PRELIMINARY DATA REGARDING THE EFFECT OF FERTILIZATION ON MACRONUTRIENTS CONTENTS IN MAIZE PLANT

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Abstract: *The main objective of this study was to evaluate the mineral nutritional status of maize in relation with fertilization system. In this context, the paper presents the results obtained after the first year of research concerning the influence of fertilization on the content of macronutrients in maize. For the evaluation of mineral nutrition of maize, measurements of macronutrients have been carried out in the 3-5 leaves stage and plant harvesting stage, respectively. The application of manure and industrial fertilizers is intended to supply the needs of nutrients for plant in certain critical periods of their nutrition and therefore to increase the yields. The fertilization consisted in applying of different doses of fertilizers, on alluvial gleyic Solonchak from Traian - Braila. The experiment has been organized in vegetation pots (type Mitscherlich) with a capacity of 20 kg soil, the PR39D81 maize hybrid. Therefore, a trifactorial experiment A x B x C, in four repetitions has been established. The results were interpreted taking into account the optimal mineral nutrient limits for maize mentioned in the literature. Several conclusions regarding the influence of fertilizers applied to maize, based on interpretation of partial results for the experiment carried out in 2011, are as follows: for the first stage (the 3-5 leaves stage), the macro nutrients contents (% from dry matter) vary depending on the element analyzed as follows: N and P – poor to normal, K – normal to high, Ca and Mg – normal; in the second studied stage (maturity stage), the macro nutrients contents (% from dry matter) vary as follows: N, P and K – poor, Ca and Mg – normal. For a better analysis of the macronutrients contents in maize, on soils affected by salinization, the experiment is carried out in the same circumstances in 2012 also. In the process improvement of salt affected soil, a specific attention must be given in selecting salt tolerant crops according to the stage of the improvement process. It has to be noticed that in the first phase of improvement, the used crops include plants more tolerant to salts, while in the last phase of improvement, when soils become more fertile and with a lower salt content, it is possible to use crops less sensitive to salts, such as rapeseed, soybean, maize, etc.*

Key words**:** *macronutrients, maize, fertilizers system*

INTRODUCTION

In order to maximize the productive potential, crop needs adequate amounts of water, light, carbon dioxide and mineral nutrients (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, and some trace elements). Soil is the main source of mineral nutrients and water for plants. Ability to provide necessary nutrients to plants varies depending on the fertility level (SIMOTA and DUMITRU, 2007).

The application of manure and industrial fertilizers is intended to supply the needs of nutrients for plant in certain critical periods of their nutrition and therefore to increase the yields.

In this context, this paper aims to present the results obtained in the first year of research on the influence of fertilization on the content of macronutrients in maize.

MATERIAL AND METHODS

For this experiment in laboratory, in the greenhouse of INCDPAPM-ICPA Bucharest, both organic fertilization, by applying manure, and mineral fertilizer, by applying foliar fertilizers and complex fertilizers (N, P, K) have been chosen.

The experiment has been organized in vegetation pots (type Mitscherlich) with a capacity of 20 kg soil, the PR39D81 maize hybrid being cultivated on alluvial gleyic Solonchak from Traian - Braila.

Therefore, a trifactorial experiment A x B x C, in four repetitions has been established (Fig. 1):

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

Figure 1. The experiment in greenhouse

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

The organic fertilizer (manure) was purchased from a dairy farm of INCDCB Balotesti, while the mineral one was prepared in the INCDPAPM-ICPA Bucharest.

The concentration of the foliar fertilizer "Amino-fert NPK" was 1%, while the amount of solution used for an application was 30 ml/pot.

Plant samples have been collected at two stages: the 3-5 leaves stage and the maturity stage.

For the plant samples, the following measurements have been carried out: total nitrogen, determined by the Kjeldahl method, and other macronutrients (P, K, Ca, Mg), which were determined in hydrochloride solution obtained by leaching the plant ash after incineration. Measurements were carried out by visible spectroscopy (P), flame photometry (K, Ca) and atomic absorption spectrometry (Mg).

Analytical data were compared with some existing thresholds from the literature, considered to be optimal.

RESULTS AND DISCUSSIONS

The results of the studied microelements' in plant (N, P, K, Ca, Mg), after the first year of research, in greenhouse, were as follows:

- the percent of N in maize plant varies between 1.970 and 2.338% for the first studied stage (3-5 leaves); and between 0.211 and 0.296% for the second stage (maturity). Values fall in the weak concentration interval (Fig. 2), low concentrations of nitrogen occur frequently, even on soils with normal or relatively high content of soil organic matter;

- the percent of P in maize plant varies between 0.169 and 0.203% for the first studied stage (3-5 leaves); and between 0.090 and 0.243% for the second stage (maturity). These values are in the weak - normal concentration interval (Fig. 3); low levels of phosphorus and, therefore, very favorable response to fertilization, are found in most plants, at values of P content less than 0.2%;

