

STUDY OF AGRONOMIC CHARACTERISTICS OF AN ASSORTMENT OF SWEET CORN HYBRIDS

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Abstract

Sweet corn is a relatively new crop for our country and with certain peculiarities compared to conventional corn cultivation technology. The aim of this study is to contribute to the improvement of cultivation technology in relation to pedoclimatic conditions in the Berzovia area, by studying the relationship between cob weight and production of sweet corn cobs according to the maturity group in an assortment of 11 sweet corn hybrids compared with the local hybrid Estival. The study was carried out in the Ramna area, characterized by an early spring, the minimum germination temperature of 10°C, taking place in the first days of April, a fact that allows obtaining early harvests. The results highlighted that the highest cob weight values were obtained in hybrids: Driver F1, Accentuate F1 and 11-Sweet Thing, between 336 and 368 g. Small cob weight values of approximately 232-255 g were obtained in hybrids the extra-early Estival and Spirit F1, the early Legend F1, Tyson F1, Starshine F1 and the semi-early hybrid Landmark F1. Regarding the production of sweet corn, SF201 F1, Jubilee F1, Driver F1, Accentuate F1 and Sweet Thing hybrids were well above the experience average in terms of cob production, surpassing the field average with gains between 2392.43 kg/ha and 5224.59 kg/ha, or in other words: the five hybrids surpassed the control by: 12.56%, 16.50%, 27.43%, 17.68%, respectively 16.76%.

Key words: *sweet corn, production, climatic conditions, vegetation period.*

INTRODUCTION

Arising as the result of a naturally occurring recessive mutation in the genes that control the conversion of sugar to starch within the endosperm, sweet corn (*Zea mays* L. *Saccharata* Sturt) is an important food grain and the second largest processing crop, second only to tomato (Mehta B.K. et al., 2017; Budak F. and Aydemir S.K., 2018; Soare, 2019).

The Iroquois gave the first recorded sweet corn (called "Papoon") to European settlers in 1779 (Williams M.M., 2008).

In the last decade we have seen an increase in consumer demand for fresh sweet corn between June and September, especially in the United States, where the vast majority of the world's acreage is grown, but also among consumers in Europe and Asia (Imbrea et al., 2014). Sweet corn has also become an important large-scale cash crop for export to Europe and other major world markets in temperate zones (David et al, 2006; Leneschi et al., 2018).

The production of sweet corn for the fresh market can be a profitable option for growers with small acreage, provided they can secure a good market and use their own labor (Imbrea et al., 2014).

Another advantage of this culture is represented by the short vegetation period and the fact that by choosing the assortment of hybrids the effects of climate change can be counteracted (Hatfield J.L. et al., 2011; Smuleac et al., 2020). Another advantage of this culture is represented by the good utilization of chemical fertilizers (Esiyok D., 2004; Bozokalfa M.K., 2008; Amanullah A.M. et al., 2010; Bhatt P.S., 2012).

MATERIALS AND METHODS

The biological material was represented by an assortment consisting of 11 hybrids of sweet corn, with different vegetation periods and which are currently sold in our country.

The research was carried out on a eutric-gleic alluvial soil, moderately glaciated, extremely

deep, medium loam/coarse sandy loam, developed on medium (clay) non-carbonate fluvial deposits.

The experiment was set up according to the Latin rectangle method, and the observations were made at the waxy milk physiological maturity, at 10 plants/repetition, respectively 30 plants/experimental hybrid.

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RESULTS AND DISCUSSIONS

The results regarding cob weight according to hybrid in the 2020-2021 experimental cycle are presented in Table 1 and Figure 1.

