SECTION 7

Evaluation of resistant cultivars and seed-applied insecticides to control soybean aphids (*Aphis glycines*) in Illinois, 2007

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Location

We established two trials. One trial was located at the Agricultural Engineering Farm near Urbana (Champaign County). Due to low numbers of soybean aphids at this location, the data are not included in this report. The other trial was located at the David and Carol Cook Farm near Sterling/Rock Falls (Whiteside County). Funding for this experiment was provided by the Illinois Soybean Association and the North Central Soybean Research Program.

Experimental Design and Methods

The experimental design was a split-plot, randomized complete block with three replications. The plot size for each treatment was 10 ft (four rows) x 20 ft. The soybean cultivars with putative resistance to soybean aphids (LD05-16060, LD05-16529, and LD05-16611) and the aphid-susceptible isolines (SD01-76R, LD05-16519, and LD05-16621) were provided from the soybean breeding program at the University of Illinois. Half of the seed of each cultivar (three resistant and three susceptible cultivars) was treated (by Syngenta Crop Protection personnel) with Cruiser 5FS at 50 g a.i. per 100 kg of seed. The other half of the seed of each cultivar was not treated with a seed-applied insecticide. The soybean cultivar was the whole plot, and the seed treatments (with or without) were the subplots.

Other cultivars with putative resistance to soybean aphids were provided from the soybean breeding programs at Kansas State University, South Dakota State University, and Michigan State University. Although the data from the plots with these cultivars were included in the analyses, they are not included in this report.

Densities of soybean aphids were determined by counting the total number of aphids on three plants in each plot. Aphid densities were assessed on 15, 21, and 27 June, on 6, 13, and 23 July, on 1, 8, 15, 22, and 28 August, and on 5 September. Two rows of each plot were mechanically harvested on 11 October, and the weights were adjusted to bushels per acre (bu/A) at 13% moisture.

Planting Information

All plots were planted on 24 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds. Cruiser 5FS was applied to designated seed lots by Syngenta Crop Protection personnel.

Active ingredients for all chemical insecticides, except those with experimental numbers, are listed in Appendix II.

Agronomic Information

Agronomic information is listed in Table 7.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using SAS (Statistical Analysis System), version 9.1 (Copyright© 2003 SAS Institute, Cary, NC).

Results and Discussion

Densities of soybean aphids assessed on seven dates (15 June through 1 August) are presented in Table 7.2. Densities of soybean aphids assessed on five dates (8 August through 5 September) and yields (bu/A) are presented in Table 7.3.

Soybean aphids were either absent or at relatively low densities (<35 aphids per plant) through 23 July (Table 7.2). The

TABLE 7.1 • Agronomic information for efficacy trial of resistant cultivars and seed-applied insecticides to control soybean aphids, Sterling/Rock Falls, University of Illinois, 2007

Planting date	24 May
Row spacing	30 inches
Seeding rate	125,000/acre
Previous crop	Corn
Tillage	Spring—disk
Harvest date	11 October

densities of soybean aphids increased noticeably from 23 July to 1 August (Table 7.2), exceeding 100 aphids per plant in the susceptible cultivars LD05-16519 (with and without Cruiser), LD05-16621 (with and without Cruiser), and SD01-76R (without Cruiser) on 1 August. The numbers of aphids in the aforementioned plots were significantly greater than the numbers of aphids in almost all other plots, although the numbers in plots with SD01-76R without Cruiser were not significantly greater than the numbers in SD01-76R with Cruiser. The mean densities of soybean aphids on 1 August were significantly lower in the plots with aphid-resistant cultivars (both with and without Cruiser) than in plots with the aphid-susceptible isolines.

The numbers of soybean aphids in the trial increased noticeably again from 1 August to 8 August (tables 7.2 and 7.3). The densities of soybean aphids on 8 August exceeded 100 aphids per plant in all cultivars except the resistant cultivar LD05-16060 treated with Cruiser. The numbers of aphids in all plots with aphid-susceptible cultivars (with and without Cruiser) were greater than the economic threshold (250 aphids per plant) on 8 August (Table 7.3), with an average of approximately 555 aphids per plant over all six plots (aphid-susceptible cultivars with and without Cruiser). The mean densities of soybean aphids on 8 August were significantly lower in the plots with aphid-resistant cultivars (both with and without Cruiser) than in plots with the respective aphid-susceptible isolines (both with and without Cruiser).

