# EVALUATION OF CULTURAL IPM PRACTICES FOR CONTROLLING TARNISHED PLANT BUGS IN COTTON

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## Abstract

A field experiment was conducted at the Delta Research and Extension Center in Stoneville, MS to investigate the impact of varietal maturity and planting date on tarnished plant bug in cotton. Four planting dates were selected to encompass the entire cotton planting window for the Delta region of Mississippi. The planting dates included mid-April (April 20, 2010, and April 14, 2011), early-May (May 6, 2010 and April 29, 2011), mid-May (May 19, 2010, and May 16, 2011), and early-June (June 2, 2010, and May 31, 2011). An early maturing variety, Deltapine 0912 B2RF (DP0912B2RF), and a late maturing variety, Deltapine 0949 B2RF(DP0949B2RF) were planted at each planting date. Fewer foliar insecticide applications were needed at the earlier planting dates. Lint yields of cotton were higher and percent yield loss was lower for DP0912B2RF than DP0949B2RF. Earlier planting dates sustained less percent yield loss and achieved greater lint yield than did later planting dates. Based on these results, growers should utilize planting date and varietal maturity to manage for earliness in an overall tarnished plant bug management program.

## Introduction

The tarnished plant bug, *Lygus lineolaris (Palisot* de Beauvois), is the most important pest of cotton in Mississippi. In 2009, growers made an average of 6.5 foliar insecticide applications per acre for this pest, resulting in an average of nearly $75/ac in control costs (Williams 2009). In 2010, growers made an average of 5.4 foliar insecticide applications per acre for tarnished plant bug with an average control cost of nearly $60/ac. The combination of tarnished plant bug control costs with other input costs such as technology fees, increased weed control costs for controlling glyphosate resistant weed species, and higher fuel and fertilize costs associated with rising energy costs make profitable cotton production difficult. The high input costs associated with cotton production make other cropping systems, such as soybeans and corn, more attractive to producers. Tarnished plant bug feeding can begin as early as plant emergence and last until the early lint development of the last harvestable bolls (Layton 1995). Although tarnished plant bugs will feed on cotton for the entire season, economic damage is most likely to occur from first square through the early flowering stages of cotton growth (Black 1973). Resistance was found in field populations of tarnished plant bugs to the pyrethroids in 1994 (Snodgrass). Snodgrass (2009) also documented resistance to acephate. Due to the increased numbers of insecticide applications and rising control costs, a sustainable management strategy needs to be developed that maximizes economic returns of cotton production. This study evaluates a cultural control method in an attempt to reduce in season foliar insecticide dependency to help alleviate input costs.

## Materials and Methods

In order to determine the impact of planting date and varietal maturity on tarnished plant bug management, an experiment was conducted in Stoneville, MS at the Delta Research and Extension Center in 2010 and 2011. The experiment was planted as a randomized complete block design with four replications. Treatments were arranged in a split-split block. The main plot factor was planting date and included four times during the recommended time frame for planting cotton in Mississippi. The four times for planting included: (1.) mid-April (April 20, 2010, and April 14, 2011), (2.) late-April/early-May (May 6, 2010 and April 29, 2011), (3.) mid-May (May 19, 2010, and May

