

## THE INFLUENCE OF GENOTYPE AND SOIL TILLAGE SYSTEM ON FORMING PRODUCTION COMPONENTS FOR SWEET CORN UNDER SOIL-CLIMATE CONDITIONS SPECIFIC TO ROMANIAN PLAIN

Maria Cristiana ONCICĂ (MORARU)<sup>1,2</sup>, Ricuța-Vasilica DOBRINOIU<sup>2</sup>,  
Luminița VISAN<sup>2</sup>, Silvana DANAILA (GUIDEA)<sup>2</sup>, Izabela OPREA<sup>3</sup>

<sup>1</sup>S.C. Biocrop S.R.L., 15B Agatha Barseescu Street, Prisum building, 2th floor,  
Phone: +40314253946, Email: morarucristiana84@yahoo.com

<sup>2</sup>University of Agronomic Sciences and Veterinary Medicine of Bucharest,  
Faculty of Biotechnology, 59 Mărăști Blvd, District 1, 011464, Bucharest, Romania,  
Phone: +4021.318.25.64, Fax: + 4021.318.25.67

<sup>3</sup>University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Agriculture,  
59 Mărăști Blvd, District 1, 011464, Bucharest, Romania,  
Phone: +4021.318.25.64, Fax: + 4021.318.25.67  
Corresponding author email: morarucristiana84@yahoo.com

### Abstract

*Knowing the fact that sweet corn valorization is mainly done, in our country, as fresh product, for boiling purposes and less for manufacturing, productivity elements and the production of corn cobs for each area unit, constitute, nowadays, priority amelioration tasks, considering that an ever significant part of sweet corn yield begins to be meant, in Romania too, to the manufacture as frozen beans or tins, this fact leading to an economic effectiveness of this crop, only for production levels found over certain limits. Research aimed at testing the behaviour of a sweet corn foreign and local assortment, hybrids which belong to different precocity categories, under the circumstances of practising two soil tillage systems (conventional system and minimum tillage system). After analysing and comparing the experimental results, one has established the superiority of the yields achieved by the minimum tillage system, system which had as result a better preservement of water in the soil, having direct impact on the crop achievement, each of the tested hybrids valorizing very well their genetical endowment concerning the productive capacity.*

**Key words:** hybrid, conventional system, minimum system, yield.

### INTRODUCTION

Sweet corn could be, for most areas of our country, a plant extremely important both for direct consumption (corn) and as a raw material for manufacturing domestic and especially foreign.

Being a short-day plant, adapted to light the intense, sweet corn in the early stages of growth, has a high resistance to drought, because the root system deeply, but water shortages during training tasseling and grain can adversely affect production (Hallauer A. R., J.B. Miranda, 1988), which is why, the success of this crop requires choosing the most appropriate technological links, so efficiency culture is maximized in terms of input minimum knowing that ecological plasticity recognized this species enables its adaptation with relative ease, the culture conditions completely changed in context of climate change (Haş I., 2004).

The research was conducted during 2014-2015 in pedo-climatic characteristics Draganesti-Vlasca location, jud.Teleorman and include comparative study on sweet corn genotypes of native and foreign origin, hybrids belonging to different groups precocity, for research to identify the most efficient consisting of corn genotypes for pedo-climatic characteristics of the Romanian Plain.

### MATERIALS AND METHODS

Experience with sweet corn was one type bifactorial placed in the field after the subdivided parcels method in three repetitions, experimental factors are the following:

Factor A: tillage system with 2 degrees:

- a<sub>1</sub> - classical system;
- a<sub>2</sub> - minimum system.

Factor B: genotype grown by 9 degrees:

- b<sub>1</sub> - PRIMA
- b<sub>2</sub> - SPIRIT FI

- b<sub>3</sub> - *CANDLE F1*
- b<sub>4</sub> - *DELICLIUL VERII*
- b<sub>5</sub> - *SWEET THING F1*
- b<sub>6</sub> - *SHIMMER F1*
- b<sub>7</sub> - *DULCIN*
- b<sub>8</sub> - *CHALLENGER F1*
- b<sub>9</sub> - *JUBILEE F1*

The experimental plot was constituted of three rows for each variant with a length of 5.04 m to 18 plants per row, the distance between lines of 70 cm. There were thus obtained the elementary plots sown area of 10.5 m<sup>2</sup> and a surface of 7.02 m<sup>2</sup> collected.

For the calculation and interpretation of experimental results is used the method of analysis of variance according to the settlement experience in the field.

During the research analyzes and determinations were made on the main elements of productivity as follows:

- number of cobs per plant;
- length of cobs (cm);
- diameter of the cobs (cm) was measured with calipers;
- the weight of the corn cob with husk (g) was obtained by weighing;
- production of cobs with husk (to/ha) was calculated by multiplying the number of ear weight cobs per plant and the number of plants per unit area achieved.

