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EVALUATION OF NEW INSECTICIDES FOR CONTROL OF COTTON FLEAHOPPERS IN TWO PRODUCTION REGIONS OF TEXAS

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Abstract

The cotton fleahopper is considered a key pest in the Southern Blacklands of Texas and an occasional pest in the Southern Rolling Plains. The Food Quality Protection Act (FQPA) may affect choice of insecticides for producers to control this pest. Five new or relatively new insecticides were evaluated and compared for cotton fleahopper control. Acetamiprid (Assail®), thiacloprid (Calypso®) and thiamethoxam (Actara®) provided the most control, although cotton fleahopper numbers were not significantly different except for season averages. Migration from alternative hosts limited control to three days after treatment (DAT). Predator numbers were low throughout the test period but a trend exists for fewer predators in treated cotton for all treatments. Insecticide treated cotton produced an average of 164 pounds of lint per acre more than the untreated cotton.

Introduction

The cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter), is considered a key pest in the eastern part of Texas. In the western part of the state, the cotton fleahopper may increase to damaging populations occasionally. Both adults and nymphs feed on new growth, including small squares (Leigh et al. 1996, Parker 1996). Squares up to pinhead size are susceptible to damage and the plant is most susceptible during the first three weeks of fruiting (Muegge et al. 2001).

Cotton fleahopper populations increase in wild hosts and move into cotton fields prior to squaring. In the Southern Blacklands, the population dynamics are consistent through years and vary only in numbers. As a result, cotton fleahoppers migrate continuously between wild hosts and cotton in this production region averages two insecticide applications for cotton fleahoppers, with a range of one to four applications depending on the populations. In the Southern Rolling Plains, wild host availability is limited by rainfall and cotton fleahopper populations usually remain at low levels. Cotton in this production region rarely averages more than one insecticide application for cotton fleahoppers.

The organophosphate insecticides are the dominant class for cotton fleahopper control in Texas. Producers are looking for alternatives to this class of insecticides because of their impact on natural enemies (King and Coleman 1989) and the potential loss of some of this class due to the Food Quality and Protect Act (FQPA). The neonicotinoid class has the potential to replace the organophosphates for cotton fleahopper control. The objectives of this experiment were to evaluate some of the neonicotinoids' effectiveness as well as indoxacarb in controlling cotton fleahoppers and to measure the impact of these treatments on beneficial arthropod numbers.

Materials and Methods

The experiment was conducted at three sites. The first site is located in the eastern part of the state in Williamson County, Texas in Taylor. The DPL 436 RR cotton was divided into 4 row X 60 ft plots with four replications in a randomized complete block design. Treatments were made beginning at matchhead square stage (May 31) and repeated seven d later (June 7). The May 31 application included azinphos-methyl (Guthion® 2 L) with all treatments except the esfenvalerate (Asana®)and oxamyl (Vydate®). Guthion® was not included in the second application and Actara® was included as a treatment (Tables 1 and 2). Applications were made with a self-propelled CO_2 sprayer equipped with two TX-6 hollow cone nozzles per row calibrated to deliver 6.0 gpa total volume at 30 psi. The adjuvant Kinetic® (0.25% v/v) was added to all treatments except the acephate (Orthene®), Guthion® and Vydate®.

The number of treatments were reduced for sites two and three (Table 3). Dimethoate was included as a producer standard and no Guthion® was used since both these sites are located in boll weevil eradication zones in the western part of the state. The experimental design and application method were the same as in site one. One application was made (July 5) in each site due to reduced cotton fleahopper pressure. Cotton in site two was PM 2326 RR located near Roscoe in Nolan County, Texas. Cotton in site three was PM 2326 RR located north of Ballinger in Runnels County, Texas.

Treatments were evaluated by counting the number of cotton fleahoppers (nymphs and adults) and predators on 10 plant terminals on three dates after each application. Percent control for cotton fleahoppers was calculated using Henderson's method (Henderson and Tilton 1955). Yields were taken in each site by harvesting 10 feet of row.

