stable manure	41,50	104,4	1,73	***	
	DL(5%)			0.52		
	DL(1%)			0,76		
	DL(0,1%)			1.14		

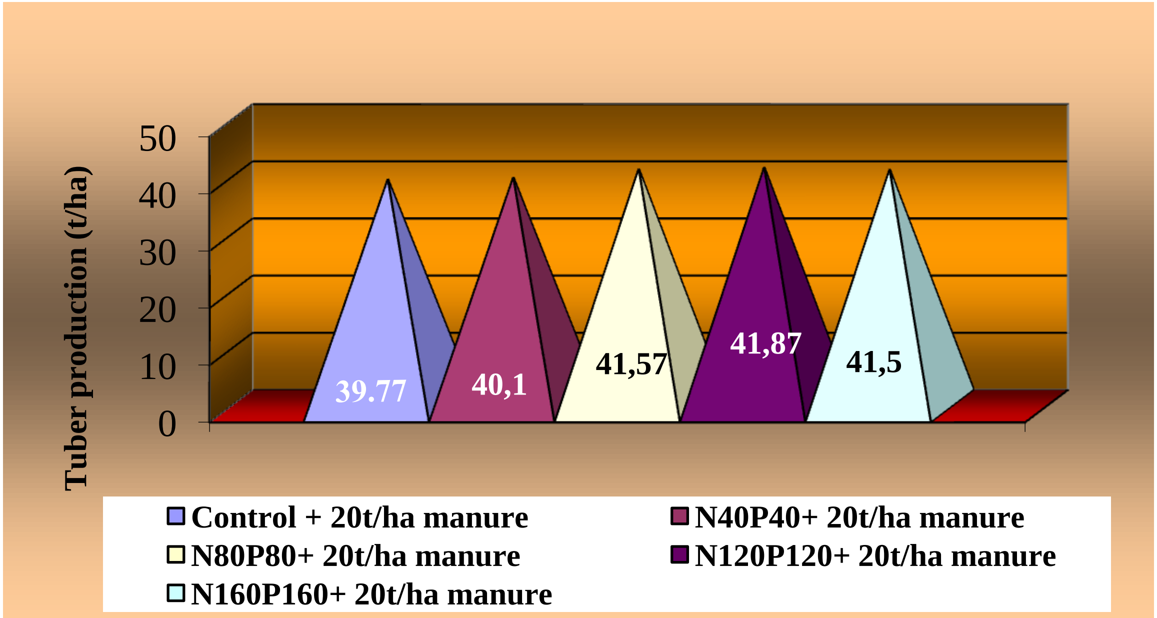

Fig. 1. Effect of differentiated organo-mineral fertilization on tuber production (2007)

Table 2.

Production results on the effect of organo-mineral fertilization in potato (year 2008), (*Redsec* variety)

N.	Fertilization variants	Average tuber production				
		t/ha	%	Difference t/ha	Significance of difference	Duncan Test
1	Control + 20t stable manure	24.25	100,0	0,00	Mt.	A
2	$N_{40}P_{40}$ + 20t stab	26.00	107.2	1.75	-	A
3	$N_{80}P_{80}$ + 20t stable manure	28.50	117.5	4.25	**	B
4	$N_{120}P_{120}$ + 20t stable manure	29.25	120.6	5.00	***	B
5	$N_{60}P_{160}$ + 20t stable manure	32.25	133.0	8.00	***	C
	DL(5%)			2.13		
	DL(1%)			3.11		
	DL(0,1%)			4.66		

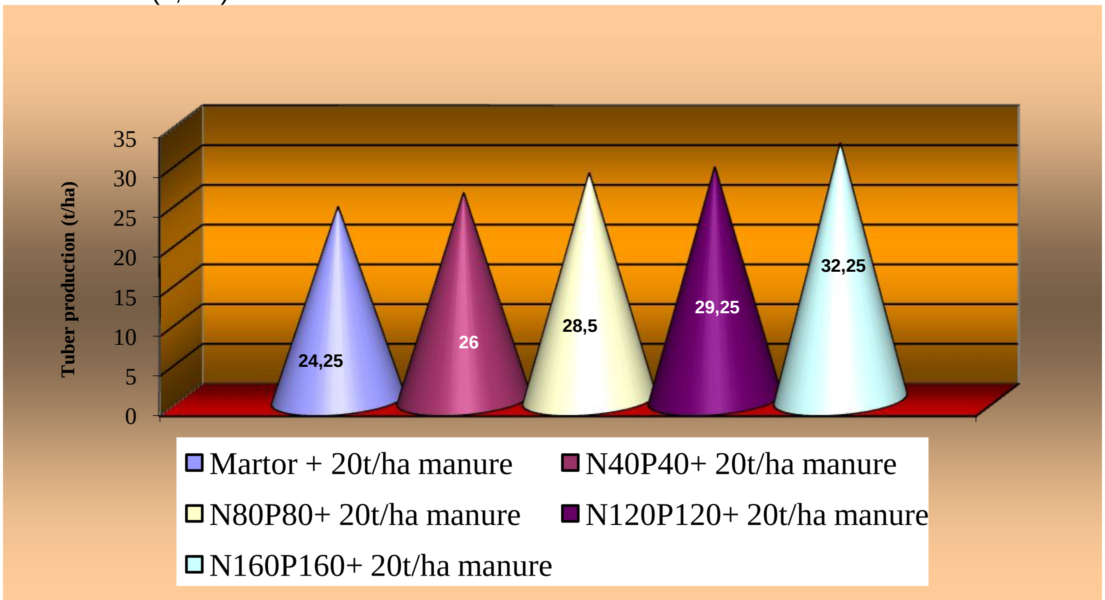

Fig. 2. Effect of differentiated organo-mineral fertilization on tuber production (2008)

The application of complex NP fertilization in a differentiated manner, according to an organically supplied agrifund with 20 t/ha stable manure, mobilizes nutrients contained by the organic fertilizer in accessible forms and makes the reserves applied through differentiated NP mineral doses readily available through mineral input. It is thus useful to assess, in order to achieve ultimate efficiency in organo-mineral combinations, that the provision of the organic resource within these fertilizing systems, through the application of semi-fermented and fermented stable manure, increases the qualitative effect of the complex NP mineral fertilization, even in the case of high and very high doses ($N_{120}P_{120}$ and $N_{160}P_{160}$). It is thus proven and practically useful to recommend the two types of fertilization in the case of potato- the mineral and organic one- as they do not exclude, but positively interact and condition one another. This recommendation becomes, according to the results obtained, of extreme efficiency and usefulness for technologies that envision high and constant tuber productions for the surface unit (that surpass 40-45 t/ha). Certainly, organo-mineral combinations in potato crops protect soil fertility on the long and sustainable term and limit agrochemical risk domains that may endanger the ecosystem in question.

- **Tuber production curves and their increases in organo-mineral fertilization (stable manure + NP)**

The graphic representation of the effect of organo-mineral combinations (formed of stable manure and complex NP doses) shows that the positive effect of these interactions in the *Redsec* variety, is much less limited by the decrease of mineral (NP) doses, thus proving that the presence of the organic component increases the effect of complex mineral combinations applied. The mutual productive effect is clear and higher in the determination of higher tuber productions than in the case of complex mineral fertilization (fig. 3., 4.).

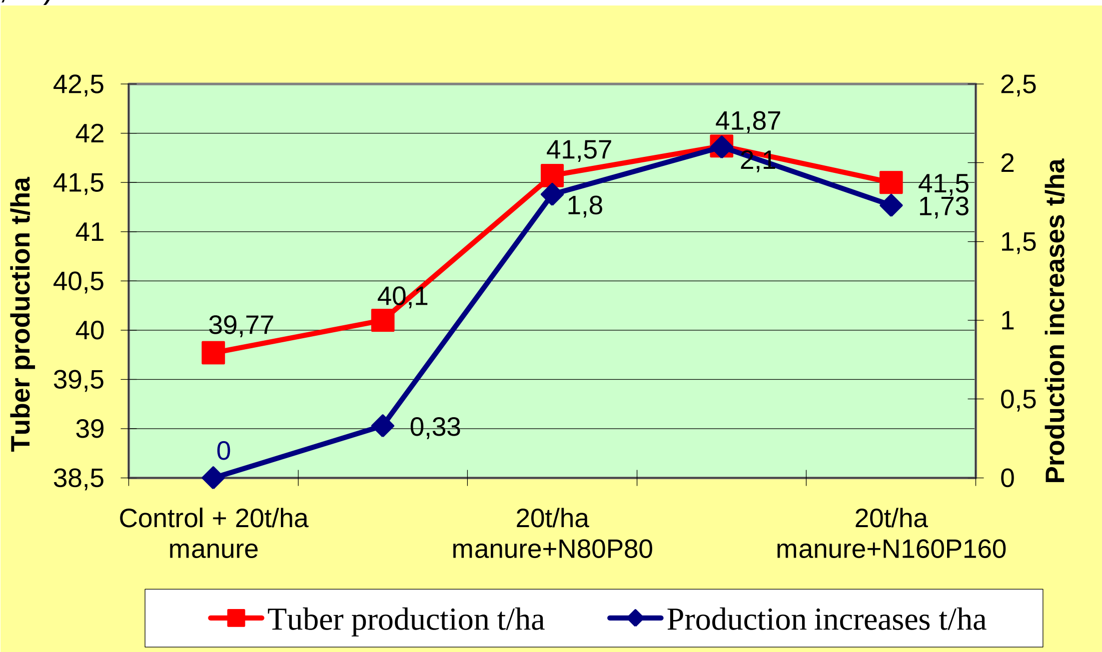

Fig.3. Effect of organo-mineral fertilization (stable manure +NP) on tuber production and production increases (Redsec variety) (2007)

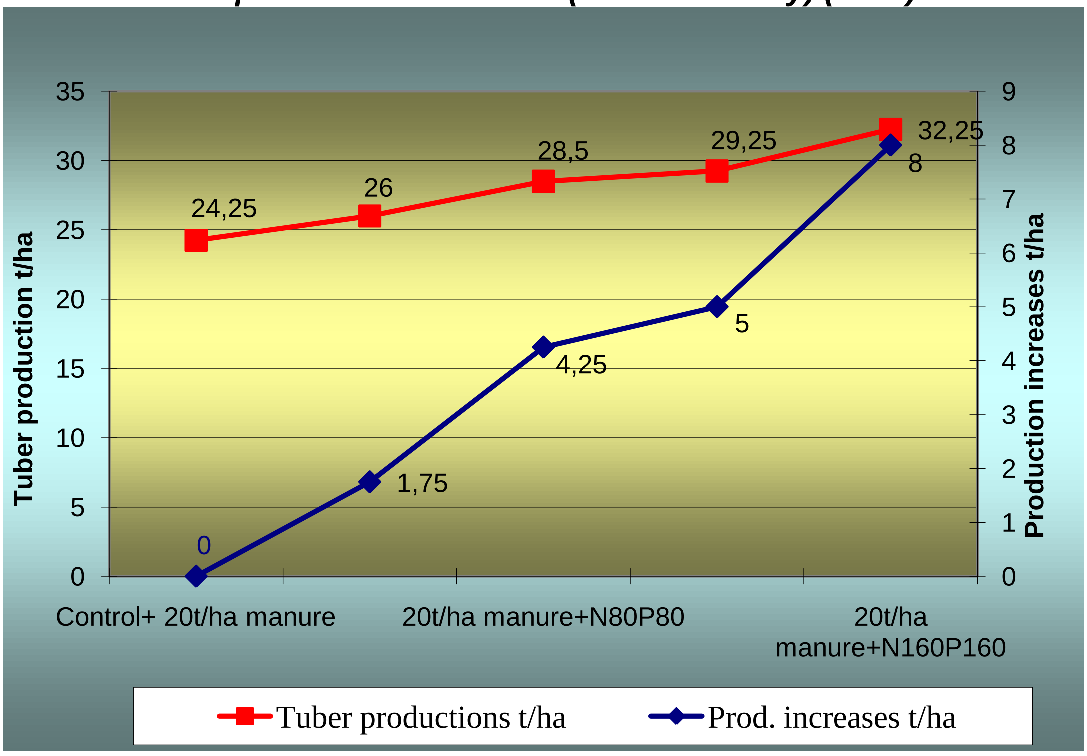

Fig. 4. Effect of organo-mineral fertilization (stable manure +NP) on tuber production and production increases (Redsec variety)(2008)

The curve of tuber production increases expressing their mathematical dependency on organo-mineral doses (manure + NP) shows a clear linearity and a constant incidence of this interrelation, thus practically recommending for superior possibilities of tuber production increases through the capitalization of this organo-mineral combination. Production increases remain constant enough even in the case of high and very high doses of organo-mineral combinations, as their effect can possibly be capitalized by the mutual enhancement of effects. This constancy and linear dependency of production increases in relation to the increase of organo-mineral interaction doses shows the superiority of organo-mineral fertilizations on potato tuber productions (in this case the *Redsec* variety) compared to the sole mineral one that may be limited in terms of the effect exhibited by doses applied.