## RESULTS AND DISCUSSIONS

Production components and production of cobs achieved per unit area constitute major objectives in choosing the most valuable genotypes of corn, to put your best worth gene pool, knowing that only levels of production which exceeded certain limits are economically efficient.

Table 1. Number of cobs/plant based on genotype and tillage system

GENOTYPE (HYBRID)	COB/PLANT				DIFFERENCE			
	(No.)		(%)		(No.)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	1.42	1.53	87	88	-0.21	-0.21	ooo	ooo
2. <i>SPIRIT F1</i>	1.59	1.73	98	99	-0.04	-0.01	oo	-
3. <i>CANDLE F1</i>	1.62	1.76	99	101	-0.01	0.02	-	-
Average early hybrids	1.54	1.67	94	96	-0.26	-0.20	ooo	ooo
4. <i>DELICLIUL VERII</i>	1.61	1.69	99	97	-0.02	-0.05	-	ooo
5. <i>SWEET THING F1</i>	1.68	1.78	103	102	0.05	0.04	***	**
6. <i>SHIMMER F1</i>	1.72	1.81	106	104	0.09	0.07	***	***
Average extra early hybrids	1.67	1.76	102	101	0.12	0.06	***	***
7. <i>DULCIN</i>	1.48	1.71	91	98	-0.15	-0.03	ooo	a
8. <i>CHALLENGER F1</i>	1.76	1.82	108	105	0.13	0.08	***	***
9. <i>JUBILEE F1</i>	1.79	1.88	110	108	0.16	0.14	***	***
Average mid early hybrid	1.68	1.80	103	103	0.14	0.19	***	***
AVERAGE EXPERIENCE	1.63	1.74	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.03; DL 1% = 0.04; DL 0.1% = 0.05

A decisive role in the production of cobs per unit area playfully number of cobs per plant. Some authors argue that it is preferable to have a single cob plants than two or three because the greater number of cobs per plant would be detrimental to their length and weight.

Also, high density planting the same result negative for this purpose (Jugenheimer, Robert

W., 1976). Experimental field sowing of the crop was made at the distance between rows and between plants in the row recommended for maize (Haş I., 2004).

Analyzing the experimental results on the number of trained cobs per plant (Table 1) we observe the superiority of hybrids grown under minimum tillage system, by charging system which yielded a number between 1.53 and 1.88

cobs/plant compared to the classic work for which the number of kernels was between 1.42 and 1.79 cobs/plant.

The lowest number of cobs formed on a hybrid plant was registered early *Prima* and the largest number of kernels was obtained by *Jubilee F1* hybrid, semi early, regardless of tillage system practiced.

From the point of view of this character, best behaved mid early hybrids, followed by extra early hybrids those early hybrids in both tillage systems.

Poor development of the ears, possible deformation of them is due to the significant

drop in temperature in June, during the development of maximum ear and formation of husk very tight around the ear may hinder the development of silk and therefore binding flowers (Jugenheimer, Robert W., 1976).

The length of the ears (Table 2) was between 16.6 cm and 19.6 cm in classic tillage system, respectively between 17.3 cm and 22.3 cm for practicing minimum tillage system the biggest ears in the case of hybrids forming mid early, followed by hybrids extra early hybrids and the times.

Table 2. The length of the ears based on genotype and tillage system

GENOTYPE (HYBRID)	LENGTH EAR				DIFFERENCE			
	(cm)		(%)		(cm)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	16.6	17.3	91	88	-1.6	-2.4	ooo	ooo
2. <i>SPIRIT F1</i>	18.2	19.7	100	100	0.0	0.0	-	-
3. <i>CANDLE F1</i>	18.4	19.6	101	99	0.2	-0.1	-	-
Average early hybrids	17.7	18.9	97	96	-1.4	-2.5	ooo	ooo
4. <i>DELICLIUL VERII</i>	17.2	18.2	95	92	-1.0	-1.5	-	-
5. <i>SWEET THING F1</i>	18.5	21.3	102	108	0.3	1.6	-	***
6. <i>SHIMMER F1</i>	18.9	20.7	104	105	0.7	1.0	***	***
Average extra early hybrids	18.2	20.1	100	102	0.0	1.1	-	***
7. <i>DULCIN</i>	17.9	18.2	98	92	-0.3	-1.5	-	ooo
8. <i>CHALLENGER F1</i>	18.8	19.9	103	101	0.6	0.2	***	-
9. <i>JUBILEE F1</i>	19.6	22.3	108	113	1.4	2.6	***	***
Average mid early hybrid	18.8	20.1	103	102	1.7	1.3	***	***
AVERAGE EXPERIENCE	18.2	19.7	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.33;DL 1% = 0.45;DL 0.1%= 0.59

Of sweet corn genotypes tested in the experiment were noted extra early hybrid *Shimmer F1* hybrid with a length of 18.9 cm and ears of hybrid *Jubilee F1* with 19.6 cm in conventional tillage system. By practicing minimum tillage system were highlighted in terms of length of ears, extra early hybrid *Sweet Thing F1* with 21.3 cm and *Jubilee F1* hybrid with 22.3 cm, the latter being superior

to other hybrids tested, regardless of tillage system practiced.

