Studii şi Cercetări	Martie 2020	Biologie	29/1	27-30	Universitatea"Vasile Alecsandri" din Bacău

CHARACTERISTICS OF FOREST SOILS FROM SIBIU COUNTY

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Key words: *eutric cambisol, preluvisol, luvisol, humus, base saturation degree.*

INTRODUCTION

Sibiu County covers 5.432 km^2, namely 2.28 % of the country's surface (https://ro.wikipedia.org/wiki/Jude%C8%9). 34% of its surface is covered by forests from which 119.370 ha are managed by Sibiu Forest District (61.065 ha public state property, 45.699 ha owned by administrative territorial units and 12.606 ha private property of juridical or physical people (http://www.dssibiu.ro/organizare/).

Land and soil degradation are one of the phenomena with negative consequences on local forest ecosystems as well as on human activities (Costea, 2007).

Sibiu County is renowned for the existence of some areas (Copsa Mica, Medias) in which the soils are polluted with heavy metals (Antonie end Pavel, 2013; Szanto et al., 2012; Oancea et al., 2015; Ungureanu, 2010).

The purpose of this article is to achieve an inventory and a description of forest soils from Sibiu County based on their type, percentage and main chemical properties.

MATERIAL AND METHOD

This study's material is composed of soil analyses realized during forest management plans from Sibiu County (every 10 years all forests from a certain area are described together with their site conditions, including soils, during the forest management activity). As such, a total of 437 soil profiles and 1392 pedo-genetic horizons from 10 forest districts were analyzed (***Forest Districts Management Plans).

The following results were centralized and analyzed: soil solution reaction (pH), degree of saturation in basis (V), total cationic exchange capacity (T), humus (H) and total nitrogen (N).

RESULTS AND DISCUSSIONS

Forest soil types from Sibiu County

The most widespread types of soil from this county are Cambisols (39% of total soils) and Luvisols (37% of total soils). As soil types, the most widespread are luvisol (27%), followed by eutric cambisol (21%) and dystric cambisol (18%), (figure 1). Other soil types (alosols, podzols, regosols, dystric leptosols) represent 9% of the total forest soils from this region. As such, a balanced distribution of soils can be observed, similar to the mountain area (dystric cambisol, entic podzol) and hill area (luvisol, preluvisol, phaeozem).

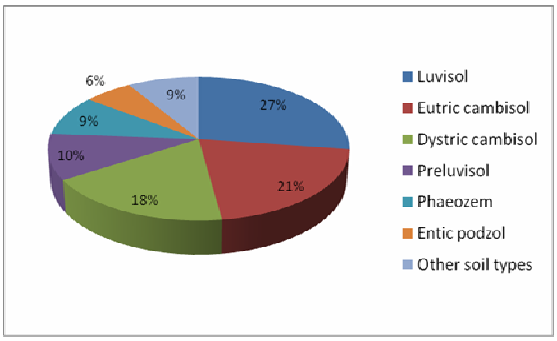

Figure 1. The percentage of forest soils from Sibiu County

Soil solution reaction

The soil solution reaction (pH) was calculated separately for the most widespread types of soils (eutric cambisol, dystric cambisol, preluvisol, luvisol, phaeozem) and on pedogenetic horizons (figure 2).

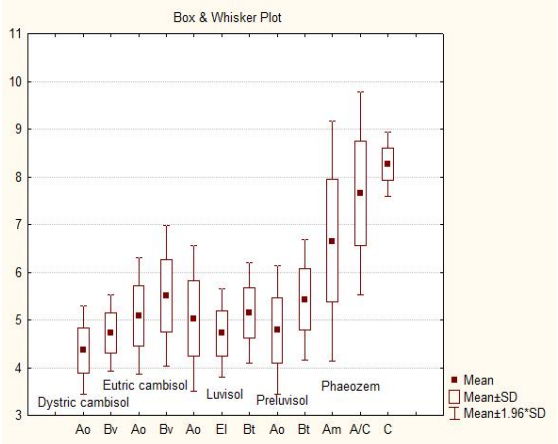

Figure 2. pH variation on genetic horizons for the most widespread forest soils from Sibiu County

The lowest pH values are recorded for entic podzol in Aou horizon (that is very acid), followed by Bs horizon and dystric cambisol who are strongly acid. Eutric cambisol, luvisol and preluvisol are moderately acid, while the soil with the highest pH is phaeozem (which is a neutral soil).

