

Contributions to the Characterization of Forest Soils from Calarasi County

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Abstract The main chemical properties of forest soils from Călăraşi County were synthesized and analysed based on the pedologic analyses realized during the forest management plans from 1988-2014. The soil characteristic for this area is fluvisol, a soil that is specific for meadow areas where the majority of forests from this county are also present. Other well represented soils from this area are phaeozem, chernozem and preluvisol, soils specific to the field area. The forest soils from this area are more alkaline than the soils from hills or mountains. At the same time, they are not so well supplied with humus and nitrogen but have a very high cationic exchange capacity. If we add to this the sufficient water supply from the meadow area, we can conclude that the soils from this county have an average towards superior reliability for the forest vegetation.

Key words

fluvisol, phaeozem, luvisol, humus, cationic exchange capacity

Călăraşi County has appeared on Romania's map in the year 1981. With a surface of 5088 km², it represents only 2.1% of the country's surface. The county is located in the Southeast part of Romania, on the left shore of Danube and Borcea channel. The relief is mainly represented by fields accompanied by meadows and puddles, while the soils are predominantly chernozems and fluvisols, with a high agricultural fertility [21].

The surface covered by state forests is of 21.605 ha, being managed by Călăraşi, Lehliu and Mitreni forest districts [22].

The purpose of the present paper is to describe the forest soils from this county.

Material and Method

The material for this study was represented by pedologic analyses present in the database owned by

"Marin Dracea" National Institute for Research and Development from Brasov [1]. Soil analyses were realized based on modern work methods, adapted to the latest European standards [6; 8] and refer to soil solution reaction (pH), the base saturation degree (V), total cationic exchange capacity (T), humus (H) and total nitrogen.

The present paper has analysed soil samples gathered during 1988-2014 from the four forest districts located in Călăraşi Forest County [20]. As a total, 111 soil profiles and 270 pedo-genetic horizons were analysed.

Results and Discussions

Types of forest soils from Călăraşi County

The most widespread type of forest soil from Călăraşi County is fluvisol, representing over half of the total number of analysed profiles. He is followed by phaeozem, chernozem and preluvisol (Fig. 1).

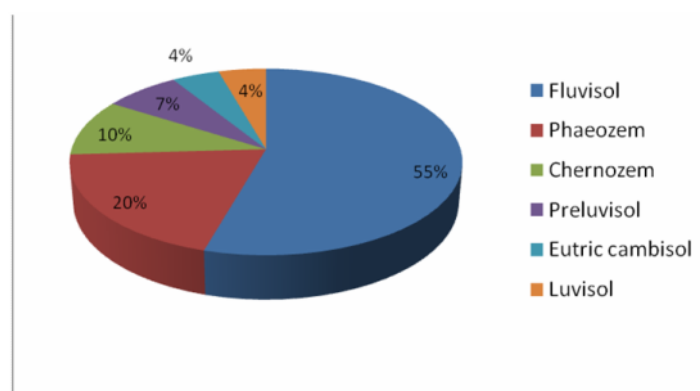


Figure 1. The percentage of forest soils identified in Călăraşi County

These types of soil have a larger spread at the country's level than to the strict level of forest soils (fluvisol represents 12% at the country's level and only 5% for forest soils; for chernozem the percentage is of 9% compared to 1%, while for phaeozem is of 16% compared to 3%), [4]. This aspect is generated by the fact that the county has a reduced surface of forests and is situated in the plain area. In addition, chernozem is the agricultural soil specific for Central Baragan Plain [13; 16] or for other plain areas [7; 14].

Soil solution reaction

The pH, or the soil solution reaction was calculated

separately for each type of soil, on pedo-genetic horizons (Fig. 2). The lowest pH values were recorded by luvisol in the El horizon (pH=5.2), while the highest were for chernozem in the Cca horizon (pH=8.26). Luvisol is moderately acid, while preluvisol is also moderately acid but only in the Ao horizon and weakly acid in the Bt horizon. All the other soils are weakly alkaline on their entire profile. High pH values were also obtained for agricultural soils located in the central part of Baragan [17]. However, the fluvisols from the Getic Plateau are more acid [12].

