THE NATURAL CONDITION OF FORMATION AND THE MAIN FEATURES OF SOILS FROM FARCAS LOCALITY, DISTRICT DOLJ

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ABSTRACT

The Farcas locality, District Dolj is located in the northern part of Dolj District, at approximately 35 km away from Craiova town.

Because of the fact that the land was given back to the former owners the land became scattered and, as a result, approximately 35-40% of the surface is not cropped and the yield per hectare is much diminished.

These aspects determined a pedological study in this area in order to know the natural conditions of formation of soils and their evolution in this part of Dolj District in order to evidentiate the main soil types and their features and to elaborate improvement measures for increasing the productivity potential of these soils.

In a mild temperate climate (annual average temperatures of 10.8^{0}C, annual average rainfall of 523 mm), on relief that is specific to piedmont hills, on varied bedrock materials corroborated with the micro relief of the zone, under a specific vegetation of oak woods, with hydrogeological features that are characteristic to this area, in the studied zone, after field studies as well laboratory analyses there have been identified the following soil types: preluvisoil, luvisoil, and aluvisoil.

The preluvisoil is encountered on plateau as well as on versants with very different declination and it has different features in function of the local conditions. On plateau the soil profile is deep, the humus content is average (2.38%) and the soil reaction is low acid (pH = 6.3). on versants, where the erosion process is more evident, the soil profile is short, sometimes without first horizon, the humus content varies between 1.2-1.5%.

The luvisoil is specific, within the researched area, to micro relief pitches and depressions where the waterlogging process creates modifications in the soil profile in comparison with nearby soils. Here there appears the eluvial horizon and the soil reaction becomes acid (pH 5.4).

The aluvisoil is encountered in low zones of the land, where the ground water determines gleysation processes at the base of the soil profile (under 50 cm).

INTRODUCTION

The Farcas locality, District Dolj is located in the northern part of Dolj District, at approximately 35 km away from Craiova town and it has a surface of 3,905 ha of which 3,615 ha are of agricultural use.

Because of the fact that the land was given back to the former owners the land became scattered and, as a result, approximately 35-40% of the surface is not cropped and the yield per hectare is much diminished.

The role of clime in the process of soil formation is widely recognized. The disaggregation of bedrock, the alteration of disaggregation products, alluvia of some products of alteration from some horizons and transportation of them in other horizons, as well as a series of properties of a soil that results from other activities, for instance atmospheric agents that make the clime of the area.

In this respect, the average annual temperature of the air at Craiova Meteorological Station is 10.8^{0}C and the annual average rainfall are 523 mm. within the studied territory there appear a series of micro clime areas that are determined by relief as: valleys are less

subjected to drought than the versant and plateau areas because here the temperature during the night decreases much more and the dew is thicker; water from rainfall is lost through leaking on versants than on plain terrain.

The territory of Farcas locality is located within the south-western part of the Getic Piedmont and it comprises a single geomorphological unit – the Piedmont Hills. The Getic Piedmont represents the geomorphological unit of transition between orogeny region of Meridionali Carpathians and the Getici Subcarpathians to the north and the quaternary plain region of low Danube.

The relief has the following forms: plateau with altitudes of 320-567 m with N-S orientation, with average altitudes of 200-400 m; much reclined versants, with a rough relief along the versant, the slopes are uneven, with 3-7% declination and 30-55%. Generally, the slopes with very high declination are more present in the inferior third and half of the versants. In the center and eastern part of the territory, on small surfaces, the versants are affected by land sliding process in different phases and this natural process is in progress because of improper use of these surfaces. On large surfaces, especially on inferior and middle third the versants show acute process of erosion: ravines, gulls and active land slide. These valleys are usually dry during the drought periods.

The studied territory belongs to middle hydrographic basin of Amaradia stream, by mean of Plosca creek that passes this locality from north to south. During high rainfall periods this creek floods yet without high damages. The other secondary valleys that gravitate toward the above mentioned valley are dry during drought periods. In the zones of slope sources there are formed small pitches of marshes during the entire year. The ground water within the high plateau is at 30 m depth and on versants, at 12-18 m, sometimes shallower and in valleys, at 2-4 m.

