



*Trial: 2008-SBAfoliar* © 2009 Regents of the University of Minnesota. All rights reserved.

## **Foliar applied insecticide control of the Soybean Aphid**

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### **Summary**

During 2008, insecticide performance against the soybean aphid (SBA) was evaluated at the University of Minnesota Southwest Research and Outreach Center near Lamberton, MN. Two timings of Leverage, two rates of Centric, Endigo and Warrior II and a single rate of Discipline 2EC, Baythroid XL, Cobalt, Baythroid XL + Lorsban 4E, Hero and Lorsban Advanced insecticides and untreated control were evaluated in a randomized block design with four replications. Similar to many commercial soybean fields, this site had several localized spots with very heavy SBA density before a SBA dispersal event in early August. The first application of Leverage was applied July 16 to R2 stage soybeans and < 40 aphids/plant. 14 days later, the second Leverage application and all other insecticide applications were made to R3 stage soybeans on July 30 to SBA populations well above economic threshold.

Throughout the trial, the two untreated controls were similar and had higher numbers of SBA/plant than all insecticide treatments. By July 29, the early application had fewer aphids than untreated plots. During August 3-7, because of dispersal of alates from the trial, all treatments, including controls, had greatly reduced SBA populations. By 4 DAT, both rates of Centric had more SBA/plant than the best performing insecticides and remained so for the duration of trial. By 18 DAT, the early Leverage application had more SBA/plant than the best performing insecticides and remained so. By 8 DAT, Lorsban Advanced had been re-colonized. By 20 DAT, Discipline 2EC, Baythroid XL, Hero, both rates of Warrior II and both rates of Endigo had the fewest SBA/plant. The two controls were not significantly different throughout the length of this trial. Yield was related to SBA population density on August 19.

These data reinforce the risk associated with below economic threshold, early insecticide applications or with poor initial SBA control. They demonstrate that products with little residual, although initially effective, can be rapidly colonized by immigrant SBA. Finally, they show that late season SBA pressure can reduce yield.

### **Background and rationale**

The soybean aphid (SBA) is the most damaging insect 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 the exception of 2004, Southwest Minnesota has had yield reducing populations of SBA every years since 2003 growing season, with 2003 and 2008 being the most widespread and severe. While most products have performed adequately, poor performance has been occasionally reported.

This trial was designed to look at aphid control and resultant yield differences between insecticide products and rates and for a single case, timing. Based on

previous studies, the products in this trial represent a range in speed and duration of soybean aphid control.

## **Methods**

This trial was located at the University of Minnesota, Southwest Research and Outreach Center, Lamberton, MN. Site, experimental design, treatments, and application methods are presented in Table 1. The growing season was characterized by late planting, moderate temperatures and moisture stress during seed fill. <http://swroc.cfans.umn.edu/Weather/weather.htm>. The lack of hot, humid weather during and after application should have maximized residual performance of pyrethroid class insecticides.

The trial was placed within an existing field of Asgrow 2002 soybeans planted May 22 with a six row, 30 inch planter (John Deere 7200 Max Emerge II).

Similar to local 2008 commercial fields, the trial site was characterized by early season aphid populations that were highly aggregated. Generally low aphid/plant populations were interspersed with numerous small areas with very heavy aphid density. Late season aphid populations were high and high numbers of alate (winged ) SBA were available to re-infest this trial (and commercial soybean fields) after treatment.

Insecticides and timings were evaluated in a randomized block design with four replications. Two untreated control plots were included within each replication to detect and if need be correct for non uniform aphid populations associated with the large size of this trial. Insecticide applications were made using an offset boom sprayer (R& D Sprayers, Opelousas, LA.) modified to run on compressed air. The design of this experiment should have favored soybean aphid re-colonization of treated plots from untreated rows on either side of the four treated rows.

3.8 fl. oz. of Leverage 2.7SE with a non-ionic surfactant (Induce) at 0.125% V/V were applied on July 16 to R2 stage soybean and on July 30 to R2 stage soybean. Centric 40WG at 1.5 and 2.0 oz., Endigo 2.06 ZC at 2.05 and 2.75 fl. oz., Warrior II at 1.28 and 1.6 fl. oz, Discipline 2EC at 5.12 fl. oz., Baythroid XL at 2.4 fl. oz., Baythroid XL at 2.0 fl. oz. plus Lorsban 4E at 8.0 fl. oz, Cobalt at 1.5 fl. oz., Hero at 5 fl. oz. and Lorsban Advanced at 16 fl. oz. were applied on July 30. The July 16 application of Leverage was applied to < 40 aphids/plant and R2 stage soybean. The July 30 treatments were applied to an average of > 850 soybean aphids/plant and R3 stage soybeans. Aphid populations at a given sample period were assessed as aphids / whole plant and based on a sample of five plants for each plot.

