THE MAIN FOREST SOILS OF DOLJ COUNTY

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ABSTRACT

Forest soils represent an important part of forest ecosystem, being natural and dynamic system, which constitute the pedosphere. The study follows classification and description on the main forest soils from Forest Directorate of Dolj County, which is composed by nine Forest District. The relief varies from terrace area until high plains and hills area. The work materials represent soils analysis report from eight forest district. Also, soil analysis is part of database at national level based on forest management plans made between 1988 - 2014. Were analyzed 330 soil profiles, with a total of 988 soil genetic horizons. The main forest soils class found from Dolj Forest Directorate was Protisol class (60%). The main soil type found was fluvisols and arenosls, which cover the high forest area. At opposite part, the small forest area was cover with solonchaks and anthrosols (entiantrosols). Furthemore the higher content of humus was founded in luvisols follow by vertisols and fluvisols. The total cationic exchange capacity is the most significant for vertisols and the lowest for arenosols.

INTRODUCTION

Climatic changes usually associated with the increase of pollution levels as well as the change in usage of degraded fields contribute to the increase of the aridity phenomenon. This phenomenon leads to the destruction of vegetation and to the increase of degraded field areas, a fact that is present in the country's south part (Achim *et al.*). The necessity of knowing in depth the forest soil types present in this area, together with their characteristics represents at least a national priority in order to ensure sustainability measures for forest ecosystems. As such, the study was realized in Dolj Forest District, at an altitudinal amplitude of 300 m, from premontane plateaus up to the Danube's meadow, concentrating only on the forest area.

Dolj County Forest Administration (C.F.A.) is composed of 9 forest districts: Amaradia, Calafat, Craiova, Filiași, Perișor, Sadova, Segarcea, Poiana Mare and Dabuleni. As such, the C.F.A. manages a total area of 60356 ha of public state forests and 26482 ha of private forests (www.craiova.rosilva.ro). The structure on forest formations is the following: 54% Turkey oak- Hungarian oak, 14% black locust stands, 11% poplar and locust parks, 9% meadows, 8% Quercus mixtures, 4% hill parks. The situation of private and state forests funds administered by the 9 units belonging to C.F.A. Dolj is rendered in Table number 1.

Table 1 Forest District Surfaces

Silvicultural district	Total area (ha)	Private property (ha)
Amaradia	16477	9176
Calafat	6125	1360
Craiova	10686	763
Dăbuleni	4797	385
Filiași	8319	1128
Perișor	7678	418
Poiana Mare	6645	993
Sadova	5653	5
Segarcea	8278	74

The purpose of the present paper is to realize a description of the soil types present in C.F.A. Dolj, a territory characterized by terrace relief (near the Danube), as well as high fields and hills (towards Filiași Forest District).

MATERIAL AND METHOD

The study material is represented by soil analysis bulletins that were realized based on forest management plants dating after 1988 from the 8 forest districts of C.F.A. Dolj. These bulletins contain the physical and chemical properties of soils, namely: humus content, pH, carbonates content, capacity of hydrogen exchange (Sh), capacity of basis exchange (Sb), total cationic exchange capacity (T), texture and the degree of saturation in basis (V).

Table 2 The analyzed forest management plans

Forest District	Management plan year
Amaradia	1997, 2009
Calafat	1994, 2004, 2014
Craiova	1997, 2007
Dăbuleni	1990, 2013
Perișor	1988
Poiana Mare	1996, 2014
Sadova	1996, 2003, 2013
Segarcea	1992, 2002, 2012

The INCDS Bucharest and INCDS Brașov pedology laboratories have realized analyses after well-established methods (Dincă *et al*., 2012) and the results were organized in a database, processed and interpreted from a pedological point of view. At the level of C.F.A. Dolj 330 soil profiles were analyzed from a number of 988 pedo-genetical horizons.

The analysis bulletins used for each forest district were identified with the forest districts that had existing data (Table 2). As such, for Perişor forest district only a single management plan period was used, while for Calafat, Sadova and Segarcea the analysis bulletins were taken from three different periods. Microsoft Excel 2007 was used for systemizing the database, while the data analysis was realized with Statistica program.

