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# AERIAL APPLICATION OF ACEPHATE AGAINST TARNISHED PLANT BUGS

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## Abstract

The objective of this experiment was to evaluate aerial application of acephate (Orthene 90 SP, 0.33 lb [form.]/acre) for performance against tarnished plant bugs, *Lygus lineolaris* (Palisot de Beauvois), using spray volumes of 2, 3, and 5 GPA. During 2004, a large block field trial was done in Madison Parish, LA against a native infestation on flowering cotton. Two applications were made with a turbine Thrush aircraft (Thrush Aircraft Inc, Albany, GA) equipped with low volume rotary nozzles to the test field. Pre-treatment numbers of tarnished plant bug adults and nymphs were distributed across the entire field. After treatment, the number of sites at which no tarnished plant bugs were found increased as application volume increased from 2 to 5 GPA. Tarnished plant bug numbers among the three treated plots were relatively low, but similar.

## Introduction

The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), is a pest of cotton in Louisiana that demands attention each year. Major infestations can cause considerable damage and yield loss. Significant yield losses have been attributed to tarnished plant bugs in numerous states (Williams 2004). In Louisiana, treatment is recommended when 10 to 25 pests per 100 sweeps are found, or when infestations are present and first position square retention falls below 70 to 80% (Bagwell et al. 2004).

Tarnished plant bug management is primarily accomplished with insecticides. Boll weevil eradication, target-selective insecticides and Bt cotton have decreased the use of broad-spectrum insecticides and co-incidental control of tarnished plant bugs. In recent years insecticide efficacy has been declining. Several factors may be associated with a decline in insecticide performance against this pest. Changes in pest ecology that contribute to more persistent migrations of adults from alternative hosts are likely part of the problem. Insecticide resistance in tarnished plant bugs has been documented in several studies. Holloway et al. (1998) reported that tarnished plant bug resistance to acephate, cypermethrin, and oxamyl increased during the 1995 and 1996 growing seasons in Louisiana. Hollingsworth et al. (1997) found tarnished plant bugs from Arkansas cotton growing regions to be tolerant to lambda-cyhalothrin, dimethoate, endosulfan, and oxamyl. During 2004, a population of tarnished plant bugs from the Mississippi hill region exhibited a high level of resistance (10-fold) to acephate (G. Snodgrass, USDA-ARS Stoneville, MS, personal communication).

Another issue that is associated with satisfactory control of tarnished plant bugs concerns pesticide application methodology. Insecticides are applied by ground equipment and aircraft in Louisiana. Applying spray to pests located in the cotton's foliage is often difficult due to the lack of droplets penetrating the crop canopy, and droplets not striking the target plant surfaces (Womac et al. 1992). The general trend in recent years is to reduce application volume (GPA). Application volume by air in Louisiana generally ranges from 1 to 3 GPA, even when insecticide labels explicitly recommend a minimum of 3 GPA for aircraft. Orthene 90 SP is recommended in aerial applications at 3 to 10 GPA (Crop Protection Reference 2002). Previous studies have reported improved insect control in cotton with higher application volumes or higher doses of the insecticide used at lower application volumes. Kirk and Esquivel (1998) found that 5 GPA treatments of Tracer gave the highest top and mid-canopy droplet densities, best efficacy, and higher yields than 2 GPA treatments of Tracer for Lepidoperous insect control. Lopez et al. (2003), using a spray table to simulate aerial application, found dicrotophos was more effective against southern green stink bugs at higher application volumes. Rester et al. (1994) demonstrated that finished spray rates of 5 GPA decreases the potential of unsatisfactory control compared to that with 2 GPA. The objective of this study was to evaluate the efficacy of three application volumes of aerially applied acephate against tarnished plant bugs.

## Methods

The study was conducted in Madison Parish, LA during the 2004 growing season. The field (93 acres) was planted with Delta Pine and Land Co., DP 555BR. All agronomic management practices followed standard recommendations from the Louisiana Cooperative Extension Service.

