RESEARCH ON THE SOILS CHARACTERIZED BY DIFFERENT DEVELOPMENT DEGREE IN THE SOUTH WEST AREA OF DOLJ COUNTY

***POPESCU C.*[1]**

(1) University of Craiova, Faculty of Agronomy, Romania, popescucristian07@yahoo.com

Keywords: soil, landscape, meadow, terrace, excess moisture, fertility.

ABSTRACT

In the southern area of Dolj County, a series of natural factors, especially those of land and excess moisture, have had a great impact and led to the formation of characteristic soils, terraces, meadows or excess moisture ones.

Generally speaking, the area's landscape is that of a smooth plain, formed by Danube, Jiu and Desnatui terraces intermingled with sand dunes. The climate is plain continentalcharacterized by average annual temperature over 11 ° C, by average annual precipitation, which is lower than 500 mm / year.

From a geological point of view, the area studied is located on the sedimentary deposits of the quaternary. The soils studied on the terraces were formed on loess and loess material, and in the Danube meadow on alluvial material of different textures often layers shaped characterized by different thicknesses.

Hydrologically speaking, southern Dolj county area, is a part of the Danube basin. Depending on the geomorphological units, the water table is characterized by fluctuating level.

Under natural conditions specific to the meadow, terrace and excess moisture areas, in the reference area the soils were divided into three groups: chernozem, aluviosoil and gley soil.

The soil types typical for the researched areaare characterized by varied evolution degrees; they are to be found on the terrace and in the meadow and they differentiate.

INTRODUCTION

A thorough knowledge of the main features of the soil, of the interaction existing between the soil and the plants and the way in which the later can be influenced and changed is the key to a successful and competitive agriculture.

Agriculture's basic science is represented by pedology; this main branch of soil science deals with soil morphology, evolution, properties, classification, spreading and their rational use.

Pedology is responsible for setting out qualitative soil indices which are to be developed by improving it.

All analyses related to soil fertility should highlight the essential relation and intrinsic connection existing between soil - water - air - plant and, also, those causes that result inplant nutrition imbalances. Based on field and laboratory research, pedology groups soils according to the way they formed and their agro-productive properties, pointing at the structure of the area, the most efficient way to use it;for agro-technics; it provides important elements related tovaried soil works; for agro-chemistry: fertilization criteria;for phyto-technics: directions in order to make outplant assortment and as it concernsameliorative pedology it offers data that help valuing poorly productive soils.

In order to increase soil productivity capacity, its fertility, the fact of knowing and being aware of its properties has become more than

necessity. Soil rational use, appropriate use of fertilizers, irrigation use, erosion, measures to combat soil erosion, pollution anddegradation processes can be applied with efficient results only after a complex and adequatestudy of soil properties has been carried out.

In order to classify soils with different degrees of evolution, the area of Macesu de Jos, located in the southern part of Dolj county was under observation, where some local landscape and excess moisture features, which influenced or still influence this area, have played a great role over time in the formation of specific soils, terraces, meadows and excess moisture.

MATERIALS AND METHODS

Soil research has been carried out on the ground ofMacesu de Jos area, located in the southern part of Dolj county, upon whicha considerable number of natural factors have acted over the years, in particular those related tolandscape and excess moisture and have resulted in the formation of specific soils, terraces, meadows and excess moisture and in the laboratory according to the instructions set out by the National Research and Development Institute for Soil Science, Agro-chemistry and Environmental Protection in Bucharest.

In the field, a profile for each soil unit was placed and developed. Morphological description of the profile was carried out (soil number and sequence of horizons, thickness, colour, texture, structure, porosity, compaction, new formations, inclusions) and samples were taken from the soil in each horizon from the basis of the profile to the topmost layer.

Soil samples collected from the field were analysed in the soil science laboratory and at OSPA Dolj where the physical, hydro-physical and chemical properties of the soils were identified in the reference area.

Based on the Methodology of Soil Science Studies, 1987, and the Romanian Soil Taxonomy System, 2012, using soil data collected from studying soil profiles and laboratory analyses, soil types were determined and they were classified into three groups: chernozems, the alluvia and gleysols.

RESEARCH RESULTS

After having carried out field research and laboratory analyses, soils of varying degrees of evolution, in the southern area of Dolj County, were divided into three groups: chernozems, alluvia and the gleysols.

