SUPPRESSION OF THRIPS BUT ENHANCEMENT OF SHORT-HORNED GRASSHOPPERS IN CONSERVATION TILLAGE: INFLUENCE OF COVER CROPS AND INSECTICIDES ON INFESTATIONS

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Abstract

In 2010, three field experiments were conducted in two locations in Georgia in conservation tillage cotton to determine the influence of cover crop (wheat or crimson clover) and insecticides (Temik (aldicarb) @ 1.75 or 5.0 lbs product/acre or Temik @1.75 lbs/acre + Diamond (novaluron) applied seven days after planting) on management of short-horned grasshopper (Acrididae) and tobacco thrips (*Frankliniella fusca* (Hinds)). Results showed significant reduction in thrips numbers in non-insecticide treated cotton in conservation tillage as compared to conventional tillage, but the reverse situation occurred with short-horned grasshoppers, which had higher populations in all conservation tillage systems as compared to plow tillage. In conservation tillage, thrips numbers were generally similar on cotton planted in crimson clover as compared to wheat. Overall, clover had a greater impact on reducing thrips populations than did wheat, but also had a greater negative impact on cotton height, stand count, and yield, especially in the low rates and absence of Temik (aldicarb). Insecticide treatment with Temik @ 1.75 or 5.0 lbs/acre reduced thrips population in all treatments compared to untreated plots, but numbers were typically 2x or higher reduction in conservation tillage. Short-horned grasshoppers were not controlled with either Temik rate in any tillage system in the three tests and populations were not significantly reduced in plots sprayed with Diamond (novaluron) @ 10 oz/acre.

Introduction

Use of conservation tillage cotton has economic advantages for growers, and it is important for entomologists to develop increased knowledge on pest biology and control in reduced tillage environments (All 1989). Conservation tillage changes the cropping environment and can influence risks for different pests in a positive, negative, or neutral manner as compared to plow tillage. Cotton stand establishment in conservation tillage cotton is a concern, so management of seedling pests such as thrips with preventive applied insecticides is common. In recent years, short-horned grasshopper (Acrididae) populations have produced serious cotton seedling damage in conservation tillage fields. All et al. (1994) reported that thrips (mostly tobacco thrips, *Frankliniella fusca* (Hinds)) infestations in seedling cotton were reduced in conservation tillage systems as compared to conventional tillage, and this observation has been verified in many

experiments with cotton. The anomaly of having reduced risk in conservation tillage for thrips injury but increased hazard for short-horned grasshopper infestations is a good example of why individual pests must be considered independently, as well as collectively, in developing pest management programs in crops. Wheat and crimson clover are cover crops that may reduce thrips infestations in conservation tillage cotton. Unfortunately, conservation tillage with either cover does not eliminate economic damage on cotton at the same level as systemic insecticides such as Temik^{tm} (aldicarb), which controls thrips for 45 days or more. Additionally, aldicarb has been shown to have little impact on short-horned grasshopper infestations in cotton, whereas various insecticides, including the IGR insecticide novaluron, have shown effectiveness for pest management. The objectives of the study were to evaluate the effect of cover crop, herbicide burndown timing, and insecticide treatment individually, and in combination, on hazard for economic damage by thrips and short-horned grasshoppers in conservation tillage cotton.

Methods

Three field tests were conducted during 2010 at the UGA Southeastern Branch Research and Education Center in Burke County and at the UGA Plant Sciences Farm near Athens. The fields were each approximately 2 acres in size and were separated into four blocks each with wheat or clover, or left fallow in November 2009. In May, the cover crops received a burndown application of glyphosate (broadcast application @ 0.74 lbs a.i./acre) at seven days or 22 days before planting cotton. The fallow blocks were plowed at least three times beginning 15 days before planting so that a smooth seed bed was present for plow tillage treatments. Eight row plots of insecticide treatment (and a nonchemical check) were randomized in each block. The insecticide treatments in-furrow applications of Temik 15G @ 1.75 lbs/acre, Temik 15G @ 5.0 lbs/acre + novaluron @ 10oz/acre, or Temik @ 5.0 lbs/acre). Novaluron (Diamond 0.83 EC) was applied in a broadcast spray in a volume of 10 gal/acre over plots seven days after planting. The cotton variety used in the test was DP164BIIRR which was tolerant to glyphosate, and herbicide was used as needed for weed control during the season following thrips sampling. Other standard agronomic practices for cotton at the locations were applied at appropriate times. The thrips were sampled on the cotton seedlings at 21 days after planting by immersing 10 randomly selected seedlings in a specimen cup containing alcohol. Thrips were counted and identified using a dissecting microscope. Short-horned grasshoppers were sampled weekly during the season by counting adults and nymphs while walking 2 x 3 ft. wide swaths transecting each plot. Data analysis utilized SAS (Statistical Analysis System) procedures for ANOVA at $P<0.05$ considering experiment design with mean separation using LSD t Test for split plot design.