The pH is higher in the last horizon (Bv, Bt or C), due to rocks formed on parental materials rich in calcium and ferro-magnesium minerals (Spârchez *et al.*, 2017). Preluvisols are also moderately acid in Timis County (Crişan and Dincă, 2017), while dystric cambisols are strongly acid in Piatra Craiului (Edu et al., 2013) or in Prahova County (Enescu et al., 2018).

Degree of saturation in basis

Base saturation degree (V) expresses the level of depletion of bases of the soil's adsorptive complex and has a larger variation for all soils from this county (figure 3).

The smallest V values are recorded for entic podzol and dystric cambisol, both being strongly acid and oligomesobasic soils. Eutric cambisol, preluvisol and luvisol (with the exception of El horizon that is oligomesobasic) are mesobasic, while phaeozem is a eubazic soil, which means that is has a very high base saturation degree value. Eutric cambisols are also mesobasic soils in Bihor County (Dincă et al., 2017), similar with preluvisols from Cluj County (Enescu et al., 2017).

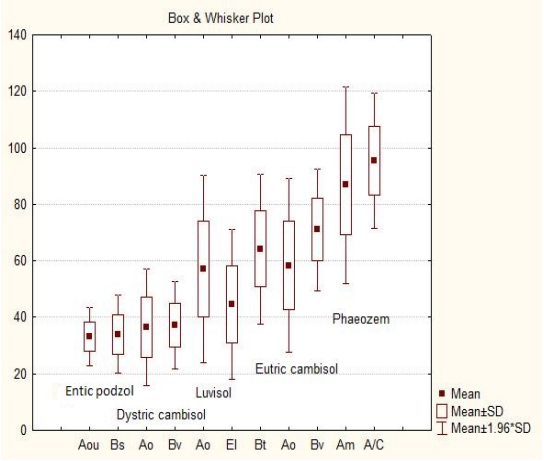

Figure 3. Base saturation degree variation for the most widespread forest soils from Sibiu County

Total cationic exchange capacity

Total cationic exchange capacity represents the cation context that can be absorbed or given to a soil (Filipov, 2005; Târziu et al., 2002), and was calculated for each type of soil as an average value per profile (table 1).

Table 1. Total cationic exchange capacity and the average humus and nitrogen contents for forest soils from Sibiu County

Eutric cambisol	Dystric cambisol	Preluvisol	Luvisol	Phaeozem	Entic podzol
Average total cationic exchange capacity per soil type (T-me 100 g^{-1} sol)					
23.89	21.30	21.42	19.98	29.99	24.31
Average nitrogen content in the A horizon per soil type (%)					
0.24	0.55	0.24	0.26	0.28	0.46
Average humus content in the A horizon per soil type (H-%)					
4.36	9.49	4.49	5.14	5.40	8.97

Phaeozem has a very large total cationic exchange capacity (>25 me 100 g^{-1} soil), while all the other soils have a high exchange capacity (between 15 and 25 me 100 g^{-1} soil), (figure 4). A high cationic exchange capacity is favorable to forest vegetation (Chisăliță et al., 2015), as can be seen for luvisols and phaeozems from the West Plain (Dincă et al., 2019).

