THE NATURAL FRAMEWORK FOR THE FORMATION AND CHARACTERIZATION OF THE SOILS OF DIOSTI COMMUNE, DOLJ COUNTY

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ABSTRACT

The investigated territory is located in the S-E part of Dolj County. It has a climate slightly influenced by Mediterranean clime. It is located entirely in the Leu – Rotunda Field, an integrated part of the eastern division of the Oltenia Plain, namely, of its northern subdivision. Within the field, a series of micro-depressions and even depressions are identified, which gives it a slightly wavy appearance. It belongs to the river basin of Olt and Jiu, all the valleys specific to the relief of the area gravitate towards these rivers. Regarding the depth of the groundwater, it is varied in the territory of the commune Diosti. In the northern part it is deeper than 8-15 m and, as such, does not influence the genetic nature of the soil, on the slopes that fall into the deep valleys of the plain it appears at the depth of 10-15 m, on the thread of valleys below 1-2 m, at the base to the slopes the depth is about 6-8 m and to the south, the groundwater is at 2.5-4 m, a situation in which the hydromorphisms characterizes the soils of the area (gleysation, groundwater influence). The bedrock on which the soils were formed is loessy, deluvial - proluvial clay and clay, which, under the influence of the climate, in some cases, has reddish and yellowish chromes. From the geobotanical point of view, the territory of Diosti commune is within the area of oak forests, in contact with the sylvosteppe. The processes of genesis and evolution of soils within the researched territory took place through the interaction, of time, of pedogenetic factors (climate, relief, hydrography, hydrology, rock, vegetation) as well as through human interaction.

In this territory, the following large groups of soils have been identified: cambic chernozem, argic chernozem, red preluvosoils, alluviosoils. The cambic cernoziom and clayey cernoziom were formed mainly in the southern part of the researched territory, especially in the area of Diosti commune. The reddish preluvosols were identified in the area of Radomir locality and the thread of valleys and on the more depressive forms but with wide plains forms were formed alluviosols.

INTRODUCTION

Soil is the main means of production in agriculture and it is limited in space. Unlike other means of production, the soil cannot be multiplied. For these reasons, meeting the everincreasing needs of food resources and raw materials can only be achieved by increasing the production per unit area. This is possible, only by knowing the whole complex of conditions under which the process of agricultural production takes place, among which the soil has the most important role.

In response to this imperative, Soil Science is called upon to establish and disseminate among the people working in the field of agriculture, the latest knowledge regarding the most judicious use of the soil, in order to obtain great productions.

Through complex and in-depth research, the most appropriate solutions for rational land use must be found by intensive cultivation with the preservation and increase of soil cover fertility including those currently considered poorly productive or even non-productive.

Knowing the soil with its main productive properties, the most modern mechanization, chemical compounds use, irrigation works can be adapted and, finally, superior quantitative and qualitative productions can be obtained.

In order to make a modest contribution to the assimilation and use of the scientific methods of exploitation and management of soil fertility, in the present paper we wanted to analyze and to establish, the natural conditions in which the main soils were formed and evolved on the territory of Diosti commune, Dolj County, as well as their physical and chemical properties.

MATERIAL AND METHOD

In the commune of Diosti, Dolj County, a series of researches were carried out that had as final object to make available to the particular agricultural producers and farmers in the area precise data regarding the conditions of formation, evolution and the main properties of the most important soils in this territory.

In order to establish the natural conditions that acted on the researched territory, and had a determining influence on soil formation, a series of geographical, geomorphological, geological, botanical, climatic, etc. materials were studied.

In order to carry out the pedological studies, 5 soil profiles were dug at characteristic points and then the research phases were done. At each soil profile the morphological properties were investigated, namely: the number of horizons, the thickness of the horizons, the texture, the structure, the porosity, the color of the horizon. From these soil profiles soil samples were taken from different depths, on genetic horizons of the profile and they were analyzed in the laboratory of OSPA Craiova.

