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PLANT BUGS AND THEIR MANAGEMENT IN TENNESSEE

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Abstract

The tarnished plant bug (*Lygus lineolaris*) and clouded plant bug (*Neurocolpus nubilus*) were the most important pests of cotton in Tennessee during 2004. Several small-plot insecticide trials and in-field threshold verification tests were performed in 2004. The results of insecticide screening trails indicated that, during mid and late season, traditional plant bug insecticides such as dicrotophos (Bidrin), acephate (Orthene), oxamyl (Vydate) and synthetic pyrethroids performed best on mixed populations of tarnished and clouded plant bugs. These products were less expensive and generally more effective than relatively new products such as thiamethoxam (Centric), imidacloprid (Trimax), acetamiprid (Intruder) and novaluron (Diamond). Replicated tests in grower's fields indicated little or no economic benefit of insecticide applications targeting plant bugs when populations were low. However, as in previous years, significant yield increases were observed when plant bug populations were near or above recommended treatment thresholds. Although fine tuning of treatment thresholds is justified, our results suggest that current plant bug thresholds are "in the ballpark".

Introduction

Various tests were performed to evaluate the efficacy of different insecticides and determine the validity of currently recommended treatment thresholds for plant bugs, including the tarnished and clouded plant bug. Most tests were done during late July and early August when plant bugs populations began to increase to treatment levels. Tennessee's current treatment threshold for plant bugs during this time is 4 bugs/6 row feet, or 4 bugs/drop cloth (Table 1). In the last several years, clouded plant bugs have become a common pest owing to reduced applications for boll weevils and caterpillar pests. It is felt that the clouded plant bug causes more damage than a tarnished plant bug, and it is more inclined to feed on bolls. Thus, we recommend that clouded plant bugs be counted as equivalent to 1.5 tarnished plant bugs when determining whether mixed plant bug populations exceed the treatment threshold.

Table 1. Tennessee treatment thresholds for tarnished plant bug in cotton.

Crop Developmental Stage	Insects per drop cloth (6 row feet)	Insects per 100 sweeps
First 2 weeks of squaring	1+	8+
Third week squaring - bloom	2+	15+
First Bloom to NAWF5 + 350 DD60's	4+ *	Seldom used (visual = 15/100 plants)

* Clouded plant bugs are counted as equivalent to 1.5 tarnished plant bugs.

Material and Methods

All tests were performed in grower's fields at several locations in West Tennessee. Additional details are provided in table headings and footnotes. Small-plot insecticide trials were applied using a CO_2 backpack sprayer calibrated to deliver 15 GPA using 8002 flat fan nozzles. Plots were 4 rows by 75 feet and replicated three times in a RCBD. All tests were evaluated 4 to 6 days after application by taking three drop cloth samples in each plot

Threshold verification trials were field length, 8-16 rows wide and replicated three or four times in a RCBD. These tests consisted of insecticide applications made at various times and differing plant bug population densities. Applications were made with a high-clearance tractor calibrated to deliver 10 GPA using TX8 or TX10 hollow-cone nozzles. In one test (Table 2), various scheduled insecticide regimes were compared with plant bug control practices as recommended by the University of Tennessee. For threshold verification trials, yields were collected using scales or a yield monitor on the center 4 or 8 rows of all plots.

Table 2. Timing of glyphosate and insecticide applications made to DP 424 BII/R (non "Flex" cotton). Cruiser treated seed was planted on May 5, 2004. Prebloom applications were Centric (1.5 - 2.0 oz/acre). Applications after bloom were Karate Z (1.96 oz/acre) or Bidrin (6 oz/acre). All plots were treated with Orthene 97 S (0.2 lb/acre) at the second node of plant development (May 21). Madison Co., TN.

