THE INFLUENCE OF LEAF FERTILIZATION ON PRODUCTION STUDY CASE REGARDING MAIZE CULTURES

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Abstract *The paper presents a study conducted at ARDS* Brăila in the agricultural year 2018 - 2019, on the influence of foliar fertilization on production and its components at maize.*

* *ARDS Agricultural Research-Development Station*

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JEL Classification
Q12

Introduction

Corn (Zea mays L) is one of the most valuable cultivated plants, due to its very high productivity and the multiple uses of its products in human nutrition, animal husbandry and in industry.

Knowing the role of nutrients in plant life underlies agrochemical measures which are applied for leading to superior plant productions both quantitatively and qualitatively.

The elements involved in plant nutrition and fertilization usually have specific roles, so they do not can replace each other. These elements, in all

conditions, have a fullness of action and effect only in the presence and optimal provision of other vegetation factors, including other nutrients.

Corn is a "voracious" plant par excellence (F. Angelini, 1965 quoted by Bîlteanu Gh., 2003) and consumes large amounts of nutrients for the harvest.

The productivity of maize results from the formula:

Grain production (kg / ha) = Dpl / ha x No. / pl x No. b / s x MMB, where:

Pld / ha - plant density per hectare;

Noco / pl - number of cobs per plant;

Nogrco / şt - number of grains on cobs;

MTGr - mass of 1000 grains.

The number of rows of berries per cob, the mass of 1000 berries and the number of cobs per plant they are genetically determined characters, being specific to each hybrid, and they are elements of productivity strongly influenced by environmental conditions (temperature, precipitation, light, physical properties and the state of supply of soil nutrients).

Material and Method of Work

The study on the influence of foliar fertilization on maize production was conducted in the agricultural year 2018-2019, in the Chiscani Experimental Center, within the Agricultural Research and Development Station Brăila, located in the South-East part of Romania, Brăila county, Chiscani commune precisely at the border of Vărsătura, Lacu-Sărat and Chiscani localities.

The soil on which the experiment was established is a phreatic, moist, moderately carbonate vermic chernozem on loess, sandy clay loam, with the following agrochemical characteristics: moderately low in calcium in the upper part of the profile (4.5 - 5.0%) and strongly carbonated in the lower part (19.3%); with a medium humus content (2.4 - 3.1%) in the upper horizons and only 1.6% in the horizon A /C transition; the total nitrogen content is normal in the upper horizons, (varies between 0.14 –0.25); the content in mobile phosphorus is

moderate and sub mediocre (174 - 225 ppm); content in mobile potassium (24.0 - 26.0 mg / 100 g soil in the arable layer) is very good only in the upper horizon (0-20 cm) and good in the Am horizon; the reaction of these soils shows values between pH 7.9 - 8.4 (predominantly alkaline).

The curve of the thermal regime specific to the vegetation period of the corn, in the year of the study, being comparatively analysed, it is observed that 2019 was warm, the average temperatures being higher than the curve specific to the multiannual averages in the Chiscani area. Throughout the maize vegetation period, the average temperatures exceed the multiannual average (figure 1).

The rainfall regime, regarding the vegetation period of the corn throughout the studied year, indicates that this period was dominated by drought, the only month that registered a higher than normal value was June (figure 2).

The above situation corroborated with the thermal regime, it can be stated that the year studied was less favourable for corn cultivation.

