INSECTICIDAL CONTROL OF APHIDS AND BOLL WEEVILS IN MISSOURI - 1998

Michael L. Boyd and Jeff House
University of Missouri-Columbia, Delta Research Center
Portageville, MO

Abstract

Tank mixing Provado with an organosilicant surfactant substantially improved cotton aphid, *Aphis gossypii* Glover, control (≈45%) and cottonseed yields (≈50 lbs.) versus Provado alone under drought-stressed conditions (≈4 weeks). In a late-season boll weevil, *Anthonomus grandis grandis* Boheman, trial, Karate 2.08CS provided better control than Karate 1EC after three applications over a 12-day period. Overall, weevil control was best obtained with Baythroid 2EC, Decis 1.8EC, Karate 1EC (0.03 lbs. AI/A), and Karate 2.08CS (0.025 and 0.03 lbs. AI/A). Karate 2.08CS (0.025 lbs. AI/A) provided longer residual control (7-day interval on 25 September) than the older Karate 1EC (0.025 lbs. AI/A).

Introduction

In 1998, outbreaks of cotton aphids, *Aphis gossypii* Glover, and boll weevils, *Anthonomus grandis grandis* Boheman, frequently occurred in southeast Missouri. Yield losses from aphids and boll weevils ranked second and third, respectively, among insects infesting Missouri cotton fields. Greater numbers of both insects were present in part due to the mild winter of 1997-1998.

Cotton aphids are an infrequent but important pest in Missouri. Generally, growers prefer to rely on biological agents (pathogens and predators) to control their aphid infestations. In 1998, the entomopathogenic fungus, *Neozygites fresenii* (Nowakowski), did not infect aphids until early-July and populations of predaceous insects were reduced due to early-season insecticide sprays for boll weevils; therefore, growers were forced to make insecticide applications for aphid infestations.

Since its entry into Missouri during the 1910's, the boll weevil generally has been an infrequent pest (Hunter and Coad 1923). Previous studies have documented that cold weather-induced mortality regulates this pest at the northern limits of its range (Gaines 1943; Pfrimmer and Merkl 1981). Sorenson et al. (1996) found that little adaption to cold temperatures has occurred at its northern range; however, several mild winters in the 1990's has permitted populations to expand. In 1998, Missouri had some of its highest weevil trap counts on record.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1032-1034x-x (1999)
National Cotton Council, Memphis TN

Missouri growers must occasionally resort to insecticides to combat pest infestations. Biological control of aphids can be delayed or sporadic in some years. Without severe winter conditions to kill hibernating weevils and eradication efforts still a few years off, Missouri growers must continue to rely on insecticides to control their boll weevils. With the uncertain availability of older compounds (carbamates and organophosphates) because of the Food Quality Protection Act, newer insecticides were screened to provide better baseline data on Missouri pest populations in 1998.

Materials and Methods

Aphid Trial

This trial was conducted at the University of Missouri-Columbia Delta Research Center's Marsh Farm near Portageville. Four-row (38-inch spacing) plots 50 feet in length were established with 'PayMaster 1330 BG' cotton planted on 19 May. Insecticides were applied on 03 July with a self-propelled sprayer calibrated to deliver 20 GPA at 32 psi through 8002 hollowcone nozzles. Treatments were replicated four times and arranged in a randomized complete block design. Plots were sampled 3 and 7 days after treatment (DAT) on 06 and 10 July by randomly collecting 20 leaves (10 each from the upper and lower plant canopy) for aphids and by examining 3-row feet with a drop cloth for beneficial arthropods. On 22 July, 6-row feet per plot were examined for plant density and fruiting loads. The center two rows per plot were mechanically harvested on 13 October.

Boll Weevil Trial

This trial was conducted at the University of Missouri-Columbia Delta Research Center's Lee Farm near Portageville. Four-row (38-inch spacing) plots 40 feet in length were established with 'Sphinx' cotton planted on 27 June. Treatments were replicated four times and arranged in a randomized complete block design. Insecticides were applied ever three to six days on 03, 09, 15, and 18 September with a self-propelled sprayer calibrated to deliver 10 GPA at 40 psi through 8002 hollowcone nozzles. Plots were sampled on 07, 13, 17, 22 and 25 September by randomly collecting 25 squares on each sampling date. Plots were not harvested due to the late planting date.

Results and Discussion

Cotton Aphid Trial

At 3 DAT, Furadan significantly lowered aphid populations relative to the four Karate treatments and the untreated check (UTC) plots (Table 1). No significant reduction was observed with Provado + Kinetic surfactant versus Provado; however, by 7 DAT, Provado +Kinetic-treated plots had an ≈45% lower aphid infestations than Provado-treated ones. By 7 DAT, aphid populations declined in the UTC plots, and this was largely attributed to the numerous lady beetle adults and larvae present in the field plots. No significant differences in lady beetle populations were observed among treatments on either sampling date (Table 2).

No significant differences in plant density and yield (seed cotton) were observed among treatments (Table 3). The only significant difference in the fruit load was both Karate 1E treatments had significantly greater number of squares and bolls than in the Furadan-treated plots (Table 3). We did observe that in Provado + Kinetic-treated plots yields increased by ≈11% and 5% versus plots treated with Provado and Furadan, respectively. Howell and Reed (1998) also noted greater yields with Provado + Kinetic versus Provado and Furadan.

