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THE INFLUENCE OF THE CONTENT ON HUMUS AND CLAY ON THE PSAMOSOIL PROPERTIES IN THE AREA POIANA MARE-DOLJ

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Key words: humus, hygroscopicity, porosity

ABSTRACT

The humus and clay are the key organic and mineral components that influence the productive capacity of sandy soils. In order to study the influence of these components there were identified spots of land with different contents of humus and clay on the studied sandy soil during the experiment. There have been taken soil samples which were analyzed in laboratory. The soil samples have been taken from 20 cm depth and there were analyzed and interpreted on a scale with 0.5% units for humus and 5% for clay.

INTRODUCTION

By mechanical fastening of sandy soil, followed by setting up of a herbaceous and woody natural vegetation yet, especially, by forestation, vine or orchards the soil formation process begins on mobile and semi mobile sands and intensify the ongoing ones.

MATERIAL AND METODH

The determination of physical, hydrophysical and chemical properties of soil have been made according with „ Metodology of elaborating pedological studies", I.C.P.A. – 1987.

RESULTS AND DISCUSSIONS

The influence of the percentage of humus and clay on the density(D), bulk density(Da) and porosity(Pt) of psamosoil

The density of soils is mainly influenced by their mineral composition and by organic components. The richer a soil in heavy minerals and scarcer in organic matter, the higher the density (2.60-2.80g/cm^3) and vice versa, when the values can drop till 2.40-2.50 g/cm^3 with mineral soils. Besides organic and mineral composition the bulk density of soils is influenced by soil loosening degree.

When a soil contains more organic matter and light mineral its bulk density (D) drops till 1,0-1.3 g/cm^3 and when it contains less organic matter and more heavy minerals its bulk density (Db) can reach 1.5-1.8 g/cm^3 (table 1).

Table 1.

The influence of the percentage of humus and clay on density, bulk density and porosity of psamosoil in the area Poiana Mare

# sample	Depth cm	Humus %	Clay %	Db g/cm^3	D g/cm^3	Pt %
1	0- 20	0- 0.5	0- 5	1.42- 1.44	2.65- 2.68	45- 47
2	0- 20	0.5- 1.0	5- 10	1.40- 1.42	2.62- 2.64	46- 48
3	0- 20	1.0- 1.5	10- 15	1.36- 1.40	2.60- 2.63	47- 50
4	0- 20	1.5- 2.0	15- 20	1.32- 1.36	2.56- 2.60	50- 52

Soil porosity depends on many factors: humus content, texture, structure, biological activity, etc. and range between 45-55% with mineral soils. Theoretically, the porosity can be calculated by means of values of density and bulk density that can be determined in laboratory (figure 1).

