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INFLUENCE OF ORGANIC AND MINERAL FERTILIZATION ON SOME AGROCHEMICAL MODIFICATION OF CHROMIC LUVISOL FROM ROMANIAN PLAIN

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Abstract

The present papers has as purpose to quantify some soil chemical modifications as a result of organic and mineral system of manuring after 21 years of experimentation in crop-rotation with: sugar-beet, winter wheat and winter barley. Chemical analyses were made on the soil sampled from 0-30 cm depth, after the winter wheat, at 8 Jully 2012 and conditioned after the usual rules. The experiment has two factors: ***A-organic manuring:*** *a_1 - without organic manure;* ***a_2 -****remanence with stable manure;* ***a_3 -*** *fertilized with leaves and crown of sugar-beet 40 t/ha and* ***B-fertilized with ammonium nitrate****: b_1 - N_0; b_2 - N_{60}; b_3 - N_{100}; b_4-N_{150} and b_5 - N_{200}. The analyses made up: pH-H_2O; hydrolytic acidity and degree of base saturation. In conclusion, applying of mineral fertilizer, negatively influenced the soil pH, but applying stable manure, in posterior effect, this was improved. Ammonium nitrogen increased hydrolytic acidity, being required soil amendment with lime. Degree of base saturation achieved significant more values in the variants with organic fertilization*

Key words*: soil, pH, hydrolitic acidity, basic degree saturation.*

INTRODUCTION

In many countries, research on soil led to the establishment of crop rotations and fertilization systems that contribute to maintaining and enhancing soil fertility (Campbell et al., 2005; Liu et al., 2006; Sandoiu et al., 1996; Stefanic et al., 2006; Grennfelt et al., 1986). Frequently, practicing intensive agriculture results in the degradation of some physical, chemical and biological properties of soils.

This paper aims to quantify soil chemical changes as a result of organic and mineral fertilization system. These changes reflect direct influences on soil biological parameters (Dinca et al., 2013; Sandoiu et al., 2012; Meng et al., 2005).

MATERIALS AND METHODS

Soil samples were collected on July 8, 2012 from a long experience of the Moara Domnească - ILFOV organized on a short rotation: sugar beet, winter wheat, winter barley. Soil samples were collected from 0-30 cm depth after winter wheat in each experimental variant were subjected to conditioning by screening and removal of visible plant debris.

Experimental variants derived from the combination of two factors: factor A-organic fertilization (a_1–organic unfertilized, a_2-remanence of 30 t/ha stable manure and a_3-application of 40 t/ha of sugar beet crop residues). Factor B-mineral fertilization (b_1–N_0, b_2–N_{60}, b_3-N_{100}, b_4-N_{150}, b_5–N_{200}). Samples were subjected to chemical analysis of soil biology in the laboratory belonging to the Faculty of Agriculture in Bucharest. Were determined as follows, the values of pH, hydrolytic acid and the base saturation degree that were performed according to the method of variance analysis (Snedecor, 1965; Carter, 1993; Schollenberg, 1945).

RESULTS AND DISCUSSIONS

The influence of organic fertilization on mineral fertilization average on pH, there is a difference statistically assured. Remanence of stable manure influence was placed in trust group **a**, which can be seen in Table 1, with a value of 5.45, followed by application of crop residues in group **b.** This can be explained, among other things, by the fact that from stable manure is released ammonium relieves acidity chromic luvisol. This was observed by Sandoiu et al. (2012) and Dinca et al. (2013). Nitrogen application rates on average organic fertilization decreased the pH from 5.62 to 4.90 to 5.62 from N_0 to N_{200}, which would be calculate to 0.003 pH units/kg N.

The influence of organic fertilization on mineral fertilization media on hydrolytic acidity, there is a difference, statistically ensured (Table 2), stable manure was placed in group c of confidence, having a value of 4.454 me/100 g ground, followed by variant fertilized, which was placed in group B reliable, hydrolytic acidity value of 5.067 m.e/100 g soil.

Application rates of nitrogen fertilization on organic average negatively influenced hydrolytic acidity.

It has registered, to the mineral unfertilized, a value of 3695 me/100 g soil, at N_{60}, the value 4.167 me/100 g soil, at N_{100}, 5.108 me/100 g soil and 6.563 me/100 soil to dose N_{200} alone in group **a**. The highest hydrolytic acidity of 7098 me/100 g soil organic fertilization was achieved with 40 t/ha of beet leaves and sugar beet to N_{200}.

