THE INFLUENCE OF PHYSICOCHEMICAL PROPERTIES OF HAPLIC LUVISOL ON SOIL ENZYMES ACTIVITY

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Abstract

Enzyme activity is an important indicator of soil microbiological properties. The role of soil enzymes, in terms of the ecosystem, is increasingly important and is defined by the relationships between soil enzymes and the environmental factors affecting their activities. Even more research exists on how the physicochemical properties of soil can influence the activity of soil enzymes.

Key words: soil, microorganism, enzymes, properties.

INTRODUCTION

In the literature there are many references about the relationship of enzyme activities and various soil properties. Soil enzyme activities are influenced by management practices because they are also related to microbial biomass which is sensitive to different treatments.

MATERIAL AND METHODS

The soil samples were collected from experimental plots field at village Cauaceu, localized at 10 kilometers from Oradea, on April 15-19.2008. The soil was collected from upper 40 cm of the haplic luvisol. In the laboratory plant material and soil macrofauna were removed and the soil samples were sieved (<2mm) and mixed. Some physical and chemical properties of the soil samples were determined as follows, soil moisture using gravimetrically method by oven-drying fresh soil at 105^0C, pH in 1:2:5 soil water suspension by pH-meter, organic material by using Walkley-Black method, nitrate (NO_3-N) determination by colorimetric method, ammonium with Nessler reagent, P mobile and K mobile by using extraction with Egner–Riehn–Domingo. In our investigation we have analyzed, also, the activity of dehydrogenises. To 15g soil, were added 0,15g $CaCO_3$. The mixture was distributed in 2 test tubes. In first test tube 0,5 ml of a 3% solution of 2,3,5-triphenyl-tetrazolium chloride (TTC) and 1,5 ml distilled water were added. In the second test tube (control sample) were added only 2 ml distilled water. After incubation at 37^0C for 24h the formazan formed was extracted with 10 ml acetone and estimated spectrophotometrically at 485 nm. The concentration of formazan was

calculated from a standard curve. Dehydrogenase activity is expressed as mg TPF/10 g soil · 24 h.

RESULTS AND DISCUSSION

The fluctuation of the biological activity of soils depends by pH, humus N, P, K content and moisture content.

Table 1

Values of monitored physicochemical and biological indicators of haplic luvisol

Indicator of haplic luvisol	Unit of measure	Haplic luvisol	Haplic luvisol cultivated with wheat	Haplic luvisol cultivated with apricot
Dehydrogenase activity	mg TPF/10 g soil · 24 h	1,84	4,58	1,33
Humidity	% of weight	14,06	17,04	16,24
pH	pH units	6,22	7,86	5,77
Humus content	%	1,61	2,63	1,63
$N\text{-}NO_3$	ppm	3,55	11	4,7
$N\text{-}NH_4$	ppm	0,9	0,3	2,2
Mobile P	ppm	11	283	15
Mobile K	ppm	110	1095	100

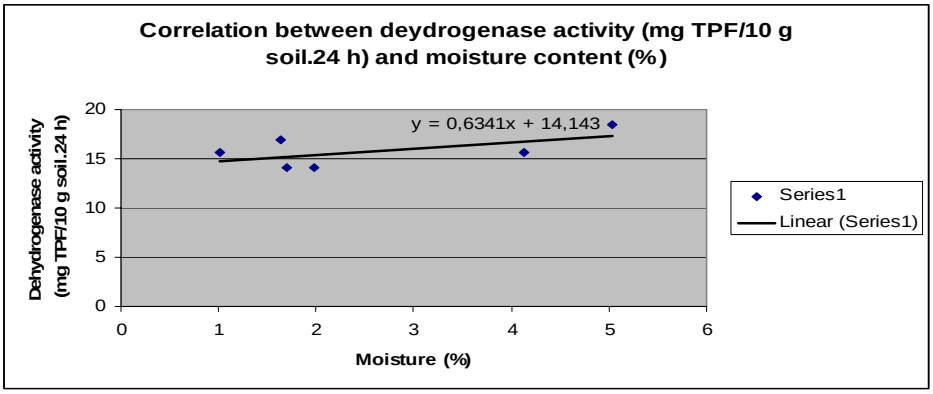

Fig. 1. Correlation between dehydrogenase activity and soil moisture

Correlation coefficient (r=0,59) show that dehydrogenase activity depends in a small measure by the moisture content of haplic luvisol.

