THE IMPACT OF PLANTING DATE AND VARIETAL MATURITY SELECTION ON TARNISHED PLANT BUG (*Lygus lineolaris)* MANAGEMENT

Brian Adams
Fred Musser
Mississippi State University
Mississippi State, MS
Angus Catchot
Mississippi State University Extension Service
Mississippi State, MS
Jeff Gore
Don Cook
Mississippi State University-DREC
Stoneville, MS
Darrin Dodds
Mississippi State University Extension Service
Mississippi State, MS

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 standard cotton planting window for the Delta region of Mississippi. The planting dates included mid-April (April 20, 2010), early-May (May 6, 2010), mid-May (May 19, 2010), and early-June (June 2, 2010). 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.

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 alone, resulting in an average of nearly $75/ac in control costs (Williams 2009). 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 among tarnished plant bugs 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. The experiment was planted as a randomized complete block design and 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), (2.) late-April/early-May (May 6, 2010), (3.) mid-May (May 19, 2010), and (4.) late-May/ early-June (June 2, 2010). 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 of 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. Total number of nodes and plant height were measured weekly throughout the season from 10 randomly selected plants per plot. 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). Nodes above cracked boll were counted 120 days after planting for each planting date. At the end of the season, the center two rows of each plot were harvested and seedcotton weights were recorded. A subsample of seedcotton from each plot was ginned and lint turnout was determined. Lint yield was converted to lbs/ac. A sample of lint from each plot will be analyzed to determine lint quality parameters. All data will be analyzed using PROC MIXED from SAS.

Results and Discussion

For both varieties and both levels of control, cumulative tarnished plant bug populations were significantly higher in the May 19th planting date compared to all other planting dates (Figs. 1-4). Lint yields of cotton were highest at earlier planting dates and decreased as planting date increased for both varieties across sprayed and unsprayed treatments, with earlier planting dates also requiring less foliar insecticide applications for tarnished plant bugs (Table 1). Lint yields in the sprayed early variety ranged from 1696 lbs. of lint per acre to 1068 lbs. of lint per acre, while the sprayed late variety ranged from 1560 lbs. of lint per acre to 896 lbs. of lint per acre. For the unsprayed plots, the early variety yields ranged from 1224 lbs. of lint per acre to 641 lbs. of lint per acre, while the late variety ranged from 876 lbs. of lint per acre to 375 lbs. of lint per acre. DP0949B2RF had greater yield loss from tarnished plant bug damage than DP0912B2RF at all planting dates (Table 2). Percent yield loss was lowest at earlier planting dates and increased as planting date became later (Table 3) despite increased numbers of foliar insecticide applications made. 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 spend 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.

Acknowledgements

We gratefully acknowledge Cotton Incorporated for their support and funding for this research. I would also like to give a special thanks to all of my co-authors for their support, patience, and guidance through this research.

References

Black, E. R. 1973. Economic threshold studies of the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), in cotton. 108 pp. Ph.D. Dissertation, Department of Entomology, Mississippi State University. Mississippi State, MS.

Bourland, F. M., D. M. Oosterhuis and N. P. Tugwell 1992. Concept for monitoring the growth and development of cotton plants using main-stem node counts. J. Prod. Agric. 5: 532-538.

Layton, M. B. 1995. Tarnished plant bug: biology, thresholds, sampling, and status of resistance. Beltwide Cotton Conferences, Memphis, TN. 131-134.

Snodgrass, G. L. 1994. Pyrethroid resistance in a field population of the tarnished plant bug. Proc Beltwide Cotton Conference, New Orleans, LA. 2. 1186-1188.

Snodgrass, G. L., J. Gore, R. Jackson and C. A. Abel 2009. Acephate resistance in populations of the tarnished plant bug(Heteroptera: Miridae) from the Mississippi River Delta. J. Econ. Entomol. 102: 699-707.

Williams, M. R. 2009. Cotton insect losses. http://www.entomology.msstate.edu/resources/tips/cotton-losses/data/2009/allstates09Official%2023.pdf.

