HOST PLANT RESISTANCE TO TARNISHED PLANT BUG IN ARKANSAS: II. CONFIRMATION OF SMALL PLOT DATA

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Abstract

The tarnished plant bug is a major pest of cotton in Arkansas. Growers routinely make 3-6 insecticide applications each year to control this pest in cotton. Resistance to insecticides has become a major issue with the tarnished plant bug. Therefore, information on possible host plant resistance is important to growers as well as decision makers. Host plant resistance does appear to be available when looking at varieties in small plot research. However, the level of resistance found in small plots may not translate to larger field plots (preference vs true resistance). It is important to evaluate possible resistant varieties in larger plots to verify their level of resistance to tarnished plant bugs. Large plot studies verifying resistance found in small plots were conducted from 2007-2013. Results of these studies show that resistant varieties require approximately half as many insecticide applications as susceptible varieties and often do not require any insecticides until late in the season when compared to susceptible varieties.

Introduction

The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois) is a major pest of cotton in the mid-Southern United States (Williams 2013). It is not uncommon for growers to make 3-6 applications of insecticide to control this pest in a normal growing season while some may make as many as 15 applications in situations of heavy pest pressure. Insecticides have been the primary line of defense against this pest in the past. However, the tarnished plant bug is developing resistance to many of the insecticides commonly used for control of this important pest (Hollingsworth et al. 1997, Holloway et al. 1998, Snodgrass and Scott 1988, Snodgrass and Elzen 1995, Snodgrass 2006). Reliance solely on insecticides to control a pest is not a good IPM practice, particularly with fewer effective products becoming available as recommended control options (Studebaker 2013). Host plant resistance to a pest is an important component of IPM and should not be overlooked. Some cotton varieties appear to exhibit a high level of resistance to tarnished plant bugs in ultra-small plots. However, data from small 1 or 2 row plots may imply that the insect merely prefers one variety over another instead of the variety being truly resistant. Varieties showing high levels of resistance in small plots should be tested in larger plots to determine the true level of resistance to tarnished plant bugs. The objective of this study was to take cotton varieties exhibiting a high level of resistance to the tarnished plant bug in small research plots and verify that resistance in much larger research plots.

Materials and Methods

Varieties that exhibited resistance as well as several that were highly susceptible in small plot research trials were planted into large plots at the Northeast Research and Extension Center, Keiser, AR during the growing seasons of 2007-2013. Varieties used are reported in Table 1. Plot size varied from year to year from 16 to 24 rows in width by 75-100 ft in length. Plots were randomized and arranged in a split-plot design with both treated and untreated for tarnished plant bugs within each variety. Treated plots were sprayed with acephate at 0.75 lbs/acre when tarnished plant bugs reached the recommended treatment threshold of 3 plant bugs per 5 row feet. Tarnished plant bug numbers were determined by taking 2 shake sheet samples from the center of each plot on a weekly basis throughout the growing season until cotton reached cutout (NAWF=5) plus 250 accumulated heat units. Heat units were determined on a DD60 heat unit scale. Plots were taken to yield by harvesting the center rows in each plot with a small plot cotton picker.

In 2011-2012, resistant varieties were monitored in grower fields to determine the level of plant bug populations in each. A nearby field with a susceptible variety was also monitored at each location. Ten pairs of grower fields were monitored and compared in both years.

Table 1. Cotton varieties tested in large plots from 2007-2013.

Variety	Resistant	Susceptible
AM UA48		X
SGS UA222	X	
ST 5288B2F	X	
PHY 375WRF		X
DP 0935B2RF	X	
ST 4498B2RF	X	
ST 4554B2RF	X	
FM 1740B2RF		X
TX-Frego		X
SG 105	X	

