

IDENTIFYING SOURCES OF RESISTANCE FOR COTTON FLEAHOPPER IN COTTON**Scott D. Stewart****The University of Tennessee****Jackson, TN****Gary L. Lentz, Kevin Willis, Billy Hanks and Sandy Steckel****The University of Tennessee****Jackson, TN****Abstract**

It could be argued that clouded plant bugs (*Neurocolpus nubilis*) have become the dominant plant bug pest in West Tennessee over the last several years. Currently, insecticide control recommendations for this pest are similar to those for the tarnished plant bug (*Lygus lineolaris*). However, until recently, very few insecticide trials have targeted clouded plant bugs. In the paper, we have summarized relative insecticide efficacy in trials that contained both the clouded and tarnished plant bug. These data indicate that, on average, the clouded plant bug is easier to control than the tarnished plant bug. Differences were especially evident for the synthetic pyrethroids, which is indicative of pyrethroid resistance in some populations of tarnished plant bug. The data also suggest that organophosphate insecticides (dicrotophos and acephate) and oxamyl provided the best control of mixed clouded and tarnished plant bug infestations.

Introduction

Mid-season infestations of tarnished plant bugs (*Lygus lineolaris*) and clouded plant bugs (*Neurocolpus nubilis*) continue to be a significant problem in West Tennessee. Both the tarnished and clouded plant bug cause similar injury to cotton, feeding on floral parts including squares, blooms and bolls. However, clouded plant bugs are relatively uncommon prior to bloom, and compared to tarnished plant bug, are more likely to injure bolls. The clouded plant bug has been the dominant plant bug species in many fields during 2003-2005, and many fields have been specifically treated for this pest on one or more occasions during this time frame. Research (Tugwell et al. 1976) and personal observation indicates that the clouded plant bug is more damaging, on a per bug basis, than the tarnished plant bug. Thus, the clouded plant bug has become an important pest in Tennessee. In drop cloth samples, current recommendations are to count clouded plant bugs as equivalent to 1.5 tarnished plant bugs. Other "working" treatment thresholds are 10 bugs per 100 plants (visual sample) or 20% internally-damaged, thumb-sized bolls. Stewart et al. (2005) reviewed some insecticide efficacy data for both tarnished and clouded plant bugs in cotton. Other than these data, there is little current information for the best selection of insecticides to control clouded plant bugs or mixed populations of tarnished and clouded plant bug. In this paper, we further attempt to elucidate the relative efficacy of common insecticides on these two species.

Material and Methods

During the last two years, we have deployed a number of insecticide screening trials for mixed infestations of clouded and tarnished plant bug. Rather than show the results of individual insecticide trials, our approach was to summarize efficacy ratings across these trials for selected insecticides including acephate 90S or 97SP, dicrotophos (Bidrin 8E), oxamyl (Vydate C-LV 3.77), synthetic pyrethroids (Karate Z 2.08E, Mustang Max 0.8E or Baythroid 2E), imidacloprid (Trimax 4), thiamethoxam (Centric 40WG) and novaluron (Diamond 0.83E). Across multiple trials, we calculated the cumulative, average counts of clouded and tarnished plant bug in untreated plots and for each insecticide treatment. The synthetic pyrethroids were lumped as a class, and if a trial had more than one pyrethroid treatment, we used the average rating data for these treatments.

Both pests, and especially the clouded plant bug, are more problematic and populations tend to be higher during mid season. Thus, all trials were put out in late July or early August, and a high percentage of the insects at this time were nymphs. All ratings were done by taking two or three shake sheet samples (5 or 6 row feet each) in each plot. We only used data from one rating date, which was always 4-6 days after the first insecticide application. All trials had three or four replicates, and with the exception of one test, individual plot were relatively small (4 rows X 40-70 ft). Applications were made with either a high-clearance tractor (8 GPA, 50 psi, TX6 nozzles) or a CO₂ backpack

sprayer (10-15 GPA, 35 psi, flat fan 80015 or 80012 nozzles). The rates of insecticides used in these trials varied slightly but were within recommended, labeled use ranges. Table 1 provides information on individual trials and treatments.

Table 1. Information on individual insecticide trials used in our analysis.

Test no.	Date of application	County	Application	Selected no. treatments	Insecticide treatments - rate in ounces product per acre (excludes check treatment in all tests)
1	7/28/05	Lauderdale	Tractor	9	Centric-2, Trimax-1.5, Acephate90-8, Bidrin-8, Diamond-9, Vydate-11.2, Mustang Max-3.5, KarateZ-1.85
2	7/28/05	Lauderdale	Tractor	4	KarateZ-1.96, Centric-2, Bidrin-8
3	7/28/05	Lauderdale	Tractor	5	Acephate90-4, Diamond-9, Trimax-1.5, Centric-1.5
4	7/30/05	Madison	Tractor	4	Acephate90-8, Bidrin-6, Baythroid-2
5	8/03/05	Madison	Tractor	4	Centric-2, KarateZ-1.94, Bidrin-4
6	8/05/05	Madison	Tractor	8	Bidrin-8, Centric-2, Diamond-9, KarateZ-2.56, Orthene90-8.8, Trimax-1.5, Vydate-11.2
7	7/29/04	Madison	Backpack	7	Bidrin-6, Centric-2, Trimax-1.5, Mustang Max-3.5, Vydate-10.2, Orthene97-8
8	8/03/04	Madison	Backpack	3	KarateZ-1.96, Diamond-9
9	8/09/04	Fayette	Backpack	3	Bidrin-6, Centric-1.5
10	8/02/04	Fayette	Tractor	2	KarateZ-1.83

Results and Discussion

In most of our trials, clouded plant bugs were as common, or more common, than tarnished plant bugs. Across all insecticide classes, the clouded plant bug was easier to control with insecticides than was the tarnished plant bug. This was especially evident for the synthetic pyrethroids, for which we had the largest number of comparisons. This is indicative of likely pyrethroid resistance in some tarnished plant bug populations. This resistance was apparent, especially in trials done in Lauderdale County during 2005. Although our purpose was not specifically to compare among the different insecticides, it is apparent that dicrotophos, acephate and oxamyl provided the best control of mixed populations of tarnished and clouded plant bug that occurred in mid season. Pyrethroid insecticide should provide adequate control of clouded plant bug infestations, and in areas where pyrethroid resistance is not established, may also control tarnished plant bug populations. However, there are clearly some geographic areas in West Tennessee where pyrethroid insecticide will not provide satisfactory control of tarnished plant bugs, at least if only one application is made.

Table 2. Relative efficacy of selected insecticides on tarnished and clouded plant bugs when summarized across multiple trials.

Insecticide	Cumulative, average counts in check plots			% Control of TPB	% Control of CPB	Difference (CPB-TPB)
	TPB	CPB	N*			
Acephate	26.5	31.4	(5)	70.5	77.0	+ 6.5
Bidrin	27.4	39.3	(7)	81.4	93.2	+ 11.8
Vydate	12.6	25.3	(3)	61.8	86.1	+ 24.3
Pyrethroids	49.2	56.7	(9)	58.7	83.0	+ 24.3
Trimax	24.4	26.3	(4)	24.8	35.8	+ 11.0
Centric	37.1	35.2	(7)	54.4	61.6	+ 7.2

Diamond	25.8	21.7	(4)	57.0	59.0	+ 2.0
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* N = Number of trials in comparison.

References

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