RESEARCH PAPER | Agriculture | Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X

Research on the Potential of Breath Modification Under the Influence of Soil Works Soil

KEYWORDS: agricultural technology works, potential respiration, soil, chernozem

Mariana Burcea	Daniela Creţu	Marian Musat
University of Agricultural Sciences and Veterinary Medicine - Bucharest, no. 59, bd. Marasti, District 1, Romania	University of Agricultural Sciences and Veterinary Medicine - Bucharest, no. 59, bd. Marasti, District 1, Romania	University of Agricultural Sciences and Veterinary Medicine - Bucharest, no. 59, bd. Marasti, District 1, Romania

ABSTRACT *The studies which are the subject of this research have been carried out to highlight the changes in the biological properties of the soil under the influence of culture and agro-technologies in order to identify measures to avoid potential reduction of fertility of the soil as well as long-term knowledge of the effect of the application of the various tillage systems on a chernozem soil type situated in SE Romania. Thus, it requires the development of soil conservation systems characterized by productivity, the climate and the ability to conserve natural resources, resulting harmony between soil fertility, system of machinery, soil protection and increase agroecosystems' biodiversity.*

INTRODUCTION

Requirements of conservation agriculture have led to the introduction and development of a new concept called "system for soil conservation tillage" (Guş, Rusu, and Bogdan, 2003), that the system tillage will improve the productive potential of the soil. At the opposite end is precision agriculture, the most advanced form of agriculture that is practiced in developed countries in Europe and the U.S., which involves assessing soil fertility indicators, one of them being potential soil respiration.

In addition to the conservative soil tillage, with major importance in increasing the fertility of the soil, is the application of fertilizers, phosphorous, potassium and nitrogen, which maintains a proper supply of nutrients in the soil and the water potential balanced in plants cells. The favourable effect of balanced nutrition, especially for wheat, has been emphasized by Shaktawat (2013). Sustainability of agriculture, we are all striving, involves monitoring the evolution of negative or positive characteristics of the soil, soil quality and their impact on agroecosystems.

METHDOLOGY

Research and comments were made in 2012, in a stationary experience (long-term experience) with four tillage systems, established more than 20 years, at Mărculeşti Agricultural Research and Development Station [ARDS], located in SE Romania, in the plain area. The area has a temperate continental climate, with maximum temperature exceeding 38^{0}C and lower rainfall 116 mm, compared to the annual average.

The soil is represented in 99% of the surface of cernisols, soil that is located the experience being a mold type with a silty loam texture, humus content of 3% and slightly alkaline reaction (8-8.5).

The existing experimental variants in a wheat-maize-soybean rotation, are placed randomly in four replications as blocks method.

Experimental variants that are studied are:

V1 - the annual autumn ploughing 23-25 cm + 2 disk tillage, the witness (At);
V2 – Autumn tillage with disk harrow for 2 years and one year with chisel (D2/C);
V3 – Autumn tillage for 8 years with disk harrow (D8);
V4 – Autumn tillage with chisel at 20 cm for 8 years (C8);
V5 – No tillage for 8 years, and for the cleaning of vegetal detritus made a pass with combiner (N8).

Soil samples were taken at the end of the growing season, and laboratory analyzes were made by the method of determining respiratory activity of the soil used in the Agrotechnics' laboratory of Veterinary Medicine Bucharest.

The principle of the method is to capture the oxygen released by the microorganism during the breath, in 0.2 N NaOH and NaOH titration of the excess of HCl 0.1 N remained bonded in the presence of 1% of timolftalein indicator.

Calculation and expression of results are according to the formula:

CO_2 mg/100g soil su = (A-B) × f × 2.2 × 5 × KU, where:

A = number of ml of HCl, which were carried out in flasks control titration (average of 3 repetitions);

B = number of ml of 0.1N HCl titration was performed for each soil samples;

2.2 = CO_2 equivalent in mg per 1 ml of HCl 0.1N;

f = correction factor;

5 = coefficient of 20g soil reporting, taken from 100g soil analysis;

KU = correction factor for soil moisture.

U % = water / soil dry × 100

Determination of the correction factor (f) is according the formula: f = 0.019011 × 10/0.019011 x ml HCl.

Experimental results were statistically processed by analysis of variance, F-test and differences limit appropriate alignment method (Ceapoiu, 1968).

CASE STUDY

The climatic data are very importantes in its influence on soil respiration activity, which acts on the air/water ratio in the soil.

