INFLUENCE OF MINERAL FERTILIZATION ON SUGAR CORN PRODUCTION

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Abstract.
The culture of sweet corn in recent years shows a growing interest among farmers in Romania, especially those with smaller areas of land, but also those with large areas, due to the increase in consumer demand, the profitability of this type of crop and the the possibility of attracting financing sources from European funds.The purpose of this study is to analyze the impact of mineral fertilization on the production of sweet corn in an assortment of marketed hybrids, in the pedoclimatic conditions of 2020.The biological material used in the study of the influence of mineral fertilization in relation to the pedoclimatic conditions in the researched area and the average of the field, was represented by 4 autochthonous sweet corn hybrids(Estival, Dulcin, Prima and Summer Delight). The research was carried out on the territory of Ramna commune, located in the north-west part of Caraș Severin county,on a eutric-gleic alluvial type soil, moderately glaciated, extremely deep, medium loam/coarse sandy loam, developed on medium (clay) non-carbonate fluvial deposits. Analyzing the production results according to the level of nitrogen fertilization on a constant background of P90K90, we observe that nitrogen fertilizers play a decisive role in achieving the production of sweet corn cobs, a fact that is also due to the short vegetation period and the rhythm intense accumulation of dry matter.

Keywords*:sweet corn, production, climatic conditions, mineral fertilization*

INTRODUCTION

The goddess mays convar. Saccharata, also known as sweet or sugar corn, is a native American crop, and the evidenceI trace the DNA back to a large herbaceous plant from the Balsa River valley in western Mexico, which is so different from today's corn. (Axinte 2006, Bîlteanu et al. 1991, David Gh. And al. 2006). Selected and improved by ancient farmers, maize moved to North and South America (Mesoamerica, the Andes, and the Caribbean) until it became a single-stem plant with seeds enclosed in a tight husk about 8,000 years ago year old. (Walker, cited by David 2003)

According to researchers at the University of Minnesota, sweet corn arose as a spontaneous mutation in field corn and was cultivated by several Native American tribes. In other words, sweet corn is the result of a naturally occurring recessive mutation in the genes that control the conversion of sugar to starch within the endosperm. The Iroquois gave the first recorded sweet corn (called "Papoon") to European settlers in 1779. (Mehta et al. 2017) It soon became a popular food in the southern and central regions of the United States. (Fageria, 2016) In Europe, sweet corn was brought as a vegetable around the year 1700. (Imbrea, 2004)

MATERIALS AND METHODS

The biological material used in the study of the influence of mineral fertilization in relation to the pedoclimatic conditions in the researched area and the field average, was represented by 4 autochthonous sweet corn hybrids and included in the Catalog of cultivated plant varieties, with the following characteristics:

1. *The Estival hybrid - is a hybrid from the very impure precocity group, the vegetation period being 80-85 days, showing medium resistance to falling and low temperatures, sugar grain, cob weight 220-230 g, suitable for all areas of cultivation corn, especially under irrigated conditions.*
2. *Dulcin hybrid, is a semi-late hybrid, vegetation period 98 days, good resistance to falling, medium at low temperatures, large cobs of 270 g, recommended for cultivation in all areas.*
3. *The Prima hybrid – is a simple hybrid, as well as very early ripening (75-80 days), very good vigor of the plants in the first phases of vegetation, production potential of 14-17 t/ha cobs, recommended in all corn growing areas .*
4. *Deliciul Verii hybrid – is a simple hybrid, from the very early precocity group (80 days), high sugar content, storage capacity after harvesting 3-4 days at a temperature of 40C, production capacity of 16-20 t/ha you know*

The experiment was of bifactorial type, laid out according to the method of randomized blocks, with the following grading of the experimental factors:

- Factor A, the cultivated hybrid, with 4 grades:
  - a1 - Summer;
  - a2- Dulcin;
  - a3 – First;
  - a4 - Delight of Summer.
- Factor B, the level of mineral fertilization, with three gradations:
  - b1 – N120P90K90;
  - b2 – N140P90K90;
  - b3 – N160P90K90.

From each hybrid, 6 rows were sown, over a length of 20 linear m/repetition, the number of repetitions being 3. To calculate the production of cobs depending on the level of mineral fertilization and climatic conditions, the cobs were harvested from the length of 10 linear m /repetition/experimental year from rows 3 and 4, removing cobs from the first two plants at the beginning of each repetition.

