Germplasm and Cultivar Release

RELEASE OF SWEET CORN (ZEA MAYS L.) OPEN-POLLINATED CULTIVAR 'SURESWEET 2011'[1]

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Sweet corn (*Zea mays* L.) is a popular food in Puerto Rico. This high-value horticultural crop can be successfully cultivated by using different levels of technology, ranging from mechanized production for processing to plantings on small-scale farms where sweet corn can be intercropped with other high value crops such as tropical pumpkin (*Cucurbita moschata* Duch. ex Lam.) or pole snap beans (*Phaseolus vulgaris* L.).

During 2007-2008, the value of local production of sweet corn was $1,067,000 (Department of Agriculture of the Commonwealth of Puerto Rico, 2010). The value of imported fresh, processed and frozen sweet corn from the United States during 2009 was $6,793,000 (U.S. Department of Commerce, 2010). Unfortunately, local production of sweet corn declined from 2002 to 2007 (USDA/NASS, 2009). This reduction in local production may be due in part to the lack of availability of seed of an adapted sweet corn cultivar.

'Suresweet' was developed by the USDA/ARS Mayagüez Institute of Tropical Agriculture as a selection from USDA-34. Harper (1946) noted that USDA-34 originated from a selection made in 1922 on a farm near Lajas, Puerto Rico. USDA-34 was selected in 1934 for seed production and distribution because of its high yield potential, large ears and long kernels.

In 1975 a recurrent selection program was initiated at the USDA/ARS Mayagüez Institute of Tropical Agriculture [now, USDA-ARS Tropical Agriculture Research Station (TARS)] to remove the partial horny type starch found in seed of USDA-34. 'Suresweet' was released in 1977 after three cycles of inbreeding, random mating and selection for sugary seed type and desirable agronomic traits (A. Sotomayor-Rios, Retired Researcher, USDA/ARS-TARS, personal communication). 'Suresweet' is maintained by the USDA North Central Plant Introduction Station as NSL 95717.

Seed of 'Sureweet' was obtained from the USDA/ARS TARS in Mayagüez, Puerto Rico. A portion of the seed was planted in a nursery at the Isabela Substation in northwestern Puerto Rico. Ears (half-sib lines) were selected from 100 plants having the best combination of desirable agronomic characteristics, presence of the sugary seed type and the absence of insect damage to the tip of the ear. In May 2004, the half-sib lines were planted at the Isabela Substation. A randomized complete block design with two replications was used. The experimental units consisted of single 5-m row lengths spaced 76 cm apart. Twenty-five seeds were planted in each row. Approximately 500 kg/ha of 10-10-10 granular fertilizer was applied at planting. Weeds were controlled manually, and

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insects were controlled with methomyl (Nudrin)[3] at a rate of 1.2 L/ha. Overhead irrigation was used to prevent drought stress. At harvest maturity, plant and ear heights of five plants in each row were recorded. The total number of lodged plants in each row was also recorded. The number of ears per row and total number of plants per row were used to calculate the number of ears per plant. The number of commercially acceptable ears from each row was counted. Mean ear length, seed quality and the degree of insect damage on the ears were determined based on a random sample of five ears from each row. Seed quality scores were based on a 1 to 9 scale where 1 = high commercial value and 9 = no commercial value. Insect damage scores were based on a 1 to 10 scale where 1 to 3 = very resistant, 4 to 6 = moderate resistance and > 6 = susceptible (Widstrom, 1967).

Twenty half-sib lines were selected based on the number of commercial ears produced per row. In addition, lines with damaged or poor quality ears were not considered for selection. Samples of 100 seed of each of the 25 selected half-sib lines were bulked and planted in an intercrossing nursery at the Isabela Substation in February 2005. The nursery consisted of forty 5-m rows spaced 0.76 cm apart. Twenty-five seeds were planted in each row. The previously described agronomic practices were used to manage this nursery. Seed from this nursery was harvested and bulked.

