SOYBEAN APHID CONTROL REPORT
SAGINAW VALLEY BEAN AND BEET FARM
2005 FIELD SEASON

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The soybean aphid (SBA) continued to be a problem in 2005 with an estimated 85% of the soybean acres in Michigan sprayed with insecticide. Four research trials were performed at the Bean and Beet farm in 2005 to improve understanding and support what was previously learned about SBA, from timing of insecticide application to efficacy of products, to looking at the impact of foliar fertilizer under heavy aphid pressure. An experiment called the "IPM Comparison" aimed at contrasting current and best IPM practices for soybean aphid. The research strongly supported the recommendations by the entomologists in the mid-west of the economic threshold of (250 SBA) per plant and the economic injury level of 1,000 SBA per plant as the point at which economic yield loss is probably occurring. This research was very important for extension, providing important information for growers on the best current knowledge of how to scout for SBA as well as, how and when best to control SBA in order to prevent a significant yield loss.

Ramp Trial:
The Ramp "IPM Comparison" trial had six treatments consisting of an untreated control, a prophylactic treatment (PRO) (sprayed with a treatment of Warrior and Headline for preventative control) at late R2 plant stage, in case soybean Rust arrived, a BMP (Best Management Practice) treatment (sprayed with Warrior when aphids reached an average of 250 per plant, a Cruiser seed treatment to evaluate the seasonal protection of Cruiser, as well as half of each Cruiser plot sprayed with Warrior when the SBA reached an average of 250 aphids per plant. SBA numbers were counted weekly on at least five plants per plot. These numbers were used to calculate 'aphid days' based on the cumulative number of aphids per plant per day though out the season. Aphids reached an average of around 17,000 aphids per plant with a high of 30,000 aphids per plant by August 4. SBA crossed the recommended threshold of 250 SBA per plant on July 13, which happened to coincide with the late R2 plant stage when the PRO treatment was sprayed. The Cruiser treated plots also had over 250 aphids per plant by July 13, so all three treatments were sprayed with Warrior (3.2 oz per acre) on this day. The PRO treatment had Headline (6.2 oz per acre) tank-mixed with the Warrior.

Table 1: The average number of SBA / plant for each treatment on a given date.

	# SBA / Plant								
	June	**July**				**August**			
Treatment	29	6	13	21	28	4	11	18	24
BMP	1 a	1 b	591 a	1 b	87 b	350 b	1,167 bc	412 a	748 a
Cruis trt	2 a	1 b	403 b	1 b	146 b	211 c	352 c	49 b	386 b
Cruis unt	2 a	1 b	403 b	1,297 a	4,415 a	11,048 a	3195 ab	285 a	21 bc
Pro	2 a	1 b	568 a	5 b	120 b	452 b	877 c	435 a	1,203 a
Unt	2 a	2 a	557 a	1,992 a	6,762 a	16,472 a	5,726 a	278 a	8 c

*Treatments followed by the same letter were not significantly different.

Table 2: The cumulative number of aphid-days over the entire season for each treatment.

Treatment	Cumulative aphid-days
Untreated	759,515 a
Cruiser Untreated	497,117 b
Prophylactic	39,781 c
Best Management Practice	39,157 c
Cruiser + Warrior	19,437 c

*Treatments followed by the same letter were not significantly different.

The above table strongly emphasizes the aphid pressure throughout the season in the different treatments, the greater the cumulative aphid days, the greater the number of aphids over a longer length of time. Aphid-days are calculated by the cumulative effect of the average number of aphids per plant per day over the entire growing season. Plots treated with Warrior (BMP, PRO, CRU TRT) had significantly fewer aphid-days than untreated or Cruiser-treated plots.

Table 3: The mean yield of each treatment at harvest.

Treatment	Yield bushels per acre
Untreated	17.3 d
BMP	37.3 b
Insurance treatment	37.6 b
Cruiser	30.1 c
Cruiser + Warrior	50.4 a

* Yields followed by the same letter were not significantly different.

The Cruiser seed treatment was cost effective, providing a gain of 13 bushels over the untreated. A single, well timed application of insecticide, at around 250 aphids per plant provided a 20 bushel gain over the untreated. There was no significant increase in yield with the addition of Headline fungicide. The addition of Warrior to the Cruiser treatment provided a 33 bushel gain over the untreated plots. A single, well timed application of Warrior performed significantly better than the Cruiser seed treatment.

