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MODIFICATION OF MAIN SOIL AGROCHEMICAL INDICATORS UNDER DIFFERENT FERTILIZATION SYSTEMS APPLIED IN GREENHOUSE FOR MAIZE AND OATS YIELDS

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Abstract

The main objective of this study was to monitor the effect that different systems of fertilization have on maize and oats yields. The research aims to find technological solutions to increase salinity tolerance in plants by application of different fertilization systems in specific conditions of soil and plant. In this context, the paper presents the results obtained after the first year of research concerning the influence of fertilization on the agrochemical indicators of soil. The fertilization system consisted in applying different doses of fertilizers on alluvial Gleyic Solonchak from Traian, Braila. The experiment has been organized in vegetation pots (Mitscherlich type) with a capacity of 20 kg soil. Therefore, a trifactorial experiment A (plant) x B (organic fertilizer) x C (foliar/mineral fertilizer), in four repetitions has been established. Fertilization system consists in organic fertilization, by applying manure, and in mineral fertilization, by applying foliar fertilizers and complex fertilizers (N, P, K). In parallel with the effect of fertilizers on agrochemical main indicators: pH, humus, total nitrogen, available phosphorus and potassium, the effects of fertilizer on maize and oats yields were also studied. For the assessment of agrochemical indicators, soil analyzes at the establishment of experience, and after the first research year was done. The results were interpreted according to the actual soil study methodology. For a better analysis of the agrochemical indicators, the experiment is carried out in the same circumstances in 2012 also, on soils affected by salinization.

Key words**:** *agrochemical indicators, fertilization system, soil, maize, oats.*

INTRODUCTION

The applicative character of Agro-chemistry results from the development of solutions for proper soil fertilization, plant and soil protection against negative effects that are caused by excess or deficiency in certain elements or chemicals required by crops to obtain increased yields.

In order to highlight the changes that occur in the agrochemical state of soil, and in its fertility state, under the influence of various agricultural technology systems, specific indicators were selected as follows: soil reaction, organic matter content or humus content and the content of main macronutrients: nitrogen, phosphorus and potassium [2].

This paper aims at presenting the results obtained in the first year of research on the influence of fertilization on soil characteristics and production.

MATERIAL AND METHOD

Researches aim to find technological solutions to increase plant tolerance to salinity by application of different fertilization systems in soil and plant specific conditions.

Therefore, an experiment was carried out in the green house of INCDPAPM-ICPA Bucharest, with a fertilization system represented both by organic fertilization, by applying manure, and mineral fertilization, by applying liquid fertilizers and foliar complex mineral fertilizers (N, P, K).

The experiment was organized in Mitscherlich pots vegetation type, with a capacity of 20 kg soil. The soil is Gleyic luvic Solonchack from Traian, Braila county. The study crops are maize and oats.

A trifactorial experiment, A x B x C type, four repetitions hab been carried out (Fig. 1):

A Factor	a_1	- oats
(plant)	a_2	- maize
B Factor	b_1	- without
(organic fertilizer)	b_2	- 30 t/ha manure
	b_3	- 60 t/ha manure
C Factor	c_1	- without
(foliar/mineral fertilizer)	c_2	- 3 foliar treatments with “Amino-fert NPK”
	c_3	- $N_{100}P_{80}K_{60}$

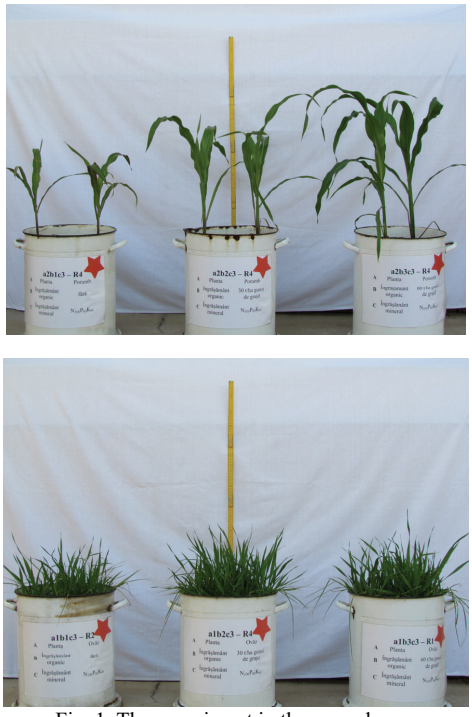

Fig. 1. The experiment in the green house

The organic and mineral (N, P, K) fertilizers were incorporated into the soil at the beginning of the experiment, while the foliar one was used during the growing season.

