

EVALUATION OF NEW INSECTICIDES FOR CONTROL OF COTTON APHID IN THE COASTAL BEND AND THE LOWER RIO GRANDE VALLEY OF TEXAS

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Abstract

Field experiments were conducted in 2002 near Corpus Christi (Coastal Bend) and Weslaco (Rio Grande Valley), TX to evaluate the effectiveness of insecticides on the cotton aphid (*Aphis gossypii* Glover). Insecticides tested included flonicamid (F1785 50DF), imidacloprid (Trimax 4F), carbofuran (Furadan 4F), acetamiprid (Intruder 70 WP), thiamethoxam (Centric 40WG), dicotophos (Bidrin 8E), and cyfluthrin + imidacloprid (Leverage 2.75 SE). Information is presented on aphid numbers, plant damage ratings, and lint yield. Damage ratings and lint yield are reported only from the Coastal Bend field study. All insecticides except Bidrin (Coastal Bend tagged leaf data) and Leverage (Rio Grande Valley) significantly reduced aphid numbers on each inspection following treatment through 8 days after treatment (DAT) in the Rio Grande Valley study and 20 DAT in the Coastal Bend study. In the Coastal Bend study, aphid counts from terminal leaf data in the Bidrin treatment were not significantly different from untreated cotton on any inspection date. Additionally, aphid counts on terminal leaves in the Trimax and Furadan cotton were not significantly different from untreated cotton on inspections 12 and 15 DAT. Intruder and Centric were the most consistent in reducing aphid numbers in both experiments. In the Coastal Bend experiment visual plant damage ratings correlated directly with aphid counts. Insecticide treated cotton (Coastal Bend) averaged 71 lb lint/acre more than untreated cotton. The Intruder and high rate of Centric treatments produced significantly greater lint yield than the untreated cotton (208 lb/acre average).

Introduction

During the last two decades insecticide use to control aphids in cotton has increased. The increase may be due to: (1) use of pyrethroid insecticides which tend to stimulate aphid reproduction, (2) increased awareness of their potential adverse affect on yield, (3) cotton varieties that are more susceptible to attack or damage, and/or (4) a sequence of long-term weather conditions favorable for increased numbers and longer duration of infestations. In recent years, Furadan has been the preferred insecticide choice for aphids by many South Texas cotton producers due to effectiveness and low cost. However, use of Furadan has required special state and federal approval (Section 18), and label restrictions make the product somewhat difficult to use. Safer and more effective insecticide alternatives for control of aphids in cotton are needed.

Materials and Methods

Coastal Bend Experiment

DPL 458 BG/RR cotton was planted on irrigated Victoria clay soil in 4-row wide x 40-ft long plots. Rows were spaced on 38-inch centers. Treatments were arranged in a RCB design with 4 replications. The entire test site was oversprayed 2 times with a pyrethroid insecticide to increase cotton aphid numbers.

Subsequently, during early bloom on Jun 24 aphids on 6 infested leaves were counted and tagged on individual plants in the center 2 rows in each plot (3 leaves/row). Thereafter, foliar insecticide treatments were applied to the center 2 rows of each plot with a self-propelled Lee Company Spider Trac, equipped with a CO₂ pressurized sprayer delivering 7 gpa total volume through 4X hollow cone nozzles (2/row) at 40 psi traveling at 3.5 mph. Silwet surfactant was included in each spray mixture at 8.0 oz/100 gallons.

Treatments were assessed by (1) counting the number of aphids on tagged leaves beginning with pretreatment (0 DAT) and thereafter on 3, 6, 9, 12, 15 and 20 DAT; (2) counting the number of aphids on expanded terminal leaves on the same plants with tagged leaves beginning 6 DAT; (3) rating plots for damage [1 = excellent fruit load, good plant growth up to 5 = low fruit load, irregular plant growth] at 10, 18, and 26 DAT; and (5) harvesting the center 2 rows in each plot on Aug 19 with a 2-row John Deere 9900 model spindle picker. A seed cotton sample from each plot was processed on a 10-saw Eagle laboratory gin to determine % lint. Data were analyzed by ANOVA and means were separated according to LSD (P = 0.05).