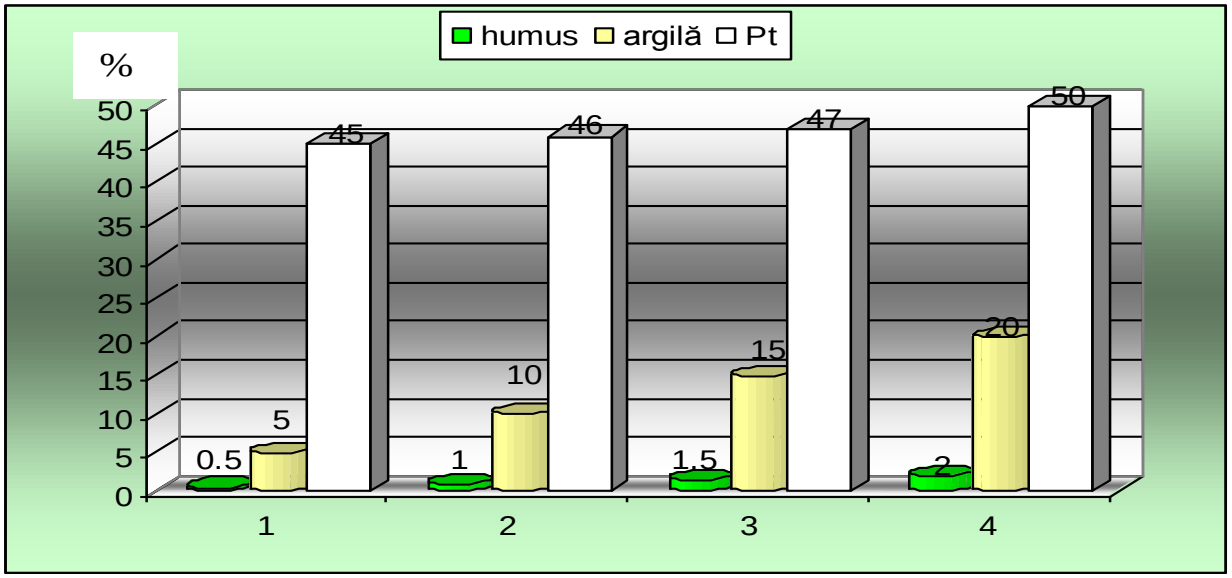

Figure no. 1. Humus and clay values from psamosoil taken in culture and evolution of total porosity

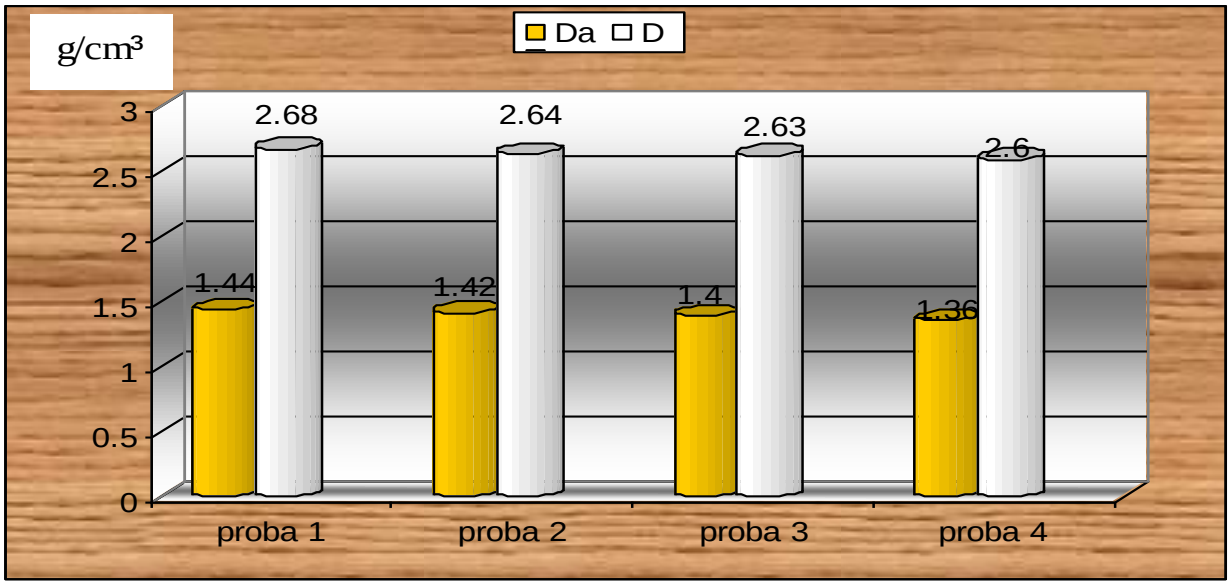

Figure no.2. Evolution of density and bulk density of psamosoil taken to be cultivated

Determinations made on sandy soils from Poiana Mare area have confirmed data from literature, with the same trend (figure 2.)

Our determinations made on sandy soils from poiana Mare have shown that these soils are compacted because the values of bulk density and total porosity are not proper. In function of humus and clay contents the bulk values ranged between 1.32 and 1.44 g/cm^3.

The increasing of humus and clay contents deterrmines a better structuration of sandy soil and a certain loosening and the consequence is that the value of bulk density improves.

The influence of the percentage of humus and clay on the physico-mechanical properties of psamosoil in the area Poiana Mare

The presence of a more consistent clay-humus complex improves all properties of sandy soil, including the physico-machanical ones.

Having a high content of coarse sand particles, the sandy soils are not cohesive and they are brittle. Therefore the lower the humus and clay content the higher the danger of sand drift by winds.The presence of humus and clay influence the adhesivity of sandy soil (table 2, figure 3).

