2008

Organic Corn Cultivar Performance

Leslie Freehill
Iowa State University

Lori Abendroth
Iowa State University, labend@iastate.edu

Roger W. Elmore
Iowa State University, relmore@iastate.edu

Organic Corn Cultivar Performance

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.

Keywords
Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

Organic Corn Cultivar Performance

Leslie Freehill, research assistant
Lori Abendroth, agronomy specialist
Roger Elmore, professor
Department of Agronomy

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 10, 2007 on soybean residue. Cultivars were overplanted and thinned to 30,000 seeds/acre. The field was tilled prior to planting and cultivated once after planting to control weeds. Fertilizer was applied as 28-29-0 at 519 lb/acre and 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-in. 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; and 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 22, 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); $P = 0.0005$ (where P is the level of probability). A difference of 1.0 was needed to determine whether ERI of one cultivar was different from another. A range of 18.6 to 21.8 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; $P < 0.0001$. Extremely low lodging was present in most cultivars, although 4.3% lodging was found in one of the OP varieties. A difference (LSD) of 1.1% was needed to determine whether the percent lodging of one cultivar was different from another. Yield was different among the cultivars; $P < 0.0001$ (Table 1). A difference (LSD) of 17 bushels/acre was needed to determine whether a cultivar yielded different from another cultivar. Yields ranged from 77 to 193 bushels/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 Northern Research and Demonstration Farm.

Acknowledgements

Appreciation is extended to Paul White for planting and harvesting the trial, and to David Rueber at the Northern Research Farm for maintaining the trial. Appreciation is also extended to Lesa Andersen, Tim Chwirka, and Matt Boyer, corn production research assistants.

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

Cultivar	Grain yield adjusted to 15% moisture bushels/acre	Grain yield significance	Root lodging percent	Root lodging significance	ERI	ERI significance
Viking O.5740	193	a	0.0	a	21.1	abc
Blue River Hybrids 48B30	190	ab	0.0	a	20.1	de
Blue River Hybrids 63H07	186	abc	0.0	a	20.2	cde
Great Harvest Organics 38T4	185	abc	0.0	a	20.6	bcde
Prairie Hybrids 3081	184	abcd	0.0	a	20.9	abcd
Cornelius ORG41	183	abcd	0.5	ab	20.2	cde
Viking O.6700	183	abcd	0.6	ab	20.4	bcde
Viking O.4520	183	abcd	0.0	a	21.8	a
Prairie Hybrids 5121	182	abcd	0.0	a	20.8	bcde
Great Harvest Organics 56V6	181	abcd	0.5	ab	20.1	de
Blue River Hybrids 66P32	180	abcd	0.0	a	21.3	ab
Pioneer 36B08 (hand weeded)	180	abcde	0.0	a	20.4	bcde
Pioneer 36B08	179	abcde	0.0	a	20.7	bcde
Prairie Hybrids 1673	175	bcde	0.0	a	20.9	abcd
Cornelius ORG65	175	bcdef	0.0	a	20.5	bcde
Viking O.5305	174	bcdef	0.0	a	21.1	abc
Prairie Hybrids 4861	172	cdef	0.0	a	20.6	bcde
Blue River Hybrids 52A20	168	def	0.0	a	21.3	ab
Great Harvest Organics 61K7	164	efg	0.0	a	20.8	abcd
Prairie Hybrids EX6700	159	fg	0.0	a	20.7	bcde
Cornelius ORG24	158	fg	0.0	a	20.2	cde
Great Harvest Organics 44X2E	149	g	0.0	a	19.8	e
F3/CH5MZ Topcross (OP)	119	h	0.0	a	20.7	bcde
AR 25B/GQN2 (OP)	109	h	1.5	b	21.0	abcd
AR 16026/S1704 (OP)	101	h	0.0	a	18.6	f
Nokomis Orange (OP)	77	h	4.3	c	20.7	bcde
		LSD=17		LSD=1.1		LSD=1.0

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