Numbers of soybean aphids declined dramatically from 8 August through 15 August, with <20 aphids per plant in all plots. We were unable to determine the exact cause of the dramatic reductions in densities of soybean aphids from 8 August to 15 August, although evidence from nearby experiments suggested that predation by the insidious flower bug (*Orius insidiosus*) played a role. Other possible causes for the reduction in aphid densities may have been heavy rainfall and/or emigration of winged aphids away from the

TABLE 7.2 • Evaluation of resistant cultivars and seed-applied insecticides to control soybean aphids (densities of aphids on seven dates), Sterling/Rock Falls (Whiteside County), University of Illinois, 2007

Product	Resistant	Rate[3]	Rate unit[3]	Mean no. aphids per plant[1,2]						
				15 June	21 June	27 June	6 July	13 July	23 July	1 Aug
SD01-76R + Cruiser 5FS	No	50	g a.i./100 kg	0.00 a	0.00 a	0.00 b	0.00 b	0.22 cd	7.33 d–h	83.67 bc
LD05-16060 + Cruiser 5FS	Yes	50	g a.i./100 kg	0.00 a	0.00 a	0.00 b	0.00 b	0.00 d	1.44 hij	31.78 cd
LD05-16519 + Cruiser 5FS	No	50	g a.i./100 kg	0.00 a	0.00 a	0.00 b	0.00 b	1.78 bcd	11.89 cde	262.44 a
LD05-16529 + Cruiser 5FS	Yes	50	g a.i./100 kg	0.00 a	0.00 a	0.00 b	0.00 b	0.00 d	1.56 g–j	43.33 cd
LD05-16621 + Cruiser 5FS	No	50	g a.i./100 kg	0.00 a	0.00 a	0.00 b	0.00 b	0.44 bcd	11.22 bcd	247.89 a
LD05-16611 + Cruiser 5FS	Yes	50	g a.i./100 kg	0.00 a	0.00 a	0.00 b	0.00 b	0.44 bcd	0.78 hij	38.22 cd
SD01-76R	No	—	—	0.00 a	0.00 a	0.00 b	0.00 b	0.78 d	3.22 f–j	130.67 ab
LD05-16060	Yes	—	—	0.00 a	0.00 a	0.00 b	0.56 a	0.78 bcd	0.67 g–j	26.44 d
LD05-16519	No	—	—	0.00 a	0.00 a	3.56 a	0.00 b	8.00 a	30.00 a	289.78 a
LD05-16529	Yes	—	—	0.00 a	0.00 a	0.00 b	0.00 b	0.00 d	3.33 e–i	28.44 cd
LD05-16621	No	—	—	0.00 a	0.00 a	0.00 b	0.56 a	2.67 abc	32.00 ab	170.56 ab
LD05-16611	Yes	—	—	0.00 a	0.00 a	0.00 b	0.00 b	1.22 bcd	3.67 f–i	84.33 cd

[1] Means were derived from the numbers of soybean aphids on three plants in each plot in each replication. Means followed by the same letter do not differ significantly (P = 0.05, PROC GLM, SAS).
[2] Statistical analyses were conducted using a square root transformation; actual means are shown.
[3] Rates indicated are for Cruiser 5FS seed treatment.

plots. Densities of soybean aphids remained low in all plots for the duration of the experiment from 15 August through 5 September. Although there were significant differences in aphid densities among plots from 15 August through 5 September, the differences were not biologically significant.