RESULTS AND DISCUSSIONS

The researched territory, respectively the commune of Diosti, Dolj County, is located in the SE part of it and it has a land area of 6,280 ha, it has a climate which is slightly influenced by Mediterranean climate, with an aridity index equal to 24, with *cfax* climatic province specification and pedologically close to the leached chernozems.

Within the field, a series of micro-depressions and even depressions are identified, which gives it a slightly wavy appearance. It belongs to the river basin of Olt and Jiu rivers, all the valleys specific to the relief of the area, gravitate towards these rivers. Regarding the depth of the groundwater, it is varied in the territory of the commune Diosti. In the northern part it overpasses 8-15 m and as such does not influence the genetic nature of the soil, on the slopes that fall into the deep valleys of the plain, it appears at the depth of 10-15 m, on the thread of valleys below 1-2 m, at the base of the slopes the depth is approx. 6-8 m and to the South the groundwater is 2.5-4 m, in which the soil is characterized by hydromorphisms (gleysation, groundwater influence). The bedrock on which the soils formed and evolved, is represented by loams and loess looms, deluvo-proluvial, which, under the influence of the climate, in some cases have reddish and yellowish chromes. From the geobotanical point of view, the Diosti territory is within the oak forest area, in contact with the sylvosteppe.

The genesis processes and the evolution of the soils within the researched territory took place through the interaction over time of the pedogenetic factors, climate, relief, hydrography, hydrology, rock, vegetation, as well as through the human interaction. in this territory, the following large groups of soils have been highlighted: cambic cernozymes, clayey cernozymes, reddish preluvosoils, alluviosoils (fig. 1).