The piedmont hills within the studied territory are of Levantine age and the soils from valleys are of very old age. There were identified the following rocks: in valleys and at the base of versants the bedrock is constituted of colluvium deposits from material that has been eroded from upstream and from versants; the versants zone is occupied by strata of heavy silt, marl clays, clayey sands and deposits of sands.

The territory of Farcas locality is located within the oak woods zone, the woods from hills being formed of *Quercus cerris* and *Quercus frainetto*. In the last years there were cleared large surfaces of woods from these hills making the erosion process more possible.

MATERIAL AND METHOD

Within the paper there were, firstly, presented the natural conditions of forming of soils from Farcas locality, District Dolj, the main soil types and their main cropping properties. By field and laboratory research we tried to bring a modest contribution to the superior capitalization of soils from studied zone such way spending less, to earn more.

For agricultural and biological characterization of soils from Farcas locality there were dug soil profiles that were researched morphologically directly in the field. Out of more representative soil profiles there were taken soil samples for laboratory analyses. The paper that was made on the basis of researching activity can be useful for elaborating the fertilization plan as well as for establishing improvement measures for enhancing the cropping potential of these terrains, to erosion control and land slide avoiding, phenomena that affect this land.

RESULTS AND DISCUSSIONS

Within the studied zone there were identified the following types of soil: preluvisoil, luvisoil, and aluvisoil.

The preluvisoil is encountered on plain zones of the studied territory, where the internal and external drainage is very good, on versants with moderate slopes and on

versants with high slopes where the erosion process has removed a part or the entire shallow horizon.

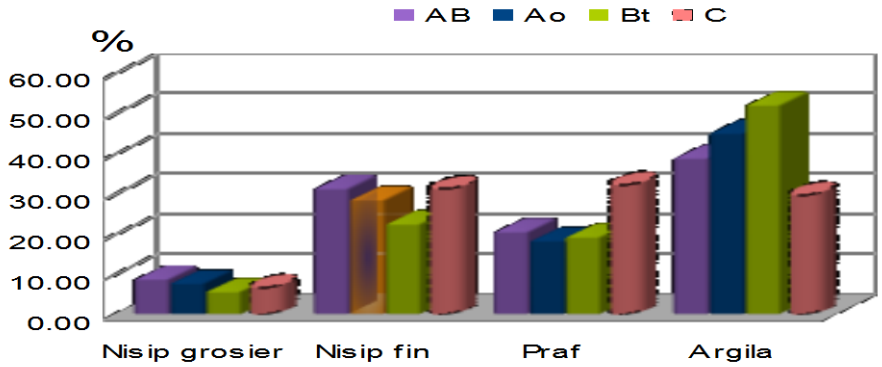

Fig.1 Size fractions of preluvisoil: thick sand, fine sand, loam and clay

The preluvisoil from plateau has a well developed soil profile (Ao-AB-Bt –C) and it is characterized by a high content of fine fractions (figure 1) that determines a value of total porosity that varies invers proportional with the bulk density and decreases from 50% in Ao horizon to 43% in Bt horizon (figure 2).

The hydro physical parameters have average values at the surface and they increase on the soil profile along with the clay content (figure 3).

The chemical properties help us to know the cropping potential of a soil, along with the hydro physical parameters. Knowing all these features there can be applied all needed measures for optimal regime for plants. Analyzing data from table 1 and figure 4 there can be concluded:

- the soil is low to average supplied by humus, respectively 2.38% in Ao horizon and it decreases on soil profile reaching 0.38 % in the C horizon;
- the soil reaction is low acid, namely 6.3 pH in Ao horizon then it becomes neutral pH 7.2 in C horizon;
- the bases saturation degree (V%) has values of 83% in Ao horizon and 97% in C horizon.

