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Management of Soybean Aphids

Abstract
The soybean aphid can be a serious pest of soybeans. This insect reached high numbers during the summer of 2001 in extreme northeast Iowa. Populations during 2002 were too low to cause economic damage; however, in 2003 infestations reached historically high populations and were above economic thresholds throughout most of Iowa. The soybean aphid has up to 15 to 18 generations annually. Overwintering eggs survive on buckthorn (Rhamnus). The nymphs hatch in the spring, and after winged female generations are born, they fly in search of soybeans. Throughout the summer, winged and wingless individuals are born. They feed on soybeans, and once crowded, the winged aphids fly in search of non-colonized soybeans. During the later stages of maturity, increased aphid mortality occurs due to the depletion of their food source, and surviving winged aphids migrate back to buckthorn. Aphid infestations that peak at the R1-R2 soybean growth stages may cause stunted plant growth with possible yellowing of leaves with reduced pod and seed counts. A black residue, sooty mold, grows on honeydew, a by-product excreted by aphids found on leaves, stems, and pods. Ants are usually present when ample honeydew is present. The objective of this experiment was to measure the performance of several insecticides for control of the soybean aphid.

Keywords
Entomology

Disciplines
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This northeast research and demonstration farm is available at Iowa State University Digital Repository: http://lib.dr.iastate.edu/farms_reports/1385

Management of Soybean Aphids

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Introduction

The soybean aphid can be a serious pest of soybeans. This insect reached high numbers during the summer of 2001 in extreme northeast Iowa. Populations during 2002 were too low to cause economic damage; however, in 2003 infestations reached historically high populations and were above economic thresholds throughout most of Iowa. The soybean aphid has up to 15 to 18 generations annually. Overwintering eggs survive on buckthorn (*Rhamnus*). The nymphs hatch in the spring, and after winged female generations are born, they fly in search of soybeans. Throughout the summer, winged and wingless individuals are born. They feed on soybeans, and once crowded, the winged aphids fly in search of non-colonized soybeans. During the later stages of maturity, increased aphid mortality occurs due to the depletion of their food source, and surviving winged aphids migrate back to buckthorn. Aphid infestations that peak at the R1-R2 soybean growth stages may cause stunted plant growth with possible yellowing of leaves with reduced pod and seed counts. A black residue, sooty mold, grows on honeydew, a by-product excreted by aphids found on leaves, stems, and pods. Ants are usually present when ample honeydew is present. The objective of this experiment was to measure the performance of several insecticides for control of the soybean aphid.

Materials and Methods

A natural population of soybean aphids infested soybeans (Syngenta NK S24-K4 RR® and Pioneer 92B38 RR®) at the Northeast Research and Demonstration Farm, Nashua, Iowa. Syngenta NK S24-K4 RR® and Pioneer 92B38 RR® were planted May 21 and May 22, 2003, respectively, in 30-inch rows. The planting population was 196,000/acre planted into standing cornstalks. The Syngenta NK S24-K4 RR® and Pioneer 92B38 RR® fields were sprayed with insecticide treatments on August 7 and 8, 2003, respectively, at the R2-R3 soybean stage of growth, with the first aphid count taken August 11, 2003. Aphid populations were measured by counting aphids on 10 soybean leaflets (fully expanded) from the top 3 inches (newest growth) of the soybean canopy.

Eight treatments were established in the field: 1) Asana (6.4 oz./acre), 2) Furadan 4F (0.5 pint/acre), 3) Lorsban 4E (1 pint/acre), 4) Baythroid (2.8 oz./acre), 5) Mustang Max (3.5 oz./acre), 6) Warrior T (3.2 oz./acre), 7) untreated check #1, and 8) untreated check #2.

All insecticides were applied in 20 gallons of water/acre broadcast over the rows, and plots were 14 rows wide and 50 feet long. Each treatment was replicated four times in a randomized complete block design.

Aphid counts were taken weekly from August 11 to September 8. Ten leaflets were taken from the center of each plot, and aphids were counted on each and averaged for an aphid population per leaflet. Seeds per pod, number of pods, seed weight per 500 grams, and total seeds were calculated from a sample of each variety from the check plots by randomly selecting five plants from each plot.

Yields were harvested from rows 3-7 and 8-12 in each plot and averaged together. This provided eight yield replications per treatment. Yields were machine harvested on September 28 and adjusted to 13% moisture. Data were analyzed by analysis of variance using Fisher's protected LSD at P=0.05. Results are shown in Tables 1–3.

Results and Discussion

The aphid populations in the check plots in both studies on August 11 were at similar densities, but weekly aphid counts showed populations rising at different rates for the two studies (Tables 1 and 2). Both plots showed peak aphid populations occurring on August 25, and again aphid populations decreased at different rates in each plot prior to soybean maturity. The aphid populations in the Syngenta soybean plot were 3.2 and 11.3 times higher on August 25 and September 2, respectively, compared with the Pioneer soybean plot. In a replicated soybean variety × Warrior insecticide plot conducted in 2003 at Nashua, aphid populations counted on August 19 showed Syngenta NK S24-K4 RR® had 180 aphids/leaflet, and the Pioneer 92B38 RR® had 376/leaflet.