- **a_2. Effect of organo-mineral fertilization (residual mushroom compost + NP) on tuber production**

Potato organo-mineral fertilization where the organic component is provided by 20t doses of residual mushroom compost determined higher tuber productions compared to the exclusive (NP) mineral fertilization and slightly more reduced ones than in the case of the employment of 20t stable manure/ha as an organic component. If the residual mushroom compost is used as a residual compost, constant average productions are obtained for the Redsec variety of 30-34 t/ha, while favourable years exhibit 36-40 t/ha. The effect of this organo-mineral combination is superior to the complex mineral (NP) one due to organic compounds in the soil, but more reduced than in the presence of stable manure, as nutritive elements in the compost employed deplete in a mushroom production year and exhibit a C/N ratio > 20. This variant clearly shows that the NP mineral input covers the depleting effect of nitrogen and other elements through normal mushroom production and additionally provides efficiency to the organo-mineral interaction (compost + NP) (table 3., 4.; fig. 5., 6.).

Table 3.

Production results on the organo-mineral effect in potato (year 2005), (*Redsec* variety)

N.	Fertilization variants	Average tuber productions				
		t/ha	%	Difference t/ha	Significance of difference	Duncan Test
1	Control + 20t compost	36.27	100,0	0,00	Mt.	
2	$N_{40}P_{40}$ + 20t compost	37.87	104.4	1.60	*	
3	$N_{80}P_{80}$ + 20t compost	38.40	105.9	2.13	**	
4	$N_{120}P_{120}$ + 20t compost	38.57	106.3	2.30	**	
5	$N_{160}P_{160}$ + 20t compost	39.80	109.3	3.53	***	

DL(5%) 1.11
DL(1%) 1.61
DL(0,1%) 2.41

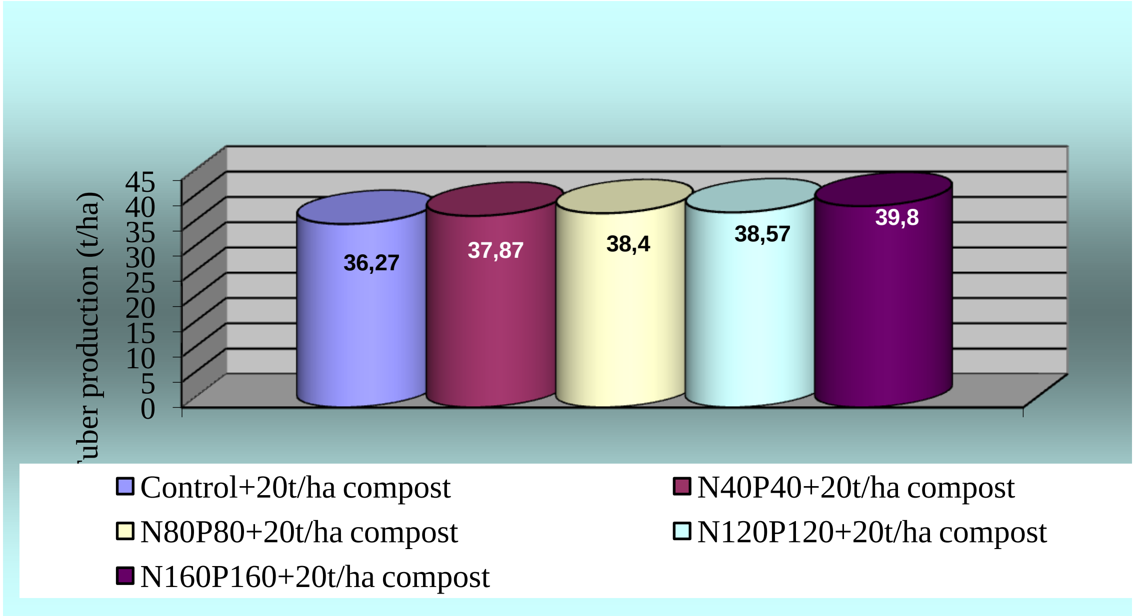

Fig. 5. Interaction of organo-mineral fertilization and mushroom compost on a differentiated NP background, on tuber production (2007)

Table 4.

Production results on the effect of organo-mineral fertilization in potato (year 2008), (*Redsec* variety)

N.	Fertilization variants	Average tuber production				
		t/ha	%	Difference t/ha	Significance of difference	Duncan Test
1	Control + 20t compost	24.75	100,0	0,00	Mt.	A
2	$N_{40}P_{40}$ + 20t compost	25.00	101.0	0.25	*	B
3	$N_{80}P_{80}$ + 20t compost	25.25	102.0	0.50	**	C
4	$N_{120}P_{120}$ + 20t compost	26.25	106.1	1.50	***	D
5	$N_{160}P_{160}$ + 20t compost	26.65	107.7	1.90	***	E

DL(5%)	0.25
DL(1%)	0.36
DL(0,1%)	0.54

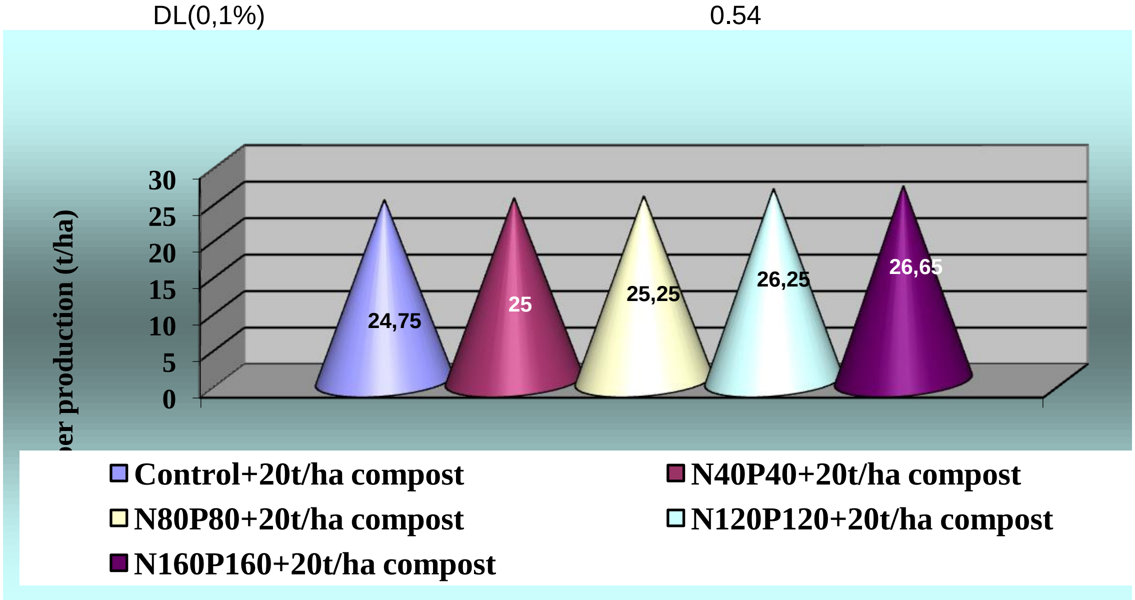

Fig. 6. Interaction of organo-mineral fertilization with mushroom compost on a differentiated mineral NP background, on tuber production (2008)

Production results obtained through the employment of residual organic components of other agricultural and horticultural crops (in this case, residual mushroom compost) supplemented and enhanced in terms of fertilizing effect by means of complex (NP) mineral input show that all these alternatives of organic resources (even residual) may efficiently support rational fertilization systems in some agricultural crops. Similarly, the high C/N ratio in these resources may get the resource involved in humification and the humic balance in the soil, while the supplementing with a mineral NP input partially regulates the mentioned ratio and enhances the fertilizing efficiency of potato nutrition. In all situations and organo-mineral combinations with compost, as well as during all experimental years, tuber productions have surpassed the ones obtained through single complex mineral NP fertilization and slightly more reduced than organo-mineral fertilization where the organic component consisted in 20 t stable manure per surface unit.

- **Tuber production curves and their increases for organo-mineral fertilization (residual mushroom compost+ NP)**

The graphics on the expression of tuber production dependency on the organo-mineral fertilizing ratio (formed of residual mushroom compost and complex NP doses) show obvious positive results of this interaction, as variants for the capitalization, of reusable organic resources in accordance with the fertilizing resources they hold in the case of the potato crop.

The production curve increases connect the effect of increase interaction to the differentiation of organo-mineral doses (compost+NP), showing the same linear dependency. This proves that in the case of stable manure, there is a direct enhancement of the two components of organo-mineral fertilization. The application of residual compost as an organic resource in the organo-mineral combinations applied, proves the same evolving trend of organo-mineral fertilizing effects, with a slight difference- a decrease of production and increases resulted from the resource under discussion, compared to stable manure interactions (fig. 7., 8.)