Table no.2.

The influence of humus and clay on adhesivity of psamosoil in the area Poiana Mare

# sample	Depth cm	Humus %	Clay %	Adhesivity g/cm^2
1	0- 20	0- 0.5	0- 5	1.00- 2.00
2	0- 20	0.5- 1.0	5- 10	2.00- 3.00
3	0- 20	1.0- 1.5	10- 15	3.00- 4.00
4	0- 20	1.5- 2.0	15- 20	> 4.00

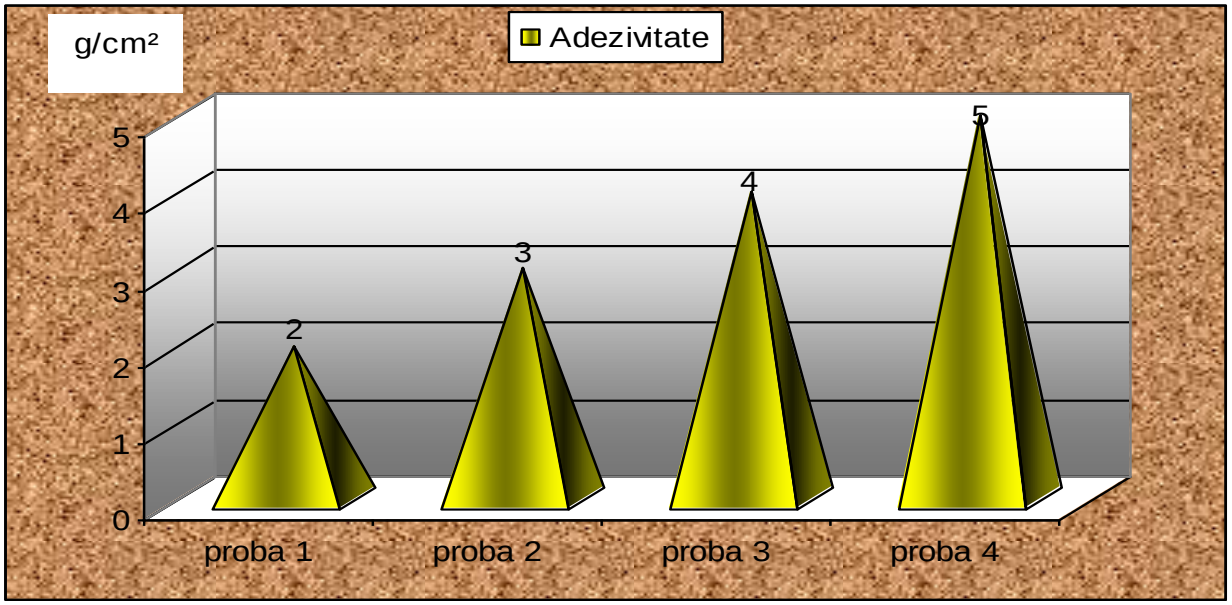

Figure no. 3. Evolution of the adhesivity of psamosoil taken to be cultivated

From data gained through determinations thare can be said that most sandy soils in this area have a low and verry low adhesivity (under 2 g/cm^2). As the humus and clay contents reach 1% and, respectively, 10%, the adhesivity improves, becoming middle or good.

Generally, sandy soil can be worked very easy, so that humus and clay less influence this feature. The influence is aparent as regard tyres adherence coefficient on soil which is slightly imporved.

The influence of the percentage of humus and clay on the hydrophysical properties of psamosoil in the area Poiana Mare

Sandy soil water properties are not favorable for plants growth and development. Due to organic matter scarcity, clay and loam content, sandy soil lose very rapidly water into the soil under gravity action, so the crop is water stressed. All water indicators are at inferior limit showing a very low water capacity.

This way, the hygroscopicity coefficient (HC) ranges between 0.5-1.0%, the wilting point (WP) between 1-2%, the moisture equivalent (ME) around 4-6% and the available water capacity (AWC) between 2-3% (table 3).

Table no.3.