16, 2011), and (4.) late-May/ early-June (June 2, 2010, and May 31, 2011). The sub-plot factor was cotton variety and included an early maturing variety and a late maturing variety. The early variety was Deltapine 0912B2RF and the late variety was Deltapine 0949B2RF. Bollgard II varieties were used to minimize the impact of lepidopteran pests on final cotton yields. The sub-sub-plot factor included two levels of tarnished plant bug control. These levels were untreated for tarnished plant bug and treated for tarnished plant bug. The treated plots were sprayed as needed based upon economic thresholds with insecticide mixtures designed to maximize the level of tarnished plant bug control. Application decisions were based on the average tarnished plant bug density of all 4 replications for a particular planting date/variety treatment. Plot size was eight rows by 75 ft. in length. Each variety was planted at the recommended seed population rate into raised conventional tilled beds with 40 inch row spacing. Seed was treated with Avicta Complete Pak to minimize the impacts of thrips. A preemergence application of herbicide was made over the entire area for control of summer annual weeds. Tarnished plant bug densities were monitored twice per week in each plot. The outside six rows of each plot were used for sampling tarnished plant bug densities. During the pre-flowering stages, tarnished plant bug adult and nymph densities were determined by taking 25 sweeps with a standard 15 inch diameter sweep net. Square retention was monitored prior to first flower by checking 25 plants per plot to determine if normally fruiting plants were retaining at least 80% of first and second position fruiting sites. During the flowering period, tarnished plant bug densities were determined by taking two drop cloth samples with a 2.5 ft. black drop cloth per plot. Numbers of adults and nymphs were recorded. Nodes above white flower were determined by counting the number of main stem nodes above the uppermost first position white flower as described in Bourland et al. (1992). Insecticide sprays were terminated in the treated plots when plants averaged NAWF 5 plus 350 heat units. At the end of the season, the center two rows of each plot were harvested and seedcotton weights were recorded. All data were analyzed using PROC MIXED from SAS.

## Results and Discussion

Generally, as planting date increased later into the season, more foliar insecticide applications were required to maintain tarnished plant bug populations at acceptable levels (Figure 1). Tarnished plant bug densities reached levels above threshold early in the year due to migrating adults, but acceptable square retention was maintained, however, late in the growing season, tarnished plant bug populations peaked, and rarely were they able to be maintained below threshold (Figure 2). Lint yields of cotton were highest at earlier planting dates and decreased as planting date increased across all factors and both years, with earlier planting dates also requiring less foliar insecticide applications for tarnished plant bugs (Table 1). The early maturing variety yielded significantly more lint per hectare than did the late variety (Table 2). Sprayed plots yielded significantly more lint per hectare than unsprayed plots (Table 3). The difference in yield of the early variety comparing sprayed to unsprayed was less than the difference in yield of the late variety when comparing sprayed to unsprayed, causing a spray by variety interaction (Table 4). Percent yield loss was generally lower at earlier planting dates, and increased as planting date became later in the planting window despite increased numbers of foliar insecticide applications for tarnished plant bugs (Table 5). The early variety sustained less yield loss than did the late variety at each planting date due to tarnished plant bugs (Table 5). Based on these results together with the problems of controlling tarnished plant bugs in the Delta region of Mississippi, growers should manage for earliness in their crop. This includes using early maturing varieties, that minimize the amount of time the crop is in the susceptible stages to tarnished plant bug damage, and planting during the optimum planting window to avoid late season population buildups of tarnished plant bugs. These factors have the potential to make cotton production sustainable once again when used as part of a total management program.

