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RESEARCH REGARDING THE TREATMENTS WITH BIO-STIMULATOR AT MAIZE CROP

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Abstract

The world`s population is constantly increasing, the areas intended for the production of bio-mass and bio-fuels are care continuously growing, while the food demand of mankind is an a continuous ascending trend. In this context, an increased efficiency in the use of agricultural areas and in obtaining large and steady productions, in compliance with the requirements of sustainable development of the agricultural eco-system, is a priority; this priority requires adequate technological measures, like a good protection of crops starting with the seed phase, application of effective treatments at the right moment, etc. Therefore, in the present paper we present the results of treatment with bio-stimulants applied as a seed treatment or in different stages of vegetation at maize. This treatment has as a result increase the quantity and quality production, to reduce phytotoxic environmental impact, a good management of resources and to reduce production costs in terms of environmental conservation. In experiment we test two bio-stimulator products for seed and different stages of vegetation with three graduations for each product (2 l/ha; 3 l/ha; 2 l+2 l/ha) Megafol and Cropmax. Both treatments has a result uniform flowering, growth rate, increased production and improved quality growth by increasing protein and starch compared to the control.

Key words*: bio-stimulant, maize, seed treatment, biometrical indicators.*

INTRODUCTION

World population is growing, so it requires continuous improvement of production technology in order to obtain high and stable yields.

In this case we present 2012, like an atypical year, the driest and hottest from last 50 years. It was drought in almost all the country, especially in south-east. The year 2012 can be characterized as a dry year due to the high frequency of days with temperatures > 30-35°C (48 days), moisture air relative < 30% (43 days) and lack of rain in May-August (13 May-16 August), when drought was accompanied by heat, suffering strong wheat plants stress water and temperature.

In this agricultural year there were high costs and losses consistently in different regions of Romania, especially in the South and East of the country, where without irrigation, generally yields are between 25 and 30% compared with those of previous years. Many corn plant shave been developed till drought installation, the during June-July, in the absence of rainfall corn plants began to suffer, dried pollen determined reducing of pollination followed by the premature plant drying.

Foliar application of specific organic matters have demonstrated to be a powerful tool for stimulating the plant to a more intense but balanced vegetative development; improving the effectiveness of usual soil and foliar mineral applications; curing or preventing nutritional disorders and/or physiopathy; making the plants overcome stress conditions affecting yields; increase efficiency of chemical treatments.

General characteristics of the Megafol: a bio-stimulant which contains L-Amino acids from vegetal extracts vitamins, proteins, growth factors and betains. Megafol is a growth activator and anti-stress. Foliar nutrition based on organic matter. Proteins are long and heavy molecules where peptide linkages bind single amino acids each other. Free amino acids are obtained through the chemical process called “hydrolysis” which breaks the linkage between each amino acid by inserting a molecule of water.

Cropmax is a certified organic bio-stimulant which is admitted in organic agriculture; increase production and improve quality growth; significantly improves resistance to diseases and pests; reduces metabolic plant deficiencies; also contribute to a better and faster development of the root system, therefore the resistance of plants to drought stress increase.

Completing basic fertilization is done by applying bio-fertilizer in vegetation that needs filling role, especially to promote the efficient use of mineral resources from the soil.

The objective of researches was to establish the impact of quantity and quality on maize production of Megafol and Cropmax treatments concerning accumulation of biomass and production costs.

MATERIALS AND METHODS

In order to achieve the objectives set in agricultural year 2012, it was held a mono-factorial experience with 9 variants (Table 1).

Investigations were conducted at S.C Tehnoplant S.A, Scinteia, district Ialomita (44°44′19″N and 27°28′11″E WGS 84), in cambic chernozem conditions with a pH of 5.5 and 3.4 humus.

Table 1. Experimental variants

Variant	Treatment	Dose	Period
V1	Control	-	
V2	Seed treatment 5-1809	200ml/100kg of seed	at sowing
V3	Megafol	2l/ha	BBCH 14-16
V4	Megafol	3l/ha	BBCH 14-16
V5	Megafol	2l + 2l /ha	BBCH 18-20
V6	Seed treatment Cropmax	200ml/100kg of seed	at sowing
V7	Cropmax	2l/ha	BBCH 14-16
V8	Cropmax	3l/ha	BBCH 14-16
V9	Cropmax	2l + 2l /ha	BBCH 18-20

The sowing data was 24 April 2012 after wheat (Mohammadi et al., 2012). Seeds are Limagrain 33.50, semi-early hybrid, group FAO 340-360, CRM 95) 50.000 plants/ha. The experience was placed in four repetitions by randomized block method, the surface of a plot was 100square meters (21.4 m/4.2 m).