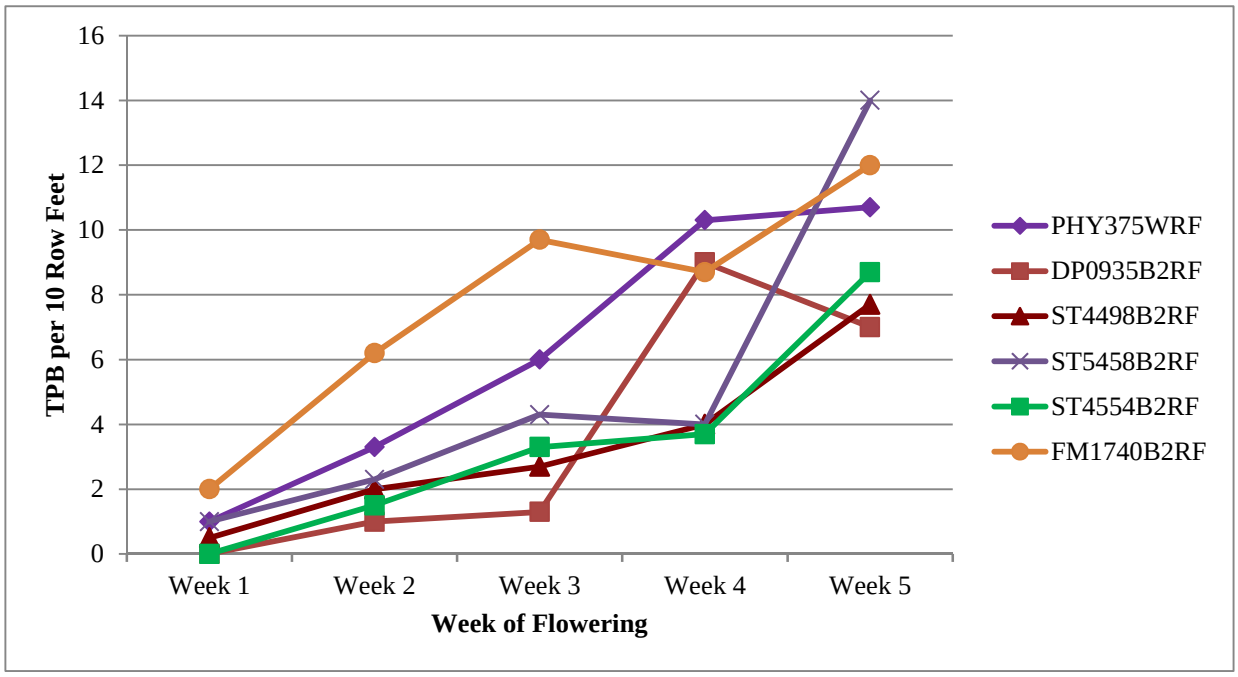

Figure 1. Tarnished plant bug density in untreated plots in 2010

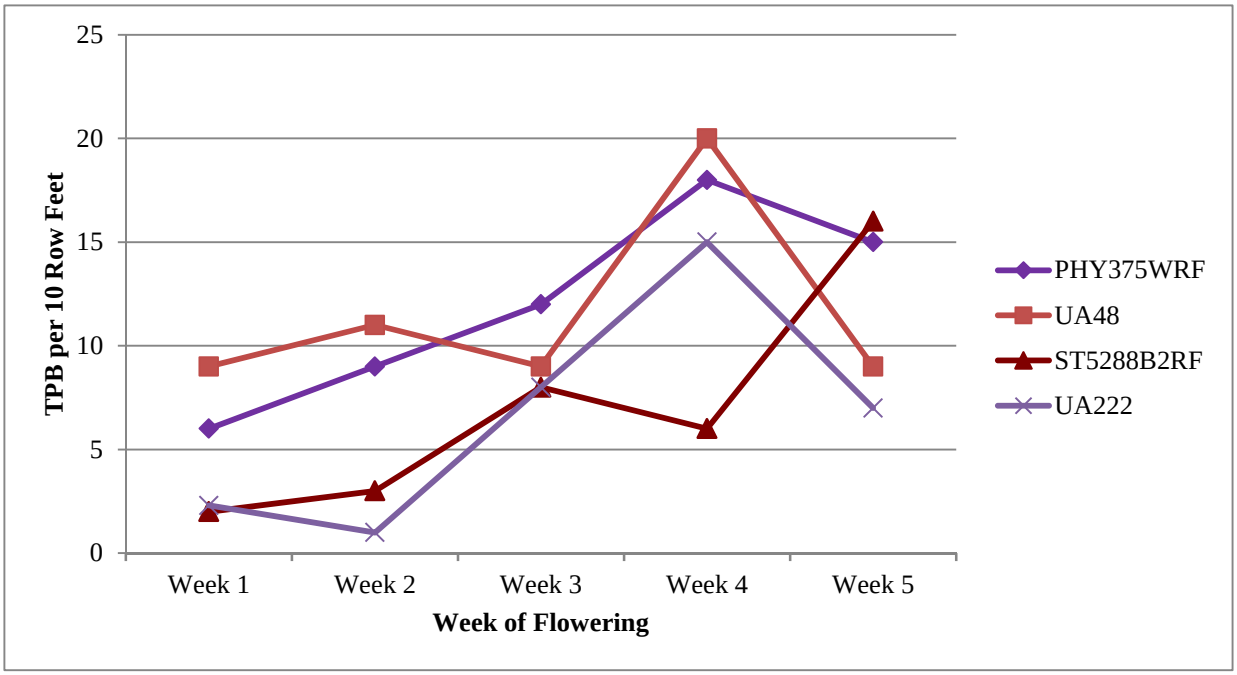

Figure 2. Tarnished plant bug density in untreated plots in 2012