Lower Rio Grand Valley Experiment

STV 489 BG/RR variety cotton was planted on irrigated Hidalgo sandy clay loam soil in 4-row wide x 50-ft long plots. Rows were spaced on 40-inch centers and treatments were arranged in a RCB design with 4 replications. Foliar insecticide treatments were applied to plots on May 9 with a CO₂ pressurized backpack sprayer delivering 10 gpa total volume through 3 nozzles per row. Silwet surfactant (0.5% by volume) was used with each insecticide. Treatments were then assessed by collecting 5 leaves from the center rows of each plot and counting aphids under a microscope. Counts were made 1, 4, 6, and 8 DAT. Data were analyzed by ANOVA and means were separated according to LSD (P = 0.05).

Results and Discussion

Coastal Bend Experiment

Tagged leaves averaged 193 aphids/leaf before treatment (Table 1). Insecticides, except for Bidrin at 9 and 12 DAT, significantly reduced aphid numbers on the tagged leaves. Likewise, terminal leaf data were similar until 12 DAT (Table 2). Beginning at 12 DAT only F1785, Intruder, and Centric treated cotton consistently had terminal leaf aphid numbers statistically lower than the number in untreated cotton. The season average damage ratings (Table 3) showed that all insecticide treatments, except Bidrin, had significantly lower damage rating values than the untreated cotton. Lint production (Table 3) followed almost the same numerical ranking as season aphid counts and damage ratings arranged from low to high. It was anticipated before harvest that the LSD value would be large (189.2 lb/acre) due to variables at the cotton test site not associated with treatments. In spite of that problem, significant differences did occur in lint yields. Intruder and Centric (high rate) treated cotton produced significantly more lint than the untreated cotton. Numerical increases in lint yield should not be discounted in light of the other data and the acknowledged field variation. Likewise, the lower yield in Furadan treated cotton did not seem to fit with overall data obtained.

Lower Rio Grande Valley Experiment

All insecticides significantly reduced aphids compared with numbers in untreated cotton on each inspection date until 8 DAT (Table 4). At 8 DAT aphid counts in untreated and Leverage treated cotton were not different nor did Furadan or Trimax treatments differ from Leverage. Centric and Intruder treatments had the fewest aphids 8 DAT but not statistically fewer than Furadan and Trimax treatments.

Conclusions

- All insecticides significantly reduced aphid numbers.
- Intruder and Centric were consistently the most effective in keeping aphid numbers low in both experiments.
- Plant damage ratings correlated directly with aphid numbers (Coastal Bend Experiment).
- Insecticide treated cotton averaged 71 lb/acre more lint than untreated cotton.
- Centric (high rate) and Intruder treatments produced significantly greater yield compared with untreated cotton (208 lb/acre more).
- Lost production from cotton aphid is expected when their numbers exceed 50-100/leaf for a period of time, possibly 7 - 10 days.

Table 1. Average number of aphids on infested cotton leaves that were tagged before insecticide treatment, Coastal Bend experiment.

Insecticide & formulation	Rate (oz/acre)	Cotton aphids/tagged leaf on days after treatment ^a							Post trt. avg.
		0	3	6	9	12	15	20	
F 1785 50DF	2.82	198 a	11.17 bc	1.9 c	14.6 b	23.8 b	3.9 c	1.4 c	9.5 c
Trimax 4F	1.00	204 a	8.40 bc	1.8 c	9.4 b	74.4 b	60.3 b	20.8 bc	29.2 c
Furadan 4F	8.00	164 a	0.04 c	1.5 c	15.6 b	79.6 b	65.4 b	19.3 bc	30.2 c
Intruder 70WP	0.60	210 a	3.29 bc	0.0 c	0.0 b	0.5 b	1.3 c	0.2 c	0.9 c
Centric 40WG	1.25	167 a	4.95 bc	1.6 c	8.8 b	42.2 b	42.2 b	14.9 bc	19.1 c
Centric 40WG	2.00	189 a	5.17 bc	0.1 c	5.8 b	25.1 b	32.6 bc	15.1 bc	14.0 c
Bidrin 8E	4.00	185 a	26.00 b	145.4 b	108.5 a	239.2 a	57.3 b	26.0 b	100.4 b
Untreated		228 a	151.40 a	252.1 a	163.9 a	273.5 a	121.9 a	71.3 a	172.3 a
LSD (P=0.05)		NS	23.36	49.83	58.61	110.7	34.53	23.29	37.78
P > F		.9661	.0001	.0001	.0001	.0001	.0001	.0001	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

^a Leaves with aphids were tagged before treatment.