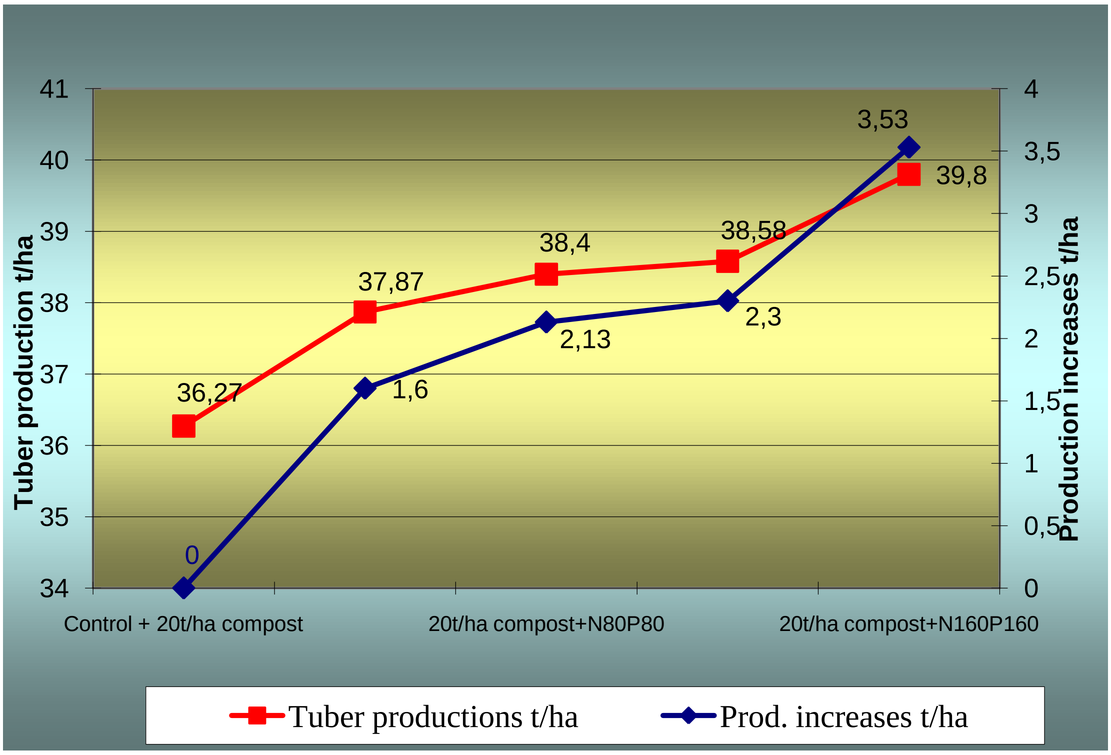

Fig. 7. Effect of organo-mineral fertilization (compost + NP) on tuber production and production increases (Redsec variety) (2007)

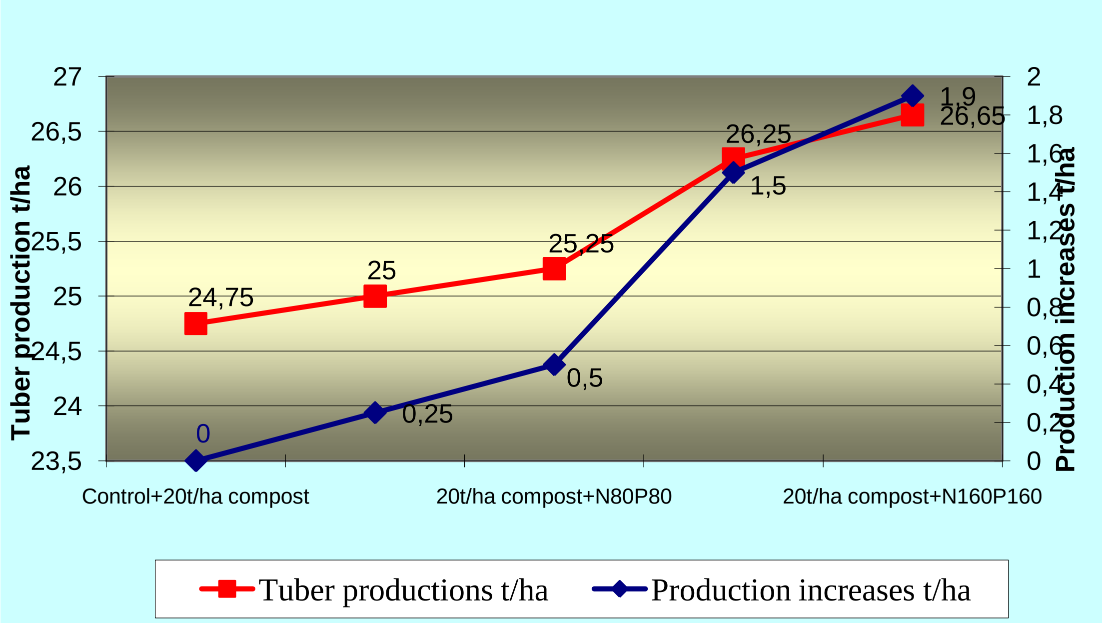

Fig. 8. Effect of organo-mineral fertilization (compost + NP) on tuber production and production increases (Redsec variety) (2008)

Within the employment of residual mushroom compost, the simultaneous application of the complex mineral source (NP) is involved in the regulation of the C/N ratio, in a more extensive manner than in the case of organo-mineral combinations, due to the presence of semi-fermented stable manure.

CONCLUSIONS

Due to a high specific nutritive consumption in N, P, K, Ca, Mg, the plant that synthesizes and accumulates starch in its tubers, displays a high requirement in terms of integrated fertilization and nutrition system that essentially favours sugar metabolism and prevents nutrition risk factors (such as N excess or K deficiency) that interfere with the synthesis of organic substances.

Experiments on the gleiosoil and typical chernozem of Cojocna confirm the nutrition and fertilization requirements of potato and highlighted the significant effects of organo-mineral fertilization, where the specific combinations were achieved by means of complex NP fertilizers alongside the two organic resources - semi-fermented stable manure (20 t/ha) and residual mushroom compost (20 t/ha).

Organo-mineral fertilization shows a determining character for the level of tuber production, thus determining quantities of up to 40-42t tubers/ha. The best results are obtained by means of fertilizing solutions that involve semi-fermented stable manure as the organic substratum, closely followed by residual mushroom compost, accompanied by complex NP mineral doses.

In the case of organo-mineral fertilization, production curves and their differences emphasize the decisive and essential effect on productions, due to organic fertilizing resources and only subsequently to the effect of NP doses applied in the combination.

Out of the organic resources under discussion, (cattle) semi-fermented stable manure provides the best nutritive conditions and fertilizing effects in the context of organo-mineral combinations. This fertilizer is followed by residual mushroom compost (2-3 years after employment). The effect of this organic compound is due to the relevant cellulosing and hemicellulosing effect, as for mushroom technology, normal NPK quantities were added.

Productions and their differences determined by organo-mineral combinations show that on the organic (20 t/ha) support, complex NP mineral doses applied can be diminished to at least $N_{80}P_{80}$ with additions of complex liquid foliar fertilizers, that exert significant effects for a technological year within optimal soil conditions.

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EFFECT OF DIFFERENT TILLAGE SYSTEMS ON MAIZE CROP PRODUCTIVITY ON THE MOLDAVIAN PLAIN

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Key words: conservative tillage, maize, yield

REZUMAT

La alegerea sistemului de lucrare a solului trebuie avute în vedere nu numai considerentele imediate dar ş i cele de lungă durată, care să asigure productivitatea ş i profitabilitatea dar sa fie ecologice ş i să conserve resursele de sol ş i apă. Experienţele au fost realizate in cadrul Staţiunii Didactice aparţinând USAMV IASI - Ferma Ezăreni din estul României (47^{o}07'latitudine N, 27^{o}30' longitudine E) pe un cernoziom cambic (SRTS-2003 sau cernoziom haplic conform WRB-SR, 1998), cu textura luto-argiloasa, pH de 6.8, conţinut de humus de 2.7% si cu un nivel mediu de fertilizare. Temperatura medie mutianuală în zona de experimentare este de 9.4^{o}C iar precipitaţiile medii multianuale de 587 mm. Experienţa a fost aşezata după metoda "parcelelor subdivizate" in trei repetiţii. Suprafaţa unei parcele a fost de 60 m^{2}, intr-o rotaţie de tip soia - grâu de toamna - porumb. Analizând valorile medii ale producţiilor în perioada 2005 - 2008 observam diferenţe semnificative in cazul variantei arat la 20 cm si distinct semnificative pentru grapa cu discuri. Aceste aspecte vin sa confirme faptul ca in cazul culturii de porumb, odată cu creşterea adâncimii de lucrare a solului creste si producţia. Astfel, in varianta lucrata cu grapa cu discuri, producţia medie pe cei trei ani a fost de 4532 kg / ha iar varianta clasica (arat la 20 cm) a înregistrat 5528 kg / ha. Cea mai mare producţie s-a regăsit in varianta martor (arat la 30 cm) - 6482 kg / ha. Variantele conservative cizel si paraplow au înregistrat valori intermediare între grapa cu discuri ş i varianta martor, cu diferenţe neasigurate statistic.

ABSTRACT

The experiment was carried out between 2005 – 2008 at Ezareni – The Experimental Farm of the Agricultural University of Iasi, in the East side of Romania (47^{o}07' N latitude, 27^{o}30'E longitude), on a cambic chernozem (SRTS-2003), or haplic chernozems (WRB-SR, 1998), with a clay-loamy texture, 6.8 pH, 2.7% humus content and a medium level of fertilization. The experimental area has an annual average temperature of 9.4^{o}C and precipitation of 587 mm. The experiment was a "split plot" design with three replicates. Plots covered an area of 60 m^{2} with a rotation of soybean - winter wheat - maize. The maize mean yield values showed significant differences in plots plowed at 20 cm and very significant results in the disc harrow treatment when compared to the control treatment. These findings confirm that increasing tillage depth result in higher yields. In disc harrow plots, the mean yield over three years was 4532 kg/ha while the conventional tillage variant (plowed at 20 cm) yield recorded 5528 kg/ha. The highest yield of 6482 kg/ha was recorded in the control treatment (plowed at 30 cm). The conservation variants, chisel and paraplow, resulted in intermediate yields between disc harrow and the control treatment, the differences being statistically nonsignificant.

INTRODUCTION

The world total of cultivated land is estimated to have increased by 466 % from 1700 to 1980: during this time, a net area of more then 12 x 106 km^{2} of land was brought into cultivation (Mayer, W. and Turner, B.L., 1992).

Research on the yields obtained in different tillage systems are contradictory. While some have found that no-till and reduced tillage provide higher yield compared with the conventional tillage (Francis GS. et al., 1987, Hodgson DR., et al., 1989 Lal R.et al. , 1989, Aslam M.et al., 1999) others contradict the previous assertion (O'Sullivan MF. and Ball BC., 1982, Beyaert RP., 2002, Dam RF. et al., 2005).

Climate change is becoming one of the main factors directly or indirectly affecting the productivity of agricultural crops, the efficiency and stability of agriculture and related industries. Reality of climate changes requires a careful revision of traditional soil and plant management technologies. In addition, a new approach and propagation of sustainable soil management technologies implementation in practical farming becomes very important. Soil is a dynamic resource that supports plants. It has biological, chemical, and physical properties, some of which change in response to how the soil is managed. A wide range of different factors indicate a soil that functions effectively today and will continue to do that in the future. Creating soils with favorable characteristics can be accomplished by utilizing management practices that optimize the processes found in native soils (Feiza V. et al., 2008).

The major driving force behind agricultural expansion has been unprecedented population growth in the past several decades. According to the United Nations Department of Economic and Social Affairs, world population currently stands at 6 billion persons and is growing at a rate of 1.33 percent per year (U.N.D.E.S.A.). The best estimate of long-range population increase projects a stabilization of growth rate at replacement level around 2050 with a maximum population of 10 billion by 2150-2200.

If the medium population growth scenario is realized, the demand for major cereals will increase at a rate of about 1.2 percent per annum for wheat and rice and 1.5 percent for maize (FAO 1992, Rosegrant, M.W et. al., 1998). The projected demand for cereal production in the next 30 years stands at 43% for rice, 44% for wheat and 56% for maize above current production levels (Cassman, K.G., 1999).

