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ACCUMULATION AND MINERALISATION OF ORGANIC MATTER IN ROMANIAN SOILS

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Abstract

Samples from surface and subjacent horizons of main soil types from chernozem to podzol were selected. The organic matter of natural and agricultural ecosystems is associated with a mineralisation of dead vegetal organism in the two investigated horizons.

Both soil colloids and released cations may be retained or deplaced to the depth. The differences of the averages and medians and the histograms of the two horizon properties show the translocation of clay and free sesquioxides and the retention or migration of some nutrient cations. The correlation of the same component from the surface and subjacent horizons are very high and show the strong influence of parent materials.

INTRODUCTION

During the soil evolution the parent materials enrich its profile surface with organic matter due to the plant and microorganism decay [3]. This humification process is accompagned by the descomposition of dead vegetals by mineralisation and release many nutrient cations.

This work is an atempt to emphasize by statistical methods the accumulation of organic matter in soils and its part in the repartition of some nutrient cations in surface horizons of soil profiles.

MATERIAL AND METHODS

Due the to vast aspect of organic matter concerning the composition, the polimerisation degree, the nature of chemical active function, the concentration e.s.o in this paper were investigated only the cantitative line of research of humus and these relations with some cations.

182 samples of surface horizons A_1 (Ap, Am, Ao, Aou, OA) and the same number of the subjacent horizons A_2 (Am, Ame, El, Ea, AB, Es) of main soil types of many regions of Roumania were selected (chernozems, luvisols, vertisols, arenosols dystric cambisols, eutric cambisols and podzols). Do not selected fluvisols to avoid the accentuated influence of present stratification.

A great part of analytical results are utilised from “Excursion Guide of Romanian Soil Science Society Conferences” between 1973 and 2006.

RESULTS AND DISCUSSION

After the descomposition of dead organisms on the surface and the surface horizons of soils is formed the humus, the soil organic matter. Its content decrease continously with the depth (figure 1) at chernozem of Afumați (Dolj) and more accentuated at Beliu (Arad) but little at albic luvisol of Dumbrava (Timiş). The smaller decrease at albic luvisol would suggest the presence of a stratification even the surface of the profile. At the soils more acids an eutric cambisol from Sucevita, a dystric cambisol from Busteni (Bucegi Mountain) and a humic popdzol from Cascada Balea (Fagaras Mountain) the quantity of organic matter is more accentuated (figure 2) but an orthic podzol from Bâlea Lac (Fagaras Mountain) appear a minim in spodic horizon Es.

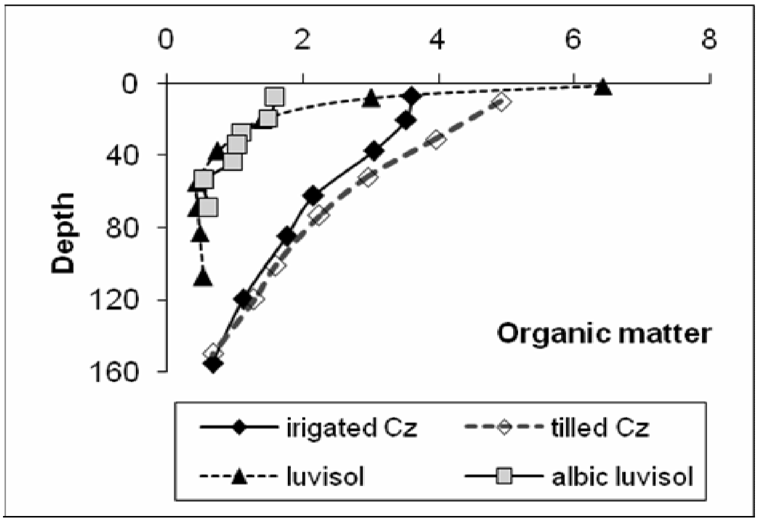

Fig. 1. Variation with the depth of organic matter

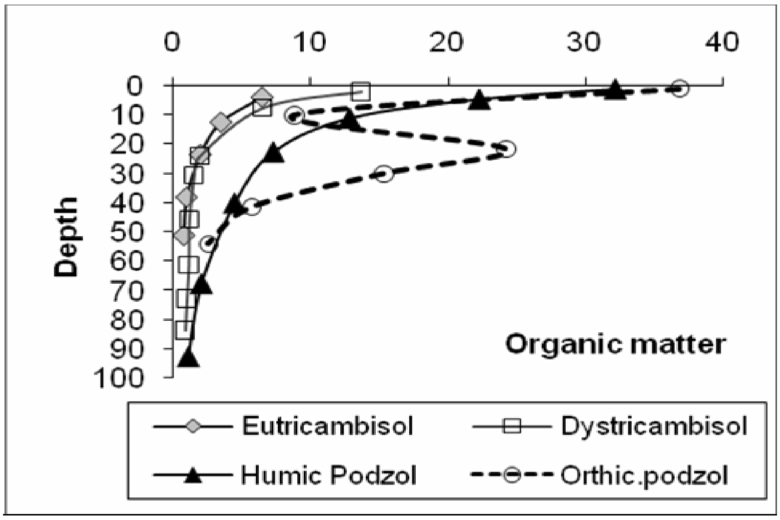

Fig. 2. Organic matter as a function of the depth

In addition the micromorfological caractherization of soil profiles emphasized the argillo-humic-ferric plasma [7, 8, 9] which take part to the colloid translocation to the depth with the formation sometimes at tilled soils of the plough pan [4]. The color variation of plasma suggest its variable composition which would determine a different translocation of its colloidal components.

