

SWEET CORN HYBRIDS THAT ARE SUITABLE FOR PRESERVING

METODE DE PROCESARE A HIBRIZILOR DE PORUMB ZAHARAT

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Abstract. Corn (*Zea mays* L.) is a multi-purpose high-output cereal. Sweet corn beans are used in making preserves when immature, before sugar is converted into starch. Six hybrids of sweet corn, that are cultivated in Moldova, were studied. They were grown on the testing fields in Bacioi, Chisinau, belonging to the National Commission charged with the study of plants. The results of the chemical and technological testing were presented. Two technological mainframes were used: with kernels steamed before and after being removed from the cobs. The research has revealed the hybrids that are best suited for canning.

Rezumat. Porumbul zaharat (*Zea mays* L.) este o cultură cerealică cu o productivitate sporită și destinat multiple. Pentru fabricarea conservelor se utilizează porumb zaharat în stadiu de maturitate lapte cu conținut maxim de glucide în boabe. S-au studiat șase hibrizi de porumb zaharat după indicii chimici, tehnologici și organoleptici a materiei prime și conservelor. Culturile au fost recoltate pe parcelele Comisiei de Stat pentru încercarea soiurilor a Republicii Moldova în s. Bacioi mun Chișinău. Cercetările s-au efectuat în două direcții: blanșarea știuleților integrali și tăerea boabelor; tăerea boabelor cu blanșarea ulterioară a acestora. În rezultatul cercetărilor s-a stabilit hibridii de porumb zaharat acceptabili pentru conservare

At present 28,6 % of sugar corn is used to process on the food purpose in the world. The area seeded with sugar corn constitutes 1,027 million ha (between 2001-2005) in the world. The main producing countries are USA, Hungary, Canada, France, Japan [1-4]. The Republic of Moldova is a favorable region to cultivate the corn. To produce the canned corn it is necessary to cultivate the sugar corn of certain sorts. The production of canned sugar corn comprised 3492 tons in 2005, 4837 ton – in 2006. During the last years, in the Republic of Moldova the sugar corn hybrids of local and import selection are intensively developed.

Research purpose: To determine the use of new and perspective sugar corn hybrids to produce the canned and congealed food.

MATERIAL AND METHOD

The sugar corn hybrids of local and import selection harvested in the milky ripeness have been tested:

- Bonus F₁, (Holland);
- Jubileu, F₁ (Holland);

- Porumbeni -340 F₁;
- Porumbeni – 341 F₁;
- Porumbeni 198 F₁ marker, *;
- Lumina F₁ (USA).

* Institute of Phytotechny and Plants Amelioration.

Sugar corn was cultivated on the land plots of State Commission of sorts testing of the Republic of Moldova in the village of Bacioi, city of Chisinau, in 2002 -2006, in conformity with „Method indications for the chemical – technological testing of fruit, vegetables, berries sorts destined for the industrial processing”.[5]

The traditional methods of preserving and namely preserving by the sterilization and congelation were used for the technological tests. The use of the sugar corn hybrids was established based on the results of the physical – chemical, technological and organoleptic research. The products samples have been produced in accordance with the technological instructions on the canned and congealed sugar corn production. The corn has been cut in the industrial machine MTBP-500.

The research of the biometric parameters of the sugar corn has been carried out in accordance with the method of measuring, gravimetry and chemical method. The following has been established: average mass; length and maximal diameter of the ear; percentage of coating leaves and output of kernels per one ear; mass fraction of: the dry substances (according to the refractometer and by drying); titrable acids (recalculated in the malic acid); glucose; fructose; saccharose; starch; cellulose; active acidity.

RESULTS AND DISCUSSIONS

Based on the results of the research of the biometric characteristics of the hybrids it has been established that as per the form, ear length, kernel color and consistency, the sugar corn hybrids correspond to the requirements of industrial processing. Depending on the hybrid, the mass of the kernels constitutes 45,3 – 49,5 % of the mass of the ear with the leaves, of the leaves 23,3 – 32,0%, bald ear -22,7-28,5%, height of the cut kernels – 6,0-9,1 mm. The mass of the ear varies between 184 - 296 g, the length of the ears is 160-240mm, diameter of the ears is 37-54 mm. The results of physical – chemical tests are presented in the table 1.

The milky ripeness of the sugar corn hybrids is characterized by the content of 20,9-28,3% of the soluble dry substances, constituting 85,0-95,0% of the mass fraction of the total dry substances in the kernel.