Results and Discussion

Cotton fleahopper populations were highly variable in plots in all three sites. There was a trend for the treated plots to have reduced cotton fleahopper populations one DAT , although none of the treatments were significantly different from the untreated plots in Williamson County (Table 4). Calypso®, Vydate® and Assail® provided the highest percent control one DAT. Indoxacarb (Steward®) and imidacloprid (Provado®) provided better control than Asana®. Cotton fleahopper populations rebounded by three DAT with only Calypso® and Assail® providing over 60 percent control six DAT.

Results from the second application were similar to the first application (Table 5). Actara®, Assail® and Calypso® performed better than the other treatments based on percent control. Only the Calypso® reduced numbers below published action thresholds and that occurred only two d after the second application.

Results were similar in Nolan and Runnels Counties. All the treated plots in Nolan County had reduced cotton fleahoppers compared to the untreated. Only the dimethoate had a higher number than the untreated seven DAT (Table 6). Cotton fleahopper numbers were highly variable in Runnels County and no trends were evident except for poor control from the dimethoate (Table 7).

Predator numbers were low during the period of the test in all three sites. The trend was for reduced predators for all treated plots (Tables 9-12). Asana®, Actara® and Orthene® had significantly lower populations of *Orius* spp. after the second application in Williamson County although none were significantly lower than the untreated plot (Table 8).

Dry conditions limited yields in the trials in Nolan and Runnels Counties. Final yields are reported for the Williamson County site only. Despite the high cotton fleahopper numbers, numerically all the treated plots had higher yields than the untreated although none of the treatments were significantly different. Yields corresponded closely to season averages for cotton fleahoppers (Table 13) with the treated cotton producing an average of 164 pounds of lint per acre more than the untreated cotton.

Conclusions

All insecticides tested provided cotton fleahopper control. Despite re-infestation three DAT in the Williamson County site, lint loss occurred where cotton was not protected. Actara®, Assail® and Calypso® were the best performing of the new insecticides. Control with Steward® was inconsistent with a trend for the lower rates providing better control than the higher rate. Cotton fleahoppers in the Southern Rolling Plains rarely reach damaging populations and moisture limitations can hide any benefits from cotton fleahopper control.

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Table 1. List of insecticides used on May 31 for cotton fleahoppers. Williamson Co., TX. 2001.

Treatment	Rate (lb ai/ac)	Rate (oz. formulation/ac)
Untreated		
Assail® 70 WP + Guthion® 2 L	0.038 + 0.25	0.86 + 16.0
Assail® 70 WP + Guthion® 2 L	0.05 + 0.25	1.14 + 16.0
Calypso® 4 SC + Guthion® 2 L	0.036 + 0.25	1.15 + 16.0
Calypso® 4 SC + Guthion® 2 L	0.047 + 0.25	1.50 + 16.0
Provado® 1.6 SC + Guthion® 2 L	0.047 + 0.25	3.76 + 16.0
Steward® 1.25 SC + Guthion® 2 L	0.09 + 0.25	9.21 + 16.0
Steward® 1.25 SC + Guthion® 2 L	0.104 + 0.25	10.60 + 16.0
Vydate® 3.77 EC	0.33	11.20
Asana® 0.66 EC	0.04	7.75
Guthion® 2 L	0.25	16.00
Orthene® 97 S + Guthion® 2 L	0.225 + 0.25	3.70 + 16.0

Table 2. List of insecticides used on June 7 for cotton fleahoppers. Williamson Co., TX. 2001.

Treatment	Rate (lb ai/ac)	Rate (oz. formulation/ac)
Untreated		
Assail® 70 WP	0.038	0.86
Assail® 70 WP	0.05	1.14
Calypso® 4 SC	0.036	1.15
Calypso® 4 SC	0.047	1.5
Provado® 1.6 SC	0.047	3.76
Steward® 1.25 SC	0.09	9.21
Steward® 1.25 SC	0.104	10.60
Vydate® 3.77 EC	0.33	11.20
Asana® 0.66 EC	0.04	7.75
Actara® 25 WG	0.047	3.00
Orthene® 97 S	0.225	3.70

Table 3. List of insecticides used on July 5 for cotton fleahoppers. Nolan and Runnels Co., TX. 2001.