To assess the impact of different fertilization systems on soil and yields, soil samples were collected from vegetation pots for different analysis and soil characterization, and for highlighting the effects of soil type, plant and fertilizer type on the final yields.

Soil samples were analysed at the beginning of the experiment (Benchmark) and at the end of growing phase of oats and maize for the first year of research.

The analytical data were interpreted according to "Methodology of soil survey studies", Volume III [1].

RESULTS AND DISCUSSIONS

Some soil characteristics for the soil samples will be described and characterized here:

- *pH variation:* soil reaction ranges from 8.08 to 8.23 for maize and 8.24 - 8.31 for oats, being moderate alkaline (Fig. 2). There is a decrease in pH values comparing to the Benchmark values (8.36, a value that falls in the class of strong alkaline pH), resulting from fertilization system chosen;

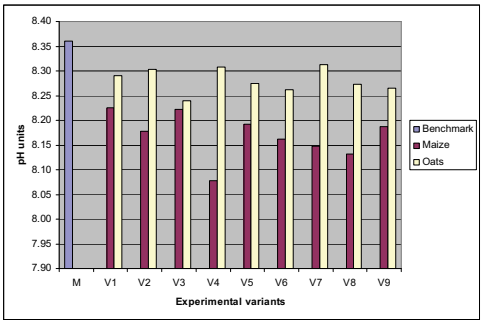

Fig. 2. pH variation

- *Humus content variation:* humus content ranges from 1.59 to 1.86% for maize and 1.64 - 2.15% for oats crop, being small to medium (Fig. 3). There is an increasing variation of humus content compared to the Benchmark (1.68%), approximately in the same class. For some specific variants, it passes in the next class, with a medium supply with humus, explained by different manure doses applied in the first moment of the experiment;

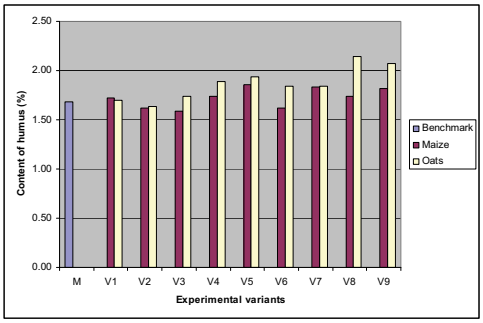

Fig. 3. Changes in humus content

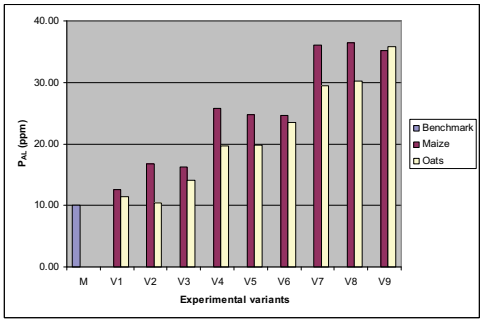

Fig. 5. Changes in mobile phosphorus content (P_{AL})

Total nitrogen content variation: total nitrogen content is very low, ranging from 0081 to 0097% for maize and from 0091 to 0107% for oats (Fig. 4). There is an increase in total nitrogen content values compared to the benchmark (0.054%), provided by the nitrogen from the organic fertilizer;

Mobile potassium content variation: it is small to medium and ranges from 117 to 170 ppm for maize and 119 to 164 ppm for oats (Fig. 6). There is an increasing content of mobile potassium comparing to the benchmark, from the low supply class to medium supply class, due to the chosen fertilizer system;

