THRIPS ABUNDANCE AND EFFECTS OF INSECTICIDAL CONTROL ON 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 to stand destruction (Watts 1937, Hawkins et al. 1966). Thrips begin feeding on cotton in Georgia immediately after seedling emergence. The cotton plants are at greatest risk early in the season when the small plants can be quite susceptible to thrips feeding on 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 monitor thrips numbers in Tift County, Georgia. Because different thrips species may respond differently to insecticidal control measures, it would be advantageous to examine the species that make up the complex (Kharboutli and Allen 2001) and means of controlling them.

The **objectives** of these studies were to (1) characterize the timing and abundance of several important thrips species, and (2) evaluate the efficacy of insecticides for thrips management in south Georgia.

Materials and Methods

Thrips Trapping Survey

In 2003, 4 thrips traps were placed at the margins of fields before being planted to cotton in each of two locations in Tift County. Traps were rectangular wells constructed of plexiglass, measuring 5.25 x 6.25 x 2.5 inches deep, and assembled with a hot glue gun. Traps were painted white on the outside and yellow on the inside. Each trap was mounted on an adjustable ring-stand to allow it to be maintained at the level of the top of the cotton plants as they grew. The traps were half-filled with a 50% aqueous solution of ethylene glycol and fitted with hardware cloth lids to minimize the possibility of ingestion by wildlife. Two 1/4" holes were drilled near the top of each trap and covered with a circle of fine mesh secured in place with hot glue. During periods of rain, these allowed for drainage without loss of the captured insects. The contents of each trap were poured into 1-pint jars and returned to the laboratory weekly for separation, counting and identification. Each sample was poured through a 120-mesh sieve (Hubbard Scientific Co., Northbrook, IL) and rinsed

with tap water. The thrips (and other insects) were then flushed into a 100 x 15 mm plastic petri dish for microscopic counting, separation of adults and nymphs, and species determination of adults.

Insecticide Trials

Cotton (variety DPL 458B/RR) was planted on 2 May 2003 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) thiamethoxam (Cruiser®)-treated seed (300 g ai/100 kg seed), (3) thiamethoxam (Cruiser®)-treated seed (30 g ai/100,000 seed), (4) thiamethoxam (Cruiser®)-treated seed (34 g ai/100,000 seed), (5) thiamethoxam (Cruiser®)-treated seed (7.65 fl oz/100 lb seed), (6) three foliar applications (May 10, 21, and 30) of acephate (Orthene® 97) at 3.2 oz ai/acre, (7) aldicarb (Temik® 15G) applied in-furrow at 3.5 lbs per acre, (8) aldicarb (Temik® 15G) applied in-furrow at 5 lbs per acre, (9) aldicarb (Temik® 15G) applied in furrow at 7.0 lbs per acre, and (10) imidacloprid (Gaucho®)-treated seed (250 g ai/100 kg seed). The foliar treatments were applied with a CO_2-powered backpack sprayer using a single TX6 nozzle calibrated to deliver 4.7 GPA.

Weekly thrips sampling was initiated two 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 thrips identification as described above. Plant height measurements (10 consecutive plants in one row) were taken on June 12. Seed cotton yields were taken by mechanically picking the middle 2 rows of each plot.

Data (thrips numbers, plant height, and yield) were analyzed using analysis of variance, followed by separation of significantly different means using Duncan's New Multiple Range Test, with $p<0.05$ as the upper limit for significance.

Results and Discussion

Thrips Trapping Survey

Average weekly trap catches of all three species were lower than those of 2001 and 2002. As in previous years, *Frankliniella tritici* was the dominant species, followed by *F. occidentalis* and *F. fusca* (Fig. 1). Peak numbers for all three species were reached on 17 May (Fig.1), although the peaks for *F. occidentalis* and *F. fusca* were weak and substantially lower than was the case for *F. tritici*.

Insecticide Trials

All treatments had significantly lower numbers of thrips nymphs in samples taken 2-3 weeks after planting than the untreated control plots. Even at 4 weeks after planting, all treatments, with the exception of Cruiser-treated seed at 30 g ai/100,000 seed and 7.65 fl oz/100 lb seed, still had significant reductions in numbers of nymphal thrips (Table 1).