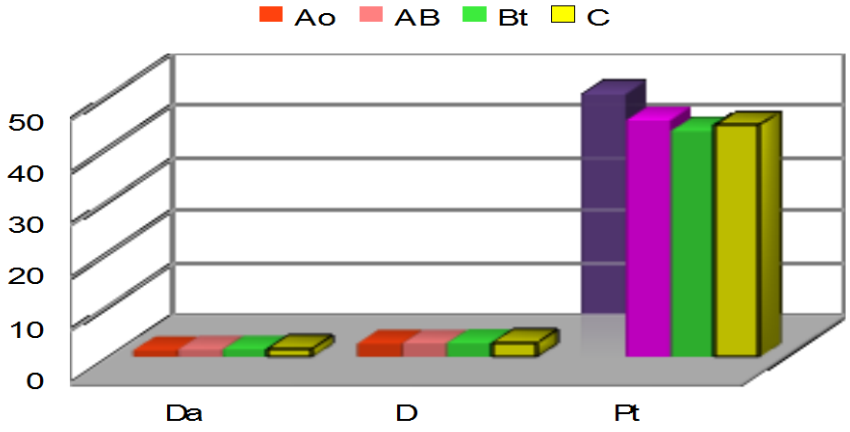

Fig.2 Bulk density, density and the total porosity of preluvisoil

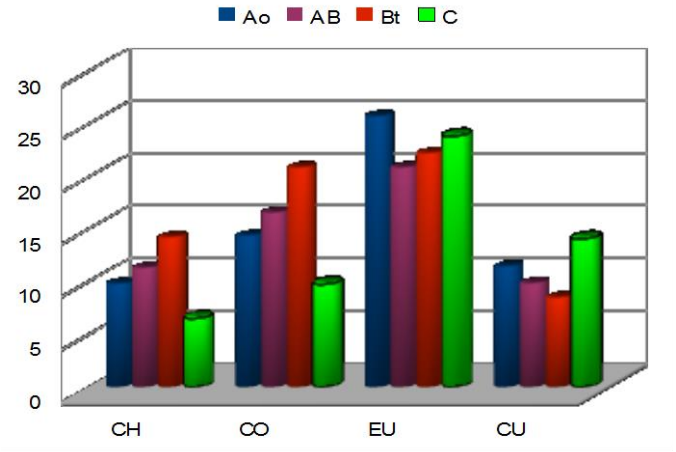

Fig.3 Hydro physical parameters of preluvisoil

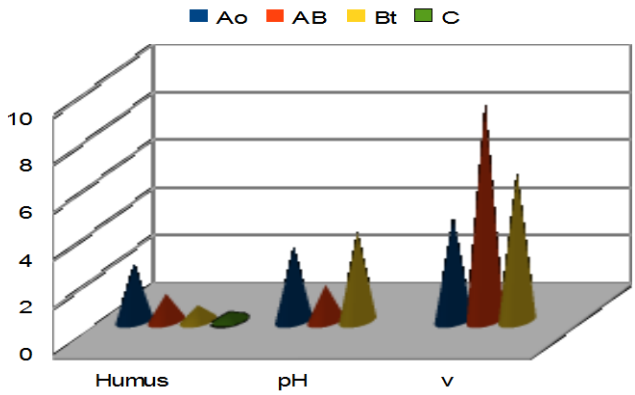

Fig.4 Chemical parameters of preluvisoil

The preluvisoil has a fine texture, a compact structure, it is average supplied by nutrients, it has a low acid reaction and it very compact. In order to increase its cropping capacity we recommend, firstly, deep tillage that have the aim to enhance its permeability for water and air and to create better conditions for root development. Because the soil has a low content of humus, and the structure is compact there is recommended the applying of manure in order to complete the humus deficiency and to create a better soil structure. In order to enhance the nutrient supplying on this soil there are recommended N and P fertilizers and for some crops, K fertilizers.

The preluvisoil encountered on versants with average slopes, morphologically is similar to the one encountered on plateau with the difference that the Ao horizon from the surface is thinner due to slow geological erosion that has slowly removed the shallow layer of soil. This is why this soil is low in humus content in Ao horizon the humus content is 1.5% and it decreases on the soil profile, the soil reaction is low acid (pH 6.4) and it becomes neutral in Bt horizon (pH 6.8) and low alkaline in C horizon (pH 7.6) and the bases saturation degree increases from 83% in Ao horizon to 98% in C horizon (figure 5).

