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COTTON FLEAHOPPER: EVALUATION OF NEW INSECTICIDES AND IMPACT ON COTTON LINT PRODUCTION

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Abstract

Loss of squares caused by cotton fleahopper often has a detrimental impact on production of cotton lint. Two field studies were conducted to evaluate insecticides for control of cotton fleahopper to determine longevity of control and impact on lint production. Insecticides significantly reduced fleahopper numbers in both experiments. In one experiment yield increase due to insecticide treatment averaged 203 lb lint/acre which provided economic benefit of $63.09/acre. No added benefit was gained in the second experiment where cotton plants compensated for early fruit loss with extended late season fruit set.

Introduction

The cotton fleahopper (CFH) *Pseudatomocelis seriatus,* is a primary pest of cotton in Texas. Both adults and nymphs suck sap from tender portions of the plant often causing small squares to shed following feeding. Bidrin and Orthene have been the primary insecticides of choice for control of CFH due to low cost of the products and their effectiveness. Information on longevity and effectiveness of newer insecticides that may be used to control CFH is needed to aid pest managers in product selection.

The objectives of the experiments were to: (1) evaluate insecticides for effectiveness in controlling CFH, (2) determine longevity of control, (3) evaluate various rates of certain products, and (4) measure impact on lint production. Insecticides evaluated were Bidrin 8E (dicrotophos), Centric 40WG (thiamethoxam), F1785 50DF (flonicamid), Intruder 70WP (acetamiprid), Intruder 70WP+ Vydate CLV (oxamyl), Orthene 75SP or 90SP (acephate), and Trimax 4F (imidacloprid).

Materials and Methods

Experiment 1

DP555BR cotton was planted April 10, 2003 on the Texas Agricultural Experiment Station Meaney Farm at Corpus Christi with a 4-row blackland planter. Plot size was 4-rows by 40 ft and planted on 38-inch centers. Treatments were arranged in a randomized complete block design with 4 replications. Insecticide treatments were made with a Spyder Trac self- propelled sprayer to the 4-row plots through 8X hollow cone nozzles (2/row) at 40 psi in a total volume of 9.5 gpa at 4 mph. In one treatment Centric was applied three times on May 7, 15, and 20 based on "automatic" application beginning at the 6 true leaf stage of plant development as a comparison to treatments made at threshold (10-15/100 plant terminals). All other treatments were made only on May 20 based on the threshold. The entire test site was treated on July 3 with Bidrin 8E (8.0 oz/acre) for the stink bug, *Euschistus quadrator*.

Treatments were assessed by (1) counting the number of CFH nymphs and adults (combined for this report) on 20 plant terminals/ plot on May 7 [6 true leaves], May 13 [pinhead square], May 20 [1/3rd grown square], May 23 [3 DAT], May 26 [6 DAT], and June 3 [14 DAT]; (2) counting lady beetles, pirate bugs, and big eyed bugs on 20 plant terminals/plot on May 26 and June 3; and (3) harvesting the 3rd row in each plot with a 1-row spindle picker. Seed cotton samples were processed on a 10-saw Eagle laboratory gin to obtain the percentage lint and calculate lint yield.

Experiment 2

The field study was conducted near St. Paul, Texas, in San Patricio County on DP555 BR variety cotton. Plots were 4 rows wide by 40 ft on 30-inch centers, and treatments were arranged in a randomized complete block design with 4 replications. Insecticide was applied with a CO_2 backpack sprayer equipped with 2X hollow cone nozzles (2/row) at 40 psi in a total volume of 5 gpa at 2.5 mph. Silwet (0.25% V/V) was applied with the Centric treatments and Crop Oil Concentrate (8 oz/acre) was applied with Intruder treatments. Treatments were applied to matchhead square stage cotton on May 21 and to 1/3-grown square stage cotton on May 28.