Regarding cobs diameter (Table 3) revealed that this character values were between 4.33 cm and 4.83 cm by practicing classical tillage system, and 4.38 cm to 5.09 cm in the case of the minimum system work, the use of this system fairly wide variations resulting from the hybrid to another, compared with the system in which it classic variations were quite close.

Table 3. Diameter ears based on genotype and tillage system

GENOTYPE (HYBRID)	DIAMETER EAR				DIFFERENCE			
	(cm)		(%)		(cm)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	4.33	4.38	94	92	-0.27	-0.37	o	oo
2. <i>SPIRIT F1</i>	4.56	4.87	99	103	-0.04	0.12	ooo	***
3. <i>CANDLE F1</i>	4.58	4.76	100	100	-0.02	0.01	o	-
Average early hybrids	4.49	4.67	98	98	-0.33	-0.24	ooo	ooo
4. <i>DELICLIUL VERII</i>	4.53	4.56	98	96	-0.07	-0.19	ooo	ooo
5. <i>SWEET THING F1</i>	4.69	4.79	102	101	0.09	0.04	***	***
6. <i>SHIMMER F1</i>	4.67	4.77	102	100	0.07	0.02	***	*
Average extra early hybrids	4.63	4.70	101	99	0.09	-0.13	***	ooo
7. <i>DULCIN</i>	4.45	4.48	97	94	-0.15	-0.27	ooo	o
8. <i>CHALLENGER F1</i>	4.78	5.06	104	107	0.18	0.31	***	***
9. <i>JUBILEE F1</i>	4.83	5.09	105	107	0.23	0.34	***	***
Average mid early hybrid	4.69	4.88	102	103	0.26	0.38	***	***
AVERAGE EXPERIENCE	4.60	4.75	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.022;DL 1% = 0.029; DL 0.1% = 0.038

By cultivating sweet corn in the classic tillage, cobs weight was, on average, 282.2 g hybrids early, 294.1 g and 296.1 g extra early hybrids in the mid early while ago practicing minimum tillage system is a significant difference

between groups in weight cobs such precocity: 298.7 g hybrids early in the 305.7 g –309.1 g hybrids extra early and mid early, the results practicing this system tillage is superior to the conventional system (Table 4).

Table 4. Cobs weight based on genotype and tillage system

GENOTYPE (HYBRID)	WEIGHT COBS				DIFFERENCE			
	(g)		(%)		(g)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	256.3	284.9	88	94	-34.5	-19.6	ooo	ooo
2. <i>SPIRIT F1</i>	294.3	305.9	101	100	3.5	1.4	***	***
3. <i>CANDLE F1</i>	295.6	305.2	102	100	4.8	0.7	***	***
Average early hybrids	282.1	298.7	97	98	-26.2	-17.5	ooo	ooo
4. <i>DELICLIUL VERII</i>	288.5	304.1	99	100	-2.3	-0.4	ooo	oo
5. <i>SWEET THING F1</i>	296.2	306.8	102	101	5.4	2.3	***	***
6. <i>SHIMMER F1</i>	297.6	306.2	102	101	6.8	1.7	***	***
Average extra early hybrids	294.1	305.7	101	100	9.9	3.6	***	***
7. <i>DULCIN</i>	283.3	302.9	97	99	-7.5	-1.6	ooo	ooo
8. <i>CHALLENGER F1</i>	301.4	311.2	104	102	10.6	6.7	***	***
9. <i>JUBILEE F1</i>	303.6	313.2	104	103	12.8	8.7	***	***
Average mid early hybrid	296.1	309.1	102	102	15.9	13.8	***	***
AVERAGE EXPERIENCE	290.8	304.5	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.33;DL 1% = 0.45;DL 0.1% = 0.59

Of the nine genotypes analyzed were noted *Challenger F1* mid early hybrids and *Jubilee F1*, cobs weight exceeding 300 g in both tillage systems.

Opposite the first hybrid that formed early cobs with an average weight of 256.3 g in conventional tillage system, respectively 284.9 minimum tillage system.

