Sugar-enhanced and Synergistic Sweet Corn Cultivar Evaluation for Northern Indiana — 2012

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Indiana growers harvested sweet corn for fresh market sales from 5,800 acres in 2011, with an average yield of 67 cwt/acre (159 crates or 3.3 tons per acre) and a total value of $17.9 million (USDA NASS, 2012). Indiana ranked 15th among states for production of fresh market sweet corn and produced about 1.3% of the nation's total in 2011. 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 15 bicolor, one yellow, and one white 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 2011 soil test showed 1.7% organic matter, pH 6.3, and 184 ppm phosphorus (P), 101 ppm potassium (K), 140 ppm magnesium (Mg), and 600 ppm calcium (Ca). Potassium (50 lb./A K_2O from 0-0-60) and nitrogen (30 lb./A N from 46-0-0) were broadcast May 8, 2012. An additional 70 lb./acre N from urea ammonium nitrate solution were injected at the whorl stage.

The trial was set up as a randomized complete block design with three replications. Sweet corn entries, 16 bicolor, one yellow (Inferno, previously trialed as 08T6110), and one white (Cloud Nine) were assigned to individual plots one row (30 inches) wide by 30 feet long. Corn was seeded May 16 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 with hand weeding. Irrigation was applied regularly through drip lines adjacent to each row. Permethrin (Arctic 3.2EC®, 4 fl. oz./acre) was applied three times from July 6 to 20 to control caterpillars.

Emergence was evaluated 13 and 19 days after planting (DAP) and final stand determined 26 DAP, after thinning. Early plant vigor was evaluated 24 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 weight and number of marketable first ears for each plot 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. 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.

Quantitative data with equal variance across treatments (P>.01) were analyzed using ANOVA followed by mean separation using Fisher's protected least significant difference at $P \leq 0.05$. Due do a planter skip in one replication each for Easy Money and Jackie, data from those plots were omitted for analysis of final stand and yield. Final stand was converted to percent of desired stand and arcsin-square-root

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transformed to achieve equal variance. Two entries were omitted from ANOVA of final stand because their variance was 0.

Results and Discussion

The growing season was hot and dry. The USDA National Agricultural Statistics Service Indiana Crop & Weather Reports documented that from May 14 to July 30, rainfall totaled 9.29 inches, with almost half of that (4.43 inches) falling after July 15. The growing degree days (GDD) accumulation from May 14 to July 30 was 1,775, 343 more than normal. Irrigation did not completely eliminate plant water stress.

By 19 DAP, emergence averaged 95% of the intended seeding rate with no significant differences among entries (data not shown). Final stand after thinning averaged 95% (range 84 to 100%) of the desired stand of 20,328 but not differ significantly among entries (data not shown). Differences in early plant vigor were observed (data not shown). Cuppa Joe, Ambrosia, and Temptation were significantly more vigorous than 11 other varieties. 1102, Easy Money, Primus (from Syngenta), and Cloud Nine had slightly lower early vigor, but were not significantly different from Ambrosia and Temptation. Navajo was the least vigorous early in the season, but Paydirt and Jackie were not significantly better. Plant vigor ratings near harvest (data not shown) were between 7.5 and 8 (out of 9) for 1274, Ambrosia, Primus (from Syngenta), Ka-ching, Allure, and Cameo. Other varieties with vigor greater than the average of 6.1 included 1102, Primus (from Stokes), Cuppa Joe, and 1273. Paydirt and Inferno were rated as the least vigorous at harvest. Ambrosia frequently produced tillers big enough to interfere with harvest. Cuppa Joe, Paydirt, 1102, Ka-ching and 1274 produced few 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 6.5 tons per acre, and ranged from 4.6 to 7.5 tons per acre. 1274, 1102, and Primus (from Syngenta), produced the top yields in tons per acre, significantly greater than eight other entries in the trial. Jackie produced the lowest yield; Paydirt, Inferno, Navajo, and Temptation did not produce significantly greater yield than Jackie. The number of marketable ears ranged from 1,113 to 1,597 dozen per acre, and averaged 1,447. Primus (from Syngenta), produced the most ears per acre, but only two varieties (Jackie and Inferno) produced significantly fewer ears than Primus.