The field boundary was mapped with a Trimble GPS backpack receiver (Trimble, Sunnyvale, CA). The field was surrounded by field corn on two sides, and cotton or woodland on the other two margins (Fig. 1). The field was divided into three blocks (31 acres), each receiving one of the three treatments: 2 GPA, 3 GPA, and 5 GPA. The treatments were not replicated due to the acreage required for the aircraft. A turbine aircraft (Thrush Aircraft Inc, Albany, GA) equipped with low volume rotary nozzles applied acephate (Orthene 90 SP, 0.33 lb [form.]/acre) on 14 July and 20 July. Data was collected with Handspring Visor hand-held computers and a Magellan GPS unit (Thales, San Dimas, CA) on 14 (pre-treatment), 16, and 22 July. The plots were sampled with five teams of students spaced 150 ft apart moving in a coordinated pattern across the field. Two shakes of a standard shake cloth were done every 90 feet in each treatment. Bayer Scoutlink software (Bayer Crop Science, Kansas City, MO) was used to record all data and automatically georeference each sample site. Excel (Microsoft, Bellevue, WA) files from Bayer Scoutlink were imported into ArcView GIS 3.3 (ESRI, Redlands, CA) on a desktop personal computer for geospatial analysis. Data collection points are presented geospatially and graduated symbols are used to represent location and number of tarnished plant bugs. Data were summarized using PROC Mean (SAS Institute 1998).

## Results and Discussion

The pre-treatment samples showed an average of 1.1 total tarnished plant bugs at each site (12 row ft sampled). Post-treatment sampling on July 16 indicated a reduction in numbers of tarnished plant bug numbers for the three treatments compared to the pre-treatment sample. Tarnished plant bug numbers were similar among the three treatments on both dates (Table 1). The percentage of the sample sites where no tarnished plant bugs were collected was highest in the 5 GPA treatment (Fig. 1). In addition, the number of sites where 2 tarnished plant bugs/site were found ranged from 23.9% in the 2 GPA treatment to 13.2% in the 5 GPA treatment.

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Table 1. Effects (Mean no./site± Standard Deviation) of Selected Aerial Application Volumes of Acephate Against Tarnished Plant Bugs, 2004

| | 14 July (Pre-Treatment) | | 16 July | | 22 July | |
|---|---|---|---|---|---|---|
| **Treatments** | **Nymphs** | **Total** | **Nymphs** | **Total** | **Nymphs** | **Total** |
| 2 GPA | 1.21± 1.32 | 1.58± 1.55 | 0.44± 0.74 | 0.84± 1.07 | 0.03± 0.16 | 0.45± 0.68 |
| 3 GPA | 0.94± 1.16 | 1.33± 1.49 | 0.31± 0.53 | 0.73± 0.98 | 0.07± 0.25 | 0.43± 0.57 |
| 5 GPA | 1.11± 1.63 | 1.56± 2.07 | 0.34± 0.58 | 0.58± 0.72 | 0.05± 0.23 | 0.53± 0.51 |

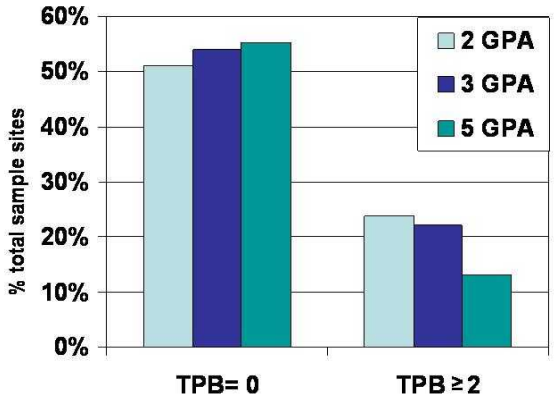


Fig. 1: Percent of sample sites represented with no (0) tarnished plant bugs (TPB) and sites 2 TPB on 16 July.