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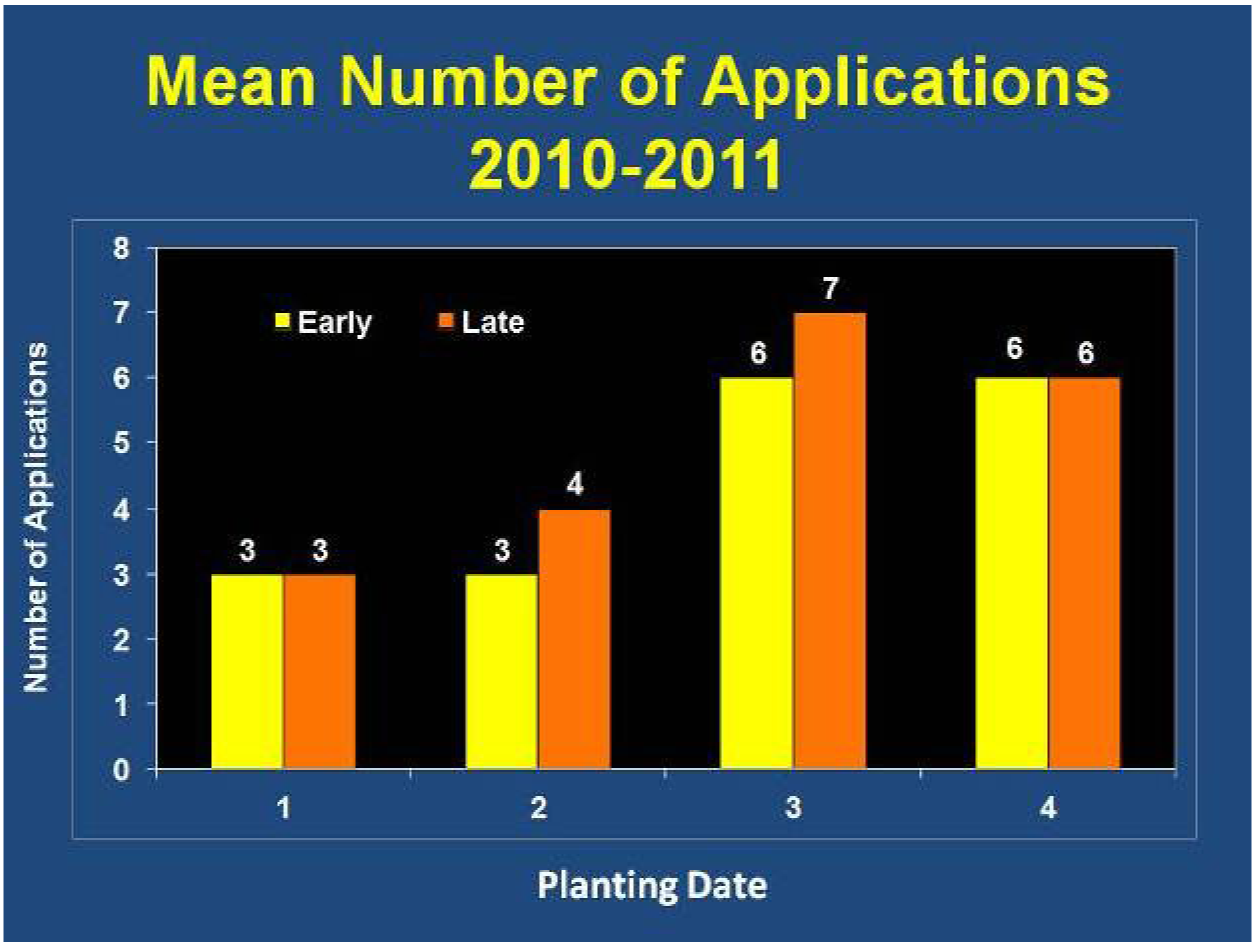


Figure 1. Mean number of applications made on each variety within each planting date.

