

**EVALUATION OF SELECTED INSECTICIDES AGAINST TARNISHED PLANT BUG IN LOUISIANA COTTON****D. R. Cook, E. Burris, D. R. Burns and B. R. Leonard****LSU AgCenter****St. Joseph, LA****Abstract**

Studies were conducted during 2004 to evaluate the efficacy of selected insecticides for management of tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois), infestations in cotton. In Test 1, Orthene 90S (0.33 lb AI/acre) significantly reduced TPB adults compared to Trimax 4F (0.047 lb AI/acre), Vydate 3.77L (0.33 lb AI/acre), Dimethoate 4E (0.33 lb AI/acre), and the non-treated control over the duration of the test. Orthene 90S (0.33 lb AI/acre) and Bidrin 8E (0.33 lb AI/acre) significantly reduced TPB nymphs compared to Dimethoate 4E (0.33 lb AI/acre) and the non-treated control. In Test 2, there were no significant differences among treatments for densities of TPB adults at 3, 5, and 7 days after treatment (DAT) or across sample dates. All insecticide treatments significantly reduced TPB nymphs compared to the non-treated control at 3, 5, and 7 DAT and across sample dates. Across sample dates, plots treated with Bidrin 8E (0.33 lb AI/acre) or Orthene (0.33 lb AI/acre) had significantly fewer TPB nymphs compared to plots treated with Trimax 4F (0.047 lb AI/acre) or Intruder 70WP (0.05 lb AI/acre). In Test 3, a combination of Centric 40WG (0.05 lb AI/acre) + Karate 2.08CS (0.025 lb AI/acre) significantly reduced TPB adults compared to Zephyr 0.15EC (0.0059 lb AI/acre) + Karate 2.08CS (0.025 lb AI/acre), Trimax 4F (0.047 lb AI/acre), Intruder 70WP (0.047 lb AI/acre), Orthene 90S (0.5 lb AI/acre), Bidrin 8E (0.25 lb AI/acre), and the non-treated control across all sample dates. Centric 40WG (0.05 lb AI/acre), Centric 40WG (0.05 lb AI/acre) + Zephyr 0.15EC (0.0059 lb AI/acre), and Orthene 90S (0.5 lb AI/acre) significantly reduced TPB nymphs compared to Trimax 4F (0.047 lb AI/acre), Intruder 70WP (0.047 lb AI/acre), and the non-treated control across all sample dates. In Test 3, all insecticide treatments except Intruder 70WP (0.047 lb AI/acre), resulted in significantly higher seedcotton yields compared to the non-treated control. Plots treated with Centric 40WG (0.625 lb AI/acre), Centric 40WG (0.5 lb AI/acre) + Zephyr 0.15EC (0.0059 lb AI/acre), Centric 40WG (0.05 lb AI/acre) + Karate 2.08CS (0.025 lb AI/acre), or Orthene 90S (0.5 lb AI/acre) produced significantly more seedcotton compared to plots treated with Trimax 4F (0.047 lb AI/acre) or Intruder 70WP (0.047 lb AI/acre).

**Introduction**

During 1995, Louisiana cotton producers made an average of 14.1 insecticide applications (Williams 1996). Most of these applications were broad spectrum insecticides targeted against boll weevil, *Anthonomus grandis grandis* Boheman, and/or bollworm, *Helicoverpa zea* (Boddie), and tobacco budworm, *Heliothis virescens* (F.), which provided control of tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), as well. With the implementation of the Boll Weevil Eradication Program and the adoption of transgenic cottons expressing genes from *Bacillus thuringiensis* Berliner for control of tobacco budworm and bollworm, the annual frequency of insecticide applications to cotton in Louisiana declined to 6.0 during 2003 (Williams 2004). Recently, the importance of tarnished plant bug as an insect pest of cotton has increased dramatically. With the reduction in insecticide applications against boll weevil and bollworm/tobacco budworm and the development of target specific insecticides, treatments specifically targeting tarnished plant bug have become more common. During 2003, tarnished plant bug was the second most important insect pest of cotton in the United States with respect to yield loss. In Louisiana, tarnished plant bug was the most important insect pest of cotton and the target of 42% of the insecticide applications during 2003 compared to 8.5% during 1995.

