THE INFLUENCE OF WHEAT AND MAIZE CULTURES ON ROTATION AND MONOCULTURE ON THE ENZYMATIC COMPONENTS OF THE SOIL

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ABSTRACT

In order to better characterize the soil's vitality and to assess the fertility level, pedo-enzymatic tests are used along with biotic and / or chemical analyzes. Pedo-enzymatic activities are evaluated in the laboratory to determine the potentials of a soil to release the ammonium and phosphorus required for soil and plant micropopulation nutrition. Pedo-enzymatic processes (pedo-phosphatase, pedo-amidase) are ongoing, to the extent that environmental conditions are favorable. The soil samples taken in the study were harvested from the Am (0-20 cm) horizon of the N_0P_{70} fertilized variant, from the following crops: wheat after soybean crops of a three-year rotation, maize coming from a 4-year field temporarely outside the crop rotation, and from monocultures of wheat and maize. From the data analyzed as a result of this study it results that the crop rotation influences the pedo-enzymatic components of the soil. Total pedo-phosphatase activity in wheat and maize cultivation (rotating) was superior, the results being in the value group compared to the total pedo-phosphatase activity of the soil under the wheat and maize monocultures where the result of the analyzes indicated a much lower, being in b. The total soil pedo-amidase activity of wheat cultivated with maize as a precursor plant was superior, the result being in the a.

INTRODUCTION

The rotation of the cultures influences the enzyme components of the soil. For this study we took into consideration the soil enzymes involved into the phosphatazic and in the soil. The first ecological, soil enzyme method through which the level of total phosphatasic activity of soil is determined was elaborated by Ștefanic G. et al. in 1965 and it was perfectioned by Ștefanic G. in 1971 and then by Irimescu M. et al. in 1998.

The enzymology of soil includes the enzymes present in the soil, independent from the living cell of the micro and macro bodies in the soil; these enzymes are found into the lacunar and cappilary water in the soil or they are absorbed on the organic and mineral colloids of the soil.

It is good to know that in similar conditions with the natural ones, the level of the enzymatic product was bigger or lesser and eventually to observe if one specifically factor of influence, or more, produces some sort of change of the enzymatic activity and enzymatic product, useful for the nutrition of the micropopulation and vegetal crops of the soil. (Ștefanic et al., 1965, Irimescu et al. 1998).

MATERIAL AND METHODS

The principle of the method about the phosphatazic activity in the soil, by Ștefanic et al. (1965), with the improvements brought by Irimescu et al. (1998) is based on the consideration that the soil contains as much phosphatazic enzymes as specific substrates. The conversion of the uncombined glucose into phosphor (P) is made with an index that represents the sin of the combination of phosphor with glucose report; this report is experimental determined by the authors of the method, in the limits of possible concentration of enzymatic phosphor released + free phosphor into the soil and the added glucose into the reaction mix (P mg/glucoză mg = 0.04) (Ștefanic et al. 2014).

The principle of the method about the phosphatazic activity in the soil, by Ștefanic et al. (2008), who considers that the soil contains more or less as much amidasic enzymes as specific substrates, (amides) came from the macro and microflora of the soil and from external sources (animals or human activity). The meeting between amidases and specific substrates (amides) with the favorable condition of their interaction into the soil (humidity, temperature) determines the enzymatic hydrolysis with the releasing of ammonia nitrogen which can be quantitative determined, spectrophotometrical. This method shows more correctly the potential of the soil in releasing the ammonia from the amides in the soil better that through the secvential testing of ureasic, asparaginasic, glutaminasic and ornitinasic potential present in different percentage in the soil (Ștefanic et al. 2014).

RESULTS AND DISCUTIONS

As it can be observed in the 1 table the total pedo- phosphatasic activity of the maize cultivated soil which has wheat before this realized a very significant increasing, 1.71 mg / 100 g soil comparing to the average of experience. To the under wheat crop soil with soy before it the total pedo- phosphatasic activity of the soil led to a significant increasing by 0.84 mg / 100 g of soil. To the under wheat and maize crop soil with soya before it the total pedo-phosphatasic activity of the soil recorded a significant decrease, 1.82 mg / 100 g of soil and also 0.73 mg / 100 g of soil compared to the average of experience.

