Soybean Yield Response to Soybean Aphid Control

Todd Vagts, crop specialist
ISU Extension

Introduction

The soybean aphid (*Aphis glycines*) is a new pest to soybeans in Iowa and the United States. First observed in Wisconsin in the fall of 2000, the soybean aphid has spread to most north-central U.S. soybean fields over the last three years. The soybean aphid is unique in that it is the only aphid that reproduces on soybeans. The soybean aphid caused economic losses to soybeans in northeast Iowa in 2001 and caused only isolated problems in 2002. But in August of 2003, the aphid spread rapidly and colonized soybean fields in the upper one-half of Iowa counties, causing widespread yield and economic losses.

Origin and Host Plants

The soybean aphid is native to China and Japan and is widespread throughout southeastern and southern Asia, as well as Australia and New Zealand. The summer host is soybeans and perhaps a few other leguminous plants. The insect overwinters on species of buckthorn (Rhamnus spp.), which are woody shrubs or trees.

Damage to Soybeans

Soybean aphids have needle-like sucking mouthparts, which they insert into soybean tissues to remove plant sap. If aphid numbers are high, leaves may become yellow and distorted, the plant may become stunted, and plant parts may be covered with a dark, sooty mold.

The soybean aphid is also capable of transmitting virus diseases to soybeans, including alfalfa mosaic and soybean mosaic. Viruses can cause leaf mottling, various leaf pod and plant deformities, stunting, and discoloration of seed. Yield losses can occur due to aphid feeding and/or virus development.

Description and Life Cycle

Soybean aphids are small, yellow aphids with distinct black cornicles. The aphid overwinters as eggs on buckthorn (Rhamnus species). The nymphs hatch in spring, giving rise to wingless females. These wingless females on buckthorn reproduce without mating, and the young develop into winged females that migrate to soybeans. These females on soybeans produce wingless females that also reproduce without mating and give rise to active young in late May and June. In late summer the wingless females produce young that develop into both winged females and males. These winged aphids migrate back to buckthorn and mate. These mated females subsequently lay eggs, beginning a new seasonal cycle.

Soybean aphids reproduce faster in cooler environments (72–77°F, with relative humidity below 78%, being optimum), but when the temperature exceeds 81°F, developmental time is lengthened.

Yield Response Data

Because of the soybean aphid's new and unpredictable presence in the U.S., few data are available for the development of management and control thresholds. Management recommendations vary from state to state and between developmental stages of the soybean. Because of this lack of management data, recommendations were made in 2003 to leave in-field farmer check strips to determine if the insecticide treatment was economical. An effort was organized to have farmers and ag industry representatives voluntarily submit soybean yield response data from the in-field check strips. Results from this effort yielded 53 data points from the northern one-half of Iowa on the response of soybean yield to an insecticide treatment. Figure 1 shows all 53 data points with treatment date on the X-axis (days before or after August 1) and soybean yield response on the Y-axis. A few outlier data points make

the data hard to interpret. By removing 11 data points, Figure 2 shows a clearer yield response to insecticide treatment. We would expect different yield response to treatment by area and treatment date. Table 1 shows the average response to treatment by county.

Results from these data should be used cautiously. In each situation we do not know how long the aphid population was present before the insecticide application was made, what the aphid population was at the time of treatment, how long the aphid population persisted after the treatment, or the effectiveness of the insecticide application. These are also only side-by-side test strips, not replicated trials. These data should only be used as a reference to help make management decisions in the future.

Acknowledgments

Much appreciation is extended to the many participants in Iowa who submitted their soybean yield data. Information on the aphid life cycle is cited from "The Soybean Aphid: Perspectives from Across the Midwest," 2001 ICM Conference, Marlin E. Rice.