The area is characterized by a temperate plains with a high degree of continental climate, with large temperature contrasts in winter (-2^{0}C, -4^{0}C in January and minimum possi-

Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X

ble by -30^{0}C) in summer (22^{0}C-23^{0}C in July and peaks above 40^{0}C). Romania climate has continental boreal character that determines significant temperature fluctuations (Dragomirescu and Enache, 1998).

The soil analyzes made in different versions tillage systems, show the influence of tillage method on soil respiration potential. This is a global indicator for the evaluation of living in soil.

On wheat crop, potential soil respiration, as a result of various technologies applied on chernozem in SE Romania, show values of 27.18 mg CO_2/100g su solution in conventional tillage system (At), indicating the great soil biological activity, followed by the chisel soil tillage system (C8), with a potential soil respiration of 26.75 mg CO_2/100g solution su.

After the two different tillage, follows the D2/C1 tillage, where the potential soil respiration is 23.03 mg CO_2/100g su solution due to intense soil tillage and crumbling soil from the surface horizon pedogenesis.

Compared with conventional tillage system (At), which is considered the control, the option with disk tillage every year (D8) recorded the lowest biological activity of the soil (12.61 mg CO_2/100g solution su), the difference being provided statistically highly significantly negative, followed by the version that was directly sowing into the soil (N8) with values statistically significantly negative solution of 18.96 mg CO_2/100g su, presented in Table 1.

Table - 1 THE INFLUENCE OF SOIL TILLAGE ON THE POTENTIAL SOIL RESPIRATION, FOR WHEAT CROP 2012

Soil tillage system	Potential soil respiration		Difference mg CO_2/100g solution s.u.	Statistical semnificance
	mg CO_2/100g solution s.u.	%		
Annual autumn ploughing (conventional tillage) (At)	27,18	100	Mt	
No-tillage for 8 years (N8)	18,96	69,75	-8,22	0
Disk ploughing for 2 years/chisel (D2/C1)	23,03	84,73	-4,15	
Disk ploughing for 8 years (D8)	12,61	46,39	-14,57	000
Chisel ploughing for 8 years (C8)	26,75	98,41	-0,43	
Tukey's test: $DL_{5\%}$ = 5,89; $DL_{1\%}$ = 8,57; $DL_{0,1\%}$ = 12,87				

This kind of researches were made by Raich and Tufekcioglu (2000) and Bonan (1993), highlighting the fact that the soil respiration also varies with vegetation. Such findings indicate that vegetation type is an important determinant of soil respiration rate, and therefore that changes in vegetation have the potential to modify the responses of soils to environmental change.

CONCLUSIONS

The soil tillage system, especially the primary soil tillage affect directly the fertility indices that define the soil fertility, and conditions that ensure the normal growth and development of plants. Different methods of tillage (ploughing, disking, chisel), direct sowing into non-tillage soil have significantly influenced on potential soil respiration.

Analysis of variance revealed significant differences of potential soil respiration in five tillage variants studied.

The intense biological activity was recorded in the variant ploughing every year, and the reduced value was in disk ploughing soil and where was direct sowing into non-tillage soil, as a result of differentiation of microorganisms living conditions ground.

REFERENCE [1] Bonan, G.B. (1993). Physiological controls of the carbon balance of boreal forest ecosystems. Can. J. For. Res. 23: 1453–1471; | [2] Burcea, M. (2007). PhD Thesis, Cercetări privind starea solului sub impactul lucrărilor tehnologice agricole. University of Agronomic Sciences and Veterinary Medicine of Bucharest. | [3]Ceapoiu, N. (1968). Metode statistice aplicate în experienţele agricole şi biologice. Edit. Agro-Silvică, Bucureşti. | [4]Dragomirescu, E., Enache, L. (1998). Agrometeorologie. Edit. Didactică şi Pedagogică, R.A. Bucureşti. | [5] Guş, P., Rusu, T., Bogdan, I., (Eds.). (2003). Sisteme convenţionale şi neconvenţionale de lucrare a solului. Editura "RISOPRINT", Cluj-Napoca, pp. 204. | [6] Raich, J. W. & Tufekcioglu, A. (2000). Vegetation and soil respiration: Correlations and controls. Biogeochemistry no. 48: pag 71–90, Kluwer Academic Publishers. Printed in the Netherlands. | [7] Shaktawat, R.P.S., Singh, H.P., Singh, D., Somvanshi, S.P.S., (2013). Front Line Demonstrations of Different Crop Management Practices în Malwa Region of Madhya Pradesh. In Indian Journal of Applied Research, Volume 3. | | |