RESEARCH ON THE BIOTIC AND ENZYMATIC POTENTIAL OF SOIL FROM TÂRGU FRUMOS MICROREGION

CERCETARI PRIVIND POTENTIALUL BIOTIC ŞI ENZIMATIC AL SOLULUI DIN CADRUL MICROZONEI TARGU FRUMOS

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Abstract. *The research was carried out in the vegetable ecosystem of Târgu Frumos microregion in 2010 – 2011. The biotic potential level illustrate an physiological activity of the totality of soil microbiota (microflora, edaphic mezofauna) which is involved in biochemical transformation of organic matter, humus and mineral soil material. The assessment of potential biotic and soil enzyme from Târgu Frumos microarea was possible with quality indicators in terms of pedobiological ecoclimatice of the year 2010 from the research stationary studied AF Maxim and A.F. Vavilov in vegetable ecosystems exploited in conventional system. The biological analysis of soil including the determination of soil physiological microflora (soil respiration and celulozoliza) and enzyme activity (catalase, invertase, urease and phosphatase).*
Key words: vital soil potential, enzymatic soil potential, biological soil analysis soil.

Rezumat. *Cercetările au fost desfăşurate în cadrul ecosistemului legumicol al microzonei Târgu Frumos în 2010. Nivelul potențialului biotic ilustrează activitatea fiziologică a totalității microbiotei solului (microfloră, mezofaună edafică) care este implicată în procesele biochimice de transformare a materiei organice, a humusului şi a materiei minerale din sol. Evaluarea potențialului biotic şi enzimatic al solului din microzona Târgu Frumos a fost posibilă cu ajutorul indicatorilor de calitate pedobiologică în condițiile ecoclimatice ale anului 2010 din staționarele de cercetare luate în studiu A.F. Maxim şi A.F. Vavilov în ecosisteme legumicole exploatate în sistem convențional. Analiza biologică a solului include determinarea activității fiziologice a microflorei solului (respirația solului şi celulozoliza) şi a activității enzimatice (catalaza, invertaza, ureaza şi fosfataza totală).*
Cuvinte cheie: potențial vital al solului, potențial enzimatic al solului, analiza biologică a solului.

INTRODUCTION

Fundamental quality of the soil in relation to known biological soil fertility factor (Stefanic, 1994, Stephanic et al., 2006; Bireescu, 2001) is a fundamental feature that characterizes micropopulation vital activity of soil, plant roots, the enzyme accumulated and biochemical processes. The fertility

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potential of the process depends on the accumulation and mineralization of soil organic matter specific, which in turn depends on the program and environmental conditions of the ecological subsystem development and anthropogenic influences (Gianfreda et al., 2005). The relationship between microbial diversity and the normal functioning of the soil is understood, on the one hand, the relationship between genetic diversity and microbial community structure and on the other hand, the relationship between microbial community structure and its function (Nannipieri et al., 2002).

The main goal of our research was to analyse the biotic and enzymatic potential of soil from Targu Frumos vegetable microzone, which could be extremely important in assessment of sustainability of vegetable production.

MATERIAL AND METHODS

The research was conducted in 2010 - 2011 in the ecosystem of micro-area vegetable Târgu Frumos for two micro-area, A.F. Maxim and A.F. Vavilov, in order to evaluate potential biotic and enzyme land in this area (Munteanu, 2009).

Samples were taken 0-20 cm soil depth on plant row and the rows where the potential range of vital biological and enzyme can be strong, being the most active roots action.

To study the effects of human intervention and technological elements in the two ecosystems vegetable was determined experimentally, physiological potential of the soil, resulted in potential respiration (Stefanic, 1994, 1999) and cellulolytic potential of soil (Stefanic, 1994, 1999) and potential soil enzyme (catalase, sucrase, urease, phosphatase total).

The determination of soil respiration was possible using respirometry by Stefanic et al. (1998) able to replace oxygen consumed in the process of soil respiration and capture CO_2 released.

The method used for determining cellulolytic potential of soil (Stefanic, 1994, 1999) is based on replacement blade cotton cloth contains 50% cotton + 50% polyester, spun common thread that, following the celulozolise to wash cloth, not to produce loss of cloth degraded and appear as an exaggerated celulozolise.

Potential catalase activity is determined in the laboratory using a device called catalazometre. Principle is based on the fact that enzymatic and chemical reaction takes place simultaneously in the soil and therefore to get only the value will be determined separately catalase activity in soil samples inactivated enzyme catalytic activity (chemical) soil (Stefanic et al., 2006).

