Soybean Aphid Efficacy Evaluation in Northwest Iowa

RFR-A1703

Erin Hodgson, associate professor
Greg VanNostrand, research associate
Department of Entomology
Terry Tuttle, 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 usage. 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 Iowa State University Northwest Research Farm in O'Brien County, Iowa. Treatments were arranged in a randomized complete block design with four replications, and soybean (Syngenta NK S24-K2) was planted in 30-in. rows May 30. Each plot was six rows wide and 44 ft long. In total, 19 treatments were evaluated with products alone or in combination (Table 1). Treatments included foliar and seed-applied products for soybean aphid. Several established insecticides and a few new products marketed for soybean aphid were included.

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 lb of pressure/square inch.

Estimation of soybean aphid populations. 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 October 20. 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 2017, aphid populations were low until mid-August. Foliar applications were made August 18 when plants were in the R5 growth stage. Soybean aphid populations averaged 241.2 ± 94.2 (± SEM; standard error of the mean) aphids/plant in the untreated control plots three days prior to the August 18 application. Soybean aphid populations in the untreated control plots peaked September 9 at 650.7 ± 129.0 aphids/plant. There was no detection of any thriving aphid populations after foliar application for any product.

There were a few significant differences in CAD among treatments ($P < 0.0001$; $F = 6.47$; df = 18, 3) (Table 1). The CAD for susceptible soybean treatments ranged from 648 to 14,004 with some significant differences among treatments. The untreated control and treatments with just pesticidal seed treatments had significantly more CAD compared with most other treatments. Yield ranged from 55–62 bushels/acre with little significant difference among treatments ($P < 0.0001$; $F = 3.79$; df = 18, 3) (Table 1). The majority of the CAD was accumulated in late August and early September, and it is not believed the differences in yield were due to soybean aphid seasonal exposure.

The recommendation for soybean aphid management is to continue to scout soybean fields 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.

Growers are strongly encouraged to incorporate host plant resistance into their seed selection. At this time, insecticidal seed treatments for aphid management is not recommended 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 following industry support for this evaluation: BASF, Cheminova, FMC, and Syngenta Crop Protection.

Table 1. 2017 soybean aphid treatments and rates at ISU Northwest Research Farm, Sutherland, O'Brien County, IA.

Treatment	Rate[a]	CAD ± SEM[b]	CAD-LSD[c]	Yield ± SEM[d]	Yield-LSD[e]
Untreated Control	-----	14,004.47 ± 3,576.81	F	57.46 ± 2.64	AB
Cruiser 5FS	79.95g	6,601.77 ± 1,939.18	DE	60.35 ± 4.79	AB
Cruiser 5FS + Warrior II 2.08CS	79.95g 1.6 fl oz	1,344.30 ± 252.94	AB	58.14 ± 3.41	AB
Warrior II 2.08CS	1.92 fl oz	2,657.48 ± 522.41	ABC	59.02 ± 3.49	AB
Lorsban Advanced 3.76EC	16.0 fl oz	1,796.35 ± 666.76	ABC	62.28 ± 3.51	A
Warrior II 2.08CS + Lorsban Advanced 3.76EC	1.92 fl oz 16.0 fl oz	3,854.51 ± 2,520.41	BCD	58.42 ± 2.32	AB
Dimethoate 4E	16.0 fl oz	1,718.64 ± 451.71	AB	58.47 ± 2.28	AB
Hero 1.24EC + Dimethoate 4E	5.0 fl oz 16.0 fl oz	1,070.83 ± 129.99	AB	59.07 ± 5.36	AB
Agri-Mek 0.7SC	2.5 fl oz	8,442.74 ± 821.96	E	57.67 ± 3.83	AB
Brigadier 2SC	6.1 fl oz	1,796.60 ± 320.17	ABC	55.35 ± 2.90	B
Carbine 50WG	2.8 oz	1,394.15 ± 586.51	AB	57.06 ± 3.83	AB
Cobalt Advanced 2.63EC	16.0 fl oz	1,488.24 ± 391.94	AB	61.45 ± 2.15	AB
Transform 50WG	1.0 oz	1,235.70 ± 185.39	AB	59.20 ± 1.93	AB
Seeker 2.09SE	2.1 fl oz	658.33 ± 115.44	A	60.37 ± 4.42	AB
Sivanto 200 1.76SL	7.0 fl oz	2,467.79 ± 710.21	ABC	57.42 ± 1.55	AB
Movento 2SC	4.0 fl oz	4,613.69 ± 930.32	CD	62.21 ± 6.32	A
Endigo ZC 2.06SC	3.5 fl oz	2,369.28 ± 496.68	ABC	57.52 ± 3.68	AB
Leverage 360 3SC	2.8 fl oz	3,235.24 ± 809.45	ABC	55.74 ± 7.97	B
Tundra 2EC	6.4 fl oz	1,466.81 ± 218.59	AB	62.24 ± 4.63	A

[a]Foliar product rates are given as formulated product per acre, and seed treatments are given as grams active ingredient per 100 kg seed.
[b]Cumulative aphid days ± standard error of the mean.
[c]Least significant difference for mean separation of cumulative aphid days ($P < 0.0001$; $F = 6.47$; df = 18, 3).
[d]Yield ± SEM; yield in bushels/acre ± standard error of the mean.
[e]Least significant difference for mean separation of yield ($P < 0.0001$; $F = 3.79$; df = 18, 3). Mean followed by the same letter do not differ.