All insecticides significantly lowered the aphid populations one week after application compared with the check plots. Insecticide treatment differences occurred on the August 18 and 25 count dates in the higher aphid population plot (Syngenta NK S24-K4 RR®) and only on August 25 in the lower aphid population plot (Pioneer 92B38 RR®). The best control throughout the four-week test period was provided by Warrior, which kept aphid populations below 1 aphid/leaflet in both studies. All insecticides produced similar yields compared with untreated checks in the higher aphid population plot, so aphid suppression by all insecticides was providing acceptable control. In the lower aphid population plot; the yields from insecticide treatments and the untreated check were not significantly different from each other due to a higher amount of statistical variation between replications. Soybean seed data using a Warrior insecticide treatment are shown in Table 3. Additional aphid control studies conducted at the Nashua location demonstrated 5.23 to 12.67 bushels/acre yield increases (data not shown). These data suggest that timely application of insecticides for management of aphids can protect against yield loss and provide economic gains, especially when populations are large and despite drought conditions, which alone can lower soybean yields.

Because this is a relatively new pest in Iowa, with limited research conducted, we will continue to monitor and conduct research on aphids so that research-based economic thresholds can be used for predicting when to apply an insecticide.

Economic thresholds and other helpful information on management of insect pests can be found in the *Integrated Crop Management* newsletter published by Iowa State University, or on the World Wide Web at: www.ipm.iastate.edu/ipm/icm/.

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Table 1. Soybean aphid counts and grain yields from Syngenta NK S24-K4 RR® soybeans sprayed with insecticides on August 7, 2003.

Treatment	Rate per acre	Aphids per soybean leaflet					Yield bu/acre
		8/11	8/18	8/25	9/2	9/8	
Asana	6.4 oz.	0.5b	6.45cd	9.9d	0.85b	0.38a	44.82a
Baythroid	2.8 oz.	1.03b	2.65d	17.43cd	1.48b	0.5a	47.12a
Furadan	0.5 pt.	0.13b	15.65bc	43.2b	18.73b	0.68a	44.87a
Lorsban	1.0 pt.	0.3b	22.00b	34.93bc	21.3b	1.18a	43.38a
Mustang Max	3.5 oz	0.55b	5.6cd	15.2cd	1.88b	0.43a	44.66a
Warrior	3.2 oz	0.23b	0.35d	0.25d	0.28b	0.13a	44.65a
Check	---	17.72a	74.72a	213.95a	59.5a	0.7a	38.66b
P-value		*0.0107*	*0.0001*	*0.0001*	*0.0037*	*0.0018*	*0.0469*
LSD 0.05		*4.5251*	*10.217*	*24.372*	*26.863*	*NS*	*4.7144*

Table 2. Soybean aphid counts and grain yields from Pioneer 92B38 RR® soybeans sprayed with insecticides on August 8, 2003.

Treatment	Rate per acre	Aphids per soybean leaflet					Yield bu/acre
		8/11	8/18	8/25	9/2	9/8	
Asana	6.4 oz.	0.28b	2.58b	2.75bc	1.23a	0.03a	40.28a
Baythroid	2.8 oz.	0.9b	2.63b	10.35bc	7.83a	0.3a	42.40a
Furadan	0.5 pt.	0.08b	3.78b	17.55bc	7.05a	0.3a	39.99a
Lorsban	1.0 pt.	0.13b	3.6b	8.73bc	1.45a	0.63a	39.84a
Mustang Max	3.5 oz	1.28b	6.28b	20.45b	2.83a	0.58a	39.69a
Warrior	3.2 oz	0.05b	0.23b	0.08c	0.43a	0.08a	41.49a
Check	---	16.91a	68.6a	67.63a	5.28a	0.32a	35.39a
P-value		*0.0001*	*0.0001*	*0.0001*	*NS*	*NS*	*NS*
LSD 0.05		*5.9048*	*20.811*	*19.649*			

Table 3. Pod and seed data using Warrior (3.2 oz/ac) with each soybean variety.

Treatment	Rate Per acre	Soybean Variety	Pods with 0 beans	Pods with 1 bean	Pods with 2 beans	Pods with 3 beans	Pods with 4 beans	Total beans/ plant	Weight (grams) of 500 seeds
Warrior	3.2 oz	NK S24-K4 RR	0.2	4.8	10.6	11.6	0.4	62.4	63
Check	---	NK S24-K4 RR	1.4	3.2	6.8	8.8	0.4	44.8	60
Warrior	3.2 oz	PNR 92B38 RR	0.4	3.2	8.6	8.6	0.0	46.2	71
Check	---	PNR 92B38 RR	1.8	2.4	8.6	8.0	0.0	43.6	65