SUMMARY

of Ph.D. thesis intitled "Reseach concerning soil content in nitrogen from the South Oltenia and influence upon underground waters"

My Ph.D thesis theme answers to a very up-to-date desideratum in the field of agrochemistry. Nitrogen issues occupies an important place in agricultural research all over the world. Nitrogen is one of the three main macroelements with essential role in plants growing. It is the main component of air (78,08% of volume and 75,5% of weight) whose main compound is ammonia. Nitrogen together with phosphorus take part in the genetic code formation.

At the present level of agricultural soil fertilization in our country, crops grow on the very high nitrogen feeding basis from soil reseve which depasses its recovering rate by pedogenetical processes. Therefore, nitrogen content knowledge is very necessary.

Chapter I shows nitrogen knowledge stage from the soil, plant and water layers in the worldwide and in Romania, too. After consulting the specialized literature, we know for sure the major role this element confers upon life. We insisted upon the forms under which nitrogen can be found and upon the influence of some physical factors on its accessibility. Abiotic factors influence on demineralisation processes of organic matter from the soil was also emphasized. A great accent also fell on plants critical phases towards its efficiency or its excess.

In Chapter II there were underlined scope and research method used, the climate, hydrology, vegetation and fauna, and major influence on the evolution of soil subtypes, soil types studied clasification, mathematical calculus used to interprete the findings.

Scientifical research were made beginning with the year 2004 in four areas of Dolj county (Gighera-34% of studied surface, Călăraşi-26%, Rast-24%

and Desa-16%).The arable surfaces percentage is presented this way: Gighera-33% from studied surface, Rast-28%, Călăraşi-25% and Desa-14%.

Before taking the soil samples on profils concerning the pedological and agrochemical characterization of soils, the field was marked and divided in homogenous sectors on the basis of a situational plan. Soil samples on the field were taken by the present methodology of Pedological Studies Elaboration made by Agrochemical and Pedological Research Institute Bucharest, in 1987, volume III.

There were presented the soil classes studied in concordance with the Roumanian System of Taxonomy of the soils (2003): Protisoils Class with psamosoils and alluviosoils; Cernisoils Class with chernozem; Cambisoils Class with eutricambosol; Hydrosoil Class with gleiosoil; Saldisoil Class with solonceacs and solonets and Antrisoils Class with erodosoil.

When presenting the natural research frame, we had maynly in view the climate represented by tables and Peguy type climatograms based on findings on the last 50 years, having in view the climatic data experimental period. There were presented the minimal, maximal and medium temperatures on the map of climatic indices, together with the rainfall quantity, estabilishing if the studied years were favourable.

The analytical data for each soil subtype were presented under graph forms with the help on ”STATISTICA” program within the research methodology.

For a better knowledge of experimental conditions in Chapter III-Personal contributions, we have made the pedological and agrochemical characterization of the main arable soil types from south Oltenia, mainly: of the psamosoils, chernozems, alluviosoils, gleiosoils, erodosoils, solonceacs and solonets.

There were also emphasized the nitrogen influence upon underground waters together with culture plants productivity and the exportation of nitrogen in plant on the studied types of soil. Therefore, soil samples were taken from the

horizons important for culture plants growing and there were made pedological and agrochemical analyses for each and every horizon.

There was established soil formula for every soil unit, morphological characterization of horizons together with main agrochemical indicators characterization.

After the research done, starting from the findings, there were established mathematical correlations between total nitrogen content and humus on one hand, and between the content of total nitrogen, clay, pH, calcium carbonate, mobile phosphorus and mobile potassium on the other hand. There were made lineary regressions between the analysed factors.

The data obtained, and presented in the synoptic table are the folloing: at the psamosoil, the eutrical type was studied first on 9 profiles in different areas (Desa, Călăraşi, Rast). The total nitrogen content was between 0,03% and 0,25% on the first horizon, between 0,02% and 0,2% an the second and between 0,05% and 0,15% on the third horizon.

Other 4 subtypes were also studied: molical, gleical, calcarical and salinical psamosoils. There was determined the content in total nitrogen on the first three horizons, which was between 0,05% and 0,25% on the first horizon, between 0,03% and 0,23% on the second horizon and between 0,01% and 0,21% on the third horizon. The chemical reaction is from weak acid to weak alkaline, the humus is under 1% and the content in clay was not more than 12%.

Four subtypes of chernozem were studied, mainly: typical, cambical, psamical and gleical chernozems. The content in total nitrogen on the first three horizons was between 0,13%-0,19%; 0,02%-0,13%; 0,03%-0,14% on the typical subtype, between 0,12%-0,13%; 0,10%-0,11%; 0,07%-0,10% on the cambical subtype, between 0,06%-0,12% onpsamical subtype and between 0,07%-0,16%; 0,05%-0,14%; 0,02%-0,12% on the gleical subtype. All the regressions are statistically sustained and they have positive values.