Sucrase activity in the soil analysis was made possible by the spectrophotometric method to determine the amount of reducing sugars (glucose and fructose, mg/100 g soil su) hydrolyzed enzymatically from sucrose.

Principle of determination of urease activity is that, ammonia result is determined quantitatively by colorimetric, with Nessler solution.

The principle method for determining the potential phosphatase activity is introduction, the enzyme mixture, a quantity of glucose act as "traps" for phosphate ions combine with free enzyme, determining the amount of glucose remaining uncombined. This can then be converted to equivalent phosphorus (P) with an index which is the quotient ratio combining phosphorus with glucose, determined experimentally by Stefanic (1999), within the limits of possible concentrations of phosphorus released free enzyme + phosphorus in soil and sugar added the reaction mixture.

RESULTS AND DISCUSSIONS

Biotic potential (vital) of the soil - soil respiration

Stationary Tg. Frumos-A.F. Maxim, the 0-20 cm depth, the values are the mean potential respiratory cultures among solar plant, varying slightly from 23.42 mg CO_2 for growing peppers - Maradona F1 to 26, 07 mg CO_2 from cucumber - Merengue.

The range of soil respiration values are lower rows nearly 50% due to summer hard consistency, low aeration porosity of soil compaction and lack of regular loose soil.

Stationary Tg. Frumos-A.F. Vavilov, the 0-20 cm depth, the values are of potential respiratory medium, comparable to those of tunnels from the solar A.F. Maxim crops among the plants, varying slightly from 24.81 mg CO_2 culture cucumbers, up to 26.14 mg CO_2, the solarium planted with tomatoes.

The range of soil respiration values are lower rows nearly 50% due to consistency

Celulozolise

For the vegetation samples for analysis at harvest time, cellulolytic potential values increase, similar to those of soil respiration, with somewhat higher values in A.F. Vavilov. These values vary among the plants A.F. Maxim between 24.53 to 27.16% cellulose and the range appear much lower values ranging from 12.65 to 15.44% cellulose.

These values vary among the plants A.F. Vavilov 25.33 to 27.18% cellulose and the range appear much lower values ranging from 13.24 to 18.27% cellulose.

Potential enzyme - catalase potential

Pedoensimatic research on the physiological potential of certain specialized enzymes to catalyze decomposition of organic waste and organic fertilizers in conventional stationary vegetables, are presented in Table 1.

Stationary Tg. Frumos – A.F. Maxim, the depth of 0-20 cm, and the values are the mean potential of catalase to the cultures of greenhouses, row of plants that vary slightly from 317-351 cmc O_2. The ranges of rows to 50% lower values.

Stationary Tg. Frumos – A.F. Vavilov, the depth of 0-20 cm, and the values are mean catalase medium potential slightly lower than those of greenhouses from A.F. Maxim values ranging from 303-322 cmc O_2. The ranges of rows to 50% lower values.

Sucrase potential

Stationary Tg. Frumos – A.F. Maxim, the depth of 0-20 cm, and the values are the mean sucrase potential plant row between 568-756 mg glucose, much higher than the beginning of the vernal season.

Table 1

Biotic potential and enzymatic study of vegetable agroecopedotops
Targu Frumos 2010

Stationary	Culture	Specification	BIOTIC AND ENZYMATIC POTENTIAL					
			Respir. (mg CO_2)	Celulozolise (%celulose)	Catalase (cmc O_2)	Sucrase (mg gl)	Urease (mg NH_4)	Total Phosphatase (mg P)
Tg.Frumos A.F.Maxim 0-20cm	Tomato *Granadero F1*	Row	25,86	26,31	317	756	6	4,2
		Interval	14,71	15,44	152	273	3	2,1
	Tomato *Caliope F1*	Row	24,31	25,21	336	684	5	3,7
		Interval	13,17	14,36	125	315	2	1,8
	Pepper *Maradona*	Row	23,42	24,53	351	568	4	4,6
		Interval	11,31	12,65	172	276	2	2,3
	Cucumber *Merengue*	Row	26,07	27,16	342	618	3	4,8
		Interval	13,51	14,08	171	306	1	2,1
Tg.Frumos A.F.Vavilov 0-20cm	Tomato *Belle F1*	Row	26,14	27,18	312	754	7	4,4
		Interval	14,05	13,24	165	471	4	3,0
	Cucumber *Merengue*	Row	24,81	25,33	322	788	9	3,7
		Interval	17,03	18,27	161	442	4	1,8
	Pepper *Verdana*	Row	25,13	26,54	303	715	7	4,8
		Interval	13,08	14,41	152	407	3	2,3

The ranges of rows to 50% lower values.

