INFLUENCE OF COVER CROPS IN CONSERVATION TILLAGE SYSTEMS ON ALDICARB RATE REQUIREMENT FOR THRIPS MANAGEMENT IN COTTON

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Abstract

In 2008 and 2009, field experiments were conducted in conservation tillage (CT) (strip-tillage) cotton to determine the influence on tobacco thrips (*Frankliniella fusca* (Hinds)) of cover crop (wheat, crimson clover, and vetch), and 7 different insecticide treatments (Temik TM (aldicarb) applied in furrow (0.13 lbs a.i./A, 0.26 lbs a.i./A, 0.38 lbs a.i./A, 0.53 lbs a.i./A, 0.75 lbs a.i./A). Additional treatments included Temik applied by precision placement in seed hills (0.19 lbs a.i./A) or seed treatment with Cruiser TM (thiamethoxam) (0.34 mg/seed). Results showed significant reduction in thrips numbers in non-insecticide treated cotton in conservation tillage as compared to conventional tillage (PT), but degree of suppression was usually not as good as with any of the types of insecticide treatments. In conservation tillage, thrips numbers were similar on cotton planted in either clover or vetch, but wheat had significantly more thrips. Overall, clover and vetch 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. Insecticide treatments reduced thrips population, but the reduction in Temik rate (3x reduction in per acre rate compared to the conventional in-furrow application rate) in precision placement plots did not have an additive control effect with conservation tillage in reducing thrips populations.

Introduction

Thrips are a major pest of seedling cotton in the Southeast and much time and energy go into thrips control to ensure a healthy vigorous stand. Since the 1980s, conservation tillage practices for field crops like cotton have increased greatly. Conservation tillage changes the cropping environment and can influence risks for different pests in a positive, negative, or neutral manner as compared to conventional tillage (All 1989). More than a decade ago it was observed that thrips (mostly tobacco thrips, *Frankliniella fusca* (Hinds)) infestations in seedling cotton were reduced in conservation tillage systems (All et al. 1994) as compared to conventional tillage, and this observation has been verified in many experiments with cotton. Wheat, crimson clover, and vetch are three cover crops that may influence hazard for thrips infestations in conservation tillage cotton. Unfortunately, conservation tillage 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. Cotton is planted in rows at a 0.15 to 0.3 m "hill" spacing, and the rate of Temik required for thrips control in conventional tillage cotton can be reduced if the granules are applied by precision placement (PP) in cotton hills as compared to the conventional application method of dribbling granules along the seed furrow. Recently, insecticide seed treatments such as Cruiser TM (thiamethoxam) have shown promise for thrips control in cotton. The objectives of the study were to evaluate the effect of cover crop, and insecticide treatment individually and in combination on hazard for economic damage by thrips in conservation tillage (strip-tillage) cotton.

Materials and Methods

Two field tests were conducted during 2008 and 2009 at the UGA Southeastern Branch Research and Education Center (SEB) in Burke County. Both tests were arranged in a randomized complete split-block design with 4 repetitions in each cover crop. In 2008 a field approximately 1 acre in size consisted of wheat cover, which was planted in November of 2007, and conventional tillage blocks. In 2009 a field approximately 2 acres in size consisted of wheat, clover, and vetch blocks, which were planted in January 2009, and conventional tillage blocks. In May the cover crops received a burndown application of glyphosate (broadcast application @ 0.74 lbs a.i./A) at 7 days (2008) or 22 days (2009) before planting cotton. The fallow blocks were plowed at least three times beginning 15 days before planting so that a smooth seedbed was present for conventional tillage treatments. Seeds were planted with 3 inch spacing. Four-row plots of insecticide treatment (and a nonchemical check) were randomized in each block. The insecticide treatments were Cruiser treated seed at (0.34 mg a.i./seed), in-furrow applications of Temik (0.13 lbs a.i./A, 0.26 lbs a.i./A, 0.38 lbs a.i./A, 0.53 lbs a.i./A, and 0.75 lbs a.i./A), and precision placement of Temik (0.19 lbs a.i./A) on each seed. Tests were planted on 5/15/2008 and 6/1/2009 with DP164BIIRF cotton. Herbicide was used as needed for weed control during the season following thrips sampling. Other standard

agronomic practices for cotton were applied at appropriate times. The furrow was left open in the PP plots to allow for treatment. An applicator with a long tube attached designed to deliver a precise amount of Temik over each seed was used to treat PP plots and the furrow was closed with an Almaco push planter.