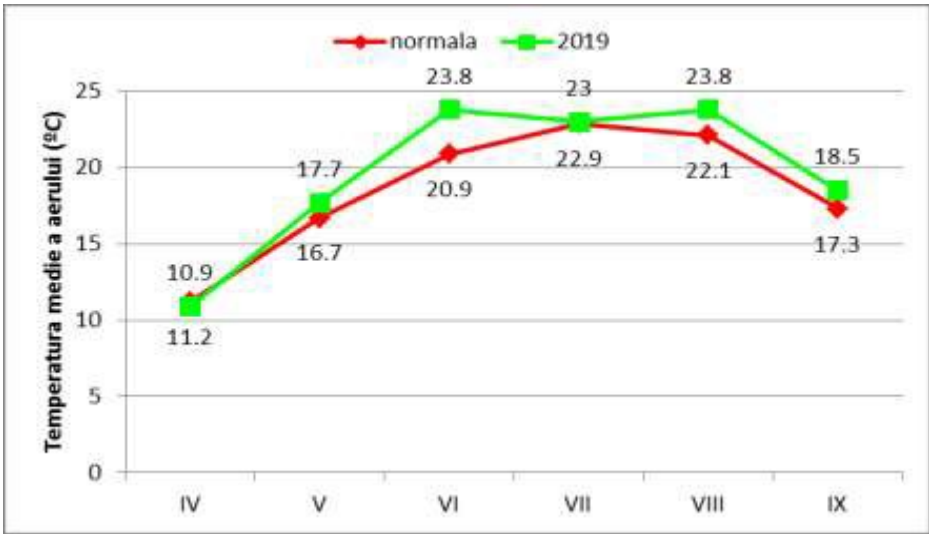

Figure no.1. The thermal regime of the maize vegetation period compared to the normal area

For the realization of the experiment was used as biological material the commercial hybrid of corn - P9241, belonging to the company Corteva, which is characterized as follows: early hybrid from the AQUAmax group, FAO group 330, with excellent drought tolerance, high stability and ecological plasticity.

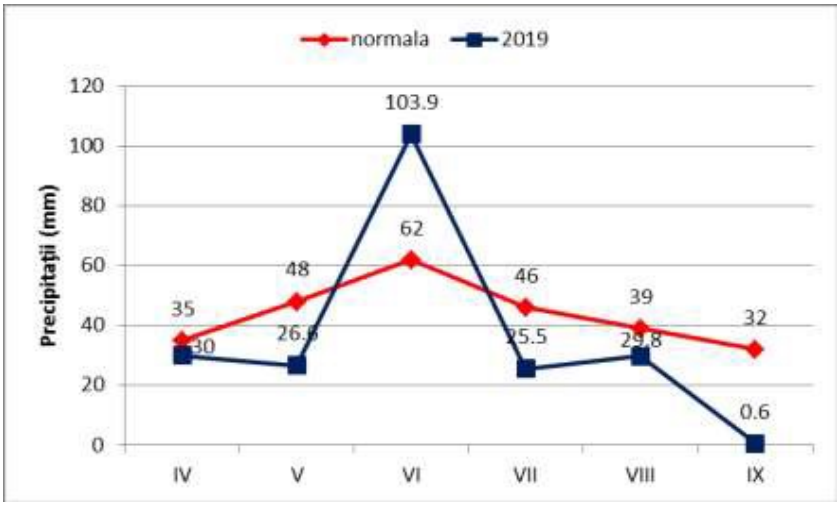

Figure 2. Variability of rainfall during maize vegetation

The following foliar fertilizers were used in the experiment: Kette Zinc, Asfac and VermiPlant.

The study of the effect of applying foliar fertilization on the production and its elements, to corn, was carried out by setting up an experiment according to the method of plots subdivided into four repetitions in the experimental field of the Agricultural Research-Development Station Brăila (ARDS Brăila).

Only three repetitions were taken to calculate the production, the fourth repetition was used to perform biometric determinations.

The variants of the experiment are described in Table 1.

