

THE INFLUENCE OF TECHNOLOGICAL LINKS UPON SWEET CORN YIELD QUALITY UNDER SOIL-CLIMATE CONDITIONS OF THE ROMANIAN PLAIN

**Maria Cristiana ONCICĂ (MORARU)^{1,2}, Ricuța-Vasilica DOBRINOIU²,
Luminița VISAN², Silvana DANAILA-GUIDEA², Andrei Gabriel IVAN³**

¹S.C. Biocrop S.R.L., 15B Agatha Barsecu Street, Prisum buiding, 2th floor,
Phone: +40314253946, Email: morarucristiana84@yahoo.com

²University 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

³University 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

Within the framework of the present climate changes, it is ever recommended to grow varieties characterized by a large ecological plasticity, varieties which can successfully pass over the extreme droughty periods which may affect both the yield and its nutritive quality. Thus, the sweet corn, variety resistant to hydric stress conditions, remarked itself by a higher calory content and a superior nutritive value in comparison with the regular corn, representing both an important source of microelements: magnezium (37-48 mg/100 g grains), potassium (270 mg/100 g grains, phosphorous (69 mg/100 g grains), natrium (16 mg/100 g grains) a source of B complex vitamins, C and E vitamins. Knowing the fact that the nutritive value represents one of the main requests in cobs trade the influence of technological links upon sweet corn yield quality, in conditions of crop irrigation lack, has been tested within a bi-factorial trial. Recorded experimental results emphasized the inferiority of the hybrids grown in the classical soil tillage system in comparison with the minimum tillage soil system, thus, both the grown genotype and the soil tillage variant significantly influence the level of production and the grains quality.

Thus, it is requested to find an alternative for animal proteins, namely vegetal proteins, which even incomplete, being cholesterol free, may constitute alternatives for a healthy food.

Key words: genotype, production, quality, technology, nutritive value.

INTRODUCTION

The sugar content is the major factor that confers sweetness beans, sweet corn, sweet taste or causing their super sweet (Hallauer A. R., J.B. Miranda, 1988).

The proteins accumulated in corn grains are essential for the human body to produce new cells and repair of damaged for various reasons. In addition, protein plays important role in growth and development. Although only proteins of animal origin contain all nine essential amino acids, and plant proteins can combine incomplete in such a way as to obtain the same effect.

Moreover, proteins in plants are healthier than animals because do not increase cholesterol levels in the blood.

The research was conducted during 2014-2015 in pedo-climatic characteristics village Draganesti - Vlașca, Teleorman County and focused determinations relating to the content in sugars, starch, total nitrogen and protein from beans from many genotypes of sweet corn domestic and foreign origin, hybrids with different vegetation periods, for research purposes consisting in identifying the most valuable genotypes nutritional aspect that can be grown in pedo-climatic characteristics of the Romanian Plain.

MATERIALS AND METHODS

The research was conducted in a bifactorial experience arranged by the subdivided parcels method in four replications, experimental factors under study are the following:

Factor A: tillage system with 2 degrees:

- a₁- classical system;
- a₂- minimum system.

Factor B: genotype grown by 9 degrees:

- b₁ - *PRIMA*
- b₂ - *SPIRIT F1*
- b₃ - *CANDLE F1*
- b₄ - *DELICIUL VERII*
- b₅ - *SWEET THING F1*
- b₆ - *SHIMMER F1*
- b₇ - *DULCIN*
- b₈ - *CHALLENGER F1*
- b₉ - *JUBILEE F1*

By combining the two experimental factors resulting 18 experimental variants, the results achieved are calculated according to the method of variance analysis, according to the settlement experience in the field.

Characters grain quality pursued during the research were laid following:

- sugar content - determined colorimetric;
- total nitrogen content - determined by the Kjeldahl method mineralization, being and the calculation of crude protein;
- starch content - determined by the method Schroll.

