

EFFECTS OF INSECTICIDAL TREATMENTS ON THRIPS ABUNDANCE, COTTON GROWTH AND YIELD IN SOUTH GEORGIA

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Introduction

Thrips in the genus *Frankliniella* are perennial pests of cotton in Georgia, and can have various substantive impacts on cotton production, ranging from minor cosmetic damage, to delay of crop maturity, or even stand destruction (Watts 1937, Hawkins et al. 1966). Thrips begin feeding on cotton in Georgia immediately after seedling emergence. The plants are at greatest risk early in the season when the seedlings can be quite susceptible to thrips damage on the leaves and growing meristem. In some instances, damage is severe enough to cause abortion of the terminal and loss of apical dominance. Thrips populations vary greatly from year to year, but in severe infestations, they can reduce yields by as much as 50 or 60 percent if not controlled by insecticides applied in-furrow, as seed treatments, or foliar sprays (Johnson et al. 2001). Lambert (1985) states that dealing with the thrips problem in cotton is complex. Universities in many cotton-producing states offer suggestions for thrips control, though their research rarely shows yield increases attributable to these control measures. Increased industry-grower interest in early season pest management has prompted us to evaluate the efficacy of insecticides for thrips management in south Georgia.

Materials and Methods

Insecticide Trial One

Cotton (variety DPL 458B/RR) was planted on 5 May 2004 at the Lang-Rigdon Farm of the Coastal Plain Experiment Station in Tift County, Georgia, using a Monosem pneumatic planter equipped to add granular insecticides in the furrow. Plots were 4 rows by 50 ft long, with a 36-inch row spacing and a minimum of 4 replications per treatment. Throughout the course of the season, all plots were irrigated for optimum growth. The treatments were (1) an untreated control, (2) aldicarb (Temik® 15G) applied in-furrow at 5 lb per acre, (3) aldicarb applied in-furrow at 5 lb per acre plus a 5 lb per acre sidedress at 3-4 true leaves (2 June 2004), (4) KC791230 15G applied in-furrow at 5 lb per acre, (5) KC791230 15G applied in-furrow at 5 lb per acre plus a 5 lb per acre sidedress at 3-4 true leaves (2 June 2004), (6) imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg seed), (7) imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg seed) plus a foliar application of acephate (Orthene® 97) at 3.0 oz ai/acre at 3-4 true leaves (3 June 2004), (8) thiamethoxam (Cruiser®)-treated seed (300 g ai/100 kg seed), and (9) L10112-A1-treated seed (600 g ai/100 kg seed). The foliar treatments were applied with a CO₂-powered backpack sprayer using a single TX6 nozzle calibrated to deliver 4.7 GPA. Thrips were sampled 1, 2, 3, and 4 weeks after planting. Each sample consisted of five plants that were picked and swirled in a 1-pint jar

containing ca. 300 ml of water, with several drops of liquid dishwashing detergent added as a surfactant. Samples were returned to the laboratory for counting. Each sample was poured through a 120-mesh sieve (Hubbard Scientific Co., Northbrook, IL) and rinsed with tap water. The thrips were then flushed into a 100 x 15 mm plastic petri dish for microscopic examination. Adults and nymphs were counted, though the numbers of both stages were pooled for statistical analysis. Seed cotton yields were taken by mechanically picking the middle 2 rows of each plot 4 October 2004.

Insecticide Trial Two

Cotton (variety DPL 458B/RR) was planted on 11 May 2004 at the Lang-Rigdon Farm of the Coastal Plain Experiment Station in Tift County, Georgia, using a Monosem pneumatic planter equipped to add granular insecticides in the furrow. Plots were 4 rows by 50 ft long, with a 36-inch row spacing and 4 replications per treatment. Throughout the course of the season, all plots were irrigated for optimum growth. The treatments were (1) an untreated control, (2) aldicarb (Temik® 15G) applied in-furrow at 3.5 lb per acre, (3) aldicarb applied in-furrow at 5 lb per acre, (4) aldicarb applied in-furrow at 5 lb per acre plus a 5 lb per acre sidedress at pinhead square (18 June 2004), (5) KC791230 15G applied in-furrow at 3.5 lb per acre, (6) KC791230 15G applied in-furrow at 5 lb per acre, (7) KC791230 15G applied in-furrow at 5 lb per acre plus a 5 lb per acre sidedress at pinhead square (18 June 2004), (8) imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg seed), (9) thiamethoxam (Cruiser®)-treated seed (300 g ai/100 kg seed), and (10) in-furrow imidacloprid (Trimax®) at 6 oz per acre. Thrips were sampled as in trial one, though without a sampling 4 weeks after planting. Seed cotton yields were taken by mechanically picking the middle 2 rows of each plot 6 October 2004.