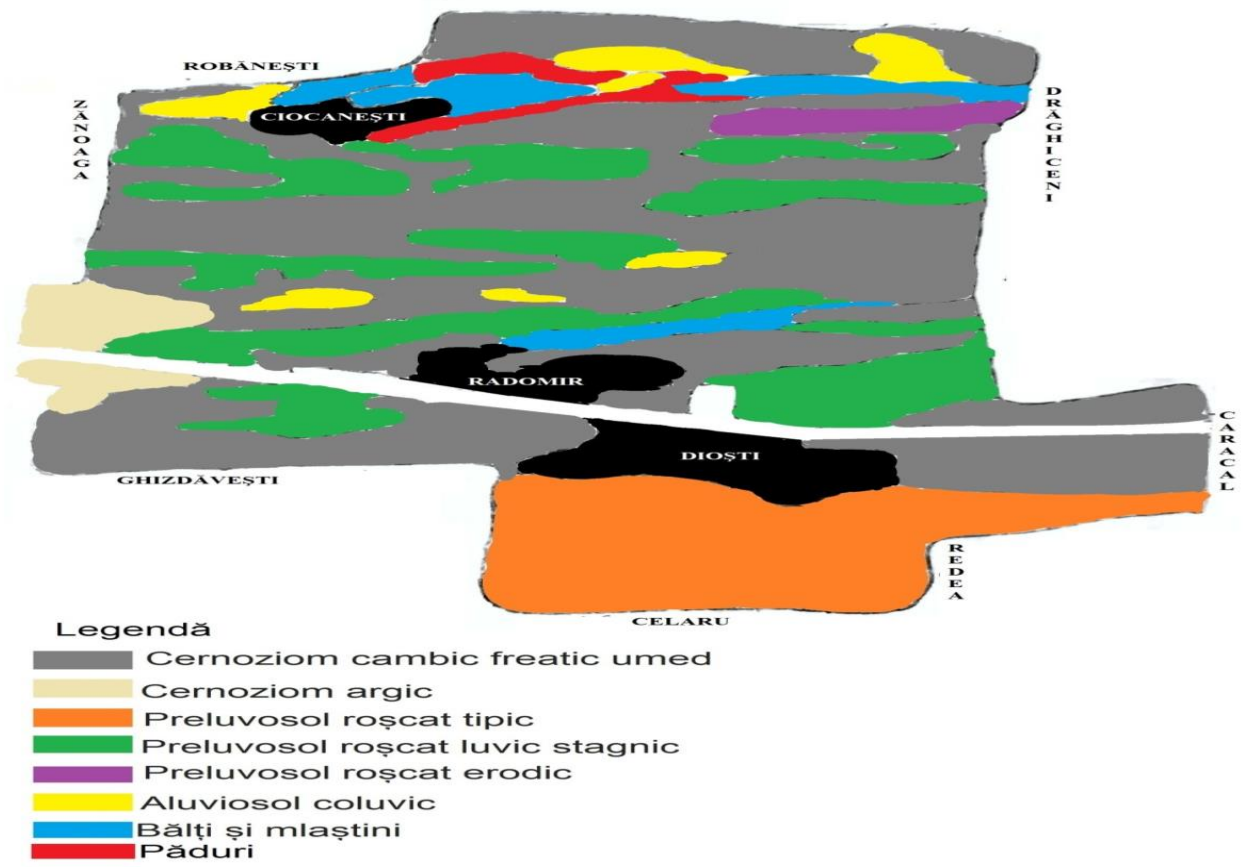

Figure 1. The map of researched soils.

The cambic gleysated chernozem is spread in the S part of the researched territory, occupying an area of 914.9 ha, which represents 14.5% of the commune's surface. The soil occupies, as a relief, the flat or low inclined plain area as well as some slightly depression areas.

The soil profile has the following horizons: Ap-Am-AB-Bv-CG.

The size composition (fig. 2.), shows a very high content of coarse sand, over 20% and a content of fine sand also high, over 35%. The loam content of the cambic phreatic chernozem is, on average, 19% over the entire soil profile. The results obtained when determining the particle size composition indicate high clay content on the horizon Bv (32.3%).

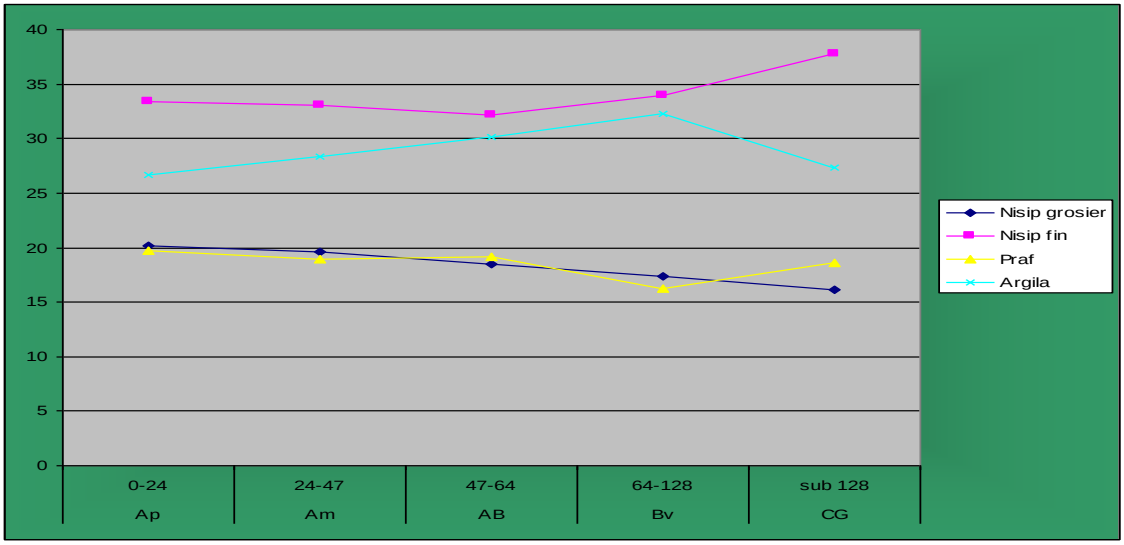

Figure 2. Particle size distribution of cambic phreatic chernozem

The bulk as well as the phisical density increase on the profile, the total porosity (Tp) decreases on the profile as the depth increases, namely: from 50% in the A horizon to 43% in the Bv and C horizon, indicating a strong soil compaction in depth due to agricultural tillage.