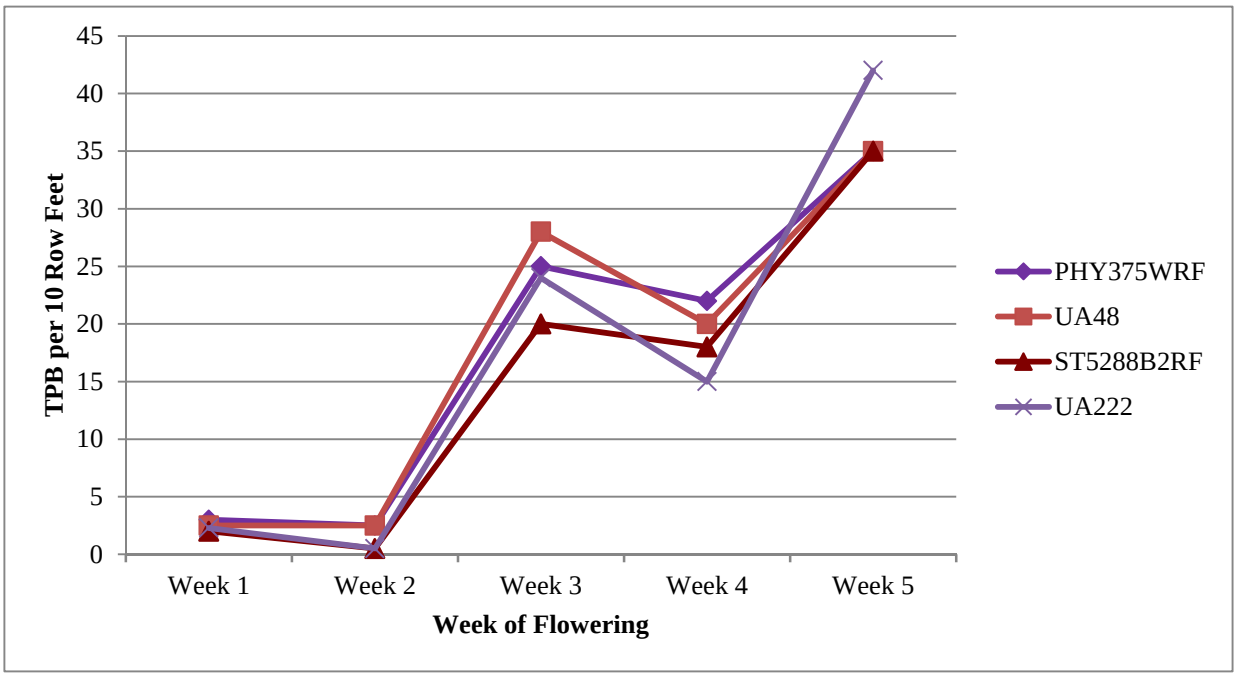

Figure 3. Tarnished plant bug density in untreated plots in 2013

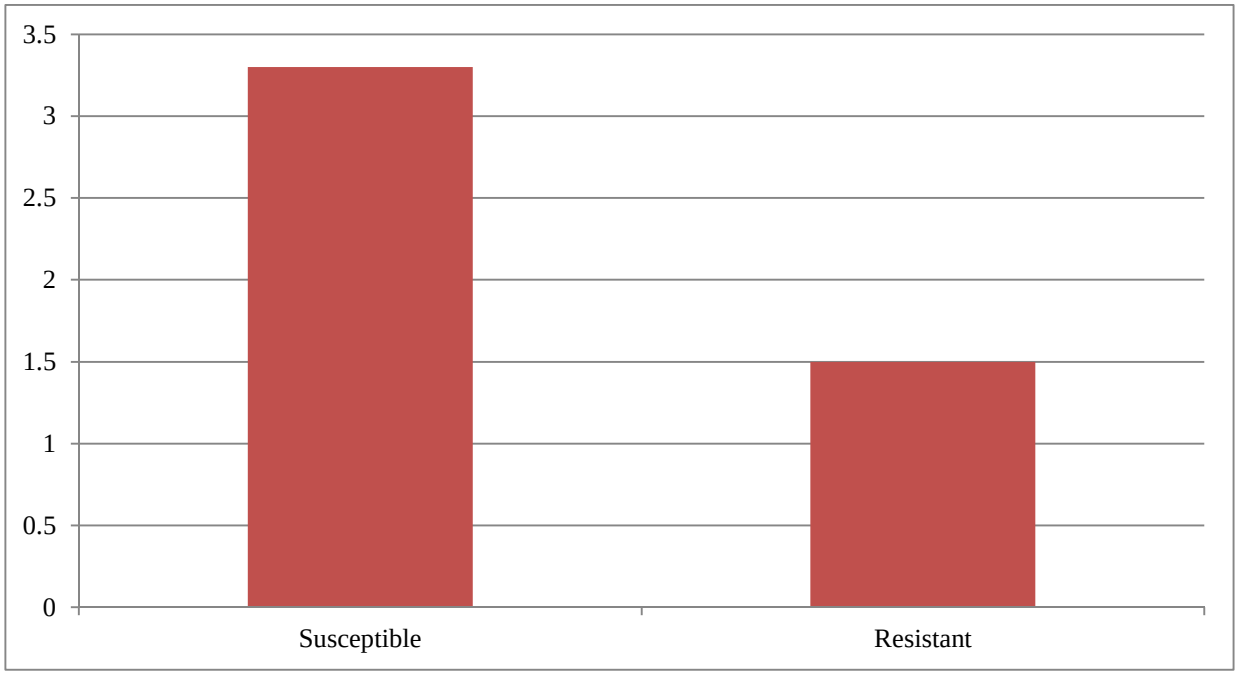

Figure 4. Average number of insecticide applications for tarnished plant bugs on