Treatment	Rate (lb ai/ac)	Rate (oz. formulation/ac)
Untreated		
Assail® 70 WP	0.05	1.14
Calypso® 4 SC	0.047	1.5
Actara® 25 WG	0.047	3.00
Orthene® 97 S	0.225	3.70
Dimethoate 4 EC	0.25	8.0

Table 4. Total number of cotton fleahoppers per 10 plants after the first application. Williamson Co., TX. 2001.

		Average number/10 Plants (Percent Control*)			
Treatment	**Rate (lb ai/ac)**	**5/31**	**6/1**	**6/4**	**6/6**
Untreated		9.50a**	9.00a (0)	3.75a (0)	9.50a (0)
Assail® + Guthion®	0.038 + 0.25	11.75a	2.50a (78)	3.75a (0)	6.00a (65)
Assail® + Guthion®	0.05 + 0.25	11.00a	3.25a (69)	4.00a (0)	8.00a (21)
Calypso® + Guthion®	0.036 + 0.25	10.50a	2.00a (80)	6.25a (0)	6.25a (61)
Calypso® + Guthion®	0.047 + 0.25	12.75a	1.75a (86)	4.25a (0)	7.75a (28)
Provado® + Guthion®	0.047 + 0.25	9.00a	7.50a (12)	6.25a (0)	10.00a (37)
Steward® + Guthion®	0.09 + 0.25	10.75a	3.50a (66)	6.50a (0)	7.25a (56)
Steward® + Guthion®	0.104 + 0.25	9.00a	5.00a (41)	4.25a (0)	8.75a (19)
Vydate®	0.33	11.50a	1.75a (84)	6.75a (0)	8.50a (50)
Asana®	0.04	10.50a	4.00a (60)	6.75a (0)	9.25a (46)
Guthion®	0.25	11.00a	2.50a (76)	2.75a (0)	5.50a (21)
Orthene® 97 S + Guthion®	0.225 + 0.25	9.50a	2.25a (75)	4.00a (0)	7.75a (24)
LSD (P=0.05)		NS	NS	NS	NS
P>F		0.254	0.133	0.548	0.892

*Percent control corrected using Henderson's formula.
** Means followed by the same letter do not significantly differ.
Plots treated on May 31, 2001.

Table 5. Total number of cotton fleahoppers per 10 plants after the second application. Williamson Co., TX. 2001.

		Average number/10 Plants (Percent Control*)			
Treatment	**Rate (lb ai/ac)**	**6/6**	**6/9**	**6/11**	**6/13**
Untreated		9.50a**	6.25a (0)	10.50a (0)	9.50a (0)
Assail®	0.038	6.00a	1.75a (56)	4.50a (0)	4.00a (2)
Assail®	0.05	8.00a	1.50a (72)	3.50a (0)	6.25a (0)
Calypso®	0.036	6.25a	1.75a (58)	5.50a (0)	7.00a (0)
Calypso®	0.047	7.75a	0.75a (85)	4.25a (0)	5.75a (0)
Provado®	0.047	10.00a	2.50a (62)	5.25a (0)	7.00a (0)
Steward®	0.09	7.25a	1.75a (63)	7.00a (0)	7.25a (0)
Steward®	0.104	8.75a	3.50a (39)	4.75a (19)	8.75a (0)
Vydate®	0.33	8.50a	2.00a (64)	6.75a (0)	5.50a (10)
Asana®	0.04	9.25a	6.50a (0)	7.00a (33)	8.50a (0)
Actara®	0.047	5.50a	0.75a (79)	5.25a (0)	7.50a (0)
Orthene®	0.225	7.75a	2.50a (51)	7.00a (0)	6.25a (2)
LSD (P=0.05)		NS	NS	NS	NS
P>F		0.892	0.319	0.624	0.809

* Percent control corrected using Henderson's formula.
** Means followed by the same letter do not significantly differ.
Plots treated on June 7, 2001.

Table 6. Total number of cotton fleahoppers per 10 plants and percent control. Nolan Co., TX. 2001.