The highest porosity is in the horizon and is due to a better structure as well as the tillage that are applied to the soil as well as due to the higher humus content in this horizon (fig. 3).

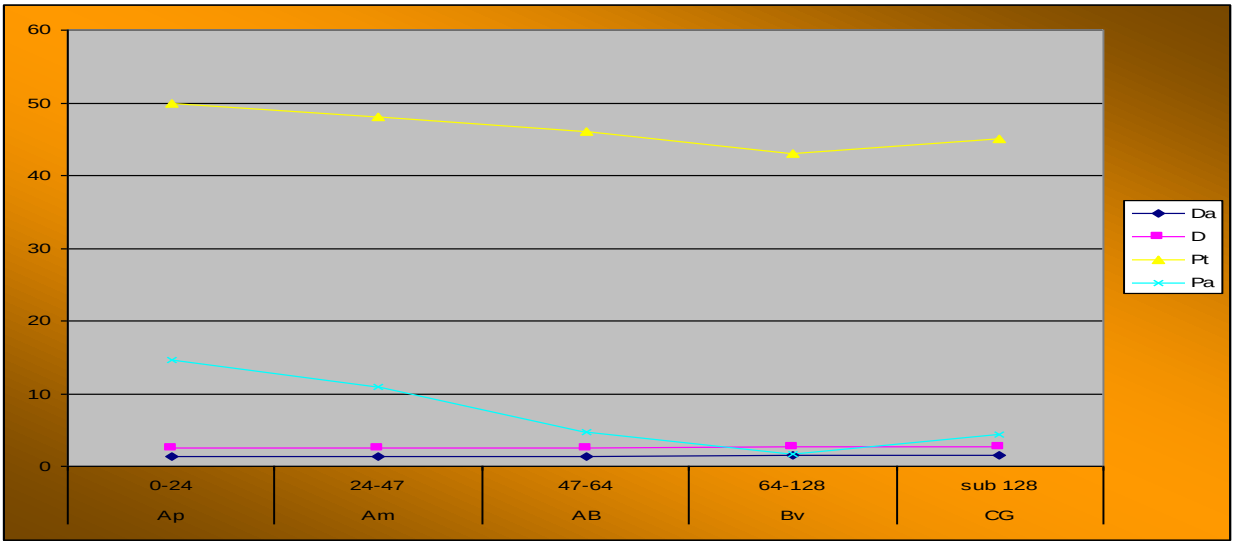

Figure 3. The main phisical features of cambic phreatic chernozem

The hydrophysical indicators show directly proportional variations in profile in function of the percentage of clay (fig. 4).