The necessary increase in food production must be based on agricultural intensification of cropland already under cultivation. The new land that can be brought under cultivation exists either in ecologically sensitive ecoregions (e.g., tropical rainforest) or on agriculturally marginal soils (e.g., too steep, too shallow, too dry or too cold). Therefore, the strategy is to enhance soil productivity per unit area, time and energy-based input from existing croplands.

MATERIAL AND METHODS

The experiment was carried out between 2005 – 2008 at Ezareni – The Experimental Farm of the Agricultural University of Iasi, in the East side of Romania ($47^o07'$ N latitude, $27^o30'$E longitude), on a cambic chernozem (SRTS-2003, or haplic chernozems WRB-SR, 1998), with a clay-loamy texture, 6.8 pH, 2.7% humus content and a medium level of fertilization. The experimental area has an annual average temperature of 9.4^oC and precipitations of 587 mm. The experiment was a “split plot” design with three replicates. Plots covered an area of 60 m^2 with a rotation of soybean - winter wheat – maize, with the current experiment in maize *(Zea Mays*).

The experimental soil tillage systems were as follows: V_1 – disc harrow , V_2 – paraplow, V_3 – chisel plow + rotary harrow, V_4 – plough at 20 cm and V_5 – plough at 30 cm (control).

To determinate the Thousand Grain Weight (TGW) and Hectolitric Weight (HW) the technical standards SR 6123/1999 and SR 6123-2/1999 were used. The maize yield is expressed as average between the yield of the unfertilized plots and the plots fertilized with $N_{80}P_{80}$.

The ANOVA procedure was used to evaluate the significance for the split plot design in three replicates. Treatment means were separated by the least significance difference (LSD) test and all significant differences were reported at 5%, 1% and 0.1% levels.

RESULTS AND DISCUSSION

The purpose of this study was to evaluate the influence of conventional and minimum tillage systems on maize yield and productivity elements in the pedoclimatic conditions of the Moldavian Plain. One of the main objectives for the soil tillage system was to create an optimal physicochemical state of the soil and to preserve this state over the whole vegetation period.

Significant differences were observed in plots plowed at 20 cm and very significant in the disc harrow treatment compared to the control treatment during 2005-2008. These results support the fact that in maize, increasing tillage depth results in higher yields. In the disc harrow plots, the mean yield over three years was 4532 kg / ha while the conventional tillage variant (plowed at 20 cm), yielded 5528 kg/ha. The highest yield of 6482 kg / ha (15.5% corrected moisture) was recorded in the control treatment (plowed at 30 cm). The conservation variants, chisel and paraplow, yielded intermediate yields between the disc harrow and the control treatment, without statistical signification *(table 1)*. The yield of the chisel treatment represents 93% from the control, (plough at 30 cm).

Table 1

Mean values of tillage systems on maize yield (2005/2008)

Tillage system	Yield		Differences to the control variant (kg/ha)	Statistical significations
	kg/ha	Comparison with control variant (%)		
Disc harrow	4531.8	69.91	-1950.7	**ooo**
Paraplow	5817.7	89.74	-664.8	
Chisel + rotary harrow	6032.2	93.05	-450.3	
Plough 20 cm	5528.3	85.28	-954.2	**o**
Plough 30 cm	**6482.5**	**100.00**	**0**	**control**

LSD 5% = 829.3 kg LSD 1% = 1206.3 kg LSD 0.1% = 1809.4 kg

Experiments on the determination of yield are difficult to compare because of differences in each experimental period (2005-2008), soil types and different climatic regime. Kapusta G. et al. (1996), after 20 years of experiments with maize grown under no-till, reduced tillage system and conventional, on silty clay soil in the southern state of Illinois – USA did not obtain significant differences between the three different tillage systems.

In a research in Quebec – Canada, Dam R.F. et al. (2005) obtained after 11 years minimum differences in maize yield between conventional system, reduced system tillage (only disc harrow) and no-till (7.4 t/ha in conventional, 7.3 t/ha in disc harrow variant, 7.2 t/ha in no-till).

As shown in Table 2, on unfertilized maize (N_0P_0), the mean values of 1000 grain weight (TGW) ranged between 273 g for the disc harrow treatment (conservative tillage system) to a maximum of 298 g for the control (plowed at 30 cm).

It should be noted that for the $N_{80}P_{80}$ fertilized variants, the lowest mean value during 2005-2008 was recorded also in disc harrow (299.67 g) with the maximum occurring (342 g) in the control treatment. The conservation tillage treatment with chisel plow and fertilized recorded the closest values to the control treatment, 328 g only 4 % lower, the difference being statistically nonsignificant. Small significant differences, close to the control treatment, were recorded in the paraplow - fertilized plot.

Variants plowed at 20 cm and disc harrow showed very significant negative differences. All five unfertilized tillage treatments showed significant differences in comparison with the control treatment (plough at 30 cm on $N_{80}P_{80}$). Analyzing separately each year, it was easily observed that in 2006/2007 the values of TGW are the smallest from the entire period resultig from a drought.

Table 2

The influence of "tillage systems x nutrient level" on Thousand Grain Weight (TGW) on maize (2005/2008)

Treatments \ Year		2005/2006	2006/2007	2007/2008	Average (g)	Average %	Statistical significations
Disc harrow	$N_{80}P_{80}$	320	260	319	299.67	87.62	ooo
	N_0P_0	282	252	285	273.00	79.82	ooo
Paraplow	$N_{80}P_{80}$	343	283	349	325.00	95.03	o
	N_0P_0	292	266	293	283.67	82.94	ooo
Chisel + rotary harrow	$N_{80}P_{80}$	347	288	349	328.00	95.91	
	N_0P_0	297	266	297	286.67	83.82	ooo
Plough 20 cm	$N_{80}P_{80}$	329	274	330	311.00	90.94	oo
	N_0P_0	285	261	288	278.00	81.29	ooo
Plough 30 cm	$\mathbf{N_{80}P_{80}}$	**354**	**314**	**358**	**342.00**	**100.00**	**control**
	N_0P_0	302	287	307	298.67	87.33	ooo

LSD 5% = 16.9 LSD 1% = 23.2 LSD 0.1 % = 31.6

Hectolitric weight furnishes information about the average density and the shape of the kernels.

The mean values for hectolitric weight (*table 3*) after three years of experiments varied between 63.3 and 68.3 kg in unfertilized variants, and 67.7 to 75.3 kg in fertilized variants.

The analysis of this indicator shows that the control treatment (plowed at 30 cm + $N_{80}P_{80}$), is clearly superior to the other treatments.

Table 3

The influence of "tillage systems x nutrient level" on Hectolitric Weight (HW) on maize (2005/2008)

Treatments \ Year		2005/2006	2006/2007	2007/2008	Average Kg/hl	Average %	Statistical significations
Disc harrow	$N_{80}P_{80}$	69	64	70	67.7	89.82	ooo
	N_0P_0	64	61	65	63.3	84.07	ooo
Paraplow	$N_{80}P_{80}$	72	70	73	71.7	95.13	ooo
	N_0P_0	67	64	67	66.0	87.61	ooo
Chisel + rotary harrow	$N_{80}P_{80}$	74	70	75	73.0	96.90	ooo
	N_0P_0	67	64	68	66.3	88.05	ooo
Plough 20 cm	$N_{80}P_{80}$	72	69	72	71.0	94.25	ooo
	N_0P_0	65	63	66	64.7	85.84	ooo
Plough 30 cm	$\mathbf{N_{80}P_{80}}$ **(M)**	**76**	**72**	**78**	**75.3**	**100.00**	**control**
	N_0P_0	69	66	70	68.3	90.71	ooo

LSD 5% = 1.1 LSD 1% = 1.5 LSD 0.1 % = 2.1

CONCLUSIONS

Phosphorous and nitrogen applications in splits up to silking time significantly improved the vegetative and reproductive growth of maize, resulting in increase grain yield, the 1000 grain weight and hectolitric weight.

Tillage systems significantly affected the maize yield. In the conditions of Moldavian plain, the highest yield was recorded in the control treatment, plough at 30 cm and fertilized, followed by conservation tillage – chisel.

When we have to choose a proper tillage system, not only the immediate arguments should be considered like the highest yield, but also the long term view in order to ensure productivity and profitability and to be environmentally friendly and to conserve soil and water resources.

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THE INFLUENCE OF CROP ROTATION ON THE SOIL QUALITY ÎN VASLUI EXPERIMENTAL PLOT AREA

CERCETĂRI PRIVIND INFLUENȚA ASOLAMENTULUI ASUPRA CALITĂȚII SOLULUI ÎN CÂMPUL EXPERIMENTAL VASLUI

MOCANU VICTORIA, DUMITRU SORINA, COTEȚ VALENTINA, EFTENE MARIUS MOCANU VASILE

Keywords: crop rotation, chemical indices, soil conservation

REZUMAT

Câmpul experimental Vaslui a fost înființat în scopul stabilirii de soluții tehnologice de cultivare a principalelor plante de cultură din Podişul Moldovei, pentru realizarea unei agriculturi durabile, cu costuri competitive pe termen mediu şi lung. Pentru această zonă asolamentul a fost format din amestec complex de graminee cu leguminoase perene, floarea soarelui, sfeclă furajeră, orzoaică de primăvară, porumb boabe. A fost monitorizată starea de calitate a solului începând cu 2008 - primăvara. S-au făcut măsurători după primul şi al doilea an de cultură, respectiv 2008 şi 2009 - toamna. S-a înregistrat o scădere uşoară a reacției solului, a conținutului de azot total şi potasiu şi o creştere a conținutului de fosfor mobil pe toate variantele experimentale. Rezultatele obținute confirmă faptul că modificările la nivelul solului se produc în perioade lungi de timp.

ABSTRACT

Vaslui experimental field was setup in order to establish technological solutions for crops growing in Vaslui area, to achieve sustainable agriculture, with competitive costs for long or medium periods. Crop rotation for this area was composed by a complex mixture of grasses with perennial pulses, sunflower, stock beet, spring two-row barley, maize. The soil quality state was monitored starting with the spring of 2008. Measurements were taken after the first and second year of cultivation, respectively in autumns of 2008 and 2009. There was a slight decrease in soil reaction, content of total nitrogen and potassium and an increase of the phosphorus content in all experimental variants. The results confirm that changes occur in soil after long periods of time.

INTRODUCTION

Study of the anthropic impact on the environment is even more important as society is more developed. The issue regarding the quality of environmental components has become a matter of public interes focusing on a healthy and harmonious way of life cycle without sudden and powerful changes on human habitats, as well as on other habitats, as a consequences of technological measures.

Public interes related to the dangers of environmental pollution and degradation of natural resources under the influence of technology has increased to such an extent, that it became the subject of underlyng political strategies.

In agriculture, simplified crop systems and the widespread practice of monoculture has led to reduced yield and harvest quality, degradation of biodiversity, soil and water quality.

Sustainability of farming systems is now measured not only by their ability to provide a certain level of production, but also by their ability to maintain medium and long term environmental conditions required by society.

In this context, researches related to technological solutions for agricultural crops in the Vaslui area were initiated, regarding crop rotation, in order to improve the conservation of soil quality in terms of obtaining optimum production.

The purpose of this paper is to highlight the influence of the crop rotation on chemical indicators of soil quality after two experimental years.

MATERIAL AND METHOD

The experimental field or trial plot is situated in the area of the Station for Research and Development for Grasslands, Vaslui, Romania.

From geographic point of view, the field is located in the Central Moldavian Tableland/Barlad Corridor, on a slope, weakly inclined.