Treatments	WeatherMax applications relative to cotton development*	Timing of "bug" insecticide applications relative to cotton development
Flex Schedule	Node 2, 6, 10	Node 6, 10, 14 and the 4th wk of bloom
PseudoFlex	Node 2, 5	Node 6, 10, 14, and the 4th wk of bloom
UT Threshold	Node 2, 5	As needed (Karate on 7/28, 4th wk)*
Schedule 2+1	Node 2, 5	Node 5, 8, and the 4th wk of bloom
Schedule 1+2	Node 2, 5	Node 8, and the 3rd and 5th wk of bloom

* WeatherMax was applied at 22 oz/acre, except 10th node application of 44 oz/acre.
**Treatment threshold for plant bugs was triggered on July 27.

Results and Discussion

Overall heliothine (bollworm and tobacco budworm) populations were low in Tennessee during 2004, and because tests were performed on Bollgard or Bollgard II cotton, caterpillar damage was too low to have a significant impact on the yields reported in these tests.

Small-plot evaluations indicated that traditional chemistries such as Bidrin, Vydate, Orthene and synthetic pyrethroids provided the best overall control of mixed clouded and tarnished plant bug populations (Tables 3 and 4). As a group, neonicotinoid insecticides (Centric, Intruder and Trimax) did not perform as well. A single application of Diamond did not provide adequate control of plant bugs in a test where populations consisted mostly of clouded plant bug (Table 4).

Table 3. Numbers of adult and immature clouded (CPB) and tarnished (TPB) plant bugs per 18 row feet at 4 DAT with a backpacker sprayer on July 29, 2004. Cotton was Cruiser-treated DP424 BGII/RR planted on May 5. Madison Co., TN.

Treatment		CPB adult	CPB imm.	TPB adult	TPB imm.	Total imm.	Total
Check		2.3 a	14.7 a	0.0 a	4.0 a	18.7 a	21 a
Orthene 97SP	0.5 lb/a	1.3 a	1.3 cde	0.3 a	0.7 a	2.0 cd	3.7 c
Leverage 2.7SE	3.5 oz/a	1.0 a	3.0 cde	0.0 a	0.7 a	3.7 cd	4.7 c
Centric 40WG	2 oz/a	1.0 a	4.7 bc	0.7 a	1.0 a	5.7 bc	7.3 bc
Trimax 4F	1.5 oz/a	2.7 a	8.0 b	0.7 a	1.0 a	9.0 b	12.3 b
M. Max 0.8E	3.5 oz/a	0.0 a	1.7 cde	0.0 a	1.3 a	3.0 cd	3.0 c
Bidrin 8E	6 oz/a	0.7 a	0.3 e	0.3 a	0.0 a	0.3 d	1.3 c
Vydate 3.77L	10.2 oz/a	1.0 a	0.7 de	0.0 a	1.3 a	2.0 cd	3.0 c
Intruder 70WP	1.1 oz/a	2.7 a	3.0 cde	0.7 a	0.7 a	3.7 cd	7.0 bc

Means not followed by the same letter are significantly different ($P < 0.05$, Fischer's protected LSD).

Table 4. Numbers of adult and immature clouded (CPB) and tarnished (TPB) plant bugs per 18 row feet at 6 DAT with a backpacker sprayer on August 3, 2004. Cotton was Cruiser-treated DP424 BGII/RR planted on May 5. Madison Co., TN.

Treatment		CPB adult	CPB imm.	TPB adult	TPB imm.	Total imm.	Total
Check		4.7 a	7.7 a	1.7 a	3.7 a	11.3 a	17.7 a
Lorsban 4E	12 oz/a	3.7 ab	1.3 b	0.7 ab	1.0 b	2.3 bc	6.7 b
Ammo 2.5E	3.25 oz/a	0.7 c	1.7 b	0.0 b	0.3 b	2.0 bc	2.7 c
KarateZ 2.08E	1.96 oz/a	1.0 c	0.7 b	0.0 b	0.3 b	1.0 c	2.0 c
Diamond 0.83E	9 oz/a	2.0 bc	3.3 b	0.0 b	1.0 b	4.3 b	6.3 b

Means not followed by the same letter are significantly different (P < 0.05, Fischer's protected LSD).

