EVALUATING EFFICACY AND ECONOMIC PROFITABILITY OF PREVENTIVE INSECTICIDAL SEED TREATMENTS IN COTTON

Suhas Vyavhare
Texas A&M AgriLife Extension Service
Lubbock, TX
Blayne Reed
Texas A&M AgriLife Extension Service
Plainview, TX

Abstract

Multi-location field trials were conducted to evaluate efficacy of insecticide seed treatments in Texas cotton. Treatments evaluated included Gaucho 600, Cruiser 5FS, Aeris, and Avicta Elite Cotton. Relative efficacy among treatments was determined by estimating thrips densities and damage during the vulnerable crop growth stages. Thrips densities were estimated by collecting plant samples from the field and thrips damage was visually rated on the scale of 0 -5 (where 0 = no damage and 5 = severe damage). Of the five trials planted across four locations (Lubbock, Kress, Brownfield, and Weslaco), only two (Kress and Lubbock) showed thrips population reaching action threshold. At Kress, mean thrips density was significantly lower in treated plots compared to the untreated check at cotyledon, 1 true leaf, and 4 true-leaves stages of cotton. At Lubbock, there were significantly fewer number of thrips in treated plots compared to untreated check during the 1 true-leaf stage of cotton. Overall, untreated plots exhibited higher thrips damage than the treated plots. Results from this study indicate that neonicotinic seed treatments still provide a good control against thrips in Texas High Plains cotton.

Introduction

Thrips are early-season pests of seedling cotton, *Gossypium hirsutum* L. In much of Texas, they are a minor pest but can be severe in areas prone to cool, wet conditions when plant growth slows down. The most common species of plant-feeding thrips in Texas cotton are western flower thrips, *Frankliniella occidentalis*; onion thrips, *Thrips tabaci*; and tobacco thrips, *Frankliniella fusca* (Albeldano et al. 2008). Thrips attack plant terminals and very small squares (flower buds), causing a silvering of the lower leaf surface, deformed or blackened leaves, and terminal and square loss. Feeding most often occurs in the new terminal growth and on the underside of the leaves. Their feeding ruptures cells, causing stunted plants and crinkled leaves that curl upward. Severe infestations can destroy terminal buds, causing excessive branching of the plants and delayed plant growth. Insecticidal seed treatments have become an industry standard. However, additional foliar insecticide application(s) are often required to effectively control thrips incurring high input costs for growers. Field trials were conducted to evaluate efficacy of insecticidal seed treatments to help consultants and producers select proper treatments.

Materials and Methods

In 2018, total of five field trials were conducted across four locations (Lubbock, Kress, Brownfield, and Weslaco) in Texas. Cotton variety, DP1612B2XF was used for Lubbock and Brownfield locations. Cotton varieties PHY490W3FE and ST4946GLB2 were used at Kress and Weslaco, respectively. Cotton seeds were treated with various products in cotton entomology laboratory at the Texas A&M AgriLife Research and Extension center in Lubbock. All seed were treated with a combination of three fungicides (Vibrance CST, Maxim 4FS, and Apron XL). Treatments included an untreated check, Gaucho 600, Cruiser 5FS, Aeris, and Avicta Elite Cotton (Gaucho 600 + Avicta Duo) (Table 1). Plantings were carried out as per the local agronomic recommendations in co-ordination with Extension County Agents. The experiments were laid out in a randomized complete block design with 4 replications. The plots were minimum of 4-rows wide X 30 ft. in length. The field trials were maintained under irrigated condition. Ten randomly selected plants from each of the vulnerable stages of plant growth [cotyledon, 1 true-leaf, 2 true-leaves, 3 true-leaves, and 4 true-leaves stages] were taken to the laboratory in glass mason jars containing 75% ethyl alcohol. Samples were processed using a washing technique and the number of thrips adults and immatures in each sample were counted using a dissecting microscope (Burris et al. 1990). Thrips damage ratings were taken during cotyledon to 4 true-leaves stages using the scale 0-5 (where, 0 = no damage and 5 = severe damage). At maturity, plots were harvested, and samples were processed to record lint and seed yield separately. Data were analyzed by ANOVA and means were separated by Tukey's mean separation test using Agriculture Research Manager (Gylling Data Management, Inc.).