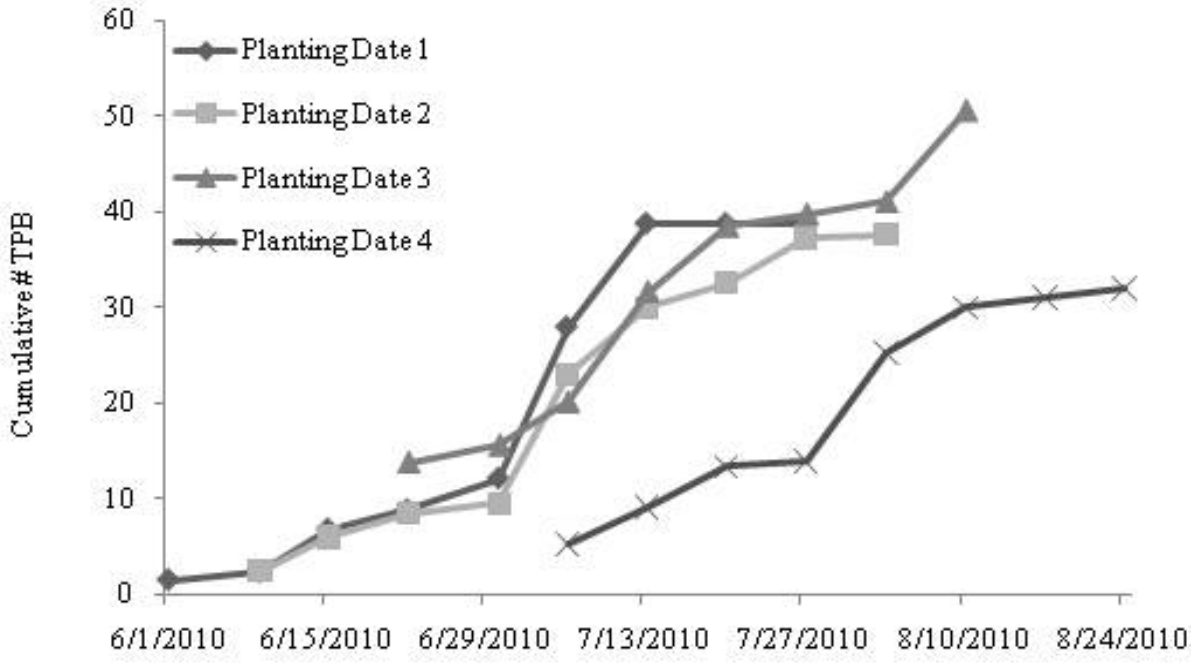

Figure 1. Cumulative seasonal densities of tarnished plant bugs in sprayed DP0912 B2RF .