Reductions in adult thrips populations were not as dramatic, which is not an unexpected result in light of their increased mobility relative to the nymphs.

With the exception of Temik® at 7.0 lbs per acre, our plant height measurements demonstrated that plants in all treatments were significantly taller than those in the untreated control (Fig. 2). However, these differences in early-season plant growth did not result in significantly greater yields. None of the treated plots differed significantly from untreated plots, but Temik® 3.5 lb in-furrow, Cruiser®-treated seed at 300 g ai/100 kg seed, and Cruiser®-treated seed at 7.65 fl oz/100 lb seed showed the greatest numerical yield increases, respectively (Fig. 3). Yields in all of the Cruiser® treatments were comparable to one another. The failure of the insecticidal treatments to significantly improve yields relative to the untreated plots, despite reducing thrips abundance, may be due to the extended growing season in south Georgia that may allow the plants to compensate for damage incurred early in the season.

It is apparent that there are several effective thrips management tools available to growers – Temik® and Cruiser® both performed well against nymphal thrips (although Temik was consistently superior numerically), as did repeated foliar applications of Orthene®. Gaucho® was moderately effective. Temik® was generally the most effective product against adult thrips.

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References Cited

Hawkins, B. S., H. A. Peacock, and T. E. Steele. 1966. Thrips injury to upland cotton (*Gossypium hirsutum* L.) Varieties. Crop Sci. 6: 256-8.

Johnson, D.R., J.D. Hopkins, G.M. Lorenz, III and J.D. Reaper, III. 2001. Evaluation of thrips management options in cotton. *In* Proceedings, 2001 Beltwide Cotton Production Conferences, National Cotton Council of America, Memphis, TN, 2: 1086-1088.

Kharboutli, M.S. and C.T. Allen. 2001. Chemical control and species composition of thrips in Arkansas cotton fields. *In* Proceedings, 2001 Beltwide Cotton Production Conferences, National Cotton Council of America, Memphis, TN, 2: 1026-1028.

Lambert, W. R. 1985. The thrips problem. *In* Proceedings, Beltwide Cotton Production Conference, National Cotton Council of America, Memphis, TN,: 130-131.

Watts, J. G. 1937. Reduction of cotton yields by thrips. J. Econ. Entomol. 30: 860-863.

Table 1. Number of thrips nymphs per plant 2, 3, and 4 weeks after planting. Tift Co., GA. 2003. Means followed by the same letter are not significantly different (P>0.05).

Treatment	nymphs			adults		
	2 week	3 week	4 week	2 week	3 week	4 week
Untreated	2.74a	5.08a	4.96a	1.94b	1.40abc	2.22a
Cruiser® seed tmt 300 g ai/100 kg seed	0.24c	1.32bc	1.84bcd	0.84cd	1.88a	1.64abc
Cruiser® seed tmt 30 g ai/100,000 seeds	0.24c	1.60bc	2.84abc	0.92cd	1.80a	1.76ab
Cruiser® seed tmt 34 g ai/100,000 seeds	0.16c	1.72bc	1.64bcd	1.20bc	1.52ab	1.40abc
Cruiser® seed tmt 7.65 fl oz/100 lb seed	0.15c	0.60c	3.40ab	0.65cd	0.95abcd	0.85abc
Gaucho® seed tmt 250 g ai/100 kg seed	1.25b	2.45b	1.75bcd	2.85a	2.00a	1.10abc
Orthene® 90SP foliar 3.2 oz ai/a 2x (3x 2003)	0.44c	0.11c	0.24d	0.20d	0.16d	0.22bc
Temik® 15G in-furrow 3.5 lb/a	0.04c	0.40c	0.68cd	0.28d	0.32cd	1.08abc
Temik® 15G in-furrow 5 lb/a	0.67c	0.16c	0.20d	0.20d	0.40bcd	0.33bc
Temik® 15G in-furrow 7 lb/a	0.0c	0.40c	0.12d	0.24d	0.88abcd	0.40bc