Table 1

The influence of the culture after precursors on the total pedo-phosphatase activity in chromic luvisol under conditions of chemical unfertilization (Moara Domnească, April 2012)

The variant	Total pedo-phosphatasic (mg /100 g soil)	Difference (mg/100 g soil)	Significance
Wheat monoculture	b 1.61	-1.82	000
Wheat after soybean	a 4.26	0.84	*
Maize monoculture	b 2.70	-0.73	0
Maize after wheat	a 5.13	1.71	***
Average	3.42		

$DL_{5\%}$ = 0,678 mg/100 g soil; $DL_{1\%}$ = 1,030 mg/100 g soil; $DL_{0,1\%}$ = 1,650 mg/100 g soil*

The total pedo-phosphatasic activity of the soil cultivated with wheat and maize (in rotation) was superior and the results were situated in the **a** value group compared to the total pedo-phosphatasic activity of the soil under the monocultures of wheat and maize where the analysis` result indicated a decreasing level; they were situated in the **b** value group.
It can be observed in the 1 figure that the highest level of the total pedo-phosphatasic activity of the soil, 5.13 mg / 100 g of soil, was obtain from the soil under the maize crop, in rotation after the wheat and than from the wheat crop in rotation with soy, 4.26 mg / 100 g of soil. The lowest level of total pedo-phosphatasic activity of soil was realized at the under the wheat monoculture of 1.61 mg/100 g soil. According to the method, it is ecological and not artificial emphasized the amidazic potential as in classical enzymology, through which is actually determined the quantity of some sort of enzyme and even izo-enzyme in the tested environment, like a response to the introduction of a specific substrate in optimal quantity, according to Michaelis-Menton. (Buturugă et al. 2015).

Table 2

The influence of the culture, after the precursor, on the total pedo-amidase activity on chromic luvisol under conditions of chemical unfertilization (Moara Domnească, April 2012)

The variant	Total Pedo-Amidasic (mg /100 g soil)	Difference mg/100 g soil	Segnificance
Wheat monoculture	c 0.23	-0.36	000
Wheat after soybean	b 0.46	-0.13	00
Maize monoculture	b 0.58	-0.01	
Maize after wheat	a 1.08	0.49	***
Average	0.59		

$DI_{5\%}$ = 0,083 mg/100 g sol; $DI_{1\%}$ = 0,180 mg/100 g sol; $DI_{0,1\%}$ = 0,209 mg/100 g sol*

To second table we can observe that the total pedo- amidasic activity of the maize cultivated soil with wheat before it compared with the experience average realized a significant increasing of 0.39 mg/100 g of soil at the under maize monoculture soil which didn`t presented significant changes. The total pedo- amidasic activity recorded a significant decrease of 0.36 mg/100 g of soil to the under wheat culture and a divers significant of 0.13 mg/100 g of soil to the under wheat culture with soy before it. The total pedo-amidasic activity of the maize cultivated soil with superior wheat before it and with result situated in **a** value group had the total pedo-amidasic activity of the soil under maize and wheat monoculture in rotation with soy analysis` results situated in **b** value group while in **c** value group is situated the result of the total pedo-amidasic activity of the under monoculture of wheat soil.

In second tabel can be observed that the highest level of total pedo-amidasic activity of soil, 1.08 mg/100 g of soil was obtained to the under maize culture in rotation after wheat and the lowest level of total pedo-amidasic activity, 0.23 mg/100 g of soil was realized at the soil under the wheat monoculture.

CONCLUSIONS

The total pedo-phosphatasic activity of the soil planted with maize after wheat and the soil planted with wheat in rotation after soy was superior, with rates of 5.13 and 4.26 mg/100 g soil, belonging to value group a, in comparison with the

complete pedo-phosphoric activity of the soil under wheat and maize monocultures, where much lower rates, belonging to value group b, were registered.

The total pedo-amidasic activity of the soil planted with maize following a wheat crop was over 1.08 mg / 100 g soil, the result being classified in value group **a**. The results of the total pedo-amidasic activity of the maize monoculture (0.58 mg /100 g soil) were classified in group **b**, as well as those of the soil planted with wheat in rotation after a soy crop (0.46 mg/100 g soil), while the wheat monoculture was distributed to group **c**, with a value of 0.23 mg / 100 g soil.

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