

# COMPARISON OF INSECTICIDES FOR COTTON APHID CONTROL

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## RESEARCH PROBLEM

Cotton aphids occur annually and must be managed in Arkansas cotton. They have become resistant to many insecticides. Monitoring the effectiveness of the insecticides which still have activity against cotton aphids is important. The information developed by these tests helps producers to choose effective insecticides for controlling these pests.

## BACKGROUND INFORMATION

Cotton aphids (*Aphis gossypii* Glover) occur each year on Arkansas cotton. Moderate to high populations can reduce lint yield and quality. Karner *et al.* (1997) reported that population densities of aphids that reached and exceeded 100 aphids/leaf caused significant injury to cotton within 3 days. Yield reductions exceeding 100 lb lint/acre have been reported by Fuchs and Minzenmayer (1995) when populations exceeded 50 aphids per leaf for 3 weeks. Aphids, however, may or may not be present long enough or in high enough populations to cause economic damage to cotton in Arkansas and thus often do not cause great yield or quality damage before their populations collapse. Often, cotton aphid populations reach high levels and then quickly disappear due to infections by an aphid parasitic fungus, *Neozygites fresenii*. However, each year some fields develop large populations of aphids, and insecticides are needed to prevent yield losses. Because aphids reproduce rapidly, they are capable of developing insecticide resistance very quickly. Insecticide resistance in cotton aphid populations causes uncertainty among growers, consultants, and county agents as to the effectiveness of insecticides for cotton aphid control. This study was conducted in order to provide data on the relative performance of old and new insecticides against the cotton aphid.

## RESEARCH DESCRIPTION

Two aphicide efficacy tests were carried out in 1999. One test was conducted against early-season aphid infestation in Lincoln County on the Randy Eagle farm near Grady. A second test was conducted against mid-season infestation in Desha County on the Southeast Branch Experiment Station (SEBES) near Rohwer. In both tests, a randomized complete-block design with four replications was used. Plots were main-

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tained using standard production practices. The test on the Randy Eagle Farm was conducted on irrigated Deltapine BXN 47 planted on 4 May 1999. Plots were four rows wide by 25 ft long. Treatments were applied on 7 June 1999 using a CO<sub>2</sub>-charged hand-boom sprayer with 2 Tx8 hollow cone nozzles per row. We used 10 gal of finished spray per acre with 0.5 part kinetic surfactant per thousand at 40 PSI. Pre-treatment counts (7 June 1999) averaged about 200 aphids per plant. Post-treatment counts were made 3 and 7 days after treatment on five randomly selected plants.

The test at the SEBES was conducted on irrigated NuCotn 33B planted on 22 May 1999. Plots were two rows wide by 25 ft long with one buffer row. Treatments were made on 30 June 1999 using a two row hand-boom sprayer with 2 Tx4 hollow cone nozzles/row. The sprays were applied at 40 PSI, with 1 part Kinetic surfactant/1000, at 10 gal of finished spray per acre. Pre-treatment counts of aphids (30 June 1999) indicated an average of 570 aphids per leaf. Post-treatment counts were taken 2 and 5 days after treatment on five randomly selected main-stem leaves. The test was terminated after 6 July 1999 because the aphid parasitic fungus, *N. fresenii*, had decimated the aphid populations in all plots. Data collected in both tests were processed using ARM and analyzed using ANOVA and Duncan's Multiple Range Test at the 0.05 level of significance.

## **RESULTS AND DISCUSSION**

At 3 days post-treatment, no statistical differences in aphid counts existed between any of the early-season insecticide treatments and the untreated check (Table 1). Aphid counts in plots treated with Dibrom were significantly higher than those treated with the more efficacious treatments such as Provado, Leverage, and Bidrin. Furadan in this test did not perform as strongly as it did in our previous tests, possibly due to the spotty aphid infestation in the field. At 7 days post-treatment, no significant differences in aphid counts existed among all treatments including the untreated check. However, aphid counts in plots treated with Bidrin + Provado (0.33 + 0.025 lb ai/acre), Leverage (2.8 oz/acre), and Provado (0.047 lb/acre) were 10.8, 20.8, and 90.3 times smaller than those found in the check plots, respectively. The high variability of plant colonization prevented significant differences among treatments from being seen.

One day after treatment, all mid-season insecticide treatments significantly reduced aphid numbers compared with the untreated check (Table 2). Aphid counts were statistically equal among all insecticides except for Furadan 4F (0.25 lb ai/acre), which significantly reduced aphid counts compared to Fulfill (0.086 lb ai/acre). However, there was a trend toward greater efficacy in Furadan- and Actara-treated plots. Furadan and Actara gave quick and substantial aphid control compared to the other insecticides. Also, doubling the rate of either compound did not significantly improve aphid control. Chemicals that also proved effective against aphids were Leverage, Provado, and Bidrin. Fulfill gave the least control in this test. Fulfill, however, is reported to be a slow-acting aphicide. At 5 days post-treatment, aphid counts were similar among all treatments including the untreated check. The similar aphid counts in all treatments was due to the breakout of the aphid parasitic fungus, which greatly reduced aphid populations in all

plots. The aphid fungus limited our ability to study the residual effects of all treatments, but may have been an especially important limitation with slow-acting products such as Provado and Fulfill.