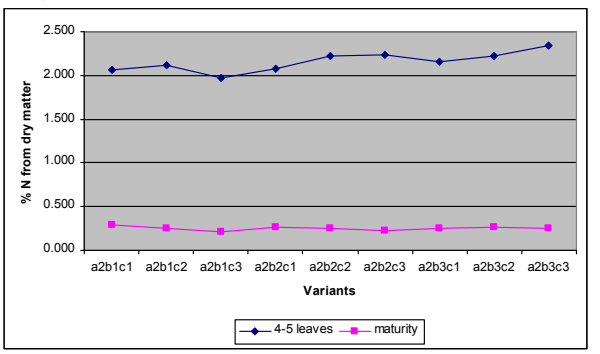

Figure 2. Variation of nitrogen content in dry matter in maize

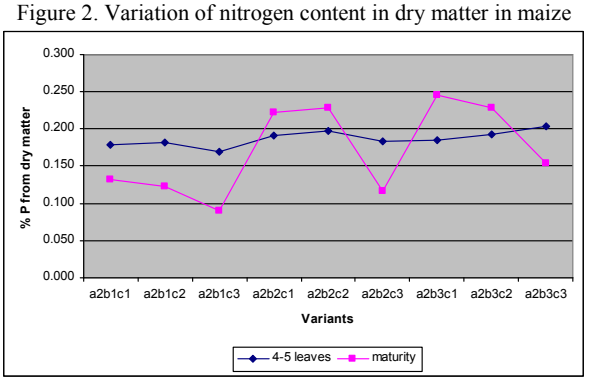

Figure 3. Variation of phosphorus content in dry matter in maize

- the percent of K in maize plant varies between 3.85 and 4.24% for the first studied stage (3-5 leaves), with values in normal to high concentration interval; and between 1.33 and 1.74% for the second stage (maturity), situated in weak concentration interval (Fig. 4). The concentration of potassium in plant tissues corresponding to a normal nutrition range from 1.5 to 5%;

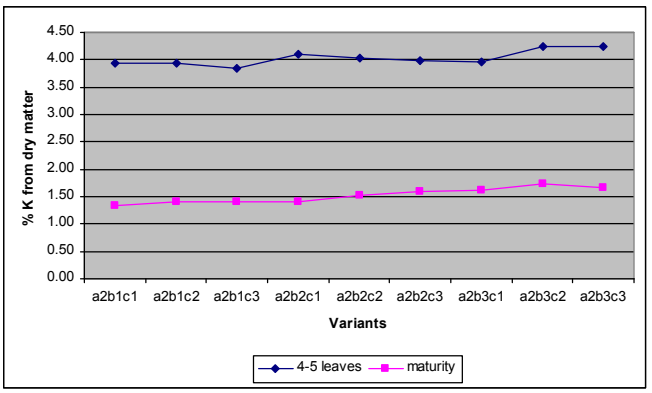

Figure 4. Variation of potassium content in dry matter in maize

- the percent of Ca in maize plant varies between 0.662 and 0.745% for the first studied stage (3-5 leaves); and between 0.227 and 0.342% for the second stage (maturity). The values range in the normal concentration interval (Fig. 5). The calcium concentrations in tissues plant, corresponding to normal nutrition, range from 0.2 to 1.0%;

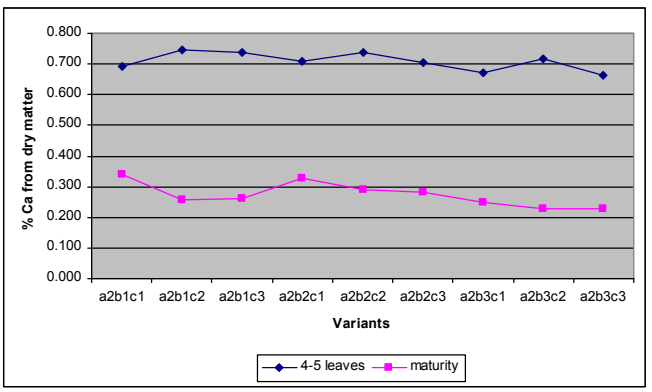

Figure 5. Variation of calcium content in dry matter in maize

- percentage of Mg in maize varies between 0.331 and 0.374% for the first studied stage (3-5 leaves); and between 0.148 and 0.275% for the second stage (maturity). The values are in the normal concentration range (Fig. 6), the magnesium content in tissues plant corresponding to a normal nutritional status being between 0.20 to 0.50%.

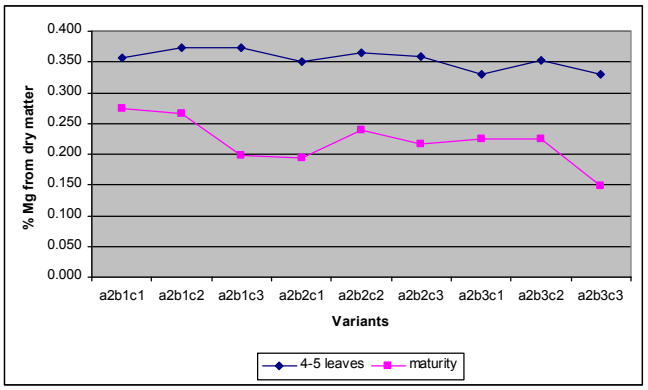

Figure 6. Variation of magnesium content in dry matter in maize

The ranges of macronutrients in the analyzed plant are discussed according to Analysis methodology for assessing plant mineral nutrition (1980) and Treaty of Agro-chemistry (RUSU et al., 2005).

CONCLUSIONS

Several conclusions regarding the influence of fertilizers applied to maize, based on interpretation of partial results for the experiment carried out in 2011, are as follows:

- for the first stage (the 3-5 leaves stage), the macro nutrients contents (% from dry matter) vary depending on the element analyzed as follows: N and P – poor to normal, K – normal to high, Ca and Mg – normal;
- in the second studied stage (maturity stage), the macro nutrients contents (% from dry matter) vary as follows: N, P and K – poor, Ca and Mg – normal.

For a better analysis of the macronutrients contents in maize, on soils affected by salinization, the experiment is carried out in the same circumstances in 2012 too.

ACKNOWLEDGEMENTS

The research was supported by the Research Program PN II RU-PD, Contract 192/10.08.2010.

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