Thrips samples were taken in plots at 14 (plants had large cotyledon leaves) and 22 (plants had large cotyledon leaves and a small vegetative branch leaf) days after planting in 2008, and at 17 (plants had large cotyledon leaves) and 24 (plants had small vegetative branch leaves) days after planting in 2009. Thrips samples were collected by immersing 10 randomly selected seedlings in a specimen cup containing alcohol. Thrips were counted and identified using a dissecting microscope. Sampling dates were 6/3/2008 and 6/10/2008, and 6/18/2009 and 6/25/2009. Plant heights (cm) and stand counts were taken on 7/2/2008 and 7/16/2009. The 2 middle rows of plots were harvested on 10/28/2008 and 12/7/2009 with an International 1822 2-row picker. 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

Both years the fields were irrigated regularly, but in 2009 much more additional rain fell during the growing season. Adult populations were over 90% tobacco thrips in both years. Immature counts predominated in the 14-day sample and the 22-day sample in 2008 and in the 17-day sample in 2009, but immatures and adults were almost even in the second sample date of 2009. Significantly higher numbers of thrips were present on cotton in both years on both sampling dates in conventional tillage as compared with wheat, crimson clover, or vetch. Most of the insecticide treatments produced significant reduction in thrips numbers compared to non-insecticide treated plots. Thrips populations within check plots were statistically the lowest in clover. Vetch had statistically fewer thrips overall than clover or wheat. In all combinations of cover crop and Temik rate, thrips populations were lower than any conventional tillage plots treated with Temik. Although the PP Temik plots did not show better control than other Temik rates in the respected cover crops, with the additive affects of cover crops it did control thrips better than the standard rate in conventional tillage plots. However, PP Temik plots in any cover crop did not outperform the standard rate plots in conventional tillage plots for yield, stand count and plant height, except in clover where stand count and height were greater. Compared to the CT check plot, wheat check plots had a higher yield in both years. In 2009 vetch and clover actually had negative impacts on yield, plant height and stand count, especially vetch (Tables 2, 3, and 4). Cruiser treated plots were higher yielding than the standard rate of Temik in all cases except in clover during 2009, but were not statistically different in 2009 in PT and CT wheat.

Table 1.

Tobacco thrips management with selected rates of Temik or Cruiser seed treatment in conservation tillage (CT) or plow tillage (PT) cotton, Midville, GA

Insecticide & Rate	Average Number of Thrips/Plant 2008		Average Number of Thrips/Plant 2009			
	PT	CT Wheat	PT	CT Wheat	CT Clover	CT Vetch
Check	17.8a	4.2cdefg	1.28a	0.46cd	0.21defghi	0.29defgh
Temik 0.88	6.9c	3.0efg	0.43cde	0.16ghijkl	0.10hijkl	0.16ghijkl
Temik 1.75	6.4cd	2.8efg	0.23fghijk	0.18ghijkl	0.14ghijkl	0.04kl
Temik 2.5	5.3cdef	3.4defg	0.39cdef	0.19ghijkl	0.23ghijk	0.08jkl
Temik 3.5	5.2cdefg	2.3fg	0.49c	0.15ghijkl	0.10hijkl	0.03l
Temik 5.0	5.9cde	2.0g	0.40cdef	0.11hijkl	0.10hijkl	0.10hijkl
Temik1.28 PP	4.6cdefg	3.1defg	0.81b	0.31cdefg	0.23ghijk	0.09ijkl
Cruiser	10.8b	5.2cdefg	1.18a	0.25efghij	0.28defghi	0.18ghijkl

Means are analyzed separately by year.
Means with the same letter are not significantly different. $P<0.05$

Table 2.