Yields were taken from the center two rows of each plot using an Almaco plot combine and adjusted to 13 % moisture.

**Table 1. Site and application information**

County:	Redwood, MN	
Nearest town:	Lamberton, MN	
Soil type:	Normania loam	
Fertility:	Soil test values (2006)	
	31 ppm P	
	163 ppm K	
	6.1 pH	
	4.1 % O.M.	
Previous Crop:	2006 Soybean, 2007 Corn	
Tillage:	Fall 2007 Disk Chisel Spring 2008 Field cultivator 1X	
Row spacing:	30"	
Cultivar:	Asgrow 2002	
Seeding rate:	165,000 seeds/acre planted 1.5" deep into a fair seedbed	
Planting date:	May 22, 2008	
Weed control:	Pre Prowl H20 2.5 pts 5/22	
	Post I Cornerstone Plus 32 fl oz 6/30/08	
	Post II Cornerstone Plus 32 fl oz 7/14.08	
Harvested :	October 11, 2008	
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:	I	II
Date:	July 16, 2008	July 31, 2008
Temperature:	78 F	78F – 84F
RH	58%	79 – 62%
DP	68.6 F	68.7 F
Wind conditions:	0-4 mph	0-5
Crop stage at application:	R2	R3
Crop height at application:	30 inches	34 Inches
Insecticide treatments were applied with a Tractor mounted offset boom sprayer (R&D Sprayers), 8002XR flat fan nozzles on 15-inch spacing, 20 gallons/acre and 40 PSI pressure with boom 18" above soybean canopy.		

**Results and discussion**

Aphid control and yield results are presented in Table 2 and Figures 1-3. On July 29, 13 days after treatment (13DAT) the early (July 16) Leverage application had fewer aphids than untreated plots. Throughout the trial, the two untreated controls were similar and had higher numbers of SBA/plant than all insecticide treatments. From August 3 – 7, all treatments, including untreated controls, had greatly reduced populations because of dispersal of alates from the trial. However, the extreme variability associated with aphid emigration makes means separation for treatment differences tentative at these dates. The early Leverage (18 DAT) application and both Centric rates (4 DAT) had higher aphid populations than other insecticide treatments on August 3. By August 7, the early Leverage (22 DAT) application and Lorsban Advanced (8DAT) treatments were being re-colonized. On August 12, the early (27DAT) Leverage treatment,

and both Centric rates (13DAT) and Lorsban Advanced (13DAT) had more SBA than other insecticide treatments. Treatments containing a higher rate of pyrethroid (both Warrior II rates, both rates of Endigo, Discipline 2EC, Baythroid XL alone and Hero) had the fewest aphids. This continued until the last sample date on August 19. Combination treatments with a lower per acre rate of pyrethroid (Cobalt, Baythroid XL plus Lorsban 4E) had late season SBA resurgence. After this time, although individual plots were not sampled, aphid populations continued to double in plots with poorer performing insecticides for another week and then gradually declined with some SBA remaining until leaf loss.

Although the early Leverage application accumulated less aphid days than the later treatment, it yielded less (Figure 2). Yield differences are related to Cumulative aphid days (CAD) but particularly to late season aphid populations. The August 19 sample date was predictive of yield (Figure 3). Based on CAD, it may be inferred from these data that yield loss from SBA in insecticide treated plots occurred after August 19.

### **Acknowledgments**

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Baythroid® XL  
Registered trademark of Bayer Crop Science

Centric™ 40WG  
Registered trademark of Syngenta Crop Protection, Inc.

Cobalt™  
Registered trademark of Dow AgroSciences LLC

Discipline™ 2EC\*  
Amvac Chemical Corporation Corporation

Endigo™ 2.06ZC  
Registered trademark of Syngenta Crop Protection, Inc.

Hero®  
FMC Corporation

Lorsban® 4E  
Registered trademark of Dow AgroSciences LLC

Lorsban® Advanced  
Registered trademark of Dow AgroSciences LLC

Warrior II with Zeon Technology®  
Registered trademark of Syngenta Crop Protection, Inc.