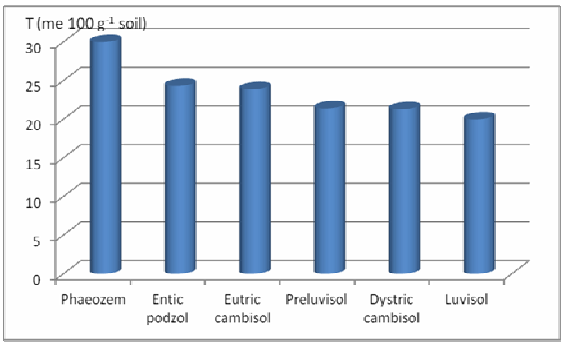

Figure 4. Total cationic exchange capacity variations for the most widespread forest soils from Sibiu County

Nitrogen

Eutric cambisol, preluvisol, luvisol and phaeozem are well supplied with nitrogen, while entic podzol and dystric cambisol are very well supplied with this element. As such, all forest soils from this county ensure a sufficient nitrogen quantity for a good forest vegetation development.

Humus

Humus is one of the most important soil parameters. The quantity from the soil depends on site conditions (Edu et al., 2012), humidity (Dincă et al., 2018), the activity of soil microorganisms (Oneț et al., 2019b; Brînzea et al., 2017; Dorobăț et al., 2019; Antonie et al., 2012) and other factors (Oneț et al., 2019a).

The highest quantity of humus is found in dystric cambisol, followed by entic podzol (figure 5). All soils are intensely humiferous, with the exception of eutric cambisol, which is moderately humiferous. Intensely humiferous entic podzols can also be found in Brasov County (Enescu et al., 2018)

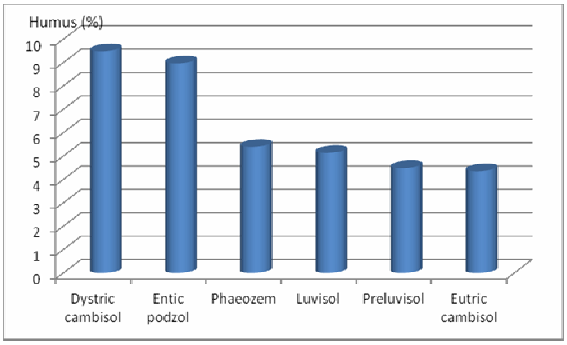

Figure 5. Humus variation for the most widespread forest soils from Sibiu County

CONCLUSIONS

Sibiu County is characterized by a balanced presence of forest soils specific to the mountain area (dystric cambisol, entic podzol) and the hill area (luvisol, preluvisol, phaeozem). The most widespread forest soils from this area are luvisol (27%), eutric cambisol (21%) and dystric cambisol (18%).

Entic podzol is a strongly acid soil, oligomesobasic, with a high total cationic exchange capacity, well supplied with nitrogen and intensely humiferous. Dystric cambisol is a strongly acid soil, oligomesobasic, with a high total cationic exchange capacity, very well supplied with nitrogen and intensely humiferous. Eutric cambisol is a moderately acid soil, mesobasic, with a high total cationic exchange capacity, well supplied with nitrogen and moderately humiferous. Luvisol is a moderately acid soil, mesobasic in Ao and Bt and oligomesobasic in El, with a high total cationic exchange capacity, well supplied with nitrogen and intensely humiferous. Preluvisol is a moderately acid soil, oligomesobasic in Ao and mesobasic in Bt, with a high total cationic exchange capacity, well supplied with nitrogen and intensely humiferous. Phaeozem is a neutral soil, eubasic, with a very high total cationic exchange capacity, well supplied with nitrogen and intensely humiferous.

ABSTRACT

Forest soils from a certain geographic area can be studied based on the soil analyses realized during forest management activities. As such, based on the values of the main chemical parameters for the 1392 pedo-genetic horizons from the 10 forest districts from Sibiu County, relevant conclusions were obtained and statistically ensured regarding their characteristics. The main soils from Sibiu County are luvisol, eutric cambisol and dystric cambisol. Entic podzol and dystric cambisol are strongly acid and oligomesobasic, while eutric cambisol, luvisol and preluvisol are moderately acid and phaeozem is neutral and eubasic. All soils form this area have a high total cationic exchange capacity and are well supplied with nitrogen and humus, having a superior reliability for the forest vegetation.

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