		Average number of cotton fleahoppers /10 Plants (Percent Control*)			
Treatment	**Rate (lb ai/ac)**	**7/5**	**7/6**	**7/9**	**7/12**
Untreated		3.3a**	2.17a (0)	2.33a (0)	5.50a (0)
Assail®	0.05	4.0a	2.00a (24)	0.50a (82)	2.33a (65)
Calypso®	0.047	2.7a	2.33a (0)	1.00a (48)	2.17a (48)
Actara®	0.047	3.0a	1.50a (24)	0.67a (68)	3.17a (37)
Orthene®	0.225	2.7a	2.00a (0)	0.67a (65)	3.50a (22)
Dimethoate	0.25	2.7a	2.17a (0)	1.00a (48)	6.83a (0)
LSD (P<0.05)		NS	NS	NS	NS
P>F		0.135	0.941	0.224	0.265

* Percent control corrected using Henderson's formula.
** Means followed by the same letter do not significantly differ.
Plots treated July 5, 2001.

Table 7. Total number of cotton fleahoppers per 10 plants. Runnels Co., TX. 2001.

		Average number of cotton fleahoppers/10 Plants			
Treatment	**Rate (lb ai/ac)**	**7/5**	**7/6**	**7/9**	**7/16**
Untreated		1.07a**	2.00a	0.00a	0.33a
Assail®	0.05	1.00a	0.67a	0.33a	0.33a
Calypso®	0.047	1.07a	1.33a	0.33a	1.00a
Centric®	0.047	1.13a	0.33a	0.00a	0.33a
Orthene®	0.225	1.20a	0.00a	0.00a	1.00a
Dimethoate		1.13a	2.00a	0.67a	0.67a
LSD (P<0.05)		NS	NS	NS	NS
P>F		0.716	0.292	0.702	0.886

* Percent control corrected using Henderson's formula.
** Means followed by the same letter do not significantly differ.
Plots treated July 5, 2001.

Table 8. Total number of *Orius* spp. per 10 plants after the second application for cotton fleahoppers. Williamson Co., TX. 2001.

		Average number/10 Plants			
Treatment	**Rate (lb ai/ac)**	**6/6**	**6/9**	**6/11**	**6/13**
Untreated		0.00a*	0.50abc	1.25a	2.00a
Assail®	0.038	0.00a	0.00c	0.50a	0.75a
Assail®	0.05	0.00a	1.00a	0.50a	0.75a
Calypso®	0.036	0.00a	0.25bc	3.25a	2.25a
Calypso®	0.047	0.00a	0.00c	0.75a	0.75a
Provado®	0.047	0.00a	0.50abc	1.25a	0.50a
Steward®	0.09	0.00a	0.75ab	0.25a	1.00a
Steward®	0.104	0.00a	0.25bc	1.25a	0.75a
Vydate®	0.33	0.00a	0.25bc	0.75a	2.25a
Asana®	0.04	0.00a	0.00c	2.50a	0.75a
Actara®	0.047	0.00a	0.00c	0.50a	1.00a
Orthene®	0.225	0.00a	0.00c	1.00a	1.75a
LSD (P=0.05)		NS	0.594	NS	NS
P>F			0.015	0.151	0.446

* Means followed by the same letter do not significantly differ.
Plots treated on June 7, 2001.

Table 9. Total number of natural enemies per 10 plants after the first application for cotton fleahoppers. Williamson Co., TX. 2001.

		Average number/10 Plants		
Treatment	**Rate (lb ai/ac)**	**6/1**	**6/4**	**6/6**
Untreated		1.00a*	1.25a	2.25a
Assail® + Guthion®	0.038 + 0.25	0.25a	1.00a	0.50a
Assail® + Guthion®	0.05 + 0.25	0.00a	0.25a	0.50a
Calypso® + Guthion®	0.036 + 0.25	0.50a	0.75a	0.75a
Calypso® + Guthion®	0.047 + 0.25	0.75a	0.50a	1.25a
Provado® + Guthion®	0.047 + 0.25	0.75a	0.25a	2.50a
Steward® + Guthion®	0.09 + 0.25	0.75a	0.50a	2.00a
Steward® + Guthion®	0.104 + 0.25	0.00a	0.50a	2.00a
Vydate®	0.33	0.00a	0.75a	2.75a
Asana®	0.04	0.50a	0.50a	1.25a
Guthion®	0.25	0.25a	0.75a	1.00a
Orthene® + Guthion®	0.225 + 0.25	0.75a	0.75a	0.75a
LSD (P=0.05)		NS	NS	NS
P>F		0.327	0.950	0.1825

* Means followed by the same letter do not significantly differ.
Plots treated on May 31, 2001.