Table no. 1. Variants of the experience

Varianta	Semnificaţia	Compoziţia chimică	Momentul aplicării	
			Tr. I (6-8 frunze) 31.05.2019	Tr.II (9-10 frunze) 10.06.2019
V1	KetteZinc+Asfac	-complex NPK, 15-15-10 + 7% Zn +3% Fe -4-clor-2 amidosulfonil-fenoxiacetat de potasiu, adaos de microelemente, aditivi; (12,5 +/- 0,05 g/l substanță activă)	KetteZinc (2 kg/ha)	KetteZinc (2 kg/ha)+Asfac (1l/ha)
V2	Martor (Mt)	netratat		
V3	VermiPlant+Asfac	-Potasiu 7163 mg/l, Magneziu 25 mg/l, Calciu 797 mg/l, Amoniu 154 mg/l, Clor 2769 mg/l, Carbon organic 5.05 g/l, Fosfor 25.4 mg/l. -4-clor-2 amidosulfonil-fenoxiacetat de potasiu, adaos de microelemente, aditivi; (12,5 +/- 0,05 g/l substanță activă)	VermiPlant (3kg/ha)	VermiPlant (3kg/ha)+Asfac (1l/ha)

Above table 2 summarizes the cultivation technology applied to corn in the experimental field at Agricultural Research-Development Station Brăila (ARDS Brăila)

Table no. 2. Culture technology

Specificații	
Data semănatului:	17.04.2019
Suprafața semănată:	0.5 ha
Planta premergătoare:	Rapiță
Fertilizarea de bază:	-
Lucrările solului:	Arat 22-25 cm Discuit+Grapă Combinator
Erbicidat preemergent:	-

Soi/Hibrid:	P9241
Tratament la sămânță:	Nuprid AL 600FS 8l/tonă
Norma de sămânță(kg/ha):	20kg (70.000 pl/ha)
Fertilizat fazial:	Uree (114kg/ha)
Erbicidat în vegetație:	Cambio 2l/ha Crew Ace 1l/ha Spraygard 0.1l/ha
Tratament pentru boli şi dăunători:	-
Lucrări mecanice în vegetație:	Prașilă mecanică
Irigat:	600 m.c./ha
Recoltat:	28.08.2019

Results and Discussions

Table 3 presents the data of the productivity elements registered for the three variants experimental.

Table no. 3. Influence of foliar fertilization on corn productivity elements

Varianta	Nr.pl./ rând	Nr.şt. /rând	Nr.rânduri boabe/şt.	Nr.boabe/ rând	Masa boabe/şt. (g)	Masă rahis (g)	Randament (%)	MMB (g)
V1	35,0	34,0	16	39	263,3	71,0	79,3	335,4
V2 (Mt.)	38,3	37,6	16	42	194,3	48,8	78,4	332,5
V3	35,3	38,6	16,6	41	229,5	45,5	83,5	325,9
MEDIA	36,2	36,7	16,2	40,6	229,0	55,1	80,4	331,3

pl. - plants; şt.- cobs; Mt. - witness;

The analysis of the data presented in table no.3 shows the following aspects:

- the average number of plants per row varied between 35.0 plants / row per variant

V1 (KetteZinc + Asfac) and 38.3 plants / row in variant V2 (Mt.). Compared to the control variant V2 (foliar unfertilized), variants V3 (VermiPlant + Asfac) and V1 (KetteZinc + Asfac) obtained values lower than this.

Values above the average of the experiment (36.2 plants / row) were obtained only by variant V2(figure no. 1);

-the average number of cobs per row varied between 34 cobs / row for variant V1 (KetteZinc + Asfac) and 38.6 cobs / row for variant V3 (VermiPlant + Asfac). Higher values of variant V2 (Mt.) (37.6 cobs / row) was obtained only for variant V3 (VermiPlant + Asfac).