Carrying out a comparative study on the morphological, physico-mechanical, hydric and chemical features of these soil groups, it is noted that there are large differences in the A horizon and they are determined by the different conditions in which they formed and developed

If one has a look at the soil profile one can notice that as it concerns chernozems they are characterized by classical horizons: Ap, Am, A / C and C. In the case of alluvia, the horizons meeting the profile are: Ap, Am, AG and G. And as it concerns gleysols, the soil profile is defined by horizons Am, AG, Go, Gr.

A. Morphological features

The colour when we think about chernozems is dark brown, black-coloured, for alluvium the colour is gleyed and if we speak about gleysols it is brown. The characteristic glomerular structure for chernozems becomes glomerular - friable when referring to alluvia and as about gleysols, they lack any kind of structure.

We have loam texture, sandy-loam for chernozems becomes sandy-clayey in

the case of alluvia and silty-clayey, loam-sandy when we refer to gleysols.

Generally speaking, chernozems and gleic soils are characterized by good porosity, a slight difference being noticed in the case of alluvial soils which are slightly porous.

B. Physical-mechanical properties

From the analysed glomerometric segments can be noted the fact that most of them are: fine sand, dust and clays as follows: fine sand increases from 49.3% (chernozems) to 61.7% (alluvia) and then decreases to 28.97 % (gleysols) (Figure 1).

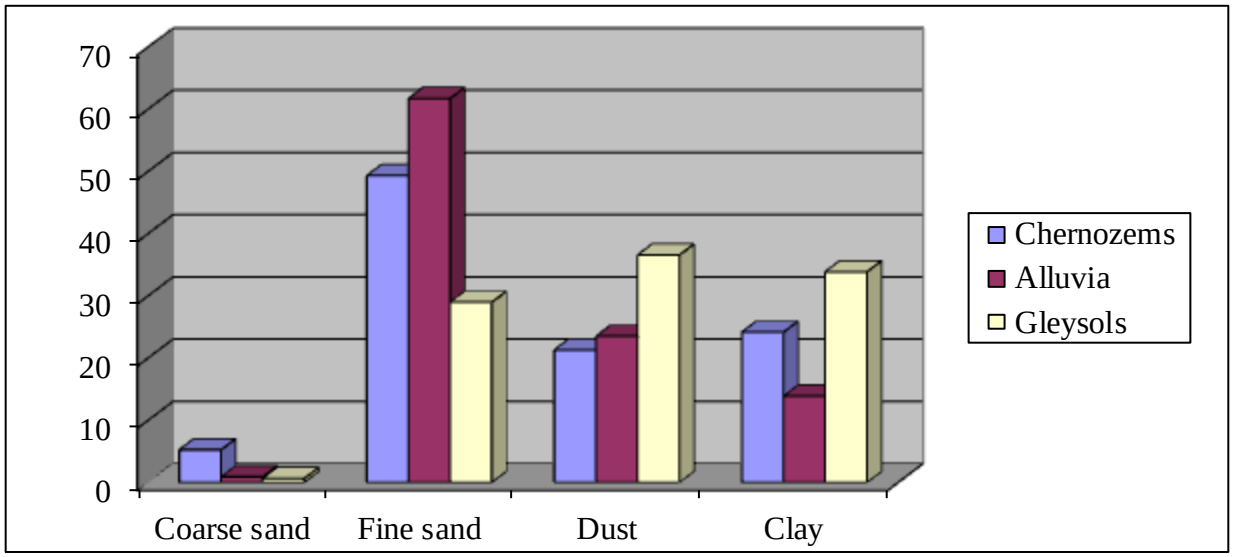

Fig.1. Physical-mechanical properties of soils with different degrees of evolution in the southern area of Dolj County

It can be noted the fact that coarse sand displays a range of different variations within the three soil groups, decreasing from 5.25% (chernozems) to 0.90% (alluvia) and 0.65% (gleysols).

Dust decreases from 21.3% (chernozems) to 23.8% (alluvia) followed by an increase to 36.54 (gleysols).

Clay content registers much more different values for the three soil groups compared to other glomerulometrice fractions, decreasing from 24.15% (chernozems) to 13.9% (alluvia), then increasing to 34.84 gleysols. Gleysols' clay addition is due to a more intense claying of these types of soils.

Low density in the case of gleysols in comparison with alluvia and chernozems is due to a higher humus content of these types of soils as opposed to mineral substances that are to be found more in depth and less on the surface (Figure 2).

Apparent density varies between wide limits, namely: 1,50 g/cm^3(alluvia), 1,30 g/cm^3(gleysols) and 1,28 g/cm^3 (chernozems). Apparent density in the case of chernozems points out the fact that these soils are loose, structured, and biologically active.

