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MICROBIAL EVOLUTION OF OENOLOGICAL INTEREST IN VINEYARD SOILS
(Summary)

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CONTENT

SUMMARY

The study of "Microbial evolution of oenological interest in vineyard soils" is a continuous theme and which can offer more accurate results and solutions. The studies done on national level demonstrated that every viticulture area or viticulture center show some leaven conveyer, there the leaven species are found distributed in a different manner.

In the period of 2003-2008, we proposed to capture aspects of leaven evolution from the soils of viticulture centers Banu Maracine and Segarcea.

For this purpose were established the following research objectives:

-the study of climate conditions of the viticulture centers that have been studied

-the study of the main soil types from the studied viticulture areas and of the spontaneous vegetation

-isolation and identification of leaven species from soils belonging to studied centers

-leaven distribution according to the area they were taken and the climatic year

The paper has the following structure:

-Introduction- 3 pages

-Chapter 1- Studies and researches regarding leaven ecology and their classification- 18 pages

-Chapter 2- The purpose of the paper, the objectives of the research, working methods- 15 pages

-Chapter 3- The obtained results and their interpretation- 199 pages

-Chapter 4- Final conclusions and recommendations- 10 pages

-Bibliography- 18 pages, in which are cited scientific papers, directly related to the theme of the study.

RESULTS ACHIEVED

1.Conclusions about the climatic conditions of the studied areas

-For 48-years (1961-2008) the annual average temperature in viticultural center Banu Maracine, was 10.8 ° C. Growing season (April-October) is characterized by an average temperature of 17.3 ° C. The warmest months with average values exceeding 20 ° C were in June, July and August and the coldest, in January when it was recorded -0.1 ° C.

-During the experiment (2003-2008)the annual average temperature was higher than normal by 0.6 ° C.Tthe warmest months were in summer, with positive deviations from normal between 0.8 and 1 ° C, which reveals the general trend of climate warming.
-The rainfall recorded, averaged over 48 years, were 585.4 mm, of which 369.5 mm in growing season.
-During the experiment, the average annual rainfall was 636.5 mm with 51.1 mm more than in the 1961-2008 period. The rainfall recorded in the growing season have averaged to 451.8 mm,significantly higher with 82.3 mm normal. Months with heavier rainfall over 70mm were in August and September. Between years in terms of monthly precipitation there are great differences , which demonstrates their uniform character in the central area of Oltenia . Relative humidity averaged between 2003-2008 was 73% and 67% in vegetation season. Annual sunshine duration was 2350 hours, of which over half of the growing season, which shows that the culture of the vine is favorable.
-Climatograms from 2003-2008 clearly reveal the continental climate of the location in Banu Maracine , generally characterized by drought in the summer months.
-It appears that on average of 48 years, in the center Segarcea vineyard, the annual average temperature was 11.2 ° C, rainfall average recorded being 288mm, and the insolation hours totaled 1439. High values over 20 ° C monthly average temperature were found in all summer months. In the same months, relative humidity was low (64-69%), and the average monthly effective brightness of the sun reached high values of 253-285 hours.
-Between 2004-2007, annual average temperature was 11.2 ° C, with reduced annual oscillations. Average annual rainfall in the same period had a value of 602mm.
-Per year and calendar month the growing season to Segarcea was a significant variation in precipitation. Increased uniformity of rainfall is particularly evident in the second half of the growing season.
-Relative air humidity is closely related to rainfall. Thus in the first three months of the season there were no differences between years, compared with the last four months when these differences were significant, up to 30%.
-Values are similar regardless to hours of insolation every year, thus demonstrating that rainfall is of short duration and have a torrential character.

-Oenological fitness, depending on climatic factors, is 4849, being close to the plantation from Banu Maracine which unquestionably indicate that in both locations can be obtained high-quality wines.

2.The types of soil and vegetation growing in studied areas.

Soils encountered **in the vineyard center Banu Maracine:**

-**Red low watered Preluvosoil** with a profile of type Ap-Ao-AB-Bt_1-Bt_2. Hydrophysic indices have medium values and correlate well with granulometric composition and organic matter content. It is medium supplied with humus in the Ap horizon (2.76%), after which it drops to 0.42% on profile. Presents a very high content of phosphorus and mobile potassium in the first horizon the values being of 80 and 320ppm respectively. The reaction of soil is slightly acid and the degree base saturation is moderate mezobazic. Depending on the morphological and physicochemical characteristics the soil has a medium to low natural fertility.

