

INFLUENCE OF ORGANIC CARBON ACCUMULATION IN LONG-TERM EXPERIENCES FOLLOWING SYSTEMATIC APPLYING OF MINERAL AND ORGANIC FERTILIZERS

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Abstract. In long-term experiences in our country assessments of changes to the content of C - organic, humus and N-organic show that the systematic application of nitrogen fertilizer at the economic optimum but also of those with N, P, K in long-term experiments in several localities ensures in time (3-4 decades) an increase of organic components in the soil, even a positive humic balance, although these technologies, in the first years of experimentation and application may cause some reduction of humus content (Borlan and Hera, 1984; Kurtinecz and Rusu, 2007). Obviously, these data, essentially contradictory led to attempts to quantify the negative or positive processes in this area and it was even concluded that changes of C – organic, humus and N - organic in the soil following systematic application of fertilizers are determined by the nature and dosage of fertilizer applied to the crops, by the level of harvests obtained, by the remaining biomass or biomass removed from the soil, by coefficients of recovery of plants concerning nutrients, by crop rotation, by soil microbiological activity etc. This paper presents the influence of accumulation of C - organic in long-term experiences following the systematic application of mineral and organic fertilizers.

Key words: soil, organic-mineral fertilizer, organic carbon.

INTRODUCTION

C-organic and humus content are complex characterizing indicators of natural reserves of these components, but also efficiency in characterizing changes, especially multiannual changes, under the impact of fertilization measures. The importance of knowing these indicators arises from the complex role of the organic components of chemical, physical and biological nature on soils. Soil organic components are involved in organic and humic soil balance, are sources of plant nutrients and give measure to the aero-hydric structure and regime, fuel the activity of soil microorganisms. Organic and organic-mineral fertilizations actually support a positive balance of C-organic and humus in soils and in case of acidic amendable soils, this effect can be boosted by measures to correct acidity by applying CaCO₃.

MATERIAL AND METHOD

Experiences from S. C. D. A. Livada were placed in 1961/1962 agricultural year, hold the status of long-term experience with organic and mineral treatments applied annually and amendments, with periodic application at 5 years (experiences led by Boeriu, Vlăduțu and Rusu during 1961-1973 and by Kurtinecz during 1974-present). Soil analyzes were performed respecting the methodology recommended by I. C. P. A. (1981, 1987).

The procedures for determining the content of C-organic and humus are based on the process of wet or dry combustion and then a titrimetric dosing, possibly a gravimetric dosing of the humifiable organic matter.

RESULTS AND DISCUSSIONS

Table 1

C-organic and Humus Content in Amended and Unamended Luvisoil

Amendment	Fertilization	Organic - C%	Humus %
Unamended	Unfertilized	1.09	1.88
	Manure 20t / ha	1.22	2.10
	Manure 20t / ha + N ₁₀₀ P ₇₀ K ₆₀	1.43	2.46
CaCO ₃ 5t / ha, 5 years- optimal amendment (optimal amendment)	Unfertilized	1.03	1.78
	Manure 20t / ha	1.29	2.22
	Manure 20t / ha + N ₁₀₀ P ₇₀ K ₆₀	1.46	2.52
CaCO ₃ 10t / ha, 5 years- excessive amendment (excessive amendment)	Unfertilized	1.01	1.74
	Manure 20t / ha	1.36	2.34
	Manure 20t / ha + N ₁₀₀ P ₇₀ K ₆₀	1.67	2.88
Amended with CaCO ₃ at 0.75 Ah	N ₅₀ P ₅₀	0.87	1.50
	Manure 20t / ha	1.01	1.74
	Manure 40t / ha	1.04	1.80
	Manure 60t / ha	1.35	2.32

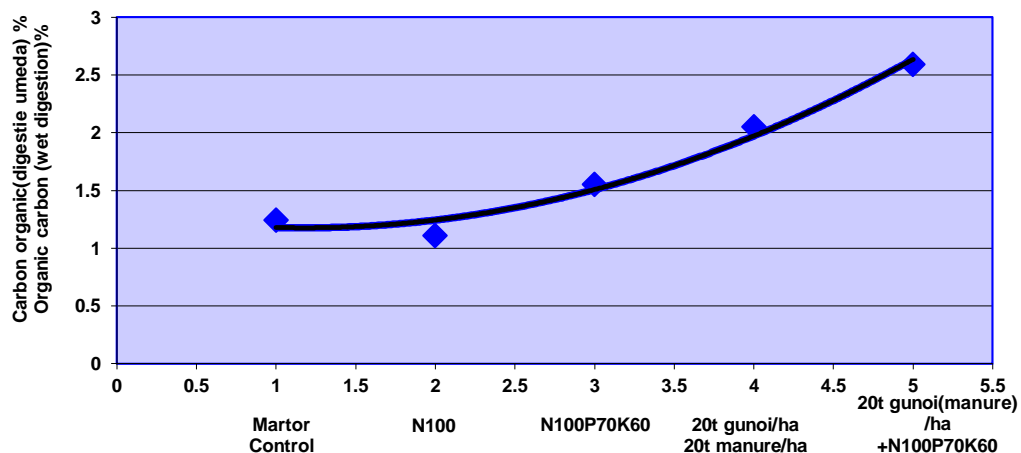


Fig. 1. Modification of C-organic Content (by Wet Digestion) by Differentiated fertilization from Livada Luvisol

Data obtained and presented above prove with certainty that amending and re-amending luvisols from Livada, without fertilization or minimum inadequate fertilization (N₅₀P₅₀) causes in the superficial soil horizon a reduction in the content of C - organic and humus (Table 1, Fig. 1). This potentially negative consequence of the amendment, for long-term experiments has been reported previously and it was proposed to quantify these changes according to the time (duration) of the amendment and the amendment applied doses (Borlan and Hera, 1984). It should be appreciated and motivated that neutralizing acidity by applying

CaCO₃ amendments may positively modify the activity of microorganisms that actually contributes to the destruction and reducing of the initial content of C - organic and humus of all this improved environment, in terms of reaction and with the Ca²⁺ contribution, it is conducive to provide positive and cumulative effect on these components of organic and organic – mineral fertilization. During this positive interaction of the amendment as organic and organic – mineral fertilization, the environment improved by the CaCO₃ application on the reaction, creates conditions of potentiating and supporting of humification, by improving the content of C - organic and humus.

CONCLUSIONS

1. The consequence of interaction between amendment and organic and organic-mineral fertilization is quantitative (as inferred from the content values of C - organic and humus) and qualitative due to Ca²⁺ saturation of the adsorption complex and also of the humus content synthesized as a result of the contribution of organic fertilizing resources;

2. The effects of amendments and differentiated fertilization on C-organic and humus content for luvisols from Livada have showed that amending (without fertilization), unilateral mineral fertilization (N₁₀₀) and complex ones (N₅₀P₅₀), minimum and under optimum soils and crops in question levels, have the effect of reducing the organic components involved in the balance of humus and nitrogen in the soil;

3. It has been proven, experimentally and analytically, that organic and organic-mineral fertilizations are effective measures in maintaining and increasing the content of C - organic and humus in the soils concerned, in these conditions of fertilization, correct and effective amendment in neutralizing acidity and reinvigorating microorganisms' activity, enhances the positive effects of organic and organic-mineral fertilizers in compensating for losses of organic compounds by oxidative degradation and maintains a positive humic balance.

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