Evaluation of Organic Corn Varieties Southeast Research Farm, 2024

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Materials and Methods

According to the USDA National Organic Program, certified organic farmers must source organic seed (seed from organically raised crops). The organic seed industry is currently growing in Iowa and the Midwest, and with this growth, organic growers are looking for University-based recommendations on organic varieties to use in Iowa. The Organic Agricultural Program at Iowa State University has been using organic seed at the Southeast Research Farm for twenty-six years with excellent results.

There were four corn varieties selected for the 2024 organic variety trial. These included the following varieties: Prairie Hybrids 5141, Prairie Hybrids 3051 (Prairie Hybrids, Deer Grove, IL), Blue River 18-06, Blue River 85-09 (Albert Lea Seed, Albert Lea, MN). Plots measuring 20 x 480 ft. were laid out in a randomized complete block design with four replications of each variety. Fertility for the corn included red clover, which was drilled into the preceding wheat crop on April 3, 2023 at roughly 15 lbs/acre. On November 13, 2023, turkey manure was applied at a rate of 5 tons/acre.

On May 10, 2024, the red clover was plowed. On May 20, the site was tilled with a soil finisher and the corn was planted at a seeding rate of 38,000 seeds/acre. Plots were rotary hoed May 29 and June 3. Plots were cultivated June 6 and June 11.

Corn plant populations were determined on June 12, and weeds were counted within square meter quadrats at three randomly selected areas within a plot. Stalk nitrate samples were taken on September 23 and analyzed at Midwest Labs in Omaha, NE.

Corn was harvested by combine on October 21, 2024. Grain quality analysis was conducted at the ISU Grain Quality Lab (Ames, IA).

Results and Discussion

Average seasonal precipitation and temperature in 2022, 2023, and 2024, as well as the 30-year monthly and seasonal averages at the Southeast Research Farm, are presented in Table 1. The highest total precipitation, from 2022-2024, occurred in April 2024 at 6.63 inches. In 2022, the total seasonal precipitation was 19.68 inches, the lowest of the three years. Total precipitation in 2024 was 31.74 inches, higher than 2022 and 2023, but similar to the 30-year average of 33.34 inches. The average temperature in 2024 was 55.6 °F, which was 2°F greater than the 30-year average of 53.42°F.

Corn plant populations averaged 31,978 plants/acre among all hybrid corn varieties, with no difference between varieties. Weed populations were equivalent across varieties. Broadleaf weeds averaged 2.25 weeds/m^2

across all varieties, while grass weeds averaged 0 weeds/m^2 on June 12, 2024 (Table 2).

Organic hybrid corn yields were excellent in 2024. Varieties BR 18-06, PH 3051, and PH 5141 at 187 bu/acre, 184 bu/acre, and 177 bu/acre, resepectively, were significantly greater than BR 85-09 at 170 bu/acre (Table 3).

Stalk nitrate levels were numerically higher in PH 5141 at 89 ppm, but all varieties were statistically equivalent (Table 3).

Grain quality analysis showed similar results across all varieties. Average moisture content across varieties was 12%. Average protein content was 6.5% and average oil was 3.58%. Average starch content was 62%, average density was 1.25 g/cc, and average ethanol yield was 2.84 gal/bu (Table 4).

These results show great promise for organic hybrid seed, which is gaining in popularity for organic production in Iowa. New organic corn hybrids are currently under development in a USDA-OREI organic corn breeding project at ISU and will be tested at the Southeast Research Farm in the future.

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Table 1. Precipitation and temperature averages, Southeast Research Farm, Crawfordsville, IA, 2022, 2023, and 2024.

	Monthly precipitation (inches)				Average air temperature (°F)			
Month	2022	2023	2024	30-yr average	2022	2023	2024	30-yr average
January	0.79	2.07	3.45	1.46	14	28	21	21.64
February	0.39	3.67	0.15	1.59	23	29	38	25.71
March	2.58	2.31	2.74	2.30	38	34	43	38.24
April	2.60	0.96	6.63	3.65	44	49	51	50.13
May	2.37	2.06	5.24	5.36	63	61	64	61.43
June	2.53	1.47	3.67	5.04	72	70	73	71.41
July	1.37	2.00	4.59	3.70	75	74	72	74.61
August	3.36	2.95	2.24	3.90	74	73	72	72.65
September	2.77	1.12	0.24	3.14	66	68	66	65.45
October	0.92	2.99	2.79	3.20	50	55	56	52.93
Total seasonal precipitation and seasonal average air temperature	19.68	21.60	31.74	33.34	51.9	54.1	55.6	53.42

Table 2. Corn and weed plant populations at Southeast Research Farm in Crawfordsville, IA, 6-12-24.

Variety	Corn population (plants/acre)	Broadleaf weeds/m^2	Grass weeds/m^2
PH 5141	32,080a[y]	2.00a	0
BR 18-06	33,080a	1.83a	0
PH 3051	31,750a	2.50a	0
BR 85-09	31,000a	2.67a	0
P-value	0.3757	0.7020	---

[y]Means followed by the same letter down the column are not significantly different at $P \leq 0.05$ or not significant (NS) (Fisher's Protected LSD Test).

Table 3. Corn yields and corn stalk nitrate at Southeast Research Farm in Crawfordsville, IA.

Variety	Yield (bu/ac)	Stalk Nitrate (ppm)
BR 18-06	187.31a	30
PH 3051	184.04a	40
PH 5141	177.37ab	89
BR 85-09	169.76b	36
P-value	0.0022	---

[y]Means followed by the same letter down the column are not significantly different at $P \leq 0.05$ or not significant (NS) (Fisher's Protected LSD Test).

Table 4. Corn grain analysis averages at Southeast Research Farm in Crawfordsville, IA.

Variety	Moisture (%)	Protein (%)	Oil (%)	Starch (%)	Density (g/cc)	Ethanol Yield (gal/bu)
PH 5141	12.85	6.05	3.60	62.45	1.24	2.86
BR 1806	11.80	5.95	3.70	62.35	1.23	2.86
PH 3051	11.95	6.70	3.50	62.15	1.23	2.82
BR 8509	12.60	7.45	3.50	61.50	1.29	2.79