RESULTS AND DISCUSSIONS

The identified types of soils were taken into consideration together with their spread within the forest district. Soils from the same 2 classes (Protisoils and Luvisoils) were identified in Amaradia and Dăbuleni forest districts. After analyzing 57 profiles, the soils from Calafat forest district were situated in Protisoil (fluvisol and arenosol), Cernisoil (chernozem and phaeozem) and Luvisoil (luvisol and preluvisol) classes. A larger soil diversity was encountered in Craiova forest district, where 5 soil classes were identified (Protisoil, Cernisoil, Antrisoil, Luvisoil, Salsodisoil). Five types from 3 soil classes (Cernisoil, Cambisoil and Luvisoil) were identified for Perișor forest district, namely chernozem, phaeozem, preluvisol, luvisol and eutric cambisol. In Poiana Mare forest district, the analyzed soils belong to the following classes: Cernisoils (chernozem and phaeozem), Hidrisoil (gleysol), Luvisoil (preluvisol and luvisol) and Protisoil (arenosol). In the case of Sadova forest district, 75% of the identified soils were situated in Protisoil class, being characteristic of fluvisol and arenosol types. Following this number, 17% were identified as belonging to Pelisoil class (vertisol type) and the rest of 8% belong to Luvisol class (preluvisol and luvisol types). Furthermore, four soil class categories were also identified in Segarcea forest district, namely: Protisoil (fluvisol and arenosol), Cernisoil

(chernozem and phaeozem), Luvisoil (preluvisol and luvisol) and Pelisoils (vertisol). The distribution of soil types on Dolj territorial subunits is present bellow (**figura 1**)