When densities of soybean aphids in plots of a given cultivar without Cruiser were compared with densities of soybean aphids in plots of the same cultivar with Cruiser, some significant differences were observed. However, all of these differences occurred when numbers of aphids were fewer than 35 aphids per plant (before 1 August, Table 7.2; after 8 August, Table 7.3). None of these differences were observed on either date (1 or 8 August) when aphid densities were at economically threatening levels. However, cumulative aphid days (data not shown) (see Appendix I) revealed a trend for lower numbers of aphids in all cultivars treated with Cruiser than in cultivars without Cruiser, with the exception of LD05-16529 (resistant).

Yield data for the six cultivars (with and without Cruiser) are reported in Table 7.3. Yields ranged from 45.57 to 57.37 bu/A. There were no significant differences in yield between a given cultivar without Cruiser and the same cultivar with Cruiser. There were also no significant differences in yield between most resistant cultivars and their respective susceptible isolines both with and without Cruiser. However, the yield of LD05-16519 (susceptible) without Cruiser was significantly higher than the yield of LD05-16529 (resistant isoline) without Cruiser.

Some of the cultivars with putative resistance to soybean aphids show promise for future development. The impact of Cruiser on densities of aphids in both resistant and susceptible cultivars remains unclear and deserves further study.

TABLE 7.3 • Evaluation of resistant cultivars and seed-applied insecticides to control soybean aphids (densities of aphids on five dates; yields), Sterling/Rock Falls (Whiteside County), University of Illinois, 2007

Product	Resistant	Rate[3]	Rate unit[3]	Mean no. aphids per plant[1,2]					Mean yield (bu/acre)[4]
				8 Aug	15 Aug	22 Aug	28 Aug	5 Sep	11 Oct
SD01-76R + Cruiser 5FS	No	50	g a.i./100 kg	296.20 cde	1.33 cde	6.67 d–i	5.33 a–e	1.11 cde	57.01 ab
LD05-16060 + Cruiser 5FS	Yes	50	g a.i./100 kg	75.90 gh	1.89 b–e	1.11 i	1.56 efg	2.33 cde	53.56 bcd
LD05-16519 + Cruiser 5FS	No	50	g a.i./100 kg	751.00 ab	15.11 a–e	8.11 a–e	3.67 a–f	7.67 ab	54.28 bc
LD05-16529 + Cruiser 5FS	Yes	50	g a.i./100 kg	235.20 def	3.67 b–e	3.44 f–i	2.89 b–g	3.89 cd	48.23 cd
LD05-16621 + Cruiser 5FS	No	50	g a.i./100 kg	376.10 bcd	2.67 b–e	14.33 a	6.11 ab	1.44 cde	55.71 abc
LD05-16611 + Cruiser 5FS	Yes	50	g a.i./100 kg	113.20 fg	5.22 a–e	1.67 hi	3.33 b–g	0.22 de	50.51 bcd
SD01-76R	No	—	—	420.10 bc	5.78 abc	11.89 abc	4.22 abc	7.22 ab	51.61 bcd
LD05-16060	Yes	—	—	119.00 fg	4.00 a–e	2.11 f–i	3.00 a–e	2.00 cd	48.87 bcd
LD05-16519	No	—	—	939.70 ab	3.33 a–e	7.33 b–g	4.33 a–f	11.11 a	57.37 ab
LD05-16529	Yes	—	—	195.00 ef	12.44 ab	12.22 abc	5.33 a–d	13.78 ab	45.57 de
LD05-16621	No	—	—	544.30 b	6.89 a–d	12.56 ab	6.22 ab	9.44 a	54.39 bc
LD05-16611	Yes	—	—	152.90 ef	1.56 b–e	5.56 c–h	2.11 b–g	9.00 ab	52.80 bcd

[1] Means were derived from the numbers of soybean aphids on three plants in each plot in each replication. Means followed by the same letter do not differ significantly (P = 0.05, PROC GLM, SAS).
[2] Statistical analyses were conducted using a square root transformation; actual means are shown.
[3] Rates indicated are for Cruiser 5FS seed treatment.
[4] Soybeans were harvested from the center two rows of each plot, and weights were converted to bushels per acre (bu/A) at 13% moisture. Means followed by the same letter do not differ significantly (P = 0.05, PROC GLM, SAS).