

THE CHARACTERISATION OF FOREST SOILS FROM IALOMIȚA COUNTY

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Abstract

Forests occupy approximately 27% of Romania's total surface. Forest soils from Ialomița County were characterized based on a large number of soil analysis obtained during the last 26 years (namely 127 soil profiles and 335 pedo-genetic horizons). These soils are characteristic to the field area from the silvosteppe areal and have developed under a humid regime (phaeozem, chernozem, preluvisol, luvisol, fluvisol). Chernozem and cambic phaeozem have a weak alkaline reaction and a B cambic horizon (Bv) resulted from the clay's concentration, while carbonates are concentrated in depth. Fluvisols have a large development in the Danube's meadow, especially in its affluent, namely Ialomița River's meadow. The parental material is represented by sands, clay sands and slime. Furthermore, organic matter in humification progress is also present. Luvisols and preluvisols are moderately acid soils in the Ao and Bt horizons, mesobasic in Ao and Bt and with a high cationic exchange capacity. They are also moderately humiferous, well supplied with nitrogen and with a good cationic exchange capacity.

Key words: forest soil, phaeozems, soil properties, Ialomița County.

INTRODUCTION

There are numerous definitions for the term “soil”, but not one that is generally accepted. As such, Hilgard (1914), defines soil as a more or less mellow and friable material from which plants, through their roots, are extracting food and which ensures growth conditions for plants. This definition is only one from the many definitions that consider soil as a mean of vegetal production. Soil is a product of several factors: the influence of climate, relief, organisms, and the soil's parent materials interacting over time.

Forest soils are regarded as the main element of the forest sites, being a strong correlation between the types of the forests and their productivity with the types of the soils. In this regard, the concept of the zonality of the soils was introduced one century ago in Romania by Gheorghe Murgoci (Stănilă, 2016).

Moreover, in order to have a clear classification of the soils across Romania, three soil classification systems were developed in our country during the last four decades, namely SRCS-1980 (valid for the timeframe 1980-

2002), SRTS-2003 (used in the timeframe 2003-2012) and SRTS-2012, in use starting from 2013 (Țărău et al., 2012; Vlad et al., 2015). Based on data from the National Statistical Institute, the forest area from Ialomița Forest District occupies a surface of 26208 ha in 2015 (www.insse.ro). The surface of state forests administered by Romsilva National Forest Administration through its three Forest Districts (Slobozia, Urziceni, Fetești) is of 22233 ha www.rosilva.ro.

The purpose of the present paper is to describe and present the characteristics of soil types identified in Ialomița Forest County.

MATERIALS AND METHODS

Ialomița County is located in the eastern part of the Romanian Plain, being also situated on the lower reach of the Ialomița River. It is bordered by Brăila, Buzău, Prahova, Ilfov, Călărași and Constanța counties (Figure 1).

Soil samples gathered in the period 1989-2015 from three Forest Districts from Ialomița County Forest Administration were analyzed for the present paper.



Figure 1. Geographical localisation of Ialomița County within Romania source

A silvicultural management plan is realized for each forest district once every 10 years. As such, the analyzed properties were: pH, humus content, nitrogen content, carbonates content, the basis exchange capacity (SB), hydrogen exchange capacity (SH), total cationic exchange capacity (T), base saturation degree (V) and texture. All these analysis are centralized in the analysis bulletins of each forest district and are part of an extended national database realized by INCDS „Marin Drăcea”, based on forest management plans. The methods used in the analysis of soil samples are accredited national and international methods (Dincă et al., 2012; Edu et al., 2013).

The present paper is based on the analyses realized for 127 soil profiles and 335 pedogenetical horizons.

RESULTS AND DISCUSSIONS

Types of soil from Ialomița County

The most widespread types of soils are the ones from Chernisols class that occupy 71% of the soils from this County, followed by Luvisols class with 20% and Protisols class with 12%. As types of soils, the most widespread is phaeozems (50%), followed by chernozems (21%), fluvisols (aluviosols) (12%), preluvisols (10%), and luvisols (5%) (Figure 2). Other types of soils (solonchaks and vertisols) represent 2% of the region’s total forest soils.