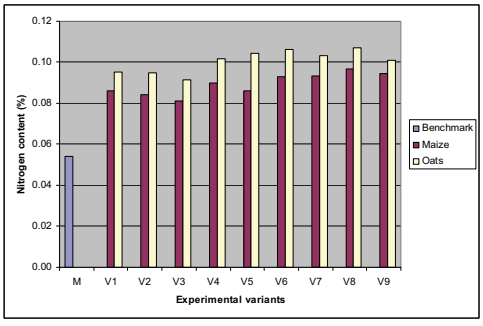

Fig. 4. Changes in total nitrogen content (Nt)

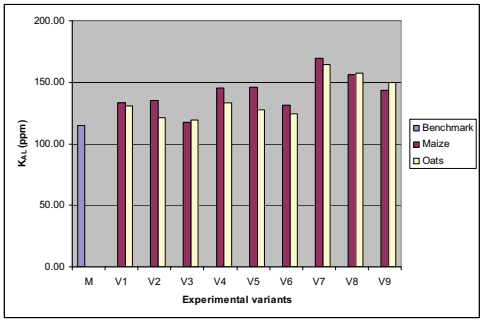

Fig. 6. Changes in mobile potassium content (K_{AL})

Mobile phosphorus content variation: it is small to medium and varies from 13 to 36 ppm for maize and 10 to 36 ppm for oats (Fig. 5). There is an increasing mobile phosphorus content compared to the benchmark (10 ppm), passing from the low supply class to the medium one, due to the chosen fertilizer system;

For maize, there is noticed a significant increase of yield comparing to benchmark, for variants V_3 = 7532 kg/ha (only mineral fertilizer $N_{100}P_{80}K_{60}$ was applied), V_6 = 9302 kg/ha (30 t/ha manure and $N_{100}P_{80}K_{60}$ were applied) and V_9 = 11292 kg/ha (60 t/ha manure and $N_{100}P_{80}K_{60}$ were applied) (Fig. 7).

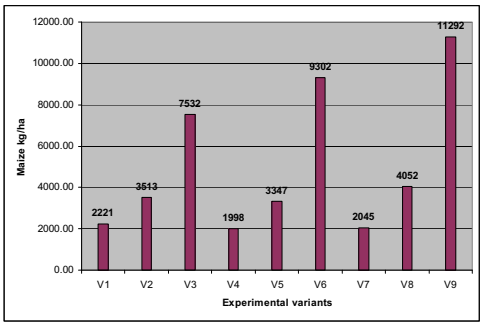

Fig. 7. Changes in maize yields

For oats, there is noticed an increase of yield comparing to benchmark, for variants V_6 = 2795 kg/ha (30 t/ha manure and $N_{100}P_{80}K_{60}$ were applied), V_8 (60 t/ha manure and 3 foliar treatments with Amino-fert NPK were applied) and V_9 = 11292 kg/ha (60 t/ha manure and $N_{100}P_{80}K_{60}$ were applied) (Fig. 8).

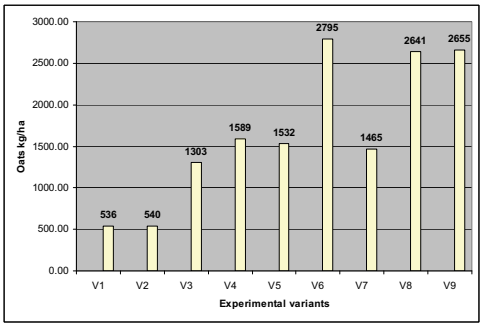

Fig. 8. Changes in oats yields

CONCLUSIONS

After the first year of experiment in green house, the evolution of agrochemical state of the Gleyic luvic Solonchack was studied, and we can say that all indicators had a positive development track, due to the applied fertilizer.
It is found that the highest yields were obtained for both crops in V9 variant, when the highest dose of manure and mineral fertilizer (60 t/ha manure and N100P80K60) have been applied.

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REFERENCES

[1] Florea, N., Bălăceanu, V., Răuță, C., Canarache, A. (redactori coordonatori), 1987. *Methodology of soil survey studies*. Agricultural Technical Prop. Red., Bucharest, vol. III, 226 p.
[2] Marinca, C., Dumitru, M., Borza, I., Ţărău, D., 2009. *Soil and soil fertility – relating with the agricultural systems from Banat*. Mirton Publishing House, Timisoara, 628 p.