INSECTICIDAL EFFICACY AGAINST A COMPLEX OF FALL AND BEET ARMYWORMS AND SOYBEAN LOOPER IN SOUTH CAROLINA COTTON

M. J. Sullivan, S. G. Turnipseed and D. Robinson
Clemson University,
Edisto Research and Education Center
Clemson University
Blackville, SC

Abstract

Field efficacy studies conducted on three grower farms indicated that the new insecticidal chemistries were more effective against beet armyworm (*Spodoptera exigua*), fall armyworm (*Spodoptera frugiperda*), and soybean looper (*Pseudoplusia includens*), than currently labeled chemistries. Pirate® (pyrrole), Tracer® (spinosyn), Proclaim® (avermectin) and Steward® (oxadiazine) provided adequate control of these secondary pests; Larvin, Curacron, Lannate (carbamates) and Karate (pyrethroid) did not provide adequate control at standard usage rates.

Introduction

The most important secondary pests of cotton in South Carolina are the armyworms, beet and fall (Sullivan et al. 1996). Soybean loopers are seldom a pest but can occur in late planted cotton in the latter part of the growing season (September) (Sullivan et al. 1992). Previous research has indicated that all of these insects are difficult to control once they become established in cotton (Sullivan et al. 1991).

A typical scenario for South Carolina growers with armyworms would be: 1.) they are not a problem in July to mid-August because pyrethroids are being applied to both conventional and *B.t.* cotton for bollworm control; these applications usually provide incidental control of the armyworm complex, 2.) armyworms, particularly fall armyworm, are usually not detected until populations are established and larvae are 2 - 7 days old, and 3.) once found, growers want to eliminate these established populations with a single insecticide application. Previous studies have indicated that two applications are necessary to control an established armyworm population.

Several new chemistry classes have emerged during the last several years; all have shown potential in controlling this secondary pest complex. These studies were conducted to evaluate the efficacy of these new compounds and compare them to established, labeled materials.

Materials and Methods

Locations 1 (Gaston) and 2 (Sandifer): Both of these were small plot trials. Plot size was 8 rows (38 inches), 30 feet long, middle six rows sprayed with a CO_2 backpack sprayer with a 2 row nozzle. Nozzles were 4X hollow cone, applying 9.5 gpa at 54 psi. Cotton variety was 'DPL 5415'. All treatments were applied one time except Tracer (0.067) which had a second application on August 28, three days following the initial application at the Gaston Farm. There were 4 replications in a RCBD and each test included an untreated control.

At the Gaston farm, two 1m beat cloth samples were taken 3 and 6 days post-treatment. Nine treatments (Table 1) were applied as foliar sprays on August 25, 1998. At the Sandifer farm, three 1m beat cloth samples were taken 3 and 6 days post-treatment. Fifteen treatments (Table 4) were applied as foliar sprays on August 11, 1998. Two rates of Pirate (0.2 and 0.25) were included in this test; each rate was applied in three different gallonages of H_2O (5, 10, and 15).

Location 3 (Herndon): Four treatments were applied with four replications. Foliar sprays were applied with a 3-pt. hitch sprayer with a Mid-Tech chemical injection system mounted on a JD 6400 Hi-clearance tractor. Plot size was 12 rows (38 inch) X 500 feet; 8X hollow cone nozzles applied 7.0 gpa@ 52 psi. Cotton variety was 'NuCotn 33B'. Application date was August 20, 1998. Three 1m beat cloth samples were taken in each plot four days post-treatment.

Results

Location 1 (Gaston): Beet and fall armyworms in this location were mostly medium to large at the time of application (Table 1). Five treatments gave significantly better control of large beet armyworms 3DAT when compared to the untreated check: Karate Z + Pirate(0.03 + 0.2), Steward (0.11), Tracer (0.067 and 0.089), and Pirate (0.25). At 6DAT, three of these treatments continued to be better than the untreated check: Tracer (0.067 and 0.089) and Pirate (0.25). The Tracer (0.067) had been applied 2 times.

Table 2 indicates all treatments were significantly better than the untreated check on large fall armyworms 3DAT. At 6DAT, only one treatment, Steward (0.065) was significantly better than the untreated check.

Soybean looper larvae were also medium to large at application (Table 3). All treatments except Karate Z (0.04) were significantly better than the check at both 3 and 6DAT. Treatments containing the newer chemistries gave the best control, namely Pirate (0.25), Tracer (0.67 and 0.89), Steward (0.065 and 0.11) and Karate Z + Pirate (0.03 and 0.2).

