EVALUATION OF STEWARD INSECTICIDE FOR CONTROL OF HELIOTHINE SPECIES IN COTTON

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RESEARCH PROBLEM

Resistance to current classes of insecticides is a primary issue for cotton growers when considering control tactics for the bollworm and tobacco budworm. The development and evaluation of new insecticides is necessary to maintain effective control measures for pests that adversely impact the economic viability of cotton production. Research is needed to evaluate the efficacy of new chemistry and determine how best to utilize this chemistry in cotton production systems.

BACKGROUND INFORMATION

Of all cotton pests in Arkansas during 1998, the bollworm/tobacco budworm complex resulted in the most acres treated, the greatest number of insecticide applications, the greatest cost of control per acre, and the greatest reduction in yield of any cotton pest (Williams, 1999). Continued reliance on pyrethroid insecticides as the major control measure for the Heliothine complex has resulted in increased levels of resistance for both species (Bagwell, 1999; Brown *et al.,*1998; Sparks *et al.*, 1993). Continued discovery of new pest control technology is essential to maintain a viable cotton production industry in Arkansas. Steward (indoxacarb) is a new insecticide that exhibits broad-spectrum activity against lepidopterous pests. Ingestion is the primary route of entry into target species, although absorption through the cuticle also occurs. Steward's novel mode of action acts to block sodium ion entry into nerve cells, resulting in paralysis and death of the pest. When pest species are exposed to a toxic dose of Steward, there is a rapid cessation of feeding (within 1-4 h) and knockdown occurs within 1-2 d (Mitchell, 1999). In this study, Steward was compared alone and in combination with Asana and also to Tracer to determine its effectiveness in controlling the bollworm and tobacco budworm.

RESEARCH DESCRIPTION

This trial was conducted in Jefferson County in 1998 to evaluate Steward efficacy against the bollworm and tobacco budworm. Insecticide treatments were evaluated in small plots arranged in a randomized complete-block design with four replica-

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tions. A conventional cotton variety (DP50) was utilized. The seasonal population mix in the test location, as determined by trap counts, was 90% bollworm and 10% tobacco budworm. Treatments were initiated when egg or small worm densities were at or approaching recommended treatment levels. Applications were made with a John Deere 6000 hi-cycle at 65 psi for every 10 gal/acre using Teejet TXVS-6 nozzles on 20-inch centers. The treatments (lb ai/acre) evaluated were an untreated control, Steward 1.25CS alone (0.065, 0.09, and 0.11), Steward 1.25SC + Asana 0.66EC (0.065 + 0.036), Asana 0.66EC alone (0.036), and Tracer 4EC (0.067). Application dates in 1998 were 22 June, 10 July, 17 July, and 28 July. Evaluation dates in 1998 were 25 June 3DAT#1, 14 July 4DAT#2, 21 July 4DAT#3, 31 July 3DAT#4, and 10 October at harvest. Data were collected by examining 50 terminals and 100 squares at random from the center of each plot. Yields were determined by harvesting the middle rows of each plot with a commercial two-row John Deere cotton picker. Data were processed using Agriculture Research Manager Ver. 6.0.1. Analysis of variance was run and the least significant difference was used to separate means.

RESULTS AND DISCUSSION

Except for a significant reduction in the number of live medium heliothine larvae per 100 squares (85%) with the Steward + Asana tankmix at 3DAT#1, there were no significant differences among treatments at 3DAT#1 and 4DAT#2 for any of the other measured parameters.

When rated 4DAT#3 (Table 1) and 3DAT#4 (Table 2), all insecticide treatments provided a similar level of Heliothine control and resulted in significantly less worm damage than was found in the untreated control. This same trend in the data was observed for total live worm counts. There were no significant differences among treatments for terminal egg counts. Insecticide treatments reduced terminal worm counts only at 4DAT#3 when the Heliothine population was at its peak in the untreated control.

All insecticide treatments significantly out yielded the untreated control. Asana 0.66EC 0.036 lb ai/acre also significantly out yielded Steward 1.25SC 0.09 lb ai/acre but failed to differ significantly from the other insecticide treatments (Table 3).

PRACTICAL APPLICATION

The pyrethroid standard, Asana, was still effective in controlling the predominantly bollworm population encountered in this trial. Steward proved to be as efficacious as Asana and also provided control equal to Tracer, which is becoming the new standard for worm control in cotton. Yields obtained from the Steward plots compared favorably with the Asana and Tracer plots. Steward with its novel mode of action shows promise as an additional effective control measure for the Heliothine complex and should be a valuable tool for resistance management when registered.

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Table 1. Evaluation of Steward insecticide for control of Heliothine species (4DAT#3).

		Heliothine			
Treatment	Rate	Damage 4DAT#3	Larvae 4DAT#3	Eggs 4DAT#3	Larvae 4DAT#3
	lb ai/acre	-------- No./100 Sq. ------		------ No./100 Term. -----	
Untreated control		13.5 a[z]	7.8 a	1.5 a	16.0 a
Steward 1.25 SC	0.065	4.5 b	1.5 b	1.0 a	1.3 b
Steward 1.25 SC	0.09	3.5 b	0.5 b	3.3 a	2.0 b
Steward 1.25 SC	0.11	4.5 b	0.3 b	0.3 a	0.8 b
Steward 1.25 SC + Asana 0.66 EC	0.065 + 0.036	2.0 b	0.0 b	3.0 a	0.3 b
Asana 0.66 EC	0.036	2.0 b	0.5 b	1.0 a	0.8 b
Tracer 4 EC	0.067	3.0 b	0.3 b	2.0 a	1.3 b
LSD (P=0.05)		4.26	1.38	3.54	4.3

[z] Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT).

Table 2. Evaluation of Steward insecticide for control of Heliothine species (3DAT#4).

		Heliothine			
Treatment	Rate	Damage 3DAT#4	Larvae 3DAT#4	Eggs 3DAT#4	Larvae 3DAT#4
	lb ai/acre	-------- No./100 Sq. ------		------ No./100 Term. -----	
Untreated control		25.3 a[z]	4.3 a	1.3 a	0.3 a
Steward 1.25 SC	0.065	2.8 b	0.8 b	0.8 a	0.5 a
Steward 1.25 SC	0.09	1.8 b	0.3 b	0.8 a	0.0 a
Steward 1.25 SC	0.11	3.5 b	0.3 b	0.5 a	0.0 a
Steward 1.25 SC + Asana 0.66 EC	0.065 + 0.036	2.3 b	0.0 b	0.0 a	0.0 a
Asana 0.66 EC	0.036	4.0 b	0.8 b	0.5 a	0.3 a
Tracer 4 EC	0.067	1.5 b	0.0 b	0.0 a	0.0 a
LSD (P=0.05)		5.9	1.87	1.51	0.52

[z] Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT).

Table 3. Yields; Evaluation of Steward insecticide for control of Heliothine species.

Treatment	Rate	Lint yield
	lb ai/acre	lb/acre
Untreated control		468.5 c[z]
Steward 1.25 SC	0.065	793.6 ab
Steward 1.25 SC	0.09	728.5 b
Steward 1.25 SC	0.11	845.4 ab
Steward 1.25 SC +	0.065	
Asana 0.66 EC	0.036	786.4 ab
Asana 0.66 EC	0.036	915.3 a
Tracer 4 EC	0.067	800.9 ab
LSD (P=0.05)		134.85

[z] Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT).