1-1-2015

Soybean Aphid Efficacy Evaluation in Northwest Iowa

Erin Hodgson
Iowa State University, ewh@iastate.edu

Greg VanNostrand
Iowa State University, gregvn@iastate.edu

Josh Sievers
Iowa State University, sieversj@iastate.edu

Soybean Aphid Efficacy Evaluation in Northwest Iowa

Abstract
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), is the most important soybean pest in Iowa and is capable of reducing yield by 40 percent. Nymphs and adults feed on sap within the phloem and can vector several plant viruses. In Iowa, soybean aphids have been a persistent pest that can colonize fields from June through September. Their summer population dynamics are dependent on weather and other environmental conditions.

Keywords
Entomology

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences | Entomology | Natural Resources and Conservation

Soybean Aphid Efficacy Evaluation in Northwest Iowa

RFR-A1452

Erin Hodgson, associate professor
Greg VanNostrand, research associate
Department of Entomology
Josh Sievers, farm superintendent

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), is the most important soybean pest in Iowa and is capable of reducing yield by 40 percent. Nymphs and adults feed on sap within the phloem and can vector several plant viruses. In Iowa, soybean aphids have been a persistent pest that can colonize fields from June through September. Their summer population dynamics are dependent on weather and other environmental conditions.

Materials and Methods

Plots were established at the ISU Northwest Research Farm in O'Brien County, Iowa. Treatments were arranged in a randomized complete block design with four replications, and soybean (Syngenta NK S25-E5 brand and Blue River Hybrid variety LD09-05484A) was planted in 30-in. rows on June 19. In total, we evaluated 16 treatments with products alone or in combination (Table 1). Treatments included foliar and seed-applied products, and also host plant resistance (*Rag1* gene) 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. Foliar applications were made to all six rows within each treated plot at full pod set (Table 1). Foliar treatments were applied using a custom sprayer and TeeJet (Springfield, IL) flat fan nozzles (TJ 8002) with 15.5 gallons of water/acre at 40 pounds of pressure/square in.

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 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. Plots were harvested on October 15. 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/acre. One way analysis of variance (ANOVA) was used to determine treatment effects within each experiment. Mean separation for all CAD and yield treatments was achieved using a least significant difference test (alpha = 0.10).

Results and Discussion

In 2014, aphid populations were low. We included several established insecticides and a few new products marketed for soybean aphid. We did not detect any thriving aphid populations after foliar application for any product.

Foliar insecticides were applied to all treatments on August 14 when plants were in the R4 growth stage. Soybean aphid populations averaged 20.7 ± 5.9 (± SEM; standard error of the mean) aphids/plant in the untreated control plots one day prior to the August 14 application. Soybean aphid populations in the untreated control plots peaked on August 18 at 42.9 ± 14.8 aphids/plant.

There were few significant differences in CAD among treatments (Table 1). The untreated control had significantly more CAD than a tank mix of Warrior II and Lorsban Advanced, but was not significantly different from any other treatment. Brigade 2EC had the highest yield of our treatments, but was not significantly different than most other treatments.

Treatments with the *Rag1* gene performed well and were all below the economic injury level for CAD. There were some significant yield differences for *Rag1*-containing treatments, however we do not believe they were due to insect feeding (Table 1). Using *Rag1* will likely suppress aphid populations and prevent economic injury in most areas of Iowa.

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. 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.

We also would 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.

Acknowledgements

We would like to thank the Iowa Soybean Association and the soybean checkoff for supporting this research. We also are grateful for the industry support from AMVAC, Bayer CropScience, Blue River Hybrids, Cheminova, Chemtura, Dow AgroSciences, Dupont, FMC, and Syngenta Crop Protection.

Table 1. 2014 soybean aphid treatments and rates at O'Brien County, IA.

Treatment	Rate[v]	CAD ± SEM[w]	CAD-LSD[x]	Yield ± SEM[y]	Yield-LSD[z]
Untreated control	-----	514.92 ± 230.73	B	66.65 ± 1.33	AB
CruiserMaxx Vibrance FS	62.5 g	376.15 ± 220.01	AB	68.30 ± 1.03	AB
Warrior II CS	1.92 fl oz	290.25 ± 139.07	AB	65.36 ± 3.42	B
Lorsban Advanced EC	16.0 fl oz	358.56 ± 65.08	AB	65.91 ± 2.23	B
Warrior II CS + Lorsban Advanced EC	1.92 fl oz 16.0 fl oz	196.99 ± 41.09	A	66.77 ± 1.70	AB
Leverage 360 SC	2.8 fl oz	377.79 ± 32.78	AB	66.81 ± 1.87	AB
Brigade 2EC	3.0 fl oz	334.43 ± 118.33	AB	69.72 ± 1.44	A
Orthene 97 ST	1 lb	393.00 ± 126.82	AB	65.75 ± 2.29	B
Cobalt Advanced EC	26.0 fl oz	415.13 ± 77.09	AB	67.08 ± 1.33	AB
Leverage 360 SC + Headline EC	2.8 fl oz 12.0 fl oz	271.08 ± 32.32	AB	67.41 ± 0.74	AB
Headline EC	12.0 fl oz	410.35 ± 78.00	AB	64.83 ± 2.91	B
Besiege ZC	9.0 fl oz	335.72 ± 112.29	AB	68.08 ± 0.52	AB
Rag1	-------	20.08 ± 8.85	a	68.60 ± 0.79	b
Rag1 + Cruiser 5FS	------- 0.0756 g	11.32 ± 3.75	a	68.88 ± 1.34	b
Rag1 + Cruiser 5FS + Warrior II CS	------- 62.5 g 0.0756 g	49.71 ± 36.99	a	71.43 ± 0.77	a
Rag1 + Warrior II CS	------- 1.92 fl oz	53.26 ± 39.74	a	70.24 ± 1.26	ab

[v]Foliar product rates are given as formulated product/acre, and seed treatments are given as grams active ingredient/100kg seed.

[w]Cumulative aphid days ± standard error of the mean.

[x]Least significant difference for mean separation of cumulative aphid days (susceptible seed: $P < 0.2915$; $F = 1.25$; df = 11, 3; and *Rag1* seed: $P < 0.8148$; $F = 0.47$; df = 3, 3).

[y]Yield ± SEM; yield in bushels/acre ± standard error of the mean.

[z]Least significant difference for mean separation of yield (susceptible seed: $P < 0.0070$; $F = 2.83$; df = 11, 3; and *Rag1* seed: $P < 0.0508$; $F = 3.35$; df = 3, 3).