Insecticide Trial Three

Cotton (variety DPL 458B/RR) was planted on 5 May 2004 at the Lang-Rigdon Farm of the Coastal Plain Experiment Station in Tift County, Georgia, using a Monosem pneumatic planter equipped to add granular insecticides in the furrow. Plots were 2 rows by 50 ft long, with a 36-inch row spacing and 4 replications per treatment. Throughout the course of the season, all plots were irrigated for optimum growth. The treatments were (1) an untreated control, (2) Knack 15 g ai/A plus V10112 20 g ai/A foliar tank mix, (3) Knack 15 g ai/A plus V10112 40 g ai/A foliar tank mix, (4) Knack 25 g ai/A plus V10112 20 g ai/A foliar tank mix, (5) Knack 25 g ai/A plus V10112 40 g ai/A foliar tank mix, (6) Knack 15 g ai/A, (7) Knack 25 g ai/A, (8) V10112 20 g ai/A, (9) V10112 40 g ai/A, and (10) V10112 60 g ai/A.

All treatments were applied with the same CO₂-powered backpack sprayer as in trial one on 19 May 2004. Thrips were sampled as in Trial One, except the dates were 3, 4, and 5 weeks after planting. Seed cotton yields were taken by mechanically picking the 2 rows of each plot 6 October 2004.

Insecticide Trial Four

Cotton (variety DPL 458B/RR) was planted on 6 May 2004 at the Lang-Rigdon Farm of the Coastal Plain Experiment Station in Tift County, Georgia, using a Monosem

pneumatic planter equipped to add granular insecticides in the furrow. Plots were 4 rows by 50 ft long, with a 36-inch row spacing and 4 replications per treatment. Throughout the course of the season, all plots were irrigated for optimum growth. The treatments were (1) an untreated control, (2) thiamethoxam (Cruiser®)-treated seed (300 g ai/100 kg seed), (3) thiamethoxam-treated seed (300 g ai/100 kg seed) plus A14006, (4) A14483A-treated seed, (5) A14483B-treated seed, (6) A14483C-treated seed, (7) aldicarb (Temik® 15G) applied in-furrow at 5 lb per acre, and (8) thiamethoxam-treated seed (300 g ai/100 kg seed) plus aldicarb applied in-furrow at 5 lb per acre. Thrips were sampled as in Trial One, though without a sampling 1 week after planting. Seed cotton yields were taken by mechanically picking the middle 2 rows of each plot 5 October 2004.

In all four trials, data (thrips numbers, and yield) were analyzed using the general linear models procedure, followed by separation of significantly different means using Duncan's New Multiple Range Test, with $p < 0.05$ as the upper limit for significance (SAS Institute 1999).

Results and Discussion

Thrips Numbers

In Trial One, all treatments had significantly lower numbers of thrips than the untreated control plots in samples taken 1 week after planting. Only some of the treatments had significant differences at 2 and 3 weeks, and by 4 weeks after planting, only one treatment -- aldicarb applied in-furrow at 5 lb per acre plus a 5 lb per acre sidedress -- was still significantly reducing numbers of thrips (Table 1).

In Trial Two, all treatments had significantly lower numbers of thrips than the untreated control plots in all samples, with the exception of in-furrow imidacloprid at one week after planting (Table 2).

In Trial Three, all treatments had significantly lower numbers of thrips than the untreated control plots in the samples made 3 weeks after planting, but no significant differences 4 and 5 weeks after planting (Table 3). All of these treatments were foliar sprays applied 5 days prior to the first sample date. Thus, by 12 days post-treatment, the insecticidal effects had greatly diminished.

In trial four, all treatments had significantly lower numbers of thrips than the untreated control plots in the samples made 2 and 3 weeks after planting. By 4 weeks after planting, only A14483B-treated seed showed a significant reduction in thrips (Table 4).

Yields

In all four trials, none of the treated plots differed significantly from untreated plots in seed cotton yield. In some instances, treated plots actually resulted in a lower numerical yield than the untreated plots. In Trial One, the highest numerical yield was in plots grown with imidacloprid (Gaucho®)-treated seed (Table 5). In Trial Two, the highest

numerical yield was in plots treated with aldicarb (Temik® 15G) at 5.0 lbs per acre (Table 6). In trial three, the highest numerical yield was in plots treated with Knack 15 g ai/A plus V10112 20 g ai/A foliar tank mix (Table 7). In trial four, the highest numerical yield was in plots grown with A14483C-treated seed (Table 8).