### **PRACTICAL APPLICATION**

Several insecticides such as Furadan, Provado, Leverage, and Bidrin provided good cotton aphid control for both early and mid-season populations. However, more aphids survived the lower rates of Furadan and Bidrin than in previous years, which may indicate resistance development. Actara, which will be sold as Centric for Arkansas cotton, is a new product with similar mode of action to that of Provado and appears to have good activity on aphids. Dibrom did not perform well against aphids in the early-season test. Fulfill gave adequate aphid control against early-season infestation but performed poorly against mid-season aphid infestation. The spottiness of the aphid infestation early in the season along with the occurrence of the aphid parasitic fungus contributed to such inconsistency that some chemicals, including Furadan and Bidrin, exhibited in this study.

### **ACKNOWLEDGMENTS**

The authors wish to thank Sheila Willis, Fran Tomerlin, Miranda Greer, Cori Treat, Cari Russell, Amy Gibson, and our chemical company cooperators for their work and cooperation in conducting this study.

### **LITERATURE CITED**

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**Table 1. Efficacy of insecticides for early-season cotton aphid control, Grady, AR, 1999.**

Treatment	Rate	3-DPT <sup>z</sup>	7-DPT	Average of 3 & 7
	lb ai/acre	-----	No. Aphids / Plant	-----
Dibrom 8	0.50	304 a <sup>y</sup>	347 a	325 a
Check	--	263 ab	271 a	267 ab
Furadan 4F	0.25	192 ab	90 a	141 ab
Bidrin 8	0.33	177 ab	156 a	166 ab
Bidrin 8	0.50	83 ab	82 a	82 b
Furadan 4F	0.125	77 ab	177 a	127 ab
Lannate 2.4 LV	0.25	73 ab	224 a	148 ab
Provado 1.6 F +	0.025			
Kinetic HV <sup>x</sup>		70 ab	17 a	44 b
Fulfill 50 WG	0.086	54 b	18 a	36 b
Bidrin 8 +	0.33 +			
Lannate 2.4 LV	0.125	49 b	183 a	116 ab
Bidrin 8 +	0.33 +			
Provado 1.6 F	0.025	42 b	25 a	33 b
Leverage 2.7 SC +	2.8 oz <sup>w</sup>			
Kinetic HV		28 b	13 a	20 b
Provado 1.6 F +	0.047			
Kinetic HV		26 b	3 a	15 b

<sup>z</sup> DPT = day(s) post-treatment.

<sup>y</sup> Means followed by the same letter are not significantly different (P=0.05).

<sup>x</sup> Kinetic used at the rate of 32 oz/100 gal.

<sup>w</sup> Leverage rate given in ounces/acre because it is a product that contains two active ingredients.

**Table 2. Efficacy of insecticides for mid-season cotton aphid control, Rohwer, AR, 1999.**

Treatment	Rate	1-DPT <sup>z</sup>	5-DPT	Average of 1 & 5
	lb ai/acre	-----	No. Aphids / Plant	-----
Check	---	522 a	168 a	345 a
Fulfill 50 WG +	0.086			
Kinetic HV <sup>x</sup>		243 b	100 a	171 b
Bidrin 8	0.50	166 bc	169 a	168 b
Provado 1.6 F +	0.025			
Kinetic HV		156 bd	83 a	120 b
Bidrin 8	0.33	141 bc	75 a	108 bc
Provado 1.6 F +	0.047			
Kinetic HV		117 bc	96 a	107 bc
Furadan 4F	0.125	80 bc	87 a	83 c
Actara 25 WG	0.023	78 bc	42 a	60 c
Bidrin 8 +	0.33 +			
Provado 1.6 F	0.025	72 bc	65 a	68 c
Leverage 2.7 SC +	2.8 oz <sup>w</sup>			
Kinetic HV		53 bc	91 a	72 c
Actara 25 WG	0.046	50 bc	28 a	39 c
Furadan 4F	0.25	31 c	66 a	48 c

<sup>z</sup> DPT = day(s) post-treatment.

<sup>y</sup> Means followed by the same letter are not significantly different (P=0.05).

<sup>x</sup> Kinetic used at the rate of 32 oz/100 gal.

<sup>w</sup> Leverage rate given in ounces/acre because it is a product that contains two active ingredients.