The climate in the studied area is temperate continental, with average annual temperatures having values of 9.2^0 C and average annual precipitation of 535.5 mm.

A crop rotation was selected for this area, consisting of a complex mixture of grasses with perennial pulses, sunflower, stock beet, spring two-row barley, maize. In order to restore and preserve the state of soil quality, sown grassland (temporary), consisting of grasses with perennial pulses were chosen for several reasons: they have high ecological plasticity, they ensure high yields and constant production of forage, they have flexibility in exploitation (grazing, mowing, mixed), they increase soil nitrogen through symbiotic fixation, and organic matter through crop residues remaining in soil, they protect soil against water and wind erosion, they have a benefic effect on the soil physic-chemical properties.

Also, the temporary grassland, consisting of perennial grasses with pulses, well used, prevents the weeds by reducing the soil seed reserve and ensuring the control of pests and diseases.

The experimental field was organized following this scheme:

1st Grup I-a

Variants	**1st year**	**2nd year**	**3rd year**
V1 -	grasses with perennial pulses	sunflower	spring two-row barley
V2 -	stock beet	maize	sunflower
V3 -	sunflower	grasses with perennial pulses	stock beet
V4 -	maize	spring two-row barley	grasses with perennial pulses
V5 -	spring two-row barley	stock beet	maize

2nd Grup II-a

Variants	**1st year**	**2nd year**	**3rd year**
V6 -	grasses with perennial pulses	grasses with perennial pulses	sunflower
V7 -	grasses with perennial pulses	stock beet	maize
V8 -	grasses with perennial pulses	sunflower	grasses with perennial pulses
V9 -	grasses with perennial pulses	maize	spring two-row barley
V10 -	grasses with perennial pulses	spring two-row barley	stock beet

3rd Grup III-a

Variants	**1st year**	**2nd year**	**3rd year**
V11 -	grasses with perennial pulses	grasses with perennial pulses	grasses with perennial pulses
V12 -	grasses with perennial pulses	grasses with perennial pulses	sunflower
V13 -	grasses with perennial pulses	grasses with perennial pulses	maize
V14 -	grasses with perennial pulses	grasses with perennial pulses	spring two-row barley
V15 -	grasses with perennial pulses	grasses with perennial pulses	stock beet

The field was fertilized with 100 kg/ha active substance, NPK complex fertilizer, in 2008 and 50 kg/ha NPK active substance in 2009, also complex fertilizer.

The soil identified in the experimental field is cambic Chernozems formed on loess deposits, with medium-fine texture (clay, medium clay), high capacity to retain water and nutrients, favourable air and water regime for plant growth and development. It is slightly loose in the first 20 cm, slightly compacted for 20-29 cm depth and moderate compacted in the rest of the soil profile. The soil is slightly compacted for 20-29 cm depth, due probably to the same depth plowing for several consecutive years. Resistance to penetration is low in the first 20 cm, keeping medium values on the entire profile. Saturated hydraulic conductivity is high in the first 20 cm and moderate deeper. The total water capacity is high and very high throughout the soil profile.

The soil is moderate supplied with organic matter, with large reserves of organic matter in the profile; very low supplied with available P, well supplied with available K.

The soil reaction is moderately acid in the first 45 cm, as a result of inadequate fertilization (fertilizer probably with physiologically acid reaction).

In order to identify changes that occur in the soil after cultivation following the proposed experimental scheme, main agrochemical soil indicators were monitored: soil reaction, organic matter content, total nitrogen content, available phosphorus and potassium content, after the first and second experimental year, The evolution of the structure indicators after each experimental cycle was monitored also.

In the present paper, only evolution of the agrochemical indicators is presented, the evolution of the physical indicators being the subject of another paper.

Soil profile characterization, soil data collection, data analysis and interpretation were done according to existing methodologies (MESP, 1987; SRTS, 2003).

RESULTS AND DISCUSSIONS

The experimental results obtained after two years have found that:

Soil reaction (pH) (Fig. 1). It could be noticed a slight decrease in soil reaction, the values remaining still in the same class: weak acid, from values of 5.81 to 6.80 to the lower limit of the interval. The first variants are an exception from that, the values fitting within moderately acid (5.01 to 5.80), as follows: variants grasses + perennial pulses - 5.75; stock beet - 5.60, sunflowers – 5. 60. In 2009, the amounts maintain the same values or even increase, but within the same class.

Variants with grasses + perennial pulses seem to be the most stable, the soil reaction being modified the least.

In 2009, the soil reaction maintains the downward trend observed in 2008. Although the decreases are not too important, it has to pay attention to the type of used nitrogen fertilizer, in order not to accelerate the decrease in soil reaction.

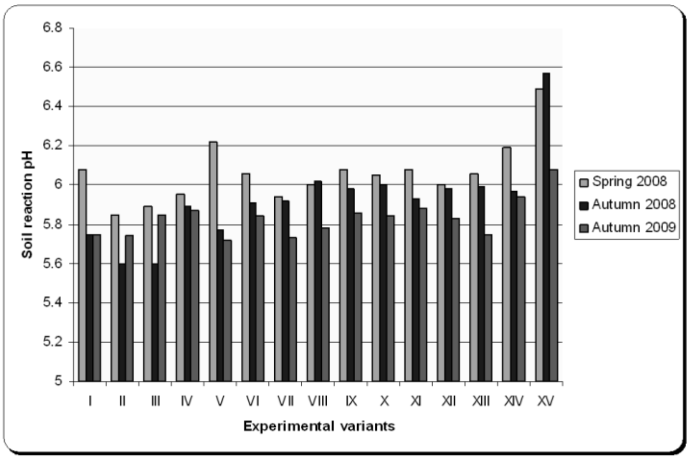

Figure 1 Soil reaction in the experimental field Vaslui

Total nitrogen content (Nt, %) (Fig.2). For autumn of 2008, there was a decrease of total N content in all variants. Total nitrogen content indicates a medium supply, at the lower limit of the range, unlike the initial state, which indicates a medium to upper supply.

The lowest values are highlighted for variants XIII and XIV, grasses + perennial pulses (0.145 to 0.148%).

In 2009, total nitrogen content decreases to half of initial content, around values of 0.100 ppm, indicating a low supply.

Significant decrease highlighted at the experimental field could be explained by massive exports through the crop and by small doses of nitrogen fertilizer used in 2009. Intense mineralization may be another cause for this area.

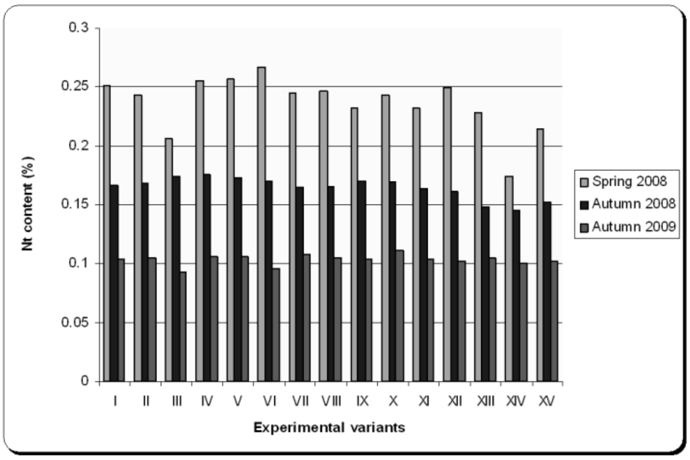

Figure 2 Nt (%) content in the experimental field Vaslui

Organic matter content (humus Ct*1,72, %) (Fig. 3). For autumn of 2008, there is a general increase in organic matter content compared to spring of 2008, but in the same class of the assessment of organic matter content (low), and to the higher limit.

The largest amount of organic matter was found in the variant VII - VIII, 4.08 and 3.54, values that go from the medium to the low class for supply of organic matter. In 2009, there has been a relative increase in organic matter content, but in the same class of the assessment of organic matter content.

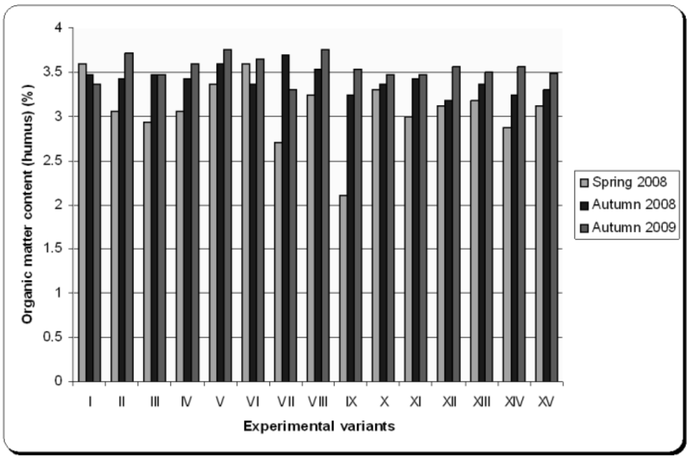

Figure 3 Organic matter content (humus)(%) in the experimental field Vaslui

Available phosphorus content (P_{AL}, ppm) (Fig. 4). The soil in the experimental field is very weak supplied with available phosphorus. In autumn 2008 a drastic decrease in available phosphorus content have been noticed in all variants of culture. Lowest value was found in variant VIII - 2 ppm, and it was a very slightly decreased in the variant I grasses + perennial pulses from 13.5 ppm to 12 ppm.

The small amount of phosphorus is given by the characteristics of parent material, which is poor in phosphorus, and phosphorus fertilizer doses were not enough to substitute soil phosphorus deficiency.

In 2009, there is a significant increase in available phosphorus in all experimental variants.

This content is doubled in variants with grasses + perennial pulses. Even in these conditions, the content of mobile phosphorus increased, the soil still remained low supplied, requiring additional inputs of phosphorus.

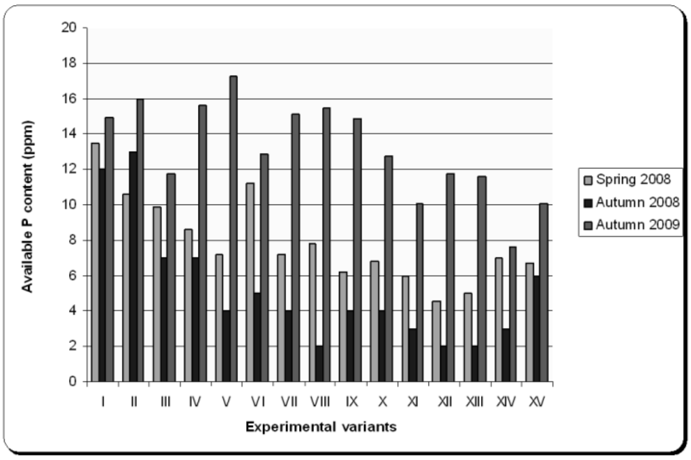

Figure 4 Available P (ppm) content in the experimental field Vaslui

Available potassium content (K_{AL}, ppm) (Fig. 5). There was a very good supply of potassium when the experience was set up. After the first cycle of vegetation, the amount of mobile potassium decreased, but the potassium level of soil supply remained good.
The highest amounts of potassium were consumed in the variant V (maize), with baseline of 230 ppm, which reached 145 ppm. The other values were around 157 ppm to 189 ppm, with a decrease from its original state.

In 2009, the downward trend observed in all experimental fields maintained. According to the results, K content is reduced almost by half from baseline. These reductions could be assigned in this stage only to the crop export.

