NUMERICAL VARIATION OF THE MAIN GROUPS OF MICROORGANISMS MONITORED IN HAPLIC LUVISOL

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Abstract

The research was done in 2008 and 2009 on three soil variant such as: agricultural haplic luvisol, apricot haplic luvisol and paddock haplic luvisol. Total number of soil microorganisms, Actinomycetes, yeast-mold, Azotobacter and nitrifying bacteria was determined using the dilution method. The results were analyzed with the ″Student″ test to determine the significance or non-significance of differences between the values. The results presented in this research suggest that during the years of study (2008-2009), the number of soil microorganisms shows a dynamic which depends by quantity and quality of nutrients and by the different cropping systems and soil management.

Keywords: seasonal variations, soil microorganisms, soil management, crop.

INTRODUCTION

The abundance of microorganisms in soil varies spatially as well as temporarily and this pattern is related to temporal and spatial variations in the quantity and quality of nutrients. Soil is a dynamic system that is vital to human activities and to maintaining ecosystems. In the evolutionary sense, microorganisms (primarily heterotrophic microorganisms) are recycling agents responsible for maintaining the biosphere. These agents develop favorable, thermodynamic chemical reactions obtaining energy and carbon from dead biomass. As a result of microbial processes of decomposition, the essential nutrients present in the biomass of one generation of organisms are available for the next generation.

MATERIALS AND METHODS

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 was collected from 0-40 profile of the haplic luvisol, in spring and autumn of years 2008 and 2009. In the laboratory plant material and soil macrofauna were removed and the soil samples were sieved (<2mm) and mixed. Total number of microorganisms, *Actinomycetes*, yeast-mold, nitrogen fixing bacteria and nitrifying bacteria were determined using the

dilution method. These soil samples (10g), were suspended in 90 ml distilled water. Dilutions (of 10^{-6}) were prepared from the soil samples using distilled water and these were dispersed with a top drive macerator for 5 min. The soil samples taken from suitable dilution were planted in or on the solid or liquid feeding medium as required. Plate-count agar was used to estimate the total number of microorganisms, the number of *Actinomycetes* was determined on Agar with glucose and asparagines. The number of yeast-mold was determined in Sabouraud Agar, the number of *Azotobacter* in Ashby's glucose agar and the number of nitrifying bacteria was determined in nourishing solution Ashby. The cells of microorganisms were counted with colony counter and with the counting chamber (nitrifying bacteria). The results were evaluated as the number of microorganisms in 1 g oven-dried soil.

The results were analyzed with the ″Student″ statistics method. Student Test is used to determine the significance or non-significance of differences between the values.

RESULTS AND DISCUSSION

The results presented in this research suggest that during the years of study (2008-2009), the number of soil micro-organisms shows a dynamic which depends by quantity and quality of nutrients and by the different cropping systems and soil management.

Table 1

Average values of total number of micro-organisms determined in haplic luvisol, in 0-40 profile of the soil

Vegetation period	Micro-organisms groups	Total number of micro-organisms (cells/1 g soil)		
		Paddock	Agricultural	Apricot
Spring 2008	N.T.G.	$27,5X10^6$	$25,7X10^6$	$17X10^6$
Autumn 2008		$36,9X10^6$	$28,7X10^6$	$19,5X10^6$
Spring 2009		$12,185X10^6$	$26,65X10^6$	$957,55X10^3$
Autumn 2009		$19,05X10^6$	$24,8X10^6$	$9,5X10^6$
Spring 2008	*Actynomicetes*	$25,45x10^6$	$17,06x10^6$	$2,39x10^6$
Autumn 2008		$6,71x10^6$	$31,715x10^6$	$2,196x10^6$
Spring 2009		1950	$21,95x10^6$	$15,8x10^3$
Autumn 2009		$1,04x10^6$	$9,3x10^5$	$6,4x10^5$
Spring 2008	Yeast-mould	$43,5x10^3$	$576x10^3$	$1,562x10^6$
Autumn 2008		$60x10^3$	$63x10^3$	$2,3x10^6$
Spring 2009		$880x10^3$	$15,01x10^3$	$21,71x10^4$
Autumn 2009		$112x10^3$	$356,5x10^3$	$1,72x10^6$
Spring 2008	*Azotobacter*	$960,5x10^3$	304	255
Autumn 2008		0	62	0
Spring 2009		162	656	191
Autumn 2009		0	$4,5x10^5$	0
Spring 2008	Nitrifying bacteria	146	$474x10^3$	$135x10^3$
Autumn 2008		0	650	362
Spring 2009		202	$825x10^3$	$187x10^3$
Autumn 2009		0	1950	750

