COMPARATIVE STUDY ON BIOLOGICAL ACTIVITY AND EDAPHIC MICROFLORA COMPOSITION FOR FOUR SOIL TYPES FROM SDE TIMISOARA

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Abstract: *Biological diversity is affected by soil conditions and intensive agriculture technologies and reduces the chances of soil to be regarded as sustainable and renewable resource. Biological component of soil is first affected by the cultivation method or technology adopted. Thus, in recent year's research in the world are focused on the quantification of the beneficial partnerships established between microbial diversity, soil and product quality, off course maintaining ecosystem sustainability. Activity of edaphic microflora and response to various stress factors can be estimated by different methods: determination of total number of micro organisms, established of respiration rates or estimation of the microbial biomass. In our work paper we proposed a comparative study of biological activity for four soil types' Chernozem, vertisol, phaeozem and gleysol typical, soils found in the Didactic Experimental Station of Timisoara. Soil samples were collected in October 2009 by the depth of 10-20 cm, and were analyzed the physical-chemical and pedological property. The method used for determining the total biological activity was proposed and optimized to soil study by Green, STOTT and DIACK in 2005. It is based on the hydrolysis capacity of fluorescein diacetate (FDA) by most representatives' species of soil microflora resulting fluorescein is then determined spectrophotometrically. In the same times were performed on average of total cultivable heterotrophic microorganisms of soil on the special media in order to estimate the quantitative and qualitative microbial load specific to each type of soil in part. We determined total heterotrophic soil bacteria on the Topping media, the number of actinomycetes on Berezova media and total soil fungi using Martin media. Remarkable results achieved showed differences between the soils studied the ability of fluorescein diacetate hydrolysis of being positive correlation with carbon content of soil and moisture. Quantity and composition of edaphic microflora is different, the proportion between different groups of soil microorganisms linking depending on your soil pH.*

Key words: *FDA hydrolysis, soil biological activity, edaphic microflora*

INTRODUCTION

Biological diversity is affected by soil conditions and intensive agriculture technologies and reduces the chances of soil to be regarded as sustainable and renewable resource. Biological component of soil is first affected by the cultivation method or technology adopted. Thus, in recent year's research in the world are focused on the quantification of the beneficial partnerships established between microbial diversity, soil and product quality, off course maintaining ecosystem sustainability. Activity of edaphic microflora and response to various stress factors can be estimated by different methods: determination of total number of micro organisms, established of respiration rates or estimation of the microbial biomass. Approximately 1% of the soil bacterial population can be cultured by standard laboratory practices. It is not known if this 1% is representative of the bacterial population (TORSVIK and al., 1998)

The method we use was proposed for the first time by SCHNÜRER, J., ROSSWALL, T., 1982 to study the biological activity of soil microorganisms and then being used by many researchers (ADAM and DUNCAN, 2001, WANANDY ST. and al 2005, GREEN, V. and al, 2006).

MATERIAL AND METHODS

The comparative study of biological activity for the four soil types Chernozem, vertisol, phaeozem and gleysol typical, soils found in the Didactic Experimental Station of Timisoara. Soil samples were collected in October 2009 by the depth of 10-20 cm, and were analyzed the physical-chemical and pedological property (tab 1.). Average of each soil samples were prepared by sieving through a sieve of 3 mm and divided into threefold. A part served to determine initial moisture of soils. Another part of soils were corrected humidity to 80% of BCC. The third part was used from incubated in deficit moisture condition (below 50% of BCC). Samples were incubated at a temperature of 20-22 Celsius degrees in two repetitions. After 2 days we determined the biological activity of soils. The method used was proposed and optimized to soil study by GREEN, STOTT AND DIACK in 2005. It is based on the hydrolysis capacity of fluorescein diacetate (FDA) by most representatives' species of soil microflora resulting fluorescein is then determined spectrophotometrically. Of soil samples with optimal moisture were performed on average of total cultivable heterotrophic microorganisms of soil (ZARNEA, GH., 1992), on the special media in order to estimate the quantitative and qualitative microbial load specific to each type of soil in part. We determined total heterotrophic soil bacteria on the Topping media, the number of actinomycetes on Berezova media and total soil fungi using Martin media (PAPACOSTEA, P., 1976). The results are presented in CFU/g dry soil.

RESULTS AND DISCUSSIONS

Biological activity of soil is due to the soil microflora activity. As can be observed in Figure 1., concentration of fluorescein released varies depending on soil type but also its moisture. Thus, the largest amount of released fluorescein, 58,325ppm was determined by incubation of phaeosom soil at the optimum soil moisture. Apparently biological activity of the phaeosom is most affected by the water shortages, on this soil is determined and the lowest amount of fluorescein released about 7,075ppm. Is equally affected the biological activity of chernozem and vertisoil in case of poor moisture. The lowest difference between average amount of fluorescein released in two versions work it was observed in the gleysol (table 2.) about 18,725ppm, the gleysol having the ability to maintain a high level of biological activity even in conditions of moisture deficit.