A sample of 1,000 seed from this nursery was used to plant an additional recombination nursery that was planted at the Isabela Substation in December 2005. The nursery consisted of forty 5-m rows spaced 0.76 cm apart. Twenty-five seeds were planted in each row. The previously described agronomic practices were used to manage this nursery. From plants in the recombination nursery we selected 86 ears that had desirable agronomic characteristics, the presence of the sugary seed type and the absence of damage to the tip of the ear.

In January 2007, the 86 half-sib lines were planted at the Isabela Substation. A randomized complete block design with two replications was used. The experimental units consisted of single 5-m row lengths spaced 76 cm apart. Twenty-five seeds were planted in each row. Approximately 500 kg/ha of 10-10-10 granular fertilizer was applied at planting, and an additional 500 kg/ha of 10-10-10 granular fertilizer was applied shortly before flowering. The other agronomic practices used to manage this nursery and the traits and methods used to evaluate the half-sib lines were the same as those described for the trial planted in May 2004.

Twenty half-sib lines were selected based on the number commercial ears produced per row. Lines with damaged or poor quality ears were not considered for selection (Table 1). Samples of 100 seed of each selected half-sib line were bulked and planted in an intercrossing nursery at the Isabela Substation in February 2009. The nursery consisted of forty 5-m rows spaced 0.76 cm apart. Twenty-five seeds were planted in each row. The previously described agronomic practices were used to manage this nursery. Seed from this nursery was harvested and bulked. From plants in the recombination nursery we selected 122 ears that had desirable agronomic characteristics, presence of the sugary seed type and the absence of insect damage to the tip of the ear.

In December 2009, the 122 half-sib lines were planted at the Isabela Substation. A randomized complete block design with two replications was used. The experimental units consisted of single 5-m row lengths spaced 76 cm apart. Twenty-five seeds were planted in each row. Approximately 500 kg/ha of 10-10-10 granular fertilizer was applied at planting, and an additional 500 kg/ha of 10-10-10 granular fertilizer was applied

[3]Company or trade names in this publication are used only to provide specific information. Mention of a company or trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

TABLE 1.—*Performance of half-sib lines of 'Suresweet 2011' sweet corn planted at the Isabela Substation in February 2007.*

Half–sib family	Population (1000/ha)	No. plants lodged/row	Plant height (cm)	Ear height (cm)	No. of ears per plant	Ear length (cm)	Ear damage score[1]	Seed quality score[2]	Number of commercial ears (1000/ha)	Seed yield (kg/ha)
79	54.3	0.5	244	130	1.0	14.7	3.5	3.5	42.5	4339
22	62.6	0.0	240	136	1.2	17.0	3.9	3.0	40.1	5099
53	47.2	0.0	244	138	0.9	16.5	3.4	2.5	39.0	4076
58	61.4	0.0	247	136	1.3	17.7	4.7	3.0	39.0	4076
73	69.7	0.0	241	132	1.3	15.4	3.0	3.0	37.8	4017
76	68.5	0.5	247	129	1.3	15.2	4.3	3.0	37.8	3652
8	39.0	0.0	225	111	0.9	14.7	4.1	4.0	36.6	2245
34	61.4	0.0	255	152	1.2	14.7	3.6	3.5	36.6	3679
46	70.8	0.0	234	126	1.3	16.4	3.8	3.5	36.6	4550
51	66.1	0.0	244	142	1.2	16.7	4.0	4.0	36.6	3699
78	54.3	0.0	245	124	1.1	16.3	3.4	3.0	36.6	4206
2	64.9	0.0	229	116	1.4	16.0	3.6	3.5	35.4	4173
13	51.9	0.0	254	141	1.1	16.7	3.3	3.5	35.4	3805
29	59.0	0.5	248	126	1.2	16.7	3.4	3.5	35.4	3543
50	63.7	0.0	240	122	1.4	15.4	3.9	3.5	35.4	2054
57	51.9	0.5	245	136	1.0	16.0	3.4	3.0	35.4	3539
71	51.9	0.5	233	118	1.0	15.5	3.7	3.0	35.4	3286
11	55.5	0.5	250	144	1.1	15.2	4.4	3.5	34.2	3578
15	55.5	0.0	245	140	1.2	16.3	3.7	3.5	34.2	3498
17	61.4	0.0	224	113	1.3	15.2	2.9	3.5	34.2	3426
Mean of 20 selected lines	58.6	0.2	242	131	1.2	15.9	3.7	3.3	36.7	3727
Overall mean	54.8	0.2	238	130	1.1	15.7	3.5	3.5	29.0	2975
LSD(0.05)	NS	NS	NS	NS	NS	NS	NS	NS	12.1	1499
CV(%)	13.7	5.8	5.8	10.3	13	6.0	20.4	22.5	21.0	25.2

