

Evaluation of Organic Soybean Varieties and Organic Popcorn Varieties and Fertilization Southeast Research Farm, 2016

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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 Agriculture Program at Iowa State University has been using organic seed at the Southeast Research Farm for fifteen years with excellent results. In addition, a new organic fertilizer (Biotic Organic™ 4-4-4, Perfect Blend, Bellevue, WA) was tested beginning in 2013, and continued in 2016, for its effect on organic popcorn production.

Organic soybean variety trial

There were four soybean varieties selected for the 2016 organic variety trial. These included the following varieties: Viking 0.2399AT12N and 0.2265 (Albert Lea Seed, Albert Lea, MN), IA2104RA12 (ISU, Ames, IA); and BR 27C5 (Blue River Hybrids, Ames, IA). Plots measuring 20 x 380 ft. were laid out in a randomized complete block design with four replications of each variety. The field was chisel-plowed on April 14, 2016, and field-cultivated on May 9 and 23 to prepare for planting. Soybeans were planted at a 1.5–inch depth at 149,000 seeds/acre on May 23. Weed management included rotary hoeing on June 6 and 10, and row cultivation on June 14 and 24. Plant and weed stands were counted on July 6,

2016. Soybeans were harvested on October 13, 2016.

Popcorn

The fourth year of the organic popcorn trial followed a conventional soybean field. Plots measuring 10 x 100 ft. were laid out in a randomized complete block design of two varieties (AP2204 and N15262) and two organic fertilizer treatments: with fertilizer and a control (no fertilizer). There were four replications of each treatment. On May 27, 2016, 60 lb/plot of Perfect Blend™ organic 4-4-4 fertilizer was applied to supply 100 lb N/acre. Plots were field cultivated on May 23 and 27 and popcorn seeds were planted at 32,000 plants/acre the same day. Plots were rotary hoed on June 6 and 10; and row cultivated on June 14. Plant and weed stands were counted on July 6, 2016. Height of popcorn plants and sampling for stalk nitrate occurred on September 22, 2016. Popcorn harvest occurred on October 12, 2016.

Results and Discussion

Despite the challenging weather in 2016, organic soybean emergence and performance was very good in southeast Iowa. Soybean plant populations averaged 90,167 plants/acre, but there were some differences between varieties. The Viking 0.2399AT12N, IA 2104RA12, and BR 27C5 had similar populations, at 92,833 plants/acre, while plots where the variety Viking 0.2265 was planted experienced a lower population, averaging 82,167 plants/acre (Table 1). Weed management was excellent in 2016, and on July 6, there was no difference among varieties in weed populations, averaging 1 grass and broadleaf weed/ft² (Table 1).

Organic soybean yields were excellent in 2016, given the challenging weather, averaging 52 bu/acre (Table 2). There were some differences between varieties, however, with the IA2014RA12 variety yielding lower (48.4 bu/acre) than the Viking 0.2399AT12N and BR 27C5, which averaged 54.9 bu/acre together. Viking 0.2265 was intermediate, at 50.4 bu/acre. Yield in the aphid-resistant variety, IA2014RA12, was lower than the other aphid-resistant variety, Viking 0.2399AT12N, which had the highest numerical yield, at 55.5 bu/acre. The lower plant population in the Viking 0.2265 soybeans did not significantly affect yield, while the higher plant population in the IA2104RA12 was not associated with a higher yield. Soybean yield results were similar to 2013 results (last time soybeans were grown in the rotation) when they averaged 51 bu/acre. These results show great promise for organic soybean seed.

Popcorn

Popcorn plant populations were similar between varieties and between fertilizer treatments, averaging 32,486 plants/acre (Table 3). Grass and broadleaf weeds were also similar between treatments, averaging 1 weed/ft² for both grass and broadleaf weeds (Table 3). The excellent weed management was due to timely rotary hoeing and row cultivation after rotary hoeing. Organic popcorn yields with the use of the Perfect Blend™ organic fertilizer were statistically higher than the control, at 3,760 lb/acre compared to 2,462 lb/acre in the control (Table 4). Yields were similar to 2013 yields of 3,298 and 2,996 lb/acre, in the fertilized and control plots, respectively. The N15262 and AP2204 variety yields were similar, at 3,111 lb/acre, averaged over both treatments (Table 4). Plant height was greater in the AP2204 variety, averaging 229 cm, compared to 198 cm in the N15262 variety (Table 4). The organic

fertilizer led to an increase in plant height of 10 cm in the AP2204 variety, but not in the N15262 variety. We will repeat this trial in 2017.

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Table 1. Soybean and weed populations in the Soybean Variety Trial experiment, Crawfordsville Farm, 7/6/16.

Variety	Plant population (plants/acre)	Grass weeds/ft ²	Broadleaf weeds/ft ²
IA 2104RA12	94,833a ^x	0.80	1.00
VIKING 0.2399AT12N	93,167a	0.70	1.10
VIKING 0.2265	82,167b	0.40	0.90
BR 27C5	90,500a	0.80	0.70
LSD _{0.05}	5960	NS	NS
p value ($\alpha=0.05$)	0.0022	0.4307	0.6986

^xMeans 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 2. Soybean yield in the Soybean Variety Trial experiment, Crawfordsville Farm, 2016.

Variety	Yield (bu/acre)
IA 2104RA12	48.35c ^x
VIKING 0.2399AT12N	55.45a
VIKING 0.2265	50.44bc
BR 27C5	54.2ab
LSD _{0.05}	0.4839
p value ($\alpha=0.05$)	0.0113

^xMeans 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. Popcorn and weed populations in the Organic Popcorn Fertilization experiment, Crawfordsville Farm, 7/6/16.

Variety	Compost	Plant population (plants/acre)	Grass weeds/ft ²	Broadleaf weeds/ft ²
NI5262	No compost	30,444	0.22	0.67
NI5262	Compost	33,166	0.58	0.58
AP2204	No compost	33,000	0.67	0.33
AP2204	Compost	33,333	1.00	0.92
LSD _{0.05}		NS ^x	NS	NS
p value (α=0.05)		0.3589	0.9353	0.1063

^xMeans 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. Popcorn height and yield in the Organic Popcorn Fertilization experiment, Crawfordsville Farm, 9/22/16.

Variety	Compost	Height (cm)	Yield (lb/acre)
NI5262	No compost	198.58c ^x	2465b
NI5262	Compost	197.42c	3739a
AP2204	No compost	223.25b	2458b
AP2204	Compost	233.64a	3781a
LSD _{0.05}		4.86	732
p value (α=0.05)		<.0001	0.0002

^xMeans 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).