The 11 hybrids tested in the 2020-2021 experimental cycle, in terms of cob weight, had the following behavior, compared to the field average:

- Summer hybrids, Spirit F1, Legend F1, Tyson F1 and Starshine F1, and the hybrid Landmark F1 they had cob weight values below the average of the experience, that is, the difference from the average of the experience is negative;
- SF201 F1, Jubilee F1, Driver F1 hybrids, Accented F1 and Sweet Thing they were higher than the experience average, they exceeded the field average with gains between 36.64-78.70 g, or in other words: the five hybrids exceeded the control by: 12.68%, 16.40%, 27.24%, 18.00%, and 16.41%, respectively.

Table 1. Results regarding the weight of the cob depending on the hybrid

A Hybrid factor	Cob weight		Difference [g]	Significance
	Mr	%		
a1. Summery	231.61	80.17	-57.28	000
a2. Spirit F1	243.15	84.17	-45.73	000
a3. Legend F1	255.31	88.38	-33.58	000
a4. Tyson F1	242.23	83.85	-46.65	000
a5. Starshine F1	251.49	87.05	-37.40	000
a6. SF201 F1	325.52	112.68	36.64	***
a7. F1 Jubilees	336.27	116.40	47.39	***
a8. Landmark F1	247.43	85.65	-41.45	000
a9. F1 driver	367.58	127.24	78.69	***
a10. Accented F1	340.83	117.98	51.95	***
a11. Sweet Thing	336.29	116.41	47.41	***
Field average	288.88	100.0	Mt	

DL 5% = 1.091 g; DL 1% = 1.483 g; DL 0.1% = 1.995 g.

Following the figure above, it can be seen that hybrid 9-Driver F1, 10-Accentuate F1 and 11-Sweet Thing have the highest values [336-368 g] compared to the other hybrids, and hybrid 1 - Estival has the lowest approximate value 232 g.

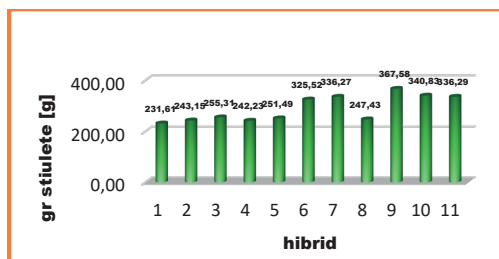


Figure 1. Variation of cob weight depending on hybrid

Low values of cob weight, approximately 232-255 g, were obtained in extra-early hybrids [1-Estival, 2-Spirit F1], early [3-Legend F1, 4-Tyson F1, 5-Starshine F1] and hybrid 8- Landmark F1-hybrid semi-early are inferior to the other hybrids studied.

The contribution of the experimental factors to the weight of the cob of sweet corn during the experimental period is presented in Figure 2. The factor A [year] contributes to the variation of the weight of the cob with 7.49%, factor B [hybrid] contributes with 92.3%, and the interaction A x B with 0.21%.

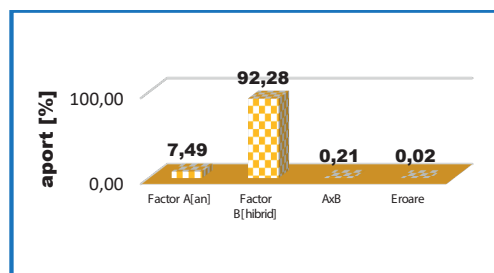


Figure 2. Contribution of factors A [year], B [hybrid] and A x B interaction

The results regarding the production of sweet corn cobs according to the hybrid in the experimental cycle 2020-2021, are presented in Table 2 and Figure 3.