There were studied 4 subtypes on alluviosoil: eutrical, molical, calcarical gleical and psamical alluviosoil. The content in total nitrogen was determined on

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the first three horizons and it was between 0,06%-0,08%; 0,04%-0,06%; 0,02%-0,04% an eutrical subtype, between 0,05%-0,15%; 0,05%-0,10%; 0,03%-0,05% on molical subtype, between 0,06%-0,45%; 0,03%-0,04%; 0,02%-0,15% on gleical calcarical subtype and between 0,05%-0,08%; 0,03%-0,06%; 0,01%-0,04% on psamical subtype.

There were identified and charcterized gleical soil subtypes, mainly: cernical, molical, psamical and eutrical gleiosoils. The content in total nitrogen varied between 0,03%-0,30% on the first subtype, between 0,10%-0,20% on the second subtype, between 0,02%-0,04% on the third subtype and 0,05%-0,07% on the fourth subtype depending on the analyzed horizon.

There are described only two erodosoil subtypes in this paper: psamical and eutrical erodosoil. The content in total nitrogen on the first subtype is between 0,01%-0,06% and the mathematical correlations are significant.

Gleical solonceacs have a total nitrogen content between 0,14%-0,15% on the first horizon, between 0,10%-0,12% on the second horizon and between 0,05%-0,10% on the third horizon.

Salinical solonets were identified in Gighera place and they are weakly supplied with total nitrogen (0,04%-0,09%).

Together with soil samples taken, there were also taken samples from water layers in the wells situated in the same places. There were determined the potassium, natrium, magnesium, calcium cations and also nitrite, nitrate, sulphur, chlorine, bicarbonate and carbonate anions. There were also determined the values of: pH, electroconductivity, salt content by connductrimetrical method, the total hardness, temporary hardness and permanent hardess.

Water layer does not contain carbonate anion (CO_3^{2-}) on any soil type. pH value varied between 6,32 (on psamosoil and alluviosoil) and 7,81 on chernozem. Concerning the hardness, the water layer has a soft feature on psamosoils, medium on alluviosoils, hard on gleiosoils and very hard on chernozems and erodosoils.

Concerning culture plants productivity and nitrogen export in plant, on the studied type of soils, we could mention that there were presented the medium crops obtained in Desa, Gighera, Rast and Bechet areas in 2006, 2007, 2008. Plants productivity and nitrogen export were emphasized on the following cultures, without chemical nutrients, as follows: wheat (Şimnic 30, Alex, Dropia type), maize (hibrid Fundulea 322, Fundulea 376 type), sunflower (Favorit, Festin, Fundulea 206 type) and rape.

The most favourable year for wheat was 2008, when the biggest crops were obtained, crops between 1500kg/ha in Rast area and 3200 kg/ha in Gighera area. The year 2007 was the most unfavourable because of the drought, the crops were between 408 kg/ha (in Rast area) and 1100 kg/ha (in Bechet area).

The most productive year for corn was 2006, the biggest crops being of 4100 kg/ha, in Gighera area, but the crops were compromised in 2007, this been declared year of calamity.

Sun flower crops registered the higest values in 2006: between 1000 kg/ha (in Desa area) and 2034 kg/ha (in Gighera place). The 2007 drought strongly affected this culture, the crops being only of 300 kg/ha (in Rast area) up to 600 kg/ha (in Gighera area). Therefore, sun flower crops were compromised.

In conclusion, crops level depending very much on rainfall quantity in the specific year and on the type of soil. Bechet place was declared calamity area in 2007 because excessive drought.

Rape crops were strongly affected by climatic conditions, being between 500-1051 kg/ha. There were obtained 2000 kg/ha only in 2006 in Gighera area, more than anywere else.

There were also made the calculus of nitrogen export in wheat, corn and sun flower crops in the 4 places and in the three year studied and the calculus of the average of the three years (2006-2008). The higest nitrogen export was in 2008 when the biggest crops were obtained. On wheat, the values varied between 8,2 kg/t (in Rast area in 2007) and 150 Kg/t (in Bechet area in 2008). On wheat the nitrogen export reached up to 102,5 kg/t (in Gighera area in 2006)

and the highest values for sun flower were registered in 2006 in Gighera area (122 kg/t) and Bechet (120 kg/t). There were made chemical analyses on plants including on seeds for nitrogen "export " calculus.

Making a synthesis of the research results, we find a direct dependence between the content in nitrogen, and pH, humus, clay and calcium carbonate from soils, which determines the nitrogen within its three forms: nitrates, nitrites and ammonial nitrogen to become more accesible to plants.

For a long-lasting agricultural practice, mainly for optimal quantity of fertilizers administration, even suboptimal and their replacement with ecological fertilizers and manure, together with the use of an optimized irrigation system, amendaments administration were necessary will determine a superior valorization of these soil types.