The influence of the humus and clay of indices hydrophysical of the psamosoil in the area Poiana Mare

# smaple	Depth cm	Humus %	Clay %	HC%	WP%	ME%	AWC%
1	0- 20	0- 0.5	0- 5	0.3- 0.6	0.5- 1.0	3- 4	2- 3
2	0- 20	0.5- 1.0	5- 10	0.5- 1.0	0.8- 1.5	4- 6	3- 4
3	0- 20	1.0- 1.5	10- 15	1.0- 2.0	1.5- 3.0	6- 9	4- 6
4	0- 20	1.5- 2.0	15- 20	> 2.0	> 3.0	> 9	> 6

The determinations of water indicators on sandy soils from poiana Mare area show a close correlation between humus and clay contents and these indicators.

This way, with a humus content under 0.5% and cclay under 5% the hygroscopicity coefficient is under 0.6% and the increasing of humus content till 2% and clay up to 15-20% determine the increasing of the hygroscopicity coefficient three fold.

The same increases have been recorded with the wilting point, from 0.5 to 3%. The moisture equivalent records values up to 9% (table 4).

In concclusion there can be said that a good method for reclaiming water indicators of sandy soils is to enhance humus content by organic fertilization and increasing the clay content by applying this type of mineral on soil.

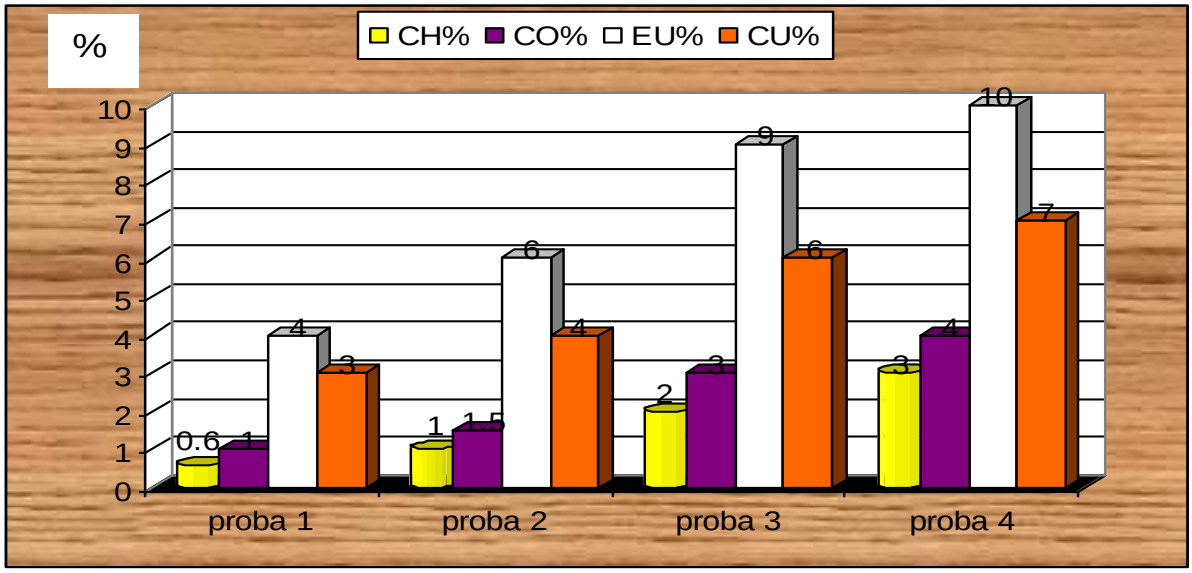

Figure no. 4. Evolution of indices hydrophysical of psamosoil investigated

The influence of the percentage of humus and clay on the chemical properties of psamosoil in the area Poiana Mare

Sandy soils are characterized by scarcity of clay – humus complex that determines a low ion exchange capacity and low nutrient supply.

Humus is considered the main pool of soil nutrients for plants that are slowly released by chemical and biochemical processes of ion exchange and solubilization. This valuable feature of humus is determined by the fact that it has a high capacity of ion exchange and holding ions of all soil colloids (aprox. 600 m.e./100 g soil).