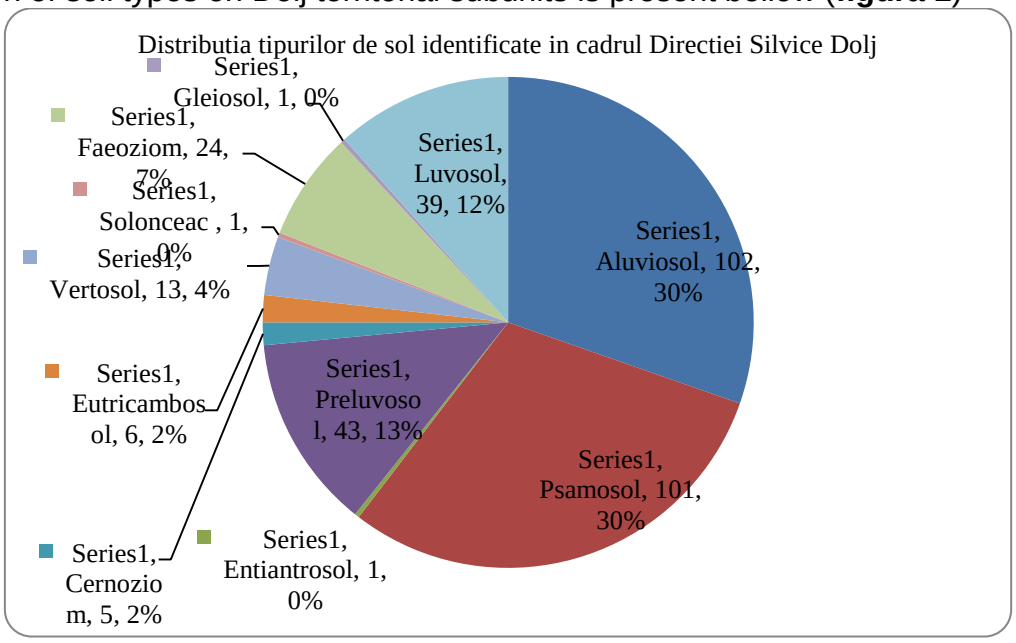

Figure 1 The percentage of soil types identified in DS Dolj

As spreading, the first three types of soils are in order: fluvisol, arenosol and preluvisol. Fluvisols occupy 330.564 ha of the forest fund's entire surface, meaning 5% of the total forest soils. A great part of these soils are situated in the Danube's Delta and Meadow, such as the forest districts from the South part of Dolj (Spârchez *et al.*, 2011). Arenosols occupy 16.988 ha, meaning under 1% of the total forest soils, while preluvisols occupy 335.050 ha, representing 5% of the total forest soils (Dincă *et al*., 2014). Even though the structure of forest formations from C.F.A. Dolj is of 54 % composed of Turkey oak- Hungarian oak, a vegetation characteristic for preluvisols, the percentage of this soil type is not consistent in the case of the present paper, where only 13% of the analyzed soil samples were identified as preluvisols. A considerable presence of arenosols can be explained by the existence of sand fields from South Oltenia, an area assimilated by C.F.A. Dolj. Taking into consideration the fact that fluvisols can be found in flowing river meadows, their presence in a percentage of 30% does not correspond to the structure of C.F.A. Dolj forest formations, where only 11% of them are poplar and black locust parks.
In regard with the pH, the main soil types identified within the forest district were analyzed, namely fluvisol, arenosol and preluvisol. The pH values were taken into consideration for each genetic horizon (**figure 2**) for the most widespread type of soils. The lowest pH values for all horizons were registered for arenosol (Ao horizon of 5,1), while the highest values were signaled for fluvisol (Ao/C horizon of 9,7).

Based on the average pH values, it can be concluded that the reaction is very weakly alkaline for fluvisol in the A ocric and Ao/C horizons, moderately acid in arenosol's A ocric horizon and weakly acid in A/C horizon. In the case of preluvisols, the reaction is very weakly acid in the A ocric horizon and B argic horizon. Acid preluvisols were also identified in other parts of the country (Chisăliță *et al.,* 2015, in O.S. Făget, D.S. Timiș). An average pH of 6,2 at preluvisoil and 5,4 at luvisoil was identified for the agricultural soils from the north-west part of Dolj County (Popescu, 2015).

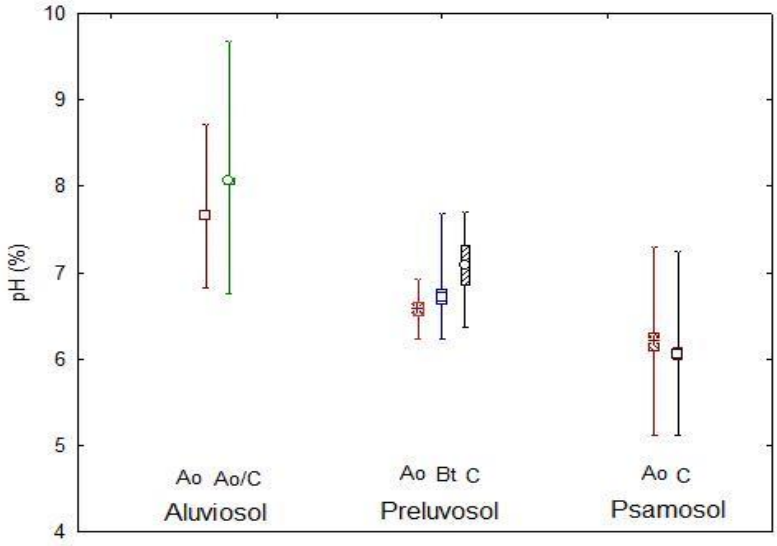

Figure 2 pH variation of pedogenetic horizons

The humus content of soils from Dolj C.F.A. (Figure 2) was calculated based on the average values from the A horizon. Luvisoil is characterized as an intensely humiferous soil and registers the highest content of humus, being followed by vertisol and gleysol (**Figure 3**). Fluvisol and preluvisol is situated within the moderately humiferous types of soils. The lowest content of humus was determined for entiantrosol (0,9%) and arenosol (2,0%).