Results and Discussion

The data demonstrates that thrips populations were significantly greater on cotton in plow tillage (overall) as compared to conservation tillage (Table 1 and Figure 1). Adult populations were over 90% tobacco thrips. Significantly higher numbers of thrips were present on cotton in conventional tillage as compared with wheat and crimson clover. Clover had a negative impact on yield, plant height, and stand count. Most of the insecticide treatments produced significant reduction in thrips numbers compared to non-insecticide treated plots. In almost all combinations of cover crop and Temik rate, thrips populations were lower than any conventional tillage plots treated with Temik. Compared to the plow tillage check plot yield, wheat check plots had a higher yield in both years. Short-horned grasshopper populations were low (did not exceed 1 short-horned grasshopper/10ft2) in both test fields located at the UGA Southeastern Branch Research and Education Center throughout the season, but higher numbers were present in the UGA Plant Sciences Farm experiment. At all three locations, more short-horned grasshoppers were usually observed in the conservation tillage systems (wheat or clover) as compared to plow tillage until late in the season. Observations of grasshopper adults and immatures in insecticide treatments indicated that novaluron @ 10 oz/acre did not reduce short-horned grasshoppers in treated plots in all three field tests.

Table 1. Tobacco thrips management with selected rates of Temik in conservation tillage (CT) or plow tillage (PT) cotton, 21 days after planting, Midville, GA.

Insecticide Rate	Average Number of Thrips		
	PT	CT Wheat	CT Clover
Check	14.1 a	5.1 bc	6.6 b
Temik 1.75	2.5 bc	2.8 bc	4.9 bc
Temik 5.0	2.2 bc	2.1 c	3.1 bc

$P<0.05$ Means followed by the same letter are not significantly different in Tukey analysis.

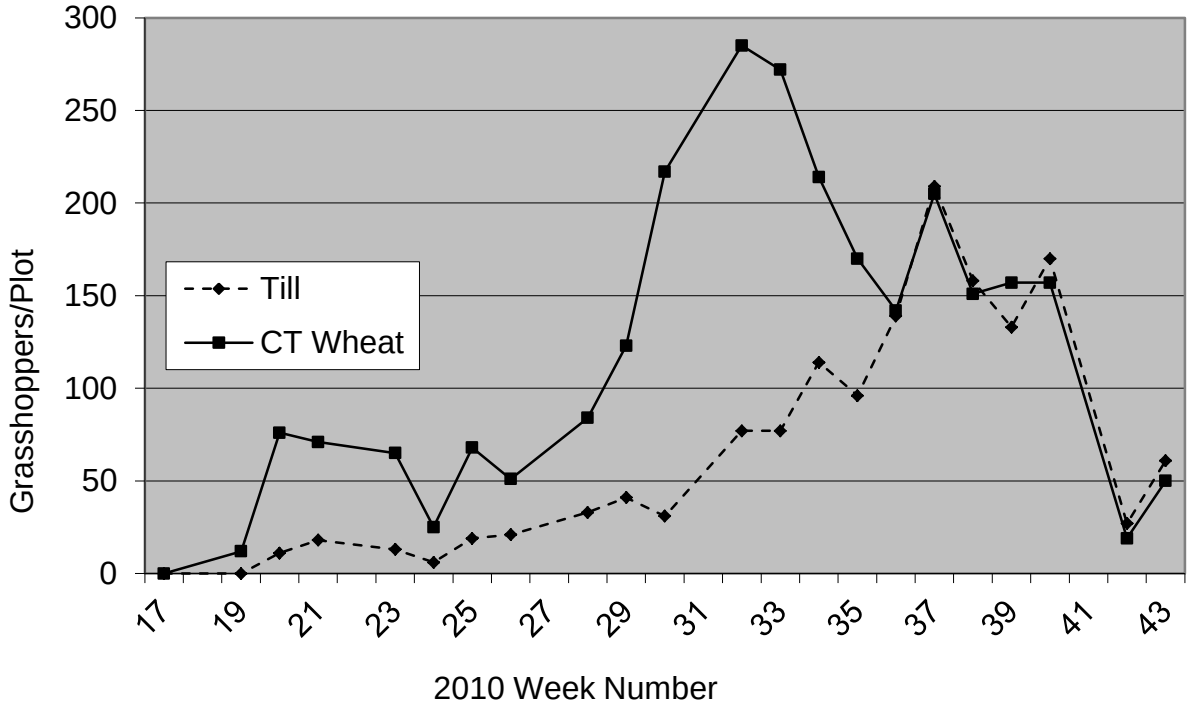

Figure 1. Influence of Cover Crops on Short-horned Grasshopper Populations in Cotton at the University of Georgia Plant Sciences Farm, 2010

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