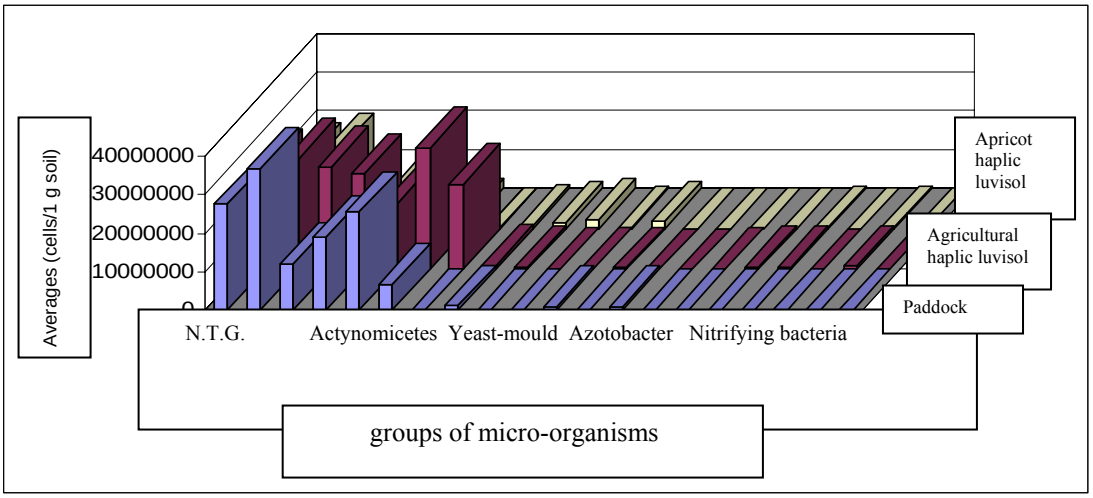

Fig. 1 Graphic interpretation of numerical variation of the main groups of microorganisms determined in haplic luvisol

The evolution of soil micro biota 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 ($p<0,05$*).

As it can bee seen 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. *Actynomicetes* were more developed in agricultural haplic luvisol. ($p<0,05$*).

Also, the number of yeast-mold was found to be higher than that of paddock and agricultural haplic luvisol. ($p<0,05$*). 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 carbon and energy source. Nitrogen fixing bacteria *Azotobacter* and nitrifying bacteria have been identified in a small number in the three soil variant and are no significant differences between the values ($p>0,10$). Fertilization, treatments with pesticides, and processing of soil, can affect the chemical and physical properties of the soil and also the activity of nitrobacteria and nitrification.

The number of microorganisms was found higher in spring because the mineralization activity of microorganisms is more intense in spring. Easily available organic substances of soil are significantly higher in spring than in autumn.

In 2008, have been registered a total number of microorganisms values more higher under wheat crop than that of the number of microorganisms values determined in autumn under maize crop.

CONCLUSIONS

The results of microbiological analysis of soil samples collected on the three soil variant: paddock, agricultural and apricot haplic luvisol suggest that microbiological processes of soil shows a seasonal variation determined in main by different cropping systems, soil management and season.

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