Foliar applied insecticide control of the Soybean Aphid (Aphis glycines).

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Summary
A soybean aphid insecticide efficacy trial was placed in a commercial soybean field near St. James, Watonwan County, MN. To rates of Asana XL, Baythroid, Lorsban 4E, Baythroid + Lorsban 4E, Mustang Max, Trimax and Warrior were evaluated. Additionally, Warrior was evaluated in combination with an anti-drift agent, non-ionic surfactant. The aphid population at this site began to increase relatively late (R4) and applications were made August 11, 2004 to R4.5 soybeans at 383 aphids/plant. The untreated plots accumulated over 3700 aphid days but populations remained below 300 aphids/plant for the duration of the trial. Yield differences between treatments were not observed. Lorsban 4E applications experienced the most rapid aphid decline. Pyrethroids required 6-14 days to reduce populations below those in plots not treated with insecticide. At 14 DAT, the treatments containing Lorsban 4E and Warrior had lower aphid populations. The 2.8 oz rate of Mustang Max and both Trimax treatment rates performed similarly to untreated. Other products were intermediate in performance. The addition of adjuvants did not affect performance of Warrior and the 2 oz rate of that product performed similarly to the 3.2 oz rate.

These data suggest that low rates of insecticide may not provide adequate control of soybean aphid and that soybean can tolerate a moderate aphid infestation without yield loss.

Background and rational
The soybean aphid (SBA) is a relatively new pest of Minnesota soybeans. It was first identified during the late summer of 2000 in SE MN. SBA subsequently spread throughout the soybean growing areas of MN during the 2001 growing season with localized yield limiting populations in 2002. During the 2003 growing season, this insect required treatment over most of the soybean producing areas of Minnesota. While most products performed well during the 2003 outbreaks, occasional poor performance was reported. It was hypothesized that these problems were related to high temperatures at application and/or the speed at which quickly mortality occurred.

This trial was designed to look at aphid control and resultant yield differences between insecticide products and rates. Based on results of previous studies, the products in this trial represent a range in rapidity (knockdown) and duration of soybean aphid control but not all labeled products or rates. Additionally, an anti-drift (InterLock) and a non-ionic surfactant (Preference) adjuvant were evaluated for their effect on aphid control. In the case of Asana XL, both rates were on the low side of rate structure with the 6.4 fl. oz./acre in common use for soybean aphid. In the case of Baythroid, the 2 fl. oz./acre rate was included as a comparison of control with the the addition of ½ pt./acre of
Lorsban 4E to a low rate of Baythroid. Trimax is a nicotinoid insecticide included in this trial to test foliar efficacy of this insecticide class. Trimax is not labeled on soybean.

**Site and application information**

Cooperators: Paul Torkelson, Steve Sodeman
County: Watonwan, MN
Nearest town: St. James, MN
Soil type: Loamy fine sands and fine sandy loams
Fertility: By necessity, this trial was placed into variable soil conditions including Litchfield loamy fine sands and Darfur fine sandy loams with the respective soil test values of: pH of 5.5 and 7.7, % O.M of 2.2 and 3.7, Phosphorus (Olsen test) of 15 and 32 ppm, and Potassium of 118 and 153 ppm. Blocks were arranged to account for this soil variability but soil type differences are reflected in the relatively high C.V. values for yield.

Tillage: Ridge-till
Cultivar: Pioneer 92B12 (SCN resistant)
Weed control: Burndown - Glyphosate + 2,4-D
Post I – Select + Flexstar+ Harmony (Broadcast)
Post II= Pursuit + Flexstar (10 inch Band)
Row spacing: 30”
Planting date: May 5, 2003
Design: Randomized complete block with 4 replications
Plot size: 15’ x 30’ (the center 4 of 6 rows (10’) were treated, the center 2 of 6 rows were sampled for aphid populations and harvested for yield.

Application date: August 11, 2004
Temperature: 52 F RH: 61.5%
Wind conditions: 0-6.6 mph
Crop stage at application: V13/R4.5 stage soybeans
Crop height at application: 28 inches
Harvested October 5, 2004

Insecticide treatments were applied with a Tractor mounted offset boom sprayer (R&D Sprayers), 8002XR flat fan nozzles on 18-inch spacing, 23 gallons/acre and 35 PSI pressure.

Early season soil moisture was low. Unlike much of southern Minnesota, this site received only moderate early season rainfall. Soybeans were beginning to exhibit moisture stress at the time of insecticide application. These symptoms decreased after late season rainfall. Additionally, the month of August was cooler than average. Southwest Minnesota soybean aphid populations were low during the 2004-growing season.

**Results and discussion**

The design of this experiment should have favored soybean aphid re-colonization of treated plots from untreated rows on either side. This was one of very few southwest Minnesota fields with soybean aphids of any significance in 2004. The soybean aphid
infestation at this location was probably locally produced and the north side of this study site consisted of a grove containing buckthorn. Aphid populations had been slowly increasing in the trial site.

