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Sugar-enhanced Sweet Corn Cultivar Evaluation for Northern Indiana, 2008

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Indiana growers harvested sweet corn for fresh market sales from 5,400 acres in 2007, according to the Indiana Agricultural Statistics Service. Average yield was 85 cwt/A (202 crates/A) and the crop had a total value of \$10.5 million. Sweet corn fields 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 12 sugar enhanced and synergistic sweet corn cultivars that were evaluated at the Pinney-Purdue Agricultural Center in Wanatah, Indiana.

Materials and Methods

The trial was conducted on a Tracy sandy loam with 1.5% organic matter and 32 ppm phosphorus (P), 92 ppm potassium (K), 155 ppm magnesium (Mg), 600 ppm calcium (Ca), and pH 6.2. It was set up as a randomized complete block design with three replications. Cultivars were assigned to individual plots one row (30 inches) wide by 30 feet long. Corn was seeded May 16, 2008, with a finger pick-up planter set to drop 23,200 seeds per acre, and later thinned to 35 plants per 30-foot row (20,328 plants per acre). Nitrogen (N) (at 20.3 lb./A) and P (at 18.2 lb./A P₂O₅) were applied at planting from 19-17-0 (10 gal. /A), and an additional 70 lb./A N from urea ammonium nitrate solution was injected June 24. 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, and by hand weeding. Irrigation was applied to incorporate herbicides, and then during the growing season as needed. Insecticides were applied as needed to control caterpillars. Emergence was recorded 13 and 21 days after planting (DAP), before thinning. Early plant vigor was evaluated 24 DAP. Eighty-two DAP, just before harvest, plant vigor, height, degree of tiller formation, and lodging were evaluated, 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. The total weight and number 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, length after husking, and shank length. One person rated the flavor of each entry. Rating scales are described below and in footnotes to Table 2. Quantitative data with equal variance across treatments were analyzed using ANOVA followed by mean separation using Fisher's protected least significant difference at $P \leq 0.05$. Relationships between yield components, ear and plant characteristics, and average days to harvest were analyzed using linear regression.

Characteristic	Rating Scale
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	3=tight. 2=firm. 1=loose.
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.

Results and Discussion

The growing season was drier and cooler than normal. Climate information obtained from the Indiana State Climate Office at Purdue University documented that the last half of May was particularly cool, with an average air temperature of 56°F, which was 6°F below normal. Soil temperature at 4 inches measured within a quarter-mile of the trial averaged 58°F and 62°F the first and second weeks after planting, respectively. From May 16 to August 15, 1640 growing degree days (GDD) accumulated, 177 fewer than normal. Aside from a 5-inch rainfall in early August, precipitation for the period totaled 6.5 inches, about half of normal. Irrigation prevented severe crop stress, but development was slower than normal, particularly early in the season.

Emergence 13 and 21 DAP averaged 79% and 91% of the seeding rate, respectively, with significant differences among varieties (Table 1). It is not clear whether differences in emergence are related to genetics of the varieties or to the fact that seed treatments varied among entries — Revelation had no seed treatment. For Revelation and Cameo, low emergence led to final stands of 75% and 89% of the desired population, respectively; other varieties were within 90% of the desired stand after thinning. Differences in early vigor were visually apparent: Revelation and BC 0808 received the lowest ratings and Temptation, Vitality and GH 0851 received the highest ratings (Table 1). At harvest the two earliest varieties, Vitality and HMS 6358BES, were rated as the least vigorous. Mystique, Ambrosia, and Cameo received the highest ratings, although they were not significantly different from five other entries. All varieties tillered, but just two consistently produced long tillers that might interfere with harvest: BC0808 and Cameo. Varieties showed differences in lodging following 5.2 inches of rain on August 4. Valiant, Revelation, Mystique, and HMX 6358BES showed the most severe lodging, and Temptation and GH 0851 showed the least.

Results for yield and ear quality are presented in Table 2. Marketable yield averaged 6.7 tons per acre. The top four varieties did not differ significantly in this measure of yield. BC 0808 and GH 0851 both produced 8.5 tons per acre, followed by BC 0805 and Cameo at 8.0 and 7.9 tons per acre, respectively. Ambrosia followed with 7.3 tons per acre, not significantly less than BC 0805 or Cameo, and similar to Kristine at 6.8 tons per acre. Revelation, Vitality, and HMX produced the fewest tons per acre, ranging from 4.7 to 5.4. Temptation, at 6.1 tons per acre, was not significantly higher than HMX 6358BES or lower than Kristine. Valiant and Mystique fell between Kristine and Temptation. The number of marketable ears ranged from 1129 to 1694 dozen per acre, and averaged 1478. Seven varieties produced more than 1460 dozen per acre and did not differ significantly, including GH 0851, BC 0805, BC 0808, Ambrosia, Vitality, HMX 6358BES, and Kristine. Revelation produced the fewest ears per acre. Average weight per ear ranged from 0.57 pound (Vitality) to 0.93 pound (Cameo). Average ear weight and yield in tons per acre were both correlated with days to harvest: later-maturing varieties tended to produce heavier ears and more tons per acre. BC 0808 and Cameo produced ears a little heavier than would be expected based on their harvest dates.