It is apparent that there are several effective thrips management tools available to growers, though insecticidal treatments failed to significantly improve yields relative to the untreated plots, despite reducing thrips abundance. The extended growing season in south Georgia may allow the plants to compensate for damage incurred early in the season, effectively masking any potential yield effects.

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Table 1. Number of thrips per plant 1, 2, 3, and 4 weeks after planting in Trial 1. Tift Co., GA. 2004.

Treatment	No. thrips/plant (adults & nymphs)			
	1 week	2 week	3 week	4 week
<u>Untreated</u>	0.75a	3.78a	8.92a	2.82ab
aldicarb (Temik® 15G) applied in-furrow at 5 lb/acre	0.25b	0.70ab	1.85bc	1.30abc
aldicarb 5 lb/acre + 5 lb/acre sidedress 2 June 2004	0.10b	0.10b	1.35bc	0.40c
KC791230 15G applied in-furrow at 5 lb/acre	0.05b	0.05b	0.90c	1.05abc
KC791230 5 lb/acre + 5 lb/acre sidedress 2 June 2004	0.10b	0.75ab	1.30bc	0.50bc
imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg)	0.0b	2.10ab	5.95abc	2.55abc
imidacloprid-treated seed + 3.0 oz ai/acre foliar acephate (Orthene® 97) 3 June 2004	0.25b	2.45ab	8.10ab	1.10abc
thiamethoxam (Cruiser®)-treated seed (300 g ai/100 kg)	0.15b	3.55a	6.45abc	2.90a
L10112-A1-treated seed (600 g ai/100 kg)	0.10b	2.60ab	3.70abc	1.10abc

Means followed by the same letter are not significantly different ($P>0.05$).

Table 2. Number of thrips per plant 1, 2, and 3 weeks after planting in Trial 2. Tift Co., GA. 2004.

Treatment	No. thrips/plant (adults & nymphs)		
	1 week	2 week	3 week
Untreated	0.45a	8.55a	6.30a
aldicarb (Temik® 15G) applied in-furrow at 3.5 lb/acre	0.0b	0.15b	0.40b
aldicarb applied in-furrow at 5 lb/acre	0.0b	0.10b	0.60b
aldicarb 5 lb/acre + 5 lb/ acre sidedress 18 June 2004	0.05b	0.10b	1.50b
KC791230 15G applied in-furrow at 3.5 lb/acre	0.05b	0.60b	0.35b
KC791230 15G applied in-furrow at 5 lb/acre	0.10b	0.30b	0.85b
KC791230 5 lb/acre + 5 lb/acre sidedress 18 June 2004	0.0b	0.25b	0.55b
imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg seed)	0.05b	1.15b	1.10b
thiamethoxam (Cruiser®)-treated seed(300 g ai/100 kg seed)	0.0b	0.60b	1.50b
in-furrow imidacloprid (Trimax®) at 6 oz per acre	0.30a	0.95b	1.65b

Means followed by the same letter are not significantly different ($P>0.05$).

Table 3. Number of thrips per plant 3, 4, and 5 weeks after planting in Trial 3. Tift Co., GA. 2004.

Treatment	No. thrips/plant (adults & nymphs)		
	3 week	4 week	5 week
<u>Untreated</u>	17.05a	10.85a	6.30a
Knack 15 g ai/A plus V10112 20 g ai/A foliar tank mix	4.90bc	9.45a	7.10a
Knack 15 g ai/A plus V10112 40 g ai/A foliar tank mix	3.15bc	4.95a	4.70a
Knack 25 g ai/A plus V10112 20 g ai/A foliar tank mix	4.40bc	8.70a	6.50a
Knack 25 g ai/A plus V10112 40 g ai/A foliar tank mix	2.95c	5.65a	5.20a
Knack 15 g ai/A	8.00bc	9.55a	5.60a
Knack 25 g ai/A	9.15b	6.80a	5.15a
V10112 20 g ai/A	5.80bc	9.05a	7.90a
V10112 40 g ai/A	4.35bc	10.45a	7.60a
V10112 60 g ai/A	4.60bc	8.90a	7.05a

Means followed by the same letter are not significantly different ($P>0.05$).

Table 4. Number of thrips per plant 3, 4, and 5 weeks after planting in Trial 4. Tift Co., GA. 2004.