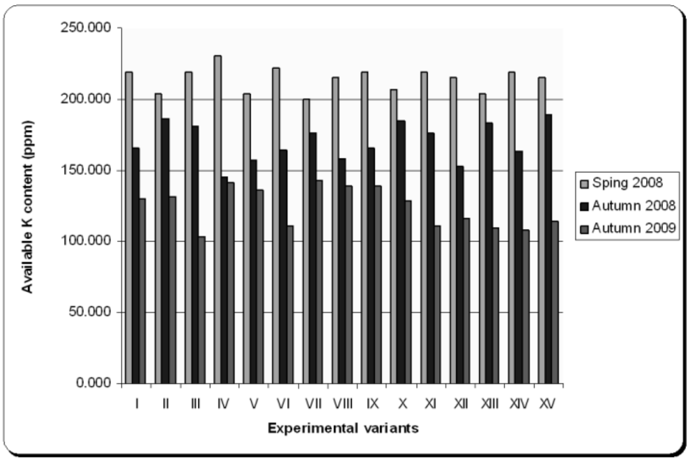

Figure 5 Available K (ppm) content in the experimental field Vaslui

It could be seen a fluctuation for each year for agrochemical indices taken into account, but there was not enough data to draw a conclusion relating the influence of crop rotation on soil quality. The changes that occur in the soil are time dependent, while the experimental period was too short. Experiments should to be continued and monitored over time to intercept changes that occur.

In terms of response, the rate of change after management interventions or other activities that result in environmental degradation edaphic property, the parameters describing the land can be grouped into several categories (Florea, 2007):

- Relatively stable parameters showing a reduced sensitivity or even relatively insensitive to these interventions, such as texture, soil skeleton, soil mineralogy.
- Labile parameters that change rapidly, even from day to day, as a result of weather changes or current management practices. Among these, it could be mentioned soil water content, bulk density, content of N, P, available K, pH, soil respiration, soil air composition.
- Intermediate parameters, which could be changed under the influence of activities for the medium to long term. This includes organic matter content, organic C content of active microbial biomass, soil structure, specific respiration, etc.

The reason of choosing these indicators to be monitored was that in order to establish the fertilizers for crop plants, soil reaction, available forms of P and K and organic matter content and nitrogen total content are taken into account. Establishing a balanced dose of nutrients in relation to soil characteristics, plant cultivation and specific expected yields leads to economically optimum yields, maintaining soil quality and soil improving.

CONCLUSIONS

- After two years of experiments, soil reaction maintain same values or slightly decreases, but within the same class. The grasses + perennial pulses variants seem to be the most stable, soil reaction being modified the least.
- In the second year of cultivation, the nitrogen content decreases from baseline to half, around 0.100 ppm, indicating a low supply for soil. The decrease in nitrogen content could be explained by massive exports through plants, by inadequate doses of nitrogen fertilizer, and by intense mineralization, specific to the experimental area.
- There is a relative increase in organic matter content after two years of experiments, the soil remaining in the same class.
- After two years of experiments, available P content increased significantly (up to double for the variants cultivated with grasses + perennial pulses), soil still remaining low supplied and requiring additional inputs of phosphorus.
- Content of the available K in the second year of researches decreased almost by half from initial values, due to consumption of potassium by plants.
- In the paper, parameters of the labile soil quality, which change rapidly, have been monitored, because they are required in order to adjust the technology each year.
- The expected changes require longer periods of time in order to occur.

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SOIL RESISTANCE TO PLOUGHING ESTIMATION IN THE OLT-VEDEA AREA

ESTIMAREA REZISTENȚEI LA ARAT ÎN SPAȚIUL OLT-VEDEA

VICTORIA MOCANU

Keywords: resistance to ploughing, pedotransfer rules, soil maps

REZUMAT

Comportamentul solurilor în ceea ce priveşte lucrarea solului se exprimă prin ceea ce se cunoaşte sub denumirea de rezistență la arat.

Utilizând criteriile propuse de Canarache (1981): tipul de sol şi textura solului în orizontul de suprafață, a fost realizată harta rezistenței la arat pentru spațiul Olt-Vedea. Informația de bază pentru realizarea acestei hărți a fost Harta Solurilor 1:200 000 pentru această zonă. Harta obținută indică o pondere însemnată a solurilor grele şi foarte grele. Solurile uşoare ocupă suprafețe neînsemnate. Solurile mijlocii ocupă doar 10,02% din suprafața întregului teritoriu.

Încadrarea pe categorii de rezistență la arat are la bază valorile rezistenței la arat corespunzătoare umidității optime de executare a lucrărilor solului.

De asemenea, a fost estimată rezistența specifică la arat pentru o serie de soluri cu textură luto argiloasă şi argiloasă din spațiul cercetat cu ajutorul modelului REP (Canarache, 1993) utilizând ca date de intrare conținutul de argilă, densitatea aparentă. Valorile obținute situează solurile cercetate în categoria solurilor grele şi foarte grele.

ABSTRACT

Soil behaviour in terms of soil tillage is expressed through a parameter namely soil resistance to ploughing. Using the criteria proposed by Canarache (1981): the soil type and soil texture in the surface horizon, the map of soil resistance to ploughing for Olt-Vedea area has been carried out. Basic information for creating this map was the Soil Map, at the scale 1:200 000. The resulted map highlights a significant weight of heavy and very heavy soils. Light soils occupy s areas, while medium soils are only about 10.02% of the entire area. The classification based on soil resistance to ploughing takes into account the values for this parameter for optimum soil moisture for soil tillage. It was also estimated the specific resistance to ploughing for some soils of analysed area by using REP model, proposed by Canarache (1993), using as inputs clay content and bulk density. The values led to the conclusion that investigated soils are heavy and very heavy soils.

INTRODUCTION

Soil texture determines the differentiated establishment of agro-technical, agrochemical and improvement measures to be applied to the soil, due to its influence on the main properties of soil.

Practically, the soils, in terms of textural differences, are classified into: coarse-textured soils, also called light soils (sandy and sandy-clay), soils with medium texture, called medium soil (from clay-sandy to the clay-dust) and fine-textured soils, also called heavy soils (from a clay loam to clay).

These names have primarily agronomical semnifications, the changes of texture in one direction or another, leading to changes in soil behaviour in relation to tillage. This classification has, also,, a wider significance related to the air, water, soil and life regimes.

Soil behaviour in the complex process of soil tillage is expressed through what is known as resistance to ploughing. The traction force applied to the plough highlights elementary reactions in soil, as compression, shear (cutting), torsional movement of soil particles, friction, stretching and breaking, etc. These reactions define the resistance of soil to plough forward during ploughing (Puiu et al., 1983).

Practically, in soil science, resistance to ploughing is not measured directly, but estimated using pedotransfer rules and functions. The soil classification according the resistance to ploughing proved its usefulness in Romania in the moment when large mechanized farms were developed, in order to solve operational problems of organization and planning, such as standardization of labour, consumption and facilities (Canarache, 1981).

In this sense, dynamometers were used in some representative plots, together with soil analysis, which allowed to highlight relationships between the resistance to ploughing and soil parameters. Based on these research results, relationships between soil type, texture and resistance to ploughing have been developed. Using these relationships, a draft map across the country to show soil resistance was drawn (Florescu, 1975; Canarache, 1981).

As it is well known, soil resistance to ploughing shows large variation, for the same soil, depending on soil humidity or water content. It is important to notice that, expressing the soil moisture as relative values to some hydrophysical indices, the values for optimum soil water content are very close for all the soils, i.e. 60-70% of field capacity and 35-40% of available water capacity in most soils, a 50-70% in very light soils.

The specific resistance to ploughing, and, generally, the resistance of soil to any tillage, is important mainly because it influences fuel consumption. The increase of this resistance with 1 kgf/dm^2 leads to an increase of the consumed diesel with 0.24 l / ha.

Correlating these data with soil moisture when the tillage is carried out, it seems that ploughing at different moistures than the optimum content could lead to increases in energy consumption up to 3-10 l / ha (Canarache, 1990).

It may also indicate that such employment is particularly effective in terms of quality of performed work, with positive consequences for subsequent work intensity and, ultimately, to yield amount.

The purpose of this study is to estimate the specific resistance to ploughing for soils from Olt-Vedea area, using the two proposed methods of Canarache (1981 and 1993).

MATERIAL AND METHOD

Classification on classes of soil resistance to ploughing is based on values of this resistance to ploughing at optimum soil moisture content.

To estimate this indicator, two ways were used:

- Estimation of specific resistance to ploughing using a pedotransfer rule based on the soil type and soil texture;
- Estimation of resistance to ploughing, using a model / pedotransfer function that takes into account the clay content and bulk density.

Estimation using the first method was done using the Soil Map of Romania, scale 1:200 000, for the Olt-Vedea area, which provided useful information.

The classification was done based on criteria proposed by Canarache, 1981 (Table 1-2).

Table 1

Criteria for land grouping after soil resistance to ploughing (Canarache, 1981)

Soil type	Soil type	Soil texture in surface horiyon				
WRB-SR-1998	SRTS-2003	Sand	Loamy sand	Sandy loam and loam	Loamy clay	Clay
		1	2	3	4	5
Kastanozems	Kastanoziom		M/2	M/2	M/2	
Calcic Chernozems	Cernoziom		M/2	M/2	MG/3	G/4
Haplic Phaeozems	Faeoziom		M/2	MG/3	G/4	G/4
Luvic Chernozems	Cernoziom argic	U/1	M/2	MG/3	G/4	G/4
Haplic Chernozems	Cernoziom cambic		M/2	MG/3	G/4	G/4
Luvic Phaeozems	Faeoziom argic		M/2	MG/3	G/4	G/4
Haplic Phaeozems	Faeoziom cambic		M/2	MG/3	G/4	G/4
Greyic Phaeozems	Faeoziom greic		M/2	MG/3	G/4	G/4
Chromic Luvisols	Preluvosol roşcat		M/2	G/4	G/4	FG/5
Haplic Luvisols	Preluvosol tipic		M/2	G/4	G/4	FG/5
Chromic Luvisols	Luvosol roscat		M/2	G/4	G/4	
Haplic Luvislos	Luvosol tipic		M/2	G/4	G/4	
Albic Luvisols	Luvosol albic		M/2	G/4	G/4	
Haplic Planosols	Planosol		M/2	G/4	G/4	
Eutric Cambisols	Eutricambosol		M/2	MG/3	G/4	G/4
Dystric Cambisols	Districambosol	U/1	M/2	M/2	G/4	
Entic Podzols	Prepodzol		M/2	M/2	G/4	
Haplic Podzols	Podzol		M/2	M/2	G/4	
Rendzic Leptosols	Rendzina		M/2	G/4	G/4	FG/5
Rhodi-eutric cambisols	Eutricambosol rodic		M/2	G/4	G/4	FG/5
Haplic Vertisols	Vertosol/Pelosol			G/4	G/4	FG/5
Eutric Arenosols	Psamosol	U/1	U/1	M/2		
Eutric Andosols	Andosol	U/1	M/2	M/2	MG/3	
Gleyic Chernozems	Cernozom gleic	U/1	M/2	G/4	G/4	FG/5
Eutric Gleysols	Gleiosol	U/1	M/2	G/4	G/4	FG/5
Stagnic Luvisols	Stagnosol	U/1	M/2	MG/3	G/4	G/4
Luvi-stagni-gleyic Phaeozems	Gleiosol		M/2	G/4	G/4	FG/5
Dystric/Eutric Histosols	Histosol	U/1	M/2	M/2		
Humic Umbrisols	Humosiosol	U/1	M/2	M/2		
Lithi-folic Histosols	Foliosol	U/1	M/2	M/2		
Haplic Solonchaks	Solonceac	U/1	M/2	MG/3	G/4	G/4
Haplic Solonetz	Soloneț	U/1	M/2	G/4	G/4	FG/5
Hyposodic –albic Luvisols	Luvisol albic solodic	U/1	M/2	MG/3	G/4	G/4
Dystric/Eutric Regosols	Regosol	U/1	M/2	M/2	MG/3	G/4
Dstric /Eutric Leptosols	Litosol	U/1	M/2	MG/3	G/4	
Dystric/Eutric Fluvisols	Aluviosol	U/1	M/2	MG/3	G/4	G/4
Haplic Fluvisols	Aluviosol entic	U/1	U/1	M/2	MG/3	G/4
Anthrosol	Antrosol	U/1	M/2	MG/3	G/4	G/4
Unconsolidate rock	Rocă (neconsolidată) la zi	U/1	U/1	MG/3	G/4	G/4