Stock higher than the average experience (36.7 cobs / row) were obtained in variants V2 and V3 (figure no.1);

-the average number of rows of berries per cob varied between 16 rows of berries / cobs at variant V1 (KetteZinc + Asfac) and variant V2 (Mt.) and 16.6 rows of grains / cobs at variant V3 (VermiPlant + Asfac). Values higher than the V2 variant (Mt.), as well as the average experience (16.2 rows of grains / cobs) was obtained only for variant V3 (figure no. 2);

-the number of grains per cob varied between 39 grains/row in variant V1 (KetteZinc + Asfac) and 42 grains / row for variant V2 (Mt.). V1 (KetteZinc + Asfac) and V3 (VermiPlant + Asfac) variants have obtained values lower than the variant V2 (Mt.). Values above the experience average (40.6 grains / row) were obtained in variants V3 and V2 (figure 2);

-the average mass of grains on cobs varied between 194.3 g for variant V2 (Mt.) and 263.3 g for variant V1 (KetteZinc + Asfac). Values higher than the V2 variant (Mt.) as well as the average experience (229 g) were obtained in variants V3 and V1 (figure 3);

-the average mass of the *rahis* varied between 45.5 g for variant V3 (VermiPlant + Asfac) and 71.0 g for variant V1 (KetteZinc + Asfac). Values lower than variant V2 (Mt.) (48.8 g) were obtained by variant V3.

Values below the average of the experiment were obtained in variants V3 and V2 (figure no. 3);

-the yield varied between 78.4% for variant V2 (Mt.) and 83.4% for variant V3 (VermiPlant + Asfac). Values superior to the V2 variant (Mt.) as well as the average experience (80.4%) were obtained under the V3 variant.

-the average mass of 1000 grains varied between 325.9 g for variant V3 (VermiPlant + Asfac) and 335.4 g for variant V1 (KetteZinc + Asfac). Values higher than variant V2 (Mt.) was getted under variant V1.

Values above the average of the experiment were obtained in variants V2 (Mt.) and V1 (figure 3).