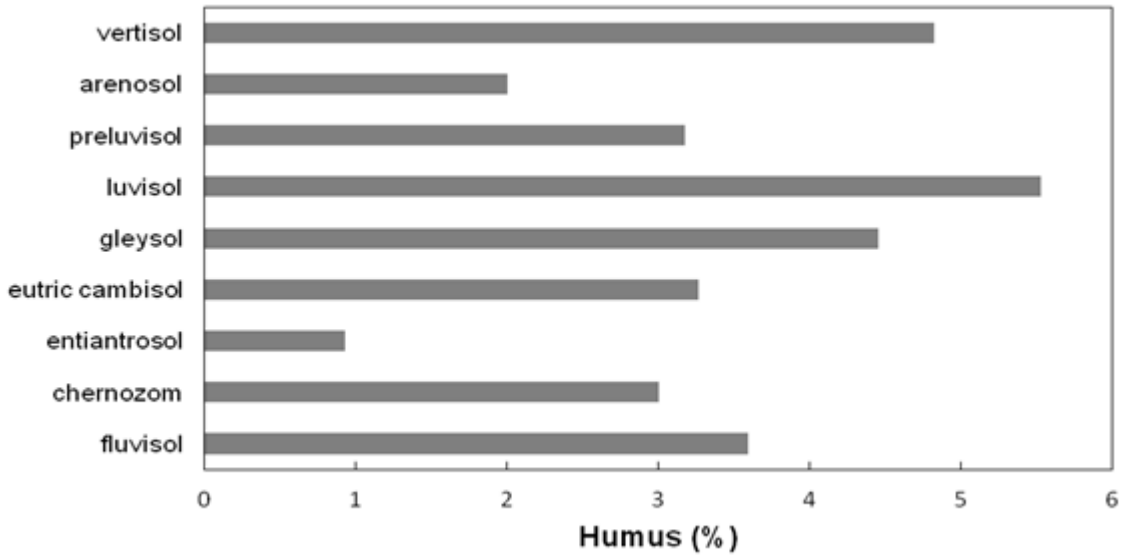

Figure 3. *Average humus content in A horizon (%)*

Other investigations realized on forest soils (Dincă *et al*. 2012, Dincă *et al*. 2015) prove the fact that, in regard with humus, the average content of Dolj forest soils is situated within limits: preluvisol = 31,5 g/kg, luvisol = 27,5 g/kg, vertisol = 33,6 g/kg, chernozem = 24,8 g/kg. An average humus content of 2,4% for preluvisol and 3,1% for luvisol was identified for the agricultural soils from the north-west part of Dolj County (Popescu, 2015).

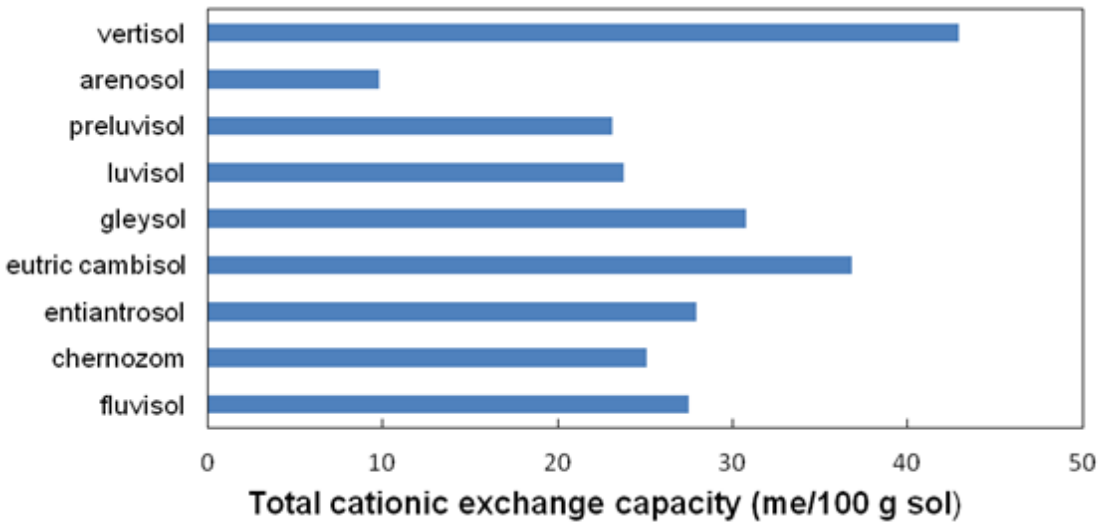

Figure 4 Total cationic exchange capacity on soil types

In regard with the total cationic exchange capacity, an average value per profile was used based on the type of soil (**Figure 4**). It has been observed that vertisol presents the highest total cationic exchange capacity (T=42,9 me/100 g sol), followed by eutric cambisol, gleysol, and fluvisol. As well as in the case of humus content, the lowest cationic exchange capacity was registered for arenosol (T= 9,8 me/100 g sol).
For forest soils from Cluj County, Enescu *et al.,* 2017, have obtained the following values in regard with the total cationic exchange capacity: 24,7 me/100 g soil for eutric cambisol, 23,7 me/100 g soil for preluvisol and 21,4 me/100 g soil for luvisol.