Technology applied for weed control: Pre-emergent, Dual 960 Gold (S-metolaclor 960 g/l) applied at the same day as sowing. After two weeks from plant emergence, at the stage of the 4-6 leaves (BBCH 14-16), it was applied a basic fertilization (N60/P60); Post-emergent Principal Plus (Rimsulfuron 3.26%, Nicosulfuron 30 g/l), both with purpose to combat monocots and dicots species. Treatment was applied on 16 May (Radulov et al., 2010; Rehm, 2003).

RESULTS AND DISCUSSIONS

At 16 May 2012 we made the biometrical determinations in the stage of 4-6 leaves, when the first treatment was applied, to measure the influence of treatment at seed (Table 2).

We also observed and increase weight of plants from 15.5 g at untreated version to 17.2 g on the treated seed (Brad et al., 2010).

Analyzing data on the main bio-metrical characteristic of maize plant at two weeks after emerge, when the first foliar treatment was applied, we established that: Cropmax and 5-1809 have very significant increase of plant green mass from 15.5 g at over 17.2 g. In term of fresh mass of plant, there was a very significant increase for both seed treatments. The treatments influence on dry mass, has increased for both treatments from 2.3 g to 2.5 g. At dry plant roots, increases are statistically (Brown, 1993).

As far as plants height in the moment of treatment we is observed an increase with 2.3 cm at Cropmax treated seeds and 2.4 cm at the treatment with 5-1809, statistically uninsured increases.

Regarding root weight at green plants we saw that is an increase from 4.1 g at untreated seed to 5.2 g when seed treatment is applied. The control seed has a dry roots weight 2.3 g and the treated seed has an average of 2.5 g. On height was found a growth from 44 cm at control seed to 46.5 cm at seeds with treatment.

We also observed and increase weight of plants from 15.5 g at untreated version to 17.2 g on the treated seed.

Analyzing the data from Table 3, is found that the seed treatment has as a result an increase of biomass fresh and dry accumulated quantity and also height on the plant (Antonio, 2013; Yuncai et al., 2008).

Table 2. Biometrics application first treatment BBCH 14-16 (16 May 2012)

Variant Treatment		Fresh plant (g)				Dry plant (g)				Height (cm)	
		Plant weight (g)	dif	Root weight	dif	Plant weight	dif	Root weight	dif	cm	dif
V1	Control	15.5	Mt	4.1	Mt	2.3	Mt	0.66	Mt	44	Mt
V2	Seed treatment 5-1809	17.2***	1.7	5.2***	1.1	2.5*	0.2	0.78	0.04	46.4	2.4
V6	Seed treatment Cropmax	17.3***	1.8	5***	0.9	2.5*	0.2	0.69	0.03	46.3	2.3
	LSD 5 %		0.82		0.24		0.12		0.04		2.43
	LSD 1%		1.31		0.39		0.21		0.06		3.64
	LSD 0.1%		1.64		0.53		0.29		0.08		5.27

Table 3. Biometrical determination at maize on BBCH 14-16 at 14 days after first vegetation treatment

Variant Treatment			Fresh plant (g)				Dry plant (g)				Height (cm)	
		Dose	Plant weight	Dif	Root weight	Dif	Plant weight	Dif	Root weight	Dif		Dif
V1	Control	-	32.1	Mt	8	Mt	4.9	Mt	1.3	Mt	53	Mt
V2	Seed treatment5-1809	200ml/100kg seed	31.8	-0.3	8.3	0.3	5.1	0.2	1.4*	0.1	56	3
V3	Megafol	2l/ha	36.1***	4	9.6***	1.6	5.5**	0.6	1.6***	0.3	57*	4
V4	Megafol	3l/ha	41.2***	9.1	10.8***	2.8	5.9***	1	1.9***	0.6	60***	7
V5	Megafol	2l + 2l /ha	36.1***	4	9.7***	1.7	5.5*	0.6	1.6***	0.3	58**	5
V6	Seed treatment Cropmax	200ml/100kg seed	32	-0.1	8.4***	0.4	5.1	0.2	1.4*	0.1	55	2
V7	Cropmax	2l/ha	36.7***	4.6	8.8**	0.8	5.4**	0.5	1.5***	0.2	58**	5
V8	Cropmax	3l/ha	41.6***	9.5	10.4***	2.4	5.8***	0.9	1.8***	0.5	60***	7
V9	Cropmax	2l + 2l /ha	36.9***	4.8	8.9***	0.9	5.5**	0.6	1.5***	0.2	57*	4
		LSD 5 %		1.86		0.47		0.28		0.08		3.10
		LSD 1%		3.04		0.75		0.43		0.13		4.80
		LSD 0.1%		3.90		1.04		0.62		0.18		6.25