Table 2. Results regarding the production of the cob

Factor A [hybrid]	Production kg/ha		Difference [kg]	Significance
	kg/ha	%		
a1. Summery	15248.88	80.07	-3795.83	000
a2. Spirit F1	16016.28	84.10	-3028.43	000
a3. Legend F1	16812.76	88.28	-2231.94	000
a4. Tyson F1	16058.72	84.32	-2985.99	000
a5. Starshine F1	16484.26	86.56	-2560.45	000
a6. SF201 F1	21437.14	112.56	2392.43	***
a7. F1 Jubilees	22186.88	116.50	3142.18	***
a8. Landmark F1	16328.23	85.74	-2716.48	000
a9. F1 driver	24269.30	127.43	5224.59	***
a10. Accented F1	22412.57	117.68	3367.87	***
a11. Sweet Thing	22236.76	116.76	3192.05	***
Field average	19044.71	100.0	Mt	

DL 5% = 93,248 kg, DL 1% = 126,744 kg, DL 0.1% = 170,491 kg

The production of cobs in the 11 hybrids tested compared to the production of the control - the average of the field, presented the following behavior:

- Summer hybrids, Spirit F1, Legend F1, Tyson F1 and Starshine F1, and the hybrid 8 Landmark F1 they had production values below the average of the experience, i.e. the difference from the average of the experience is negative;

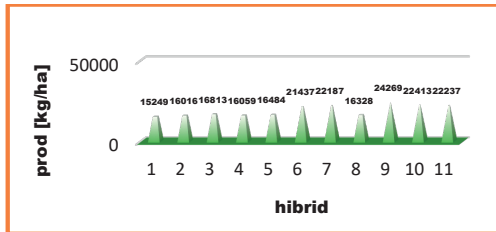


Figure 3. Variation of cob production depending on hybrid

- SF201 F1, Jubilee F1, Driver F1 hybrids, Accented F1 and 11 Sweet Thing were clearly higher than the average of the experience, they exceeded the average of the field with increases between 2392.43 kg/ha and 5224.59 kg/ha, or in other words: the five hybrids exceeded the control by: 12.56%, 16.50%, 27.43%, 17.68%, respectively 16.76%.

Following the figure above, it can be seen that the hybrid 9-Driver F1- 24270 kg/ha - semi-early hybrid has the highest value compared to the other hybrids, and the hybrid 1-Estival - 15250 kg/ha, has the lowest value.

The contribution of the experimental factors to the production of sweet corn cobs is presented in Figure 4.

The factor A [year] contributes to the production variation with 11.94%, the factor B [hybrid] contributes with 87.70%, the interaction A x B with 0.33%.

So the biggest contribution is the B [hybrid] factor, followed by the A [year] factor.

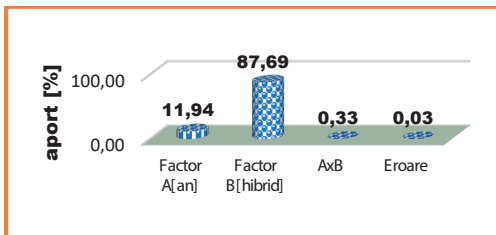


Figure 4. Contribution of factors A [year], B [hybrid] and A x B interaction

Calculating the correlation coefficient helps us establish the linear dependence between the two studied variables, while the regression coefficient a_1 shows us how much the dependent variable [production] increases/ decreases by increasing the independent variable [cob weight] by one unit.