Timing Trial:
A timing trial was established to determine the optimum time to spray Warrior insecticide for SBA control. The timing trial consisted of ten treatments; one treatment sprayed each week for SBA, as well as a treated check sprayed multiple times during the season, and an untreated check. SBA on five plants per plot were counted weekly for a minimum of; the treated check, the untreated check, the treatment sprayed the previous week, and the treatment to be sprayed the day of counting.

Table 4: The average # SBA/ plant for each weekly count are shown across the table. The treatment dates are listed down- each one showing the date of Warrior application. The treated check had multiple applications of Warrior.

	Date SBA were counted							
	July				**August**			
Treatment date	6	13	21	28	4	11	18	24
Untreated	278	1003 a	2494 a	7203 a	11006 a	3675 a	512 a	580 a
Treated check		3 c	0 c	106 c	3 c	4 b	0 b	0 a
6 July	278	2 c	3 c	130 c				
13 July		493 b	0 c	60 c				
21 July			1311 b	53 c				
28 July				4344 b	3588 bc			
4 August					9943 ab	296 b		
11 August						4148 a	158 b	
18 August							440 a	15 a
24 August								554 a

*Note: Treatments were counted for aphids only the same day they were sprayed and the following week after warrior application. The treated and untreated checks were counted every week. The untreated check may be used as a reference to how high the aphid numbers may have gotten before the treatment date.

**Average counts per plant followed by the same letter were not significantly different.

The untreated check had numbers reaching an average of over 11,000 SBA per plant. The economic threshold of 250 SBA per plant was crossed on July 13. The yield was not significantly different in the July 13 spray treatment from the treated check which was sprayed multiple times. The optimum time to spray as shown by this trial was when the SBA numbers crossed the recommended economic threshold of 250 aphids per plant. If Warrior application was delayed for two weeks after the economic threshold was crossed, there was significant yield loss due to the increased number of aphids.

Table 5: The mean yield of each treatment at harvest.

Treatment	Yield bushels per acre	Significance
Treated check	61.0	a
July 13	56.5	a
July 6	55.5	ab
July 21	54.5	ab
July 28	49.6	b
August 24	42.2	c
August 4	40.5	cd
Untreated	37.3	cde
August 11	35.1	de
August 18	30.7	e

*Yields followed by the same letter were not significantly different.

Efficacy Trial:

An efficacy trial with seven different products as well as an untreated check was evaluated for performance of insecticide control of SBA. All products were applied based on the recommended economic threshold, when the average SBA number passed 250 per plant (July 14). The products were sprayed at 40 psi with a rate of 23.8 gallons per acre. Although there were significant differences in the residual control among the different products (SBA numbers climbed somewhat faster following some treatments than others), all products provided a significantly higher yield than the untreated. There were no significant differences in yield between any of the products, indicating the importance of optimal timing of insecticide application, rather than the specific product used.

Table 6: The yield of soybeans sprayed with different insecticide treatments for SBA control.

Product	Rate per acre	Yield, bu/a
Proaxis	3.2 oz	52.8 a
Warrior	3.2 oz	52.7 a
Asana XL	6.4 oz	52.6 a
Baythroid + Lorsban	2 oz + 8 oz	50.8 ab
Baythroid 2E	2.8 oz	50.5 ab
Lorsban 4E	1 pint	49.7 ab
Orthene	1 lb	49.0 ab
Untreated	--	38.9 c

*Data analyzed and separated using ANOVA and lsd [F=3.4, p = 0.005]

* Treatments followed by the same letter were not significantly different

***Note:** Foliar sprays were applied 14 July. Backpack sprayer – 24 GPA, 40 psi, twinjet nozzles

Table 7: The average number of SBA per plant following a certain number of days after treatment (DAT) of insecticide application.