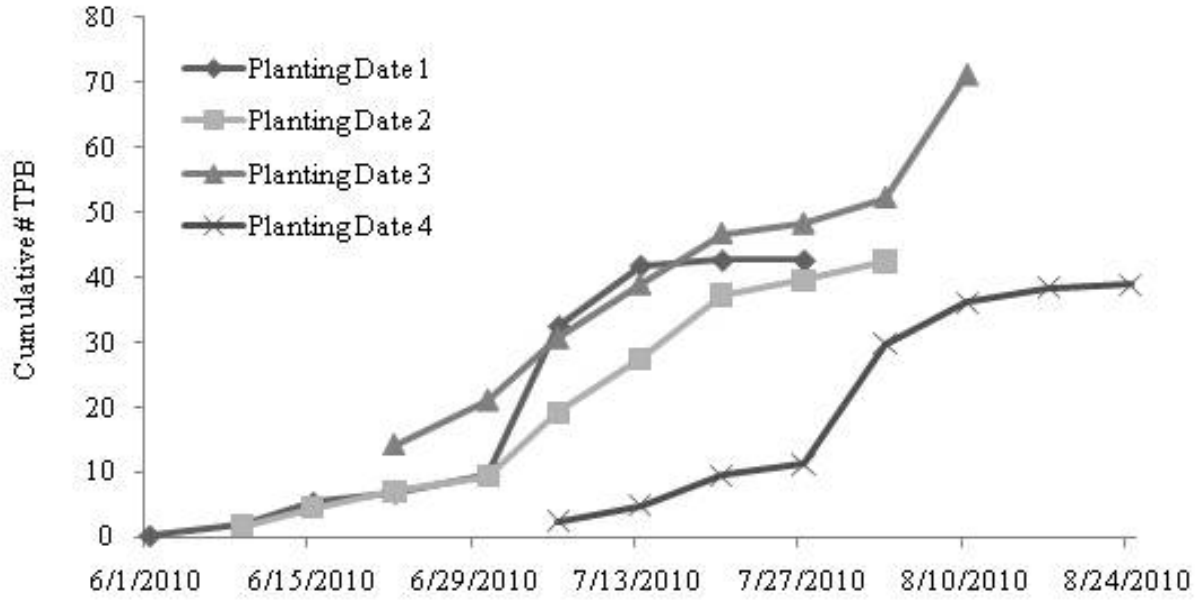

Figure 2. Cumulative seasonal densities of tarnished plant bugs in sprayed DP0949 B2RF.

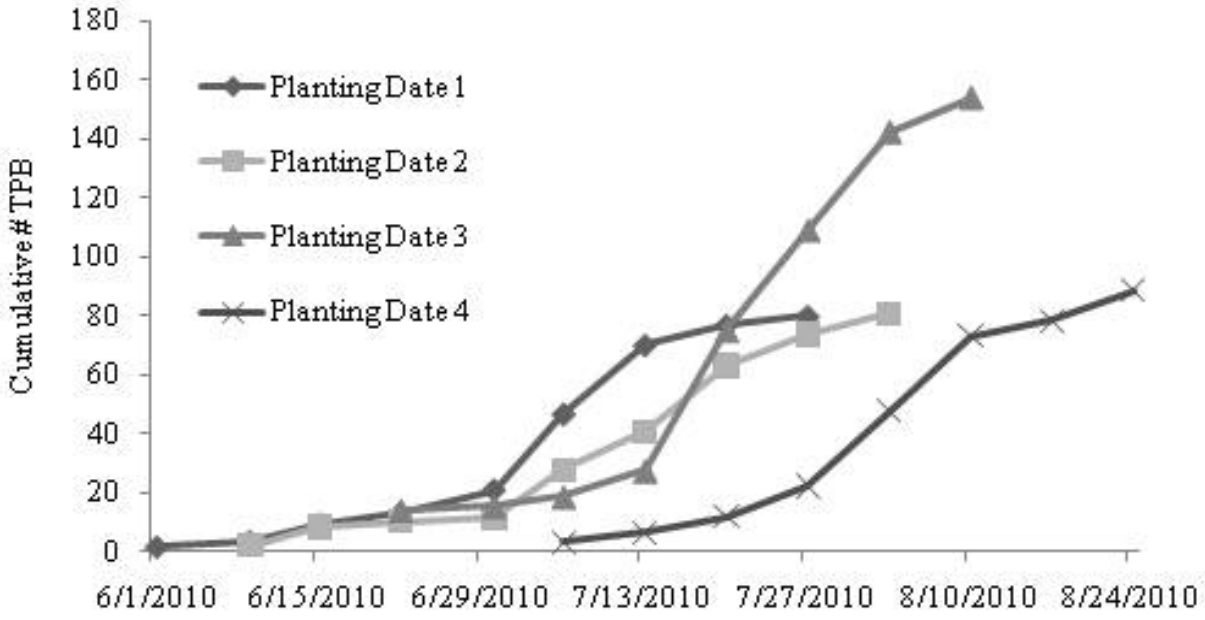

Figure 3. Cumulative seasonal densities of tarnished plant bugs in unsprayed DP0912 B2RF

