MANAGEMENT OF THE HELIOTHINE COMPLEX USING TRADITIONAL AND NEW INSECTICIDES

D. R. Johnson, G. M. Lorenz,
L. M. Page and J. D. Hopkins
Cooperative Extension Service
University of Arkansas
Little Rock, AR

Abstract

The Heliothine complex was controlled effectively five new insecticides Steward (indoxacarb), Denim (emamectrin benzoate), Tracer (spinosad), and Intrepid (RH-2485). The control of Heliothine species was excellent with each insecticide. A rate response was observed using Steward and S-1812.

Introduction

The tobacco budworm has developed resistance to the pyrethroid insecticides and every other class of insecticides developed previously. The development of new chemistry to control tobacco budworm in cotton is a continuing challenge for the new discovery research component of agricultural industries. The most recent discoveries that are being developed include Steward (indoxacarb) by Du Pont, Tracer (spinosad) by Dow Elanco, Proclaim (emamectrin benzoate) by Novartis, Intrepid (RH-2485) by Rohm & Haas and S-1812 by Valent. These insecticides were evaluated in field test and compared to the standard insecticide Karate manufactured by Zeneca and Asana produced by DuPont.

Denim or emamectrin benzoate is a second generation avermectin insecticide for crop protection being developed by Merck and Co. Inc. emamectrin benzoate is a novel semi-synthetic avermectin insecticide derived from the fermentation product, avermectin B1 (abamectin) It is a broad spectrum lepidoptericide with good activity against beet armyworm, loopers, cotton bollworm and tobacco budworm. Research trials indicate that the product is active at very low rates in the range of 0.0075 to 0.015 lb ai/acre. The insecticide has low impact on beneficial arthropods (Dunbar et al. 1996).

Steward or indoxacarb is a broad-spectrum lepidoptera insect control agent. The primary route of entry into the target insects is through ingestion, although the product is also absorbed through the cuticle. Indoxacarb has a novel mode of action and acts by inhibiting sodium ion entry into nerve cells, resulting in paralysis and death of the pest species. Indoxacarb is considered to have a favorable comparative environmental and ecological profile with a high level of safety to beneficial insects and mites. Indoxacarb has also shown activity against plant bug species that occur in cotton.

Tracer or spinosad, the first product in the naturalyte class, is characterized by both contact and stomach activity and rapid knockdown which is highly unusual for a natural product (Thompson et al. 1996a). The spinosyns are a naturally derived group of insect control molecules form a new species of Actinomycetes, *Saccharopolyspora spinosa*, which is characterized, as bacteria. Spinosad is a mixture containing the two most active natural factors, A and D (Thompson et al. 1996b). Tracer is controls a broad spectrum of lepidoptera including eggs, but has little or no activity against predacious insects or sucking pests (Peterson et al. 1996).

Intrepid or RH-2485 is novel chemistry discovered by Rhom and Hass Company. The insecticide is a growth regulator or molt-accelerating compound that has activity against lepidoptera insect pests. It is highly effective on foliage larvae especially the bollworm, *Heliocoverpa zea*.

Karate or lambdacyhalothrin and Asana or esfenvalerate are broad-spectrum insecticide active against a wide range of insect pests. Both are very active against the larvae of the bollworm. The tobacco budworm, a key pest of cotton, has developed resistance to this class of insecticides (Bagwell et al. 1995) and caused control problems to occur in cotton when this insect is present at treatment levels.

Methods

The treatments included in these tests are listed in Tables 1, 2 and 3. The test was arranged in a randomized complete block design and plots were 8 rows by 50 feet long. The test site was located in Jefferson county approximately 8 miles southeast of Pine Bluff, Arkansas. The treatments were applied in 10 gallons total volume per acre. Treatments were applied on July 12, July 19(Trt#2), August 6 and August 12(Trt#4), 1999. The cotton crop was produced using standard agronomic practices and irrigated. The variety was BXN 47 planted May 5, l999. Yields were determined by harvesting the middle 2 rows using a John Deere cotton picker. Evaluations were made 3 to 4 days post treatment. Plots were evaluated by examining 50 squares and terminals for the presence of damage and larvae.

Results and Discussion

The tobacco budworm is normally the most frequent the last week in June and around the last of July and first part of August. During 1999, the overall tobacco budworm population level was substantially lower than the previous growing season. The population was predominately Heliocoverpa zea with a small percentage of Heliothis

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virescens occurring in late July. The data from treatments from the insecticides tested are presented in Table 1,2,and 3.

Steward or indoxacarb insecticide was evaluated for control of Heliothine. The 0.011 rate of indoxacarb was the most effective with larval counts of 0.1 and 1.3 compared to 3.5 and 4.8 respectively, in the untreated check. A rate response was observed with a gradual decline in counts as the rate increased. Denim had significantly lower infestations with count of 0.8 and 0.5. Intrepid was used in combination with Karate but no advantage was observed in the test from using the combination. All treatments had yields significantly higher that the untreated check.

Tracer and Leverage were evaluated alone and in combination. . All treatments had significantly fewer damaged squares and larvae after the second treatment (Table 2). Leverage and a combination of Leverage with Tracer were not significantly different from the untreated check on the fourth treatment. Tracer controlled Heliothine well overall. All treatments yielded significantly higher than the untreated check; however, the Tracer/Leverage combinations tended to have higher yields.