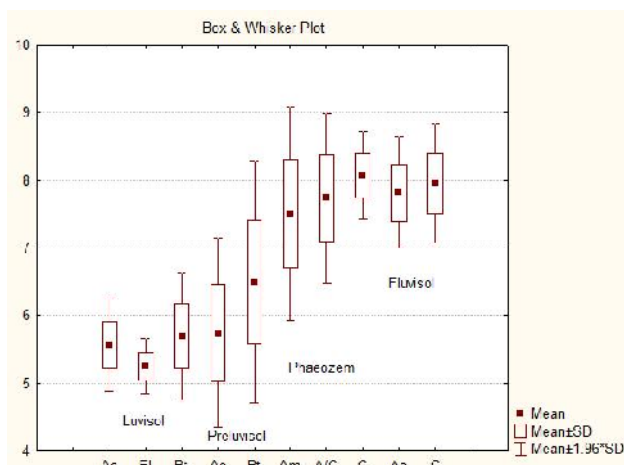


Figure 2. pH variation of generic horizons for the most widespread forest soils from Călărași County

Degree of saturation in basis

As in the case of pH, the base saturation degree (V) was analysed on soil types and on pedo-genetic horizons. All soils from this area are eubasic with the exception of luvisol in El horizon and preluvisol in Ao which are mesobasic (Fig. 3). Forest fluvisols from

Brăila have recorded similar values of the base saturation degree [3], as well as phaeozem from Cluj County [10], while preluvisols from Bihor County have higher values than the ones recorded by the same soils from Călărași [5]

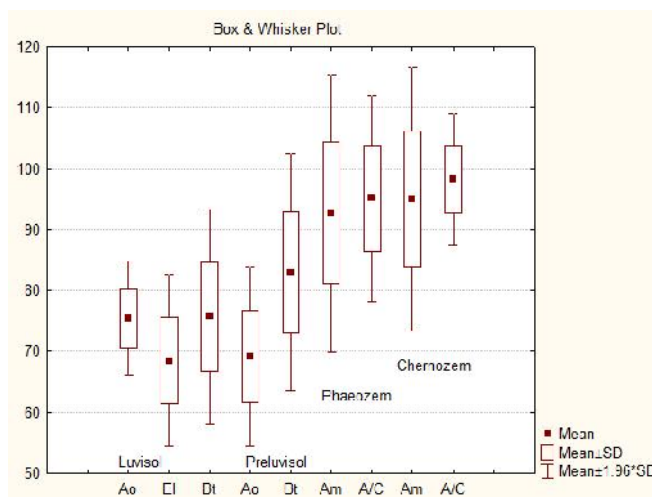


Figure 3. Base saturation degree variation for the most widespread forest soils from Călărași County

Humus

Humus is a characteristic that defines numerous forest soils [9], being usually calculated and interpreted only for the first horizon. In the case of forest soils from

Călărași County, it can be seen (Table 1) that the majority of soils are moderately humiferous (fluvisol, eutric cambisol, chernozem, phaeozem) with the exception of luvisol and preluvisol who are intensely

humiferous (Fig. 4). The eutric cambisols' humus content from this area is reduced when compared with other

areas [18].

Table 1.

Average content of humus, nitrogen and total cationic exchange capacity for forest soils located in Călărași County

Fluvisol	Eutric cambisol	Preluvisol	Luvisol	Phaeozem	Chernozem
Average humus content in A horizon on soil type (%)					
2.65	3.11	7.30	6.36	4.51	3.15
Average nitrogen content in A horizon on soil type (%)					
0.13	0.16	0.37	0.33	0.23	0.16
Average total cationic exchange capacity on soil type (T-me 100 g⁻¹ soil)					
36.80	27.19	25.84	20.12	29.47	30.67