\*not labeled on soybean

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**Table 2. Foliar applied insecticide control of soybean aphid.**  
**DAT are days after treatment from July 16 (treatment 12) and July 30 (all other insecticide treatments).**  
**Cumulative aphid days are not representative of yield loss since aphid pressure continued after 8/19**  
**U of M Southwest Research and Outreach Center, Lamberton, MN Potter and Irlbeck (2008).**

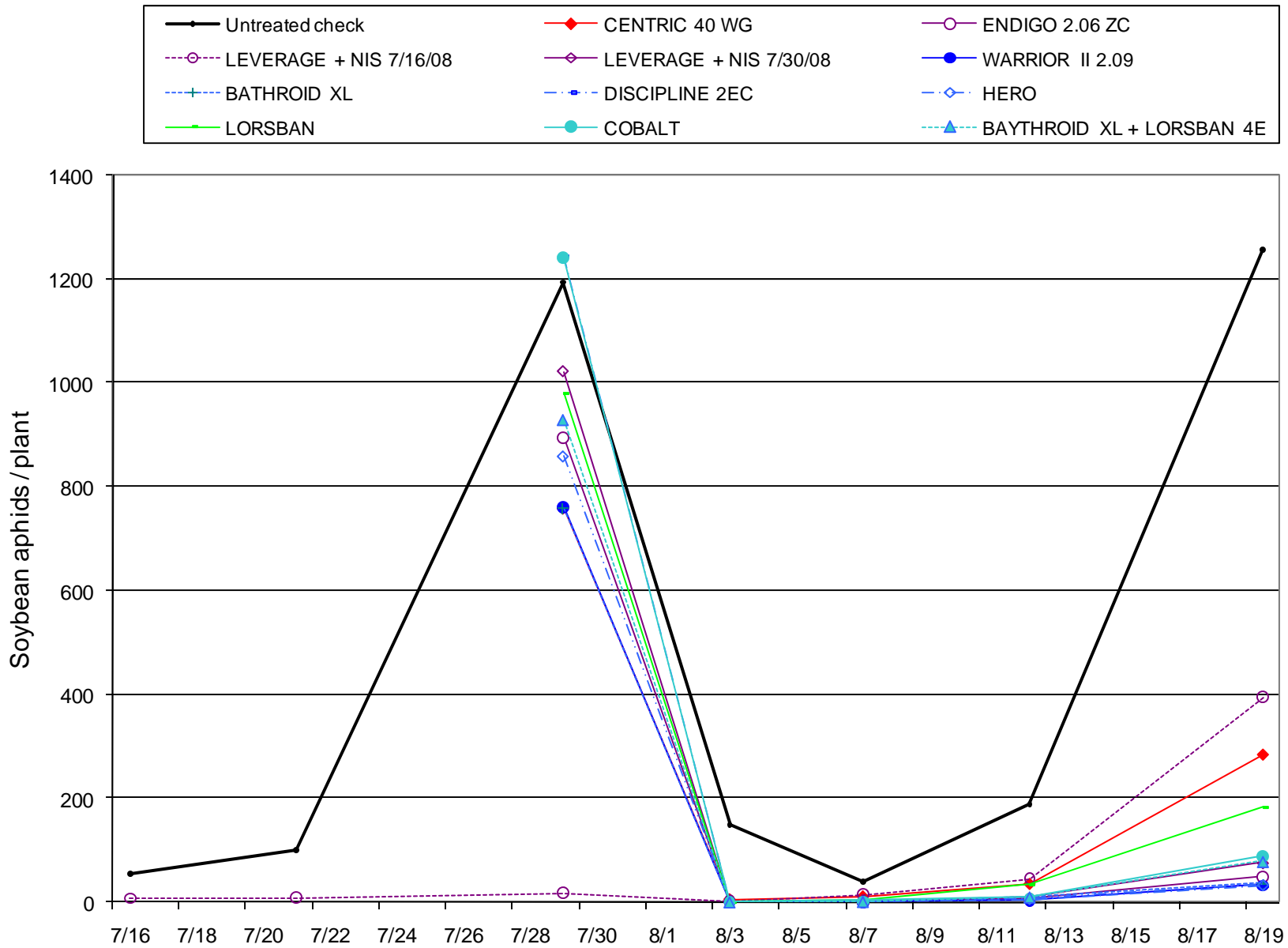
Product	Rate	Application Date	YIELD Bu/Acre 10/11/2008	SBA /plant 7/16/2008 0DAT(12)	SBA /plant 7/21/2008 5DAT(12)	SBA /plant 7/29/2008 13 DAT(12) 0DAT	SBA /plant 8/3/2009 18DAT(12) 4DAT	SBA /plant 8/7/2009 22DAT(12) 8DAT	SBA /plant 8/12/2008 27DAT(12) 13DAT	SBA /plant 8/19/2008 34DAT(12) 20DAT	Cumulative Aphid Days (CAD) 7/29/2008 to 8/19/2008
1 <b>Untreated check 1</b>			40.0 fg	11.5 a	21.7 a	516.6 a	120.9 a	33.6 a	146.1 a	1167.7 a	6459.2 ab
2 Centric 40 WG	1.5 oz wt/a	7/30/2008	44.4 de			758.1 a	5.2 b	10.8 bc	34.9 b	284.0 bc	3003.7 bc
3 Centric 40WG	2 oz wt/a	7/30/2008	44.1 def			526.9 a	2.3 bc	8.2 bc	29.8 bc	183.2 bc	2024.2 c
4 Endigo 2.06 ZC	2.05 fl oz/a	7/30/2008	48.3 a-d			896.6 a	0.2 de	0.8 ef	7.4 d-g	48.9 d-g	1689.6 c
5 Endigo 2.06 ZC	2.75 fl oz/a	7/30/2008	47.0 a-e			686.6 a	0.0 e	0.1 f	2.7 h	38.7 fg	1629.3 c
6 Warrior II 2.09	1.28 fl oz/a	7/30/2008	49.0 abc			721.1 a	0.0 e	0.6 f	2.7 fgh	32.8 efg	1991.9 c
7 Warrior II 2.09	1.6 fl oz/a	7/30/2008	49.9 ab			800.3 a	0.1 de	0.2 f	4.0 e-h	44.7 efg	2119.1 c