Analyzing the influence of vegetation treatment over maize plant green mass is observed a very significant increase from 32.1 g to 36 g for all variants were applied bio-stimulator products. At the seed treated variant, at this moment differences were not statistically identified. Analyzing the influence of treatment on green table roots after applying the first treatment is found that when applying the two bio-stimulants Megafol and Cropmax in dose of 2 l/ha and 3 l/ha we observed a very significant increase from 8 g in at control seed at over 1.6 g at seeds treated with 2 l/ha of Megafol, and where we use 3 l/ha bio-mass increase was of 2.4 g at Cropmax and 2.8 g at Megafol. Under the influence of treatment, at dry mass plant, it is a distinctive significant increase statistically provided at 2 l/ha doses, while using 3 l/ha doses is determinate a distinctive significantly increase of dry roots bio-mass. Application of treatments determined a significant increase in dry biomass of roots for all variants studied. In terms of plant heights under the influence of bio-stimulator treatments at seed, although at this point had determinate heights increases, which are statistically assured (Yuncai, 2008).

3 June represents the time when the second treatment was applied, at 8-10 leaves (BBCH 18-20) and we wanted to observe the same. Another measurement was made at 18 June for overall assessments of the effects on the main biometrical indicators. At harvest we checked the quantity and quality indicators (MMB, U%, MH, Starch, Protein).

Data in Table 4 make reference to main bio-metrical indicators determined at 14 days after the second treatment on vegetation. After we analyzed the effects of bio-stimulant on green mass plant of maize, it was observed that in lack of treatment mass was about 36.5 g, and when the treatment was applied we detect a statistically uninsured increase. In case when both treatments were applied, at both tested products and in both doses it was obtained very significant green mass increases.

Table 4. Biometrical determination at maize on BBCH 14-16 at 14 days after second foliar treatment

Variant	Treatment	Fresh plant (g)				Dry plant (g)					
		Plant weight	Dif	Root weight	Dif	Plant weight	Dif	Root weight	Dif	Height (cm)	Dif
V1	Control	36.5	Mt	9.2	Mt	5.6	Mt	1.5	Mt	64.2	Mt
V2	Seed treatment5-1809	37.1	0.6	9.5	0.3	5.9	0.3	1.6*	0.1	67.8	3.6
V3	Megafol	41.0**	4.5	11.0***	1.8	6.3**	0.7	1.8***	0.3	69.0*	4.8
V4	Megafol	47.4***	10.9	14.7***	5.5	6.8***	1.2	2.2***	0.7	72.7***	8.5
V5	Megafol	50.1***	13.6	15.9***	6.7	7.1***	1.5	2.5***	1.0	75.3***	11.1
V6	Seed treatment Cropmax	36.8	0.3	9.7	0.5	5.9	0.2	1.6*	0.1	66.6	2.4
V7	Cropmax	42.2***	5.7	10.1*	0.9	6.2**	0.6	1.7**	0.2	67.8	3.6
V8	Cropmax	47.8***	11.3	13.5***	4.3	6.7***	1.0	2.1***	0.6	72.7***	8.5
V9	Cropmax	49.2***	12.7	14.8***	5.6	7.2***	1.6	2.2***	0.7	74.2***	10.0
	LSD 5 %		2.23		0.59		0.33		0.10		3.82
	LSD 1%		3.64		0.95		0.51		0.16		5.92
	LSD 0.1%		4.67		1.31		0.73		0.22		7.71

Analyzing the influence of bio-stimulator treatments on roots green mass we established that in case of control seed, roots accumulate 9.2 g, and when the treatment was applied we have increases of 0.3 g at 5-1809 bio-stimulant and 0.5 g with Cropmax treatment. In case of treatments on vegetation it was observed increases at green biomass of roots. Analyzing the influence of treatment at dry roots mass it was establish that the treatment applied determined increases of accumulated bio-mass statistically assured. When we refer at dry mass we record statistically assured increases for all the experimental variants compared with the control. At control we have a height of 64.2 cm but treatments on seeds determined insignificantly increases of plants and when treatment vegetation was applied were followed by significantly increases of plants height. When Megafol 2 l + 2 l/ha was applied we obtain the biggest increases. Application of bio-stimulator treatments resulted in improvement of all biometric indicators maize plants.

