Scientific Papers. Series A. Agronomy, Vol. LVI, 2013
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

RESEARCH ON VARIABILITY OF SOIL PHYSICAL AND CHEMICAL INDEXES IN THE MOUNTAINS OF ROMANIA

Elena-Mihaela EDU[1], Sevastian UDRESCU[1], Mircea MIHALACHE[1], Monica IONESCU[2]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Mărăşti Blvd, District 1, 011464, Bucharest, Romania
[2]Forest Research and Management Institute, 128 Eroilor Blvd, Postal Code 077190,
Voluntari, Romania

Corresponding author email: elenaedu@ymail.com

Abstract

This paper presents results of research conducted in 2010-2013 in the mountains, we studied 60 profiles with 260 horizons.
Are analyzed following chemical parameters: pH, organic C, total N, exchange acidity, base saturation level and physical texture.
The results refer to the type of soil formed under different types of forest stands in the first mineral horizon of the soil profile organic carbon and total nitrogen is higher than these lower horizons. Mountain soils are acidic and basic cations poorer. The values of C/N ratio of their correlation with altitude shows a degree of normal fertility.

Key words: *organic carbon, total nitrogen, forest soil, the C/N.*

INTRODUCTION

Influence of tree species on soil properties was studied by ecologists long (Muller, 1887). Were studied but more parameters influencing soil fertility. Recently the role of carbon in the soil as a source of greenhouse gases is studied in relation to the type of correlation to forest species (Binkley, 1995; Jandl et al., 2007).
To mitigate greenhouse effects, it is essential to provide managers and policy makers with accurate informat ion on the current state, dynamics, and spatial distribution of carbon sources and sinks (De Jong et al., 2000). Forest ecosystem, as a huge carbon pool, has been also proposed as a means to reduce net greenhouse gas emissions, by either reducing CO_2 sources or enhancing sinks (Kenneth et al., 2004). Forest carbon sink and stock would be possible to substantially offset the industrial emissions of carbon dioxide by expanding the forest areas (Wang et al., 2009).
As a result of strong association between soil organic and mineral fractions, a prerequisite to selective characterization of soil organic materials has been its separation from the mineral portion. Many studies of soil organic matter (SOM) have utilized chemical extractants or physical methods to fractionate soil organic matter (Stevenson et al, 1989). Chemical fractionation and characterization methods have not proven particularly useful in following the dynamics of organic material in soils (Oades and Ladd, 1977).

MATERIALS AND METHODS

The soil samples were harvest of the 10 research points with 3 repeated for each point, the following standard depth 0-10 cm, 10-20 cm, 20-40 cm, > 40 cm.
Preparation of soil samples is based on the ISO 11464 method (ISO 11464, 1994).
Collected samples should be transported to the laboratory as soon as possible and be air dried or dried at a temperature of 40°C. They can then be stored until analysis (Cools and De Vos, 2010).
Soil samples were collected on geometric horizons (standard) from 0-10 cm, 10-20 cm, 20-40cm, 40-80 cm for each profile and made five repetitions.
The soils pH was electri-chimically determinat in water, the reading being fulfilled wich Thermo Orion 3 pH-meter. The carbonates were goso-volumetrically determined with the Scheibler calcimeter (ICP forests, 2010). The

organic carbon was determined thoug the dry ignition method by using the Leco Tru Spect CN automatic analyser (LECO 1996, CNS-2000). The total nitrogen from de soil was established through the humid mineralization method and titrimetrical dosage-Kjeldahl method with the Gerhard mineralizor and still. The exchange acidity the extract of potssium acetate (ICP forests, 2010). The basic cations (K, Na, Mg, Ca) were determined through the repeated blenders wiht ammonium acetat, total cationic exchange capacity (T), by summing SB + Ac, the saturation degree of base (V%), the formula V% = SB/T*100.

RESULTS AND DISCUSSIONS

For the present article we have studied the soil sample gathered in the year 2010 and 2012, from 60 profiles and 260 soil horizons.
Selected sample areas are located between 410 and 1850 m.

Figure 1. The plots location

Most samples analyzed an acidic pH of between 3.0-5.5, only 40 of the 260 samples were carbonates. The soils are richest in organic carbon and nitrogen.
The total cation exchange capacity can be explained by the emphasized growth of the forest soils acidity and implicitly of the hydrogen cations at the same time with the atitude.