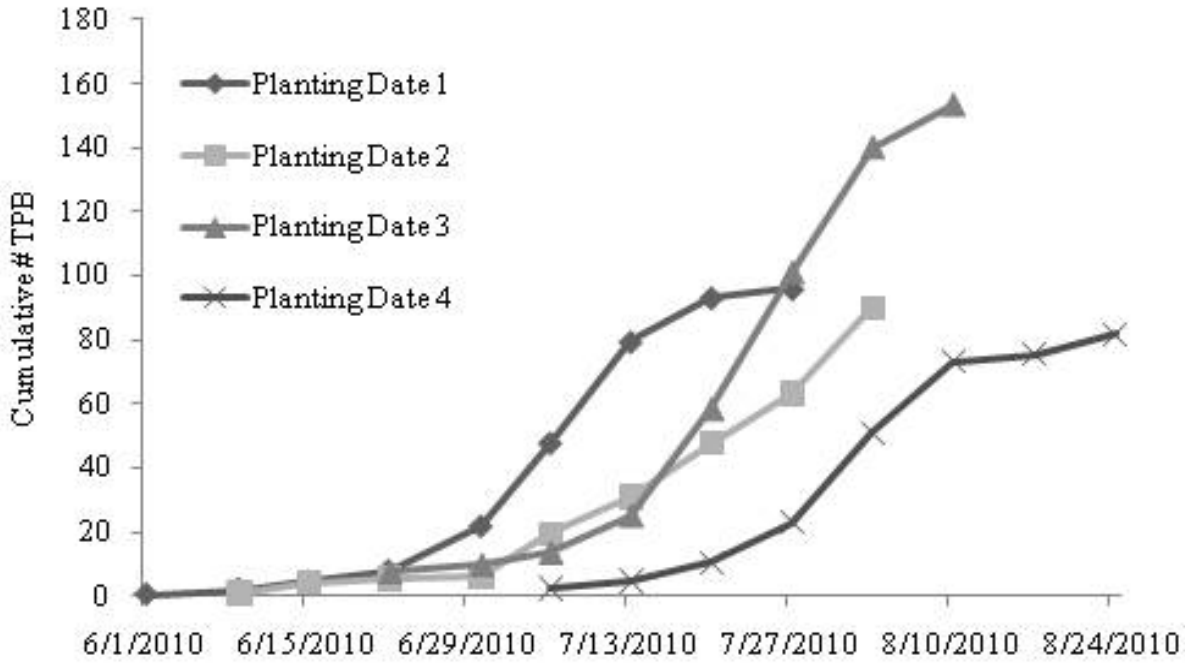

Figure 4. Cumulative seasonal densities of tarnished plant bugs in unsprayed DP0949 B2RF

Table 1. Yield of early (DP0912B2RF) and late (DP0949B2RF) maturing cotton cultivars sprayed and unsprayed for tarnished plant bugs at four planting dates.

	Sprayed		Unsprayed	
Planting Date	**DP0912B2RF**	**DP0949B2RF**	**DP0912B2RF**	**DP0949B2RF**
April 20, 2010	[1](3)1696a	[1](3)1550ab	1224a	876ab
May 6, 2010	[1](4)1732a	[1](4)1560a	1171ab	892a
May 19, 2010	[1](7)1432b	[1](7)1338b	1011b	732b
June 2, 2010	[1](7)1068c	[1](7)896c	641c	375c
LSD (P=0.05)	156.95	214.55	162.40	144.12

Means within a column followed by the same letter are not significantly different (LSD, P=0.05).
[1](Number of foliar insecticide applications made based current economic thresholds for tarnished plant bugs in Mississippi)

Table 2. Percent yield loss due to tarnished plant bug damage for early (DP0912B2RF) and late (DP0949B2RF) varieties.

	DP0912B2RF	DP0949B2RF
Percent Yield Loss	30%	47%

Table 3. Percent Yield loss due to tarnished plant bug damage for four planting dates.

	April 20, 2010	May 6, 2010	May 19, 2010	June 2, 2010
Percent Yield Loss	35%	37%	36%	48%