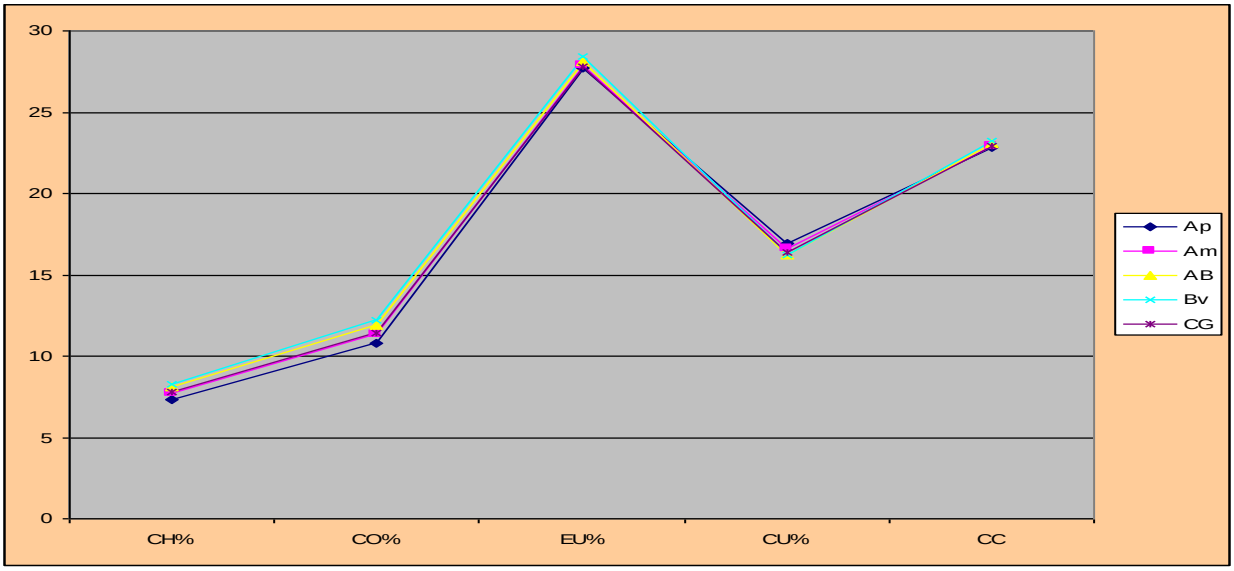

Figure 4. The hydro-phisical features of cambic phreatic chernozem.

The chemical properties along with the physical and size ones help us to determine the degree of soil fertility. Studying the analyzes carried out in the laboratory in order to establish the values of the main chemical properties of the cambic gleysated chernozem, we can say that a higher percentage of humus is found in contrast to the other soils, humus being one of the most important components of the soil that influences the soil fertility. The investigated soil is

average supplied with humus, the recorded values show a decrease of humus along with the increase of the depth, reaching a value of 0.66% in the horizon C, which indicates a poor structure of the soil in depth. The reaction of the soil is variable in profile, namely: in the horizon Ap and Am the pH value indicates a weak acid reaction, in the horizon AB and Bv it indicates a neutral reaction and in the horizon C a low alkaline reaction (fig. 5). From the data obtained it is found that in terms of the content in total N, it is found in different quantities on the profile, namely: 0.182% in the surface horizon (Ap) and much lower in the horizons Bv and C. From this the conclusion is drawn that the soil has a medium supply with N. The soil is well and very well supplied with available P and K almost throughout the profile. In the upper horizon (Ap) the P content was 6.8 mg / 100 g soil and 2.3 mg / 100 g soil in horizon C; K has values between 16.1 mg / 100 g soil in horizon C and 20.1 mg / 100 g soil in the horizon Am (Fig. 6.).