Ear length ranged from 6.7 to 8.4 inches, and diameter ranged from 1.8 to 2.1 inches. The longest ears were produced by BC 0808, Mystique, and BC 0805 (8.1 to 8.4 inches). GH 0851, Ambrosia, and Cameo, all 7.9 inches, were not significantly shorter than BC 0805. HMX 6358BES, Revelation, Kristine, and Valiant produced ears 7.4 to 7.5 inches long. Temptation, at 7.1 inches, was not different from those, or from Vitality, which had the shortest ears at 6.7

inches. Varieties that had ears with a diameter of 2 inches or greater included Ambrosia, BC 0808, Cameo, Kristine, Mystique, and Temptation. Vitality, HMX 6358, and GH 0851 had the narrowest ears at 1.8 inches. Shank length ranged from 2.5 inches for Revelation and Vitality, to 5.1 inches for Cameo, with the average being 3.4 inches (Table 1). Ear length and shank length were positively correlated with days to harvest. Mystique and BC 0808 produced longer ears than would be expected based on their harvest dates, and Cameo had longer shanks than expected based on harvest date. Ear height, measured from the ground to mid-ear, ranged from 15.4 inches for HMX 6358BES, to 24.9 inches for Cameo and was correlated with harvest date — later varieties tended to have higher ears.

Husk cover ratings averaged 4.3. BC 0805, GH 0851, Kristine, Valiant, Temptation, and Vitality averaged greater than 4.5, indicating more than 2 inches of husk cover on most ears. Revelation and Ambrosia averaged from 3.8 to 3.9, indicating 1.25 to 2 inches of cover on most ears. Mystique averaged 3.0, indicating 0.75 to 1.25 inches of cover. The husks of BC 0808 and Mystique were loose around the ear tip. Tip fill ratings averaged 3.9. Vitality, Temptation, and GH 0851 had very good tip fill, averaging 4.5 or more, indicating that most ears had kernels filled nearly to the tip. Valiant, BC 0805, and HMX 6358 BES had good tip fill, averaging 4.3 to 4.4, indicating ears with less than 0.5 inch of the tip unfilled. Most ears of Kristine and Revelation also had good tip fill. Cameo and BC 0808 produced ears with 0.5 to 1 inch of unfilled kernels. Varieties more than 1 inch unfilled kernels on most ears included Mystique and Ambrosia. For overall ear quality in terms of appearance, Temptation received the highest rating. Other varieties above the 6.1 average included Vitality, Kristine, BC 0805, and GH 0851. Ambrosia and BC 0808 received the lowest ratings for overall ear appearance.

Varieties that received flavor ratings of very good to excellent, or better, included Mystique, Revelation, Ambrosia, Kristine, Valiant, and GH 0851. Cameo and BC 0805 consistently received ratings of very good.

Often, producers select one or two varieties in each maturity range so it is helpful to compare varieties of similar maturity. Among the three earliest varieties in this trial, Temptation consistently received higher ratings related to plant vigor, produced the heaviest ears, best overall ear quality, and ears highest on the plant, but received the lowest flavor rating. HMX 6358BES had the longest ears and good ear quality, but suffered more lodging. Vitality was the earliest, produced the shortest ears, and also had good ear quality. Among the six varieties harvested 82 to 85 DAP, BC 0808 and Ambrosia produced the highest yield, BC 0808 and Mystique produced the largest ears, Kristine and Valiant had the best ear quality, and all except BC 0808 received flavor ratings of very good or better. One bicolor and one yellow variety were harvested 88 DAP: both BC 0805 and GH 0851 produced high yields of large, high quality ears almost 2 feet from the ground on strong plants. Careful evaluation of results presented in Tables 1 and 2 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. Emergence, final stand, early and late plant vigor, tillering, lodging, and ear shank length for 12 sugar-enhanced and synergistic sweet corn varieties in northern Indiana, 2008.

Cultivar	Emergence ^z %		Final Stand <i>plants/A</i>	Plant Vigor ^y		Tillers ^x	Height Class ^w	Shank Length ^v	Lodging ^u
	May 29	June 6		June 9	Aug. 6				
Vitality	77	91	20,134	7.7 ±0.7	4.0	3.7	2.0	2.9	4.0 ±0.6
HMX 6358BES	88	103	20,328	7.3 ±0.3	5.0	3.3	1.7	2.6	3.3 ±0.9
Temptation	76	80	18,586	8.0 ±0.6	6.3	3.0	1.7	3.3	6.7 ±0.9
Revelation	44	66	15,294	4.0 ±1.2	6.3	3.7	1.7	2.5	3.0 ±0.0
Mystique	85	88	19,941	6.7 ±0.3	7.7	2.3	2.0	3.4	3.3 ±0.3
BC 0808	67	100	20,328	5.3 ±0.7	5.7	4.3	2.0	3.7	4.0 ±0.6
Valiant	78	93	20,328	6.3 ±1.2	6.3	3.7	1.7	2.5	2.3 ±0.7
Kristine	81	89	19,747	7.0 ±0.0	6.0	2.7	1.7	3.5	3.7 ±0.3
Ambrosia	98	107	20,328	7.0 ±0.0	7.3	3.3	2.0	2.7	4.7 ±0.7
Cameo	72	78	18,198	7.3 ±1.2	7.3	4.0	3.0	5.1	5.7 ±0.9
BC 0805	91	95	20,134	7.3 ±0.3	6.7	3.0	2.0	4.2	5.0 ±0.0
GH 0851	92	101	20,328	7.7 ±0.7	6.7	3.7	1.7	4.1	6.3 ±0.7
<i>Grand Mean</i>	79	91	19,457	6.8	6.3	3.4	1.9	3.4	4.3
<i>LSD .05^t</i>	17	13	—	—	1.6	<i>ns</i>	—	0.7	—