There are several insecticides recommended for tarnished plant bug control on cotton in Louisiana including acephate (Orthene 90S, 97S and generics), Bidrin 8E, Centric 40WG, Trimax 4F, and Vydate 3.77L (Bagwell et al. 2004). During 2001 to 2003, acephate, Bidrin, Centric, Trimax, and Vydate generally provided satisfactory control of tarnished plant bug in Arkansas, Louisiana, and Mississippi (Leonard 2002a, 2002b, Greene and Capps 2003, Layton et al. 2003, Walsh et al. 2003, Capps et al. 2004, Gable et al. 2004, Lorenz et al. 2004, Studebaker et al. 2004). Diamond 0.83EC (novaluron) received registration for use on cotton during 2004. Diamond is an insect growth regulator that has activity against lepidopteran larvae and heteropteran nymphs (Anonymous 2004). Results from trials conducted in Arkansas and Louisiana indicate that Diamond provides satisfactory control of tarnished plant bug nymphs (Greene and Capps 2003, Gable et al. 2004).

During the 2004 growing season, there were numerous reports of large and extended tarnished plant bug infestations on cotton in the mid-south. Numerous insecticide applications were required to control these infestations (B. R. Leonard, G. M. Lorenz III personal communication). Also during 2004, a population of tarnished plant bug exhibiting a high level of resistance (10-fold) to acephate was discovered in Mississippi (G. Snodgrass, unpublished data, USDA-ARS Stoneville, MS). Populations of tarnished plant bug exhibiting varying levels of tolerance/resistance to some organophosphates, pyrethroids, cyclodienes, and carbamates including methyl parathion (Cleveland and Furr 1979, Snodgrass and Elzen 1995), dicotophos and monocrotophos (McCaa and Schuster 1986, Snodgrass and Elzen 1995), dimethoate (Snodgrass and Scott 1988), cypermerthrin, bifenthrin, and permethrin (Snodgrass 1994, Snodgrass and Elzen 1995, Holloway et al. 1998), lambda-cyhalothrin, dimethoate, endosulfan, and oxamyl (Hollingsworth et al. 1997) have been reported. With the increase in status of tarnished plant bug as a cotton pest, the limited number of insecticides available for plant bug control, and with the potential for insecticide resistance, it is important that insecticides be evaluated regularly to determine if their performance has remained satisfactory.

### **Materials and Methods**

Trials were conducted during 2004 at the LSU AgCenter Northeast Research Station near St. Joseph, LA to evaluate the efficacy of selected recommended and experimental insecticides against tarnished plant bug on cotton. Cottonseed, Delta and Pine Land Delta Pearl (Tests 1 and 2) and Delta and Pine Land 555 BR (Test 3) were planted on a Commerce silt loam on 22 Apr, 8 Jul, and 27 May, respectively for Tests 1, 2, and 3. Plot size was four rows (centered on 40 inches) by 50 feet and treatments were replicated four times in a randomized complete block design in all tests. Treatments were applied with a high clearance sprayer and CO<sub>2</sub> charged spray system calibrated to deliver 10 gpa through Teejet TX-12 hollow cone nozzles (2/row) on 30 Jul and 6 Aug (Test 1), on 24 Sep (Test 2), and on 14, 21 Jul and 2, 10 Aug (Test 3). Treatment efficacy was determined by sampling the center two rows of each plot with a sweep net (25 sweeps/row) at 4 and 6 DAT2 (Test 1), at 3, 5, and 7 DAT (Test 2), and at 3 and 7 DAT3 and 3 and 7 DAT4 (Test 3). In Test 3, the two center rows of each plot were mechanically harvested using a John Deere spindle type picker on 1 Nov. Yields were converted to lb seedcotton/acre. Data were subjected to ANOVA and means separated according to Fisher's Protected Least Significant Difference. A total of 0.34, 0.04, and 3.12 inches of rainfall occurred from the first application until the end of sampling in Tests 1, 2, and 3, respectively.

### **Results and Discussion**

In Test 1, there were no significant differences among treatments for tarnished plant bug (TPB) adults at 4 and 6 DAT2 (Table 1). At 4 DAT2, all insecticide treatments except Intruder and Dimethoate, significantly reduced TPB nymphs compared to the non-treated control. Plots treated with Centric, Vydate, Orthene, or Bidrin had significantly fewer TPB nymphs compared to the non-treated plots at 6 DAT2. Orthene significantly reduced TPB adults compared to the non-treated control across all sample dates. All insecticide treatments, except Dimethoate, significantly reduced densities of TPB nymphs compared to the non-treated control across all sample dates. Plots treated with Centric, Vydate, Orthene, or Bidrin had significantly fewer TPB nymphs compared to plots treated with Dimethoate.