Treatment	No. thrips/plant (adults & nymphs)		
	2 week	3 week	4 week
<u>Untreated</u>	4.00a	6.88a	2.60ab
thiamethoxam (Cruiser®)-treated seed(300 g ai/100 kg seed)	0.68b	1.00b	2.84a
thiamethoxam-treated seed plus A14006	0.60b	1.72b	1.56abc
A14483A-treated seed	0.68b	0.92b	2.04abc
A14483B-treated seed	0.52b	1.76b	1.16c
A14483C-treated seed	0.76b	1.00b	1.68abc
aldicarb (Temik® 15G) applied in-furrow at 5 lb/acre	0.20b	0.20b	1.44bc
thiamethoxam-treated seed plus 5 lb/acre in-furrow aldicarb	0.36b	1.12b	1.44bc

Means followed by the same letter are not significantly different ($P>0.05$).

Table 5. Seed cotton yields of insecticide treatments for thrips control in trial 1. Tift Co., GA, 2004.

Insecticide Treatment	Pounds Seed Cotton/Acre
Untreated	2141.7a
aldicarb (Temik® 15G) applied in-furrow at 5 lb/acre	1923.9a
aldicarb 5 lb/acre + 5 lb/acre sidedress 2 June 2004	2069.1a
KC791230 15G applied in-furrow at 5 lb/acre	2178.0a
KC791230 5 lb/acre + 5 lb/acre sidedress 2 June 2004	2341.4a
imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg)	2777.0a
imidacloprid-treated seed + 3.0 oz ai/acre foliar acephate (Orthene® 97) 3 June 2004	2595.5a
thiamethoxam (Cruiser®)-treated seed (300 g ai/100 kg)	2577.3a
L10112-A1-treated seed (600 g ai/100 kg)	2704.4a

Means followed by the same letter are not significantly different ($P>0.05$).

Table 6. Seed cotton yields of insecticide treatments for thrips control in trial 2. Tift Co., GA, 2004.

Insecticide Treatment	Pounds Seed Cotton/Acre
Untreated	2784.2a
aldicarb (Temik® 15G) applied in-furrow at 3.5 lb/acre	2711.6a
aldicarb applied in-furrow at 5 lb/acre	3132.7a
aldicarb 5 lb/acre + 5 lb/ acre sidedress 18 June 2004	2777.0a
KC791230 15G applied in-furrow at 3.5 lb/acre	2780.6a
KC791230 15G applied in-furrow at 5 lb/acre	3067.4a
KC791230 5 lb/acre + 5 lb/acre sidedress 18 June 2004	3052.8a
imidacloprid (Gaucho®)-treated seed (300 g ai/100 kg seed)	2635.4a
thiamethoxam (Cruiser®)-treated seed(300 g ai/100 kg seed)	2882.2a
in-furrow imidacloprid (Trimax®) at 6 oz per acre	2987.5a

Means followed by the same letter are not significantly different ($P>0.05$).

Table 7. Seed cotton yields of insecticide treatments for thrips control in trial 3. Tift Co., GA, 2004.

Insecticide Treatment	Pounds Seed Cotton/Acre
Untreated	2689.8a
Knack 15 g ai/A plus V10112 20 g ai/A foliar tankmix	3303.3a
Knack 15 g ai/A plus V10112 40 g ai/A foliar tankmix	2958.5a
Knack 25 g ai/A plus V10112 20 g ai/A foliar tankmix	2551.9a
Knack 25 g ai/A plus V10112 40 g ai/A foliar tankmix	2845.9a
Knack 15 g ai/A	2791.5a
Knack 25 g ai/A	3183.5a
V10112 20 g ai/A	2806.0a
V10112 40 g ai/A	3005.6a
V10112 60 g ai/A	2914.9a

Means followed by the same letter are not significantly different ($P>0.05$).

Table 8. Seed cotton yields of insecticide treatments for thrips control in trial 4. Tift Co., GA, 2004.

Insecticide Treatment	Pounds Seed Cotton/Acre
Untreated	2816.9a
thiamethoxam (Cruiser®)-treated seed(300 g ai/100 kg seed)	2828.5a
thiamethoxam-treated seed plus A14006	2694.9a
A14483A-treated seed	2825.6a
A14483B-treated seed	2648.4a
A14483C-treated seed	2918.5a
aldicarb (Temik® 15G) applied in-furrow at 5 lb/acre	2628.1a
thiamethoxam-treated seed plus 5 lb/acre in-furrow aldicarb	2773.3a

Means followed by the same letter are not significantly different ($P>0.05$).