CORRELATION BETWEEN THE SOIL REACTION AND THE CONTENT OF ORGANIC CARBON AT A TYPICAL LUVOSOIL

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Abstract. The soil's reaction defines and expresses its ability to maintain in solution a certain activity of hydrogen (H^+) and hydroxide (OH^-) ions, because the soil acts as a donor or acceptor of protons (H^+ ions) (Rusu et al., 2005). The term of humus defines the organic inanimate component in the soil resulting from the conversion by micro organisms of crop residues and is quantitatively assessed by the organic carbon content increased by 1.724 times. This ratio represents the average ratio between the mass of humus and the average content of carbon in humus (100: 58% C = 1.724). Humus is one of the most important components of soil. It contributes to power the plants with nutrients, it influences the water holding capacity, temperature, aeration and other properties of the soil (Davidescu et al., 1999). Knowing the humus content is strictly necessary for the assessment of soil fertility, knowing that, humus fulfills multiple functions: reserve and source of nutrients; component of the complex colloidal with an important role in the retention of cations in the soil structure and in the water retention; stimulates the activity of microorganisms. So humus is the soil fertility main determinant. Knowing the pH value is of great importance in the plant and crop nutrition process, as each species prefers certain pH conditions for their proper development. This paper presents the correlation between soil's pH and the content of organic carbon, respectively humus on a typical luvosoil from Livada.

Keywords: humus, nutrients, pH conditions, organic carbon

INTRODUCTION

The notion designating the fundamental characteristics of soil and ensuring its place in the ecosystem and its perpetuation in time is fertility. This notion belongs to the soil, to life and biochemical processes in it. Due to these processes, an inert material mass begins to accumulate organic matter as a product of the activity of autotrophic, heterotrophic later microorganisms and green plants. This organic material is processed further reaching in the end the most evolved form, both in terms of quality and resistance in time, called humus.

The ability of a soil to provide necessary plant nutrients, to retain water, to provide gas exchange with the atmosphere, to retain and modify pollutants, to resist erosion and produce rich harvests is strongly affected by the quality and the amount of organic matter in the soil.

The organic matter in the soil is a carbon-rich material that includes plants, animals and microbial residues in various stages of decomposition. Living organisms in the soil and plant roots are part of the carbon reserve in the soil, but are not considered organic matter than when they die or when they interrupt the connection to the plant.

The term of humus is used by some soil scientists as a synonymous to the organic matter in the soil, which is to indicate global organic materials in the soil, including humic substances. Humus, as the main component of soil organic matter, is a parameter directly involved in ensuring functionality and fertility to the soil. Agricultural management must focus its technology actions to avoid losses of humus in the process of mineralization. As long as the mineralization is not compensated by synthesis of new humic substances, the humus content in the arable layer declines together with production capacity of the soil. The no deficit balance of humus is one of the conditions for maintaining and increasing soil fertility (Borlan Z., Hera C., Rusu M., 1994).

Through the determination of the organic carbon content in the soil are established the practical solutions for improvement and conservation of the humus reserves in the soil. Humus and soil organic matter represents the permanent reserve of soil nutrients, which determines the fertility itself. Mineral nutrition of the plants is largely influenced by the circuit of nutritional substances.

MATERIAL AND METHOD

The type of soil analyzed is a typical luvosoil from Livada, holding the status of long term experiments, with organic treatments applied annually, being extracted at a depth of 0-20 cm and holding the following pedoagrochemical characteristics, exhibited in Table 1.

In the present research, the determination of organic carbon and hence the humus is based on wet oxidation and then on titrimetric, possibly gravimetric dosing of the humifiable organic matter. The pH was determined potentiometrically in aqueous suspension, at the ratio soil:water of 1:2,5. Readings of pH values in soil samples taken were done using a pH-meter and the results were expressed in pH units, to two decimals, with an accuracy of ± 0.05.