susceptible versus resistant varieties in large plots from 2007-2013

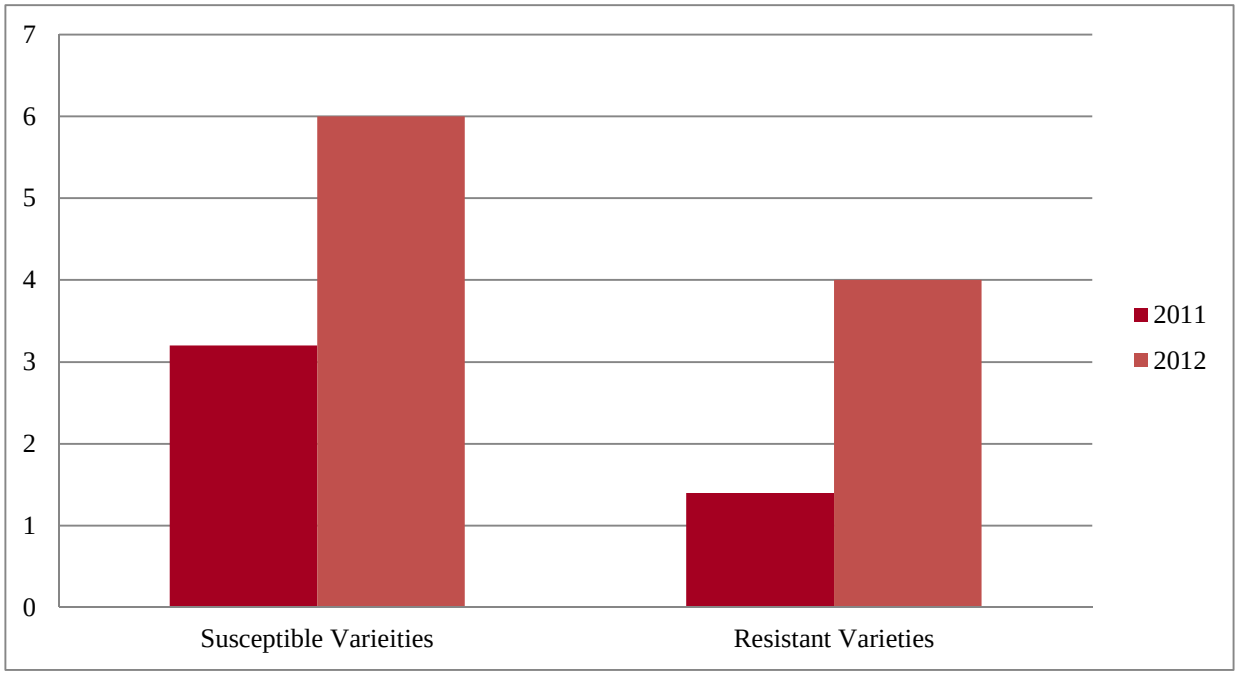

Figure 5. Average number of insecticide applications for tarnished plant bugs on commercial fields in 2011 and 2012.