Average weight per ear (including the shank) ranged from 0.53 lb. (Paydirt) to 0.86 lb. (1102). Three entries had an average ear weight equal to or greater than 0.80 lb. and did not differ significantly from 1102: 1274, Cloud Nine, 1273, Ka-ching, and Cameo. Ears of Jackie, Profit, Navajo, and Temptation were heavier than ears of Paydirt, but significantly lighter than ears of 13 other entries. Ear length ranged from 6.7 to 9.4 inches, and diameter ranged from 1.65 to 1.94 inches. The longest ears were produced by Ka-Ching, Cloud Nine, and Primus (from Syngenta) (8.97 to 9.42 inches). The shortest ears ranged from 6.74 to 7.17 inches and included Navajo, Jackie, and Profit. Cameo produced the widest ears, followed by Ambrosia, Cloud Nine, 1273, 1274, 1102, Allure, and Temptation, which were not significantly narrower than Cameo. Paydirt produced the narrowest ears. Primus (from Stokes), Cuppa Joe, and Jackie also had relatively narrow ears, less than 1.75 inches in diameter, and not significantly different from Paydirt.

Shank length ranged from 2.6 inches to 6.1 inches and averaged 4.0 inches. 1102 had significantly longer shanks than any other entry. Varieties with shanks between 2.6 and 3.7 inches included Ambrosia, Temptation, Allure, Navajo, 08TG110, Jackie, Cuppa Joe, and Cloud Nine; these did not differ significantly.

Ear height from the soil to mid-ear ranged from 18.5 to 31.4 inches and averaged 24.9 inches. Height was at least 24 inches for Cameo, Primus, 1102, Cuppa Joe, Temptation, Navajo, Ambrosia, Ka-ching, Cloud Nine, and Allure. Paydirt produced ears less than 20 inches from the ground.

Husk cover ratings averaged 2.6 (on a 1 to 5 scale, with 5 best). Profit and Easy Money were rated above 4, indicating they typically had at least 1.25 inches of husk covering the ear tip. Husk cover ratings for Inferno, Primus (from Syngenta), 1274, Temptation, and Navajo averaged between 2.6 and 3.8, indicating 0.75 to 1.25 inches of cover on most ears. Ka-ching, Jackie, Cameo, 1102, and Paydirt had less than 0.75 inches of cover on most ears. On some ears of Ambrosia, Allure, Cloud Nine, Cuppa Joe, and 1273 husk cover was poor enough that kernels at tip of ear were not covered. The husks of Allure, Cloud Nine, and Cuppa Joe were consistently loose around the ear tip.

Tip fill ratings averaged 4.0 out of 5. Varieties with a rating greater than 4.5 for tip fill (indicating most ears were filled nearly to the tip) included 1102, Jackie, Profit, Temptation, and Easy Money. Varieties with a rating between 3 and 4.5 for tip fill included Paydirt, Navajo, 1273, Primus, 1274, Ka-ching, Cuppa Joe, Primus, Inferno, Cameo, and Allure. Cloud Nine had the poorest tip fill rating at 1.9, and Ambrosia (rated 2.4) also had more than 1 inch unfilled on most ears.

For overall ear quality, Easy Money, Profit, and Ka-Ching received the highest ratings: between 5.7 and 6.7 out of 9. Other varieties rated greater than the 3.9 trial average included 1102, Temptation, Navajo, 1274, and Primus (from both seed sources). Flavor ratings did not differ significantly among entries (data not shown).

