Soybean Aphid Efficacy Evaluation in Northeast Iowa

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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 insect 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 Northeast Research Farm in Floyd County, Iowa. Treatments were arranged in a randomized complete block design with four replications, and soybeans (Syngenta NK S24-K2 brand) were planted in 30-in. rows using standard production practices May 14. Each plot was six rows wide and 50 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.

Application techniques. The ideal foliar application would be when aphids exceeded the economic threshold of 250/plant. Soybean aphid populations were low at this location until early September and foliar applications were made to the center four rows within each treated plot during beginning seed 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/square inch.

Estimation of soybean aphid populations. Soybean aphids were counted on single plants at randomly selected locations within each plot. All 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. Plots were harvested October 3. Yields were determined by weighing grain with a hopper, which rested on a digital scale sensor custom designed for the combine. Yields were corrected to 13 percent moisture and reported in bushels/acre. One-way analysis of variance (ANOVA) was used to determine treatment effects within each experiment. Mean separation for CAD and yield treatments was achieved using a least significant difference test (alpha = 0.10).

Results and Discussion

In 2017, aphid populations remained low. Plots were uniformly colonized by early August. However, there was not enough seasonal accumulation of aphids to exceed the economic injury level and therefore cause yield loss.

The untreated control had 11.6 ± 7.5 (± SEM; standard error of the mean) aphids/plant four days prior to the August 18 application and peaked August 25 at 132.2 ± 39.1 aphids/plant. There were some significant differences among CAD treatments, ranging from 132 to 1,872 ($P < 0.0001$; $F = 6.87$; df = 18, 3) (Table 1). Many foliar insecticides were effective in reducing CAD, and there were some significant differences in CAD between foliar insecticides.

Yield ranged from 57–61 bushels/acre with some significant differences among treatments ($P = 0.1950$; $F = 1.34$; df = 18, 3) (Table 1). Although there were yield differences, it is not believed it was due to soybean aphid seasonal exposure. Overall, the treatment containing a foliar application of Seeker 2.09SE (2.1 fl oz/acre rate) had the highest yield. The lowest-yielding treatment was a foliar application of Movento 2SC (4.0 fl oz/acre rate) (Table 1). The late-season accumulation of aphids may not have impacted yield, indicating a late-season application may not be cost effective.

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 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.

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Table 1. 2017 soybean aphid treatments and rates at the ISU Northeast Research Farm, Nashua, Floyd County, Iowa.

Treatment	Rate[a]	CAD ± SEM[b]	CAD-LSD[c]	Yield ± SEM[d]	Yield-LSD[e]
Untreated Control	-----	1,872.49 ± 423.71	E	60.21 ± 0.72	ABCD
Cruiser 5FS	79.95g	703.09 ± 142.11	BCD	59.35 ± 1.03	ABCDE
Cruiser 5FS +	79.95g	321.53 ± 77.75	AB	60.10 ± 0.89	ABCD
Warrior II 2.08CS	1.6 fl oz				
Warrior II 2.08CS	1.92 fl oz	960.78 ± 440.14	CD	58.77 ± 0.78	ABCDE
Lorsban Advanced 3.76EC	16.0 fl oz	152.73 ± 25.49	A	58.09 ± 0.93	DE
Warrior II 2.08CS +	1.92 fl oz	134.20 ± 67.52	A	59.77 ± 1.25	ABCDE
Lorsban Advanced 3.76EC	16.0 fl oz				
Dimethoate 4E	16.0 fl oz	177.66 ± 48.71	A	59.32 ± 0.65	ABCDE
Hero 1.24EC +	5.0 fl oz	193.72 ± 53.04	A	60.67 ± 0.60	ABC
Dimethoate 4E	16.0 fl oz				
Agri-Mek 0.7SC	2.5 fl oz	982.96 ± 165.16	CD	58.29 ± 1.15	CDE
Brigadier 2SC	6.1 fl oz	147.256 ± 48.62	A	59.67 ± 1.53	ABCDE
Carbine 50WG	2.8 oz	182.30 ± 40.19	A	60.76 ± 1.12	ABC
Cobalt Advanced 2.63EC	16.0 fl oz	132.67 ± 9.96	A	60.63 ± 0.87	ABC
Transform 50WG	1.0 oz	128.69 ± 20.20	A	60.96 ± 0.81	AB
Seeker 2.09SE	2.1 fl oz	137.78 ± 28.25	A	61.13 ± 1.04	A
Sivanto 200 1.76SL	7.0 fl oz	207.07 ± 17.64	A	59.24 ± 1.27	ABCDE
Movento 2SC	4.0 fl oz	615.03 ± 112.78	BC	57.41 ± 1.15	E
Endigo ZC 2.06SC	3.5 fl oz	131.68 ± 30.41	A	60.33 ± 0.66	ABCD
Leverage 360 3SC	2.8 fl oz	1,067.8 ± 255.01	D	58.58 ± 1.48	BCDE
Tundra 2EC	6.4 fl oz	391.21 ± 153.14	AB	58.05 ± 1.86	DE

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

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

[c]Least significant difference for mean separation of cumulative aphid days ($P < 0.0001$; $F = 6.87$; $df = 18, 3$).

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

[e]Least significant difference for mean separation of yield ($P = 0.1950$; $F = 1.34$; $df = 18, 3$). Mean followed by the same letter do not differ.