

SOYBEAN: *Glycine max* L. ‘Pioneer 93B67’ and ‘Pioneer 93M12’

SEED TREATMENTS IN SOYBEAN, 2005

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Seedcorn maggot (SCM): *Delia platura*

Soybean aphid (SA): *Glycine max*

Bean leaf beetle (BLB): *Ceratoma trifurcata*

Various rates of Gaucho, Cruiser, and AGST 03001 were tested against soybean insects at the OARDC and the Northwest Agricultural Research Station near Wooster and Custar, OH, respectively, in four different studies. Tests were designed as a RCB with eight various insecticide/fungicide seed treatments and a single check plot, and 3 or 4 replications. Plot size was 4 rows by 100 ft at the OARDC and 8 rows by 75 ft at the Northwest Station. Cruiser and Gaucho were commercially applied while AGST 03001 was applied prior to planting to simulate a hopperbox treatment (it should be noted that this latter treatment was done in a bucket, and thus, good coverage was achieved). At both locations, one study was planted relatively early (early May) while a second plot was planted relatively late (early June). Soybean variety for both early plantings was Pioneer 93B67, while Pioneer 93M12 was for both late plantings. At the OARDC, alfalfa was plowed and disked on 5 May or 10 June, respectively, to enhance SCM populations. The first plowing on 5 May was done in early May as would normally be done. The second plowing occurred on 10 June after the majority of SCM flies had emerged from the first study. Soybeans were planted on 9 May and 13 June on 30-in rows. At the Northwest Station, fields were planted on 11 May and 1 June, respectively.

Stand counts were taken following emergence by counting the number of plants in 5-ft sections in four locations per plot. At the OARDC, SCM traps (1 x 3 ft) were placed throughout the plots to determine the relative size of the SCM population. The level of defoliation from overwintered adult BLB was documented in early June after BLB feeding ended. Aphid sampling began at both locations in July, when counts were made on 5 or 10 randomly chosen plants per plot on the number of soybean aphids present. Sampling ended in mid-August when the aphid populations began to crash, or when they reached the economic threshold (250 aphids per plant). Sweep net samples were also taken in each plot during this same time period (10 sweeps per sample per plot). Because of the large numbers of BLB in the late planting at the Northwest Station, pod injury data were also collected by counting the total number of pods per plant from 10 plants per plot along with the number of injured pods. The percentage of injured pods per plot was calculated. Harvest data were taken in October.

Because a seed treatment only offers protection for the seed and is not expected to control maggots in the surrounding area, no differences in SCM counts were expected and thus, no statistical analyses except for calculating the mean were conducted on that data. Soybean aphid data were transformed by $\log_{10}(x + 1.0)$ prior to analyses; pretransformed data are presented. There were no foliar insects consistently sampled in the plots at Wooster, thus no data are presented from this location. However, at the Northwest Station, BLB were in sufficient numbers in the late planting to warrant analyses. Data on percent pod injury were transformed by $\arcsin(\sqrt{x})$; pretransformed data are presented. All data were analyzed with ANOVA and means separated using LSD.

At Wooster, the average number of SCM that emerged was about 80 per trap for the first study and 120 for the second study. Out of the four separate studies, there were three significant differences obtained with plant stands. The first two reductions were in the early and late plantings at the OARDC that had SCM. In the early planting, many of the materials allowed for greater plant stands. However, the fungicide-only treatment (Apron Maxx + Apron XL) also had a statistically high stand; thus, it is difficult to separate the insecticide's contribution from that of the fungicide. However, numerically, this treatment had lower stands than the Cruiser treated plots. In the late planting, the highest plant stands were in the three treatments that had Cruiser. This increase in stand was not seen with the other seed treatments. It again should be noted that at the OARDC, alfalfa was tilled in early June following the emergence of seedcorn maggot adults from the early-planted field. The other significant stand difference was in the late planting at the Northwest Station, when the highest stand was in the check. The loss of plant stand with all the seed treatments was perhaps because of lower flowability with the treated seed compared with the non-treated seed. Because of the unlikelihood of SCM being present at the Northwest Station (no green living crop had been tilled as in Wooster), a plant stand reduction had not been expected. Similar observations of slightly reduced stands with seed treatments have been observed in previous year's studies. In this and those previous studies, the same planting equipment has been used, which is a different system than that used at the OARDC.

Bean leaf beetle defoliation was only observed at the Northwest Research Station. Feeding was relatively light, and thus, no data were collected. Nevertheless, it was easy to separate the check and fungicide-alone treatment plots from all the insecticide seed treatments based on defoliation alone. Insecticide seed treatments had very little leaf feeding (<5%), while the check and fungicide-alone treated plots had numerous feeding holes (~20%) suggesting an active BLB population.

