EVALUATION OF VALENT'S S-1812 INSECTICIDE FOR CONTROL OF HELIOTHINE SPECIES IN COTTON

Donald R. Johnson, Gus M. Lorenz, John D. Hopkins, and Larry M. Page[1]

RESEARCH PROBLEM

The Heliothine complex consisting of the tobacco budworm, *Heliothis virescens*, and the cotton bollworm, *Helicoverpa zea*, are primary pests of cotton grown in the southern United States. The continued reliance on the limited selection of insecticides that are available for Heliothine pest control in cotton has led to the development of resistance by certain populations of tobacco budworms and bollworms to pyrethroids, organophosphates, and carbamates. Research is needed to evaluate the potential of new classes of insecticides in controlling Heliothine species in cotton.

BACKGROUND INFORMATION

Tobacco budworms and cotton bollworms are well established as a major pest complex of southern cotton (Luttrel, 1994). In Arkansas during 1998, the bollworm/tobacco budworm complex caused and estimated 4.66% yield loss or an approximate loss of 29 million dollars (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. In this study, Valent S-1812 was compared alone and in combination with Asana and Orthene and also to Tracer to determine its effectiveness in controlling the cotton bollworm and tobacco budworm.

RESEARCH DESCRIPTION

The field trial was conducted in Jefferson County in 1999 to evaluate Valent S-1812 efficacy against the bollworm and tobacco budworm. Insecticide treatments were evaluated in small plots arranged in a randomized complete-block design with four replications. The cotton variety utilized was Stoneville BXN47. The seasonal population mix in the test location, as determined by trap counts, was 89% bollworm and 11% 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 45 psi for every 8.56 gal/acre using Teejet TXVS-6 nozzles on 20-inch centers.

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[1] Pest Management Section Leader and IPM Coordinator, University of Arkansas, Cooperative Extension Service, Little Rock, AR; Insecticide Testing Coordinator and Extension Associate (Pest Management), University of Arkansas Cooperative Extension Service, Lonoke, AR.

The treatments (lb ai/acre) evaluated were an untreated control, S-1812 4EC (0.1, 0.15, 0.2), S-1812 4EC + Orthene 90S (0.075 + 0.75), S-1812 4EC + Asana 0.66EC (0.075 + 0.02), Asana 0.66EC (0.02), Orthene 90S (0.75), Orthene 90S + Asana 0.66EC (0.5 + 0.02), and Tracer 4EC (0.067). Application dates in 1999 were 18 July, 15 July, 3 August, and 9 August. Evaluation dates in 1999 were 12 July 4DAT#1, 19 July 4DAT#2, 6 August 3DAT#3, 12 August 3DAT#4, and 1 October at harvest.

Data were collected by examining 50 terminals and 50 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

When Heliothine square damage was evaluated, treatments failed to differ significantly at 4DAT#1 and 3DAT#3. At 4DAT#2 all treatments significantly reduced the number of bollworm damaged squares compared to the untreated control but failed to differ significantly among themselves. At 3DAT#4 all insecticide treatments except S-1812 0.1 lb ai/acre provided a significant reduction in the number of bollworm damaged squares compared to the untreated control (Table 1.).

No differences were observed among treatments for the numbers of small-sized Heliothine larvae per 50 squares at any rating. When rating the numbers of medium sized Heliothine larvae per 50 squares, significant differences occurred only at 3DAT#4. S-1812 0.15 lb ai/acre, S-1812 0.15 lb ai/acre, S-1812 0.2 lb ai/acre, S-1812 0.075 lb ai/acre + Orthene 0.75 lb ai/acre, S-1812 0.075 lb ai/acre + Asana 0.02 lb ai/acre, Orthene 0.75 lb ai/acre, and Tracer 0.067 lb ai/acre significantly reduced the numbers of medium sized larvae at this rating (Table 2.). At 3DAT#3 only S-1812 0.15 lb ai/acre provided a significant reduction in the number of total live larvae per 50 squares (Table 4). When rating the numbers of large Heliothine larvae and total Heliothine larvae per 50 squares at 3DAT#4, all insecitcide treatments caused a significant reduction compared to the untreated control (Tables 3 and 4).

All insecticide treatments significantly out yielded the untreated control but failed to differ significantly among themselves (Table 5).

PRACTICAL APPLICATION

The pyrethroid standard, Asana, was still effective in controlling the predominantly bollworm population encountered in this trial. S-1812 alone 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. No increases in performance were observed for any of the tankmixes tested. Yields obtained from the S-1812 plots compared favorably with the Asana and Tracer plots. S-1812 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. Square damage: evaluation of Valent's S-1812 insecticide for control of Heliothine species in cotton.

	Heliothine square damage			
Treatment (Rate)	4DAT#1	4DAT#2	3DAT#3	3DAT#4
lb ai/acre				
S-1812 (0.1)	11.0 a[z]	2.0 b	4.8 a	5.0 ab
S-1812 (0.15)	9.3 a	5.5 b	5.3 a	1.3 b
S-1812 (0.15)	8.5 a	1.8 b	4.5 a	2.5 b
S-1812 (0.2)	10.5 a	2.0 b	5.5 a	1.5 b
S-1812 + Orthene (0.075 + 0.75)	9.5 a	3.0 b	5.8 a	3.3 b
S-1812 + Asana (0.075 + 0.02)	11.0 a	4.8 b	5.5 a	1.0 b
Asana (0.02)	7.0 a	2.0 b	3.8 a	3.8 b
Orthene (0.75)	15.0 a	7.0 b	7.5 a	2.3 b
Orthene + Asana (0.5 + 0.02)	9.8 a	3.8 b	7.8 a	2.0 b
Tracer (0.067)	11.0 a	2.5 b	6.5 a	2.8 b
Untreated control	14.5 a	12.8 a	5.8 a	8.3 a

[z] Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls).