Regarding the composition of edaphic microflora of soils studied, in the figure 2, can be observe Fig 2, that the community structure of soil microflora is different for each type of soil in part. The chernozem and phaeosom have the highest microbial load, the largest being eubacterias. Follow the actinomycetes and micromycetes, the results are presented in cfu / g dry soil (see Figure 2.). On vertisol and gleysol the number of eubacterias is lower, 3473,28x 10^4 and respectively 3843 x 10^4 compared with other soils. But we are witness in a numerical increase in the other microbial categories. A high number of micromycetes we see in gleysol, intense biological activity being due to these microbial groups. The micromycetes have higher tolerance to water deficit compared with bacteria (SWISHER, R., CARROLL, G.C., 1980). This explains why the differences reported for the determinations of the fluorescein released, in the case of optimal moisture and deficit moisture, are the lowest for this soil. The largest number of actinomycetes was determined on chernozem soil with the largest load of humus, the actinomycetes is typical for these soils (TRASAR-CEPEDA ET ALL, 1998). The phaeosom, with the highest bacterial contents has also the highest biological activity in conditions of optimum moisture. But, in conditions of moisture deficiency, reduced amounts of fluorescein signify the collapse of the biological activity of soil. This means that the bacterial population consists in most nonsporogenic species. They have high-speed multiplier, which is particularly useful in terms of restoring growth conditions.

Table 1.

Physical-chemical characteristics of analyzed soils

Soil type	**Chernozem**	**Vertisol, Low gleizated, moderate carbonation**	**Phaeozem**	**Gleyosol**
Horizont Ap 0-25 cm				
Dust<0,02 mm	29,2	27,2	35,3	26,0
Clay <0,01 mm	41,1	41,8	35,5	37,1
Sand 0,2-0,02 mm	29,2	30,5	29,2	36,7
Sand 0,2-2mm	0,5	0,5	0,4	0,2
pH in H_2O	6,45	6,51	5,60	8,05
Humic mater (%)	4,09	2,85	3,60	3,35
$CaCO_3$	-	-	-	0,16
N total (%)	0,136	-	-	0,112
P ppm	28,8	51,81	17,4	30,5
K ppm	138	-	149	249

Table 2.

Differences in soil biological activity reflected by the average amount of released fluorescein

Soil type	**Optimum moisture**	**Deficit moisture**	**Difference**
	$\bar{x}$ (ppm)	$\bar{x}$ (ppm)	$\bar{x}$ (ppm)
Chernozem	40,18	11,625	28,555
Vertisol	32,625	5,162	27,463
Phaeozem	58,325	4,075	54,28
Gleyosol	48,5	29,775	18,725

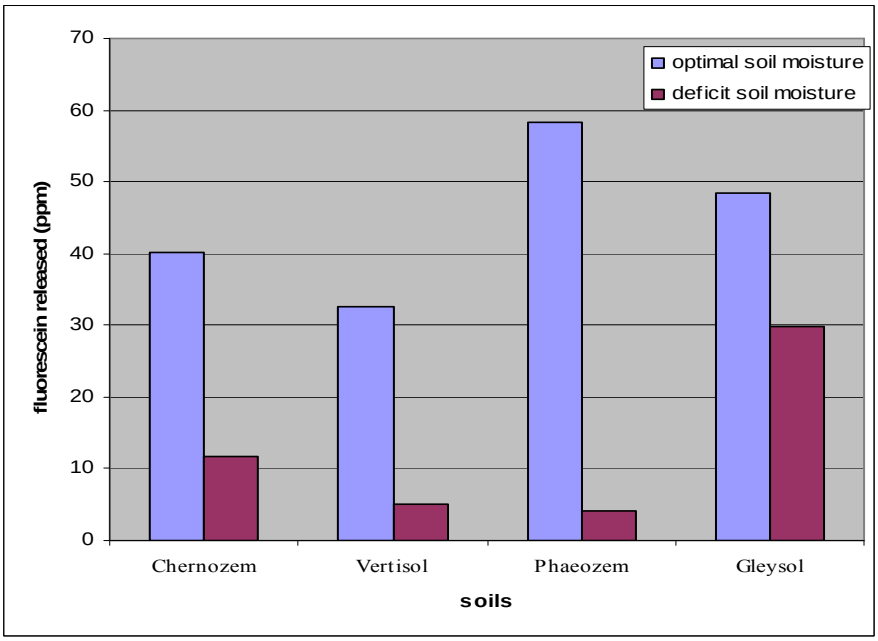
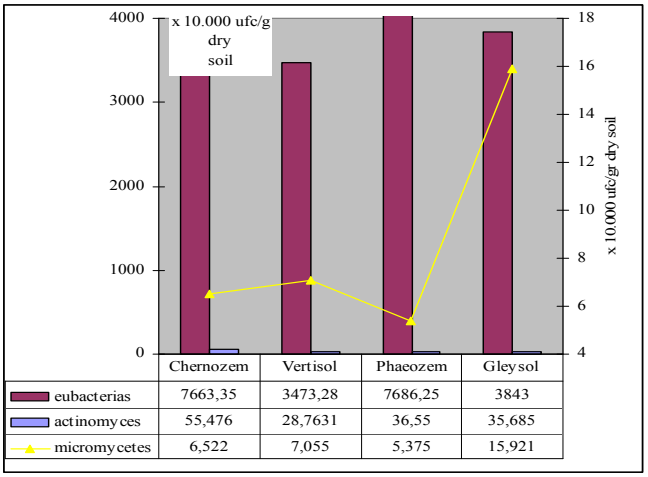


Figure 1. The amount of florescein released after two days incubation of soil samples



	Chernozem	Vertisol	Phaeozem	Gleysol
eubacterias	7663,35	3473,28	7686,25	3843
actinomyces	55,476	28,7631	36,55	35,685
micromycetes	6,522	7,055	5,375	15,921

Figure 2. The structure of soil community microflora

CONCLUSIONS

Each soil type has a specific microbial structure determines its biological activity.

Soils with high humus content, like Chernozem and Phaeozem have the microflora mainly composed of eubacterial species with high capacity multiplier, which determine a high biological activity. The biological activity of Gleysoil due to the large number micromycetes ensures a biological activity than high the average of other soils under deficit moisture condition.

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