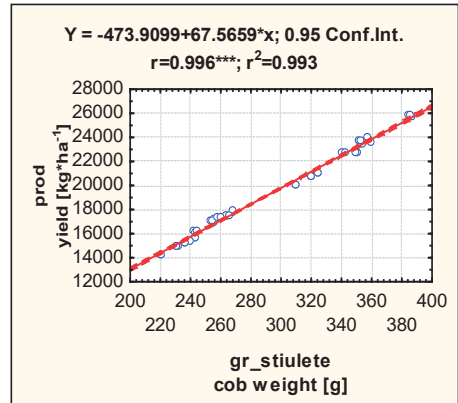


Figure 5. Correlation between cob weight and production

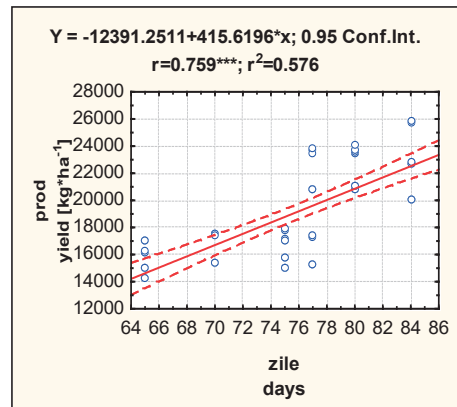


Figure 6. Correlation between the growing season of hybrids and production

Analyzing the values presented in Figures 5 and 6, it is found that cob production correlates positively with any of the 2 independent variables [cob weight and vegetation period], the correlation coefficients vary between 0.67 and 0.99, the correlation is from close to very closely, the coefficients are statistically assured at $\alpha = 0.001$ level.

According to the coefficient of partial determination [$d = r^2 * 100$], cob production was influenced by 99.3% by cob weight and 57.6% by vegetation period.

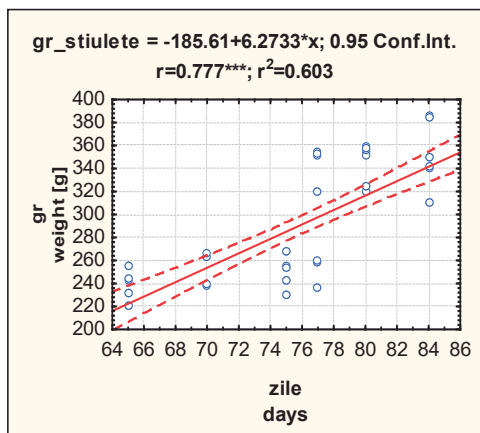


Figure 7. Correlation between growing season and cob weight

The data presented in Figure 7 show us that there is a positive correlation between the weight of the cob and the vegetation period, by increasing the value of one of them leads to the increase of the values of the other variable, i.e. the variables are directly proportional.

TEST DUNCAN pt	α5%	- factor B	DL 5% = 90.50 kg	Date originale	Date sorte	Mean	Class
Mean 1				15250.	I	Mean 9 = 24270.	A
Mean 2				16020.	H	Mean 10 = 22410.	B
Mean 3		E		16810.		Mean 11 = 22240.	C
Mean 4		H		16060.		Mean 7 = 22190.	C
Mean 5		F		16480.		Mean 6 = 21440.	D
Mean 6		D		21440.		Mean 3 = 16810.	E
Mean 7		C		22190.		Mean 5 = 16480.	F
Mean 8		G		16330.		Mean 8 = 16330.	G
Mean 9		A		24270.		Mean 4 = 16060.	H
Mean 10		B		22410.		Mean 2 = 16020.	H
Mean 11		C		22240.		Mean 1 = 15250.	I

Figure 8. Duncan test for B factor

Following the 55 comparisons [C112], classes A - I were obtained.

The highest production value - 24270 kg/ha, was obtained at b9[Driver F1] - class A, which differs significantly from other hybrids.

The lowest value of 15250 kg/ha was obtained at b1 [Estival] - class I, a value that differs significantly from the other hybrids.

It should be noted that in the case of hybrids:

- **b11** [Sweet Thing] and **b7** [Jubilee F1], are part of the same homogeneity class - class C. We can say that the hybrid 11 [Sweet Thing] and the hybrid 7 [Jubilee F1], do not differ significantly from each other, i.e. in the two hybrids, a homogeneous production value of approximately 22,200 kg/ha is obtained
- **b2** [Spirit F1] and **b4** [Tyson F1], are part of the same homogeneity class - class H. We can say that the Spirit F1 hybrid and the Tyson F1

hybrid do not differ significantly from each other, i.e. the two hybrids have a homogeneous value of the production of 16600 kg/ha.