Besides humus, clay contributes to hold nutrients into the soil and disposing them to the plants, having a capacity up to 100 – 150 m.e./100 g soil. On average, humus contains 4-6% nitrogen, 45-60% carbon, 30-40% hydrogen, 3-8% oxygen and it is the main supplying source of microelements for plants. Annualy, by microbiological activity there are released 0.5-1.0 % of humus reserve, resulting 50-100 kg/ha nitrogen that can be used by

plants.The results obtained by analyzing soil samples from poiana Marea area emphasizes a close correlation between humus and clay contents and different chemical properties of the soil (table 4, figures 5,6 and 7).

Table no. 4.

The influence of humus and clay of the chemical properties of psamosoil in the area Poiana Mare

# sample	Depth Cm	Humus %	Clay %	Ah	BS	T	V %	Nt %	P	K	$CaCO_3$
				m.e./100g sol					ppm		
1	0- 20	0- 0.5	0- 5	0.10	8.06	8.70	99	0.020	4.5	50	4.2
2	0- 20	0.5- 1.0	5- 10	0.12	9.8	9.92	98	0.045	12	88	2.16
3	0- 20	1.0- 1.5	10- 15	0.26	11.1	11.36	97	0.060	28	120	1.70
4	0- 20	1.5- 2.0	15- 20	0.35	12.7	13.05	97	0.080	40	160	1.50

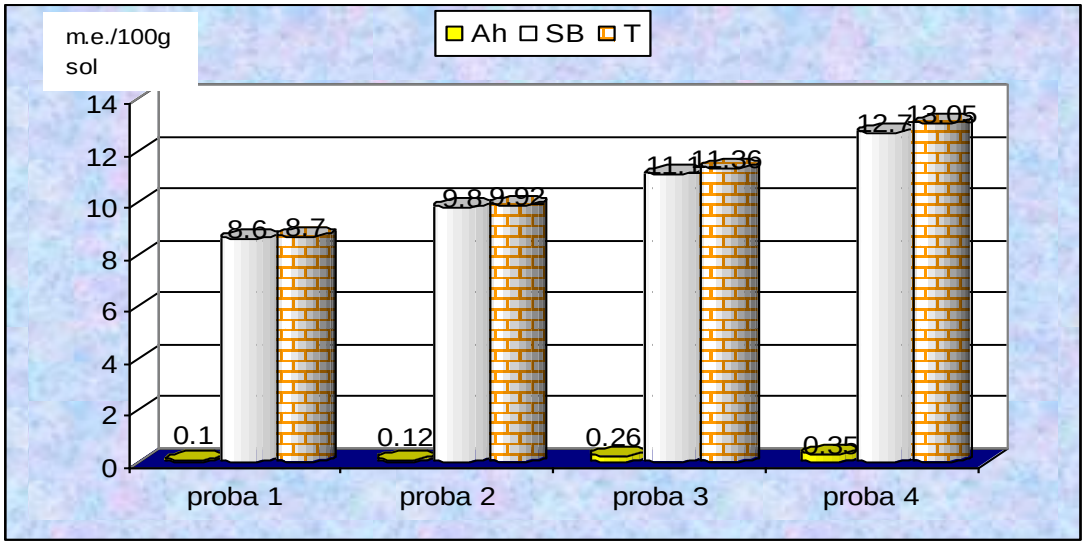

Figure no. 5. Evolution of chemical properties: Ah, SB, T.

This way, with sandy soils that have the lowest humus content there was recorded the most unfavorable values of chemical features that determmines poor life conditions for plants. As the humus content increases, so do the the chemical features of the soil.