In Table 5 are represented recorded productions at maize. At control variant it was a production value of 2153 kg/ha and treatments applied to the seed determined a significantly distinctive increase of 228 kg/ha for seeds treated with 5-1809 and an increase of 242 kg/ha at Cropmax treatment. The other treatments applied on vegetation had as a result very significant increases between 408 kg/ha and 741 kg/ha. Maximum production in case of Megafol treatment was of 2895 kg/ha with a very significant increase of 741 kg/ha when we have a dose of 2 l + 2 l/ha. At 2 l + 2 l/ha with Cropmax maximum production was of 2813 kg/ha, it was obtained a very significant increase of 659 kg/ha. Analyzing the effect of two bio-stimulator products, differences were not statistically assured. The seed and vegetation treatment determinate statistically assured increases.

Table 5. Yields obtained in experimental variants

Var	Treatment	Dose	Kg/ha	Dif
V1	Control	-	2153.7	Mt
V2	Seed treatment 5-1809	200ml/100kg seed	2382.0**	228
V3	Megafol	2l/ha	2581.0***	427
V4	Megafol	3l/ha	2790.0***	636
V5	Megafol	2l + 2l /ha	2895.0***	741
V6	Seed treatment Cropmax	200ml/100kg seed	2396.0**	242
V7	Cropmax	2l/ha	2562.0***	408
V8	Cropmax	3l/ha	2760.0***	606
V9	Cropmax	2l + 2l /ha	2813.0***	659
		LSD 5 %		132.83
		LSD 1%		211.58
		LSD 0,1%		305.92

The two tested products at the same dose had similar effects on production (Yuncai, 2008).

Referring to the growing rhythm of maize plant from the data above it was remarked that treatments during maize vegetation period have a good influence on the growing rhythm, at the beginning of growing and seed treatment seems to have a slight negative effect on growing, but we have to underline that till the end of vegetation period this favorable effect has disappeared, maintaining negative effect of variant 1 (seed treatment) and soft positive effect at the moment of silking (Alam, 1999).

Table 6. Production quality indices of experimental variants

Variant	Treatment	MMB		MH		U % harvest		Starch		Protein	
		g	Dif	Kg/l	Dif	%	Dif	%	Dif	%	Dif
V1	Control	339.4	Mt	87.1	Mt	14.2	Mt	69.8	Mt	10.03	Mt
V2	Seed treatment 5-1809	340.0	0.6	86.6	-0.5	14.2	0.0	69.7	-0.1	9.96	-0.1
V3	Megafol	340.2	0.8	87.2	0.1	14.6	0.4	69.9	0.1	9.93	-0.1
V4	Megafol	340.5	1.1	87.2	0.1	14.6	0.4	70.2	0.4	9.88	-0.1
V5	Megafol	340.0	0.6	87.3	0.2	14.9	0.7	70.3	0.5	9.78	-0.3
V6	Seed treatment Cropmax	340.3	0.9	87.3	0.2	14.2	0.0	69.1	-0.7	10.01	0.0
V7	Cropmax	340.1	0.7	87.2	0.1	14.5	0.3	69.8	0.0	9.98	0.0
V8	Cropmax	340.4	1.0	87.3	0.2	14.7	0.5	70.1	0.3	9.92	-0.1
V9	Cropmax	340.4	1.0	87.3	0.2	14.7	0.5	70.1	0.3	9.91	-0.1
	LSD 5 %		16.78		4.45		0.74		3.50		0.51
	LSD 1%		26.68		7.05		1.19		5.65		0.80
	LSD 0.1%		33.45		9.66		1.72		8.28		1.15

In Table 6 were presented results of the bio-stimulant treatment influence on main quality indicators of maize.

Treatments applied determined increases of MMB, MH, starch, U% and protein but those were not statistically assured (Wittwer and Teubner, 1959).

CONCLUSIONS

- Seed treatment has as a result an increase of fresh biomass and dry accumulated quantity and also height on the plant.
- Application of treatments determined a significant increase in dry biomass of roots for all variants studied.
- In terms of plant heights under the influence of bio-stimulator treatments at seed, although at this point had determinate heights increases, which are statistically assured.
- Application of bio-stimulator treatments resulted in improvement of all biometric indicators maize plants.
- The two tested products at the same dose had similar effects on production.
- Treatments applied determined increases of MMB, MH, starch, U% and protein but those were not statistically assured.

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