8 Cobalt	15 fl oz/a	7/30/2008	46.2 b-e			1241.9 a	0.1 de	2.1 de	7.8 cde	87.9 cd	2793.9 bc
9 Hero	5 fl oz/a	7/30/2008	50.5 a			859.2 a	0.1 de	0.6 ef	6.7 d-g	33.3 fg	1949.3 c
10 <b>Untreated check 2</b>			37.7 g	99.0 a	178.8 a	1873.8 a	174.8 a	44.1 a	231.5 a	1344.7 a	10396.6 a
11 Baythroid XL	2.4 fl oz/a	7/30/2008	46.0 b-e			758.6 a	0.0 e	0.5 ef	8.2 def	35.5 fg	1858.3 c
12 Levrage 2.7SE NIS (Induce)	3.8 fl oz/a 0.125 % v/v	7/16/2008 7/30/2008	43.2 ef	6.3 a	8.0 a	17.2 b	1.4 bcd	13.5 b	44.1 b	393.3 b	1606.0 c
13 Leverage 2.7SE NIS (Induce)	3.8 fl oz/a 0.125 % v/v	7/30/2008 7/30/2008	45.8 b-e			1021.6 a	0.2 de	1.1 ef	8.1 def	75.6 def	2846.2 bc
14 Lorsban Advanced	16 fl oz/a	7/30/2008	45.1 cde			980.9 a	0.6 cde	4.1 cd	33.0 b	182.2 bc	3124.9 bc
15 Discipline 2EC	5.12 fl oz/a	7/30/2008	47.2 a-e			1243.1 a	0.0 e	0.0 f	2.1 gh	29.4 g	1980.7 c
16 Baythroid XL Lorsban 4E	2 fl oz/a 8 fl oz/a	7/30/2008	45.5 cde			948.1 a	0.0 e	0.9 ef	9.5 cd	77.8 de	1777.3 c
LSD (P=.05)			4.275	0.850t	1.014t	0.479t	0.258t	0.249t	0.368t	0.374t	0.411t
Standard Deviation			2.991	0.491t	0.586t	0.335t	0.1810t	0.174t	0.257t	0.262t	0.288t
CV			6.56	70.65	52.84	12.66	57.82	41.59	26.06	13.88	8.46
Prob(F)			0.0001	0.4975 NS	0.2595 NS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0106
Grand Mean			45.6	38.9	69.4	868.2	19.1	7.56	36.2	253.8	3.4t
P(Bartlett's X2)			0.164	0.077	<b>0.033*</b>	0.082	<b>0.001*</b>	<b>0.002*</b>	0.12	0.196	0.155

Means followed by same letter do not significantly differ (P=.05, LSD)

t=Mean descriptions are reported in transformed data units (log), and are not de-transformed.

