Soybean Aphid Efficacy Evaluation

RFR-A1251

Erin Hodgson, assistant professor
Greg VanNostrand, research associate
Department of Entomology
Josh Sievers/Ryan Rusk, farm superintendents

Introduction

Soybean, *Glycine max* (L.), grown in Iowa and most of the north central region of the United States has not required regular insecticide use. The soybean aphid, *Aphis glycines* (Hemiptera: Aphididae), causes yield losses from direct plant feeding, and has been shown to transmit several plant viruses. In Iowa, soybean aphid can colonize soybean fields in June and has developed into outbreaks in July and August capable of reducing yields by nearly 40 percent.

Materials and Methods

Plots were established at the Iowa State University Northwest Research Farm, Sutherland, O'Brien County, Iowa. Treatments were arranged in a randomized complete block design with four replications, and soybean (Syngenta 05RM310021 and 07JR801843) was planted in 30-in. rows on May 14. In total, we evaluated 14 treatments with products alone or in combination (Table 1). Treatments included foliar and seed-applied products and also host plant resistance for soybean aphid. Most products were insecticides but some fungicides were used in combination with insecticides.

Application techniques. The ideal foliar application would be when aphids exceeded the economic threshold of 250/plant. However, soybean aphid populations were very low at this location and foliar applications were made to all six rows within each treated plot at full pod set (Table 1). Foliar treatments were applied using a backpack sprayer and TeeJet (Springfield, IL) twinjet nozzles (TJ 11002) with 20 gallons of water/acre at 40 lb of pressure per square inch.

Estimation of soybean aphid populations and cumulative aphid days. Soybean aphids were counted on single plants at randomly selected locations within each plot. All aphids (adults, nymphs, and winged aphids) were counted on each plant. Summing aphid days accumulated during the growing season provides a measure of the seasonal aphid exposure that a soybean plant experiences. Cumulative aphid days (CAD) are calculated with the following equation:

$$\sum_{n=1}^{\infty} = \left(\frac{x_{i-1} + x_i}{2} \right) \times t$$

where x is the mean number of aphids on sample day i, x_{i-1} is the mean number of aphids on the previous sample day, and t is the number of days between samples i - 1 and i.

Yield and statistical analysis. Harvesting took place on September 27. Yields were determined by weighing grain with a grain hopper, which rested on a digital scale sensor custom designed for the combine. Yields were corrected to 13 percent moisture and reported as bushels per acre.

One way analysis of variance (ANOVA) was used to determine treatment effects within each experiment. Means separation for all CAD and yield treatments was achieved using a least significant difference test ($P \leq 0.10$).

Results and Discussion

Foliar insecticides were applied to most treatments on August 16; a few had a target application of beginning pod set and were applied July 20. Soybean aphid populations averaged 0.80 ± 0.43 (± SEM; standard error of the mean) aphids/plant three days prior to

the August 16 application. Soybean aphid populations in the untreated control plots peaked on August 26 at 5.60 ± 1.86 aphids/plant. There were some significant differences in CAD among treatments ($P < 0.03$; $F = 2.07$; df = 13, 3). Soybean aphid colonization was very patchy and influenced the mean separation analysis. Note that the *Rag1* treatment had virtually no aphid development. There were no significant differences among any of the treatments in regards to yield ($P < 0.99$; $F = 0.30$; df = 13, 3) (Table 1). In the absence of soybean aphid, the yield was similar between the susceptible and *Rag1* treatments.

In 2012, aphid populations were very low. We included several established insecticides and a few new products marketed for soybean aphid. Most foliar products were effective at reducing CAD and protecting yield. We did not detect any thriving aphid populations after foliar application for any product.

In the absence of heavy aphid pressure, we do not expect to see a yield response to insecticides. Therefore, our recommendation for soybean aphid management is to continue to scout soybean and to apply a full rate of a foliar insecticide when populations exceed 250 aphids/plant.

One well-timed foliar application applied after aphids exceed the economic threshold will protect yield and increase profits in most situations. We would also strongly encourage growers to incorporate host plant resistance into their seed selection. At this time, we are not recommending insecticidal seed treatments for aphid management because of soybean aphid biology in Iowa. To date, most foliar insecticides are very effective at reducing soybean aphid populations if the coverage is sufficient. Achieving small droplet size to penetrate a closed canopy may be the biggest challenge to managing soybean aphid.

Acknowledgements

We would like to thank the Iowa Soybean Association and the soybean checkoff for supporting this research. We are also grateful for the following industry support for this evaluation: Syngenta Crop Protection, Dow AgroSciences, and Bayer CropScience.

Table 1. 2012 soybean aphid treatments and rates at the ISU Northwest Research Farm, O'Brien County, IA.

Treatment	Rate[a]	CAD ± SEM[b]	CAD-LSD[c]	Yield ± SEM[d]	Yield-LSD[e]
Untreated Control	-----	678.25 ± 273.57	BCD	53.77 ± 1.23	A
Rag1	-----	17.13 ± 9.91	A	53.82 ± 1.67	A
CruiserMaxx Beans	56 (ST)	311.63 ± 81.88	ABC	55.87 ± 1.06	A
Rag1 + CruiserMaxx Beans	----- 56 (ST)	367.88 ± 344.27	ABC	53.68 ± 2.43	A
Rag1 + CruiserMaxx Beans + Warrior II CS	---- 56 (ST) 1.92	14.88 ± 9.55	A	54.01 ± 2.19	A
Rag1 + Warrior II CS	------ 1.92	224.25 ± 199.10	AB	55.10 ± 2.03	A
Warrior II CS	1.92	746.00 ± 423.53	CD	55.73 ± 1.28	A
Endigo ZC	3.5	227.63 ± 81.73	AB	55.42 ± 1.64	A
Cobalt Advanced EC	13.0	175.38 ± 72.05	A	54.50 ± 1.61	A
Warrior II CS + Lorsban Advanced EC	1.6 16.0	948.25 ± 378.41	D	56.58 ± 1.23	A
Leverage 360	2.8	93.88 ± 42.68	A	57.22 ± 1.54	A
Leverage 360	2.8	193.25 ± 95.40	A	56.71 ± 1.64	A
Leverage 360	3.8	212.25 ± 102.66	AB	54.84 ± 2.35	A
Leverage 360 + Stratego YLD	2.8 4.0	44.75 ± 25.64	A	57.76 ± 1.33	A

[a]Foliar product rates are given as formulated product/acre, and ST (seed treatments) are given as grams active ingredient/100 kg seed.
[b]CAD ± SEM; cumulative aphid days ± standard error of the mean.
[c]CAD-LSD; least significant different mean separation test for cumulative aphid days.
[d]Yield ± SEM; yield in bushels/acre ± standard error of the mean. .
[e]Yield-LSD; least significant different mean separation test for yield.