The other eight tested hybrids practicing minimum tillage system had a significant influence on weight cobs they exceeding 300 g, regardless of hybrid analyzed.

In terms of our country where sweet corn is consumed primarily as boiled corn, cobs with husk production is the main type of production economic interest because the sale is made in the form cobs cob wrapped in corn husks.

Weight cobs with kernels number per plant are the two basic components of production per unit area cobs.

Hybrid's productions made in the study ranged from 21.83 to 32.61 t/ha under classical system tillage and 26.15 to 35.33 t/ha when used minimum tillage system values minimum being recorded early first hybrid in both tillage systems, differences in production between the two tillage systems in all genotypes tested is about 4 t/ha for minimum tillage system (Table 5).

The highest production capacity showed an early hybrid *Jubilee F1* hybrid that achieved a yield of 32.61 t/ha in conventional tillage system, respectively 35.66 t/ha by practicing minimum system.

Table 5. Cobs production based on genotype and tillage system

GENOTYPE (HYBRID)	PRODUCTION				DIFFERENCE OF PRODUCTION			
	(To/ha)		(%)		(To/ha)		(%)	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	21.83	26.15	77	82	-6.69	-5.76	ooo	ooo
2. <i>SPIRIT F1</i>	28.07	31.75	98	99	-0.45	-0.16	ooo	-
3. <i>CANDLE F1</i>	28.73	32.22	101	101	0.21	0.31	*	**
Average early hybrids	26.21	30.0	92	94	-6.93	-5.61	ooo	ooo
4. <i>DELICLIUL VERII</i>	27.86	30.83	98	97	-0.66	-1.08	ooo	ooo
5. <i>SWEET THING F1</i>	29.86	32.77	105	103	1.34	0.86	***	***
6. <i>SHIMMER F1</i>	30.71	33.25	108	104	2.19	1.34	***	***
Average extra early hybrids	29.48	32.28	103	101	2.87	1.12	***	***
7. <i>DULCIN</i>	25.15	31.07	88	97	-3.37	-0.84	ooo	ooo
8. <i>CHALLENGER F1</i>	31.83	33.98	112	106	3.31	2.07	***	***
9. <i>JUBILEE F1</i>	32.61	35.33	114	111	4.09	3.42	***	***
Average mid early hybrid	29.86	33.46	105	105	4.03	4.65	***	***
AVERAGE EXPERIENCE	28.52	31.91	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.19; DL 1% = 0.25; DL 0.1% = 0.33

## CONCLUSIONS

The number of ears trained on the plant was higher in the case of hybrids grown in the system minimum tillage, the lowest number of ears trained on a plant being registered hybrid early *Prima* and the largest number of cobs were obtained by early hybrid *Jubilee F1* regardless of tillage system practiced.

Biggest ears length was obtained for mid early hybrids, hybrids extra early and follow the times, pointing out extra early *Shimmer F1* hybrid with a length of 18.9 cm and *Jubilee F1*

hybrid with 19.6 cm conventional tillage.

By practicing minimum tillage system stood out in terms of length of ears, *Jubilee F1* hybrid, which is superior to others hybrids tested in both tillage systems.

Use of minimum tillage has the effect of variations from a fairly wide hybrid another in terms of the diameter of the ears compared to the system in which it classical variations were quite close.

In terms of the number of rows of kernels on the cob formats best behaved extra early hybrids, regardless of tillage system practiced.

The number of grains formed all had substantial variations in the case of extra early and mid early hybrids in both tillage systems, early hybrids being the weakest in terms of this character.

In terms of the weight of ears stood mid early hybrids *Challenger F1* and *Jubilee F1*, cobs weight exceeding 300 g in both tillage systems, while early hybrid *Prima* kernels which consists of an average weight of 256.3 g in conventional tillage system, respectively 284.9 minimum tillage system.

The smaller productions cobs were obtained hybrid early first in both systems tillage, the highest productive capacity of showing early hybrid *Jubilee F1*, hybrid which were obtained yields of over 32 t/ha in both tillage systems, differences in production between the two

tillage systems in all genotypes tested is about 4 t/ha for minimum tillage system.

Therefore, we conclude that, for specific climatic conditions Romanian Plain is recommended to cultivate hybrids of corn in the category extra early and mid early, under minimum tillage system.

## REFERENCES

- Hallauer A. R., J.B. Miranda, 1988, Quantitative Genetics in Maize Breeding, Iowa State Univ. Press, Ames Iowa, 224-238.
- Haş I., 2004, Particularităţi tehnologice pentru cultura porumbului în Transilvania, Editura Boema Turda, 21-45.
- Jugenheimer, Robert W., 1976, Corn improvement seed production and uses, John Wiley & Sons Inc, 278-345.