

Organic Corn Cultivar Performance

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Introduction

The acreage of organic corn cultivars planted each year is increasing in Iowa. In 2005, 20,247 acres of organic corn were planted in the state, ranking Iowa second in the nation for organic corn production (USDA ERS, 2005). Public perception that organic production is healthier for both the environment and the consumer has fueled the increase.

Organic seed is non-transgenic cultivars produced organically. Organic corn producers select cultivars based on a variety of factors, including strong early growth and vigor, competitiveness to weed pressure, insect and disease tolerance, high protein grain composition, and yield and grain moisture. These selection criteria are important to organic producers, and may not be as important for conventional producers. Organic producers often plant organic cultivars later to allow for more pre-plant tillage (to help control early-season weed pressure) and to ensure rapid emergence of seed that is untreated against insects and diseases. Limited research has been conducted to date on cultivars best-suited for organic production in Iowa. Research was initiated across the state in 2007 and will continue in 2008 across multiple locations to negate the environmental variations that exist year to year, allowing identification of top-performing hybrids.

Materials and Methods

Twenty organic hybrids, one conventional non-GMO hybrid and four open-pollinated (OP) varieties were used in 2007. The

conventional hybrid (Pioneer 36B08) was included to provide a comparison with other non-organic hybrids and also served as a hand-weeded check. The trial was planted May 3, 2007 on soybean residue. Cultivars were overplanted and thinned to 30,000 plants per acre. The field was tilled prior to planting and cultivated once after planting to control weeds. Nitrogen was applied as NH_3 at 140 lbs/acre; no pesticides were used. Weed, insect and disease pressure was extremely low; low weed pressure could be a result of herbicide carry-over from the year before.

Individual plots were 4 rows wide (30-inch spacing) by 15.5 feet long. Seed germinability; emergence rate; early- and late-season plant heights; primary ear node height; percent lodging and stalk rot; leaf architecture; weed, insect and disease ratings; grain protein, oil and starch content; yield and moisture were collected. An emergence rate index (ERI) was used to measure how quickly and uniformly each cultivar emerged after planting. Multiple stand counts were taken during emergence and used to calculate ERI:

$$\sum_{n=\text{first}}^{\text{last}} = \frac{[\%n - \%(n-1)]}{n}$$

% n = percentage of plants emerged on day n
% (n-1) = percentage of plants emerged on day n-1
n = number of days after planting
first = first day any plants emerged
last = last counting day (emergence complete)

A high ERI value indicates a cultivar which emerged quickly and uniformly, while a low ERI value indicates a cultivar that emerged slowly and unevenly. ERI numbers are strictly relative and can therefore only be compared among cultivars within one location. Plots were harvested October 10, 2007. Grain yield was adjusted to 15% moisture basis. SAS

PROC MIXED was the statistical program used in analyzing the data, with a significance level of $P \leq 0.05$.

Results and Discussion

We will present ERI, root lodging and grain yield in this report. Emergence rate index differed based on cultivar (Table 1); $P < 0.0001$ (where P is the level of probability). A difference of 3.3 was needed to determine whether ERI of one cultivar was significantly different from another. A range of 16.6 to 26.9 existed among the cultivars, clearly showing a difference in emergence which is critical to organic producers since they use untreated seed and want quick emergence to limit exposure to insect feeding and disease. Percent root lodging at harvest also differed based on cultivar; $P < 0.0001$. Minor lodging was present in most cultivars, but 20.6% and 26.5% lodging was found in two of the OP varieties. A difference (LSD) of 7.7% was needed to determine whether the percent lodging of one cultivar was significantly different from another.

Yield was significantly different among the cultivars; $P < 0.0001$ (Table 1). A difference (LSD) of 22 bu/acre was needed to determine whether one cultivar yielded significantly different from another cultivar. Yields ranged from 79 to 189 bu/acre; this environment and location allowed for good separation among the cultivars. The four OP varieties consistently yielded less than the organic and conventional hybrids. Consider this data as 'preliminary;' use it with caution as it is only from one year and one location.

Research will continue in 2008 at the Northeast Research and Demonstration Farm.

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Table 1. Cultivar grain yield, root lodging and emergence rate index (ERI). Cultivars are sorted by yield, from highest to lowest. Treatment means with any letter in common are not significantly different from one another. Northeast Research and Demonstration Farm, Iowa State University, 2007.

Cultivar	Grain yield adjusted to	Grain yield significance	Root lodging	Root lodging significance	ERI	ERI significance
	15% moisture bu per acre					
Prairie Hybrids 5121	189	a	2.2	ab	19.3	ghi
Great Harvest Organics 61K7	188	a	7.1	abcd	16.6	i
Blue River Hybrids 63H07	188	a	4.7	abc	26.0	abc
Viking O.4520	183	ab	0	a	26.9	a
Blue River Hybrids 48B30	182	ab	0	a	24.6	abcd
Cornelius OR665	181	ab	2.4	ab	18.3	hi
Pioneer 36B08	181	ab	0	a	-	-
Prairie Hybrids 3081	179	ab	0	a	23.4	bcdef
Pioneer 36B08 (hand weeded)	177	abc	0	a	-	-
Blue River Hybrids 66P32	174	abc	3.6	ab	25.4	abcd
Prairie Hybrids 7861	170	abc	3.9	abc	20.0	fgh
Cornelius OR641	169	abc	0	a	23.2	cdef
Great Harvest Organics 38T4	168	abc	4.6	abc	24.9	abcd
Great Harvest Organics 44X2E	168	abc	1.8	ab	19.4	ghi
Viking O.5305	166	abc	0.6	a	20.9	efgh
Great Harvest Organics 56V6	164	bc	7.5	abcd	23.5	abcde
Blue River Hybrids 52A20	164	bc	1.7	ab	25.9	abc
Viking O.6700	163	bc	8.9	bcd	19.0	ghi
Cornelius OR624	158	bc	4.1	abc	26.6	ab
Prairie Hybrids EX6700	156	c	0.6	a	17.8	hi
Viking O.5740	156	c	0.6	a	20.8	efgh
Prairie Hybrids 1673	156	c	0.6	a	20.7	efgh
AR 25B/GQN2 (OP)	113	d	13.3	de	20.7	efgh
F3/CH5MZ Topcross (OP)	113	d	20.6	ef	22.2	defg
AR 16026/S1704 (OP)	110	d	11.4	cd	18.7	hi
Nokomis Orange (OP)	79	d	26.5	f	24.4	abcd

LSD=22

LSD=7.7

LSD=3.3