

Sugar-enhanced and Synergistic Sweet Corn Cultivar Evaluation for Northern Indiana — 2011

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Indiana growers harvested sweet corn for fresh market sales from 6,500 acres in 2010, with an average yield of 92 cwt/acre (219 crates or 4.6 tons per acre) and total value of \$14.4 million (USDA NASS, 2011). Indiana ranks 13th among states for production of fresh market sweet corn. 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 23 bicolor and one yellow sugar-enhanced and 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 2010 soil test showed 1.5% organic matter, pH 6.2, 27 ppm phosphorus (P), 86 ppm potassium (K), 180 ppm magnesium (Mg), and 650 ppm calcium (Ca). Potassium (150 lb. K₂O/A from 0-0-60) and lime (1 ton/A) were broadcast in fall 2010 and spring 2011, respectively.

The trial was set up as a randomized complete block design with three replications. Sweet corn entries, 22 bicolor and one yellow (08TG110), were assigned to individual plots one row (30 inches) wide by 30 feet long. Corn was seeded May 9, 2011, with a finger pick-up planter and later thinned to 35 plants per 30-foot row (20,328 plants per acre). Nitrogen (N) (at 20.3 lb./acre) and P (at 18.2 lb./acre P₂O₅) were applied at planting from 19-17-0 (10 gal. /acre), and an additional 70 lb./acre N from urea ammonium nitrate solution was injected at the whorl stage.

Tefluthrin (Force 3G[®]) was applied at planting to control corn rootworms. Weeds were controlled with atrazine (Atrazine 4L[®]) and s-metolachlor (Dual II Magnum[®]) applied after seeding, one cultivation, and hand weeding. Irrigation was applied during the growing season as needed. Permethrin (Arctic 3.2EC[®], 4 fl. oz./acre) was applied four times from July 5 to July 26 to control caterpillars.

Emergence and early plant vigor were evaluated 22 days after planting (DAP), before thinning. Seventy-four DAP, just 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, approximately 19 to 22 days after 50% silking. The weights and numbers of marketable ears were recorded. Three ears from each plot were selected to evaluate degree of husk cover, husk tightness, degree of tip fill, overall attractiveness, average ear diameter and length after husking, and shank length. Four people rated the flavor of most entries based on one uncooked ear apiece from each plot. Rating scales are described in table footnotes. Letter ratings for flavor were converted to numerical ratings for statistical analysis, and plots observed to be obviously overmature were excluded from statistical analysis of flavor (one rep each of CSYBF7-263, Profit, and Espresso).

Quantitative data with equal variance across treatments were analyzed using ANOVA followed by mean separation using Fisher's protected least significant difference at $P \leq 0.05$. When variance was 0 for one or two entries, analysis was performed without those entries to achieve equality of variance.

Relationships between yield components, ear and plant characteristics, and average days to harvest were analyzed using linear regression.

Results and Discussion

The growing season was wet with an exceptionally warm period in mid-July. The USDA National Agricultural Statistics Service Indiana Crop & Weather Reports documented that from May 9 to July 31, rainfall totaled 15.68 inches, 4.85 inches more than normal. The period from May 9 to May 29 received 3.21 inches more rain than normal. Rainfall recorded at the Ag Center was 4.97, 3.54, 7.28, and 3.17 inches for May, June, July, and August, respectively. The growing degree days (GDD) accumulation from May 9 to July 31 was 1,600, 96 more than normal. From July 18 to the end of the month there were six days with a maximum temperature above 90°F and six nights with a minimum temperature above 70°F.

By 22 DAP, emergence averaged 108% of the intended seeding rate (data not shown). After thinning, all plots were within 98% of the desired stand of 20,328 plants per acre. Differences in early plant vigor were observed (data not shown). Temptation and Espresso were more vigorous than 18 other varieties. Synergy and Vitality had slightly lower early vigor, but were not significantly different from Temptation and Espresso. Pay Dirt (from both seed sources) was the least vigorous early in the season. Plant vigor ratings near harvest were strongly correlated with days from planting to harvest: later-maturing varieties tended to be more vigorous. Pay Dirt was rated as the least vigorous at harvest. Most varieties produced tillers with some large enough to interfere with harvest (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 7.4 tons per acre, and ranged from 4.9 to 9.2 tons per acre. Cameo produced the greatest yield, followed by 1102 and Powwow. These varieties produced significantly greater yield than 17 other entries in the trial. Vitality produced the lowest yield of 4.9 tons per acre. Pay Dirt and Fastlane also produced low yield, from 5.5 to 5.8 tons per acre. Tons per acre was strongly correlated with harvest date; later-maturing varieties produced greater yield. Tons per acre were also correlated with shank length: varieties with longer shanks produced greater tonnage; shanks were not broken off before weighing ears. The number of marketable ears ranged from 1,533 to 1,742 dozen per acre, and averaged 1,631. Thirteen varieties did not differ from the most productive variety 1080; and eight did not differ from the least productive variety Rendezvous.