The technology applied for the experience with testing the response to the level of mineral fertilization was established with autumn wheat as the predecessor plant, the land preparation works consisted of plowing at 28 cm, immediately after harvesting the predecessor plant, and in the spring before the preparation of the germinal bed s - they applied complex fertilizers of the 15:15:15 type. The difference in nitrogen until the achievement of the three fertilization reports was achieved by applying urea, together with the mechanical grid.

Sowing was carried out in the last decade of April, at a density of 55,000 bg/m2. Weed control was carried out by pre-emergent weeding with Stomp Aqua, in a dose of 3 l/ha.

To combat the cob worm (Ostrinia nubilalis) a treatment was carried out usinga mixture of 1.5 kg/ha Affirm + 100 ml Fastac, applied together. During the experimental period, it was not necessary to carry out treatments against diseases.

RESULTS AND DISCUSSIONS

The production results of the first experimental year according to the hybrid shown in table 1 and figure 1, show that, compared to the field average of 15 018 kg/ha, the Deliciul Verii hybrid registered a greater difference in production by 377.5 kg/ha ha and Dulcin with 542.71 kg/ha, which corresponds to a 2.5% and 3.6% increase in production respectively, statistically assured as very significant.

In the case of Estival hybrids (14174.38 kg/ha) and First (14941.77 kg/ha), the productions obtained were below the average of the field, the production differences recorded being statistically assured as very significant in a negative sense.

Table 1

Production results by hybrid in 2020

A factor Hybrid	Corn production		Difference [kg/ha]	Significance
	[kg/ha]	%		
a1 – Summer	14174.38	94.4	-843.80	000
a2 – Sweet	15560.89	103.6	542.71	***
a3 – First	14941.77	99.5	-76.42	000
a4 – Summer Delight	15395.68	102.5	377.50	***
/Field average	15018.18	100.0	Mt	
DL 5% = 19.28 kg DL 1% = 26.13 kg; DL 0.1% = 34.99 kg				

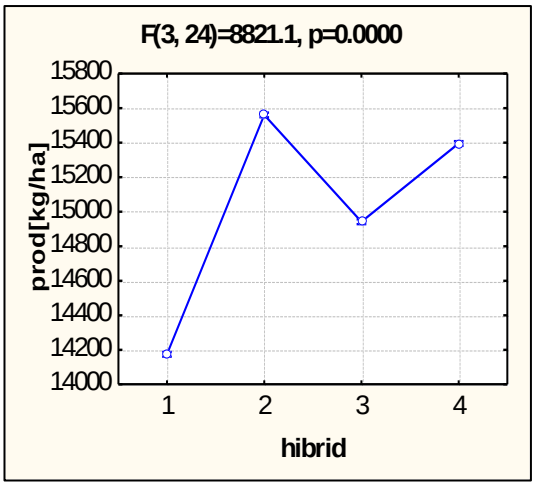

Figure 1 Variation of corn production in the 4 hybrids [factor A]

Sweet corn production has an upward trend from hybrid 1 to hybrid 2, downward from hybrid 2 to hybrid 3 and again upward from hybrid 3 to hybrid 4. Sweet corn production values vary between 14170 kg and 15600 kg. The lowest production of sweet corn was obtained at a1[Estival], and the highest at a2[Dulcin]. The differences between mineral fertilization levels are very significant [$p<0.001$].

Table 2 and figure 2 show the results of cob production from the first experimental year, depending on the level of mineral fertilization.

Depending on the level of mineral fertilization, only on the agrofund with N120P90K90, the production was below the average of the field, the yield difference of -1101 kg/ha, being statistically assured as very significant in the negative sense.

On the other two fertilization levels N140P90K90 and N160P90K90, the production of sweet corn cobs exceeded the average of the field, the biggest difference in production being recorded on the agro-fund with 160 kg/ha of nitrogen, the difference of 1080 kg/ha, being statistically ensured as very significant.