		SBA Counts*, # per plant (plant stage)			
Product	**Rate/ acre**	**4 DAT (R2-4)**	**7 DAT (R3-4)**	**14 DAT (R4)**	**21 DAT (R4)**
Untreated	--	1636 a	907 a	1977 a	2813 a
Orthene	1 lb	42 bc	85 b	70 bc	373 bc
Asana XL	6.4 oz	89 bc	7 bc	29 bcd	170 c-f
Baythroid 2E	2.8 oz	36 bcd	2 c	20 bcd	177 c-f
Proaxis	3.2 oz	3 fg	0 c	21 cd	126 def
Warrior	3.2 oz	1 fg	0 c	18 cd	234 b-e
Baythroid + Lorsban	2 oz + 8 oz	0.5 fg	0.6 c	55 bcd	225 b-e
Lorsban 4E	1 pint	0 g	0.6 c	67 bc	282 bcd

* Data analyzed and separated using ANOVA and lsd: 4 DAT[F=14.9; p< 0.001], 7 DAT [F= 6.2; p< 0.001], 14 DAT [F=7.2; p< 0.001], 21 DAT [F = 8.7, p< 0.001]. SBA counts were log- or log+1 transformed.

Foliar Feed Trial:

The Foliar Feeding experiment was done to look at the effect of applying a foliar fertilizer to plots both with and without aphids. There were four treatments replicated four times.

Treatments (Rate/Acre)

- None, no SBA or feeding (Warrior, 3.2 oz / acre) 'None'
- Soybean aphid only (FF, 2 qts /acre) 'SBA'
- Foliar Feeding only (Warrior, 3.2 oz / acre) 'FF'
- Soybean aphid and foliar feeding (Warrior, 3.2 oz and FF, 2qts/acre) 'FFSBA'

The liquid fertilizer contained the following: Total nitrogen (10%), phosphorous & potassium (10%), boron & iron (0.1%), manganese & zinc (0.05%) and molybdenum (0.0006%).

The foliar fertilizer was applied at a rate of 2 quarts per acre at the R3 and R5 plant stages, according to label instructions. Warrior was applied to the 'None' and 'FF' treatments to keep them aphid-free. Seven days after each fertilizer application, a 30-leaf sample was collected from each plot. Leaves from each plot were bulked, washed with water and potassium-free soap, dried in an oven. Leaf samples were sent to A&L Great lakes Laboratory, Fort Wayne, IN, for analysis. Only N and K levels are reported here, since these nutrients are linked to aphid growth and reproduction (N positively, K negatively). Plots were harvested for yield on September 30.

BEAN & BEET	No Soybean aphid (Warrior treated)		Soybean aphid (no insecticide)	
	No FF	FF	No FF	FF
# SBA/plant, 3 DAT at R3	0 b	0 b	943 a	848 a
# SBA/plant, 5 DAT at R5	0 b	0 b	292 a	494 a
Yield, bu/a	56 a	56 a	34 c	39 b
%N, R3 stage	6.10 a	6.16 a	5.84 b	5.98 ab
%N, R5 stage	4.77	4.79	4.58	4.63
%K, R3 stage	2.04 ab	2.09 a	1.82 c	1.86 bc
%K, R5 stage	1.31	1.30	1.25	1.27

SBA number per plant was significantly lower, and yield was significantly greater, in plots treated with Warrior. In plots with heavy aphid pressure, yield averaged 5 bu more in fertilized plots. When plots were fertilized at R3 stag, plots with heavy aphid pressure had significantly lower % N and % K than treated plots. However, there were no significant differences between fertilized and unfertilized pairs. When plots were fertilized at the R5 stage, no significant difference in %N and % K were detected.

Conclusions:

Applying insecticide at the optimum time is more important than the product used. If SBA numbers cross 250 SBA per plant (the economic threshold) and the numbers are climbing, an insecticide application is probably warranted. The idea is to spray SBA before their numbers reach the economic injury level of 1,000 SBA per plant. Although Cruiser seed treatment suppressed SBA numbers early in the season, it did not provide adequate season-long protection. Headline fungicide did not provide a significant yield increase in this trial where no rust was present. Although, the addition of a foliar fertilizer created a significant increase in yield under heavy SBA pressure, the foliar feed did not increase yield when SBA was controlled with a timely application of insecticide. Ultimately, a timely application of insecticide for SBA control will prevent yield loss more than the addition of a foliar fertilizer at the R3 and R5 plant stages.

This past year was a very good year for SBA Research at the Saginaw Valley Bean and Beet farm. The Bean and Beet farm has been a prime location for SBA research, with SBA pressure often far surpassing other locations in Michigan. Paul Horny and Dennis Fleischmann did a superb job of managing the research farm. They provided many acres of well-managed acres of soybeans, and were of great assistance in making sure the research ran smoothly and properly.