Average weight per ear ranged from 0.50 lb. (Vitality) to 0.94 lb. (1102). Three entries had an average ear weight greater than 0.90 lb. and did not differ significantly from 1102: Cameo, SEB6SH1102, and Powwow. Fastlane and Pay Dirt produced heavier ears than Vitality, but lighter than other varieties. Ear length ranged from 6.0 to 8.2 inches, and diameter ranged from 1.65 to 2.07 inches. The longest ears were produced by Ka-Ching, Cameo, and Espresso (8.1 to 8.2 inches). The shortest ears ranged from 6.0 to 6.3 inches and included Fastlane and Vitality. Powwow and Cameo produced the widest ears, followed by Allure, Ambrosia, SEB6SH1102, 1102, Synergy, and BC 0822. Vitality and Pay Dirt produced the narrowest ears, less than 1.7 inches in diameter. Ear size was correlated with days to harvest: later maturing varieties tended to have heavier, longer, and wider ears. Espresso was notably longer than expected based on its harvest date. Cameo was both longer and wider than expected. Pay Dirt and Primus were lighter and narrower than expected based on their harvest dates.

Shank length ranged from 2.2 inches to 7.2 inches and averaged 4.5 inches. Varieties with the longest shanks were 1102 and SEB6SH1102, both greater than 6.7 inches, followed by Cameo at 5.9 inches. Varieties with shanks between 3.25 and 4.25 inches included 08TG110, SEB6RH1080, Allure, Temptation, Espresso, 1080, and Ambrosia; these did not differ significantly. Vitality had the shortest shanks at 2.2 inches. Ear height, measured from the ground to mid-ear was greater than 24 inches for

Cameo, BC 0822, Powwow, SEB6SH1102, 1102, Primus, Rendezvous, Jackie, and Temptation. Fastlane and Pay Dirt produced ears less than 20 inches from the ground.

Husk cover ratings averaged 3.9. BC 0822, Profit, and CSYBF7-263 consistently had more than 2 inches of husk past the tip of the cob. Primus, Ka-Ching, Fastlane, Vitality, 1102, Temptation, Espresso, SEB6SH1102, and 08TG110 consistently had at least 1.25 inches of husk cover. Husk cover ratings for Allure, Ambrosia, Jackie, SEB6RH1080, Pay Dirt, Rendezvous, and 1080 averaged between 2.7 and 3.8, indicating 0.75 to 1.25 inches of cover on most ears. Synergy, Powwow, and Cameo had less than 0.75 inches of cover on most ears. The husks of BC 0822, Allure, Synergy, 1080, and Powwow were 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 Fastlane, Synergy, Profit, and Temptation. Varieties with a rating between 3 and 4 for tip fill included CSYBF7-263, Pay Dirt, 08TG110, Espresso, Cameo, BC 0822. Ambrosia had the poorest tip fill rating at 2.4, indicating more than 1 inch unfilled on most ears.

For overall ear quality in terms of appearance, Profit, Fastlane, Ka-Ching, and Allure received the highest ratings, between 7.0 and 7.3 out of 9. Other varieties greater than the 5.7 average included Primus, SEB6SH1102, Jackie, 1102, Espresso, Temptation, CSYBF7-263, and the yellow entry 08TG110. 08TG110 and Primus received the best flavor ratings, followed by 1102, Synergy, and Allure.

Careful 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.