Boll Weevil Trial

Significant differences among treatments were observed on the first two sampling dates (07 and 13 September) following two insecticide applications; however, none of the treatments reached the target threshold of <20% square damage (Table 4a). On 17 September, all four Karate treatments, Baythroid, and Decis had reduced square damage below 20% after three applications (Table 4b). After four applications, all insecticide treatments except the two Regent ones and Fury were below the 20% damage threshold. The greater control with Karate 2.08 CS versus Karate 1EC and the Karate treatments versus Regent is similar to data gathered in Arkansas (Meyers et al. 1998). In our trial all insecticide treatments significantly decreased square damage on the last three sampling dates, and damage ranged from 8% to 44% (versus 77% in UTC plots) on the last sampling date.

Acknowledgments

The authors wish to thank an excellent crew of summer workers (Josh Chipman, Shelly Davidson, Travis Huck, and Gus Recker) for their hard work. We also appreciate the support of Mr. Jake Fisher, Delta Research Center Superintendent, and his farm crew.

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Table 1. Insecticide control of cotton aphids, Portageville, MO -1998.

	# aphids / 20 leaves	
Treatment (lb. AI/A)	July 06	July 10
Provado 1.6F (0.0375)	125.5 b-d	132.3 c
Provado 1.6F (0.0375) + Kinetic (0.25% v/v)	110.3 cd	73.3 c
Furadan 4F (0.25)	37.8 d	112.5 c
Karate 1EC (0.025)	325.8 ab	182.5 bc
Karate 1EC (0.03)	465.8 a	392.5 a
Karate 2.08CS (0.025)	285.5 a-c	372.5 a
Karate 2.08CS (0.03)	343.0 a	339.3 ab
UTC	297.5 a-c	116.0 c

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

Table 2. Lady beetle populations in cotton aphid trial, Portageville, MO - 1998.

	# Lady Beetles[1] / 3-ft.	
Treatment (lb. AI/A)	July 06	July 10
Provado 1.6F (0.0375)	2.5	2.8
Provado 1.6F (0.0375) + Kinetic (0.25% v/v)	2.8	4.5
Furadan 4F (0.25)	4.0	3.0
Karate 1EC (0.025)	9.8	13.3
Karate 1EC (0.03)	13.3	13.8
Karate 2.08CS (0.025)	3.8	6.5
Karate 2.08CS (0.03)	7.0	9.8
UTC	10.0	6.5

[1] Lady beetle adults and larvae.

Table 3. Plant stand density, number of fruiting structures, and yield for cotton aphid trial, Portageville, MO - 1998.

Treatment (lb. AI/A)	# Plants[1]	# Fruit[1]	Seed Yield (lb./A)
Provado 1.6F (0.0375)	7.6	16.0	449.6
Provado 1.6F (0.0375) + Kinetic (0.25% v/v)	7.6	16.3	499.0
Furadan 4F (0.25)	7.0	12.3	471.9
Karate 1EC (0.025)	7.0	19.1	447.2
Karate 1EC (0.03)	8.1	21.0	442.2
Karate 2.08CS (0.025)	7.6	17.1	444.7
Karate 2.08CS (0.03)	6.8	16.0	434.8
UTC	6.6	16.5	424.9

[1] Average number per 3-row feet

Table 4a. Insecticide control of boll weevils, Portageville, MO - 1998.

	# damaged squares / 25 squares	
Treatment (lb. AI/A)	Sept. 07	Sept. 13
Karate 1EC (0.025)	12.3 bc	7.0 b
Karate 1EC (0.03)	13.5 a-c	7.3 b
Karate 2.08CS (0.025)	9.3 c	7.3 b
Karate 2.08CS (0.03)	12.3 bc	6.8 b
Regent 2.5EC (0.038)	14.8 ab	10.8 ab
Regent 2.5EC (0.05)	16.8 a	9.8 ab
Fury 1.5EC (0.033)	12.8 a-c	10.3 ab
Baythroid 2EC (0.028)	13.5 a-c	7.5 b
Decis 1.8 EC (0.019)	12.0 bc	6.0 b
UTC	16.8 a	14.5 a

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

Table 4b. Insecticide control of boll weevils, Portageville, MO - 1998.

	# damaged squares / 25 squares		
Treatment (lb. AI/A)	Sept. 17	Sept. 22	Sept. 25
Karate 1EC (0.025)	5.0 b-e	3.3 cd	7.3 bc
Karate 1EC (0.03)	2.5 e	2.3 cd	3.8 cd
Karate 2.08CS (0.025)	3.3 de	1.5 d	3.3 cd
Karate 2.08CS (0.03)	1.5 e	2.3 cd	2.0 d
Regent 2.5EC (0.038)	7.8 b-d	7.8 b	10.8 b
Regent 2.5EC (0.05)	9.8 ab	7.0 b	11.0 b
Fury 1.5E C(0.033)	8.3 bc	5.5 bc	6.5 c
Baythroid 2EC (0.028)	2.5 e	1.8 cd	3.5 cd
Decis 1.8 EC (0.019)	3.5 c-e	3.0 cd	5.0 cd
UTC	14.0 a	16.5 a	19.3 a

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