Valent's new insecticide was evaluated and results are listed in Table 3. The insecticide S-1812 was evaluated at rate from 0.1 to 0.2 pounds ai per acre. A rate response was observed from the lowest to highest rate. However, the control appeared to be optimal at he 0.15 pound rate. All treatments had significantly fewer larvae than the untreated check on both dates reported and significantly fewer damaged squares after the fourth treatment. All treatments had significantly higher yields that the untreated check.

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Table 1. Evaluation of Steward, Tracer, Denim and Intrepid compared to Karate Z for control of Heliothine species in cotton.

	Larvae and damaged squares / 50 squares				
Treatment/Rate	squares 4 DAT Trt # 2	larvae 4 DAT Trt # 2	squares 3 DAT Trt # 4	larvae 3 DAT Trt #4	Lint Yield lbs/A
Steward 0.06 lb ai/A	3.5 a	0.8 a	6.3 a	2.3 a	1035 ab
Steward 0.09 lb ai/A	5.0 a	0.3 a	5.3 a	1.8 a	1017 ab
Steward 0.11 lb ai/A	3.0 a	0.1 a	4.0 a	1.3 a	1014 ab
Tracer 0.08 lb ai/A	7.3 a	0.8 a	3.3 a	0.5 a	1058 ab
Denim 0.01 lb ai/A	5.5 a	1.0 a	6.8 a	1.3 a	*
Denim 0.01 lb ai/A+ Karate Z 0.025 lb ai/A	4.5 a	0.5 a	6.0 a	2.8 a	1041 ab
Steward 0.06 lb ai/A+ Karate Z 0.025 lb ai/A	1.8 a	0.3 a	5.8 a	1.0 a	1093 a
Intrepid 0.1 lb ai/A+ KarateZ 0.025 lbai/A	3.5 a	0.0 a	4.8 a	1.5 a	1010 ab
Intrepid 0.15 lb ai/A+ Karate Z 0.025 lb ai/A	3.5 a	0.0 a	4.8 a	1.3 a	1007 ab
Karate Z 0.025 lb ai/A	5.8 a	0.8 a	7.0 a	1.8 a	1012 ab
untreated	13.3 b	3.5 b	8.3 a	4.8 b	825 b

Means followed by same letter do not significantly differ(P=.05, Duncan's MRT)

Table 2. Evaluation of Tracer and Leverage for control of Heliothine species in cotton.

	Larvae and damaged squares / 50 squares				
Treatment/Rate	squares 4 DAT Trt # 2	Larvae 4 DAT Trt #2	Squares 3 DAT Trt #4	Larvae 3 DAT Trt #4	Lint Yield lbs/A
Tracer 0.067 lb ai/A	5.3 a	0.8 a	3.3 a	0.1 a	1018 a
Tracer 0.067 lb ai/A + Leverage 3 oz/A	3.3 a	0.8 a	3.5 a	0.5 ab	1141 a
Tracer 0.04 lb ai/A	3.3 a	0.1 a	2.5 a	0.0 a	1033 a
Tracer 0.04 lb ai/A + Leverage 3 oz/A	2.3 a	0.1 a	3.0 a	0.0 a	1119 a
Leverage 3 oz/A	1.0 a	0.1 a	3.8 a	1.0 ab	1087 a
untreated	9.3 b	2.8 b	4.8 a	2.3 b	906 a

Means followed by same letter do not significantly differ(P=.05, Duncan's MRT)

Table 3. Evaluation of S-1812, Orthene and Asana for control of Heliothine species in cotton.

	Larvae and damaged squares / 50 squares				
Treatment/Rate	**squares 4 DAT Trt#2**	**larvae 4 DAT Trt #2**	**squares 3 DAT Trt #4**	**larvae 3 DAT Trt #4**	**Lint Yield lbs/A**
S-1812 0.1 lb ai/A	2.0 a	0.8 a	5.0 ab	1.5 a	912 a
S-1812 0.15 lb ai/A	5.5 a	0.0 a	1.3 a	0.0 a	1049 a
S-1812 0.2 lb ai/A	2.0 a	0.5 a	1.5 a	0.5 a	864 a
S-1812 0.075 lb ai/A+					
Orthene 0.75 lb ai/A	3.0 a	0.0 a	3.3 a	0.5 a	1033 a
S-1812 0.075 lb ai/A+					
Asana 0.02 lb ai/A	4.8 a	1.0 a	1.0 a	0.0 a	936 a
Asana 0.02 lb ai/A	2.0 a	0.0 a	3.8 a	1.8 a	970 a
Orthene 0.75 lb ai/A	7.0 a	0.8 a	2.3 a	0.5 a	917 a
Orthene 0.5 lb ai/A+					
Asana 0.02 lb ai/A	3.8 a	0.3 a	2.0 a	1.0 a	1008 a
Tracer 0.067 lb ai/A	2.5 a	0.5 a	2.8 a	0.5 a	1030 a
Untreated	12.8 b	1.0 a	8.3 b	5.0 b	672 b

Means followed by same letter do not significantly differ(P=.05, Duncan's MRT)