At a national level, dystric cambisols occupies the 1st place as spread in forest soils (2292385 ha, meaning 35%), luvisols the 2nd place (1440052 ha, meaning 22%), eutric cambisols occupies the 3rd place (with a total area of

869909 ha, meaning 13%), while preluvisols the 5th place (335050 ha, meaning 5%) (Dincă et al., 2014).

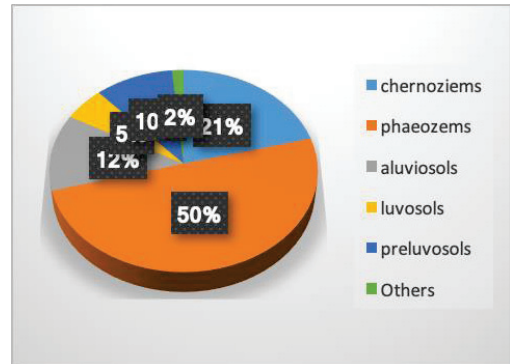


Figure 2. The predominance of forest soils identified in Ialomița County

In Balta Borcea impounded compound, the main soil types are fluvisols and gleysols (Mihalache et al., 2009). Chernozems is the agricultural soil characteristic for the analysed area (Gherghina et al., 2010).

Soil solution reaction

The soil’s solution reaction (pH) was calculated differentially on pedogenetic horizons for the most widespread types of soils (Figure 3).

Fluvisols has an average pH of 8.05 in the Ao horizon and 8.18 in C, being a moderately alkaline soil, while chernozems registers 7.81 in Ao and 8.37 in A/C, being a moderately alkaline soil (with the highest values). Phaeozems has an average pH in the Am horizon of 7.92 and 8.12 in the C horizon, while luvisols registers 6.36 in Ao, 5.42 in E1 and 6.42 in Bt - moderately acid. However, preluvisols is a moderately acid soil in the Ao horizon (pH = 6.34) and Bt (pH = 6.46).

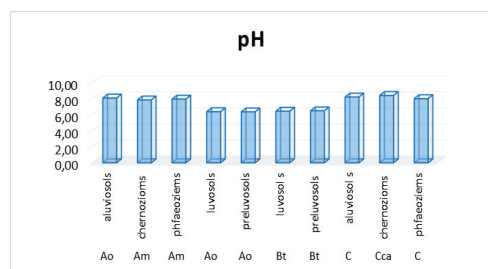


Figure 3. pH variations for the most widespread forest soils from Ialomița Country

In Giurgiu County, phaeozems has an average pH of 6.9 in the Am horizon and 7.35 in the A/C horizon, while chernozems reaches 7.53 in the Am horizon and 8.12 in the A/C horizon (Crişan et al., 2017a).

Soil base saturation

The degree of base saturation is one of the soil's most important chemical indicators, that is strongly correlated with the soil's reaction (Spârchez et al., 2011; Târziu et al., 2004). The values of this indicator are determined either by calculation in the case of acid soils - as a percentage report between the content of exchangeable basis (SB, me/100 g soil, determined through the Kappen method) and the total cationic exchange capacity ($T = SB + A$), or by determining T_{Na} (Bower method), in the case of alkaline soils.

Based on these parameter, luvisols and preluvisols are eubasic soils (Figure 4).

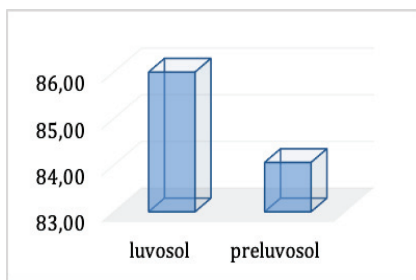


Figure 4. Base saturation degree variation for the most widespread soils from Ialomita County

In Arad County, forest soils (chernozems, luvisols and preluvisols) are also eubasic (Cântar & Dincă, 2018).

The total cation exchange capacity

The total cation exchange capacity (T) was determined through the Bower method and was calculated for each type of soil as an average profile value (Table 1).