In one threshold verification trial (Table 5), one or two applications of KarateZ (1.83 oz/acre) significantly improved yields compared with untreated plots. In this test, overall plant bug populations were well above recommended treatment thresholds. In a separate test, four different insecticides were used, each replicated four times and compared to untreated "check" plots (Table 6). One-half of these plots were treated once and the other half were treated a second time with the same insecticide. Plant bug and stink bug populations were well below treatment thresholds. There were no differences among the performance of the insecticides; thus, yield data from all insecticide-treated plots were combined prior to analysis. Neither one nor two insecticide applications impacted yields in this test as compared with yields in the untreated check plots.

Table 5. Numbers of stink bugs and clouded (CPB) and tarnished (TPB) plant bugs per 18 row feet at 4 days after the first of one or two treatments of Karate Z (1.83 oz/acre) made with a high-clearance insecticide sprayer. Applications were made on August 2 and/or 12, 2004. Cotton was Cruiser-treated PM1218 BR planted on in mid May. Fayette Co., TN.

Treatment	CPB	TPB	Stink Bugs	Total Bugs	Yield (lb lint/acre)*
Check	7.3 a	19.0 a	2.0 a	28.3 a	666 a
1 Application	1.0 a	3.3 a	0.3 b	4.7 b	768 a
2 Applications	---	---	---	---	816 a

Means not followed by the same letter are significantly different (P < 0.05, Fischer's protected LSD).
* P = 0.06, LSD = 152 lb (untreated vs. treated = 666 vs. 792 lb, P < 0.05, LSD = 106 lb).

Table 6. Numbers of clouded (CPB) and tarnished (TPB) plant bugs per 12 row feet at 4 days after each of one or two second insecticide applications made with a high-clearance insecticide sprayer. Applications of Karate Z (1.83 oz/acre), Baythroid (1.83 oz/acre), Mustang Max (3 oz/acre) and Bidrin (6 oz/acre) were made on August 2 and/or 11, 2004. Cotton was Cruiser-treated PM1218 BR planted on May 20. Fayette Co., TN.

Treatment		CPB	TPB	Stink Bugs	Total Bugs	Yield (lb lint/acre)*
Check	(4DAT1)	0.0 a	0.5 a	0.0 a	0.5 a	---
Treated x 1	(4DAT1)	0.0 a	0.4 a	0.0 a	0.4 a	1260 a
Check	(4DAT2)	0.0 a	0.0 a	0.0 a	0.0 a	1263 a
Treated x 2	(4DAT2)	0.25 a	0.25 a	0.1 a	0.6 a	1282 a

Means not followed by the same letter are significantly different (P < 0.05, Fischer's protected LSD).
* P = 0.9258, LSD = 124.9 lb (untreated vs. treated = 1263 vs. 1271lb, P = 0.8275, LSD = 241 lb).

Another study examined various insecticide regimes for plant bug control on Bollgard II cotton and compared these with applications based on UT recommended treatment thresholds (Tables 2 and 7). Overall plant bug populations were very low prior to bloom. In plots that were not treated with insecticides for plant bugs ("UT Threshold" treatment), an average of 0.75 tarnished plant bugs per 100 sweeps were found across weekly sampling dates from June 11 to July 7. During this same time frame, square retention never dropped below 93% in these same plots. In mid July, plant bug populations increased, reaching the treatment threshold in the "UT Threshold" plots on July 27 (Figure 1). These plots were sprayed with KarateZ (1.96 oz/acre) the following day. This coincided with a scheduled treatment, of the same insecticide, that was made during the fourth week of flowering in several other treatments ("Flex", "PseudoFlex" and "Schedule 2+1"). In another treatment ("Schedule 1+2"), a previous application of Karate (1.96 oz/acre) was made during the third week of flowering with a follow-up application of Bidrin (6 oz/acre) during the fifth week of flowering. With the exception of one treatment ("Flex"), where a high-rate and late application of WeatherMax was made, the yield of all treatments were statistically identical (Table 7). It is important to note that the observed yield loss in the "Flex" treatment was the result of making an off-label application to cotton that did not possess the Flex trait of glyphosate resistance under development by Monsanto.