Aphid populations at the time insecticides were applied were barely at treatment threshold levels and approximately 282 aphids/plant relatively uniformly distributed across the trial area. Alatoid nymphs were observed at the time of insecticide application. Similar to observations at some sites in previous years, populations declined at R 4.5 due to the production of alate aphids. After 2 days after treatment (DAT) populations remained stable until R6 when populations collapsed due primarily to emigration of aphids from maturing soybean plants. Population loss from emigration was greater and population rebound was less in replications to the north side of the trial. This may have been to greater moisture stress and poorer plant health. Increasingly variable (plant to plant and replication to replication) aphid populations are reflected in extremely high c.v. values.

Aphid control and yield results are presented in Table 1.

At 2 days after treatment (2 DAT), only the 1 and 2 pt./acre Lorsban 4E treatments had fewer aphids than untreated plots.

By 6 DAT after treatment all treatments containing Warrior, Lorsban 4E (1,2 and ½ pt./acre Lorsban 4E+ 2 oz. Baythroid), and the 2.8 fl. oz./acre rate of Baythroid had fewer aphids than other treatments. The untreated check, 2 fl.oz/acre rate of Baythroid, 2.8 fl. os./acre rate of Mustang Max, 5.8 and 6.4 fl. oz/acre rate of Asana XL, and the 1 and 1.5 fl. oz./acre rate of Trimax rate had the greatest numbers of aphids. This lack of aphid control was probably not just due to slow kill because new nymphs were observed in lesser performing treatments. Additionally, unlike previous studies in SW Minnesota, this trial was conducted under cool conditions and would not explain the very slow reduction in aphid populations with several of the pyrethroid treatments (Asana XL, Mustang Max).

The relative performance of treatments remained constant through 14 DAT after treatment. Treatments containing Warrior and Lorsban had the fewest aphids. Both Trimax rates, the 2.8 fl. oz./acre rate of Mustang Max, and untreated check had the greatest number of aphids. The Asana XL, Baythroid and 4 fl oz./acre Mustang Max rate treatments were intermediate in soybean aphid control.

Rate response within products not as pronounced as 2002 and 2003 but due to collapse of the aphid populations control ratings base 14 DAT were not possible. Significant soybean aphid population rebound was not observed for any treatment during the limited duration of this trial (14 DAT) and development of the infestation relatively late season in the growing season.

No difference in control from the 2 fl. oz./acre rate of Warrior with or without adjuvants occurred, nor was the 2 oz. rate less effective than the 3.2 fl. oz/acre rate. The reason (environmental, greater tolerance) for the slower and relatively lower performance of some of the pyrethroids is unclear.
No differences in end of season soybean plant development (height, nodes, pods) were observed (data not shown). Slightly earlier maturity was observed in some but not all Lorsban 4E treated plots. This was not reflected in yield.

At the time of population collapse 22 DAT, the untreated checks had accumulated more than 3700 aphid days. However populations/plant did not exceed 300 aphids/plant in the check or any treatments and the lack of yield response to aphid control is not surprising.

Acknowledgments:
Many thanks to, Mark Anderson and Mellisa Olsem, Phil Price, for aphid counting assistance. Yield data would not have been possible without the intrepid SWROC mobile plot spraying and combining crew of Steve Quiring, Jeff Irlbeck and Mark Colter.

Asana® XL
® Registered trademark of E.I. du Pont de Nemours and Company

Baythroid®
® Registered trademark of Bayer Crop Science

Lorsban® 4E
® Registered trademark of Dow AgroSciences, LLC

InterLock™
Agrilliance LLC

Mustang Max™
FMC Corporation

Preference®
Registered trademark of Agrilliance LLC

Trimax™ *
Bayer Crop Science and is not currently labeled on Soybean

Warrior®
® Registered trademark of Syngenta Crop Protection, Inc.

*not labeled on soybean

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Table 1. Foliar applied insecticide control of Soybean Aphid.
Paul Torkelson farm, St. James, MN.

<table>
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<tr>
<th>Date</th>
<th>Crop Stage</th>
<th>Estimated Aphids/plant</th>
<th>Estimated Aphids/plant</th>
<th>Estimated Aphids/plant</th>
<th>Estimated Aphids/plant</th>
<th>Estimated Aphids/plant</th>
<th>Estimated Aphids/plant</th>
<th>YIELD (bu/a) at 13% moisture</th>
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<tr>
<td>8/6/2004</td>
<td>V12/R4</td>
<td>112.3</td>
<td>282.3</td>
<td>144.6 ab</td>
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Means followed by the same letter do not significantly differ (P=0.05, Duncan's New MRT)
Mean comparisons performed only when AOV treatment P(F) is significant at mean comparison OSL
Mean separations for aphids/plant estimates are based on Log transformed data
Insecticide application 8/11/04 with 23 GPA and 35 PSI