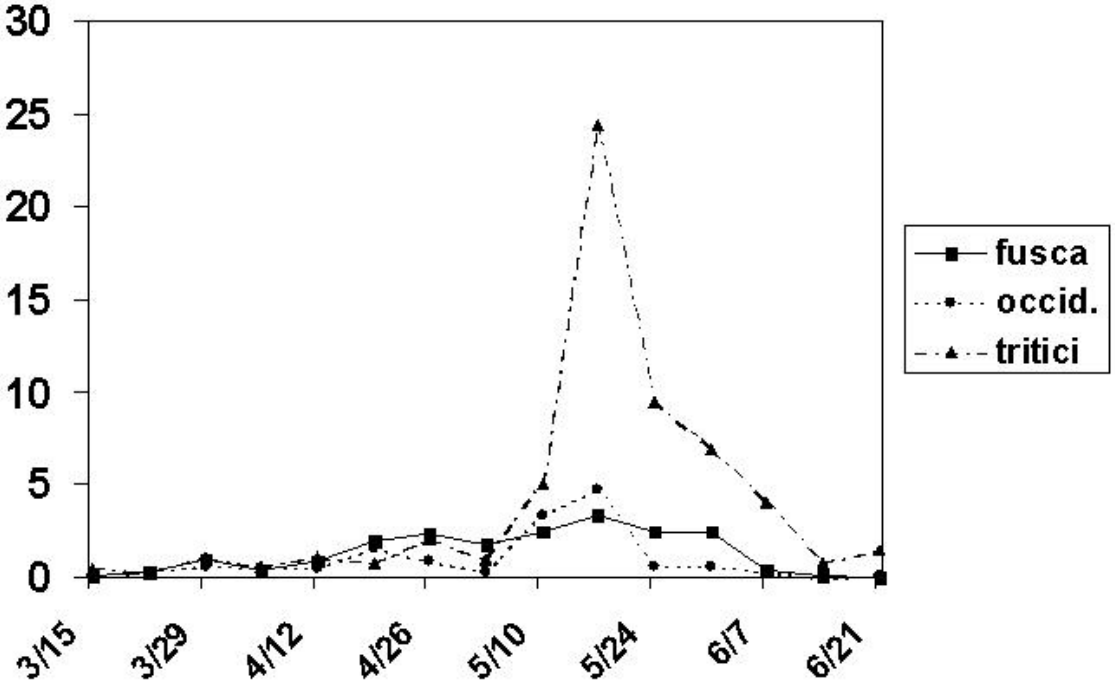

Figure 1. Average thrips trap catch for Tift Co. *F. fusca, F. occidentalis,* and *F. tritici* 2003.