The hot and dry weather this season stressed sweet corn in this trial. Nonetheless many varieties produced acceptable yields and quality. 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 sugar-enhanced and synergistic sweet corn varieties in northern Indiana, 2012. 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 Tight-ness[3]	Tip Fill[3]	Over-all[3]
		Pred.	Actual	*doz/A*	*ton/A*									
Navajo	ST	67	68	1,371 ABC	5.6	0.68	6.74	1.78	3.2	25.4	3.7±0.2	1.7±0.2	4.4±0.1	4.7±0.3
Jackie	ST	70	68	1,171 BC	4.6	0.64	6.92	1.72	3.5	23.8	2.4±0.4	1.4±0.2	4.8±0.1	3.7±0.3
Paydirt	CR	70	68	1,549 A	5.0	0.53	7.32	1.65	4.4	18.6	2.4±0.3	1.4±0.3	4.4±0.2	3.3±0.3
Profit	CR	72	68-70	1,565 A	6.2	0.67	7.17	1.79	4.3	20.9	4.1±0.1	1.6±0.3	4.8±0.2	5.7±0.9
Easy Money	CR	75	68-70	1,582 A	7.3	0.78	7.72	1.82	4.7	21.3	4.3±0.0	1.9±0.1	4.6±0.3	6.7±0.3
Temptation	SE	72	70	1,371 ABC	5.7	0.69	7.54	1.83	3.0	26.4	3.2±0.4	1.6±0.1	4.7±0.0	5.0±1.2
Inferno (yellow)	RU	75	70-72	1,113 C	5.1	0.77	7.92	1.82	3.4	22.7	2.7±0.2	1.6±0.2	3.6±0.1	3.7±0.3
Cuppa Joe	RU	72	70-75	1,549 A	7.0	0.75	8.43	1.71	3.6	26.7	1.8±0.1	1.0±0.0	3.9±0.3	1.7±0.3
1102	SE	73	72-75	1,452 AB	7.5	0.86	8.07	1.86	6.1	27.4	2.4±0.3	2.1±0.1	5.0±0.0	5.0±1.0
Ambrosia	RU	75	72-75	1,355 ABC	6.3	0.78	8.71	1.92	2.6	25.1	1.1±0.1	1.3±0.3	2.4±0.3	1.0±0.0
Cloud Nine (white)	RU	77	72-75	1,420 AB	7.2	0.85	9.14	1.90	3.7	24.2	1.7±0.5	1.0±0.0	1.9±0.1	2.3±0.3
1273	SE	78	75	1,500 A	7.3	0.81	8.35	1.89	4.8	23.0	1.9±0.4	1.7±0.2	4.4±0.3	3.7±0.3
Ka-ching	CR	78	75	1,468 A	7.1	0.80	9.43	1.79	3.9	25.1	2.3±0.3	1.3±0.2	4.0±0.2	5.7±0.9
Allure	RU	75	75-77	1,355 ABC	6.0	0.75	8.68	1.85	3.0	24.0	1.6±0.2	1.0±0.0	3.3±0.3	2.3±0.3
1274	SE	79	75-77	1,468 A	7.5	0.86	8.14	1.89	4.9	23.9	3.0±0.4	1.8±0.4	4.0±0.2	4.3±0.3
Primus	SY	81	77-79	1,597 A	7.4	0.78	8.97	1.78	4.3	28.8	3.0±0.4	1.3±0.3	3.8±0.1	4.3±0.3
Primus	ST	81	77-79	1,581 A	7.2	0.76	8.82	1.71	4.4	29.4	2.6±0.4	1.1±0.1	4.2±0.1	4.0±0.0
Cameo	CR	84	79	1,517 A	7.3	0.80	8.50	1.94	4.8	31.4	2.4±0.1	1.2±0.1	3.4±0.2	3.7±0.7
Grand Mean			*73*	*1,447*	*6.5*	*0.75*	*8.14*	*1.81*	*4.0*	*24.9*	*2.6*	*1.4*	*4.0*	*3.9*
LSD .05[4]			–	*262*	*1.1*	*0.08*	*0.48*	*0.11*	*1.2*	*1.9*	–	–	–	–

[1]Seed Source: CR=Crookham; RU=Rupp; SE=Seminis; SY=Syngenta.

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

[3]Husk 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.

[4]Means differing by more than this amount are significantly different at $P \leq .05$ based on Fisher's Protected LSD. LSD for yield does not apply to Jackie or Easy Money because yield values are means of two replications instead of three. Means followed by the same letter do not differ significantly. – AOV not performed.

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