Total porosity ranges between 50% (chernozems) and 41% (alluvia). Taking into account total porosity of the three soil groups one can say that chernozems are characterized by satisfactory porosity, gleysols by an almost satisfactory one and alluvia by unsatisfactory one.

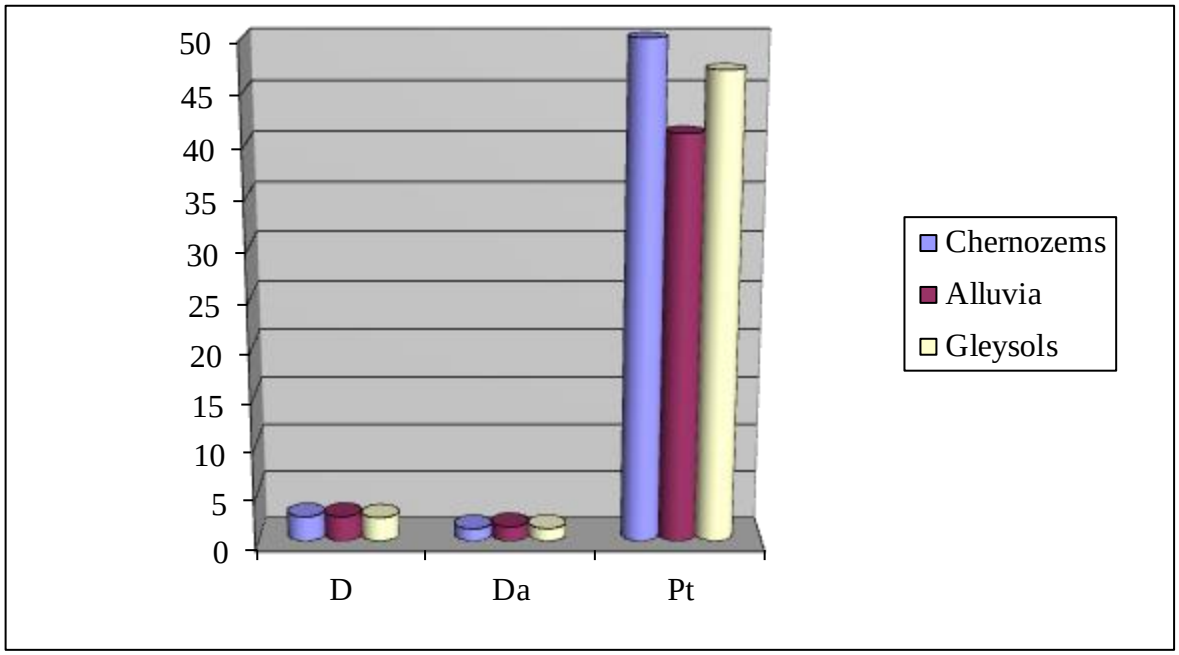

Fig. 2. Physical-mechanical properties of soils with different degrees of evolution in the southern area of Dolj County

C. Hydro-physical properties

As anyone can see in Fig.3 the value of hygroscopic coefficient decreases from 5.75% (chernozems) to 1.99% (alluvia), and then it sharply increases to 9% (gleysols).

Hygroscopic factor is influenced by the mineralogical nature of the clay, the type of the absorbing ions, as well as by the humus in the soil, especially when it is found in large quantities, as in the case of gley soils.

Studying the data obtained after analyses were carried out, one can notice that the value of permanent wilting point registers a rapid decrease from 8.45% (chernozems) to 2.92 (alluvia) followed by a sharp increase to 13.23% for gleysols. This variation in permanent wilting point is influenced by humus and clay content which is different from one soil type to another. A decrease in humus content for alluvia that was not accompanied by an increase in clay results in a decrease of these soils' permanent wilting point when compared to chernozems and gleysols' permanent wilting point.

Moisture equivalent is influenced by the percentage of clay particles and soil humus content. Humus gradual increase from alluvia to gleysols leads toan intense increase in the moisture equivalent from 12.03% (alluvia) to 39.63% (gleysols).

Field capacity, another soil water index, shows an increase from alluvia (20, 23) to chernozems, 22, 14 and also gleysols, 23, 88.

The range of active moisture ranges from 10.65 (gleysols) to 17.31 (alluvia).

D. Chemical properties

If we have a look at Fig. 4 we can notice the fact that that the three groups of soils studied are characterized by a neutral up to alkaline reaction. Gleysols' alkaline reaction is due to the fact that clay-humic complex is greatly saturated by bases.