Table 1. Treatment description

Treatment/ Formulation	Active Ingredient(s)	Rate (mg AI/Seed)
Gaucho 600	Imidacloprid	0.375
Cruiser 5FS	Thiamethoxam	0.340
Aeris	Imidacloprid + thiodicarb	0.375 + 0.375
Avicta Elite Cotton	Imidacloprid + thiamethoxam + abamectin	0.375 + 0.340 + 0.150

Results and Discussion

Only two study sites (Lubbock and Kress) had thrips population densities reaching action threshold (1 thrips/ true leaf). At Kress, there were significantly fewer thrips in treated plots compared to the untreated check at cotyledon, 1 true leaf, and 4 true-leaves stages of cotton (Table. 2). At Lubbock, mean thrips density was significantly lower in treated plots compared to untreated check during the 1 true-leaf stage of cotton (Table 3). The thrips pressure subsided drastically after the 1 true-leaf stage at Lubbock study site. Overall, untreated plots exhibited higher thrips damage compared to the treated plots (Table 4). Thrips damage rating varied significantly across treatments at 4 true-leaves stage of cotton at Kress. At Lubbock site, thrips damage rating varied significantly during 1 true-leaf and 4 true-leaves stages of cotton. No significant differences were observed among treatments for lint yield at any of the location.

Table 2. Mean thrips densities (number of thrips/ 10 plants) across crop growth stages at Kress, TX.

	Cotyledon stage			1 true leaf stage			4 true leaves stage		
	Immatures	Adults	Total	Immatures	Adults	Total	Immatures	Adults	Total
Untreated check	9.5a	9.8a	19.3a	24.0a	18.8a	42.8a	42.0a	13.3a	55.3a
Gaucho 600	2.0b	2.3b	4.3b	7.0b	8.5b	15.5b	11.0b	4.5b	15.5b
Cruiser 5FS	2.6b	1.7b	4.3b	7.5b	9.8b	17.3b	10.8b	6.0b	16.8b
Aeris	1.5b	2.5b	4.0b	9.5b	9.8b	19.3b	13.3b	5.3b	18.6b
Avicta Elite Cotton	2.5b	2.3b	4.8b	9.8b	9.8b	19.6b	15.8b	7.3b	23.1b
P value	*0.033*	*0.0051*	*0.0036*	*0.0139*	*0.0116*	*0.0069*	*0.0007*	*0.0264*	*0.001*

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

Table 3. Mean thrips densities (number of thrips/ 10 plants) across crop growth stages at Lubbock, TX.

	Cotyledon stage			1 true leaf stage			4 true leaves stage		
	Immatures	Adults	Total	Immatures	Adults	Total	Immatures	Adults	Total
Untreated check	1.3	4.0ab	5.3	64.0a	18.3a	82.3a	6.7	9.3	16.0
Gaucho 600	0.7	2.7ab	3.4	13.7b	4.0b	17.7b	11.0	6.0	17.0
Cruiser 5FS	0.0	8.0a	8.0	17.3b	9.0ab	26.3b	6.0	10.3	16.3
Aeris	0.0	4.0ab	4.0	4.7b	7.7ab	12.4b	8.0	8.7	16.7
Avicta Elite Cotton	0.0	1.3b	1.3	6.7b	2.0b	8.7b	5.0	12.0	17.0
P value	0.5977	0.0363	0.1604	0.0004	0.0217	0.0004	0.6972	0.0697	0.9995

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

Table 4. Mean thrips damage rating (scale: 0-5, where 0 = no damage and 5 = severe damage).

	Kress		Lubbock	
	1 true leaf stage	4 true leaves stage	1 true leaf stage	4 true leaves stage
Untreated check	1.5	3.1a	3.8a	3.5a
Gaucho 600	0.9	1.3b	2.5bc	2.7ab
Cruiser 5FS	1.3	1.6b	2.7bc	2.3b
Aeris	1.0	1.6b	3.0b	2.2b
Avicta Elite	0.9	1.5b	2.0c	2.8ab
P value	0.259	0.0167	0.0019	0.0243

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

Summary

Thrips species complex in Texas High Plains cotton is dominated by *T. tabaci* and *F. occidentalis*. Results indicate that thrips populations in this region are fairly sensitive to the neonicotinic seed treatments. Insecticide seed treatments provided a good control against thrips, however, no significant yield response was observed. Timely growing conditions of 2018 favorable for plant growth helped cotton to recover from early thrips injury in the areas where thrips population levels reached action threshold. These findings are in line with previous studies that reported no significant yield benefit in response to thrips control provided by insecticide treatments in cotton grown under favorable growing conditions (unpublished data, Vyavhare et al.).

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