Table 2

Resistance to ploughing (REP model estimation)

Symbol	Cod	Description	Value
U	1	Soils with low resistance to ploughing	<35 kgf/dm^2
M	2	Soils with medium resistance to ploughing	36-55 kgf/dm^2
MG	3	Soils with medium-high resistance to ploughing	56-60 kgf/dm^2
G	4	Soils with high resistance to ploughing	61-75 kgf/dm^2
FG	5	Soils with very high resistance to ploughing	>75 kgf/dm^2

A second method of estimation was used for a range of soils for which analytical data are available. For example, some soils with clay-loamy texture and clay texture from the area investigated have been selected.

The model estimated specific resistance to ploughing based on clay content and bulk density, based on the following equation:

$$REP = -71+0.7571C + 60.91BD + 0.,3841\ C*BD,$$

where:

REP- resistance to ploughing kgf/dm^2; C - clay content (%) and BD - bulk density (%).

RESULTS AND DISCUSSIONS

Using the first method for estimation, a map with the soil resistance to ploughing for soils from Olt-Vedea area was obtained (Fig. 1-2).

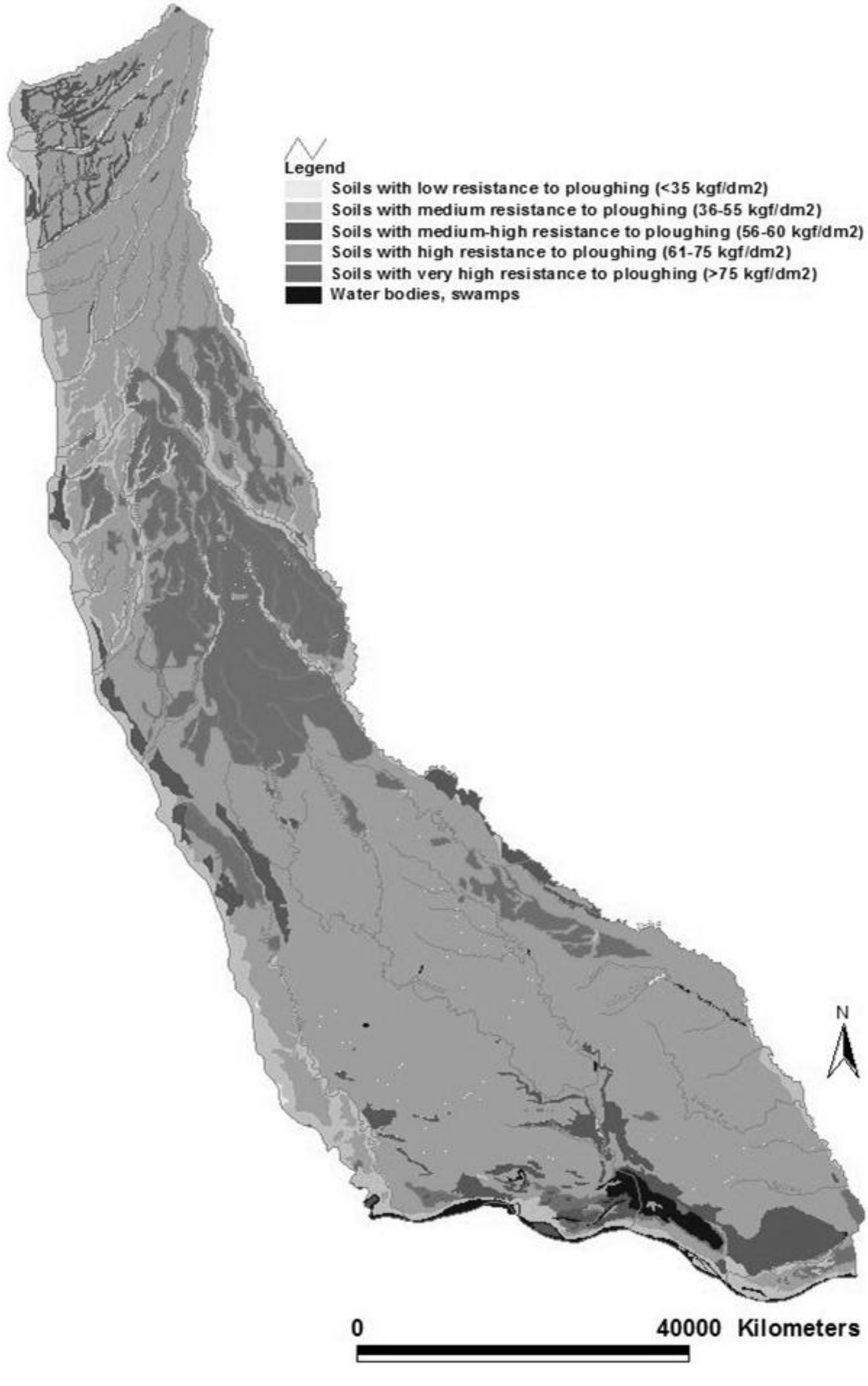

Figure 1 The soil resistance to ploughing map in Olt-Vedea area

The results highlighted high percentage of areas with high and very high resistance to ploughing in this area, soils with low resistance, occupying 0.35% of the area surveyed, soils with medium resistance occupying 10.02% , soils with medium-large resistance occupying 7.02%, while heavy soils occupy 63.91%. Heavy soils occupy 17.29% of the entire area.

The data presented illustrates the very large area occupied by heavy and very heavy soils - 81.2% in this area.

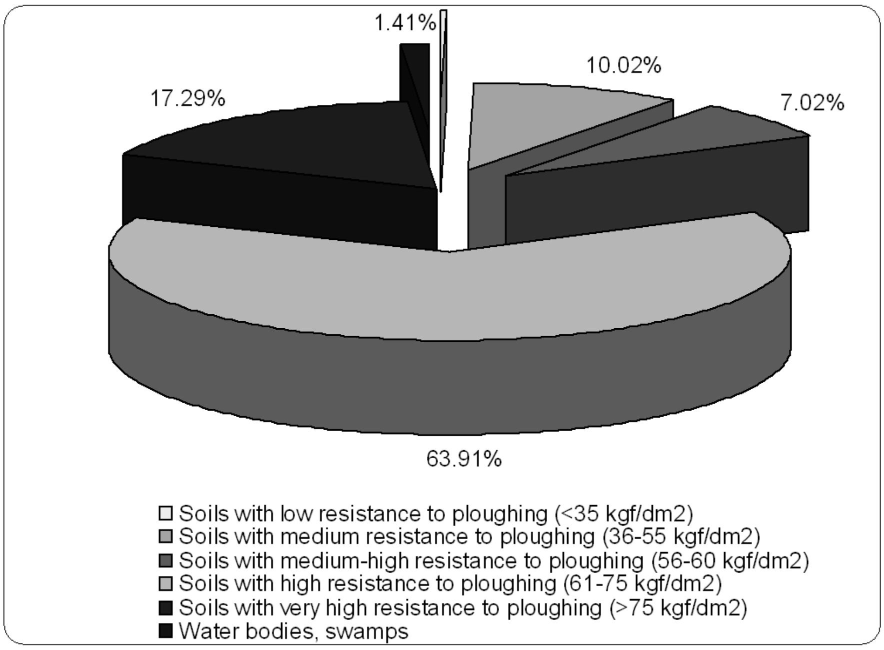

Figure 2 Soil distribution taking into account soil resistance to ploughing

A second method for estimation, REP model, allows to obtain specific values of soil resistance to ploughing (Table 3), based on clay content and bulk density.

The method is more accurate than the first method, but requires analytical data that are not always available.

Comparing the two methods, it could be noticed that results are not always identical, the soil compaction having a major contribution to the soil resistance to ploughing.

Table 3

The specific resistance to ploughing for some soils of Olt-Vedea area (obtained with REP model)

Soil type	Location	Clay (%)	Bulk Density (g/cm^3)	REP kgf/dm^2
Haplic Vertisols	Boianu I	48.0	1.33	70.87
Haplic Vertisols	Boianu II	49.1	1.27	67.48
Haplic Vertisols	Mogoşeşti	43.1	1.30	63.88
Stagnic-pellic Vertisols	Mogoşeşti	46.9	1.30	66.32
Stagnic-pellic Vertisols	Constantineşti	47.3	1.50	81.06
Vertic Luvosols	Mogoşeşti	39.2	1.40	67.31
Haplic Vertisols	Stoicaneşti	50.2	1.28	69.65
Stagnic-pellic Vertisols	Bacea	48.7	1.47	82.91
Vertic Phaeozems	Maldaeni	41	1.42	68.90
Vertic-planic Luvosols	Fagetele	29.9	1.31	46.47
Stagnic-vertic Luvosols	Poboru	40.7	1.23	53.96
Chromic Vertisols	Icoana	40.0	1.18	49.29

Depending on the available soil data, the use of one or other of these two methods to estimate the specific resistance highlights behaviour of soil in the moment of ploughing.

This knowledge supports the land users in the organization of farm machinery park and in estimating fuel requirements for implementing the farm.

It also have to take into account the shorter best period for tillage for heavy soils, being necessary to focus a greater number of tractors / farm machinery to carry out agricultural tillage at the optimum moisture content and with a minimum consumption of fuel.

CONCLUSIONS

Two methods were used to estimate the specific resistance to ploughing, using a pedotransfer rule based on the soil type and texture, and a pedotransfer function that allows the estimation based on content clay and bulk density.

A map was obtained using the first method, and it presents the specific soil resistance to ploughing for soils of Olt-Vedea area, based on the Soil Map of Romania, scale 1:200 000 for the area studied.

The output map indicates a significant percentage of heavy and very heavy soils. Light soils occupy minor areas, while medium soils occupy only 10.02% of the entire territory.

The second method allowed obtaining specific resistance to ploughing as values not always similar as those estimated by the first method, the soil compaction having a significant impact in terms of soil resistance to ploughing.

The proposed methods for estimating the specific resistance to ploughing allow, according to available data, to get a representative image of a given territory.

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EVALUAREA CAPACITĂȚII DE ACUMULARE A METALELOR GRELE PENTRU UNELE SPECII DIN VEGETAȚIA SPONTANĂ A UNEI ZONE INDUSTRIALE POLUATĂ DIN ROMÂNIA

ASSESSMENT OF HEAVY METALS ACCUMULATION ABILITIES OF WILD PLANT SPECIES GROWING ON AN INDUSTRIAL POLLUTED SITE FROM ROMANIA

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Keywords: heavy metals, accumulation, plant species.