^tPercentage of intended seeding rate. Planted May 16, 2008.

^u1=very weak. 5=average. 9=very vigorous. Mean ± standard error if AOV not performed.

^x1=no or very few tillers. 3=tillers common but not tall enough to interfere with harvest. 5=tillers tall enough to interfere with harvest on most plants.

^v1=less than 5 feet. 2=5 to 6 feet. 3=more than 6 feet.

^wMeasured from attachment to stalk to base of ear; average of three ears per replication.

^y0=no lodging. 1=all plants severely lodged. Evaluated after 5.2 inches of rain on August 4. Mean ± standard error.

^zMeans differing by more than this amount are significantly different at $P \leq 0.05$ based on Fisher's Protected LSD. AOV not performed.

Table 2. Yield, ear size, and quality of synergistic and sugar-enhanced sweet corn in northern Indiana, 2008.

Cultivar	Seed Source ^z	Color	Days to Harvest ^y		GDD to Harvest ^x	Yield of Marketable Ears		Avg. Ear Weight <i>lb</i>	Ear Length <i>in</i>	Ear Dia. <i>in</i>	Ear Ht. <i>in</i>	Husk Cover ^w	Husk Tightness ^w	Tip Fill ^w	Over-all ^w	Flavor ^v
			Pred.	Actual		<i>doz/A</i>	<i>ton/A</i>									
Vitality	RU	BI	67	77	1421	1517	5.2	0.58	6.7	1.8	16.3	4.6	1.7	4.9	6.3	G
HMX 6358BES	HM	BI	66	80	1493	1484	5.4	0.60	7.5	1.8	15.4	4.3	2.0	4.4	6.0	G-VG
Temptation	RU	BI	70	80	1493	1371	6.1	0.74	7.1	2.0	19.7	4.7	2.2	4.9	8.0	G-F
Revelation	HM	BI	68	82	1529	1129	4.7	0.69	7.4	2.0	16.7	3.9	1.8	3.7	5.7	E-VG
Mystique	CR	BI	75	82	1529	1387	6.3	0.76	8.4	2.0	21.4	3.0	1.1	2.2	5.7	E-VG
BC 0808	SY	BI	73	83	1538	1613	8.5	0.88	8.4	2.0	19.4	4.1	1.3	3.3	5.3	F-G
Valiant	CR	BI	78	83	1538	1404	6.3	0.75	7.4	1.9	22.2	4.7	2.0	4.3	6.0	VG-E
Kristine	CR	BI	80	83	1547	1468	6.8	0.77	7.4	2.0	18.4	4.9	2.0	3.9	6.7	VG-E
Ambrosia	RI	BI	75	83	1547	1581	7.3	0.77	7.9	2.1	21.0	3.8	2.0	2.4	5.0	VG-E
Cameo	CR	BI	80	85	1568	1436	7.9	0.93	7.9	2.0	24.9	4.1	1.8	3.3	6.0	VG
BC 0805	SY	BI	82	88	1603	1646	8.0	0.81	8.1	1.9	22.9	5.0	1.9	4.3	6.3	VG
GH 0851	SY	Y	81	88	1603	1694	8.5	0.83	7.9	1.8	23.6	5.0	2.0	4.6	6.3	E-VG
<i>Grand Mean</i>						1478	6.7	0.76	7.7	1.9	20.2	3.8	1.8	3.9	6.1	—
<i>LSD .05^u</i>						203	0.9	0.06	0.4	—	2.0	—	—	—	—	—
<i>r²</i>						ns	0.60	0.58	0.41	ns	0.58	—	—	—	—	—

^zSeed Source: CR=Crookham. HM=Harris Moran. RI=Rispens. RU=Rupp SY=Syngenta.

^yDays from planting to harvest. Predicted number is from seed supplier.

^xGDD=corn growing degree days.

^wHusk cover, tip fill: 1=worst. 5=best. Husk tightness: 1=loose. 3=very tight. Overall: 1=worst. 9 =best.

^vFlavor: F=fair. G=good. VG=very good. E=excellent. Summary of ratings by one person for three ears per cultivar.

^uMeans differing by more than this amount are significantly different at $P \leq .05$ based on Fisher's Protected LSD. AOV not performed.

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