-**The medium red eroded Preluvosoil** with a profile of type Ap-AB-Bt_1-Bt_2-C. Natural fertility is lower than the low red watered preluvosoil as its humus content is only 1.28% in Ap horizon. The amount of humus is smaller than the erosion effect more or less intense that removes all or part of Ao horizon, horizon of accumulation of organic matter. Is poorer in nutrients and colloidal complex.

-**The pseudogleizat red Preluvosoil** with a profile of type Ap-ABw-Btw-Bt. The presence of alteration processes and debasification lead to the formation of larger amounts of clay, over 38%, sinking to a strong, low permeability and a pH value below 6. Although soil is rich in colloidal complex, it has a low natural fertility due to increased erosion processes, a lower humification caused by failure to microbiological activity.

Soils encountered **in the vineyard center Segarcea:**

-**The argic chernozem** diagnosis is a profile type Ap-Am-Bt-C. Is strong and sinked and is poorer in humus whose value falls below 3%. Total nitrogen content is reduced below 0.128%. Soil reaction is slightly acidic in the first horizons and slightly alkaline within the depth, the pH value increasing from 6.6 to 8.1. Hydrogencarbonate ions predominate in complex colloidal and the degree of base saturation is 90%.

-**The pseudogleized argic chernozem** with a profile of type Ap-Amw-Btw-C. Anaerobiosis conditions created by longer stagnant water causes purple-gray spots that highlighted in the second half and in the first half of Amw Btw horizon.

Hydrophysic indices have high values because the clay content and the humus content is in the middle of Amw and Ap horizons (3,11 and respectively 3, 01%) and then subtracting the profile up to 0.43%. The soil contains a significant proportion of nutrients, has a slightly acid to slightly alkaline reaction and the degree of base saturation is higher than 90%.

-**The cambic chernozem** has a profile of type Am-AB-Bv-C. It has a texture from argillaceous to clayeyous. Is well supplied with humus whose value is 3.6% in the Am horizon. Soil reaction is neutral to surface and slightly alkaline in depth, the pH increasing from 6.9 to 8.2. Colloidal complex is saturated in hydrogencarbonate cations, predominanting calcium and the degree of base saturation is higher than 95%. These properties prints better soil fertility.

-**The cambic pseudogleized chernozem** is characterized by reduction processes in the first part of the soil profile that is type-I-ABw Bvw-C. As cambic chernozem is well stocked with humus (3.42%) and total nitrogen (0.17%). His reaction is neutral to slightly alkaline pH increasing the profile from 6.8 to 7.9. Colloidal complex is saturated in hydrogencarbonate cations and the degree of base saturation level is higher than 90%.

-The forests from Banu Maracine area correspond to Turkey oaks (*Quercus cerris)* and Hungarian oak (*Quercus frainetto).* Suitable grasslands are drought prolonged, dominated mainly by grasses *Festuca valesiaca* and *Botriochloa ischaemum*.In The association of hair grass steppe (*Festucetum valesiacae*) we can find xerofile dicotyledonous as: *Potentilla argentea, Linaria genistifolia, Centaurea micracanthos, Lotus corniculatus, Medicago minima, Trifolium campestre, etc.*

-In the strong association of grass on sunny slopes is being installed the xerofila association dominated by *Botriochloa ischaemum* with accompanies such as *Poa bulbosa, Plantago lanceolata, Medicago falcata, Centaurea micracanthos,etc.*

-At the limit of vineyards and meadows mentioned it is found the *Cynodontetum dactyloni* association with weed species accompanying the *Digitaria sanguinalis, Polygonum aviculare, Xanthium spinosum, Amaranthus retroflexus, Stellaria media, etc*

-In planting vines we can encounter other weeds with greater frequency these being called *Echinochloa crus-galli, Setaria viridis, Capsella bursa pastoris, Rorippa austriaca, etc*

-In Segarcea location, as well as in Banu Maracine location, there are a large number of weeds largely similar.