RESULTS AND DISCUSSIONS

The chemical analyzes sweetness grain corn produced in the experimental field to focus on the content of mono- and di-sugars, particularly glucose and fructose, found in the highest amount in grains and the concentration of which affects decisively sweet taste.

After determining the sugar content (Table 1), it was found that this indicator ranged between 2.5 – 3.7 g when used classical system tillage and 3.1 – 4.4 g when corn was grown in minimum tillage system, the latter system leading to an intense accumulation of sugars in the berries, regardless of genotype analyzed.

The higher the sugar content was obtained for mid early hybrids, hybrids from which it was recorded an average content of 3.4 g sugars in

the classic tillage, and 4.1 g sugars in the minimum tillage system.

The lowest sugar content was obtained with early hybrid *Prima*, regardless of tillage system practice: 2.5 g in the classic tillage system and 3.1 g in the minimum tillage system.

Most valuable hybrids in terms of sugar content were extra early hybrid *Sweet Thing F1* and early hybrid *Jubilee F1*, hybrids amount of sugars in grains was 3.6 – 3.7 g under the conventional tillage system and 4.4 g when using minimum tillage system.

The lowest sugar content was obtained with early hybrid *Prima*, regardless of tillage system practice: 2.5 g in the classic tillage system and 3.1 g in the minimum tillage system.

Most valuable hybrids in terms of sugar content were extra early hybrid *Sweet Thing F1* and early hybrid *Jubilee F1*, hybrids amount of sugars in grains was 3.6 – 3.7 g under the conventional tillage system and 4.4 g when using minimum tillage system.

Unlike ordinary corn, high starch content which is a positive character because it is the most important raw material for industrial starch, corn starch mellitus indicates a high level of harvesting late or inadequate preservation (Jugenheimer, Robert W., 1976).

Analyzing the experimental results regarding the starch content of the grain (Table 2) show that the favorable impact of practicing minimum tillage system on this indicator, decreasing significance; starch content compared to the values registered in terms of the classic tillage system, indifferent analyzed the genotype of corn this fall having a direct impact on improving food value of grain.

The lowest content of starch was registered in early hybrid *Spirit F1* in the classic tillage system, and extra early *Sweet Thing F1* in the minimum tillage system, these hybrids are superior in terms of culinary other genotypes of corn tested in experience.

On the opposite side stood the extra early hybrid *Deliciul verii* and the mid early hybrid *Dulcin*, hybrids that registered the highest starch content, namely 18.54 – 18.55 g in classic tillage system, these hybrids registering the high starch content and conditions of use minimum tillage system, the values of this indicator was 17.89 g or 17.93 g.

Table 1. Sugar content by genotype and tillage system

GENOTYPE (HYBRID)	SUGAR CONTENT				DIFFERENCE			
	(g/100g)		(%)		(g/100g)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	2.5	3.1	78	81	-0.7	-0.7	ooo	ooo
2. <i>SPIRIT F1</i>	3.4	3.7	106	97	0.2	-0.1	-	-
3. <i>CANDLE F1</i>	3.2	3.9	100	103	0.0	0.1	-	-
Average early hybrids	3.0	3.6	95	94	-0.5	-0.7	ooo	ooo
4. <i>DELICLIUL VERII</i>	2.9	3.3	91	87	-0.3	-0.5	o	ooo
5. <i>SWEET THING F1</i>	3.6	4.4	113	116	0.4	0.6	**	***
6. <i>SHIMMER F1</i>	3.4	3.8	106	100	0.2	0.0	-	-
Average extra early hybrids	3.3	3.8	103	101	0.3	0.1	*	-
7. <i>DULCIN</i>	3.1	3.8	97	100	-0.1	0.0	-	-
8. <i>CHALLENGER F1</i>	3.5	4.1	109	108	0.3	0.3	*	*
9. <i>JUBILEE F1</i>	3.7	4.4	116	116	0.5	0.6	***	***
Average mid early hybrid	3.4	4.1	107	108	0.7	0.9	***	***
AVERAGE EXPERIENCE	3.2	3.8	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.26;DL 1% = 0.34;DL 0.1% = 0.45