Table.2

Production results according to the level of mineral fertilization, in the year 2020

Factor B/ Level of fertilization	Corn production		Difference [kg/ha]	Significance
	[kg/ha]	%		
b1 – N120P90K90	13916.25	92.7	-1101.93	000
b2 – N140P90K90	15039.98	100.1	21.79	*
b3 – N160P90K90	16098.32	107.2	1080.14	***
Average field	15018.18	100.0	Mt	
LD 5% = 17.63 kg LD 1% = 24.72kg LD 0.1% = 34.94 kg				

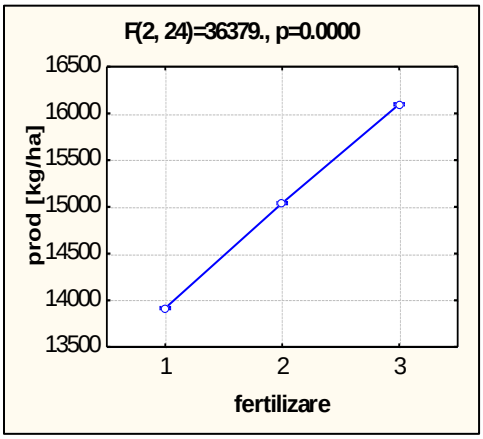

Figure 2 Variation of maize production at the three levels of fertilization [factor B]

The production of sweet corn has an upward trend depending on the level of fertilization. The values vary between 13920 kg/ha and 16100 kg/ha. The differences between fertilization levels are highly significant [p<0.001]. We can conclude that there is a linear relationship between fertilization and corn production.

The production results of the first experimental year at the interaction of the experimental factors hybrid x level of mineral fertilization are presented in table 3 and figure 3.

The results show that, compared to the control - the average of the experience, the following increases were obtained:

- at a1 [Estival] statistically very significant differences were obtained at all 3 levels of fertilization, but at b1[N120P90K90] and b2[N140P90K90] the production of sweet corn is below the average of the experience and the statistical assurance is negative;
- at a2 [Dulcin] very significant differences were obtained at all 3 levels of fertilization, it should be noted that at b1[N120P90K90], the production is below the average of the experience;
- at a3 [Prima], statistically very significant differences were obtained at b1[N120P90K90], respectively, b3[N160P90K90], and at b2[N140P90K90] a significant difference. It should be noted that at b1[N120P90K90] and b2[N140P90K90] the productions are below the experience average.

- at a4 [Deliciu Verii] statistically very significant differences were obtained at all 3 levels of fertilization, but at b1 [N120P90K90] the production of sweet corn is below the average of the experience.

Table 3

Production results from the year 2020 at the interaction of the experimental factors hybrid x level of mineral fertilization

A factor Hybrid	B factor Level of fertilization	Corn production		Difference [kg/ha]	Significance
		[kg/ha]	%		
a1 – Summer	b1 – N120P90K90	12985.41	86.5	-2032.77	**000**
	b2 – N140P90K90	14148.04	94.2	-870.14	000
	b3 – N160P90K90	15389.69	102.5	371.51	***
a2 – Sweet	b1 – N120P90K90	14462.55	96.3	-555.63	000
	b2 – N140P90K90	15598.66	103.9	580.48	***
	b3 – N160P90K90	16621.47	110.7	1603.28	***
a3 – First	b1 – N120P90K90	13902.32	92.6	-1115.86	000
	b2 – N140P90K90	14978.65	99.7	-39.53	0
	b3 – N160P90K90	15944.33	106.2	926.14	***
a4 – Summer Delight	b1 – N120P90K90	14314.71	95.3	-703.47	000
	b2 – N140P90K90	15434.54	102.8	416.36	***
	b3 – N160P90K90	16437.80	109.5	1419.61	***
Average field	15018.18				
	DL 5% = 34.64 kg; DL 1% = 48.04; DL 0.1% = 66.78				

Sweet corn production increases with the level of fertilization. The highest production values are obtained at the N160P90K90 farm, and the lowest at the N120P90K90 farm.

If we compare the hybrids with each other, we can see that the highest production is obtained in hybrid 2[Dulcin], and the lowest production in hybrid 1[Estival] regardless of the level of fertilization.

CONCLUSIONS

On the N120 fertilization level, a lower production was obtained than the experience average, the difference of -1109 kg/ha, being statistically assured as very significant in the negative sense, and on the N140 agrofund, the production obtained was approximately equal to the field average.

The production of sweet corn increases with the level of fertilization. The highest values of production are obtained on the agrofund fertilized with N160P90K90, and the lowest on the agrofund fertilized with N120P90K90.

Analyzing the production results according to the level of nitrogen fertilization on a constant background of P90K90, we observe that nitrogen fertilizers play a decisive role in achieving the production of sweet corn cobs, a fact that is also due to the short vegetation period and the rhythm intense accumulation of dry matter.

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