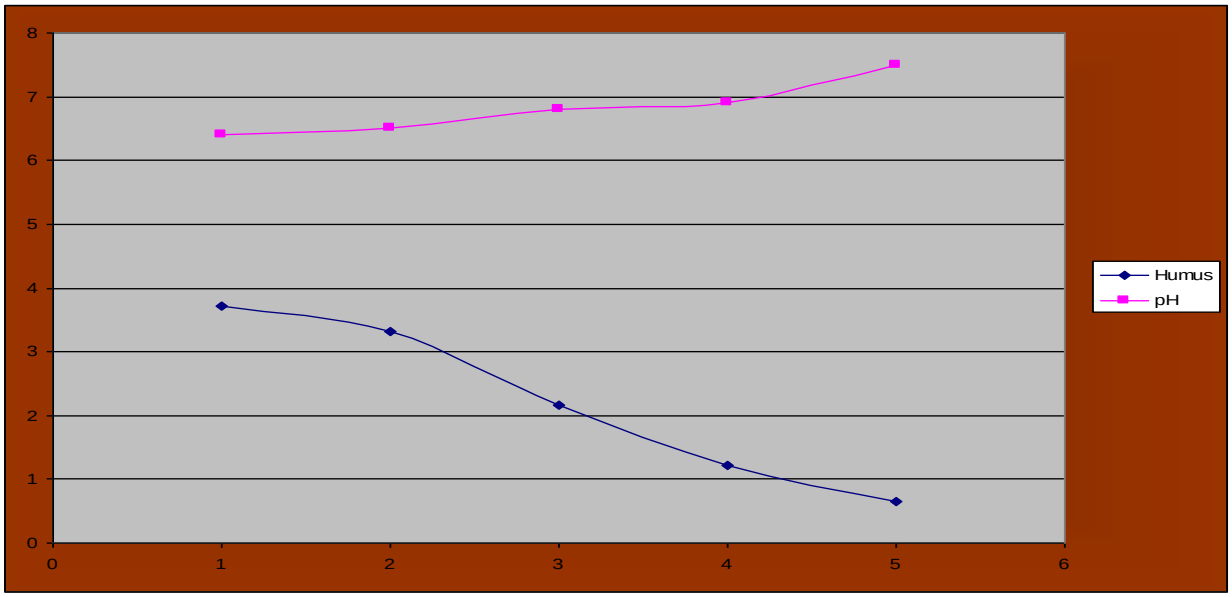

Figure 5. The humus content and the pH of the cambic gleysated chernozem

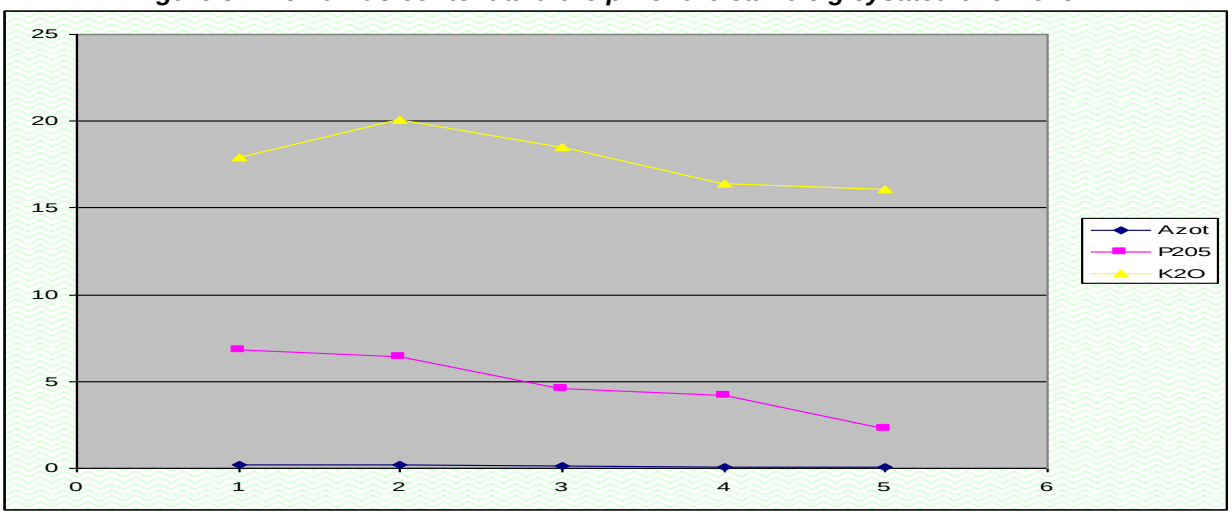

Figure 6. The nutrients content of the cambic gleysated chernozem

The hydrolytic acidity (SH) has the highest value in the surface horizon (AB) 3.4 me / 100 g soil and gradually decreases in depth reaching 1.1 me / 100 g soil in the C horizon. The bases exchange capacity (BEC) has values ranging from 24.4 me / 100 g soil in the A horizon and increases in the C horizon (30.2 me / 100 g soil). The cation exchange capacity (T) is under the influence of hydrolytic acidity (Ah) to a small extent and under the influence of