The influence of organic fertilization on mineral fertilization average concerning the degree of base saturation (Table 3) there is a difference statistically ensured. Remanence of stable manure was placed in a trust group with a value of 78.14%, followed by unfertilized variant, which was placed in group b of confidence, with a value of 74.27%. On average of organic fertilization, nitrogen application rates negatively influenced the degree of base saturation. It has registered a value of 81.504% to mineral fertilized and the amount of 67.931%, dose N_{200} application.

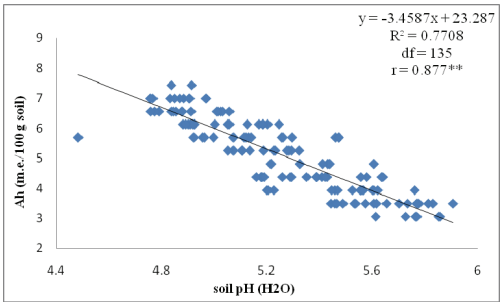

Figure 1. Correlation between hydrolytic acidity (m.e./100 g soil) and soil pH (H_2O)

CONCLUSIONS

1. Applying of mineral fertilizers, negatively affected the soil pH, and remanence of stable manure improved the soil quality.
2. Mineral nitrogen application increased the hydrolytic acidity, for which it is recommended the application of amendments to the variants fertilized with mineral nitrogen.
3. The degree of base saturation values recorded significantly better increase of pH (H_2O) in organic fertilized variants.

Table 1. Influence of organic and mineral fertilization on chemical reaction of chromic luvisol from Moara Domnească - ILFOV

A \ B		**b_1– N_0**	**b_2–N_{60}**	**b_3-N_{100}**	**b_4–N_{150}**	**b_5–N_{200}**	**Average A**
a_1– unfertilized		c 5.48 a	c 5.22 b	b 5.13 b	c 4.88 c	b 4.84 c	c 5.11
a_2–remanence of 30 t/ha stable manure		a 5.79 a	a 5.66 b	a 5.45 c	a 5.31 d	a 5.02 e	a 5.45
a_3–application of 40 t/ha leaves and crown of sugar beet		b 5.58 a	b 5.56 a	b 5.21 b	b 4.99 c	b 4.84d	b 5.24
Average B		5.62 a	5.48 b	5.27 c	5.06 d	4.90 e	
Factors		*A*	*B*	*B*A*	*A*B*		
LSD	*5%*	0.011	0.029	0.046	0.050		
	1%	0.018	0.039	0.062	0.068		
	0.1%	0.033*	0.052*	0.085*	0.091*		

Table 2. Influence of organic and mineral fertilization on hydrolitic acidity (m.e/100 g soil) of chromic luvisol from Moara Domnească – ILFOV

A \ B		b_1– N_0	b_2–N_{60}	b_3-N_{100}	b_4–N_{150}	b_5–N_{200}	Average A
a_1– unfertilizat		b 3.647 e	b 4.234 d	b 5.106 c	b 5.886 b	b 6.465 a	b 5.067
a_2– remanence of 30 t/ha stable manure		c 3.305 e	c 3.500 d	c 4.234 c	c 5.104 b	c 6.127 a	c 4.454
a_3–application of 40 t/ha lives and crown sugar beet		a 4.134 e	a 4.767 d	a 5.984 c	a 6.610 b	a 7.098 a	a 5.719
Average B		3.695 e	4.167 d	5.108 c	5.867 b	6.563 a	
Factors		*A*	*B*	*B*A*	*A*B*		
LSD	*5%*	0.0998	0.0998	0.1724	0.1711		
	1%	0.1656*	0.1338*	0.2462*	0.2318*		
	0.1%	0.3096	0.1792	0.3661	0.3104		

Table 3. Influence of organic and mineral fertilization on basic degree saturation (%) of chromic luvisol from Moara Domnească – ILFOV

A \ B		b_1– N_0	b_2–N_{60}	b_3-N_{100}	b_4–N_{150}	b_5–N_{200}	Average A
a_1– unfertilizat		b 80.801 a	b 78.01 b	b 74.75 c	b 70.93 d	c 66.878 e	b 74.27
a_2– remanence of 30 t/ha stable manure		a 83.911 a	a 81.22 b	a 79.85 c	a 75.83 d	a 69.911 e	a 78.14
a_3–application of 40 t/ha lives and crown sugar beet		c 79.800 a	b 77.48 b	c 71.47 c	c 67.55 d	b 67.00 d	c 72.66
Average B		81.504 a	78.908 b	75.363 c	71.441 d	67.931 e	
Factors		*A*	*B*	*B*A*	*A*B*		
LSD	*5%*	1.0099	0.7181	1.3657	1.2437		
	1%	1.6747*	0.9731*	2.0080*	1.6854*		
	0.1%-	3.1318	1.3031	3.1459	2.2570		

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