CHARACTERIZATION OF THE GLEY STAGNIC PHAEOZEM WITH REGARD TO THE ORGANIC CARBON CONTENT AIMING AT THE SETTING OF A TREE PLANTATION

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Abstract: *The study of the organic matter content in the soil has always played an important part in agricultural science. At present, the practical matters revolving around this issue have become of a global nature. The seriousness of the problem resides in a tendency towards the diminishing of the organic matter content in processed arable soils. The purpose of the research is to pursue the distribution in processed genetic horizons of the organic carbon content in order to create a tree plantation on a gely-stagnic phaeozem in the locality of Uila –Batoş. Soil analyses were conducted according to the certified RENAR methodology of the SOIL-PLANT ANALYSIS LABORATORY within the department of Agrochemistry of the UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE CLUJ-NAPOCA. This method relies on the oxidation principle of the soil carbon into carbon dioxide through the warming up of the soil to 900^0 C in an oxygen gas flow devoid of carbon dioxide. This procedure is based on the dry combustion process. When the soil is heated to a temperature of 900^0 C, the total carbonate quantity present is entirely decomposed. In order to determine the organic carbon content, the carbonates present are discarded. The organic carbon and humus supply reveals average representations of this organic soil component (the determined humus values fall within 2-4% limits), while de real domain of humus content variation is 2.1 to3.1%. In order to maintain the humus content that preponderantly falls within the average representation domain (2-4%), periodical organic fertilization is recommended with organic resources (semi-fermented stable manure or/and poultry manure). The introduction of the organic material in any form in the soil leads to an available energetic input in othe forms and thus increases the heterogeneity and decreases the entropy. Furthermore, a long-term support of humification and the humus content occurs, as well as the increase of soil quality, fertility and productivity. Organic fertilization that incorporates humiferos resources in the soil plays an important part in increasing qualitative and quantitative productivity per surface unit. No other mineral fertlizer, either simple or composed, can make up for the specific and complex effects of organic fertilizers on soils and crops. Stable manure incorporated in the soil, as a complete organic fertilizer that contains all nutritive elements, makes a contribution at improving the structural state, increasing caloric capacity, accessible water resources and exerts a beneficial action on the activity of soil macro and microorganisms, stimulating their activity and development.*

Key words**:** *carbon, humus, dry combustion*

INTRODUCTION

Humus, as the main component of organic matter, is a dirrect parameter involved in ensuring soil functionality and fertility. Agricultural management must channel all technological action towards avoiding humus loss as a consequence of the mineralization process. Humus results from the microbial synthesis process from dead organs and plant tissues, The humification of plant residues and humus accummulation are essential components of the soil formation process and its long-term evolution. Humus is food and energy source for soil organisms thus influencing their biologic activity.

The humus content is indirrectly assessed, according to the orgaic carbon content, the

main humus constituent, multipying it by a coefficient (1.7241), relying on the ratio o the average percentual carbon content in the humus quantity (58%).

The humic balance can be disturbed and the humus content can be reduced through cultivation and intensive tilling, by the lack of organic fertilizers, as well as the natural phenomenon of erosion, thus through processes that favour mineralization instead of humification. In exchange, the application of organic fertilizers (stable manure, plant residues, poultry manure) positively influences the humic balance, the synthesis and accummulation of humus in the soil.

MATERIAL AND METHODS

The soil samples under analysis were collected at S.C. Batoş-Uila on a gley-stagnic phaeozem profile that exhibits the specific pedoagrochemical indices of this soil type. Phaeozems are characterized by the subsequent morphology: a molic horizon A (Am), a transition horizon A/B and the BtG horizon. The Am horizon is the intense bioaccummulation horizon with a 40-50 cm thickness. A/B is the transition horizon with a gradual transition towards the BtG horizon where gleying processes are encountered due to water excess with a prism-like structure and iron oxide stains. In the superior part of this horizon, colours and shades of the molic and transition horizons are kept. Fertility in the superior horizon is an average supported by average humus contents alongside compaction phenomena in the transition horizon and BtG.

The analysis method that aims at the determination of the organic carbon is dry combustion. The organic carbon content is calculated from this content according to the function correction of carbonates in the sample. Upon the previous removal of carbonates, the organic carbon content is directly measured.

RESULTS AND DISCUSSIONS

For a clearer emphasis of the pedoagrochemical traits of the gley-stagnic phaeozem from Batoş-Uila, specific physico-chemical analyses were conducted in the laboratory (Table 1, Table 2 and Table 3). Soil analyses, as well as physical and chemical ones fir within the specific and characteristic limits of the class and the pedologic soil type.