In Test 2, there were no significant differences among treatments for TPB adults at 3, 5, or 7 DAT or across sample dates (Table 2). At 3, 5, and 7 DAT and across sample dates, all of the insecticide treatments significantly reduced TPB nymphs compared to the non-treated control. Plots treated with Vydate, Orthene, or Bidrin had significantly fewer TPB nymphs compared to plots treated with Intruder at 3 DAT. At 5 DAT, Bidrin significantly reduced TPB nymphs compared to Trimax, Intruder, or Diamond. Across sample dates, plots treated with Orthene or Bidrin had significantly fewer TPB nymphs compared to plots treated with Trimax or Intruder.

Table 1. Efficacy of selected insecticide treatments against tarnished plant bug adults and nymphs at 4 and 6 DAT2 and means across all sampling dates.

Treatment/Form.	Rate/acre Lb/AI	4 DAT2		TPB/25 sweeps 6 DAT2		Mean	
		Adults	Nymphs	Adults	Nymphs	Adults	Nymphs
Centric 40WG	0.05	0.8	0.1c	1.0	0.1bc	1.0abc	0.6cd
Trimax 4F	0.047	1.8	1.0bc	0.9	0.8abc	1.1ab	1.0bc
Vydate 3.77L	0.33	0.8	0.4bc	0.8	0.1bc	1.1ab	0.6cd
Orthene 90S	0.33	0.5	0.1c	0.4	0.0c	0.5c	0.4d
Bidrin 8E	0.33	0.6	0.5bc	0.6	0.5bc	0.6bc	0.4d
Intruder 70WP	0.05	0.5	1.3abc	0.8	0.6abc	0.8bc	0.9bcd
Dimethoate 4E	0.33	2.0	1.6ab	1.6	1.0ab	1.6a	1.3ab
Non-treated	-	0.8	2.6a	1.6	1.5a	1.1ab	1.9a
$P>F$		0.35	0.02	0.22	0.05	0.03	<0.01

Means within columns followed by a common letter are not significantly different (FPLSD,  $P$  0.05).

Table 2. Efficacy of selected insecticide treatments against tarnished plant bug adults and nymphs at 3, 5, 7 DAT, and means across all sampling dates.

Treatment/Form.	Rate/acre Lb/AI	3 DAT		5 DAT		TPB/25 sweeps 7 DAT		Mean	
		Adults	Nymphs	Adults	Nymphs	Adults	Nymphs	Adults	Nymphs
Centric 40WG	0.05	1.4	4.6bc	3.6	4.0bc	1.9	5.5b	2.3	4.7bcd
Trimax 4F	0.047	3.0	5.3bc	2.5	6.1b	1.1	6.1b	2.2	5.8bc
Vydate 3.77L	0.33	2.3	3.4c	3.2	3.9bc	3.6	3.7b	3.0	3.8cd
Orthene 90S	0.33	2.9	2.6c	2.0	3.6bc	3.5	3.9b	2.8	3.4d
Bidrin 8E	0.33	1.5	2.6c	2.8	1.6c	3.4	3.4b	2.5	2.5d
Intruder 70WP	0.05	2.6	7.0b	3.8	5.5b	3.8	6.5b	3.4	6.3b
Diamond 0.83EC	0.045	2.6	3.9bc	2.4	5.3b	3.0	4.8b	2.7	4.6bcd
Non-treated	-	2.9	11.1a	2.9	10.0a	2.5	13.4a	2.8	10.8a
$P>F$		0.22	<0.01	0.72	<0.01	0.13	<0.01	0.76	<0.01

Means within columns followed by a common letter are not significantly different (FPLSD,  $P$  0.05).

In Test 3, there were no significant differences among treatments for densities of TPB adults and nymphs at 3 DAT3 or TPB adults at 7 DAT4 (Table 3). At 7 DAT3, plots treated with Centric (0.05 and 0.625 lb AI/acre), Centric + Zephyr, Centric + Karate, or Bidrin had significantly fewer TPB adults compared to the non-treated plots. Plots treated with Centric (0.05 and 0.625 lb AI/acre), Centric + Zephyr, Centric + Karate, or Orthene had significantly lower densities of TPB nymphs compared to the non-treated plots. At 3 DAT4, all insecticide treatments except Intruder and Bidrin, significantly reduced TPB adults compared to the non-treated control. Also, all insecticide treatments except Trimax and Intruder, significantly reduced densities of TPB nymphs compared to the non-treated control. At 7 DAT4, plots treated with Centric (0.05 lb AI/acre), Centric + Zephyr, or Orthene had significantly fewer TPB nymphs compared to the non-treated control.