TEST DUNCAN pt	α5%	- interactione AxB	DL 5% = 128 kg	Mean	Class
Mean 1				14310.	A
Mean 2		L		15010.	B
Mean 3		O		15760.	C
Mean 4		H		15010.	C
Mean 5				15460.	D
Mean 6		G		20110.	D
Mean 7		F		20790.	E
Mean 8		N		15270.	F
Mean 9		D		22760.	F
Mean 10		E		21010.	G
Mean 11		F		20350.	H
Mean 12		K		16190.	I
Mean 13		J		17030.	I
Mean 14		H		17870.	J
Mean 15		J		17030.	J
Mean 16		I		17310.	K
Mean 17		I		22770.	L
Mean 18		C		23590.	L
Mean 19		I		17390.	M
Mean 20		A		23780.	O
Mean 21		B		23810.	O
Mean 22		C		23650.	P

Figure 9. Duncan test for A x B interaction

From the same homogeneity class [that is, similar values were obtained in the respective hybrids] are:

- Mean22 a2b11-Sweet Thing and Mean18 a2b7-Jubilee F1 [hybrid 11, year 2021 and hybrid 7 year 2021], about 23600 kg/ha - class C;
- Mean17 a2b6-SF201 F1 and Mean9 a1b9-Driver F1 [hybrid 6, year 2021 and hybrid 9 year 2020] with production of 22770 kg/ha - class D;
- Mean11 a1b11- Sweet Thing [Sweet Thing, year 2020] and Mean7 a1b7 - Jubilee F1 [Jubilee F1, year 2020], belong to the same homogeneity class - class F. We can say that hybrid 11 [Sweet Thing] and hybrid 7, [Jubilee F1], do not differ significantly from each other, i.e. the two hybrids obtain a homogeneous production value of 20800 kg/ha in 2020;
- Mean16 a2b5-Starshine F1 and Mean19 a2b8-Landmark F1 [hybrid 5, year 2021 and hybrid 8 year 2021], i.e. hybrid 5 Starshine F year 2021 and hybrid 8-Landmark F1 year 2021 gave a similar yield of 17400 kg/ha - first class;
- Mean13 a2b2 - Spirit F1 and Mean15 a2b4 - Tyson F1, belong to the same homogeneity class - class J. We can say that the Spirit F1 hybrid and the Tyson F1 hybrid do not differ significantly from each other, that is, the two hybrids have a homogeneous value of production, approximately 17000 kg/ha, in 2021.
- Mean2 a1b2-Spirit F1 and Mean4 a1b4-Tyson F1, are part of the same homogeneity class - class O. So the Spirit F1 hybrid and

the Tyson F1 hybrid do not differ significantly from each other, that is, the two hybrids have a homogeneous production value of 15000 kg/ha, in 2020.

CONCLUSIONS

The success of a sweet corn crop depends on the choice of an assortment of hybrids with different vegetation periods, which allow production to be staggered and ensure availability for the market in the months of June-August, the period in which the highest demand for fresh consumption is met

The highest cob weight values were obtained in the hybrids: Driver F1, Accentuate F1 and 11-Sweet Thing, between 336 and 368 g. Low cob weight values of approximately 232-255 g were obtained in the hybrids the extra-early Estival and Spirit F1, the early Legend F1, Tyson F1, Starshine F1 and the semi-early hybrid Landmark F1.

The contribution of the experimental factors to the realization of the sweet corn cob weight during the experimental period showed that Factor A [experimental year] contributes to the variation of the cob weight by 7.49%, factor B [the experimented hybrid] contributes by 92.3%, and the A x B interaction by 0.21%.

The largest cob production of 24270 kg/ha was achieved with the Driver F1 semi-early hybrid, and the lowest of 15250 kg/ha, with the Estival hybrid.

The contribution of the experimental factors to the realization of the production of sweet corn cobs was in percentage of 11.94% for Factor A [experimental year], 87.70% for factor B [experimental hybrid] and 0.33% for the A x B interaction.

Among the 11 hybrids tested, the semi-early hybrid Driver F1 had the best performance both in terms of agronomic characteristics and cob production.

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