Table 1. Total cation exchange capacity and average humus and nitrogen content for forest soils from Ialomîţa County

Fluvisols	Chernozems	Luvisols	Preluvisols	Phaeozems
Total average cation exchange capacity per type of soil (T, me/100 g soil)				
-	-	24.08	25.42	-
Average humus content (%)				
1.99	2.23	4.05	3.40	2.11
Average nitrogen content (%)				
0.10	0.11	0.21	0.17	0.11

For Timiş County, forest fluvisols have a T of 34.5, while luvisols records a value of 23.0 and preluvisols 23.3 (Crişan et al., 2017b).

Humus

The humus content (H, %) was determined through humid oxidation (the Walkley - Black method) for each type of identified soil from the A horizon (Table 1, Figure 5). Fluvisols, phaeozems and chernozems are moderately humiferous soils, while luvisols and preluvisols are humiferous soils. The quantities of humus from this county are similar with the average values calculated for forest soils for the entire country (Dincă et al., 2012). The average humus quantities recorded here are similar with the ones recorded for the entire Romanian Plain (Stănilă et al., 2014).

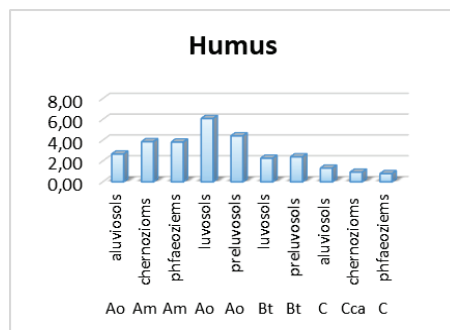


Figure 5. The variation of humus content for the most widespread forest soils from Ialomîţa County

Nitrogen

As in the case of the humus content, the nitrogen was also calculated only for the first horizon as both elements are accumulated through the decomposition of organic matter at the surface and in the first centimeters of the soil's profile.

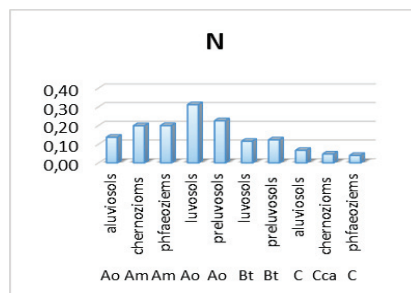


Figure 6. The variation of nitrogen content for the most widespread forest soils from Ialomîţa County

The lowest quantity of nitrogen was found for fluvisols and phaeozems, which are a well-supplied soil with nitrogen, while all the other soil types were very well supplied with nitrogen.

Carbonate content

The content of hardly soluble carbonates is determined in soils with a pH greater than 7, influencing the pH of soils and originating from parental rocks or deposited from groundwater.

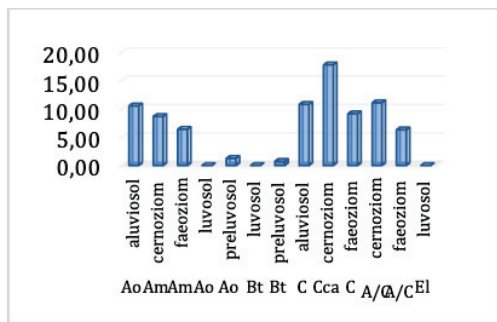


Figure 7. Carbonate content variation for the most widespread forest soils from Ialomița Country

The highest content of carbonates was contained by chernozems, in the Cca horizon (17.79%), while the smallest quantity was observed for preluvisols in Bt (0.75%).

CONCLUSIONS

The majority of the forest soils across Ialomița County belong to Cernisols and Luvisols classes. The most representative forest soils were phaeozems and chernozems, followed by fluvisols, preluvisols and luvisols.

Fluvisols, phaeozems and chernozems are moderately humiferous soils, while luvisols and preluvisols are humiferous soils.

The forest soils from this county are alkaline, from the ones that registered a great pH value (fluvisols, chernozems and phaeozems), to the moderately acid ones (luvisols and preluvisols). In regard with the base saturation values, the forest soils were eubasic (luvisols and preluvisols).

The soils vary from moderately humiferous (fluvisols, phaeozems and chernozems) to humiferous (luvisols and preluvisols).

The lowest quantity of nitrogen was found for fluvisols and phaeozems, which are a type of soil well-supplied with nitrogen, while all the other soil types were very well supplied with this element.

The content of carbonate is highest in chernozems and smallest in preluvisols.

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