Plant heights at 45 days after planting in conservation tillage (CT) or plow tillage (PT) cotton, Midville, GA

Insecticide & Rate	Plant Heights (cm) 2008		Plant Heights (cm) 2009			
	PT	CT Wheat	PT	CT Wheat	CT Clover	CT Vetch
Check	32.2e	50.4abc	70.0efg	75.2cdef	69.3efg	60.1h
Temik 0.88	42.8d	51.7abc	79.7abcd	79.6abcd	79.4abcd	76.9bcde
Temik 1.75	51.0abc	52.6abc	75.8cdef	76.9bcde	74.9cdef	76.5cde
Temik 2.5	50.5abc	50.2abc	79.2abcd	79.6abcd	72.2def	62.2gh
Temik 3.5	50.8abc	54.8ab	75.6cdef	75.1cdef	76.6bcde	66.9fgh
Temik 5.0	49.4bcd	56.5a	76.4cde	76.8bcde	79.7abcd	82.3abc
Temik1.28 PP	51.5abc	50.1abc	75.9cde	74.6cdef	79.7abcd	75.4cdef
Cruiser	47.6cd	55.5ab	79.6abcd	85.4ab	87.9a	81.5abc

Means are analyzed separately by year.
Means with the same letter are not significantly different. P<0.05

Table 3.

Plant counts at 45 days after planting in conservation tillage (CT) or plow tillage (PT) cotton, Midville, GA

Insecticide & Rate	Plant Counts/Row Ft 2008		Plant Counts/ Row Ft 2009			
	PT	CT Wheat	PT	CT Wheat	CT Clover	CT Vetch
Check	2.5bc	4.2a	2.0abcdef	2.0abcde	1.5defghij	0.6m
Temik 0.88	2.6bc	4.2a	2.0abcdef	2.4ab	2.1abcd	1.5defghijkl
Temik 1.75	2.3bc	4.3a	1.5defghijkl	1.7bcdefgh	1.6cdefghi	1.5defghij
Temik 2.5	2.9b	4.0a	1.8bcdefg	2.0abcdef	1.0hijklm	0.8 lm
Temik 3.5	2.0cd	4.3a	1.2ghijklmn	1.4efghijkl	1.5defghij	0.8klm
Temik 5.0	2.7bc	4.0a	1.8bcdefg	1.9abcdef	1.3fghijklm	0.8jklm
Temik1.28 PP	2.8bc	4.3a	1.5defghijk	1.2ghijklm	1.5defghijk	1.0ijklm
Cruiser	1.4d	4.1a	2.4ab	2.3abc	2.6a	1.6cdefghi

Means are analyzed separately by year.
Means with the same letter are not significantly different. P<0.05

Table 4.

Seed cotton yield in conservation tillage (CT) or plow tillage (PT) cotton, Midville, GA

Insecticide & Rate	Harvest Weight (lbs/A) 2008		Harvest Weight (lbs/A) 2009			
	PT	CT Wheat	PT	CT Wheat	CT Clover	CT Vetch
Check	2604d	3852ab	2777a	2800a	2541ab	1874b
Temik 0.88	2854cd	3266bcd	2713ab	2527ab	2518ab	2369ab
Temik 1.75	3088cd	3195bcd	2913a	2981a	2768a	2804a
Temik 2.5	3201bcd	3237bcd	2827a	3086a	2450ab	2233ab
Temik 3.5	2642d	3218bcd	2800a	2859a	3072a	2641ab
Temik 5.0	3226bcd	3303abcd	3076a	2800a	2713ab	2564ab
Temik1.28 PP	3455abc	3412abc	2972a	2650ab	2541ab	2596ab
Cruiser	3061cd	4008a	2949a	2959a	2664ab	3004a

Means are analyzed separately by year.
Means with the same letter are not significantly different. P<0.05

Discussion

The data demonstrates that thrips populations were significantly greater on cotton in conventional tillage (overall) as compared to conservation tillage. Cover crops may have a positive influence on reducing thrips populations in cotton without using insecticides. With the addition of PP Temik applications, thrips control may be improved in fields with different cover crops. The potential for lower rates of Temik to be applied in furrow at planting in addition to the usage of cover crops may improve environmental cleanliness and enhance the likelihood that Temik will stay on the market despite its toxicity.

References

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