Table 2. Live medium larvae counts: evaluation of Valent's S-1812 insecticide for control of Heliothine species in cotton.

	Medium Heliothine larvae			
Treatment (Rate)	4DAT#1	4DAT#2	3DAT#3	3DAT#4
lb ai/acre				
S-1812 (0.1)	1.0 a[z]	0.0 a	0.3 a	0.8 ab
S-1812 (0.15)	0.8 a	0.0 a	0.3 a	0.0 b
S-1812 (0.15)	2.0 a	0.0 a	0.3 a	0.5 b
S-1812 (0.2)	1.3 a	0.3 a	0.3 a	0.3 b
S-1812 + Orthene (0.075 + 0.75)	2.0 a	0.0 a	0.8 a	0.3 b
S-1812 + Asana (0.075 + 0.02)	1.5 a	0.0 a	1.0 a	0.0 b
Asana (0.02)	0.5 a	0.0 a	0.8 a	1.3 ab
Orthene (0.75)	1.3 a	0.5 a	2.0 a	0.3 b
Orthene + Asana (0.5 + 0.02)	2.3 a	0.0 a	0.3 a	1.0 ab
Tracer (0.067)	2.3 a	0.3 a	0.8 a	0.0 b
Untreated control	3.5 a	0.5 a	1.5 a	2.3 a

[z] Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls).

Table 3. Live large larvae counts: evaluation of Valent's S-1812 insecticide for control of Heliothine species in cotton.

	Large Heliothine larvae			
Treatment (Rate)	4DAT#1	4DAT#2	3DAT#3	3DAT#4
lb ai/acre				
S-1812 (0.1)	0.3 a[z]	0.8 a	0.5 a	0.5 b
S-1812 (0.15)	0.3 a	0.0 a	0.0 a	0.0 b
S-1812 (0.15)	0.5 a	0.0 a	0.8 a	0.0 b
S-1812 (0.2)	0.5 a	0.3 a	0.3 a	0.0 b
S-1812 + Orthene (0.075 + 0.75)	0.3 a	0.0 a	0.3 a	0.0 b
S-1812 + Asana (0.075 + 0.02)	0.5 a	0.8 a	0.5 a	0.0 b
Asana (0.02)	0.3 a	0.0 a	0.0 a	0.0 b
Orthene (0.75)	0.8 a	0.8 a	1.3 a	0.3 b
Orthene + Asana (0.5 + 0.02)	0.0 a	0.3 a	1.3 a	0.0 b
Tracer (0.067)	1.0 a	0.3 a	1.0 a	0.0 b
Untreated control	1.3 a	1.3 a	1.3 a	1.8 a

[z] Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls).

Table 4. Total live larvae counts: evaluation of Valent's S-1812 insecticide for control of Heliothine species in cotton.

	Total Heliothine larvae			
Treatment (Rate)	4DAT#1	4DAT#2	3DAT#3	3DAT#4
lb ai/acre				
S-1812 (0.1)	3.3 a[z]	0.8 a	1.8 abc	1.5 b
S-1812 (0.15)	2.8 a	0.0 a	0.5 c	0.0 b
S-1812 (0.15)	2.8 a	0.0 a	1.8 abc	0.5 b
S-1812 (0.2)	4.0 a	0.5 a	1.8 abc	0.5 b
S-1812 + Orthene (0.075 + 0.75)	2.8 a	0.0 a	1.5 bc	0.5 b
S-1812 + Asana (0.075 + 0.02)	3.0 a	1.0 a	2.5 abc	0.0 b
Asana (0.02)	2.0 a	0.0 a	1.5 bc	1.8 b
Orthene (0.75)	2.8 a	0.8 a	4.0 a	0.5 b
Orthene + Asana (0.5 + 0.02)	2.5 a	0.3 a	2.8 abc	1.0 b
Tracer (0.067)	4.5 a	0.5 a	2.3 abc	0.5 b
Untreated control	7.3 a	1.0 a	3.3 ab	5.0 a

[z] Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls).

Table 5. Yield: evaluation of Valent's S-1812 insecticide for control of Heliothine species in cotton.

Treatment/Rate	Lint Yield	
lb ai/acre	lb/acre	
S-1812 (0.1)	912	a[z]
S-1812 (0.15)	1049	a
S-1812 (0.15)	999	a
S-1812 (0.2)	864	a
S-1812 + Orthene (0.075 + 0.75)	1033	a
S-1812 + Asana (0.075 + 0.02)	936	a
Asana (0.02)	970	a
Orthene (0.75)	917	a
Orthene + Asana (0.5 + 0.02)	1008	a
Tracer (0.067)	1030	a
Untreated control	672	b

[z] Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls).