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THE EFFECT OF FOLIAR FERTILIZATION ON THE YIELD AND GENERATIVE FACTORS OF MAIZE

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ABSTRACT
We examined the effect of different foliar fertilization products on the yield and generative factors of maize in 2015. The experiment was set in three repetitions, random blocks on the area of Tangazdaság Ltd. in Hódmezővásárely. The soil of the experiment was meadow chernozem. Soil analysis data showed that it had had good nitrogen, and very good phosphor and potassium contents. During the experiment we applied two times foliar fertilization. The year 2015 was unfavourable for corn production. In 2015 the amount of precipitation in the vegetative period of corn was lower by 83.4 mm than the average. The average temperature showed a positive deviation compared to the average of several years. We processed the obtained data by single factor variant analysis. The yield of the control treatment was 6.39 t/ha, the yields of the foliar fertilization plots ranged between 6.5-7.5 t/ha. The foliar fertilization products increased the yield of corn, but this difference was not significant. By the application of foliar fertilization the generative factors of corn did not change significantly.

Keywords: corn, nutrient supply, foliar fertilization, yield, generative factors,

INTRODUCTION

Today, in order to achieve high yields, cultivated plants cannot always get enough microelements from the soil, therefore the importance of foliar fertilization increased. The timing is decisive for rapid and effective intervention to prevent yield loss or deterioration, and we can achieve yield increase and quality improvement as well. With the application of foliar fertilization we can increase the resistance of maize against the ecological stress factors, diseases and pests as well (HOFFMANN ET AL., 2004).
Considering the aspects of efficiency and environment protection, maize needs only $N_{60\text{-}120}$, $P_2O_{5\ 45\text{-}90}$, $K_2O_{53\text{-}106}$ kg ha^{-1} active agent. With N doses larger than $N_{60\text{-}120}$ kg ha^{-1} the quantity of NO_3-N reaches 150-200 mg kg^{-1} in the 100-120 cm soil profile which can result in marked environment pollution (SÁRVÁRI, 1995).
The foliar fertilization increased the yield, but it was not significant. With foliar fertilization the crude fat increased while the N-free extract decreased significantly. The results showed that there was no considerable difference in the energy contents of control and treated maize (JAKAB ET AL., 2014).
PEPÓ (2001) found that crop rotation strongly modified the optimum N doses (+PK) of maize. The optimum N doses were N_{113}+PK in triculture, N_{147}+PK in biculture and N_{187}+PK in monoculture. The efficiency of fertilization was modified by crop rotation and the water supply of the crop year. The yield surpluses resulting from fertilization were 1378 kg ha^{-1} in triculture (peas-winter wheat-maize), 2477 kg ha^{-1} in biculture (winter wheat-maize) and 2325 kg ha^{-1} in monoculture. There were hybrid-specific differences between the maize genotypes in optimum N doses (+PK) in the long-term experiments. In practice, the best hybrids are those that can produce high yields with the application of moderate (low) N doses (+PK).
KÁDÁR (2008) says that the macro and micro element requirements of most arable crops can be satisfied through soil. The future spread of foliar fertilisation must be grounded by

comprehensive experimental research. Accurate, repeated small plot trials are necessary to clarify the factors influencing the effectiveness of foliar fertilizers and recommendations must be developed for consultation.

The crop year had a great effect on the yield and generative factors of maize. The lack of rainfall during the tasselling can decrease the yield with large amount (FUTÓ AND SÁRVÁRI, 2015; DÓKA AND PEPÓ, 2009; KARANCSI, 2012).

The nitrogen supply had a great effect on the yield and generative factors of maize (GRANTHAM, 1997). The increasing nitrogen doses increased the amount of generative factor of maize and the yield as well (HEJAZI AND SOLEYMANI, 2014.

MATERIAL AND METHOD

Soil properties of the experimental field

We set the experiment on the area of Tangazdaság Ltd. in Hódmezővásárhely. The soil was meadow chernozem, the reaction of which was nearly neutral (pH_{KCL} 7.17). Before setting the experiment the soil analysis data showed that it had good nitrogen, and very good phosphor and potassium contents. The Zn content was low (*Table 1*).

Table 1. Main properties of the experimental field area

pH (KCl)	P_2O_5 (mg/kg)	K_2O (mg/kg)	Humus (%)	Soil plasticity value (K_A)	Zn (mg/kg)
7.17	336	620	3.39	48	1.76

Weather in the experimental years

The year 2015 was unfavourable for maize production. In 2015 the amount of precipitation in the vegetative period of maize was lower by 83.4 mm than the average. The average temperature showed a positive deviation compared to the average of several years. The positive deviation of average temperature together with deficient precipitation had a negative effect on the development of corn, which resulted in low yields (*Table 2*).

Table 2. The distribution of precipitation in the vegetative period of corn in 2015

Month	Rainfall (mm)	Average rainfall (mm)	Difference (mm)
April	7.6	39.9	-32.3
May	75.5	58	17.5
June	12.2	75.3	-63.1
July	61.6	58.7	3.0
August	51.8	48.7	3.1
September	29.0	40.7	-11.7
Total amount of rainfall (mm)	**237.7**	**321.1**	**-83.4**

Main features of the agro-technology applied

Our small-scaled plough experiment was set in three replications, organised as a random block in 2013. We applied foliar fertilization treatments, which we supplemented with a control plot. The foliar fertilization was applied twice (31 May and 6 June) in a dosage of 1 l/ha. The fore-crop was maize. Fall tillage involved deep ploughing at 32 cm depth in the experimental years. The corn hybrid in the experiment was DKC 4025 (FAO 340). We harvested the plots by hand. We processed the obtained data by single factor variant analysis.

RESULTS

Without foliar fertilization the yield of the examined hybrid was 6.39 t/ha. With foliar fertilization the yield was 6.5-7.5 t/ha. Under the influence of foliar fertilization treatments the yield increased, but the increase compared to the control yield was not significant. We obtained the highest yield in the Amalgerol+Fitohorm Turbo Zn treatment (7.5 t/ha) and Fitohorm Turbo Zn treatment (7.35 t/ha) (*Figure 1*).

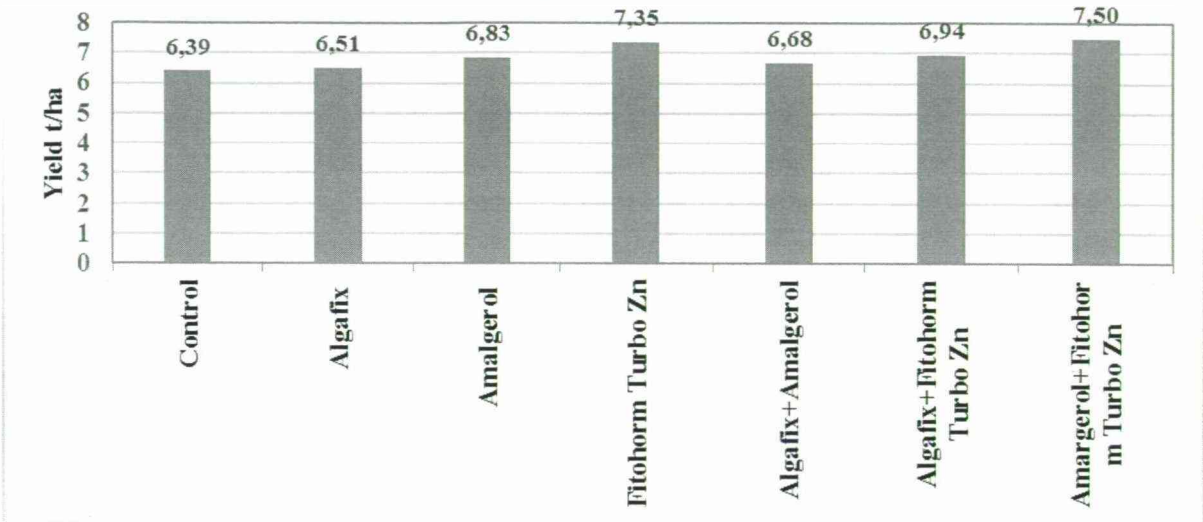

Figure 1. The yield of the maize hybrid in control and foliar fertilization treatment

We examined the effect of foliar fertilization on the generative factors of maize (thousand seed weight, cob:grain yield rates, seed moisture content). The thousand seed weight was 288.16 g in control treatment. Under the influence of foliar fertilizers the thousand seed weight ranged between 286.66 and312.33 g. The change was not significant. The values of cob:grain yield rates were 89.0-90.0%. The different treatment did not increase this parameter, because it is highly dependent on the genetical characteristics of hybrids. In 2015 the average temperature of July and August was higher, than the 50-year average, therefore the corn wilted earlier. The seed moisture content of control plots was the lowest 12.85%. In treated parcels we measured 13.36-14.38%. The difference wasn't significant between control and treated results (*Table 1.*).

Table 1. The result of foliar fertilizers on the different generative factors of corn

Treatments	Thousand seed weight (g)	Cob:grain yield rates	Seed moisture content at harvest (%)
Control	288.16	89.0	12.85
Algafix	312.33	90.0	14.38
Amalgerol	299.33	89.0	13.73
Fitohorm Turbo Zn	302.16	89.7	13.40
Algafix+Amalgerol	290.16	89.7	13.56
Algafix+Fitohorm Turbo Zn	286.66	89.0	13.64
Amalgerol+Fitohorm Turbo Zn	295.5	89.0	13.36
LSD5%	n.s.	n.s.	n.s.

CONCLUSIONS

The highest effect on the yield were the treatments which contained Zn (Algafix+Fitohorm Turbo Zn 6.94 t/ha, Fitohorm Turbo Zn 7.35 t/ha, Amalgerol+ Fitohorm Turbo Zn, 7.5 t/ha) which indicates that this area is a low Zn content in the soil to prevent the achievement of higher yields. The uptake of Zn also prevent soil phosphorus supply is very good because of antagonism between the two elements. The generative factors in terms of Algafix and Fitohorm Turbo Zn treatments were the best. Under the influence of foliar fertilizer treatment there were not significant differences in examined parameters. The use of zinc foliar fertilizer is recommended in this area in order to achieve higher yields and yield safety.

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