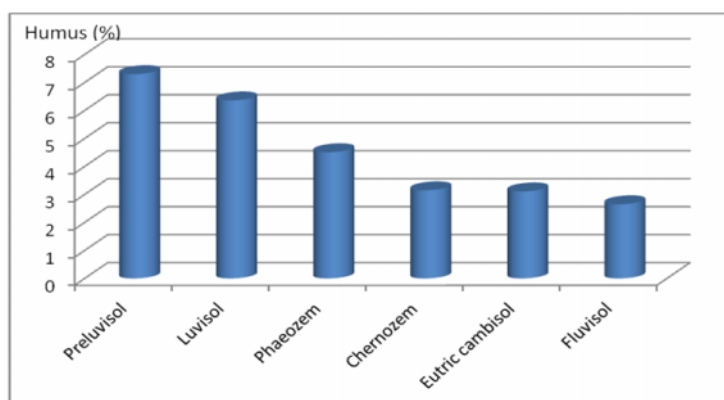


Figure 4. Variation of humus quantity for the most widespread forest soils from Călărași County

Nitrogen

From the point of view of nitrogen supply, fluvisol, chernozem and eutric cambisol are normally supplied with this element, while phaeozem is well supplied and luvisol and preluvisol are very well supplied. The quantity of nitrogen for forest soils located in this area is more reduced when compared with hill or mountain areas. However, this fact does not represent an impediment for the good development of forest vegetation.

Total cationic exchange capacity

Total cationic exchange capacity (T) represents the

cation content that can be absorbed or given by a soil [19]. This element was calculated for each soil type as an average of all values obtained in the laboratory, regardless of the samples' harvesting depth (table 1). All soils from this area have a very high total cationic exchange capacity, with the highest values being recorded by fluvisol and chernozem (Fig. 5). Total cationic exchange capacity depends on the soil's biologic activity [15]. Similar values were obtained by fluvisols from Timis: 34.5 me 100 g⁻¹ soil [2] and luvivals from Brasov: 22.6 34.5 me 100 g⁻¹ soil [11].

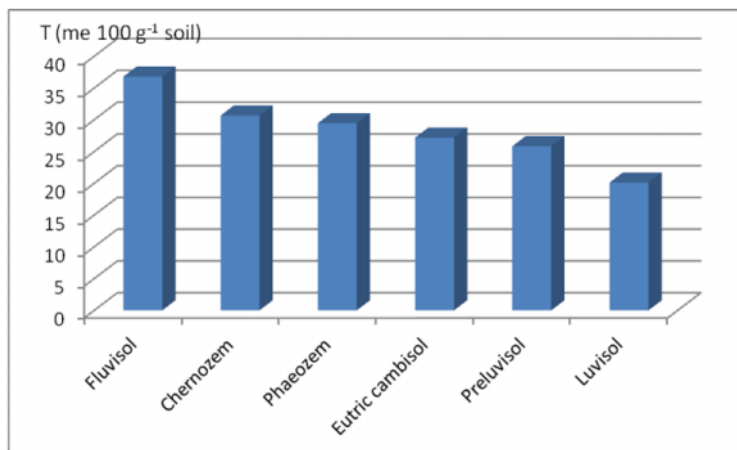


Figure 5. Total cationic exchange capacity variation for the most widespread forest soils from Călărași County

Conclusions

Forest soils characteristic for Călărași County are specific to meadows and forest plain: fluvisol, phaeozem, chernozem and preluvisol.

Fluvisol is a weakly alkaline soil, eubasic, moderately humiferous and normally supplied with nitrogen. Phaeozem is a weakly alkaline soil, eubasic, well supplied with nitrogen, with a very high total cationic exchange capacity, well supplied with nitrogen and moderately humiferous. Chernozem is a weakly alkaline soil, eubasic, with a very high total cationic exchange capacity, normally supplied with nitrogen and moderately humiferous. Eutric cambisol is an eubasic soil, with a very high total cationic exchange capacity, normally supplied with nitrogen and moderately humiferous. Luvisol is a moderately acid soil, eubasic in Ao and Bt and mesobasic in El, with a very high total cationic exchange capacity, very well supplied with nitrogen and intensely humiferous. Preluvisol is a moderately acid soil in the first horizon and weakly acid in the second one, mesobasic in Ao and eubasic in Bt, with a very high total cationic exchange capacity, very well supplied with nitrogen and intensely humiferous.

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