Table 2. The starch content by genotype and tillage system

GENOTYPE (HYBRID)	STARCH CONTENT				DIFFERENCE			
	(g/100g)		(%)		(g/100g)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	18.38	17.76	101	102	0.15	0.27	-	**
2. <i>SPIRIT F1</i>	18.03	17.24	99	99	-0.20	-0.25	o	oo
3. <i>CANDLE F1</i>	18.12	17.33	99	99	-0.11	-0.16	-	o
Average early hybrids	18.17	17.44	100	100	-0.16	-0.14	o	-
4. <i>DELICLIUL VERII</i>	18.54	17.89	102	102	0.31	0.40	***	***
5. <i>SWEET THING F1</i>	18.06	17.23	99	99	-0.17	-0.26	o	oo
6. <i>SHIMMER F1</i>	18.16	17.38	100	99	-0.07	-0.11	-	-
Average extra early hybrids	18.25	17.50	100	100	0.11	0.03	-	-
7. <i>DULCIN</i>	18.55	17.93	102	103	0.32	0.44	***	***
8. <i>CHALLENGER F1</i>	18.17	17.27	100	99	-0.06	-0.22	-	oo
9. <i>JUBILEE F1</i>	18.14	17.36	100	99	-0.09	-0.13	-	-
Average mid early hybrid	18.28	17.52	100	100	0.17	0.09	*	-
AVERAGE EXPERIENCE	18.23	17.49	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.16;DL 1% = 0.21;DL 0.1% = 0.28

Observe also increase the starch content in direct proportion to the increase of the growing season hybrids tested, the highest content of starch is registered mid early hybrids, followed by extra early hybrid and the early hybrids, in both systems tillage.

Total nitrogen in corn mellitus derives largely from zein and gluten proteins that were identified cysteine, alanine, asparagine, glycolul, proline, serine along with essential amino acids methionine, leucine, isoleucine, histidine, phenylalanine, lysine and tryptophan. Other compounds isolated from corn, which is present in the structure of the heterocyclic nitrogen, vitamins: niacin, pantothenic acid, thiamine, riboflavin, folic acid and pyridoxines (Sprague G.F., S.A. Eberhart, 1977).

By practicing a conventional tillage, total nitrogen content in grains of corn ranged from 268 - 312 mg, the highest content was recorded in the case of mid early hybrids, followed by those extra early and the early hybrids (Table 3). When using minimum tillage system, there is a significant increase in the total nitrogen content in the grain, regardless of genotype analyzed in comparison with the classic tillage system, this index values ranging between 319 and 363 mg.

Of the nine genotypes behaved myself tested the early hybrid *Jubilee F1* in both tillage systems, with a total nitrogen content of 312 mg in the classic tillage system and 363 mg at minimum tillage system.

By analyzing the protein content of the grains we find that this indicator is higher in the practice of minimum tillage system compared to conventional tillage systems (Table 4).

Thus, if the conventional system where the protein content was between 2.58 and 2.97 g, in the minimum tillage system the accumulated protein in beans was between 3.26 and 3.76 g.

First they stood in hierarchical order, mid early hybrids, extra early hybrids and the early hybrids in the minimum tillage system while, if conventional system, hierarchy, in terms of protein content, was : extra early hybrids, the early hybrids and mid early hybrids.

The lowest protein content was recorded at early hybrid *Prima* (2.58 g in the classic tillage system and 3.26 g in the minimum tillage system), the maximum being obtained at mid early hybrid *Challenger F1* in both tillage systems, respectively 2.97 g in the classic tillage system and 3.76 in the minimum tillage system.

