MONITORING OF MICROBIAL POPULATIONS IN HAPLIC LUVISOL

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Abstract
Most soils are classified on the basis of their chemical and physical properties. The reason for this is that a soil's chemical and physical properties are more readily defined and measured than their microbiological properties. While important indicators such as aeration, aggregation and organic matter content, erosion and crusting are indicators of potential soil productivity, we must give more attention to soil biological properties because of their important relationship to crop production, plant and animal health, environmental quality and food safety and quality. This paper presents the results regarding the influence of haplic luvisol management practices on microbiological properties under different cultivation conditions. Investigation of the microbiological properties of haplic luvisol, under different cultivation conditions showed that anthropics action such as fertilization and treatments with pesticides promoted certain microorganisms while others are inhibited.

Keywords: soil, microflora, pesticides, fertilizers.

INTRODUCTION

Research is needed to identify and quantify reliable and predictable biological/ecological indicators of soil quality. The basic concept here is not to classify soils for the study of microorganisms but for farmers to be able to control the soil microbiota so that biologically-mediated processes can improve the growth, yield, and quality of crops as well as the fertility and productivity of soils. The ultimate objective is to reduce the need for chemical fertilizers and pesticides (National Academy of Sciences, 1989; 1993).

MATERIALS AND METHODS

In this study will be investigate the microbiological activity of haplic luvisol as a result of chemical fertilization and application of several treatments with pesticides.

The research was done in 2008 and 2009 on three soil variant such as: agricultural haplic luvisol, apricot haplic luvisol and paddock haplic luvisol. In agricultural and apricot haplic luvisol are always applied chemical fertilizers and treatment with pesticides but paddock haplic luvisol is untilled soil and has no history of pesticides and fertilizers application. The experimental plots field is localized at 10 kilometers from Oradea, at village Cauaceu.

The soil samples were collected from upper 40 cm of haplic luvisol profile. The total microbiota of agricultural, apricot and paddock haplic luvisol was determined using the Koch method (1882). Dilution of soil samples (10^{-6}) were suspended in 90 ml distilled water. The soil samples taken from suitable dilution were planted in the solid feeding medium as required (plate-count agar for the total number of microorganisms and Sabouraud agar for yeast-mold).

The cells of microorganisms were counted with colony counter and with counting chamber. The results were evaluated as the number of microorganisms in 1 g oven-dried soil.

RESULTS AND DISCUSSION

All the results are presented in tables and analyzed with the ″Student″ statistics method. Student Test is used to determine significance of differences between several sequences of values.

In table 1 and 2 are presented the results of microorganisms counting and the significance of differences between total numbers of microorganisms values determined in haplic luvisol under different cultivation conditions.

Table 1

Significance of differences between total number of microorganisms values determined in haplic luvisol under different cultivation conditions

Vegetation period	Haplic luvisol type	Depth (cm)	Mean values		Significance labels
			a	b	
Spring 2008	Paddock(a)/ Agricultural(b)	0-40	27,5x10^6	25.7x10^6	p>0.10
	Paddock(a)/ Apricot(b)	0-40	27.5x10^6	17x10^6	p<0.05*
	Agricultural(a)/ Apricot (b)	0-40	25.7x10^6	17x10^6	p>0.10
Autumn 2008	Paddock(a)/ Agricultural (b)	0-40	36.9x10^6	28.7x10^6	p>0.10
	Paddock(a)/ Apricot(b)	0-40	36.9x10^6	19.5x10^6	p<0.05*
	Agricultural(a)/ Apricot (b)	0-40	28.7x10^6	19.5x10^6	p>0.10
Spring 2009	Paddock(a)/ Agricultural (b)	0-40	12.185x10^6	26.65x10^6	p<0.05*
	Paddock(a)/ Apricot(b)	0-40	12.185x10^6	957.55x10^3	p>0.10
	Agricultural(a)/ Apricot(b)	0-40	26.65x10^6	957.55x10^3	p>0.10
Autumn 2009	Paddock(a)/ Agricultural (b)	0-40	19.05x10^6	24.8x10^6	p>0.10
	Paddock(a)/ Apricot(b)	0-40	19.05x10^6	9.5x10^6	p>0.10
	Agricultural(a)/ Apricot (b)	0-40	24.8x10^6	9.5x10^6	p<0.05*

Significance labels: * – 0.01< α <0.05

Table 2

Significance of differences between total number of yeast and mould values determined in haplic luvisol

Vegetation period	Haplic luvisol type	Depth (cm)	Mean values		Significance labels
			a	b	
Spring 2008	Paddock(a)/ Agricultural(b)	0-40	$43.5x10^3$	$576x10^3$	p>0.10
	Paddock(a)/ Apricot(b)	0-40	$43.5x10^3$	$1.562x10^6$	p<0.05*
	Agricultural(a)/ Apricot (b)	0-40	$576x10^3$	$1.562x10^6$	p>0.10
Autumn 2008	Paddock(a)/ Agricultural (b)	0-40	$60x10^3$	$63x10^3$	p>0.10
	Paddock(a)/ Apricot(b)	0-40	$60x10^3$	$2.3x10^6$	p<0.05*
	Agricultural(a)/ Apricot (b)	0-40	$63x10^3$	$2.3x10^6$	p<0.05*
Spring 2009	Paddock(a)/ Agricultural (b)	0-40	$880x10^3$	$15.01x10^3$	p<0.05*
	Paddock(a)/ Apricot(b)	0-40	$880x10^3$	$21.71x10^4$	p>0.10
	Agricultural(a)/ Apricot(b)	0-40	$15.01x10^3$	$21.71x10^4$	p>0.10
Autumn 2009	Paddock(a)/ Agricultural (b)	0-40	$112x10^3$	$356.5x10^3$	p<0.05*
	Paddock(a)/ Apricot(b)	0-40	$43.5x10^3$	$576x10^3$	p>0.10
	Agricultural(a)/ Apricot (b)	0-40	$43.5x10^3$	$1.562x10^6$	p<0.05*

Significance labels: * – $0.01< \alpha <0.05$

In superior soil profile (0-20 cm), the evolution of the microbiota indicate that in the agricultural and apricot haplic luvisol the number of total microorganisms is more lower comparative with the number of microorganisms counted in paddock haplic luvisol.

In the inferior profile of the soil (20-40 cm) the number of total microorganisms of agricultural haplic luvisol was found to be higher than that of the paddock and apricot haplic luvisol.

As it can bee seen, in both profile, in apricot haplic luvisol the total number of microorganisms is reduced. The most recently studies have shown that the treatments with pesticides and fertilization can affect the development of microorganisms.

In apricot haplic luvisol use of pesticides had inhibitory effects on microorganisms. In apricot haplic luvisol, in both profile, the number of yeast-mold was found to be higher than that of paddock and agricultural haplic luvisol. These microorganisms have an important role in affecting the persistence of pesticides, having the capacity for rapid elimination of highly persistent or toxic chemicals. The yeast-mold uses the pesticides such as a carbon and energy source.

CONCLUSIONS

In this research has been observed that, in long term, the utilization of chemical fertilizers and the treatments with pesticides have inhibitory effects on microbiological activity but certain microbial groups, such as yeast-mold have been promoted. Precision agriculture is a system of integrated production technologies designed to maximize agricultural production efficiency. The results presented in this paper confirm the reporting of specialty literature. These results are specifically for the experimental condition and play a part in for a good understanding of the phenomenal.

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