Statistical differences in soybean aphid densities were observed on a few of the sampling dates at Wooster, but none were found at the Northwest Station. However, there were no meaningful differences from the check plots. Sampling ended when the populations began to crash in both plantings at the OARDC (where populations were always low) and the early planting at the Northwest Station (also relatively low). In the late planting at the Northwest Station, aphid populations continued to build in the late planting; however, because it was evident that the seed treatments did not prevent the treatment threshold from being reached in any of the plots, sampling was also terminated.

As with the soybean aphid, a few differences in BLB populations were obtained at the Northwest Station. However, no differences from the check occurred, and on most dates, no statistical differences were obtained. It should be mentioned that for BLB, the data are for the first generation of adult beetles except for the late planting on Sept 9 when the second generation made its appearance.

A significant difference in yield was obtained between treatments in the late planting at Wooster, the only yield difference obtained. AGST 03001 and the fungicide alone, along with the check, had reduced yields; these treatments also had significant reductions in plant stand (Table 1) because of the SCM. There were no differences in the percent BLB-injured pods.

Table 1. Plant stands at the OARDC and the Northwest Station

Treatment ^a	Rate	Soybean plants per 5 ft			
		Plants at OARDC		Plants at Northwest	
		Early	Late	Early	Late
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	28.1 abc	22.6 b	29.7 a	22.1 b
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	30.4 ab	31.9 a	26.4 a	21.6 b
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	31.6 a	30.4 a	27.2 a	21.0 b
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	30.0 abc	33.9 a	29.8 a	21.9 b
Gaicho 480 + L1269-D	62.5 + 9 g ai/cwt	27.3 abc	25.2 b	28.9 a	21.6 b
Gaicho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt	21.8 d	23.7 b	29.3 a	20.8 b
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	25.8 bcd	16.1 c	33.5 a	22.0 b
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	25.3 cd	24.8 b	28.2 a	21.8 b
Check	--	20.9 d	24.1 b	30.1 a	24.9 a

Means in a column followed by the same letter are not significantly different (LSD, P = 0.05)

Table 2. Soybean aphids on early planted soybeans at the OARDC

Treatment ^a	Rate	Soybean aphids per plant			
		July 11	July 18	July 25	Aug 1
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	8.8 a	7.1 a	7.6 a	15.4 a
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	4.0 bc	5.2 a	6.9 a	3.7 e
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	4.4 bc	6.8 a	3.7 a	5.7 de
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	4.3 bc	4.0 a	5.2 a	8.0 abcd
Gaucho 480 + L1269-D	62.5 + 9 g ai/cwt	2.4 cd	8.2 a	5.6 a	5.8 cde
Gaucho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt	1.2 d	7.1 a	9.1 a	5.5 cde
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	5.1 b	7.6 a	4.6 a	11.2 abc
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	6.5 ab	6.5 a	4.0 a	7.7 bcde
Check	--	6.6 b	11.0 a	7.9 a	13.4 ab

Data transformed using $\log_{10}(x + 1.0)$ prior to analyses; pretransformed data presented. Means in a column followed by the same letter are not significantly different (LSD, $P = 0.05$).

Table 3. Soybean aphids on late planted soybeans at the OARDC

Treatment ^a	Rate	Soybean aphids per plant			
		July 11	July 18	July 25	Aug 1
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	7.6 a	6.7 a	13.7 a	5.8 ab
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	1.5 c	2.2 a	6.7 a	3.0 abc
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	4.7 ab	4.7 a	8.4 a	2.6 bc
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	2.3 bc	1.5 a	9.8 a	3.8 abc
Gaucho 480 + L1269-D	62.5 + 9 g ai/cwt	1.5 c	3.1 a	7.9 a	1.5 c
Gaucho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt	2.7 bc	3.5 a	10.3 a	2.4 c
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	6.6 a	4.8 a	14.9 a	3.5 abc
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	6.2 ab	3.9 a	8.6 a	1.9 c
Check	--	5.1 ab	5.9 a	7.3 a	6.4 a

Data transformed using $\log_{10}(x + 1.0)$ prior to analyses; pretransformed data presented. Means in a column followed by the same letter are not significantly different (LSD, $P = 0.05$).

Table 4. Soybean aphids on early planted soybeans at the Northwest Station

Treatment ^a	Rate	Soybean aphids per plant			
		July 7	July 20	July 27	Aug 3
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	1.1 a	4.1 a	28.1 a	27.5 a
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	0.4 a	2.5 a	17.2 a	25.4 a
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	0.6 a	2.4 a	19.8 a	32.8 a
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	1.2 a	1.5 a	23.6 a	32.7 a
Gaucho 480 + L1269-D	62.5 + 9 g ai/cwt	0.8 a	1.9 a	11.2 a	32.2 a
Gaucho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt 29.5 a	2.6 a	1.1 a	18.9 a	29.5 a
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	4.4 a	5.6 a	15.8 a	27.4 a
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	1.4 a	2.8 a	20.4 a	40.0 a
Check	--	2.6 a	7.2 a	28.6 a	21.4 a

Data transformed using $\log_{10}(x + 1.0)$ prior to analyses; pretransformed data presented. Means in a column followed by the same letter are not significantly different (LSD, $P = 0.05$).