The colloid translocation produces a displacement to the depth of elements from the clay mineral lattice and from free sesquioxides, from adsorbed cations on the mineral colloids and from chelated cations on organic matter. In the same time are depaced to the depth the cations from soil solution after their solubility, their retention of mineral surfaces and the organic matter stability.

Some statistical data of investigated samples are presented in the tables 1 and 2. The large property ranges and the great values of variation coefficients (tables 1 and 2) permit to consider the two sample groups as statistical representative for surface and subjacent horizons of soils from our country. The differences between the mean and median values are generally great enough and suggest multiple distribution and/or large ranges of assimetry.

The two averages of organic matter contents from A_1 and A_2 5.68% and 3.26% respectively have values greater as medians 3.05% and 2.1% rspectively (tables 1 and 2).

Table 1

Statistical date of investigated samples of A_1 surface horizons

Propriety	No.	Mean	Var. coeff.	Minim	Maxim	Median
Humus %	180	5.68	101.86	0.9	47.12	3.05
Clay %	180	27.58	53.56	3.5	75.6	26.15
pH	180	6.03	26,28	3.3	9.39	5.95
C.E.C.*	82	24.42	59.69	7.2	76.55	21.24
% saturation V*	82	65.45	45.26	3.3	100	72.05
Exch.Ca+Mg*	82	14.93	73.47	0.5	47.92	12.65
Exchangeable K	82	0.39	72.68	0.05	1.26	0.32
Aridity Index	82	39.21	64.64	17.4	182	30.85
Bacteria number	62	4854	285	3.79	105606	1514
Fungi number	62	11.23	98.64	0.1	53	2.6

**Exchangeable cations in me/100 g soil.*

Table 2

Statistical dates of investigated samples of A_2 subjacent horizonts

Propriety	No.	Mean	Var. coeff.	Minim	Maxim	Median
Humus %	180	3.26	98.82	0.3	23.86	2.1
Clay %	180	30.27	56.22	2.5	75.7	27.75
pH	180	6.17	27.59	3.7	9.97	6.16
C.E.C.*	82	19.7	56.17	3.9	65.2	18.97
% saturation V	82	66.12	48.16	2.5	100	81.9
Exch.Ca+Mg*	82	14.45	90.36	0.02	63.49	14.09
Exchangeable K	82	0.3	70.88	0.01	1.13	0.3
Aridity Index	82	39.21	64.64	17.4	182	30.85
Bacteria number	62	2603	153	0.1	19250	1187
Fungi number	62	5.58	82.66	0.08	22.8	4.75

**Exchangeable cations in me/100 g soil.*

Although their distribution are uninominal right assymetrical (figure 3) with the maxim at 4.46% and 2.1% respectively. The maxim of A_2 subjacent horizons is smaller and outside of the distribution curve of surface A_1 horizons. The assymetry range of both distribution is very large between 15.12% and 47.12% for A_1 and

7.55% and 23.85% for A_2 and justify the differences between averages and medians.

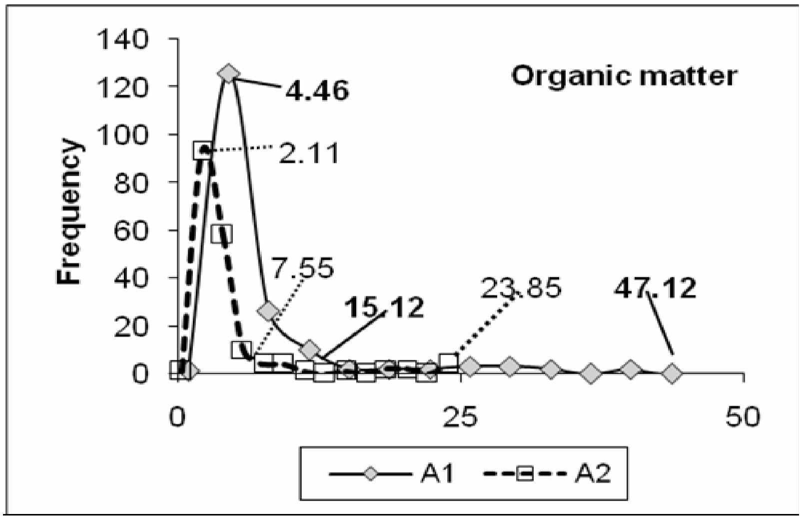

Fig. 3. Distribution of organic matter in A1 and A2

CONCLUSIONS

1. The organic matter is accumulated in the surface soil horizons due to the dead microorganism and plant decay.
2. By means of selected sample group from surface (A_1) ans subjacent (A_2) horizons is emphasized an organic matter accumulation. The humification is associated with a mineralisation which releases nutrient cations.
3. The accumulation of the organic matter is influenced by clay content, pH, percent saturation and apparent density and correlate with heavy metals and exchangeable cations.
4. The component concentrations of A_2 high correlated with these of A_1 and show a strong inheritance from parental materials.

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