Terminals of 25 plants/plot were examined for CFH nymphs and adults (combined for this report) 3, 5, and 8 DAT-1 (days after treatment), and 3, 5, 7, 10 and 14 DAT-2. Plants were mapped for fruit set 14 DAT-2 (June 11). Green and open bolls on 40 row-ft were counted on August 27. A 25-boll sample was obtained from each plot, ginned to determine average lint weight/boll and this information was used to estimate lint production/acre.

Results and Discussion

Experiment 1

CFH numbers did not reach treatment threshold until cotton was between 1/3 grown square stage and first bloom (May 20); although 2 treatments had already been applied to the "automatic" treatment by that date (Table 1). After the May 20 treatment (3 DAT), significantly more CFH were present in untreated cotton (p = .0533). Insecticide treated cotton contained statistically fewer CFH 6 DAT. By 14 DAT all insecticide plots except for Trimax and low rate of Intruder still contained statistically fewer CFH compared to untreated cotton.

Yield improvement due to insecticide use was surprisingly high (Table 2). The average yield increase amounted to 203 lb/acre and ranged from 121 to 257 lb/acre. It was evident that these insecticides were effective in reducing CFH and protecting cotton fruit. Further, the least dollar return occurred where 3 treatments were made providing evidence that treatment for CFH is not necessary until their numbers are at or near established threshold levels. Timely treatment is advised when CFH numbers warrant.

Experiment 2

All insecticides significantly reduced CFH numbers by 3 DAT-1, and numbers remained statistically lower than in untreated plots 8 DAT-1 (Table 3). However, by 8 DAT-1, CFH numbers again exceeded 15/100 plant terminals in all plots except the Centric (1.25 oz/acre) treatment which was at 14 CFH/100 plant terminals. CFH counts 3, 5, 7, 10 and 14 DAT-2 were significantly reduced by all treatments compared to numbers in untreated cotton. The later counts were made in blooming cotton. Except for the Bidrin treatment, significantly greater numbers of squares were set in all insecticide treatments compared to the untreated cotton (Table 4). Square set in untreated cotton was slightly above 50% 14 DAT-2. This reduced level of square set would indicate lower yield compared with the higher fruit sets observed in insecticide treated cotton at this stage of growth. However, estimated lint yields were not significantly different in the experiment. Further, using numerical yield values, monetary losses for treating CFH were found except for the Bidrin and Orthene treatments.

Conclusions

1. Insecticides effectively reduced CFH numbers in both experiments. Their numbers remained statistically lower than in untreated cotton for 14 DAT, except in experiment 1 for the Trimax and Intruder (low rate without COC) treatments.

2. Since CFH migration was not a major problem in these studies, their numbers in insecticide treated cotton were generally maintained below 15 per 100 plant terminals for about one week following treatment.

3. In experiment 1 it was evident that the May 20 treatment made at the 1/3-grown square stage to increasing numbers of CFH (12.7/100 terminals average on that date) resulted in significant yield increase (203 lb lint/acre average increase) and economic benefit ($63.09/acre average benefit). This magnitude of increase from one treatment was unexpected and could not be fully explained.

4. In experiment 1 no added benefit was gained by applying two earlier treatments when CFH number averaged 1.8 and 3.4/100 plant terminals at the 6 true leaf and pinhead stages, respectively. Refer to plots treated with Centric automatically at the 6 true leaf stage, pinhead square stage, and the 1/3-grown square stage.

5. Except for the Bidrin 14 DAT-2 treatment, square set was significantly better for all insecticide treatments compared to untreated cotton in experiment 2. Generally we expect to observe increased cotton production under these test conditions. Late season rains and good growing conditions can result in compensation for earlier differences in square set.

6. Lint production differences were not observed in experiment 2. However, some of the numerical increase in yield that did occur may have been due to treatment.

Table 1. Number of fleahoppers (nymph and adult counts combined) per 100 plant terminals in cotton treated with various insecticides, Texas Agricultural Experiment Station, Nueces County, TX, 2003.