Table 3. Efficacy of Centric combinations against tarnished plant bug adults and nymphs at 3 and 7 DAT3 and 3 and 7 DAT4.

Treatment/Form.	Rate/acre Lb/AI	3 DAT3		7 DAT3		TPB/25 sweeps 3 DAT4		7 DAT4	
		Adults	Nymphs	Adults	Nymphs	Adults	Nymphs	Adults	Nymphs
Centric 40WG	0.05	0.8	0.8	0.4c	2.0c	1.4cd	1.5c	2.0	1.5bc
Centric 40WG	0.0625	0.9	1.8	1.8b	3.8bc	1.4cd	2.9bc	1.9	1.8abc
Centric 40WG + Zephyr 0.15EC	0.05 0.0059	0.4	0.9	1.3bc	2.8bc	1.6bcd	1.4c	1.5	0.9c
Centric 40WG + Karate 2.08CS	0.05 0.025	0.1	1.0	0.4c	2.5bc	1.3d	1.5c	2.3	3.6a
Zephyr 0.15EC+ Karate 2.08CS	0.0059 0.025	0.4	1.9	2.3ab	4.3abc	1.0d	2.3c	3.5	2.1abc
Trimax 4F	0.047	0.9	3.0	2.0ab	4.6abc	3.1abc	4.1ab	2.8	2.4abc
Intruder 70WP	0.047	1.0	2.1	1.9ab	5.0ab	2.4bcd	4.0ab	1.9	3.4ab
Orthene 90S	0.5	0.9	1.3	1.9ab	2.4bc	2.4bcd	1.9c	2.1	1.4c

Bidrin 8E	0.25	1.4	1.0	1.3bc	4.9ab	3.3ab	1.9c	2.8	3.4ab
Non-treated	-	0.6	2.5	3.1a	6.6a	4.4a	5.3a	3.9	3.5a
<i>P&gt;F</i>		0.77	0.29	<0.01	0.03	0.01	<0.01	0.15	0.05

Means within columns followed by a common letter are not significantly different (FPLSD, *P* 0.05).

Across sample dates, all insecticide treatments except Bidrin, Trimax, and Intruder, significantly reduced densities of TPB adults and nymphs compared to the non-treated control (Table 4). All insecticide treatments, except Intruder, resulted in significantly higher seedcotton yields compared to the non-treated control. Plots treated with Centric (0.625 lb AI/acre), Centric + Zephyr, Centric + Karate, or Orthene produced significantly more seedcotton compared to plots treated with Trimax or Intruder.

Table 4. Efficacy of Centric combinations against tarnished plant bug adults and nymphs across sample dates and impact on seedcotton yield.

Treatment/Form.	Rate/acre Lb/AI	TPB/25 sweeps		Seedcotton Yield lb/acre
		Adults	Nymphs	
Centric 40WG	0.05	1.3bcd	1.2c	2,520abc
Centric 40WG	0.0625	1.5bcd	2.1bc	2,641ab
Centric 40WG + Zephyr 0.15EC	0.05 0.0059	1.1cd	1.2c	2,664a
Centric 40WG + Karate 2.08CS	0.05 0.025	0.9d	1.8bc	2,678a
Zephyr 0.15EC + Karate 2.08CS	0.0059 0.025	1.8bc	2.3bc	2,451abcd
Trimax 4F	0.047	2.1ab	2.9ab	2,197cd
Intruder 70WP	0.047	1.8bc	2.9ab	2,128de
Orthene 90S	0.5	1.8bc	1.4c	2,663a
Bidrin 8E	0.25	1.9abc	2.2bc	2,315bcd
Non-treated	-	2.7a	3.7a	1,864e
<i>P&gt;F</i>		<0.01	<0.01	<0.01

Means within columns followed by a common letter are not significantly different (FPLSD, *P* 0.05).

### Acknowledgments

The authors wish to thank the summer employees at the Northeast Research Station for their assistance with these studies also the LSU AgCenter, Cotton Incorporated, and Louisiana's cotton producers for financial support.

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