REZUMAT

Acest studiu s-a realizat în scopul estimării transferului şi acumulării Cd , Pb şi Zn în țesuturile vegetale ale unor specii prezente în vegetația spontană a unei zone poluate (Copşa Mică, județul Sibiu). Vegetația spontană a acestui areal se caracterizează printr-o largă diversitate a speciilor prezente. Prezența metalelor în sol, în cantități excesive, precum şi reacția moderat sau slab acidă a solurilor sunt factori care au favorizat transferul acestor poluanți în plante. Plantele aparținând speciilor *Sinapis arvensis şi Xanthium strumarium* au acumulat cele mai mari cantități de cadmiu, plumbul s-a acumulat cel mai mult în plantele din specia *Cynodon dactylon* iar plantele din specia *Verbascum phlomoides* au acumulat cele mai mari cantități de zinc. S-a constatat că niciuna dintre speciile identificate nu întruneşte calitățile unei plante hiperacumulator însă, sunt capabile să se dezvolte normal şi să acumuleze cantități importante de metale grele în țesuturi.

ABSTRACT

The natural vegetation growing on an industrial polluted site (Copşa Mică, Sibiu county) was examined to asses the uptake of Cd, Pb, Zn and their subsequent accumulation in plants. A botanical survey of the area showed a large biodiversity of plant community. High contents of heavy metals in soil, as well as the moderate or slightly acid reaction are factors enhancing the transfer of metals from soil to plants. The maximum accumulation of cadmium was observed in *Sinapis arvensis* and *Xanthium strumarium*. The *Cynodon dactylon* plants accumulated the highest lead amount and *Verbascum phlomoides* revealed maximum zinc accumulation. The results emphasized that none of the species investigated accomplished the conditions of being considered a hyperaccumulator but some of these species can, however, develop normally and accumulate high quantities of metals in their tissues.

INTRODUCTION

Heavy metals play an important role in plant metabolic functions and some, such zinc, are essential for plant growth of some processes. However, at high concentrations they are strongly toxic and may impair the growth of some plant species. Heavy metals contamination in ecosystems poses major environmental problems worldwide with substantial economic consequences. Phytoremediation – the use of plants to remove (phytoextraction) or immobilize (phytostabilization) contaminants – may offer a safe and low cost method for the remediation of metal-contaminated soils (Marques et al., 2007).

Many studies have been conducted to identify plant species capable to accumulating heavy metals. It is often difficult to predict the behaviour and fate of metal on a contaminated matrix only through an extrapolation of results obtained from laboratory ecotoxicity experiments (Marques et al., 2007). In the field, differences in the metal availability for plant uptake, operation of ecological compensation mechanisms, exposure to metal mixtures and adaptation to metal stress may occur (Lock et al., 2003). Field studies are necessary to obtain information on how indigenous plant behave under the conditions installed. Studies identifying species with potential capacity for heavy metal accumulation are valuable when selecting the most appropriate plants for phytoremediation strategies.

This study focuses on the accumulation of Cd, Pb and Zn in soils in polluted area Copsa Mica and the availability of these metals for the plant community at highly polluted site. Metal accumulation and transfer to native flora was also studied, in order to evaluate the phytoremediation ability of these plant species.

MATERIAL AND METHOD

Soil and plants were sampled in the surroundings of the Copşa Mică industrial platform.

Soil samples were dried, sieved and homogenised. Pseudo-total concentrations of heavy metals (Cd, Pb and Zn) were assayed after HNO_3-$HClO_4$ digestion.

Plant material was washed thoroughly in tap and distilled water and dried. For acid mineralisation of plant tissues, were used mixture HNO_3-$HClO_4$ and digestion was performed in open-tube system

The metals in the soil and plant extracts were analysed by atomic absorption spectrometry (GBC 932 AA).

Estimation of heavy metal transfer from soil to plant was performed using the transfer factor proposed by Knox and Adriano (2002): $TF = [metal]_{shoot} / [metal]_{soil}$

RESULTS AND DISCUSSIONS

Levels of Cd, Zn and Pb in soils from studied area were much higher than alert thresholds set by Order no. 756 / 1997. The values of cadmium content in soil ranged between 23 and 42 mg kg^{-1}, lead content varied between 583 and 1978 mg kg^{-1} and zinc content ranged between 731 and 2191 mg kg^{-1}.

The spontaneous vegetation developed in the investigated area includes plants representing the following species: *Cynodon dactylon, Equisetum arvense, Verbascum phlomoides, Phragmites australis, Asclepias syriaca, Calamagrostis arundinacea, Convolvulus arvensis, Raphanus raphanistrum, Matricaria perforata, Astragalus glycyphyllos, Apera spica-venti, Xanthium strumarium* and *Sinapis arvensis*. According to the literature of speciality, some of these species are considered plants tolerant to the stress induced by pollution caused by heavy metals. Prasad and de Oliveira Freitas (1999) include *Cynodon dactylon* in the category of plants tolerant to the stress induced by high contents of heavy metals in soil.

The analysis of values obtained for the transfer factor emphasizes that values over 1 were obtained only for Zn (Figure 1). *Verbascum phlomoides* showed the highest value of transfer factor for zinc (1.41). This plants are able to accumulate large amounts of zinc but also lead and cadmium. The high value of transfer factor for zinc (1.22) calculated for *Cynodon dactylon* denote an ability to accumulate this metal. Also, these plants are able to accumulate high amount of lead. The highest value of TF for Pb (0.85) was obtained for *Cynodon dactylon*. The low availability of lead for plants is sustained by low values obtained for the transfer factor. Only *Asclepias syriaca*, *Cynodon dactylon* and

Verbascum phlomoides reached lead TF values close to 1; the other species showed values much lower, ranging between 0.14 and 0.54 (Figure 1).

For cadmium transfer factor values ranged between 0.90 (*Xanthium strumarium* and *Sinapis arvensis)* and 0.10 (*Phragmites australis*). Although cadmium is a metal with a high mobility, the values of transfer factor obtained indicate that there are plants which restrict the access of this metal to the above-ground parts. Among these species are distinguished *Apera spica-venti* (TF – 0.17), *Astragalus glycyphyllos* (TF – 0.12), *Calamagrostis arundinacea* (TF – 0.13) and *Phragmites australis* (TF – 0.10).

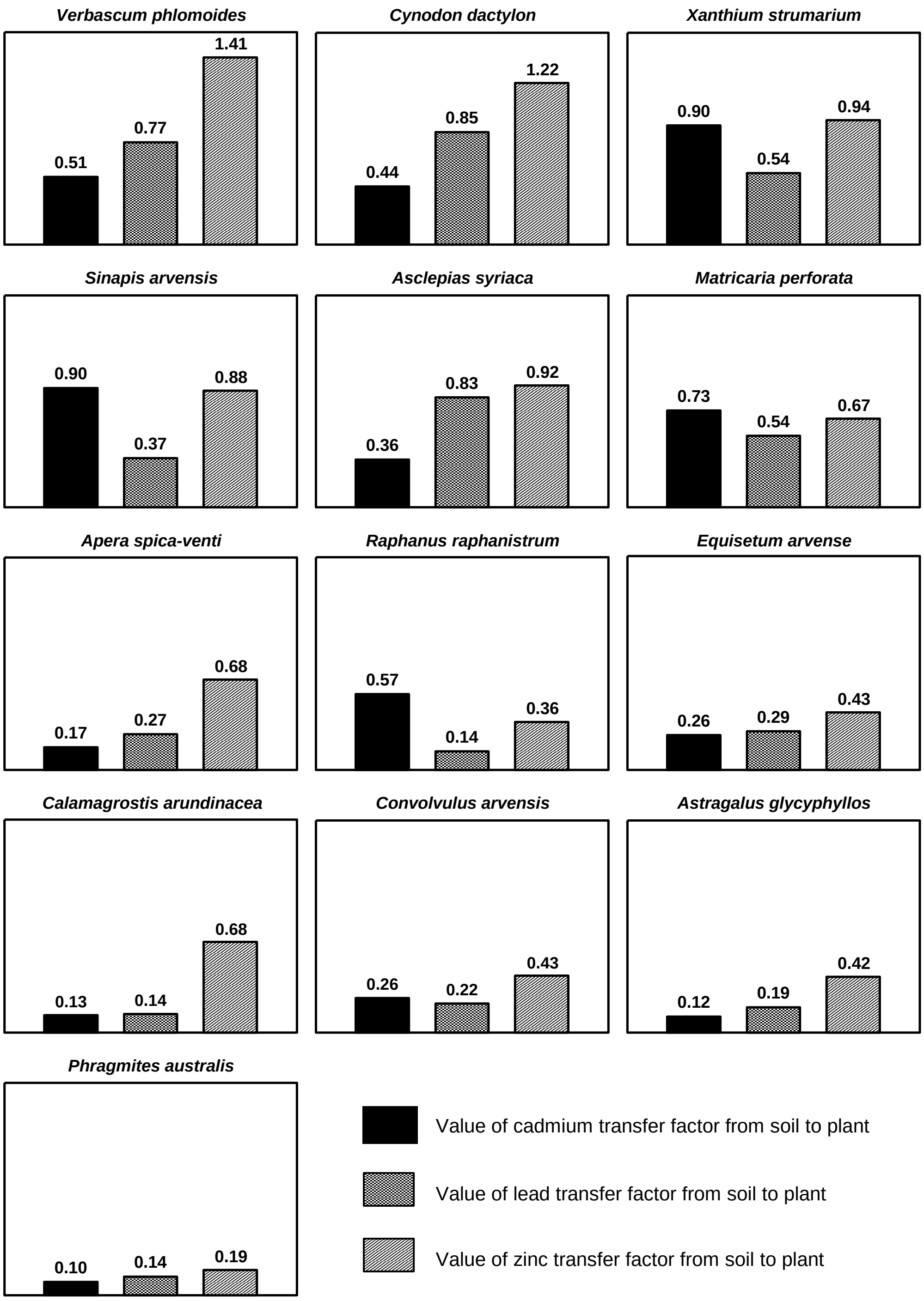

Figure 1. Values of metal transfer factor (TF) from soil to plant estimated for some species identified in the spontaneous vegetation from polluted area'

Phragmites australis showed the lowest TF for Cd, Pb and Zn (0.10, 0.14 and 0.19). According to previous studies *Phragmites australis* develop specific protection mechanisms induced by heavy metal pollution (Erdei, 1998; Marques et al., 2007).

The transfer factor criteria have been used to identify plants that accumulate large amounts of metals. According to the definition of hyperaccumulators none of the studied plants can be considered having this ability but some of them have a strong capacity to accumulate those heavy metals. The plant individuals found in the area did not show visual toxicity symptoms, indicating heavy metals tolerance and possibly metal resistance. It has to be remembered that the collected plants naturally colonized the very polluted soils, so they were well adapted to extreme heavy metal concentrations in soil.

CONCLUSIONS

Even none of the studied plants can be considered a hyperaccumulators some of them could be used to remediate soils contaminated with Cd, Pb and Zn (*Verbascum phlomoides*, *Cynodon dactylon*, *Xanthium strumarium* and *Asclepias syriaca*) because they have a strong capacity to accumulate these heavy metals.

All species identified in this area could be used to vegetate soils with large amounts of Cd, Pb and Zn because they grew and developed normally in the heavy metals contaminated soils.

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