-Annual dicotyledonouses with higher frequency are represented by *Amaranthus retroflexus, Capsella bursa pastoris, Chenopodium album, Galium aparine, Sinapis arvensis, Taraxacum officinale, etc.*
-Perennial dicotyledonouses frequently encountered are *Cardaria draba, Cichorium intybus, Cirsium arvense, Ranunculus repens, Sambucus ebulus, Trifolium hybridum, etc.*
-Perennial monocotyledons are most encountered are: *Sorghum halepense, Lolium perene, Cynodon dactylon, Poa silvicola,*and annual moncotyledons with frequency are *Echinochloa crus-galli, Setaria viridis, Bromus arvensis, Bromus commutatus, etc.*

3.Isolation and Identification of Leaven Species in the soil of viticulture centers Banu Maracine and Segarcea

-As a result of the study made in viticulture centers Banu Maracine and Segarcea, during 2003-2008, from the soil's wine-making micro flora, have been isolated and identified 64 strains: 35 strains in the Banu Maracine viticulture center and 29 strains in the Segarcea viticulture center.
-The leaven strains isolated in the Banu Maracine viticulture center soil have been taxonomically framed into the following genres: *Saccharomyces, Saccharomycodes, Zygosaccharomyces, Pichia, Hansenula, Hanseniaspora, Schizosaccharomyces, Metschnikowia,* within the *sporuliferous* leavens and *Kloeckera, Brettanomyces, Candida, Rhodotorula* within the *non-sporuliferous* leavens.
-Within the genres, 15 species of leavens have been identified, of which 10 species (*Saccharomyces ellipsoideus, Saccharomyces oviformis, Saccharomyces rosei, Saccharomycodes ludwigii, Pichia membranefaciens, Hansenula anomala, Hanseniaspora uvarum, Metschnikowia pulcherrima, Schizosaccharomyces pombe, Zygosaccharomyces baillii)* within the *sporuliferous* ones and 5 species (*Candida vini, Brettanomyces intermedium, Kloeckera apiculata, Rhodotorula glutinis, Rhodotorula rubra)* belonging to *non-sporuliferous* leavens.
-The leaven strains isolated in the Segarcea viticulture center soil have been taxonomically framed into the following genres: *Saccharomyces, Pichia, Hanseniaspora, Metschnikowia,* within the *sporuliferous* leavens and *Kloeckera, Candida and Rhodotorula* within the *non-sporuliferous* leavens.
-Within the genres, 9 species of leavens have been identified, of which 6 species (*Saccharomyces ellipsoideus, Saccharomyces oviformis, Saccharomyces rosei, Pichia membranefaciens, Hanseniaspora uvarum, Metschnikowia pulcherrima)* within the *sporuliferous* ones and 3 species

(*Candida vini, Kloeckera apiculata, Rhodotorula glutinis)* belonging to *non-sporuliferous* leavens.

4. Distribution of Leaven Strains in the Studied viticulture centers and the Environment where They have been Identified

-From the spontaneous leaven micro flora from the soil of Banu Maracine viticulture center, during 2004 and 2007 have been isolated and identified 23 (56%) leaven strains.
-The percentage distribution of isolated leaven strains is depending on climate conditions existing during the study periods (2004 and 2007).
-In the Segarcea viticulture center, in the plantation soil, have been isolated and identified 18 (44%) leaven strains, during the study periods (2004 and 2007).
-The percentage distribution of isolated leaven strains is depending on soil and weather conditions of the periods.
-In the studied areas, during 2004 and 2007, in the soil samples, have been isolated 41 leaven strains, distributed in this way:

-21 leaven strains in 2004
-20 leaven strains in 2007

-From the total number of leaven strains isolated from the soil samples during 2004, 67% were found in samples from the Banu Maracine viticulture center and 33% were found in samples from the Segarcea viticulture center.
-In the climatic conditions of the year 2007, from the soil samples have been isolated 20 leaven strains out of which 45% were found in the Banu Maracine viticulture center and 55% in the Segarcea viticulture center.
-Regarding the species diversity, a great similarity has been noticed regarding the identified species while differences have been noticed to the percent of the species.
-In both of the observed years (2004 and 2007), the sporuliferous species have prevailed, the non-sporuliferous ones being also found in both of the viticulture centers, their percent being varied.
-Studying the percentage repartition of the leaven strains according to the collected soil samples, in the years observed and for both the viticulture centers, it has been observed that most of the species found in the plantation soil belong to the *Saccharomyces* genre, followed, according to the percentage order, by the *Kloeckera* genre (the imperfect form), *Hansenula*, *Hanseniaspora, Rhodotorula, Pichia.* The leaven strains of the *Candida* and *Metschnikowia* genres have been found in the smallest percentage.

-It is necessary that this kind of studies continues so that the leaven strains with technological and physiological features convenient for wine types that might be obtained in these viticulture areas are identified.