[1]Rated on a scale from 0 to 5, where 0 = no damage, 1 = silk damage, 2 = 0 to 1 cm of the ear tip damaged, 3 = 1 to 2 cm of ear tip damaged, 4 = 2 to 3 cm of the ear tip damaged and 5 = > 3 cm of the ear tip damaged.

[2]Rated on a scale from 1 to 10, where 1 = excellent and 10 = unacceptable seed quality characteristics.

shortly before flowering. The other agronomic practices used to manage this nursery and the traits and methods used to evaluate the half-sib lines were the same as those described for the trial planted in May 2004. Twenty half-sib lines were selected based on the number of commercial ears produced per row. Lines with damaged or poor quality ears were not considered for selection (Table 2).

Botanical Description

'Suresweet 2011' has yellow seed with the shrunken sugary trait conferred by the recessive *su* allele. A Brix value of 14% was obtained from an ear of 'Suresweet 2011' randomly harvested from the recombination nursery planted in October 2010. Neibauer and Maynard (2002) reported that Brix readings of sweet corn with the *su* allele usually range from 10 to 15%. 'Suresweet 2011' has a 100 seed weight of 24 g. Plants flowered (silked) 80 to 85 days after planting (DAP). Ears were mature for fresh market harvest from 105 to 110 DAP. Seed reached physiological maturity approximately 140 DAP. Mean plant height of the 20 selected half-sib lines was 242 cm in 2007 and 205 cm in 2009 (Tables 1 and 2). Mean ear height of the 20 selected half-sib lines was 131 cm in 2007 and 100 cm in 2009 (Tables 1 and 2). Mean ear length of the 20 selected half-sib lines was 15.9 cm in 2007 and 13.7 cm in 2009 (Tables 1 and 2). The mean number of lodged plants of the 20 selected half-sib lines was low in both trials. Mean number of lodged plants was 0.2 from the first cycle of selection, and 1.1 from the second cycle of selection (Tables 1 and 2).

Tolerance to Pests and Diseases

'Suresweet' was considered to be resistant to corn earworm [*Heliocoverpa zea* (Boddie)] and to most leaf diseases found in the humid tropics. 'Suresweet' and 19 other maize inbreds and populations were screened in the field in Guadeloupe, FWI for reaction to corn earworm [*Heliocoverpa zea* (Boddie)]. (Welcker et al., 1997). 'Suresweet' was found to have among the highest levels of resistance.

The mean ear damage score of the 20 selected lines from the first cycle of selection was 3.7 whereas the mean of the 20 selected lines from the second cycle of selection was 1.1 (Tables 1 and 2). It should be noted, however, that insect pressure was lower in the trial planted in December 2009. The overall mean damage score for all half-sib lines in the trial was 1.4.

Production

González-Fuentes et al. (1988) evaluated the effects of three drip-irrigation regimes on the growth characteristics and commercial yield of 'Sureweet' sweet corn. Harvested as sweet corn, 'Suresweet' produced a mean yield of 6,487 kg/ha in the plots that received the greatest amount of water.

In the present study, economic yield was measured as the number of commercial ears/ha. The mean number of ears/ha of the 20 selected lines from the second cycle of selection was 42,300 whereas the mean of the 20 selected lines from the first cycle of selection was 36,700 (Tables 1 and 2). On the other hand, mean seed yield of the 20 selected lines from the second cycle of selection (2,987 kg/ha) was lower than the mean of the 20 selected lines from the first cycle of selection (3,727 kg/ha). The mean seed quality score of the 20 selected lines from the second cycle of selection (2.4) was slightly better than the mean seed quality score of the 20 selected lines from the first cycle of selection (3.3), (Tables 1 and 2).