Table 1

Pedoagochemical Properties of a Typical Luvosoil

Physical and Chemical Analysis				
Horizon	**Ao**	**El**	**E / B**	**Bt**
Depth (cm)	0-20	20-32	32-51	51-128
pH	6.22	6.34	6.04	5.91
$CaCO_3$%	-	-	-	-
Humus%	1.38	0.64	0.31	
N-total	0069	0033	.0415	
P ppm	10	10	10	
K ppm	76	62	81	
Ah me	1.31	1.92	2.58	4.60
Sb me	14.0	11.92	21.51	20.40
V%	91	86	89	81
Granulometric Analysis				
Coarse sand (2,0-0,2mm)%	6.57	5.04	4.45	1.73
Fine sand (0.2-0.02mm)%	38.93	35.96	35.25	27.37
Dust (0.02-0.05mm)%	14.0	12.20	12.0	9.60
Dust II (0.05-0.002mm) %	14.95	18.25	17.35	16.90
Physical clay (<0.002mm)%	25.55	28.55	30.95	44.40
Texture	LL / 42	LL / 42	LL / 42	TT / 52

RESULTS AND DISCUSSIONS

Analysis of organic carbon and humus was made titrimetrically using Walkley-Black method (modified by Gogoaşă) and the pH reaction was determined in aqueous suspension and the results are presented in Table 2.

Table 2

Content of Organic Carbon and Humus and pH Values of a Luvosoil from Livada

Soil type	Fertilization	pH $_2$ O	V%	Organic - C%	Humus%
A. Typical Luvisol - Livada					
Amended with $CaCO_3$	N_{50} P_{50}	5.75	81.5	0.87	1.50
	Manure 20t / ha	5.77	84.0	1.01	1.74
	Manure 40t / ha	5.85	84.2	1.04	1.80
	Manure 60t / ha	5.87	86.7	1.35	2.32

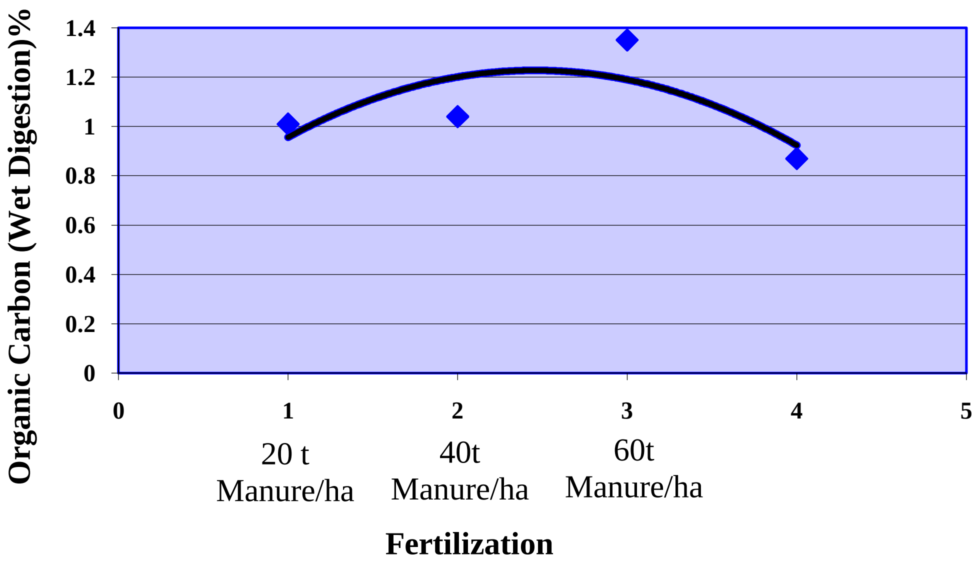

Fig. 1. Dependency of Organic Carbon Content to Fertilization Levels

Amendments to neutralize acidity by applying $CaCO_3$ may positively modify the activity of microorganisms that contributes to the destruction and reducing of the initial organic carbon and humus content in this improved environment in terms of reaction and with contribution of Ca^{2+} is conducive to provide positive cumulative effect on those components of organic and mineral fertilization. In this positive interaction of amendment as organic and organic-mineral fertilizer, the improved environment by the $CaCO_3$

application, on the reaction, creates conditions of humification development and support, by improving the content of organic carbon and humus (Fig. 1).

CONCLUSIONS

Researches aforementioned have proved that organic fertilization, depending on different doses of manure, lead in time (in the 5th decade of such fertilization) to an increase of the organic carbon and humus content in soils on account of unabated oxidative damage, in fact, by applying organic fertilizers.

The consequence of the interaction of mineral and organic fertilizer, together with amendment is quantitative (as deduced from the content values of organic carbon and humus) but also qualitative, due to saturation with Ca^{2+} of the adsorptive complex, thus of the synthesized humus content as a result of the contribution of organic fertilizer resources.

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