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

**Figure 1. Soybean aphid response to insecticide (higher rate shown where more than one rate was tested)  
University of Minnesota Southwest Research and Outreach Center, Lamberton, MN  
Potter and Irlbeck (2008)**



Untreated check=mean of untreated plots. Where more than one rate was included in trial the lower of the two rates is shown

Figure 2. Soybean aphid population and yield response to insecticide application timing

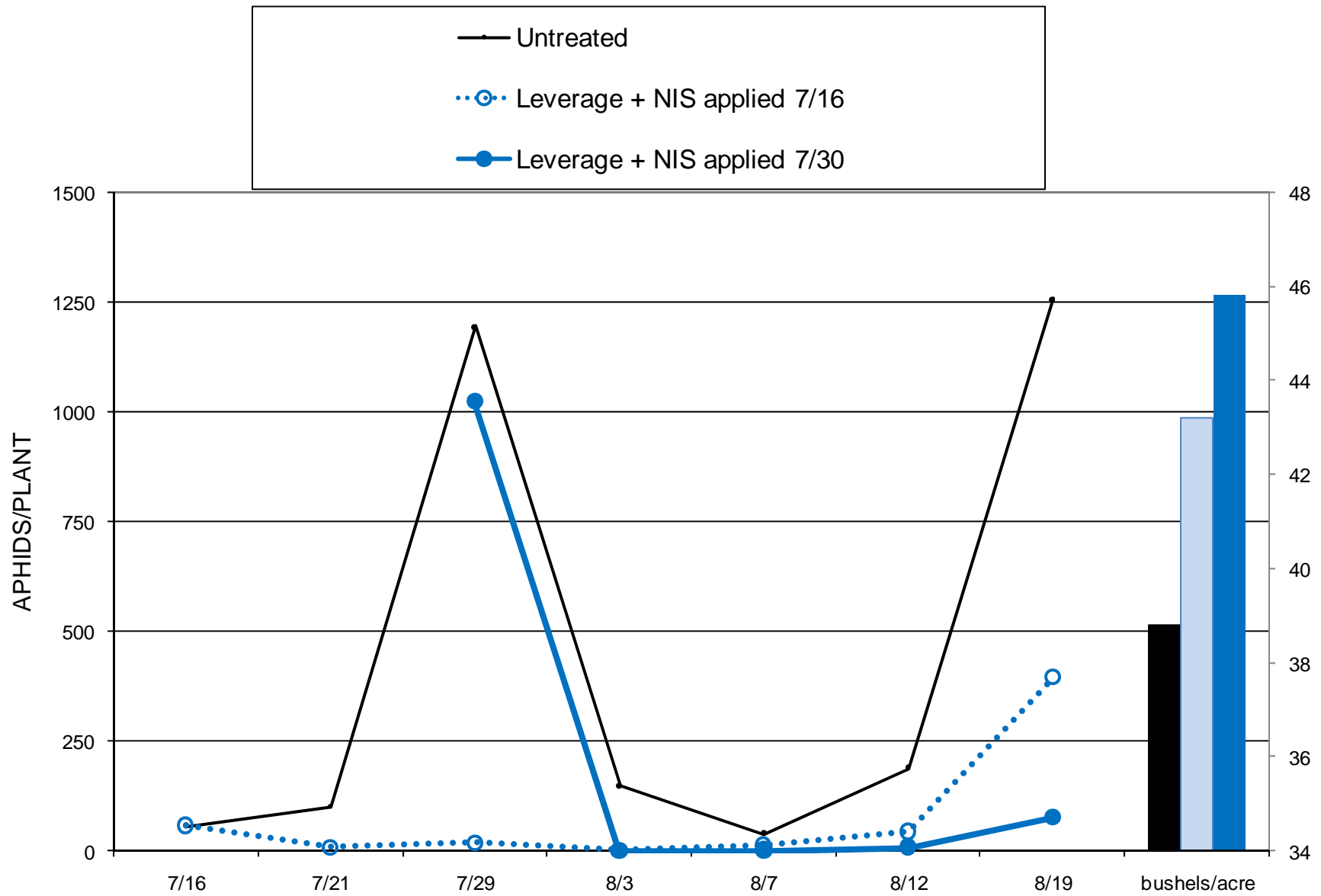


Figure 3.