Treatment	Rate (oz/acre)	5/7[c]	5/13[d]	5/20[e]	3 DAT[c] 5/23	6 DAT 5/26	14 DAT 6/3	Post Trt. Avg
Orthene 75SP	4.8	2.5 a	3.8 a	13.8 a	2.5 b	7.5 b	8.8 bc	6.3 b
Bidrin 8E	2.4	1.3 a	2.5 a	13.8 a	11.3 b	8.8 b	13.8 bc	11.2 b
Trimax 4F	1.0	2.5 a	5.0 a	15.0 a	8.8 b	7.5 b	17.5 ab	11.3 b
F1785 50DF	2.8	3.8 a	2.5 a	12.5 a	3.8 b	3.8 b	8.8 bc	5.4 b
Centric 40WG	2.0	0.0 a	3.8 a	11.3 a	0.0 b	0.0 b	1.3 c	0.4 b
Centric 40WG[a]	2.0	2.5 a	1.3 a	2.5 a	2.5 b	0.0 b	6.3 bc	2.9 b
Intruder 70WP	0.4	1.3 a	2.5 a	11.3 a	3.8 b	5.0 b	15.0 abc	7.9 b
Intruder 70WP	0.6	0.0 a	2.5 a	12.5 a	0.0 b	5.0 b	13.8 bc	6.3 b
Intruder 70WP + COC[b]	0.4	1.3 a	2.5 a	11.3 a	7.5 b	7.5 b	11.3 bc	8.7 b
Intruder 70WP + COC[b]	0.6	1.3 a	3.8 a	16.3 a	2.5 b	8.8 b	5.0 bc	5.4 b
Intruder 70WP + Vydate CLV	0.4 + 8.5	2.5 a	2.5 a	10.0 a	3.8 b	1.3 b	1.3 c	2.1 b
Untreated		2.5 a	3.8 a	11.3 a	33.8 a	28.8 a	30.0 a	30.8 a
LSD (P = 0.05)		NS	NS	NS	18.44	13.84	15.78	14.16
P > F		.9398	.9973	.4006	.0533	.0211	.0480	.0177

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

[a] Centric 40WG (2.0 oz/acre) was applied to this treatment May 7, 15, and 20. All other treatments were applied only on May 20.

[b] COC = Crop Oil Concentrate (1.0 pint/acre).

[c] Cotton growth stage was 6 true leaves.

[d] Cotton growth stage was pinhead square.

[e] Cotton growth stage was 1/3-grown square. All treatments were applied on this date.

Table 2. Lint production of cotton treated with various insecticides, Texas Agricultural Experiment Station, Nueces County, TX, 2003.

Treatment	Rate (oz/acre)	Yield (lb lint/acre)	Lint lb increase over UTC	$ return over untreated[c]
Orthene 75SP	4.8	1642 ab	197	67.45
Bidrin 8E	2.4	1566 b	121	40.08
Trimax 4F	1.0	1688 a	243	81.41
F1785 50DF	2.8	1700 a	255	[d]
Centric 40WG	2.0	1681 a	236	74.92
Centric 40WG[a]	2.0	1620 ab	175	33.55[a]
Intruder 70WP	0.4	1572 b	127	40.79
Intruder 70WP	0.6	1661 a	216	72.12
Intruder 70WP + COC[b]	0.4	1669 a	224	75.92
Intruder 70WP + COC[b]	0.6	1702 a	257	86.53
Intruder 70WP + Vydate CLV	0.4 + 8.5	1631 ab	186	58.17
Untreated		1445 c		

Means in the yield column followed by the same letter are not significantly different by ANOVA. LSD (P = 0.05) was 88.7 and P > F = .0001.

[a] Centric 40WG (2.0 oz/acre) was applied to this treatment May 7, 15, and 20. All other treatments were applied only on May 20.

[b] COC = crop Oil Concentrate (1.0 pint/acre).