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1034-1036 (1999)
National Cotton Council, Memphis TN

Location 2 (Sandifer): Beet armyworm efficacy at 3DAT is shown in Table 4. With small larvae, all treatments were significantly better than the untreated check except Larvin (0.8), Curacron (1.0), Lannate (0.45), Confirm (0.125) and Pirate (0.25 in 15 gal. H_2O). With large beet armyworm, all treatments except three gave significantly better control than the check; Larvin (0.8), Curacron (1.0) and Lannate (0.45).

Control was significantly better for small beet armyworm 6DAT (Table 5) with all treatments except Curacron (1.0), Larvin (0.8), Lannate (0.45), Confirm (0.125), and Pirate (0.25 at 5 gal. H_2O). With large larvae, only Confirm (0.125) was not significantly better than the untreated check.

Again in this test, the newer chemistries provided better control of beet armyworm than the standard materials. Both rates of Pirate (0.2 and 0.25) at three water rates (5, 10, 15 gpa) gave adequate control. All three rates of Steward (0.065, 0.09, 0.11), Tracer (0.075), and Proclaim (0.0125) also provided adequate control of small and large beet armyworm at both 3 and 6DAT.

Location 3 (Herndon): All treatments gave significantly better control of both small and large fall armyworm compared to the untreated check (Table 6). With large larvae, Karate Z + Lannate (0.03 + 0.45) was significantly better than Tracer (0.089) or a high rate of Karate Z alone (0.04).

Summary

Tracer®, Steward®, Pirate®, and Proclaim® provided better control of beet and fall armyworm and soybean looper than currently labeled standard materials.

Literature Cited

Sullivan, M. J., S. G. Turnipseed, and T. W. Smith. 1991. Beet armyworm control in South Carolina. pg. 777. In, Proceedings. Beltwide Cotton Conferences, San Antonio, TX. Vol. 2, National Cotton Council of America.

Sullivan, M. J., S. G. Turnipseed, T. W. Smith, and A. R. Wenck. 1992. Attempts to control soybean looper in South Carolina Cotton. pg. 862. In, Proceedings Beltwide Cotton Conferences. Nashville, TN. Vol. 2, National cotton Council of America.

Sullivan, M. J., T. W. Smith, S. G. Turnipseed, and J. T. Walker. 1996. Management of secondary pests in South Carolina cotton. pp. 877-878. In, Proceedings. Beltwide Cotton Conferences, San Diego, CA. Vol. 2, National Cotton Council of America.

Table 1. Mean number of beet armyworms 3 and 6 days post treatment. Gaston Farm, 1998.

		beet armyworms[b]		
		3 DAT		6DAT
Treatment[a]	rate(ai/ac)	small	large	large
Larvin	0.8	1.0ab	8.8ab	6.8a
Karate Z	0.04	0.3ab	8.5ab	5.8a
Karate Z + Lannate	0.03 0.6	0.5ab	15.3a	2.5bc
Karate Z + Pirate	0.03 0.2	0.8ab	3.0bcd	0.8cd
Steward	0.065	0.0b	7.0abc	2.0bcd
Steward	0.11	0.3ab	1.3cd	1.0bcd
Tracer 2X[c]	0.067	0.0b	3.0bcd	0.5d
Tracer	0.089	1.5a	3.5bcd	0.8cd
Pirate	0.25	0.0b	0.3d	0.5d
Check	-	1.0ab	11.5a	2.8b
LSD(0.05)	1.43	8.79		2.6

[a] Applications were made with a CO_2 backpack sprayer on August 25, 1998. [b] Means in the same column followed by the same letter are not significantly different (alpha=.05). Square root(X+.05) transformation for analysis, original means presented.
[c] A second application was made August 28.

Table 2. Mean number of fall armyworms 3 and 6 days post treatment. Gaston Farm, 1998.

		fall armyworms[b]		
		3DAT		6DAT
Treatment[a]	rate(ai/ac)	small	large	large
Larvin	0.8	0.0b	1.0e	1.3bc
Karate Z	0.04	0.3ab	5.0b	5.5a
Karate Z + Lannate	0.03 0.6	0.0b	1.8de	1.5bc
Karate Z + Pirate	0.03 0.2	0.0b	4.8bc	3.3ab
Steward	0.065	0.0b	1.5de	0.5c
Steward	0.11	0.8a	1.8de	1.5bc
Tracer 2X[c]	0.067	0.0b	4.3bc	1.5bc
Tracer	0.089	0.3ab	4.8bc	2.0bc
Pirate	0.25	0.0b	2.8cd	2.5b
Check	-	0.3ab	8.8a	3.0ab
LSD(0.05)		0.55	0.57	2.7

[a] Applications were made with a CO_2 backpack sprayer on August 25, 1998. [b] Means in the same column followed by the same letter are not significantly different (alpha=.05). Square root(X+.05) transformation for analysis, original means presented.
[c] A second application was made August 28.