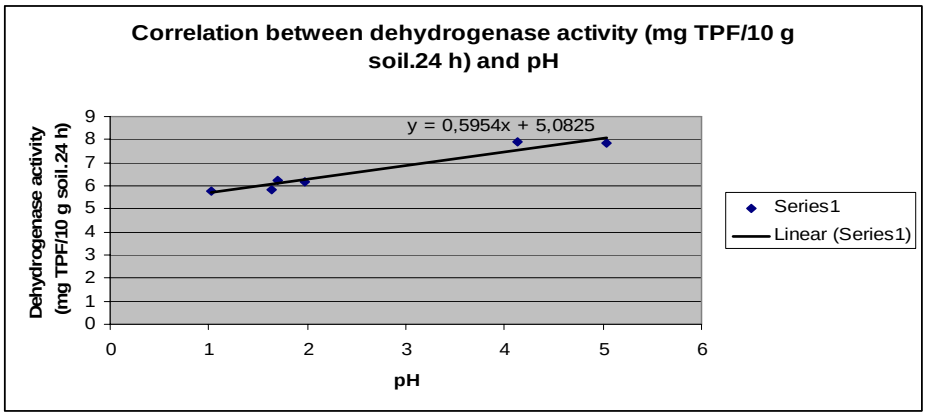

Fig. 2. Correlation between dehydrogenase activity and pH

As it can be seen between dehydrogenase activity and pH is a strong correlation (r=0,97). These enzymes are produced by various organisms and act intra- or extra- cellular.

Soil enzymes are mainly of bacterial and fungal origin, and in conclusion, increasing of the pH values is strong correlated with increasing of enzymes activity.

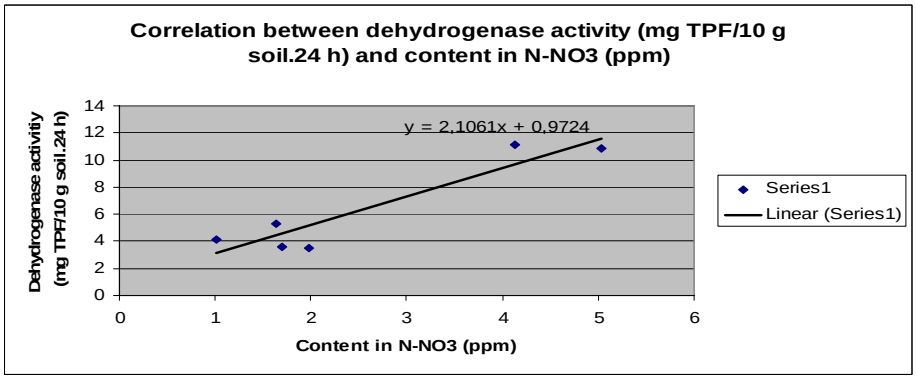

Fig. 3. Correlation between dehydrogenase activity and content in $N\text{-}NO_3$ of preluvosoil

To observe the biological activity of preluvosoil depending of the content in $N\text{-}NO_3$ dehydrogenase activity was correlated with $N\text{-}NO_3$. Dehydrogenase activity showed a strong positive correlation to soil content in $N\text{-}NO_3$. (r=0,93).

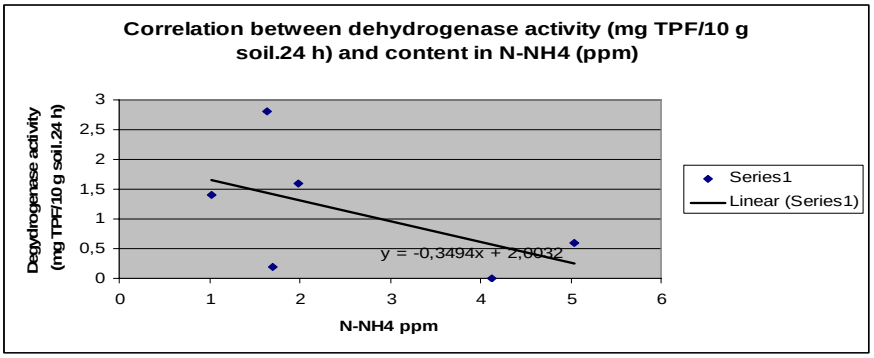

Fig. 4. Correlation between dehydrogenase activity and content in N-NH_4

Fig. 4 showed that between dehydrogenase activity and content in N-NH_4 exist an inversely proportional correlation (r=-0,53).