Table 3. Total nitrogen content by genotype and tillage system

GENOTYPE (HYBRID)	NITROGEN CONTENT				DIFFERENCE			
	(mg/100g)		(%)		(mg/100g)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	268	319	90	92	-29	-26.0	ooo	ooo
2. <i>SPIRIT F1</i>	303	346	102	100	6.0	1.0	***	-
3. <i>CANDLE F1</i>	309	349	104	101	12.0	4.0	***	***
Average early hybrids	293	338	99	98	-11.0	-21.0	ooo	ooo
4. <i>DELICLIUL VERII</i>	276	329	93	95	-21.0	-16.0	ooo	ooo
5. <i>SWEET THING F1</i>	309	358	104	104	12.0	13.0	***	***
6. <i>SHIMMER F1</i>	302	353	102	102	5.0	8.0	***	***
Average extra early hybrids	296	347	100	101	-4.0	5.0	ooo	***
7. <i>DULCIN</i>	288	333	97	97	-9.0	-12.0	ooo	ooo
8. <i>CHALLENGER F1</i>	307	356	103	103	10.0	11.0	***	***
9. <i>JUBILEE F1</i>	312	363	105	105	15.0	18.0	***	***
Average mid early hybrid	302	351	102	102	16.0	17.0	***	***
AVERAGE EXPERIENCE	297	345	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 1.78; DL 1% = 2.39; DL 0.1% = 3.13

Table 4. Crude protein content by genotype and tillage system

GENOTYPE (HYBRID)	CRUDE PROTEINE CONTENT				DIFFERENCE			
	(g/100g)		(%)		(g/100g)		SIGNIFICATION	
	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage	classic tillage	minimal tillage
1. <i>PRIMA</i>	2.58	3.26	93	92	-0.19	-0.29	ooo	ooo
2. <i>SPIRIT F1</i>	2.77	3.62	100	102	-0.01	0.07	-	***
3. <i>CANDLE F1</i>	2.83	3.69	102	104	0.05	0.14	***	***
Average early hybrids	2.72	3.52	98	99	-0.15	-0.08	ooo	ooo
4. <i>DELICLIUL VERII</i>	2.87	3.32	103	94	0.09	-0.23	***	ooo
5. <i>SWEET THING F1</i>	2.81	3.65	101	103	0.03	0.10	***	***
6. <i>SHIMMER F1</i>	2.85	3.63	103	102	0.07	0.08	***	***
Average extra early hybrids	2.84	3.53	102	99	0.19	-0.05	***	ooo
7. <i>DULCIN</i>	2.48	3.36	89	95	-0.30	-0.19	ooo	ooo
8. <i>CHALLENGER F1</i>	2.97	3.76	107	106	0.19	0.21	***	***
9. <i>JUBILEE F1</i>	2.88	3.69	104	104	0.10	0.14	***	***
Average mid early hybrid	2.77	3.60	100	101	-0.01	0.16	-	***
AVERAGE EXPERIENCE	2.78	3.55	100	100	Mt.	Mt.	Mt.	Mt.

DL 5% = 0.020; DL 1% = 0.026; 0.1% DL = 0.035

CONCLUSIONS

The sugar content of the grains was higher by practicing minimum tillage system, the highest level of sugars being recorded for mid early hybrids in both tillage systems.

The starch content of grains increased in direct proportion to the increase of the growing season hybrids tested, the highest starch content was recorded at mid early hybrids, followed by extra early and early hybrids in both tillage systems.

By practicing minimum tillage system the total nitrogen content increases significantly in the grain, regardless of genotype analyzed compared to the classic tillage system.

The protein content of beans find that this indicator is higher in the practice of minimum tillage system compared to the conventional tillage system, the first hovering followed by the mid early hybrids, extra early and early hybrids.

REFERENCES

- Hallauer A. R., J.B. Miranda, 1988, Quantitative Genetics in Maize Breeding, Iowa State Univ. Press, Ames Iowa, 224-238.
- Jugenheimer, Robert W., 1976, Corn improvement seed production and uses, John Wiley & Sons Inc, 278-34.
- Sprague G.F., S.A. Eberhart, 1977, Corn breeding.pp. Corn and Corn Improvement, American Society of agronomy, Madison, WI, p. 305-36.