the sum of exchangeable bases to a large extent, registering values between 27.8% in the upper horizon (Ap) and 31.3% in horizon C. The degree of saturation in bases V% has values between 87% in the horizon Ap, 96% in the horizon C, which shows that the soil is strongly saturated (fig. 7.).

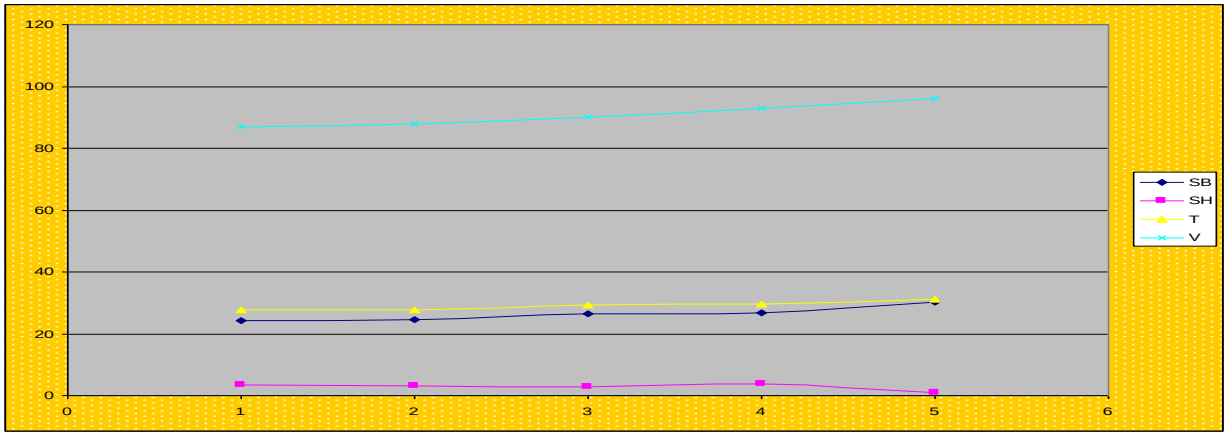

Figure 7. The colloidal complex of the cambic gleysated chernozem

The clayey chernozem is widespread in the southern part of the commune, making the transition between the cambic chernozem and the reddish preluvosoil. As a relief zone it is found on the High Plain Leu-Rotunda. The land covers an area of 789 ha, which represents 12.5% of the commune's surface. The soil profile has a sequence of horizons: Ap-Am-AB-Bt-C. The texture of the soil is variable, namely: it is clay in the surface horizon and clay-clay in the transition horizons AB and Bt, being influenced by the soil content in clay, the hydro physical indicators that vary in profile. The analyzes performed to determine the chemical properties (table 1.), show a lower humus content in the clayey chernozem compared to the soil presented above, indicating poor soil structure in depth and poor aeration. The highest values were registered in the horizons from surface A 3.02% and Am 2.57% compared to the horizon C where the value of 0.54% was registered. The soil reaction is weakly acidic in the surface horizon and neutral in the horizon C (pH = 7.2). The bases exchange capacity (BEC) shows values that increase in profile from 18.4 me / 100 g soil in Ap, reaching 25.3 me / 100 g soil in C horizon. The total cation exchange capacity (T) being under direct influence of hydrolytic acidity and the sum of the exchangeable bases, has values that increase in profile from 23.2% in A to 26.9% in horizon C. The degree of saturation in bases (V%) has lower values compared to those of the cambic phreatic chernozem, these values being between 79% in the A horizon and 94% in the C horizon.

