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Elizabeth Maynard

Purdue University - Main Campus, emaynard@purdue.edu

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Sugar-enhanced and Synergistic Sweet Corn Cultivar Evaluation for Northern Indiana — 2013

Elizabeth T. Maynard, Purdue University, Valparaiso, IN 46383

Indiana sweet corn acreage harvested for fresh market averaged 5,633 acres annually from 2010-2012, with a yield of 71 cwt/acre (160 crates or 3.5 tons per acre) and annual value of \$13.7 million (USDA NASS, 2013). Indiana ranked 19th among states for production of fresh market sweet corn and produced about 0.8% of the nation's total in 2012. The 2007 USDA Ag Census reported 603 Indiana farms producing sweet corn for fresh markets and 51 farms selling to processors. Sweet corn fields for fresh market sales are located throughout the state. In northern Indiana, bicolor corn is most commonly grown. Varieties with improved eating quality are of interest to both producers and consumers. Producers are also interested in yield, ear size, appearance, and agronomic characteristics.

This paper reports on 9 bicolor and one yellow sugar-enhanced or synergistic sweet corn entries that were evaluated at the Pinney-Purdue Agricultural Center in Wanatah, Indiana.

Materials and Methods

The trial was conducted on a Tracy sandy loam. The fall 2012 soil test showed 1.6% organic matter, pH 6.7, and 77 ppm phosphorus (P), 102 ppm potassium (K), 155 ppm magnesium (Mg), and 700 ppm calcium (Ca). Potassium (270 lb./A K₂O from 0-0-60) was applied in fall 2012, and nitrogen (30 lb./A N from 46-0-0) was applied prior to seeding in 2013. An additional 70 lb./acre N from urea ammonium nitrate solution was injected two weeks after seeding.

The trial was set up as a randomized complete block design with three replications. Sweet corn entries were assigned to individual plots one row (30 inches) wide by 30 feet long. Corn was seeded June 5, 2013, with a finger pick-up planter set to drop seeds 10.125 inches apart (20,600 plants per acre) and later thinned to 35 plants per 30-foot row (20,328 plants per acre).

Weeds were controlled with atrazine (Atrazine 4L[®]) and s-metolachlor (Dual II Magnum[®]) applied preplant incorporated and hand weeding. Irrigation was applied from an overhead boom as needed. Permethrin (Arctic 3.2EC[®], 4 fl. oz./acre/application) was applied to control caterpillars.

Emergence was evaluated 12 days after planting (DAP) and final stand determined 16 DAP, after thinning. Early plant vigor was evaluated 16 DAP. Shortly before harvest, plant vigor, height, and degree of tiller formation were rated and the height from the soil to the middle of the ear was measured for three ears per plot. Each plot was harvested when corn reached marketable stage. Typically marketable stage is 19 to 22 days after 50% silking, but this year cool weather meant corn was ready 26-29 days after silking. For each plot the weight and number of marketable first ears and number of marketable ears that were fancy were recorded. Ears that touched the soil due to lodging of plants were not considered marketable. Three ears from each plot were selected to evaluate degree of husk cover, husk tightness, degree of tip fill, flag leaf length, overall attractiveness, average ear diameter and length after husking, and shank length. Overall ear quality was also rated. One person rated the flavor of all entries based on one uncooked ear from each plot. Rating scales are described in table footnotes. Letter ratings for flavor were converted to numerical ratings for statistical analysis.

Quantitative data with equal variance across treatments ($P > .05$) were analyzed using ANOVA followed by mean separation using Fisher's protected least significant difference at $P \leq 0.05$.

Results and Discussion

Weather was cool and wet in June, cool and dry in July, and cool with normal rainfall in August. The USDA National Agricultural Statistics Service Indiana Crop & Weather Reports documented that from June 2 to June 30, rainfall totaled 9.25 inches, (6.4 inches above normal,) with over 4 inches falling within a week and half of planting. The trial area had standing water for a time during this period. The growing degree days (GDD) accumulation from June 3 to September 1 was 1,710, 145 less than normal.

By 12 DAP, emergence averaged 90% of the desired stand with no significant differences among entries (data not shown). Final stand after thinning averaged 88% (range 82 to 99%) of the desired stand of 20,328 but did not differ significantly among entries (data not shown).