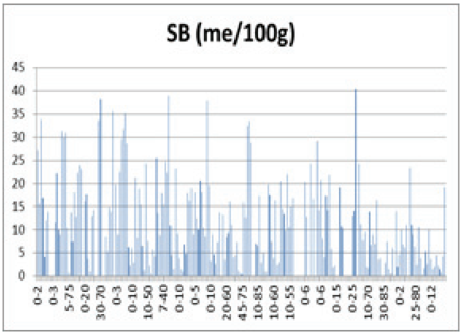

Figure 2. Correlation altitude – pH

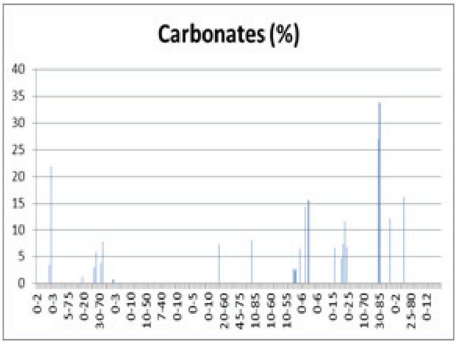

Figure 3. Correlation altitude – Carbonates

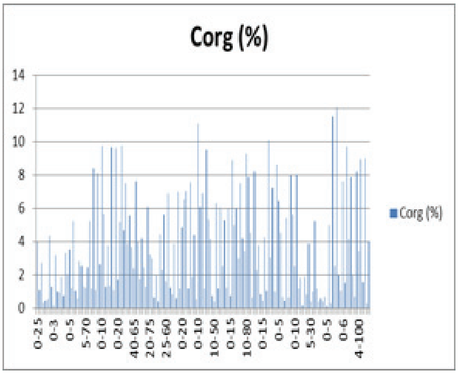

Figure 4. Correlation altitude – organic carbon

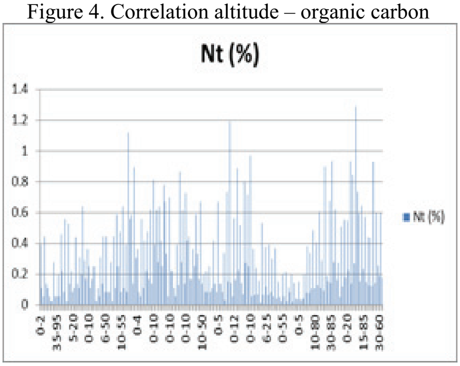

Figure 5. Correlation altitude – total nitrogen

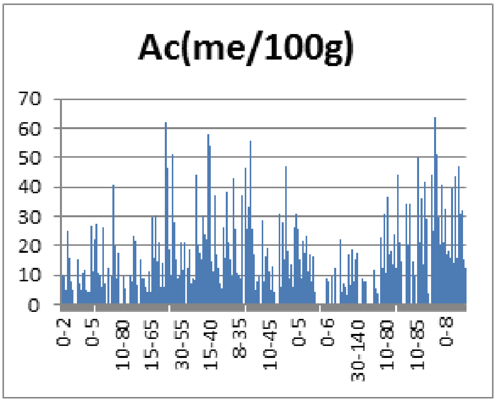

Figure 6. Correlation altitude – exchange acidity

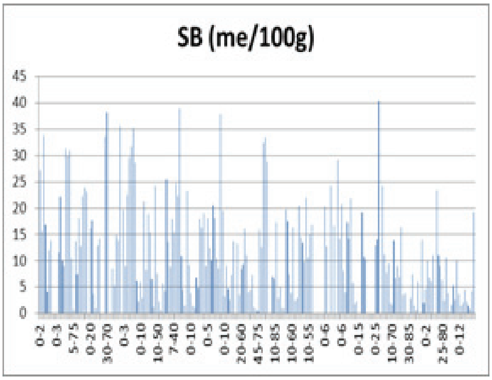

Figure 7. Correlation altitude – SB

CONCLUSIONS

The results have shown that the mountain forest soils are strongly acidic.

Soil organic matter (SOM) varies quantitatively and qualitatively, both within a single soil profile (vertical variability) and among different soils (horizontal variability). Correlation with altitude showed a degree of normal fertility.

ACKNOWLEDGEMENTS

This research work of was financed from Project POSDRU/107/1.5/S/76888 and also was carried out with the support of Forest Research and Management Institute.

REFERENCES

Binkley D., 1995. The influence of tree species on forest soils: Processes and patterns. In: Mead, D.J., Cornforth, I.S. (Eds.), Proceeding of the Trees and Soil Workshop, Lincoln University.

Cools N., De Vos B., 2010. Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests, Part X, ICP Forests, Belgium.

Dumitru I., Toader T., 2004. Padurile României, Parcurile Nationale si Parcurile Naturale. Editura Intact Bucuresti.

De Jong B.H.J., Tipper R., Montoya-Go´mez G., 2000. An economic analysis of the potential for carbon sequestration by forests: evidence from southern Mexico. Ecological Economics.

Jandl R., Lindner M., Vesterdal L., Bauwens B., Baritz R., Hagedorn F., Johnson D.W., Minkkinen K., Byrne K.A., 2007. How strongly can forest management influence soil carbon sequestration? Geoderma, 137, pp. 253 – 268.

Kenneth R., Richards C.S., 2004. A review of forest carbon sequestration cost studies: a dozen years of research. *Climatic Change*.

ICP forests, 2010. Manual on methods criteria for harmoniyed sampling, assessment, monitoring and analzsis of effects of air pollution on forests.

ISO 11464, 1994. Soil Quality – Pretreatment of samples for physic-chemical analysis. International Organization for Standardization. Geneva, Switzerland. 9, p. (available at www.iso.ch).

LECO 1996, CNS-2000. Elemental Analyzer-Instruction Manual.

Mihalache M., 2006. Pedologie – geneza, proprietatile si taxonomia solurilor. Editura Ceres, Bucuresti.

Muller P.E., 1887. Studien uber die naturlichen Humusformen und deren Einwirkungen auf Vegetation und Boden. Julius Springer, Berlin.

Oades J.M., Ladd J.N., 1977. Biochemical properties: carbon and nitrogen metabolism. In 'Soil Factors in Crop Production in a Semi-arid Environment'.

Stevenson F.J., Elliott E.T., 1989. Methodologies for assessing the quantity and quality of soil organic matter. In 'Dynamics of Soil Organic Matter in Tropical Ecosystems'.

Zinke P.J., 1962, The pattern of influence of individual forest trees on soil properties. Ecology 43.

Wang G.X., Oyana T., Zhang M.Z., Adu-Prah S., Zeng S.Q., Lin H et al. 2009. Mapping and spatial uncertainty analysis of forest vegetation carbon by combining national forest inventory data and satellite images. Forest Ecology and Management.