Carbonates are to be found in all three soil groups starting with the surface layer, with levels ranging from 2.2% (chernozems) to 7.3% (gleysols). The existence of CaCO3 at the surface of the soils studied is due both to mother rock and excessive summer heat which causes water rise in the water table which is CaCO3 rich to the soil surface.

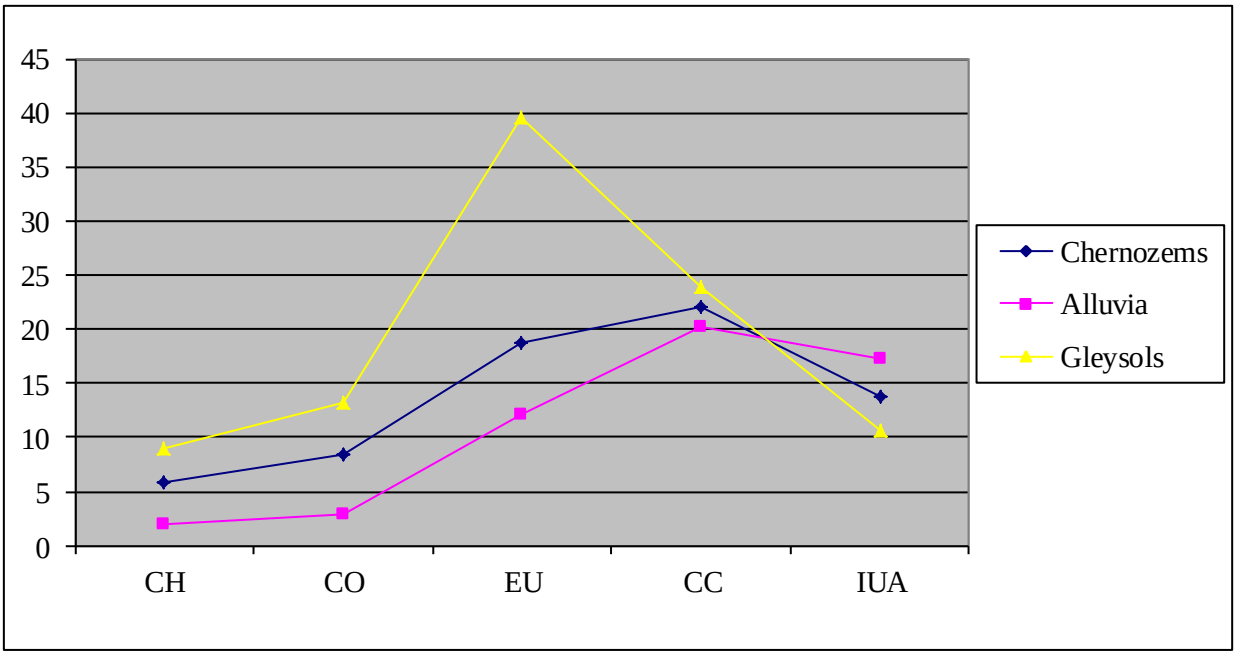

Fig. 3. Hydro-physical properties of soils with different degrees of evolution in the southern area of Dolj County

Humus varies between 2.49% (alluvia) and 8.60 (gleysols). Carrying out an analysis in terms of the percentage of humus related to the depth of the profile it can be noted that the soil is normally supplied with humus when we refer to chernozems and well supplied with humus in the case of alluvia and gleysols. The higher percentage of humus in the case of gleysols is due to vegetation that grows on these soils, vegetation that is subject to decomposition.