Differences in early plant vigor were observed (data not shown). Temptation, Utopia, and BC002 were significantly more vigorous than 6 other varieties. SC1102, Profit, Allure, and Inferno had significantly lower early vigor than Temptation and Utopia, and significantly greater early vigor than Ambrosia, Cuppa Joe, and Jackie. Jackie also had low early vigor in the 2012 trial at this location, but, Ambrosia and Cuppa Joe were among the most vigorous that year, along with Temptation. It is not unexpected that some varieties would perform relatively well in one year, and not in another year due to more stressful conditions. Plant vigor ratings near harvest (data not shown) were 8 or above (out of 9) for Allure, Cuppa Joe, SC1102, and Utopia. Profit and BC1002 were rated as the least vigorous at harvest. Cuppa Joe (7.0 ft.) and Allure (6.9 ft.) were significantly taller than other varieties and BC1002 (5 ft.) was significantly shorter (data not shown). SC1102, Ambrosia, and Utopia were 6.3-6.4 feet tall and Jackie, Temptation, Profit, and Inferno were 5.8-6.0 feet tall. Varieties produced small or no tillers (data not shown).

Results for yield and ear quality are presented in Table 1. Per acre yields have been calculated by multiplying plot yields by the number of plots per acre and likely overestimate expected yield from field scale production. Marketable yield averaged 7.9 tons per acre, and ranged from 5.4 to 10.9 tons per acre. SC 1102 and Utopia produced the top yields in tons per acre, significantly greater than all other entries in the trial. BC8002 produced the lowest yield; Profit and Jackie did not produce significantly greater yield than BC8002. The number of marketable ears averaged 1,412 dozen per acre. SC1102 produced the greatest number, 1,597, followed by Temptation at 1,533, but there were no significant differences among varieties. The percentage of marketable ears that were fancy ranged from 76 to 95% and averaged 86% (data not shown). For Jackie and Utopia more than 94% of the marketable ears were fancy, a significantly higher percentage than for BC1002, Inferno, Profit, and Cuppa Joe.

Average weight per ear (including the shank) ranged from 0.69 lb. to 1.24 lb. Utopia had the heaviest ears in the trial, followed by SC1102. BC1002 produced the lightest ears. Allure, Inferno, Ambrosia, and Cuppa Joe produced ears between 0.94 and 0.98 lb. Temptation, Jackie, and Profit produced ears between 0.78 and 0.85 lb. Ear length ranged from 7.1 to 9.1 inches, and diameter ranged from 1.78 to 2.11 inches. The longest ears were produced by Utopia, followed by Ambrosia and Cuppa Joe, all longer than 8.7 inches. Allure, Inferno, and SC1102 produced ears between 7.9 and 8.5 inches long. BC1002, Jackie, Temptation, and Profit produced ears less than 7.5 inches long. SC1102, Utopia, and Ambrosia produced the widest ears, followed by

Inferno: all of these had diameters greater than 2 inches. BC1002 and Jackie produced the narrowest ears, less than 1.9 inches in diameter.

Shank length ranged from 3.4 inches to 8.3 inches and averaged 5.2 inches. SC1102 had significantly longer shanks than any other entry, followed by Utopia (6.9 inches), also significantly longer than the remaining entries. Varieties with shanks less than 5 inches included Inferno, Temptation, Allure, Ambrosia, and BC1002; these did not differ significantly.

Ear height from the soil to mid-ear ranged from 20.3 to 29.2 inches and averaged 24.0 inches. Height was at least 24 inches for Cuppa Joe, SC1102, Ambrosia, Utopia, and Temptation.

Husk cover ratings averaged 3.6 (on a 1 to 5 scale, with 5 best). Profit, Temptation, Inferno, and Allure were rated above 4, indicating they typically had at least 1.25 inches of husk covering the ear tip. Husk cover ratings for SC1102, Cuppa Joe, BC1002, and Jackie averaged between 2.6 and 3.8, indicating 0.75 to 1.25 inches of cover on most ears. Ambrosia and Utopia had less than 0.75 inches of cover on most ears. The husks of Allure and Utopia were consistently loose around the ear tip.

Tip fill ratings averaged 4.1 out of 5. Varieties with a rating greater than 4.5 for tip fill, indicating most ears were filled nearly to the tip, included SC1102, Utopia, Jackie, and Profit. Temptation, Allure, and BC1002 averaged 4.1 to 4.4 for tip fill, indicating no more than ½ inch unfilled at the tip. Cuppa Joe, Inferno, and Ambrosia averaged between 3.1 and 3.6, indicating no more than 1 inch unfilled at the tip.