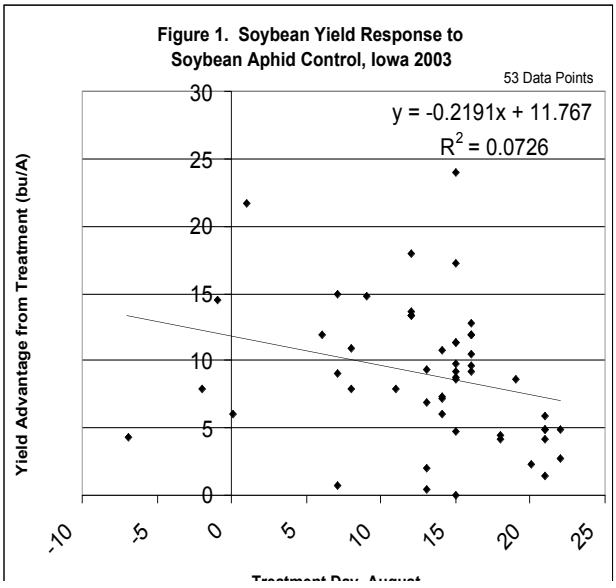

Figure 1. Soybean Yield Response to Soybean Aphid Control, Iowa 2003

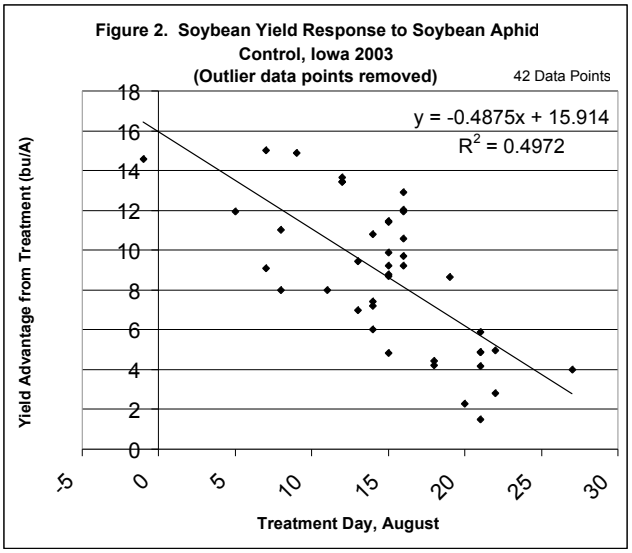

Figure 2. Soybean Yield Response to Soybean Aphid Control, Iowa 2003 (Outlier data points removed)

Table 1. Soybean Yield Response to Insecticide Treatment by County

	Soybean Yield (bu/A)				
County	**Treated**	**Non Treated**	**Treatment Advantage Bu/A**	**Average Application Date**	**Data Points**
Adair	41	39	2	13-Aug	1
Allamakee	40	36	4	25-Jul	3
Benton	41	29	11	15-Aug	1
Beuna Vista	32	24	8	8-Aug	1
Bremer	37	26	11	14-Aug	1
Buchanan	43	28	15	7-Aug	1
Calhoun	45	38	7	17-Aug	11
Carroll	40	40	0	15-Aug	1
Cherokee	39	34	4	18-Aug	1
Chickasaw	27	18	9	13-Aug	1
Dallas	44	40	4	18-Aug	1
Fayette	42	28	14	12-Aug	1
Floyd	46	35	11	8-Aug	1
Franklin	34	23	11	15-Aug	1
Grundy	52	34	18	12-Aug	1
Hardin	42	25	17	15-Aug	1
Howard	40	35	5	12-Aug	3
Humboldt	51	43	9	17-Aug	2
Ida	48	40	8	29-Jul	1
Mitchell	39	30	9	7-Aug	1
O Brien	39	32	7	27-Aug	2
Pocahontas	45	38	8	17-Aug	10
Poweshiek	50	26	24	15-Aug	1
Story	38	24	13	12-Aug	2
Tama	49	34	15	9-Aug	1
Winneshiek	51	41	10	31-Jul	2
Average	*42*	*32*	*10*	*11-Aug*	