With the preluvisoil located on versants with even slope a part of the shallow horizon which was fertile, has been transported by rainfall on valleys and this is why this soil has a low content of nutrients and humus and it has a low natural fertility. In order to improve the cropping capacity of this soil there is recommended, firstly, the erosion control by slope line plowing, avoiding to crop wide row crops, by buffer strips or by contour strip

crops. In order to complete the nutrient deficiency there are recommended organic and mineral fertilizers.

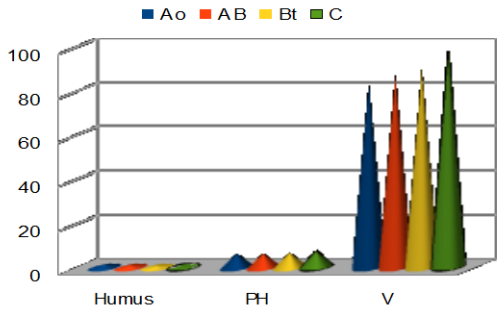

Fig.5 Chemical parameters of the preluvisoil from moderate slope versants

On the versants with high slope, because of acute erosion of water the arable horizon has been removed and at the soil surface there appeared AB horizon. The soil is very poor in humus because the fertile soil layer has been removed, the humus content is 1.2% in AB horizon and it decreases a lot on the soil profile. The soil reaction is low acid (pH 6.5) and it becomes neutral on the soil profile, in Bt horizon and low alkaline in C horizon (figure 6).

The preluvisoil from high slope versants have a soil profile without the first horizon because it has been taken away entirely by erosion. This is why this soil has a low fertility and it is low supplied by humus and nutrients. In order to reclaim this soil there must be applied radical measures of erosion control and among them are vine and orchard cultivation only on terraces, pastures cropping and where the slope is too high there is recommended woods plantings. In order to succeed these crops there are needed for these soil high doses of organic fertilizers as well as mineral ones and when this soil is cropped by pastures the grazing has to be made rationally in order to avoid the erosion process.

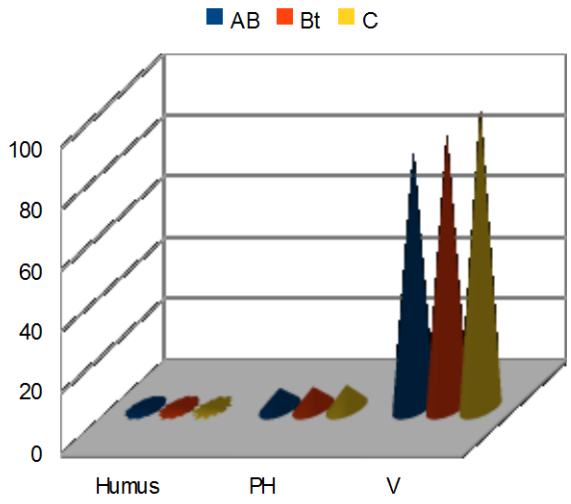

Fig. 6 The chemical parameters of the preluvisoil from high slope versants

The luvisoil has been found on plain terraces in micro depressions, on some northern versants that are low reclined, where, because of waterlogging or shadow the excess of water is maintained a longer time at the soil surface and in the first part of the soil profile. Due higher moisture the alteration processes are more intense and a part of clay is decomposed in oxides and bases that are leached deeper. There is formed silica that remains at the soil surface giving to the soil a bleaching appearance (horizon El). The soil profile is profound of Ao-El-Bt-C type.

In figure 7 we can see that this type of soil is low supplied by humus, only 1.4% in Ao horizon and it considerably decreases on the soil depth reaching 0.2% in C horizon, the soil reaction is acid (pH 5.6), the bases saturation degree is relatively high, ranging between 77% and 86%.