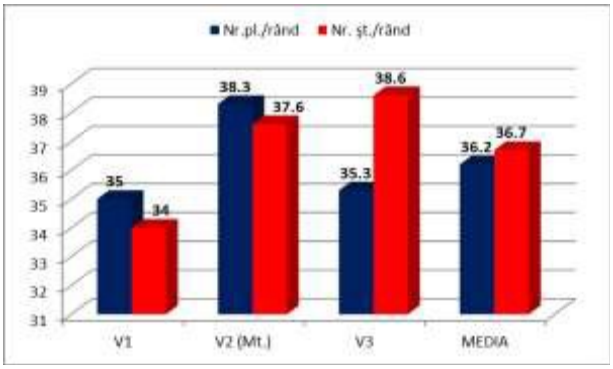

Figure no. 3 Number of plants and cobs in a row

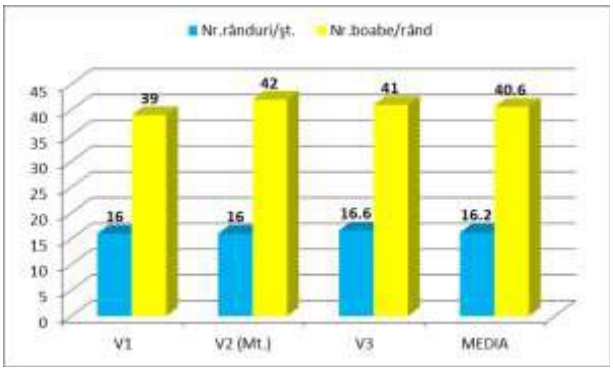

Figure no. 4 Number of rows and grains per row

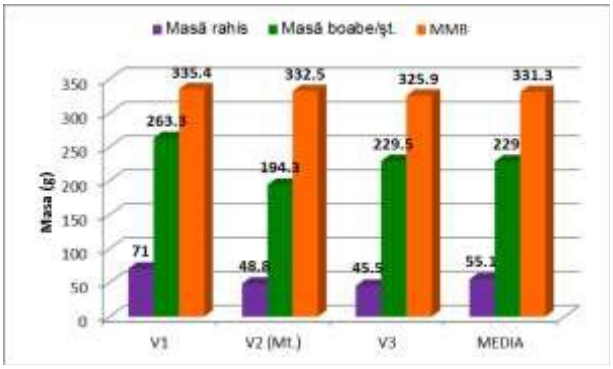

Figure no. 5 Mass of rickets, grains / st. and MMB

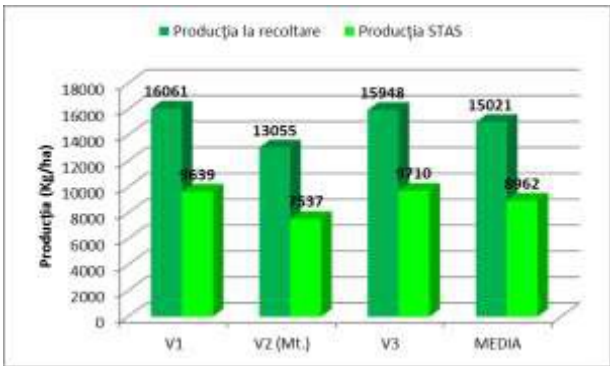

Figure no. 6 Maize production

Table 4 shows the humidity values at the time of harvest, production at harvest and production, MMB and MH recalculated at 14% humidity.

Table no. 4 Influence of foliar fertilization on maize production

Varianta	Umiditatea (%)	Producţia		Producţia Stas		MMB (g)	MH (kg/hl)
		Kg/ha	±faţă de Mt.	Kg/ha	±faţă de Mt.		
V1	23,53	16061	3006	9639	2102	335,41	64,50
V2 (Mt.)	24,03	13055	-	7537	-	332,51	64,73
V3	23,00	15948	2893	9710	2173	325,94	65,16
MEDIA	23,52	15021		8962		331,28	64,79

Analyzing the data in Table 4, it is possible that:

-grain humidity varied between 23.00% for variant V1 (KetteZinc + Asfac) and 24.03% for variant V2 (Mt). Values lower than variant V2 (Mt) were obtained for variants V3 and V1;

-grain production was recalculated at 14% humidity and expressed in Kg / ha. The production varied between 7537 kg / ha for variant V2 (Mt.) and 9710 kg / ha for variant V3 (VermiPlant + Asfac). Or obtained values higher than variant V2 (Mt.) for both variant V1 and variant V3 with a production increase of 2102 kg / ha and 2173 kg / ha, respectively;

-hectoliter mass varied between 64.50 kg / hl for variant V1 (KetteZinc + Asfac) and 65.16 kg / hl for variant V3 (VermiPlant + Asfac). Values higher than variant V2 (Mt.) as well as the average experience (64.79 kg / hl) were obtained for variant V3.

Conclusions

According with the analysis of the data carried out along the study about the influence of foliar fertilization on production and its components, the following conclusions can be drawn:

-corn reacted better to fertilization with VermiPlant + Asfac (variant V3) obtaining values higher than the control-unfertilized variant (V2) as well as the variant fertilized with KetteZinc + Asfac (V1) as regards: number of cobs / row, number of rows of grains / cobs, table spinal cord, yield, hectolitre mass; respectively grain production;

-corn reacted better to fertilization with KetteZinc + Asfac (V1) obtaining values superior to the control variant - unfertilized (V2) as well as to the variant fertilized with VermiPlant + Asfac (variant V3) regarding: mass of grains / cobs, mass of 1000 grains;

-corn reacted better to fertilization with VermiPlant + Asfac (variant V3) obtaining values higher than the variant fertilized with KetteZinc + Asfac (V1) in terms of: the number of plants / row, number of grains / row;

-fertilization with KetteZinc + Asfac (V1) further influenced grain filling, which led to obtaining grains with a higher mass than in the case of the other variants, and fertilizing with VermiPlant + Asfac (variant V3) further influenced the formation of grains;

-application of foliar fertilizers have influenced both the size of the productivity elements and maize production.

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