Uses

'Suresweet 2011' can be harvested as sweet corn for the fresh market. As an open-pollinated cultivar, 'Suresweet 2011' has more variability in plant and ear height and

TABLE 2—*Performance of half-sib lines of 'Suresweet 2011' sweet corn planted at the Isabela Substation in December 2009.*

Half–sib family	Plant population (1000/ha)	Number of lodged plants/row	Plant height (cm)	Ear height (cm)	No. of ears per plant	Ear length (cm)	Ear damage score[1]	Ear quality score[2]	Number of commercial ears (1000/ha)	Seed yield (kg/ha)
97	68.4	2.0	222	114	1.00	13.0	0.8	3.0	51.3	3396
60	71.1	0.5	205	96	0.97	14.2	1.7	2.5	47.4	3001
80	64.5	1.5	190	90	0.93	12.9	1.2	2.5	47.4	2918
74	71.0	1.5	201	96	0.85	13.1	1.2	3.0	46.1	2801
111	64.5	1.5	202	98	0.95	13.1	0.8	2.0	44.7	2595
56	71.1	0.0	211	104	0.89	14.4	0.8	3.0	43.4	3263
61	67.1	0.5	203	92	0.96	14.7	1.4	2.0	43.4	3422
121	57.9	2.5	209	99	1.15	15.0	0.8	2.5	43.4	3403
38	68.4	1.0	219	109	0.93	15.2	1.5	1.0	42.1	3793
42	71.0	1.0	224	114	0.87	13.3	1.0	2.5	42.1	3331
32	73.6	1.0	218	108	0.86	15.0	0.9	2.0	40.8	3352
26	68.4	0.5	211	113	0.91	13.2	1.1	3.0	40.8	3130
88	59.2	0.0	207	100	1.07	13.2	1.2	1.0	40.8	3307
16	67.1	1.5	214	106	0.84	14.5	0.7	2.0	39.5	3193
76	69.7	0.5	182	78	0.87	13.1	1.7	3.0	39.5	2351
82	65.8	1.5	197	86	0.90	14.1	0.4	2.0	39.5	2757
92	55.3	2.5	206	105	0.98	13.7	1.5	2.5	39.5	2468
101	68.4	1.5	194	90	0.83	13.0	1.7	3.0	39.5	2327
52	68.4	0.5	187	92	0.93	13.4	1.3	2.0	38.2	2565
17	67.1	1.0	197	100	0.77	11.8	1.2	2.5	36.9	2374
Mean of 20 selected lines	66.9	1.1	205	100	0.92	13.7	1.1	2.4	42.3	2987
Overall Mean	57.5	1.2	202	98	0.85	13.5	1.4	3.1	29.0	2231
LSD(0.05)	18.9	NS	26	19	NS	1.3	NS	NS	18.9	1132
CV(%)	16.6	105.7	6.5	9.6	19.60	5.0	45.5	33.0	32.9	25.6

[1]Rated on a scale from 0 to 5, where 0 = no damage, 1 = silk damage, 2 = 0 to 1 cm of the ear tip damaged, 3 = 1 to 2 cm of ear tip damaged, 4 = 2 to 3 cm of the ear tip damaged and 5 = > 3 cm of the ear tip damaged.

[2]Rated on a scale from 1 to 10, where 1 = excellent and 10 = unacceptable seed quality characteristics.

days to maturity than a hybrid. Therefore, 'Suresweet 2011' would be more appropriate for small-scale producers or home gardens where uniformity is not as important as it is for a large-scale mechanized operation.

Availability of seed

The University of Puerto Rico Agricultural Experiment Station seed programs at the Isabela and Lajas Substations will maintain foundation seed stocks of 'Suresweet 2011'. Recurrent selection based on the performance of half-sib families will be used to continue to select the 'Suresweet' population for increased number of commercial ears per hectare, ear quality, and reduced insect damage on ears.

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