Soybean Aphid Efficacy Evaluation

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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 soybean insect pest in Iowa and is capable of reducing yield by 40%. 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 Research and Demonstration Farm in O'Brien County, Iowa. Treatments were arranged in a randomized complete block design with four replications, and soybean (Syngenta NK S26-E3) was planted in 30-in. rows on May 13. In total, 26 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 aphids per plant. Foliar applications were made to all six rows within each treated plot August 17. Foliar treatments were applied using a custom sprayer and TeeJet flat fan nozzles (TJ 8002) with 20 gallons of water per acre at 30 lbs. 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 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, xi-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 September 30. Yields were determined by weighing grain with a grain hopper that rested on a digital scale sensor custom designed for the combine. Yields were corrected to 13% 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) with the Tukey adjustment.

Results and Recommendations

The plots were initially colonized by soybean aphid in late June, with some population growth in August. There were a few other soybean insect pests present (Japanese beetle, colaspis beetles, grasshoppers, and stink bugs), but economic populations were not evident. Natural enemies, such as beetles, flies, lacewings, and wasps were present throughout the reproductive stages, but did not significantly impact aphid populations. Aphid populations did not approach the economic threshold; however, plots were sprayed August 17. Plants were at R5 (beginning seed set) at the time of the foliar application. Soybean aphid populations peaked August 16. In the untreated control, aphid populations reached 17.4 per plant ± 6.8 (± standard error of the mean).

Cumulative aphid days ranged from 188 to 562, and no significant differences were observed among treatments. Although not significantly different, Plinazolin Technology at the middle rate evaluated had the most CAD. Cruiser 5FS and Cruiser 5FS + Warrior had the lowest CAD out of the treatments evaluated. Yield differences are unlikely to occur when aphid populations do not reach the economic threshold, which is what was observed in 2022 (Table 1).

The 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 per plant. One well-timed foliar application applied after aphids exceed the economic threshold will protect yield and increase profits in most situations. 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 are not recommended for aphid management because of soybean aphid biology in Iowa.

Acknowledgments

We 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 Corporation, Corteva Agrisciences, Nichino America Inc, and Syngenta Crop Protection LLC.

Table 1. 2022 soybean aphid treatments, rates, CAD, and yield at O'Brien County, Iowa.

Treatment	Rate[a]	CAD ± SEM[b]	CAD-LSD[c]	Yield ± SEM[d]	Yield-LSD[e]
Untreated control	0	376.55 ± 107.82	A	51.66 ± 1.41	A
Cruiser 5FS	0.0756 mg ai/seed	188.53 ± 29.40	A	56.09 ± 1.86	A
Cruiser 5FS and Warrior II CS	0.0756 mg ai/seed 1.92 fl. oz.	215.82 ± 32.22	A	52.07 ± 1.93	A
CruiserMaxx Vibrance + Saltro FS	0.1695 mg ai/seed	436.51 ± 78.03	A	54.12 ± 1.31	A
CruiserMaxx Vibrance + Saltro FS and Warrior II CS	0.1695 mg ai/seed 1.92 fl. oz.	397.58 ± 106.17	A	50.00 ± 3.30	A
Plinazolin Technology	0.684 fl. oz.	405.98 ± 76.90	A	50.32 ± 2.97	A
Plinazolin Technology	1.37 fl. oz.	562.43 ± 27.02	A	45.41 ± 1.85	A
Plinazolin Technology	2.05 fl. oz.	395.90 ± 22.90	A	48.73 ± 1.44	A
Endigo (A)	3.5 fl. oz.	244.93 ± 53.51	A	49.83 ± 1.47	A
Warrior II CS	1.92 fl. oz.	414.49 ± 26.05	A	49.03 ± 2.60	A
Endigo (B)	4.5 fl. oz.	326.27 ± 88.35	A	49.71 ± 2.26	A
Revytek	8.0 fl. oz.	268.05 ± 65.64	A	48.00 ± 3.30	A
Revytek and Renestra	8.0 fl. oz. 6.8fl. oz.	270.74 ± 68.65	A	51.39 ± 3.03	A
Revytek and Hero	8.0 fl. oz. 10.3 fl. oz.	328.99 ± 113.18	A	50.26 ± 2.42	A
Revytek and Endigo	8.0 fl. oz. 4.5 fl. oz.	309.14 ± 57.19	A	57.07 ± 2.42	A
Revytek and Ridgeback	8.0 fl. oz. 13.8 fl. oz.	312.49 ± 127.46	A	50.52 ± 3.81	A
Revytek and Warrior II CS	8.0 fl. oz. 1.92 fl. oz.	496.95 ± 95.47	A	52.61 ± 2.44	A
Sefina DC	3.0 fl. oz.	233.03 ± 59.53	A	48.29 ± 1.44	A
PQZ (A)	0.8 fl. oz.	453.49 ± 115.58	A	54.95 ± 2.89	A
PQZ (B)	1.2 fl. oz.	349.34 ± 81.78	A	48.31 ± 3.59	A
PQZ (C)	1.6 fl. oz.	432.08 ± 36.41	A	47.02 ± 3.38	A
Ridgeback (A)	8.6 fl. oz.	385.10 ± 94.08	A	54.72 ± 2.09	A
Ridgeback (B)	10.3 fl. oz.	318.33 ± 82.63	A	55.39 ± 2.65	A
Transform WG	0.75 oz.	339.58 ± 94.14	A	52.00 ± 3.21	A
Sniper EC	4.8 fl. oz.	467.44 ± 96.25	A	52.45 ± 4.28	A
Renestra	6.8 fl. oz.	365.86 ± 52.60	A	50.25 ± 4.53	A

[a]Foliar product rates are given as formulated product per acre, and seed treatments are given as milligrams active ingredient per seed.
[b]Cumulative aphid days ± standard error of the mean.
[c]Least significant difference for mean separation of cumulative aphid days (P = 0.1774; F = 1.32; df = 25, 78).
[d]Yield ± SEM; yield in bushels per acre ± standard error of the mean.
[e]Least significant difference for mean separation of yield (P = 0.3381; F = 1.12; df = 25, 78).