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Organic Corn Cultivar Performance

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Abstract
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.

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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 on May 17, 2007 on oats-alfalfa residue. Cultivars were overplanted and thinned to 30,000 plants/acre. The field was tilled prior to planting and cultivated three times after planting to control weeds. Composted manure was applied in the spring at 8 tons/acre. No pesticides were used; weed, insect and disease pressure was low.

Individual plots were 4 rows wide (30-inch spacing) by 15.5 ft long. Seed germinability, emergence rate, early- and late-season plant heights, primary ear node heights, 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 that 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 yet due to a harvesting error, grain yield results will not be discussed in this report. 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 and root lodging in this report. Emergence rate index differed based on cultivar (Table 1); P = 0.0211 (where P is the level of probability). A difference of 1.5 was needed to determine whether ERI of one cultivar was different from another. A range of 17.6 to 20.8 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 = 0.0002. Minor lodging was present in most cultivars, although 20.3% and 24.1% lodging occurred in two of the OP varieties. A difference (LSD) of 10.3% was needed to determine whether the percent lodging of one cultivar was different from another. 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 Neely-Kinyon Research and Demonstration Farm.

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Table 1. Cultivar emergence rate index (ERI) and root lodging performance. Cultivars are sorted by ERI, from highest to lowest.[1]

Cultivar	ERI	ERI significance	Root lodging percent	Root lodging significance
Viking O.4520	20.8	a	0.1	a
Pioneer 36B08	20.7	ab	2.5	a
Great Harvest Organics 38T4	20.2	abc	3.5	ab
Blue River Hybrids 52A20	20.1	abcd	2.7	ab
Prairie Hybrids EX6700	20.1	abcd	1.6	a
Blue River Hybrids 66P32	20.0	abcd	3.6	ab
Blue River Hybrids 48B30	19.9	abcde	2.3	a
AR 25B/GQN2 (OP)	19.8	abcde	20.3	cd
Great Harvest Organics 56V6	19.8	abcde	9.2	ab
Great Harvest Organics 44X2E	19.7	abcde	1.8	a
Viking O.5740	19.6	abcde	2.6	a
Blue River Hybrids 63H07	19.6	abcde	3.1	ab
Prairie Hybrids 5121	19.5	abcde	3.2	ab
Pioneer 36B08 (hand weeded)	19.5	abcde	0.5	a
Nokomis Orange (OP)	19.4	abcde	13.0	bc
Great Harvest Organics 61K7	19.3	abcdef	5.4	ab
Prairie Hybrids 7861	19.3	abcdef	7.4	ab
Cornelius ORG24	19.2	abcdef	0.9	a
F3/CH5MZ Topcross (OP)	19.0	bcdefg	24.1	d
Viking O.5305	18.9	cdefg	1.0	a
Cornelius ORG41	18.7	defg	0.0	a
AR 16026/S1704 (OP)	18.5	efg	4.2	ab
Prairie Hybrids 3081	18.5	efg	5.6	ab
Prairie Hybrids 1673	18.5	efg	0.6	a
Cornelius ORG65	17.8	fg	4.7	ab
Viking O.6700	17.6	g	25.4	d
		LSD=1.5		LSD=10.3

[1]Treatment means with any letter in common are not different from one another.