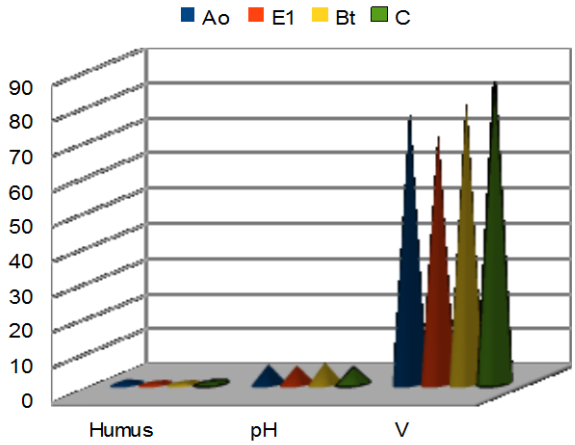

Fig. 7 Chemical parameters of luvisoil.

The luvisoil has unfolded more intense processes of podsolation because it is located on plateau and micro depressions where the internal and external drainage is low. This is why the elluvial horizon appears at the soil surface, the reaction is acid and the degree of nutrient supplying is low. Because of low productive capacity this soil need human intervention in order to obtain higher and secure harvests. On this soil the soil reaction has to be corrected by applying lime as amendment. In order to improve soil water and air permeability and to reduce soil waterlogging there must be done deep tillage without reversal of furrow in order to avoid bringing to the surface of El horizon that is toxic for plants roots. In order to enhance the supplying with nutrients there is need applying of organic and mineral fertilizers in large doses. In order to improve the cropping capacity of this soil there must be applied modern soil management techniques and cropping plants that can grow in acid soil conditions.

The aluvisoil can be found on valleys where the bedrock is formed of alluvial material or colluvial material from versants. The ground water is at shallow depth (1-1.5 m) determining, in some situations, gleysation processes at the base of the soil profile. The gleysated aluvisoil are found on valleys and it has a high cropping capacity due to high humus content (figure 8) and nutrients. In zones where the ground water is at depth more than 1.5 m the anaerobic processes have a less influence on soil profile and the soil is the most fertile in Farcas area. In order to be cropped there must be done drainage works in order to deepen the water table. These soils respond very well to organic and mineral fertilization.

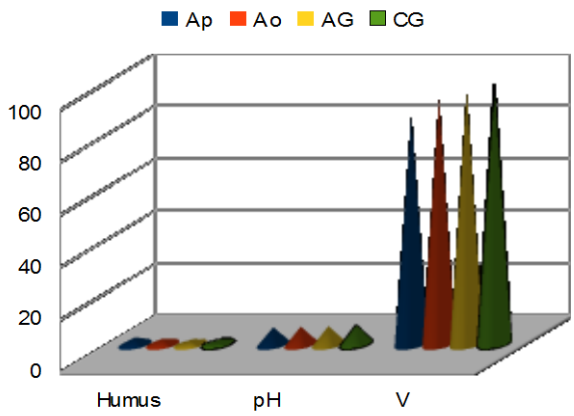

Fig. 8. Chemical parameters of gleysated aluvisoil

CONCLUSIONS

The territory of Farcas locality, District Dolj is located in the S-E part of Getic Piedmont, Amaradia Platform and it has a high undulated relief formed of piedmont hills and wide valleys with N-S and E-W orientation.

In the environment conditions of piedmont hills there was formed as zonal type of soil the preluvisoil that can be found on plateau on the studied territory. This type of soil, because of fine texture by high content of clay in B horizon has a low internal drainage. A part of the studied territory that very significant, on versants with slopes that have different degrees of declination and it is affected by surface and deep erosion. On the preluvisoil there are found several degrees of erosion from low to high eroded. On versants there can be found gullies and even ravines yet a part of them are consolidated by wood plantations and this action must be done on the other parts in order to avoid the aggravation of the erosion process. The eroded soils are scarce in nutrients because the humus content is low due to removing the fertile soil layer from the soil layer in part or the entire such layer. At the base of versants and on valleys between them there was formed the gleysated aluvisoil by accumulating eroded material from upstream versants. The gleysated aluvisoil has a higher natural fertility than preluvisoil and it can be used for arable crops and hay fields due to total mechanization possibilities.

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