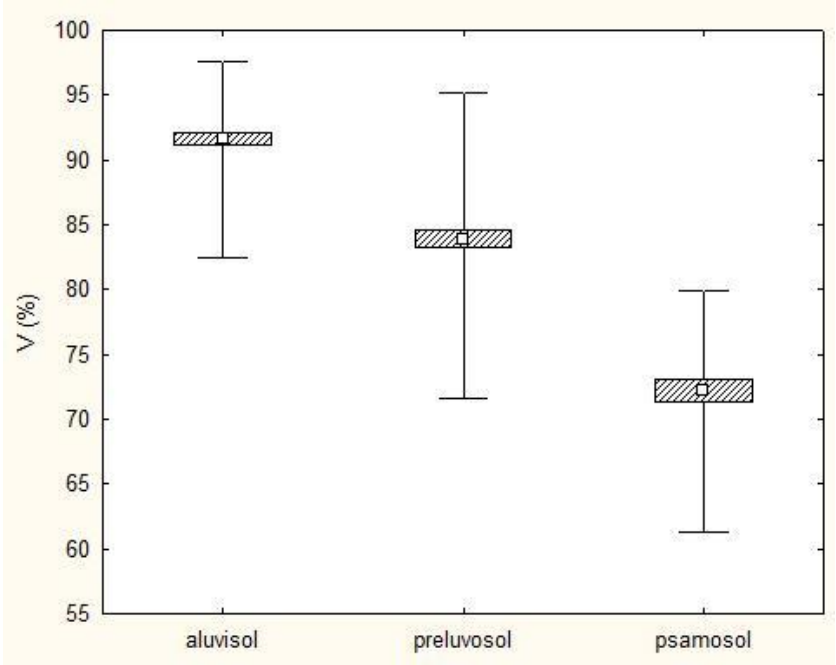

Figure 5 Variation of the basis saturation degree

Figure 5 represents a graphic of the variation of the degree of saturation in basis for the first three types of soils with the largest spread of the district. Fluvisol presents values ranging between 82% and 98% while preluvisol registers the highest variation amplitude, followed by arenosol.

In regard with the mineral troficity categories, based on the average value of the basis saturation degree, psamosol is situated in the mesobasic soil category (V<75%), while fluvisol and preluvisol are eubasic soils (V>75%).
Similar values for the degree of saturation in basis for forest preluvisols were also obtained in Giurgiu County (Crișan *et al.,* 2017).

Furthermore, the existence of a dependency relation between the soil's pH and the degree of saturation in basis can be observed through the value trends for the main encountered forest soils, a fact that is also mentioned in the specialty literature (Chiriţă1974, Spârchez *et al.* 2011).

CONCLUSIONS

The present paper intended to describe thoroughly the main forest soils from Dolj County that have an impact in technical solutions destined for the lasting management of forests. The most widespread types of soils from Dolj County Forest Administration are fluvisols, arenosols and preluvisols, while the mot least spread are gleysols, eutric cambisols and chernozems. The humus content of these soils is highest in the case of luvisols, followed by vertisols and fluvisols. Based on the spreading level, fluvisols are the most basic soils, while preluvisols are the most acid. The total cationic exchange capacity is highest for vertisols and lowest for arenosols. Fluvisols and preluvisols are eubasic while arenosols are mesobasic. It is important to mention that the repartition of soil types and subtypes and implicitly their physical and chemical properties are also caused by the existent parental material. Furthermore, their spreading particularly characterizes the vegetation's adapting method. As such, a detailed knowledge of the spreading and properties of forest soils for this region offers valuable information necessary for applying present and future strategies regarding the carbon stock in forest soils.

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