Table 2. Average number of aphids on terminal cotton leaves, Coastal Bend experiment.

Insecticide & formulation	Rate (oz/acre)	Cotton aphids/terminal leaf on days after treatment					Post trt. avg.
		6	9	12	15	20	
F 1785 50DF	2.82	32.0 b	55.5 b	67.2 cd	5.1 cd	1.9 bc	32.3 bc
Trimax 4F	1.00	12.3 b	29.1 b	124.9 bc	31.7 ab	9.3 b	41.4 b
Furadan 4F	8.00	23.8 b	26.9 b	84.0 bcd	18.9 a-d	6.8 bc	32.1 bc
Intruder 70WP	0.60	2.5 b	2.3 b	3.0 d	2.3 d	1.0 c	2.2 c
Centric 40WG	1.25	13.1 b	15.7 b	41.8 cd	11.7 bcd	3.3 bc	17.1 bc
Centric 40WG	2.00	4.8 b	13.6 b	33.0 cd	14.1 bcd	3.4 bc	13.8 bc
Bidrin 8E	4.00	214.0 a	144.2 a	267.3 a	27.8 abc	17.8 a	134.2 a
Untreated		221.3 a	154.0 a	172.9 ab	40.1 a	20.00 a	121.7 a
LSD (P=0.05)		45.05	56.33	101.8	22.98	8.28	38.42
P > F		.0001	.0001	.0005	.0281	.0003	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

Table 3. Insecticide cost, plant damage ratings, and lint production of cotton treated with insecticide for aphids, Coastal Bend experiment.

Insecticide & formulation	Rate (oz/acre)	Cost (\$/acre)	Plant damage ratings ^a				Yield (lb lint/acre)
			10 DAT	18 DAT	26 DAT	AVG	
F 1785 50DF	2.82	-	3.0 bc	2.0 cd	3.3 abc	2.8 bc	757 ab
Trimax 4F	1.00	5.25	3.3 b	3.3 ab	3.3 abc	3.3 b	742 abc
Furadan 4F	8.00	4.50	2.8 bc	2.5 bc	3.6 ab	3.0 bc	686 bc
Intruder 70WP	0.60	4.80	1.3 d	1.0 d	2.0 c	1.4 e	911 a
Centric 40WG	1.25	5.25	2.3 bcd	2.0 cd	2.4 bc	2.2 cd	820 ab
Centric 40WG	2.00	8.40	2.0 cd	1.8 cd	2.0 c	1.9 de	896 a
Bidrin 8E	4.00	2.89	5.0 a	4.0 a	4.5 a	4.5 a	557 c
Untreated			5.0 a	4.3 a	3.8 ab	4.4 a	696 bc
LSD (P=0.05)			1.11	1.15	1.58	0.74	189.2
P > F			.0001	.0001	.0325	.0001	.0154

Means in a column followed by the same letter are not significantly different by ANOVA.

^a Damage ratings range from 1 = excellent fruit load, good plant growth up to 5 = low fruit load, irregular plant growth. DAT = days after treatment.

Table 4. Insecticide cost and number of aphids on cotton leaves, Lower Rio Grande Valley experiment.

Insecticide & formulation	Rate (oz/acre)	Cost (\$/acre)	Cotton aphids/leaf on days after treatment			
			1	4	6	8
Centric 40WG	2.0	8.40	26.4 b	2.8 b	1.2 b	1.4 c
Intruder 70WP	0.8	6.40	22.4 b	4.0 b	2.9 b	2.2 c
Trimax 4F	1.5	7.87	12.9 b	10.5 b	9.3 b	13.7 bc
Furadan 4F	8.0	4.50	14.1 b	13.9 b	7.6 b	13.9 bc
Leverage 2.75E	3.0	8.79	23.9 b	10.8 b	15.6 b	25.1 ab
Untreated			86.4 a	84.9 a	59.0 a	29.8 a

Means in a column followed by the same letter are not significantly different by ANOVA (P = 0.05).