Table 10. Total number of natural enemies per 10 plants after the second application for cotton fleahoppers. Williamson Co., TX. 2001.

		Average number/10 Plants			
Treatment	**Rate (lb ai/ac)**	**6/6**	**6/9**	**6/11**	**6/13**
Untreated		2.25a*	2.00a	4.25a	4.00a
Assail®	0.038	0.50a	2.00a	1.50a	2.50a
Assail®	0.05	0.50a	2.75a	2.00a	1.75a
Calypso®	0.036	0.75a	1.75a	5.00a	4.50a
Calypso®	0.047	1.25a	1.25a	2.00a	3.25a
Provado®	0.047	2.50a	1.75a	2.50a	2.00a
Steward®	0.09	2.00a	2.75a	3.25a	2.50a
Steward®	0.104	2.00a	2.00a	3.50a	3.00a
Vydate®	0.33	2.75a	2.25a	2.50a	5.25a
Asana®	0.04	1.25a	2.25a	6.75a	5.00a
Actara®	0.047	1.00a	3.50a	4.25a	3.50a
Orthene®	0.225	0.75a	1.00a	3.50a	3.75a
LSD (P=0.05)		NS	NS	NS	NS
P>F		0.1825	0.655	0.174	0.698

* Means followed by the same letter do not significantly differ.
Plots treated on June 7, 2001.

Table 11. Total number of natural enemies per 10 plants. Nolan Co., TX. 2001.

		Average number of natural enemies/10 Plants		
Treatment	**Rate (lb ai/ac)**	**7/6**	**7/9**	**7/12**
Untreated		5.67a*	4.67a	7.00a
Assail®	0.05	5.00a	2.67a	3.33a
Calypso®	0.047	5.50a	4.00a	6.33a
Actara®	0.047	5.17a	3.17a	3.83a
Orthene®	0.225	4.50a	2.50a	5.50a
Dimethoate 4 EC	0.25	6.00a	3.17a	8.17a
LSD (P<0.05)		NS	NS	NS
P>F		0.625	0.244	0.312

* Means followed by the same letter do not significantly differ.
Plots treated July 5, 2001.

Table 12. Total number of natural enemies per 10 plants. Runnels Co., TX. 2001.

		Average number of natural enemies/10 Plants		
Treatment	**Rate (lb ai/ac)**	**7/6**	**7/9**	**7/12**
Untreated		2.30a*	2.70a	3.70a
Assail®	0.05	0.70a	2.00a	2.00a
Calypso®	0.047	2.00a	2.30a	2.30a
Actara®	0.047	1.30a	2.00a	3.30a
Orthene®	0.225	1.70a	1.70a	2.70a
Dimethoate	0.25	2.70a	4.00a	5.70a
LSD (P<0.05)		NS	NS	NS
P>F		0.409	0.517	0.339

* Means followed by the same letter do not significantly differ.
Plots treated July 5, 2001.

Table 13. Season average for cotton fleahoppers and final yields. Williamson Co., TX. 2001.

		Average Number per 10 Plants	
Treatment	**Rate (lb ai/ac)**	**Season**	**Yield**
Untreated		8.08a*	1241.65a
Assail®	0.038	3.75d	1462.55a
Assail®	0.05	4.42cd	1428.45a
Calypso®	0.036	4.79bcd	1357.97a
Calypso®	0.047	4.08d	1516.20a
Provado®	0.047	6.41abc	1243.60a
Steward®	0.09	5.54bcd	1509.63a
Steward®	0.104	5.83abcd	1419.00a
Vydate®	0.33	5.21bcd	1395.40a
Asana®	0.04	7.00ab	1385.63a
Actara®	0.047	4.04d	1313.20a
Orthene®	0.225	4.96bcd	1428.90a
LSD (P=0.10)		2.26	228.45±158
P>F		0.0612	0.2661

* Means followed by the same letter do not significantly differ.
Plots treated on May 31 and June 7, 2001.