The mass fraction of the carbohydrates constitutes depending on the sugar corn hybrid: 12,3-19,5% of starch, sum of saccharose, glucose and fructose - 1,45 – 3,86 %, saccharose predominates 74-77 %, glucose and fructose are of insignificant quantity.

The sugar corn refers to the raw material with a high content of proteins, the value of which, depending on the sort constitutes 3,3-4,5% and it is a neutral raw material according to pH indexes.

The content of the mineral substances and toxic elements in the sugar corn is presented in the table 2. The high content of potassium and magnesium is characteristic of the sorts presented.

Table 1

Physical chemical indexes of the sugar corn

№	Hybrid name	Mass fraction ,%			Mass fraction of the carbohydrates, %					Active acidity (pH)
		soluble dry substances (by refractometer)	dry substances, (by drying)	proteins	fructose	glucose	saccharose	starch	cellulose	
1	Bonus F ₁	20,9	22,6	3,8	0,12	0,39	1,23	12,3	0,69	7,26
2	Jubileu F ₁	26,2	27,5	3,3	0,17	0,49	1,05	13,35	0,54	7,08
3	Porumbeni 340 F ₁	28,3	32,7	4,5	0,08	0,45	1,00	19,49	0,93	6,90
4	Porumbeni 341 F ₁	25,9	30,4	3,9	0,03	0,41	1,01	18,6	0,82	6,98
5	Porumbeni 198 F ₁	22,0	-	-	0,12	0,88	2,86	-	-	6,75
6	Lumina F ₁	26,5	-	-	0,14	1,24	2,12	-	-	6,80

Table 2

Content of the mineral substances and toxic elements in the sugar corn

№	Hybrid name	Content of mineral substances, mg/kg						Content of toxic elements, mg/kg			
		K	Na	Ca	Mg	Fe	Mn	Pb	Cd	Cu	Zn
1	Bonus F ₁	162,5	12,9	107,5	50,7	6,75	1,45	<0,01	not found	0,54	6,0
2	Jubileu F ₁	179,8	12,9	72,5	109,4	2,82	1,48	not found	not found	0,56	7,2
3	Porumbeni 340 F ₁	166,3	25,9	50,9	93,2	11,88	1,3	<0,01	not found	0,63	7,1
4	Porumbeni 341 F ₁	165,8	25,4	50,6	93,8	11,20	1,25	<0,01	not found	0,67	7,0

The members of the tasting commission have noted that the sugar corn hybrids presented may be used to produce the canned sugar corn and the other canned food the by the thermal processing and congelation.

The canned corn of the sort „Porumbeni 198” obtained most of the points in the organoleptic evaluation. The canned corn of the hybrid „Porumbeni 341” have a pleasant appearance and taste. The samples of the congealed sugar corn presented in the tasting

have the good organoleptic characteristics and may be used in the production of this type of the products (table 3).

Table 3

Organoleptic indexes of the canned sugar corn by sterilization and congelation

№	Hybrid name	Processing method	
		canned	congealed
		Average grade	
1	Porumbeni 198 F ₁	4,7	4,4
2	Porumbeni 341 F ₁	4,3	4,1
3	Lumina F ₁	4,5	4,2

The samples offered to be tasted have a fine consistency, a sweet taste characteristic for the sugar corn in the milky ripeness and a pleasant aroma.

The process flowsheet of the sugar corn processing for the preserving includes : leaves removing, tips cutting, washing of the ear remnants, steaming of the ears, their cooling, kernels cutting, flotation, separating of kernels from water,

The technological process foresees cutting of kernels from the steamed ears or cutting of kernels from the unsteamed ears and their consecutive steaming. It has been asserted that the output of the kernels in the processing with the prior steaming of the ears constitutes 41,2%, but in case of cutting of kernels from the unsteamed ears it is 36,8%. Thus, the second method of processing leads to the increase of the raw material consummation. At the same time, choosing the flowsheet of the sugar corn processing, it is necessary to take in account that at the steaming of the ears the heating consummation is more than in the steaming of the kernels.

CONCLUSIONS

1. The research has been carried out on the sorts of the sugar corn of the local and imported selection: Bonus F₁, Jubileu F₁, Porumbeni -340 F₁, Porumbeni – 341 F₁, Porumbeni 198 F₁, Lumina F₁.

2. The biometric and physical chemical characteristics of the sugar corn hybrids have been established.

3. The sorts researched may be used to produce the canned sugar corn.

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