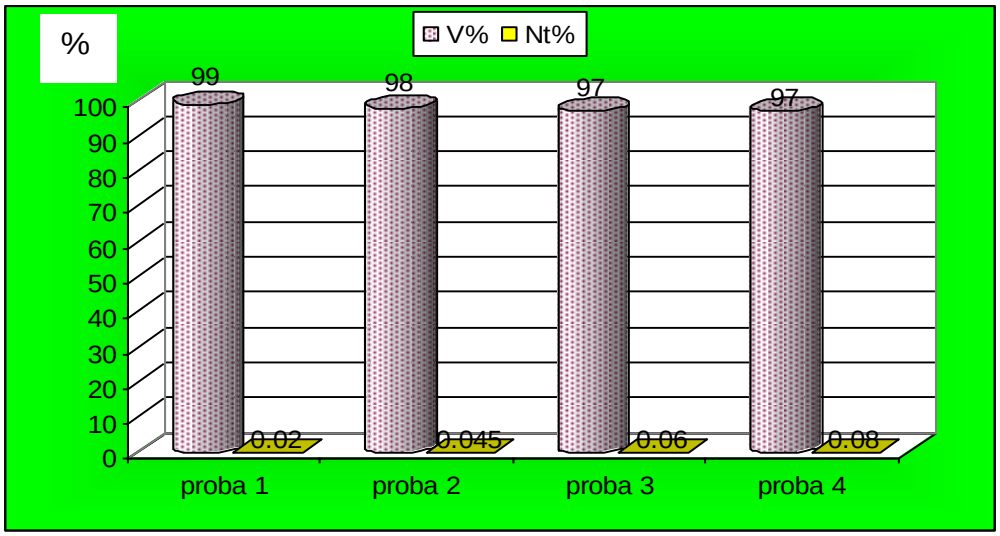

Figure no. 6. Evolution of chemical properties: V and Nt.

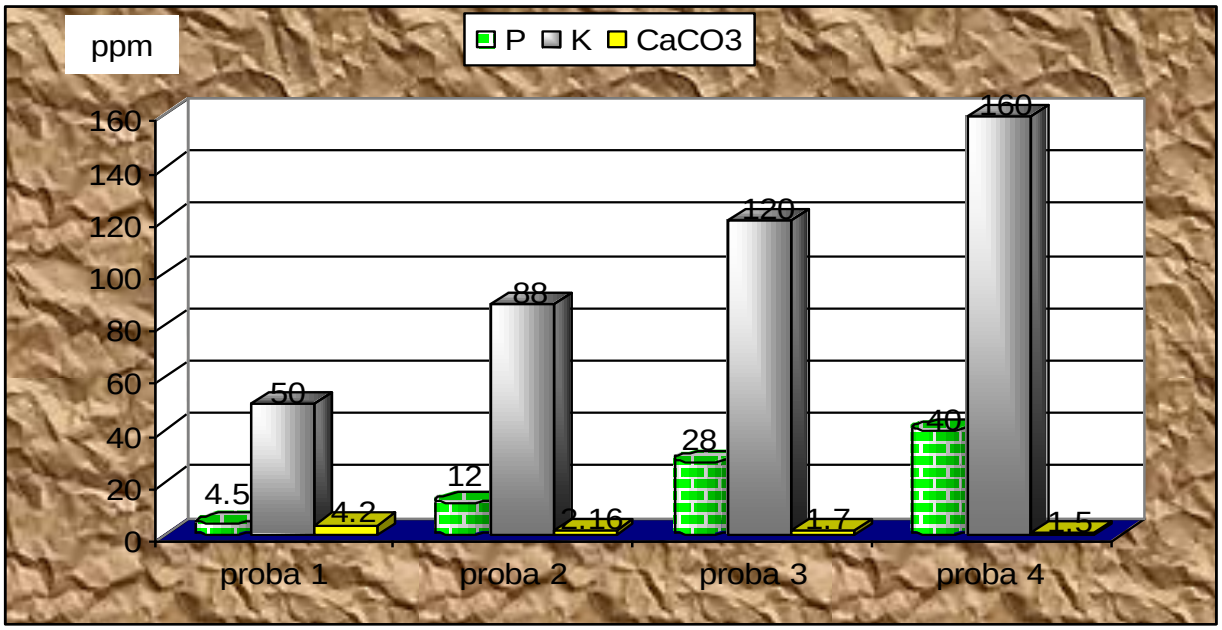

Figure no. 7. Evolution of chemical properties: P, K and $CaCo_3$

Humus and clay are the key components of the soil exchange complex that, in turn influence the plant process of nutrition; this fact was emphasized by soil analyzes that have been performed at Poiana Mare soils. This way, with a humus content under 0.5% and clay under 5% the soil total cation exchange capacity is under 9 m.e./100g soil, the total nitrogen content is under 0.02%, the available phosphorus content is very low (4-5 ppm) and the available potassium content is under 50 ppm.

With a humus content of 1.5-2.0% and clay of 15-20% the total cation exchange capacity rises till 13-14 m.e./100g soil and the soil nutrient content recorded a four times increase.

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