The determination of the total organic-C content in the gley-stagnic phaeozem from Batoş-Uila emphasizes different values for the two soil horizons where the samples were collected.

The results of the analyses obtained express an average to good content of total organic-C and lie at the basis of the determination of the soil humus content, resulted in the organic-C content multiplied by a a factor of 1.724 originating in the ratio between the humus mass and the average carbon content therein (100:58).

From a quantitative point of view, the values obtained show average and good contents of humified organic matter of the gley-stagnic phaeozem in Batoş-Uila.

Data comparison regarding the organic-C content determined through dry combustion with existing and reference data specific to argic paheozem are higher. This is first due to the methodology specificity of the analysis, which, in the first case, clearly oxidizes all organic resources under differentiated humification studies.

If there is future generalization of these comparisons and references to the two combustion methods, including long-term experiments on a long-term dynamics of organic matter, variable interpretation limits can be set for comparative organic-C studies.

Table 1.

Granulometric analysis of the gley-stagnic phaeozem (Batoş-Uila)

Pedologic horizonz	Depth of sample collection (cm)	Granulometric analysis (%)				
		Sand		Dust	Clay	Texture
		coarse	fine	I+II		
Am	0-20	3,5	33,69	31,63	31,18	LM
A/B	40-60	2,9	26,93	24,77	45,40	LA
Bt_1G	100-120	1,5	26,51	25,68	46,31	AL
$Bt_2(g)$	140-160	1,00	25,42	26,18	47,40	AL

Table 2.

Physical analyses of the gley-stagnic phaeozem (Batoş-Uila)

Determining indicator	U.M.	Pedologic horizon		
		Am	A/B	Bt_1G
Humidity at collection	%	24.20	26.10	23.40
Real density	g/cm^3	2.58	2.63	2.71
Apparent density	g/cm^3	1.18	1.41	1.56
Totak porosity	%	55.30	47.20	42.40
Coefficient of higroscopicity	%	7.90	9.60	13.50
Withering coefficient	%	11.85	14.40	20.25

Table 3.

Chemical analyses of the gley-stagnic phaeozem (Batoş-Uila)

Determined indicator	U.M.	Pedologic horizom			
		Am	A/B	Bt_1G	$Bt_2(g)$
pH_{H2O}	-	6.45	6.84	7.40	7.45
Humus	%	2.30	1.80	1.50	1.20
I_N	-	2.20	1.70	1.50	1.20
Mobile P	ppm	18.00	4.80	4.00	3.20
Mobile K	ppm	156.00	140.0	126.00	90.00

Table 4.

Determination of organic-C content in the gley-stagnic phaeozem (Batoş-Uila) (through dry combustion)

Determined indicator	U.M.	Pedologic indicator	
		Am	A/B
Organic carbon	mg	3.165	2.727
		3.725	2.286
		3.337	2.581
		3.116	2.629
		3.532	2.352
		3.637	2.456

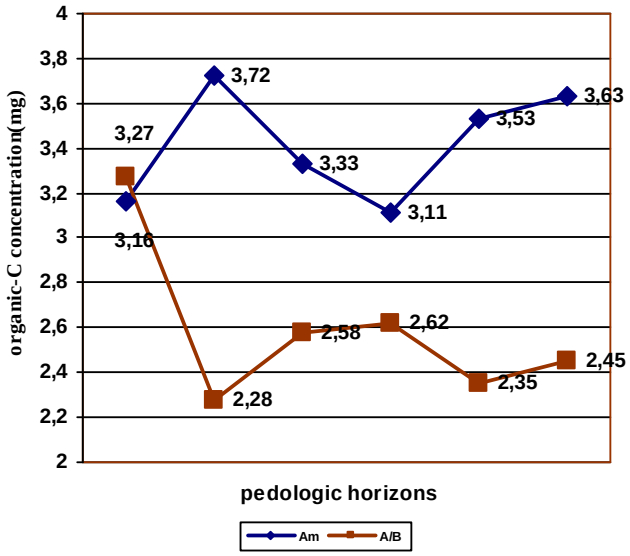

Fig. 1. Values obtained through the dry combustion method for organic-C

CONCLUSIONS

Within the same soil, the gley-stagnic phaeozem in Batoş-Uila, the organic-C reserve is significantly higher in the processed horizon from the surface, compared to the values obtained in medial and deep horizons, due to the fact that the process of bioaccummulation is present in the superficial horizon.

The organic-C includes a part of the raw humus (unevolved through synthesis due to the natural water excess on the slope). Thus, there is a certainty regarding the values obtained through the traditional methods of wet combustion.

Future research in the field must take into account the quantitative and expression relations of the organic-C values (determined through dry and wet combustion).

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