Table 5. Soybean aphids on late planted soybeans at the Northwest Station

Treatment ^a	Rate	Soybean aphids per plant				
		July 7	July 20	July 27	Aug 3	Aug 11
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	0.8 a	1.9 a	17.4 a	35.0 a	242.5 a
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	0.7 a	1.8 a	9.7 a	29.2 a	257.5 a
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	0.8 a	2.2 a	11.9 a	25.4 a	330.0 a
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	0.8 a	1.7 a	7.6 a	22.9 a	265.0 a
Gaucho 480 + L1269-D	62.5 + 9 g ai/cwt	0.8 a	1.6 a	11.9 a	27.0 a	347.5 a
Gaucho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt	0.7 a	1.8 a	10.3 a	24.2 a	220.0 a
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	0.9 a	2.2 a	11.3 a	48.8 a	282.5 a
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	0.7 a	1.9 a	9.3 a	27.5 a	260.0 a
Check	--	0.8 a	2.0 a	15.4 a	41.6 a	277.5 a

Data transformed using $\log_{10}(x + 1.0)$ prior to analyses; pretransformed data presented. Means in a column followed by the same letter are not significantly different (LSD, $P = 0.05$).

Table 6. Bean leaf beetle in early and late plantings soybeans at the Northwest Station

Treatment ^a	Rate	Bean leaf beetles per sample						
		Early planting			Late planting			
		July 19	July 28	Aug 11	July 19	July 28	Aug 11	Sept 9
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	12.5 a	6.3 a	1.0 a	16.8 b	13.3 a	1.3 a	33.5 a
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	17.8 a	17.0 a	1.8 a	11.5 bc	19.8 a	3.5 a	36.0 a
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	18.8 a	10.8 a	0.8 a	13.5 bc	11.3 a	1.0 a	36.8 a
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	11.3 a	15.3 a	2.0 a	23.3 a	9.8 a	1.8 a	38.5 a
Gaucho 480 + L1269-D	62.5 + 9 g ai/cwt	14.5 a	7.0 a	1.0 a	10.0 c	9.8 a	2.0 a	38.3 a
Gaucho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt	13.8 a	10.5 a	0.0 a	16.8 b	9.8 a	1.8 a	37.0 a
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	14.3 a	9.3 a	1.5 a	14.0 bc	9.0 a	2.0 a	38.5 a
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	14.3 a	11.5 a	0.8 a	15.0 bc	12.0 a	3.0 a	33.8 a
Check	--	17.5 a	9.0 a	1.8 a	13.8 bc	12.5 a	0.8 a	36.3 a

Means in a column followed by the same letter are not significantly different (LSD, P = 0.05).

Table 7. Yields from the OARDC and the Northwest Station and BLB pod injury from late planting at NW Branch

Treatment ^a	Rate	Yield (bu/acre)				Percent (%) pod injury
		OARDC		Northwest		
		Early	Late	Early	Late	
Apron Maxx + Apron XL	1.5 + 0.48 fl oz/cwt	53.6 a	40.9 bc	45.5 a	38.0 a	26.6 a
Cruiser + Apron Maxx + Apron XL	1.3 + 1.5 + 0.48 fl oz/cwt	53.9 a	43.3 a	49.4 a	37.1 a	27.1 a
Cruiser + Apron Maxx + Apron XL	0.0757 mg ai/seed + 1.5 + 0.48 fl oz/cwt	54.0 a	42.8 ab	47.3 a	38.0 a	22.6 a
CruiserMaxx + Apron XL	3.0 + 0.48 fl oz/cwt	51.3 a	43.1 ab	46.8 a	39.3 a	30.0 a
Gaicho 480 + L1269-D	62.5 + 9 g ai/cwt	51.2 a	42.0 abc	48.2 a	37.8 a	24.1 a
Gaicho 480 + Protégé + Allegiance	62.5 + 3 + 4 g ai/cwt	51.2 a	41.3 abc	47.8 a	38.4 a	27.7 a
AGST 03001 + Warden	1.8 + 5.0 fl oz/cwt	53.7 a	37.0 d	47.3 a	35.9 a	29.5 a
AGST 03001 + Warden	3.6 + 5.0 fl oz/cwt	54.0 a	40.3 c	48.1 a	36.8 a	31.4 a
Check	--	51.2 a	40.2 c	48.4 a	41.6 a	23.2 a

Data on percent pod injury were transformed by arcsin(sqrt x); pretransformed data are presented. Means in a column followed by the same letter are not significantly different (LSD, P = 0.05)