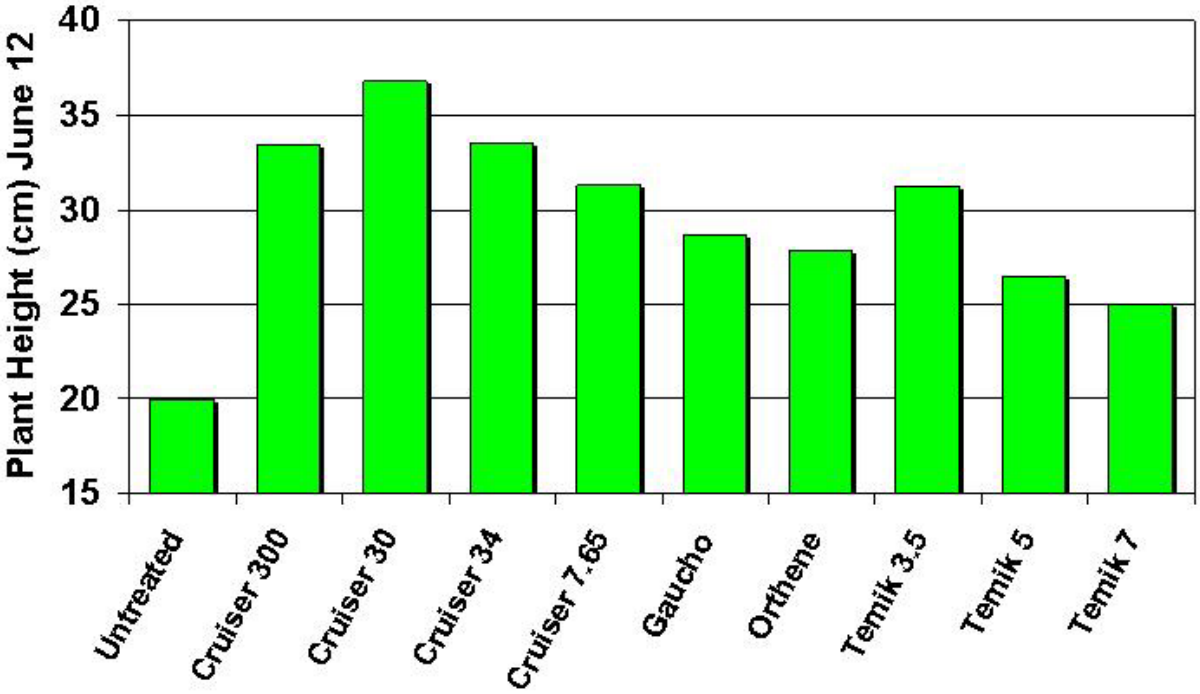

Figure 2. Average height in cm of cotton plants treated with various insecticidal thrips treatments 6 weeks after planting. Tift. Co., GA. 2003.

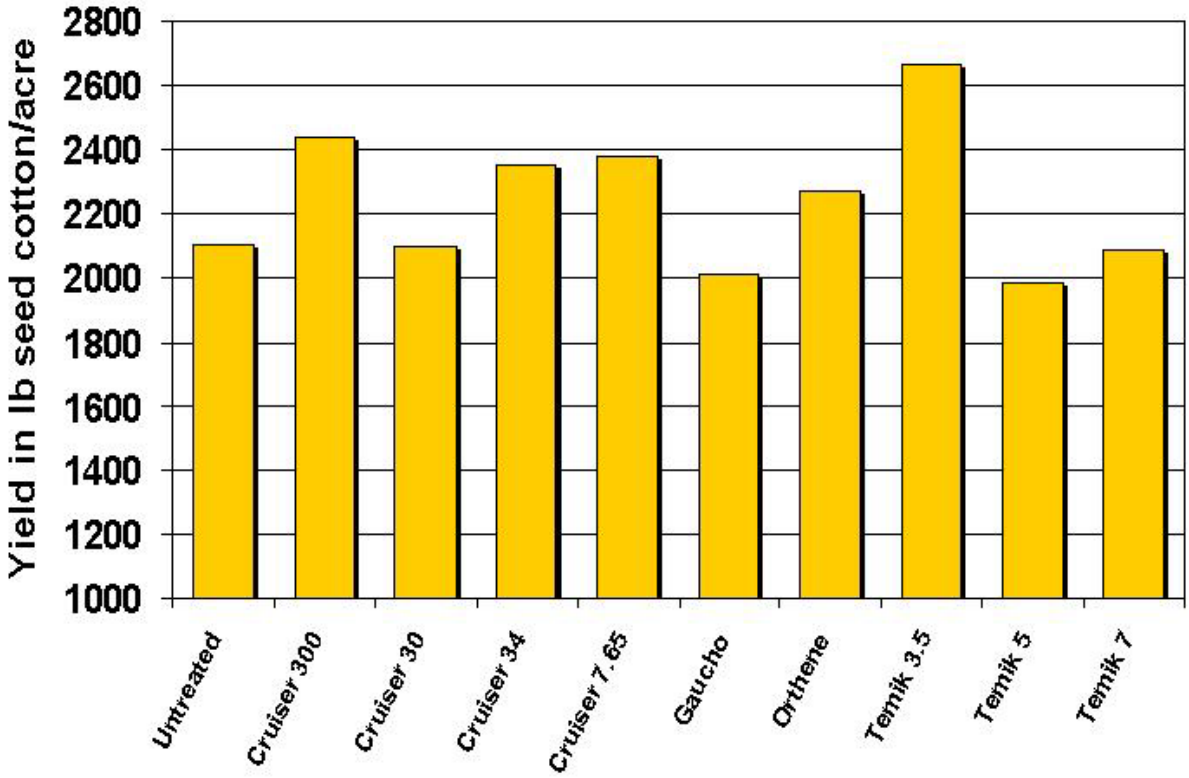

Figure 3. Average yield in lb. seed cotton/acre for various insecticidal thrips treatments. Tift. Co., GA. 2003.