Evaluation of Soybean Varieties for Certified Organic Production—Neely-Kinyon Trial, 2006

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Introduction

Bean leaf beetles have periodically been a problem for organic tofu soybean producers throughout the Midwest because of the resulting seed staining, which can downgrade the quality of the soybeans at market. Beginning in 2000, we have evaluated soybean varieties at the Neely-Kinyon Farm in Greenfield, Iowa, for yield and seed staining under organic production methods.

Materials and Methods

Varieties selected for the 2006 organic soybean variety trial included the following: Pioneer 9305, Blue River 3F43, Blue River 2FN93, Blue River 28YP5, MRK0431CTB, MRK0427CTA, and Schillinger 240F.Y. Plots measuring 20 × 90 feet were laid out in a completely randomized block design with four replications of each variety. Soybeans were planted at a depth of 2 inches on May 23, 2006, at a rate of 200,000 seeds/acre. Weed control was established through the following procedures: rotary hoeing on June 1 and June 14; cultivation on June 12 and June 27; and walking plots on June 29. Plant stands were counted on June 13-14. Weed population data were taken on June 13-14 and June 26. Insect sampling with an emphasis on bean leaf beetles occurred on June 13-14, August 2-3, and September 14, by sweeping across plants 20 times in each plot with a 15-in. diameter sweep net. Insects were placed in Zip-lock bags and transported in coolers to Iowa State University. Insects were frozen until enumeration in the laboratory. Soybeans were harvested on October 31. The percentage of stained soybeans was determined by counting the number of stained soybeans in a 200-gram sample that was randomly collected from the harvest of each plot.

Results and Discussion

Plant stands were not significantly different among varieties in 2006 (Table 1), ranging from 59,250 plants/acre in the Schillinger 240F.Y to 80,750 in Pioneer 9305. Stands were also excellent in the organic varieties, with Blue River 2FN93 averaging 80,500 plants/acre. Weed populations were low in these plots in 2006, and there were no significant differences among varieties in grass and broadleaf weeds on June 13–14 and June 27 (Table 1). Yields were excellent in 2006, ranging from 45 to 51 bu/acre, despite drought-like conditions in spring and summer. There was a trend towards the organic varieties, Blue River 2FN93 and BR 3F43, producing the highest yields at 51 bu/acre, but the other varieties were not significantly different, except for Schillinger 240F.Y and BR 28YP5 at 47 bu/acre.

Bean leaf beetle populations were low on the June sampling date, but increased during the August and September sampling dates (Table 2). Although there were no significant differences in bean leaf beetle numbers among varieties on the three sampling dates, seed staining was greatest in Pioneer 9305 and Blue River 3F43 at 5.2%, and lowest in MRK0431CTB and MRK0427CTA, with ≤1.4% stained seeds (Table 2). Blue River 28YP5 had significantly higher protein levels than the other varieties at 41.3% (Table 3). This was followed by Schillinger 240F.Y (38.6%), Pioneer 9305 (37.0%), and BR 3F43 (36.6%). Oil content in the BR 2FN93 (18.4%) and Pioneer 9305 (18.3%) were significantly greater

than the other varieties (Table 3). MRK0431 CTB had the highest fiber content, and MRK0431 CTB and BR 2FN93 had the highest carbohydrate content at 23% (Table 3).

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Table 1. Soybean populations, weeds, and yields, organic soybean variety trial, Neely-Kinyon, 2006.

Variety	Soybean plants/acre	Weeds/m^2 June 13-14, 2006		Weeds/m^2 June 26, 2006		Yield (bu/acre)
		Grasses	Broadleaves	Grasses	Broadleaves	
Pioneer 9305	80,750	1.25	0.42	3.00	1.50	47.94ab
Blue River 3F43	58,000	0.50	0.75	0.17	1.17	50.77a
Blue River 2FN93	80,500	0.75	0.92	0.17	1.00	51.17a
Blue River 28YP5	69,417	0.83	1.33	0.25	1.25	46.58b
MRK0431CTB	69,167	1.83	0.75	0.50	1.42	45.22b
MRK0427CTA	64,083	0.75	0.33	0.17	1.08	48.82ab
Schillinger 240F.Y	59,250	0.08	0.33	0.00	0.17	46.82b
LSD (0.05)	NS	NS	NS	NS	NS	3.85

Table 2. Insect populations and percentage of stained soybeans, organic soybean variety trial, Neely-Kinyon, 2006.

	Insect populations/ 20 sweeps[z]								
Variety	Beneficial insects	Bean leaf beetles	Beneficial insects	Pest insects	Bean leaf beetles	Beneficial insects	Pest insects	Bean leaf beetles	Stained soybeans (%)
	June 13-14, 2006		August 2-3, 2006			September 14, 2006			
Pioneer 9305	0.25	1.25	5.00	65.50	47.75	3.25	81.50	74.50	5.16c
Blue River 3F43	0.25	0.17	4.00	43.75	30.50	2.75	109.50	102.25	2.70ab
Blue River 2FN93	0.25	1.00	5.25	64.75	49.25	2.00	115.25	109.25	5.21c
Blue River 28YP5	0.00	1.00	3.50	55.00	40.75	3.00	77.50	72.00	4.41bc
MRK0431CTB	0.00	1.33	7.50	50.50	33.00	3.50	104.50	95.00	1.14a
MRK0427CTA	0.00	1.33	7.25	36.75	30.50	4.25	104.75	92.75	1.40a
Schillinger 240F.Y	0.08	1.00	6.50	71.00	53.75	4.00	64.33	48.67	4.25bc
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	1.84

[z] Insect populations were censused on plants in 10 feet of row for the June 13-14 sampling date.

Table 3. Grain quality, organic soybean variety trial, Neely-Kinyon, 2006.

Variety	Grain Quality (%)				
	Protein	Oil	Fiber	Carbohydrates	Moisture
Pioneer 9305	37.00c	18.25a	4.70c	22.05c	11.46c
Blue River 3F43	36.58c	17.88b	4.78b	22.78b	11.60bc
Blue River 2FN93	35.38d	18.40a	4.80ab	23.43a	11.50c
Blue River 28YP5	41.28a	16.38d	4.50d	19.85d	12.09a
MRK0431CTB	35.80d	17.98b	4.85a	23.38a	11.63bc
MRK0427CTA	35.93d	17.95b	4.83ab	23.30ab	11.70c
Schillinger 240F.Y	38.55b	17.11c	4.71c	21.63c	12.04a
LSD (0.05)	0.62	0.26	0.05	0.54	0.19