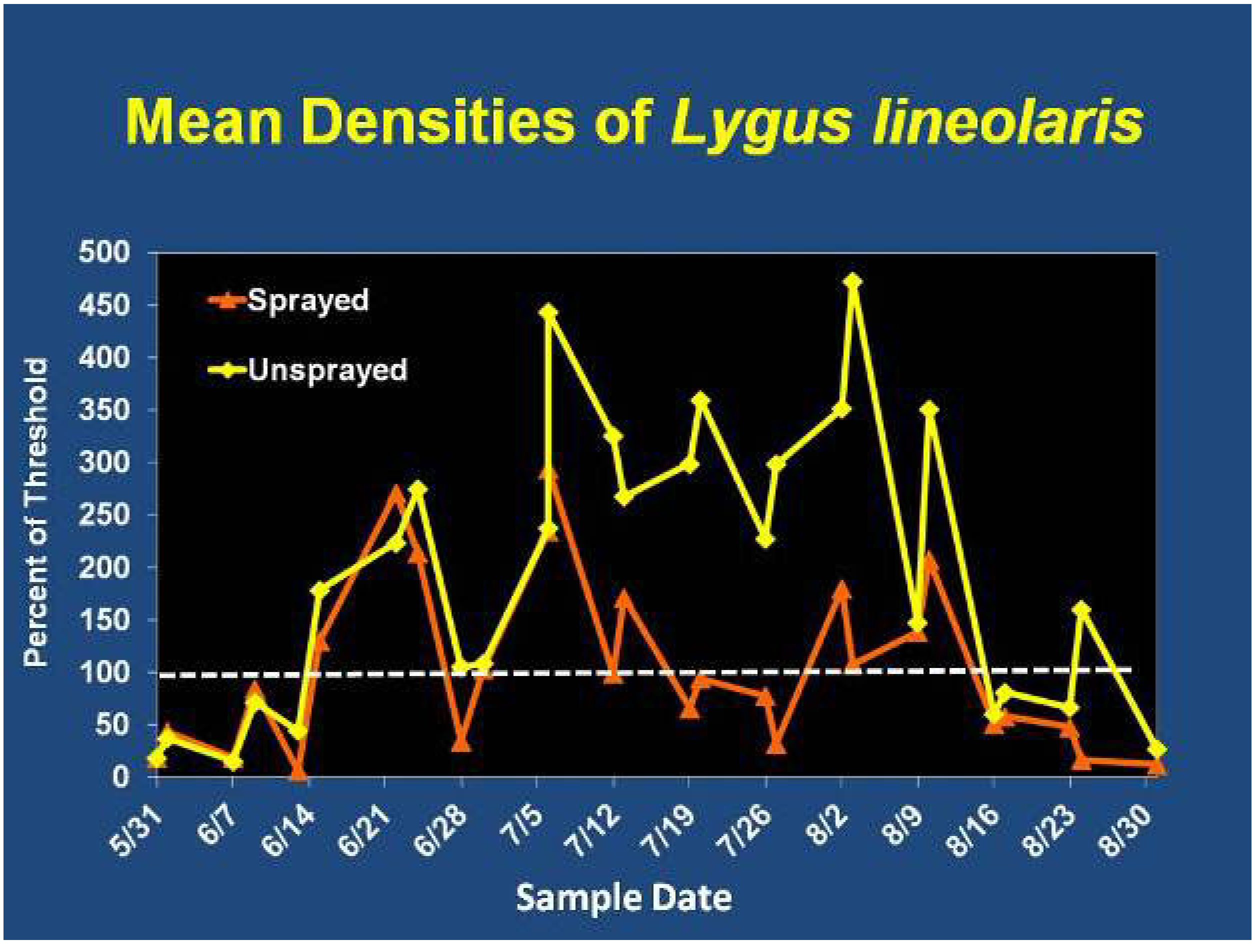


Figure 2. Mean densities of Tarnished Plant Bug densities throughout the growing seasons, 2010-2011.

Table 1. Impact of planting date as a management tool for tarnished plant bug on yield.

| Planting Date | Yield |
|---|---|
| **Mid April** | 1274a |
| **Early May** | 1162b |
| **Mid May** | 1020c |
| **Early June** | 887d |
| **LSD (P=0.05)** | **90.65** |

Means within a column followed by the same letter are not significantly different (LSD, P=0.05).

Table 2. Effect of varietal maturity as a management tool for tarnished plant bug on yield.

| Varietal Maturity | Yield |
|---|---|
| **Early** | 1213a |
| **Late** | 959b |
| **LSD (P=0.05)** | **64.09** |

Means within a column followed by the same letter are not significantly different (LSD, P=0.05).

Table 3. Effect of spraying for tarnished plant bugs on yield.

| Control Level | Yield |
|---|---|
| **Sprayed** | 1310a |
| **Unsprayed** | 862b |
| **LSD (P=0.05)** | **64.10** |

Means within a column followed by the same letter are not significantly different (LSD, P=0.05).

Table 4. Interaction of spray and varietal maturity on yield.

| Effect | Yield |
|---|---|
| **Early Sprayed** | 1390a |
| **Late Sprayed** | 1229b |
| **Early Unsprayed** | 1036c |
| **Late Unsprayed** | 689d |
| **LSD (P=0.05)** | **90.65** |

Means within a column followed by the same letter are not significantly different (LSD, P=0.05).

Table 5. Percent yield loss of each variety at each planting date.

| Planting Date | Percent Yield Loss | |
|---|---|---|
| | Early | Late |
| **Mid April** | 22 | 37 |
| **Early May** | 21 | 44 |
| **Mid May** | 23 | 44 |
| **Early June** | 38 | 56 |