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Evaluation of Soybean Varieties for Certified Organic Production—Neely-Kinyon Trial, 2004

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Introduction

Bean leaf beetles have continued to be 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 2004 organic soybean variety trial included the following: 6024FG (from Gold Country Seeds), IA2064, IA3017, MRK0327, MRK0330, MRK0431, NC+2A83, NC+3A44, Pioneer 9305, Schillinger 240F.Y, Schillinger 254F.P, and Schillinger 284F.HP.Y. Plots measuring 20 × 100 ft were laid out in a completely randomized block design with four replications of each variety. Soybeans were planted at a depth of 2 in. on June 7, 2004, at a rate of 200,000 seeds/acre. Weed control was established through the following procedures: rotary hoeing on June 16, 28, and July 8; cultivation on June 30, July 13, and 28, and walking plots on June 30 and July 20. Plant stands were counted on June 22, 2004. Bean leaf beetle sampling occurred on September 9, by sweeping across plants in each plot with a 15-in.-diameter sweep net. Insects were placed in reclosable bags and transported in coolers to Iowa State University. Insects were frozen until counted in the laboratory. Soybeans were harvested on October 12. The percentage of stained soybeans was determined by counting the number of stained soybeans in a 60-gram

sample that was randomly collected from the harvest of each plot.

Results and Discussion

On June 22, stands in the MRK0327, MRK0330, MRK0431, NC+2A83, Pioneer 9305, Schillinger 254F.P, and Schillinger 284F.HP.Y plots were significantly greater than in the 6024FG, IA2064, IA3017, NC+3A44, and Schillinger 240F.Y plots (Table 1). There were no significant differences among varieties in grass and broadleaf weeds on June 22 or July 7 (Table 1). Yields were excellent in 2004, ranging from 47–54 bushels/acre. Yields in IA2064, IA3017, MRK0330, MRK0431, NC+2A83, NC+3A44, and Pioneer 9305 were significantly greater than 6024FG, Schillinger 240F.Y, and Schillinger 254F.P. Bean leaf beetle and soybean aphid populations were reduced in 2004, with a seasonal average of 1.3 beetles/8 sweeps in all varieties (Table 2). Seed staining was also reduced, with 6024FG, MRK0327, MRK0330, MRK0431, NC+2A83, NC+3A44, Pioneer 9305, Schillinger 254F.P, and Schillinger 284F.HP.Y having less than 1.4% stained seeds (Table 2). IA3017 was included in the trial as an oil crop (low linolenic fatty acids) and was therefore excluded from the staining analysis. These seeds are crushed into oil, because seed coat color is not an issue. Grain quality was excellent in all varieties (37%+ in protein levels), with significantly higher protein levels in the Schillinger 284F.HP.Y variety, averaging 41% (Table 3). The organically produced seed level from NC+2A83 was also high at 39.93%. Oil content in the IA2064 variety (18%) was significantly greater than the other varieties.

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Table 1. Soybean populations, weeds, and yields, 2004.

Variety	Soybean plants/acre	Weeds/m ² June 22, 2004		Weeds/m ² July 7, 2004		Yield (bu/acre)
		Grasses	Broadleaves	Grasses	Broadleaves	
		6024FG	77,083e	1.08	1.25	
IA2064	119,917d	0.83	0.50	0.08	0.17	52.81ab
IA3017	127,583d	0.50	1.25	0.08	0.08	53.81a
MRK0327	144,167bc	0.42	0.75	0.00	0.42	51.58abd
MRK0330	151,167abc	0.42	0.33	0.08	0.42	54.22a
MRK0431	155,167a	0.83	0.33	0.08	0.17	53.34a
NC+2A83	146,000abc	0.89	0.33	0.17	0.08	52.54ab
NC+3A44	124,167d	0.75	0.92	0.00	0.92	54.32a
Pioneer 9305	152,667ab	0.67	0.50	0.08	0.17	52.63ab
Schillinger 240F.Y	125,500d	0.17	1.50	0.33	0.17	48.34ce
Schillinger 254F.P	147,167abc	0.33	0.75	0.00	0.50	49.13cde
Schillinger 284F.HP.Y	141,667c	0.42	0.67	0.00	0.25	50.42bc
LSD (0.05)	10,584	NS	NS	NS	NS	2.80

Table 2. Bean leaf beetle, soybean aphid, beneficial insect populations, and percentage of stained soybeans.

Variety	Beneficial insect population/8 sweeps	Aphid population/8 sweeps	Bean leaf beetle population/8 sweeps	Stained soybeans (%)
	6024FG	2.50	2.00	
IA2064	2.75	0.75	1.00a	2.86bc
MRK0327	4.50	0.25	0.75ab	0.97ab
MRK0330	1.75	1.25	0.25ab	1.38ab
MRK0431	2.50	0.50	0.75ab	1.32ab
NC+2A83	3.00	5.25	2.00a	0.56ab
NC+3A44	4.25	1.00	0.75ab	0.51ab
Pioneer 9305	4.25	5.00	2.00a	0.35a
Schillinger 240F.Y	4.25	2.00	1.75a	4.78c
Schillinger 254F.P	3.75	1.25	0.50ab	0.88ab
Schillinger 284F.HP.Y	4.75	1.25	1.75a	1.38ab
LSD (0.05)	NS	NS	1.92	2.48

Table 3. Grain quality, organic soybean variety trial, 2004.

Variety	Grain Quality (%)			
	Protein	Oil	Fiber	Carbohydrates
6024FG	38.00e	16.93c	4.67d	22.40c
IA2064	37.53fg	17.86a	4.64e	21.97d
IA3017	37.75ef	16.64d	4.73c	22.88b
MRK0327	37.57fg	16.95c	4.74c	22.75b
MRK0330	36.99h	16.96c	4.81a	23.25a
MRK0431	37.47fg	17.01c	4.76b	22.76b
NC+2A83	39.93b	15.85e	4.58f	21.65ef
NC+3A44	38.51d	17.43b	4.56fg	21.50f
Pioneer 9305	37.42g	17.49b	4.68d	22.40c
Schillinger 240F.Y	39.97b	15.65f	4.57f	21.81de
Schillinger 254F.P	39.46c	15.10g	4.72c	22.73b
Schillinger 284F.HP.Y	40.63a	15.88e	4.54g	20.96g
LSD (0.05)	0.30	0.17	0.03	0.22

Values with the same letter do not differ.