For overall ear quality, Jackie and Temptation received the highest ratings, between 7.7 out of 9. Other varieties rated greater than the trial average of 5 included Profit and SC1102. Flavor ratings were varied from one replication to the next except for Inferno and Profit, which consistently received ratings of ‘excellent’ (5 on a 5-point scale) and Temptation, which was rated ‘good’ (3 on a 5-point scale) (data not shown).

The cool and wet spring caused serious stress early at the start of the season. The cool weather slowed corn development compared to a more typical year, but yield and ear quality were not compromised. Evaluation of results presented in Table 1 combined with results from other locations and years should aid producers in selecting varieties best suited to their operations. The relatively small number of varieties in the trial reflects the growing interest in ‘supersweet’ corn types as opposed to those in this trial with sugar-enhanced and synergistic genetics. A separate trial evaluating supersweet varieties was conducted at the same location, and results are reported in a separate article.

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Table 1. Yield, ear size, and quality of sugar-enhanced and synergistic sweet corn varieties in northern Indiana, 2013. Varieties listed in order of harvest.

Cultivar	Seed Source ¹	Days to Harvest ²		Yield of Marketable Ears		Avg. Ear Weight lb	Ear Length in	Ear Dia. in	Shank Length in	Ear Ht. in	Husk Cover ³	Husk Tightness ³	Tip Fill ³	Overall ³
		Pred.	Actual	doz/A	ton/A									
BC1002	SY	70	72.0	1,323	5.4	0.69	7.4	1.78	3.4	22.3	2.8±0.2	1.3±0.2	4.1±0.1	3.7±0.3
Temptation	SE	72	72-75	1,533	7.7	0.84	7.3	1.93	4.4	22.6	2.8±0.3	1.7±0.2	4.6±0.1	7.7±0.3
Jackie	RU	70	72-75	1,323	6.5	0.82	7.3	1.83	5.5	25.1	4.7±0.2	1.9±0.1	4.4±0.1	7.7±0.3
Profit	RU	72	72-75	1,404	6.6	0.78	7.1	1.90	5.2	20.3	5.0±0.0	1.9±0.1	4.6±0.1	6.3±0.9
Inferno	CR	74	77-79	1,404	8.1	0.95	8.0	2.03	4.6	22.4	4.7±0.3	1.4±0.1	3.2±0.2	4.3±0.9
Ambrosia	RU	75	79.0	1,323	7.6	0.95	8.8	2.08	4.2	25.7	2.4±0.1	1.9±0.1	3.1±0.1	3.0±0.0
Cuppa Joe	RU	73	79-82	1,484	8.4	0.94	8.7	1.94	5.6	29.2	3.6±0.3	1.4±0.1	3.6±0.3	3.3±0.3
Allure	RU	75	79-82	1,387	8.1	0.98	8.4	1.99	4.4	22.3	4.0±0.4	1.1±0.1	4.1±0.1	4.3±1.3
SC1102	SE	76	82-84	1,597	10.9	1.14	8.0	2.11	8.3	26.8	3.8±0.4	1.7±0.0	4.7±0.2	5.3±0.9
Utopia	RU	76	82-84	1,339	9.9	1.24	9.1	2.08	6.9	25.4	2.4±0.4	1.1±0.1	4.7±0.0	4.7±0.7
<i>Grand Mean</i>			78	1,412	7.9	0.93	8.0	1.97	5.2	24.0	3.6	1.5	4.1	5.0
<i>LSD .05⁴</i>			–	NS	1.5	.07	.20	.08	1.2	3.7	–	–	–	–

¹Seed Source: RU=Rupp; SE=Seminis; SY=Syngenta.

²Days from planting to harvest. Predicted number is from seed supplier. Actual values are range for 3 replications.

³Husk cover: 5=more than 2 inches cover; 4=1.25-2 inches; 3=0.75-1.25 inches; 2=less than 0.75 inch; 1=ear exposed. Husk tightness: 1=loose; 3=very tight; Tip fill: 5=kernels filled to tip of cob; 4=less than 0.5 inch unfilled; 3=0.5-1 inch unfilled; 2=more than 1 inch unfilled; 1=more than 2 inches unfilled; Overall: 1=worst. 9=best. Mean ± s.e.m.

⁴Means differing by more than this amount are significantly different at $P \leq .05$ based on Fisher's Protected LSD. Means followed by the same letter do not differ significantly. – AOV not performed.