Table 3. Mean number of soybean looper 3 and 6 days post treatment. Gaston Farm, 1998.

		soybean looper[b]		
		3 DAT		6DAT
Treatment[a]	rate(ai/ac)	small	large	large
Larvin	0.8	0.5a	7.0b	2.3b
Karate Z	0.04	0.0a	14.0a	3.3ab
Karate Z + Lannate	0.03 0.6	0.0a	3.5cb	3.0b
Karate Z + Pirate	0.03 0.2	0.0a	0.5cd	0.0c
Steward	0.065	0.0a	0.8cd	0.3c
Steward	0.11	0.0a	1.0cd	0.0c
Tracer 2X[c]	0.067	0.0a	0.8cd	0.0c
Tracer	0.089	0.0a	1.5cd	0.0c
Pirate	0.25	0.0a	0.0d	0.0c
Check	-	0.3a	15.5a	5.5a
LSD(0.05)		0.5	4.54	2.2

[a] Applications were made with a CO_2 backpack sprayer on August 11, 1998. [b] Means in the same column followed by the same letter are not significantly different (alpha=.05). Square root(X+.05) transformation for analysis, original means presented.
[c] A second application was made August 28.

Table 4. Mean number of beet armyworms 3 days post treatment. Sandifer Farm, 1998.

		beet armyworms[b]	
Treatment[a]	rate(ai/ac)	small	large
Steward	0.065	0.8b	6.8bcdef
Steward	0.09	0.0b	4.3edf
Steward	0.11	0.8b	3.3edf
Tracer	0.075	1.5b	4.5edf
Pirate 5 gal H_2O	0.2	0.0b	1.0f
Pirate 10 gal H_2O	0.2	0.0b	1.5f
Pirate 15 gal H_2O	0.2	0.0b	1.3f
Pirate 5 gal H_2O	0.25	0.5b	0.8f
Pirate 10 gal H_2O	0.25	1.0b	2.5f
Pirate 15 gal H_2O	0.25	7.0ab	6.8cdef
Larvin	0.8	2.8ab	11.8abcd
Curacron	1.0	5.8ab	17.3ab
Lannate	0.45	5.3ab	14.3ab
Proclaim	0.0125	0.3b	3.0ef
Confirm	0.125	9.5ab	9.0bcde
Check	-	11.0a	24.3a
LSD(0.05)		9.36	11.5

[a] Applications were made with a CO_2 backpack sprayer on August 11, 1998. [b] Means in the same column followed by the same letter are not significantly different (alpha=.05). Square root(X+.05) transformation for analysis, original means presented.

Table 5. Mean number of beet armyworms 6 days post treatment. Sandifer Farm, 1998.

		beet armyworm[b]	
Treatment[a]	rate(ai/ac)	small	large
Steward	0.065	0.3c	5.8bc
Steward	0.09	0.0c	3.3bcd
Steward	0.11	0.0c	1.5cd
Tracer	0.075	0.8c	2.8bcd
Pirate 5 gal H_2O	0.2	0.3c	2.3cd
Pirate 10 gal H_2O	0.2	0.3c	2.0cd
Pirate 15 gal H_2O	0.2	0.5c	2.8bcd
Pirate 5 gal H_2O	0.25	1.3abc	6.5bcd
Pirate 10 gal H_2O	0.25	0.0c	1.3d
Pirate 15 gal H_2O	0.25	0.5c	1.8cd
Larvin	0.8	2.8abc	4.0bcd
Curacron	1.0	0.5c	4.3bcd
Lannate	0.45	7.3a	4.5bcd
Proclaim	0.0125	7.3a	2.5bcd
Confirm	0.125	1.5ab	9.0ab
Check	-	6.3ab	14.8a
LSD(0.05)		5.55	6.15

[a] Applications were made with a CO_2 backpack sprayer on August 23, 1998. [b] Means in the same column followed by the same letter are not significantly different (alpha=.05). Square root(X+.05) transformation for analysis, original means presented.

Table 6. Mean number of fall armyworms 4 days post treatment. Herndon Farm, 1998.

		fall armyworm[b]	
Treatment[a]	rate(ai/ac)	small	large
Karate Z	0.04	0.67b	4.b
Karate Z + Pirate	0.03 0.2	0.67b	2.cd
Karate Z + Lannate	0.03 0.45	0.67b	1.d
Tracer	0.089	0.58b	3.bc
Check	-	2.42a	8.a
LSD(0.05)		0.84	2.1

[a] Applications were made with a 3 pt. hitch high-clearance sprayer on August 20, counts were taken on August 24, 1998.
[b] Means in the same column followed by the same letter are not significantly different (alpha=.05). Square root(X+.05) transformation for analysis, original means presented.