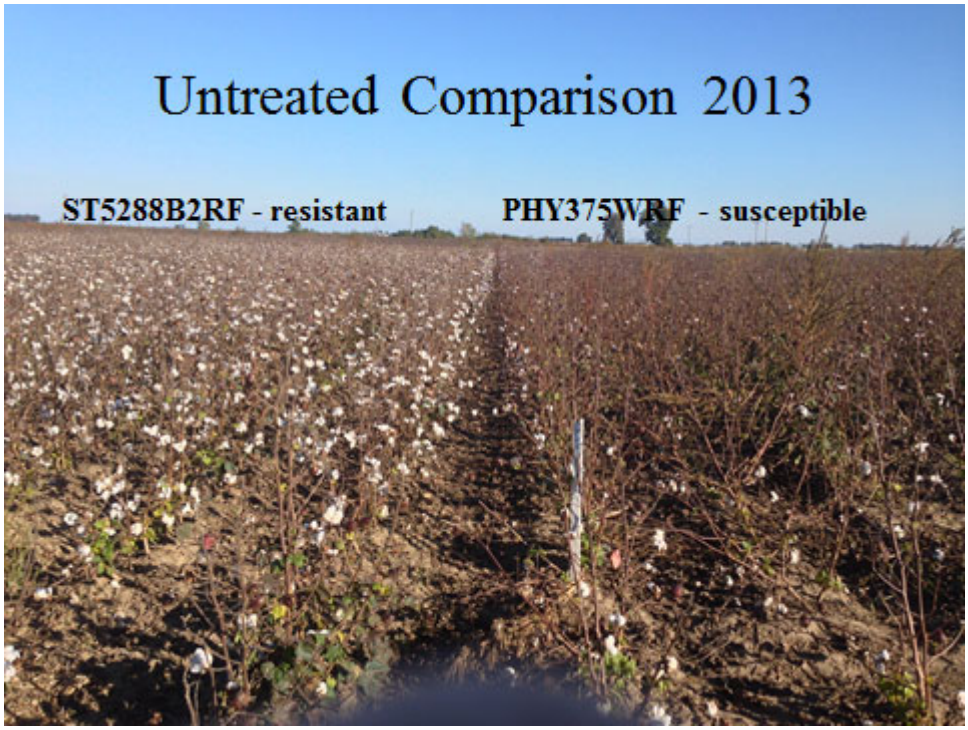

Figure 6. Comparison of an untreated resistant and susceptible variety under extremely high tarnished plant bug populations in 2013.

Results and Discussion

Tarnished plant bug populations varied from year to year and only the data from representative selective years is reported. Results in Figures 1and 2 are typical of those found throughout the course of this study. Tarnished plant bug numbers are reported in levels per 10 row-ft, therefore the economic threshold in each figure would be 6 as is shown by the red horizontal line in Figure 1. In 2010 the susceptible varieties reached treatment threshold during the 2nd and 3rd week of flowering while the resistant varieties did not reach threshold until the 4th and 5th week of flowering (Figure 1). In 2012 four varieties were tested, two resistant and two susceptible. The 2 susceptible varieties reached threshold on the first week of flowering while the resistant varieties did not reach threshold until the third week (Figure 2). In 2013, tarnished plant bug numbers were extremely high and all varieties reached treatment level at the same time regardless of resistance level (Figure 3). The weather conditions during the 2013 growing season were also extremely wet; resulting in delayed and sometimes missed insecticide applications. Untreated susceptible varieties in 2013 had no fruit at the end of the season, while resistant varieties did have some visible (Figure 6). In all years with the exception of 2013, resistant varieties reached treatment threshold from one to three weeks after the susceptible varieties. Susceptible varieties often required twice as many insecticide applications to control tarnished plant bugs as the resistant varieties (Figure 4). This also translated at the grower level as can be seen from the grower fields monitored in 2011 and 2012 (Figure 5).

Summary

Resistance measured in small plots does appear to translate to large plots as well as to grower fields. On average, resistant varieties required half as many insecticide applications for tarnished plant bugs and often did not require treatments until later in the season. In some years resistant varieties did not require a treatment until the last week of flowering just as plots reached cutout resulting in very little yield loss from tarnished plant bugs. By utilizing resistant varieties growers should be able to maximize yield and reduce costs associated with tarnished plant bugs. An added benefit is the possible delay of insecticide resistance development in this insect by reducing the number of insecticide applications.

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