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Table 1. Yield, ear size, and quality of bicolor sugar-enhanced and synergistic sweet corn varieties in northern Indiana, 2011. 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	Flavor ⁴
		Pred.	Actual	doz/A	ton/A										
Fastlane	HM	67	74	1,581	5.6	0.59	6.0	1.76	4.3	19.9	4.7±0.2	1.6±0.1	4.8±0.2	7.0±0.0	2.9 DEFG
Vitality	SE	67	74	1,646	4.9	0.50	6.3	1.69	2.2	21.6	4.7±0.2	1.8±0.1	4.0±0.0	4.0±0.0	3.3 CDE
CSYBF7-263	CR	73-78	77*	1,694	7.3	0.72	6.8	1.82	4.3	23.9	5.0±0.0	2.2±0.2	3.9±0.1	6.3±0.3	2.7 EFG
Espresso	RU	72	77*	1,646	7.1	0.72	8.1	1.82	3.6	22.4	4.3±0.2	2.2±0.4	3.7±0.3	6.7±0.3	1.4 H
Profit	RU	-	77*	1,646	7.1	0.72	6.9	1.83	5.0	22.1	5.0±0.0	2.2±0.2	4.6±0.1	7.3±0.3	2.8 DEFG
Pay Dirt	RU	70	77	1,662	5.8	0.58	6.9	1.68	4.3	18.4	3.2±0.7	1.9±0.1	4.1±0.2	5.0±0.6	3.2 CDE
Temptation	SE	72	77	1,662	7.2	0.72	6.9	1.85	3.6	24.2	4.3±0.3	1.4±0.2	4.6±0.4	6.3±0.7	2.7 EFG
Rendezvous	HM	70	77-79	1,533	6.4	0.70	6.5	1.78	4.9	26.7	3.1±1.1	1.6±0.3	4.3±0.0	4.7±0.9	2.4 FG
08TG110	RU	75	77-79	1,613	7.2	0.74	7.1	1.82	4.1	23.6	4.0±0.3	1.4±0.1	3.8±0.1	6.3±0.3	4.7 A
Jackie	HM	-	77-79	1,549	6.4	0.68	6.5	1.79	4.5	24.6	3.7±0.3	2.1±0.1	4.2±0.4	6.7±0.3	3.2 CDE
Pay Dirt	CR	70	77-79	1,597	5.6	0.58	7.0	1.65	4.4	17.3	3.1±0.3	1.4±0.1	3.9±0.2	4.3±0.9	2.8 DEFG
Synergy	SE	77	79-84	1,662	8.1	0.81	7.5	1.93	4.4	20.3	2.6±0.6	1.1±0.1	4.7±0.2	4.3±0.9	3.7 BC
1080	RU	76	82	1,742	7.6	0.72	7.4	1.86	3.4	21.2	2.9±0.1	1.0±0.0	4.4±0.2	3.7±0.3	3.0 DEF
Ambrosia	RI	75	82	1,646	7.5	0.76	7.8	1.97	3.3	24.0	3.7±0.2	1.8±0.3	2.4±0.3	4.0±0.0	2.7 EFG
SEB6RH1080	SE	71	82	1,629	7.4	0.76	7.6	1.86	4.0	20.8	3.3±0.2	1.3±0.0	4.4±0.1	5.3±0.9	2.2 G
1102	RU	72	82-84	1,565	8.9	0.94	7.1	1.94	7.2	28.0	4.6±0.3	2.3±0.3	4.2±0.1	6.7±0.3	3.9 BC
SEB6SH1102	SE	72	82-84	1,549	8.6	0.92	7.3	1.97	6.7	28.3	4.2±0.5	1.9±0.1	4.3±0.3	6.7±0.3	2.7 EFG
Allure	RU	75	84	1,662	8.6	0.86	7.6	1.97	3.6	23.3	3.8±0.4	1.1±0.1	4.0±0.0	7.0±0.0	3.5 BCD
BC 0822	SY	77	84	1,662	8.0	0.80	7.2	1.89	4.7	29.0	5.0±0.0	1.1±0.1	3.3±0.0	5.7±0.7	2.9 DEFG
Ka-Ching	CR	77	84	1,662	8.5	0.86	8.2	1.88	5.3	24.0	4.7±0.3	1.6±0.3	4.0±0.0	7.0±0.0	2.7 EFG
Powwow	HM	75	84	1,581	8.7	0.91	7.3	2.07	5.2	28.8	2.4±0.1	1.0±0.0	4.3±0.2	4.0±0.0	2.8 DEFG
Cameo	CR	84	84-86	1,646	9.2	0.93	8.2	2.07	5.9	31.0	2.4±0.6	1.3±0.2	3.6±0.2	4.3±0.3	3.1 CDEFG
Primus	SY	81	84-86	1,678	8.1	0.81	7.8	1.79	4.7	27.8	4.8±0.1	1.9±0.1	4.3±0.2	6.7±0.3	4.1 AB
<i>Grand Mean</i>				<i>1,631</i>	<i>7.4</i>	<i>0.75</i>	<i>7.2</i>	<i>1.86</i>	<i>4.5</i>	<i>24.0</i>	<i>3.9</i>	<i>1.6</i>	<i>4.1</i>	<i>5.7</i>	<i>3.0</i>
<i>LSD .05⁵</i>				<i>104</i>	<i>0.6</i>	<i>0.04</i>	<i>0.3</i>	<i>0.09</i>	<i>0.9</i>	<i>2.3</i>	–	–	–	–	<i>(variable)</i>
<i>r² 6</i>				<i>ns</i>	<i>0.80</i>	<i>0.75</i>	<i>0.55</i>	<i>0.55</i>	<i>0.23</i>	<i>0.36</i>	–	–	–	–	–

Notes on next page

Table 1 (*continued*)

¹Seed Source: CR=Crookham; HM=Harris; RI=Rispens; RU=Rupp; SE=Seminis; SY=Syngenta.

²Days from planting to harvest. Predicted number is from seed supplier. Actual values are range for 3 replications. Asterisk indicates corn was noted to be overmature for one rep of that variety and so the harvest date for that rep was not included in DAP.

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 \pm s.e.m.

⁴Flavor: Raw ears evaluated by four people in most cases. 1=poor; 2=medium; 3=good; 4=very good; 5=excellent. Least square means that do not share a letter are significantly different at $P \leq .05$ based on Fisher's Protected LSD.

⁵Means differing by more than this amount are significantly different at $P \leq .05$ based on Fisher's Protected LSD. For diameter, LSD does not apply to Ka-Ching or Profit. – AOV not performed.

⁶ r^2 for regression vs. actual days to harvest is the proportion of variability explained by days to harvest. ns=regression not significant at $P \leq .05$.