Table 7. Lint yield (based on 35% turnout) and boll damage caused by plant bugs or stink bugs for various insecticide regimes made to DP424 BGII/R cotton (see table 2).

Treatments	Yield (lb lint/acre)*	% Bug damage to bolls (9/9/04)
Flex Schedule	679 a	0.5 a
PseudoFlex	1114 b	3.0 a
UT Threshold	1115 b	3.0 a
Schedule 2+1	1101 b	4.0 a
Schedule 1+2	1189 b	2.0 a

Means not followed by the same letter are significantly different ($P < 0.05$, Fischer's protected LSD).
*LSD = 108 lb.

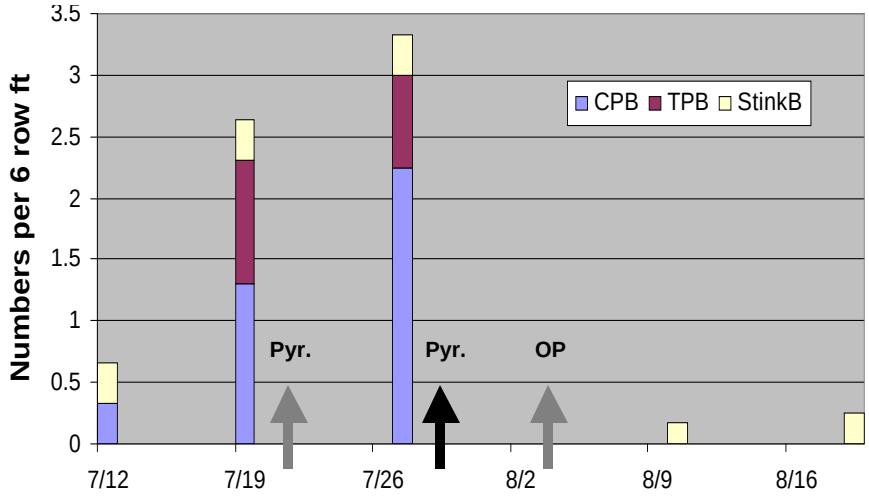

Figure 1. Average numbers of clouded plant bug (CPB), tarnished plant bug (TPB) and stink bugs per 6 row feet in the "UT Threshold" plots (see Table 2). Karate Z (1.96 oz/acre) was applied to this treatment on July 28 (black arrow), one day after reaching the recommended threshold. Karate Z (1.96 oz/acre) and Bidrin (6 oz/acre) were applied to the "Schedule 1+2" treatment on July 20 and August 3, respectively (gray arrows). All other treatments were treated with Karate Z (1.96 oz/acre) on July 28, during the fourth week of bloom (also indicated by the black arrow).

When these data are combined with previous years' experiences (e.g., Massey and Stewart 2004), it suggests that currently recommended treatment thresholds and traditional insecticides are near optimum for the efficient management of mid season plant bug infestations. However, some refinement of treatment thresholds and sampling

methodology is probably necessary. Bollgard cotton has been adopted on over 90% of the acreage in the state, only providing partial control of bollworms. Because plant bug populations are not significantly resistant to pyrethroid insecticides in at least most of Tennessee, these compounds are especially useful when bollworms are present. Less reliance on synthetic pyrethroids during mid and late season may be possible if more bollworm-active Bt cottons (i.e., Bollgard II and WideStrike) are adopted.

Acknowledgments

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References

Massey, C.B. and S. Stewart. 2004. Impact of insecticidal oversprays on Bollgard, Bollgard II and non-Bt cotton. Pp. 1628, *In* Proceedings of the Beltwide Cotton Conferences.