[c] Cotton value based on $0.50/lb for lint and $0.05/lb for seed; costs include Bidrin ($90.00/gal), Centric ($4.70/oz), Intruder ($8.00/oz), Vydate CLV ($67.00/gal), Orthene ($2.44/acre), and Trimax ($5.50/oz). Crop oil concentrate cost was $0.76/acre and application cost was calculated at $3.00/acre. Harvesting/hauling/ginning cost for extra lint above untreated cotton was set at $0.21/lb lint.

[d] Experimental insecticide.

Table 3. Number of fleahoppers (nymphs and adult counts combined) per 100 plant terminals in cotton treated with various insecticides, Hopkins Agricultural Services, San Patricio County, TX, 2003.

Treatment[a]	Rate (oz/acre)	3 DAT-1[d] 5/24	5 DAT-1 5/26	8 DAT-1 5/28	3 DAT-2 5/31	5 DAT-2 6/2	7 DAT-2 6/4	10 DAT-2 6/7	14 DAT-2 6/11
Centric 40WG[b]	2.0	8.0 b	6.0 bc	20.0 bc	0.0 b	2.0 b	0.0 b	2.0 c	4.0 b
Centric 40WG[b]	1.25	11.2 b	3.2 c	14.0 c	0.0 b	2.0 b	1.2 b	3.2 bc	5.2 b
Intruder 70WP[c]	0.6	7.2 b	6.0 bc	29.2 bc	0.0 b	3.2 b	2.0 b	7.2 b	3.2 b
Intruder 70WP[c]	0.9	11.2 b	6.0 bc	27.2 bc	0.0 b	1.2 b	2.0 b	5.2 bc	3.2 b
Bidrin 8E	0.8	10.0 b	16.0 b	28.0 bc	0.0 b	4.0 b	0.0 b	6.0 bc	4.0 b
Orthene 90SP	4.0	9.2 b	12.0 bc	35.2 b	0.0 b	0.0 b	1.2 b	3.2 bc	5.2 b
Untreated		61.2 a	42.0 a	73.2 a	14.0 a	17.2 a	25.2 a	15.2 a	26.0 a
LSD (P = 0.05)		9.08	10.56	18.52	2.88	5.84	4.20	4.84	5.52
P > F		.0001	.0001	.0001	.0001	.0001	.0001	.0004	.0001

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

[a] Treatments were made on May 21 and 28.

[b] Silwet was included at 0.25 % V/V.

[c] Crop Oil Concentrate was included at 0.5 pint/acre.

[d] DAT = days after treatment.

Table 4. Percentage of squares present on plants on June 11 (14 DAT-2) and lint production of cotton treated with various insecticides, Hopkins Agricultural Services, San Patricio County, TX, 2003.

Treatment[a]	Rate (oz/acre)	% set square 14 DAT-2	Yield (lb lint/acre)	$ reatrun over untreated[d]
Centric 40WG[b]	2.0	87.30 a	629 a	- 9.78
Centric 40WG[b]	1.25	80.35 ab	577 a	-21.97
Intruder 70WP[c]	0.6	69.13 bc	611 a	-6.00
Intruder 70WP[c]	0.9	80.57 ab	597 a	-15.98
Bidrin 8E	0.8	63.30 cd	661 a	21.74
Orthene 90SP	4.0	71.85 bc	631 a	6.88
Untreated		51.65 d	583 a	
LSD (P = 0.05)		14.729	NS	
P > F		.0015	.3010	

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

[a] Treatments were made on May 21 and 28.

[b] Silwet was included at 0.25 % V/V.

[c] Crop Oil Concentrate was included at 0.5 pint/acre.

[d] Cotton value based on $0.50/lb for lint and $0.05/lb for seed; costs include Bidrin ($90.00/gal), Centric ($4.70/oz), Intruder ($8.00/oz), Vydate CLV ($67.00/gal), Orthene ($2.44/acre), and Trimax ($5.50/oz). Other costs per treatment included Crop Oil Concentrate ($0.38/acre), Silwet ($1.00/acre), and application cost was calculated at $3.00/acre. Harvesting/hauling/ginning cost for extra lint above untreated cotton was set at $0.21/lb lint.