Organic Corn Hybrid Trial at the Neely-Kinyon Farm, 2008

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Materials and Methods

With demand for organic corn increasing, variety selection is a key step in successful organic corn production. In 2007, research on growing pure stands or mixing organic corn hybrids was initiated in a joint project with Ohio State University and the University of Wisconsin with the overall goal of identifying organic corn varieties best suited for organic grain production in three distinct production regions of the Corn Belt. Activities focused on two objectives: 1) evaluate the agronomic performance and grain quality of organic certified varieties in pure stands, and 2) investigate potential benefits of mixing corn varieties to enhance grain yield and quality. Results of recent studies in South Dakota and Minnesota indicate that farmers can improve grain yield and protein content of corn without additional inputs by mixing varieties of different parentage and similar flowering date in the same field. Studies with various cereals have shown that varietal blends can enhance yield stability and help minimize yield losses from various foliar diseases.

Materials and Methods

Three treatments, replicated four times in a completely randomized design, consisted of two single varieties of organic hybrid corn seed (Blue River 66P32 and BR 71R52) and one mixture of the two varieties. Seed was planted on May 18, 2008, at 32,000 seeds/acre into a certified organic field at the Neely-Kinyon Farm in Greenfield, Iowa, that had received an application of hoophouse swine compost at 8 tons/acre on April 24, 2008. Corn plant population data were taken on June 10 and 30, 2008. Weeds were maintained with one rotary hoeing on June 2 and two cultivations on June 17 and 22. Weed counts were taken on June 10 and June 30, and, on July 10, weed ratings were taken by estimating the percent of cover provided by the corn plants versus the weeds. Corn borer evidence and presence data were taken on 12 corn plants from each treatment on July 10.

Ear and plant height data were taken on October 14. Corn stalk samples were taken on October 14 and brought to the Iowa State University Soils & Plant Analysis Laboratory for nitrate analysis. Ears were collected from the field on October 14 and data pertaining to ear length, ear diameter, ear weight, grain weight, tip damage, and rot ratings (0 = no damage; 3 = >20% of ear damaged) were taken the following week. Plots were harvested with a combine on November 10, 2008. Grain quality was determined by the ISU Grain Quality Analysis Lab, Ames, Iowa.

Results and Discussion

In 2008, there were no significant differences in plant populations among treatments (Table 1), averaging 23,259 plants/acre on June 30. Yields also were not significantly different among treatments, averaging 178 bu/acre for Blue River 66P32 and BR 71R52 (Table 1). The hybrid mix, while not statistically lower than the pure stands, averaged 168 bu/acre. Plant height, averaging 273 cm, was equivalent in all treatments (Table 1). The height of the corn ear was also similar between BR 66P32 and BR 71R52 (Table 1). In 2008, weed management suffered from flooded conditions in the organic corn trial. In the June 10 weed ratings, the BR66P32 appeared to have slightly higher (26 weeds/sq. meter) grass weeds than the pure stands, although not significantly greater than the

average of 20 weeds/sq. meter (Table 2). Broadleaf weeds averaged 4 weeds/sq. meter and were not different among treatments. Weed counts on June 30 showed a similar trend of no differences among treatments. On July 10, weed coverage averaged 11% across all treatments, with no statistical differences detected (Table 2). Corn borer larvae were not found in any plant in 2008.

Ear length averaged 23 cm, with ear diameter 16 cm, and no significant differences among the three treatments (Table 1). Average ear weight was 220 g/ear, with no significant differences among the three treatments (Table 1), but significantly lower than the 2007 ear weight of 362 g/ear. Some ear tip damage (from insects/disease/mold), averaging 3 cm in length, was visible at harvest (Table 1). Less rot was detected in ears in 2008 compared to 2007, with ear rot ratings averaging <1 across all treatments (Table 1). Moisture at harvest averaged 15% (Table 3) with no differences among treatments. Protein levels in harvested grain were lower in 2008 at 6.4% compared to 7.7% in 2007, with no differences among treatments, suggesting leaching of nitrogen supplies during flooded periods (Table 3). Corn stalk nitrate levels supported this supposition: NO_3-N at the end of the season ranged from 20 to 748 ppm (Table 1), which is considered inadequate for maximum yields. Oil content averaged 3.7% and starch 62%, with no significant differences among the three treatments (Table 3). Overall, organic corn yields were excellent, considering the challenging environment, but protein content suffered as a result of poor conditions.

Acknowledgments

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Table 1. Corn crop performance in N-K OSU trial, 2008.

Treatment	Yield (bu/acre)	Population 10 June (plants/acre)	Population 30 June (plants/acre)	Stalk nitrate (ppm)	Corn height at harvest (cm)	Height of plant where corn ear originated (cm)	Corn ear length (cm)	Corn ear width (cm)	Weight of corn ear (g)	Damage on corn ear (cm)	Ear rot rating (0 to 3)
Variety A	171.95	26889	24667	20.0	270.56	111.22	23.8	15.9	228.5	2.94	0.33
Variety A + B	168.03	24250	23222	74.5	275.11	112.33	22.3	16.1	208.7	3.39	0.78
Variety B	183.80	26000	21889	247.7	272.89	116.33	22.8	16.2	221.6	2.56	0.22
$LSD_{0.05}$	NS [z]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

[z] Means within a column are not significant (NS), or significant at $p \leq 0.05$ (Tukey-Kramer HSD test).

Table 2. Weed populations in N-K OSU trial, 2008.

	10 June		10 July		30 June	
Treatment	Grass (plants/m^2)	Broadleaves (plants/m^2)	Weed cover (%)	Corn cover (%)	Grass (plants/m^2)	Broadleaves (plants/m^2)
Variety A	26.3	5.78	10.11	89.89	7.00	0.89
Variety A + B	15.5	2.38	12.89	87.11	5.44	1.22
Variety B	17.1	4.10	11.11	88.89	5.22	1.88
$LSD_{0.05}$	NS [z]	NS	NS	NS	NS	NS

[z] Means within a column are not significant (NS), or significant at $p \leq 0.05$ (Tukey-Kramer HSD test).

Table 3. Grain quality in N-K OSU, 2008.

Treatment	Starch	Oil	Protein	Moisture
Variety A	61.63	3.77	6.73	13.3
Variety A + B	61.90	3.70	6.33	16.2
Variety B	62.10	3.67	6.15	14.5
$LSD_{0.05}$	NS [z]	NS	NS	NS

[z] Means within a column are not significant (NS), or significant at $p \leq 0.05$ (Tukey-Kramer HSD test).