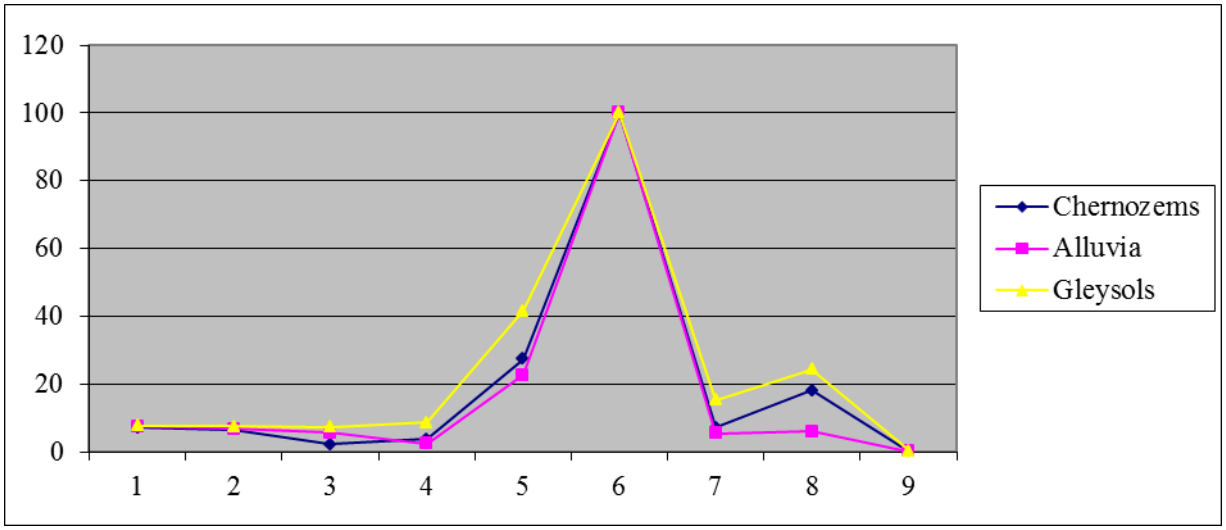

Fig. 4. Chemical properties of soils with different degrees of evolution in the southern area of Dolj County

Legend:

1. pH H2O	4. Humus %	7. P2O5 mg for 100 g soil
2. pH KCL	5. S.B. ml for 100 g soil	8. K2O mg for 100 g soil
3. Carbonates %	6.V %	9.N %

The exchange capacity for bases registers an increase from 22.7 me per 100 g soil (alluvia) to 41.63 me per 100 g soil in the case ofgleysols. This is the

result of bases which can be found inquite considerable quantities from the very surface of the studied soil.

Bases degree of saturation in all three soil groups studied is 100%.

As it concerns soils' phosphorus supply we can say that chernozems and alluvia are well supplied with phosphorus and as it concerns gleysols they are very well supplied.

Potassium content increases from 6.0 mg to 100 g soil (alluvia) to 18.2 mg per 100 g soil (chernozems) and 24.4 per 100 g soil (gleysols). Carrying out an analysis on potassium soil supply it can be said that alluvia are poorly supplied with potassium whilst chernozems and gleysols are well-supplied.

Total nitrogen content varies between 0.164% (alluvia) and 0.403 (gleysols). As it concernssoils' nitrogen supply, alluvia and chernozems are supplied with nitrogen and gley soils are well supplied.

CONCLUSIONS

The area on which this pedological study on soils with varying degrees of evolution was carried out, is part of a flat plain of the middle plain in Oltenia, Dolj County.

Analysing and interpreting field and laboratory data, the following conclusions can be drawn:

Soil types that are to be identified within the researched area, with varying degrees of evolution, are to be found on the terrace and in the meadow and they differentiate one from another.

1. Chernozems soils are evaluated soils which have formed, evolved and are characterized even today by the same physical-geographic characteristics.

2. Alluvia are less genetically evaluated soils; the natural factor that has opposed totheir evolution over the years is represented by thealluvial material deposit in successive layers.

3. Gleysols are soils whose formation and evolution is closely relatedto groundwater moisture excess.

BIBLIOGRAPHY

1. **Cotet, P.,** 1957, *Oltenia Plain - Geomorphological Studies. Scientific Publishing House,* Bucharest.

2. **Florea N., Munteanu I.,** 2012, *The Romanian Soil Taxonomy System, Sitech Publishing House,* Craiova.

3.**Glodeanu M., Popescu S., Alexandru T**., *Investigations concerning the possibility of converting the liquid flow into an electric parameter in order to automatize the working process for agricultural sprinkling machinery. Theird Conference Energy Eficiency and Agricultural Engineering*, Bulgaria, pp 140-143, 2006.

4. **Popescu Cristian,** 2016, *The cropping characterization of soils from Vladaia locality, district Mehedinti, Analele Universitatii din Craiova, Agricultura, Montanologie, Cadastru, vol. XLVI /1* , pg. 364-371, ISSN 1841-8317, ISBN CD-ROM 2066-950X.

5. **Popescu Cristian**,2017,*The suitability classes as arable land of soils from South – Western zone of Dolj District, the territory of Piscu Vechi and Ghidici localities, Analele Universitatii din Craiova, Agricultura, Montanologie, Cadastru, vol. XLVII /1* , pg. 374-378, ISSN 1841-8317, ISBN CD-ROM 2066-950X.

6. **Vasile C**., 2016, *The implementation of an automated system of monitoring of the steam tempertures at the formation of compound feed granules, Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series, Vol. XLVI, no. 2*, 2016, ISSN: 1841-8317, pag. 588-593.

7**. ***** 1987, *The methodology of pedological studies,* vol. I, II, III, ICPA.