Stationary Tg. Frumos – A.F. Vavilov, the depth of 0-20 cm, the values are mean sucrase potential, something greater than 715-788 mg glucose A.F. Maxim respectively.

The interval between rows of plants, compared with plants that are irrigated row and loose, the average decrease by 50%, in submijlociu.

Potential urease

Stationary Tg. Frumos – A.F. Maxim, the depth of 0-20 cm, the values are the mean potential urease row crops in greenhouses for plants, ranging from 3-6 mg NH_4 easy.

The interval between rows of plants, compared with plants that are irrigated row and loose, the average decrease by 50% in the small.

Stationary Tg. Frumos – A.F. Vavilov, the depth of 0-20 cm, and the values are the mean potential of urease, something greater than A.F. Maxim between 7-9 mg NH_4.

The interval between rows of plants, compared with plants that are irrigated row and loose, the average decrease by 50%.

Potential total phosphatase

Stationary Tg. Frumos – A.F. Maxim, the depth of 0-20 cm, the values are the mean total phosphatase potential for growing vegetables in solar light among plants ranging from 3.7 to 4.8 mg P, higher than the vernal season.

The interval between rows of plants, compared with plants that are irrigated row and loose, the average decrease by 50%.

Stationary Tg. Frumos – A.F. Vavilov, the depth of 0-20 cm, the values are the average potential of solar phosphatase crops among the plants, comparable to those of A.F. Maxim 3.7 to 4.8 mg P.

The interval between rows of plants, compared with plants that are irrigated row and loose, the average decrease by 50%.

Biological activity is lower due to poor physical and mechanical properties (medium-fine texture soil, low aeration porosity and texture summer hard soil and the human impact of subsidence phenomenon and especially stressful and limiting the impact of risk factors conventional technology system.

CONCLUSIONS

1. The biotic potential physiological activity illustrate the totality of soil microbiota (microflora, mezofaună edaphic) which is involved in biochemical transformation of organic matter, humus and mineral soil material;

2. Values as indicators of fertility and are influenced by specific environmental conditions and the microclimate of a technological nature;

3. Lower biological activity especially within the physical and mechanical properties due to faulty (medium-fine texture soil, low aeration porosity and consistency summer hard soil and human impact through phenomena due to subsidence and the effects of stressful and limiting factors risk to life in the soil.

4. These positive features are due to increased levels of some chemical

quality and especially the fertility and biological quality under stressful and mitigation of risk factors determined by the conventional system in which risk factors significant roles in limiting and stressful have.

REFERENCES

1. **Bireescu Geanina, 2001** - *Cercetări privind procesele vitale si enzimatice în soluri forestiere si agricole din Moldova* - Teză de doctorat, USAMV Bucuresti.
2. **Gianfreda L., Rao M.A., Piotrowska A., Palumbo G., Colombo C.M., 2005 –** *Soil enzyme activities as affected by anthropogenic alterations: intensive agricultural practices and organic pollution* – Science of the Total Environment, 341, p. 265-279.
3. **Munteanu N., 2009 –** *Proiect SIECOLEG – Raport intermediary etapa a II a / 2009. Contract de cercetare nr. 52-141/2009 cu CNMP.*
5. **Nannipieri P., Kandeler E., Ruggiero P., 2002** – *Enzyme activities and microbiological and biochemical processes in soil* - Enzymes in the Environment Activity, Ecology and Applications. New York:Marcel Dekker, 2002, p.1-33.
6. **Ştefanic G., 1994** - *Cuantificarea fertilității solului prin indicatori biologici* - Lucr. Conf. Naț. Şt. Sol., Tulcea, vol. 28A, p. 45-55.
7. **Ştefanic G., 1999** – *Metode de analiză biotică, enzimatică si chimică a solului*. Rev. Agrofitoteh. Teoretică si Aplicată, ICCPT Fundulea, supliment.
9. **Ştefanic G., Oprea G., Irimescu M. E., 1998** – *Research for developing indicators of biological, chemical and soil fertility potential* – Soil Science, XXXII, nr.1-2, p. 37-47.
10. **Ştefanic G., Săndoiu D., Gheorghiță Niculina, 2006** - *Biologia solurilor agricole*. Ed. Elisavaros, Bucuresti.