Table 1.

The chemical features of the clayey chernozem

Horizon	Depth, cm	Humus %	pH	N %	P_2O_5 mg/100 g soil	K_2O mg/100 g soil	BS me/100 g soil	HS me/100 g soil	T	V %
Ap	0-23	3.02	6.0	0.151	7.3	19.8	18.4	4.8	23.2	79
Am	23-36	2.57	6.3	0.135	4.4	17.4	21.3	4.0	25.3	84
AB	36-52	1.76	6.5	0.091	2.5	17.2	20.6	3.5	24.1	85
Bt	52-138	1.03	6.7	0.056	2.1	16.6	22.8	2.9	25.7	88
C	< 138	0.54	7.2	0.028	0.8	16.8	25.3	1.6	26.9	94

The reddish preluvosoil is spread in the central and northern part of the investigated area, occupying the largest area, namely, 2925 ha. It is found in the high area of the Leu-Rotunda Field occupying the flat and slightly inclined

lands. It has in the composition of the profile the following horizons: Ap-Ao-AB-Bt-C. The results of analyzes on the chemical properties (table 2.), show a lower humus content, a weak acid reaction on the A horizon and a neutral reaction (pH = 7.1) on the C horizon. The soil is poorly supplied with nitrogen. Phosphorus and potassium are present in average quantities which makes the typical red dish preluvosoil to be characterized as an average soil supplied with these elements.

Table 2.

The chemical features of the reddish preluvosoil from Diosti commune, Dolj County

Horizon	Depth, cm	Humus %	pH	N %	P_2O_5 mg/100 g soil	K_2O mg/100 g soil	BS me/100 g soil	HS me/100 g soil	T	V %
Ap	0-21	2.65	5.9	0.130	4.3	15.6	16.8	5.7	22.5	74
Ao	21-34	2.44	6.0	0.115	3.5	14.0	17.1	5.2	22.3	76
AB	34-47	1.76	6.4	0.084	2.4	13.4	18.3	4.1	22.4	81
Bt	47-148	0.92	6.5	0.049	1.7	12.9	20.1	3.9	24.2	83
C	<148	0.46	7.1	0.027	1.2	12.9	22.4	1.8	24.2	92

The colluvial alluviosoil, is present at the base of the slopes formed by depositing the eroded material from the slopes. It occupies an area of 60.4 ha, which represents 0.90% of the area of the unit. It is formed of fine textured colluvial materials under a oak vegetation. The groundwater is at a great depth. It has a profile of the type: Ao-Bt-C. The horizon Ao has a thickness of over 50 cm, fine uniform texture, granular structure, acid or weak acid reaction, medium supplied with humus.

CONCLUSIONS

After analyzing the researches conducted on the territory of the commune of Diosti, in order to know the natural conditions of soil formation, the main types of soil and their agro productive properties, the following conclusions are drawn:

- the territory studied from a geomorphological point of view is fully integrated in the Leu-Rotunda High Field, an integrated part of the Eastern division of the Oltenia Plain, and from a hydro morphological point of view it belongs to the Olt and Jiu basins;
- from the climatological point of view the researched territory belongs to the climatic province *c.f.a.x.* , a province that pedologically belongs to leached chernozem (cambic and clayey);
- the vegetation under which the soils identified in the area were formed is represented by clumps of forests made up of species with poor development and grassy vegetation represented by grasses with dense shrub;
- the texture of the soils identified is clay and clay-clay;
- the bulk density has lower values at the surface and higher in depth (30-40 cm) which indicates a soil compaction;
- the hydro physical indices correlate well with the particle size composition, they have higher values in the surface horizons;
- the reaction is weakly acidic or neutral, depending on the soil type
- the soils of Dioşti commune are medium supplied with humus, the highest content in humus being recorded by the gleysated cambic chernozem (over 3.5%);
- as far as the content in nutrients is concerned, it is variable.

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