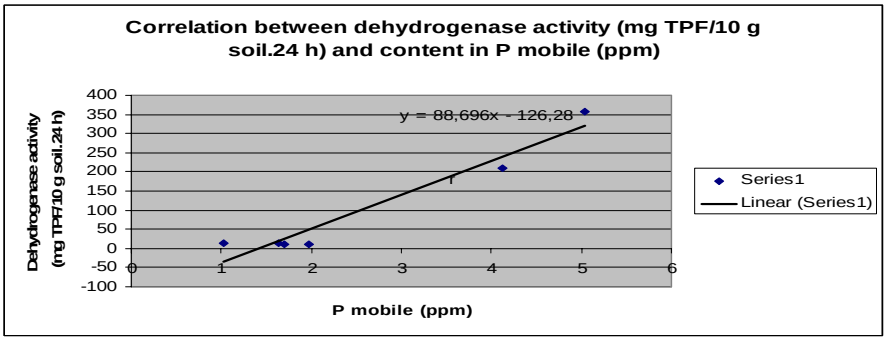

Fig. 5. Correlation between dehydrogenase activity and P mobile

As it can be seen, dehydrogenase activity depends by the content in P of preluvosoil (r=0,97).

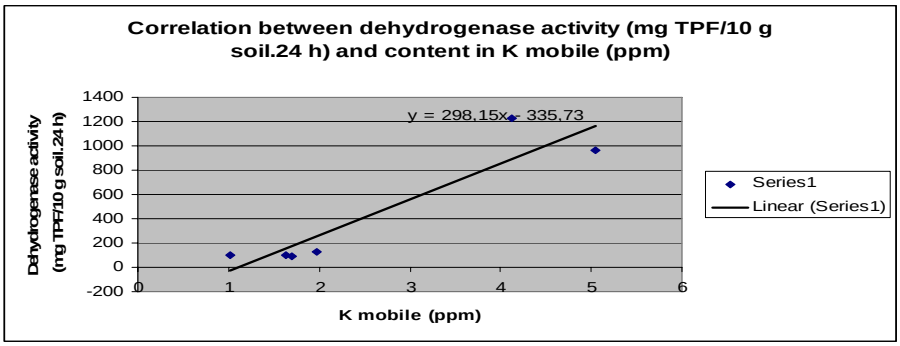

Fig. 6. Correlation between dehydrogenase activity and content in K

Fig. 6 shows the strong correlation between dehydrogenase activity and content in K mobile of preluvosoil (r=0,92).

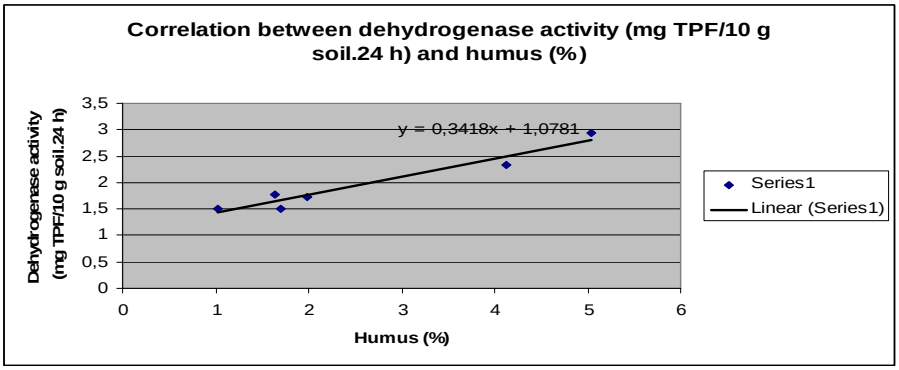

Fig. 7. Correlation between dehydrogenase activity and humus

Several enzymes are known to be present in the soil which catalyze organic matter turnover. In this way, between the content in humus and dehydrogenase activity exist a strong positive correlation (r=0,97).

CONCLUSIONS

From research it is evident that physicochemical properties of soil can influence the activity of soil enzymes.

The results presented in this study showed the strong correlation between enzymatic activities of haplic luvisol under different management practices and cultivation condition and pH, content in humus, $N\text{-}NO_3$, $N\text{-}NH_4$, mobile phosphorus, mobile potassium.

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