INVESTIGATION OF FIELD PLOT SIZE ON VARIATION IN WHITE FLOWER ANTHER INJURY ASSOCIATED WITH TARNISHED PLANT BUG HOST PLANT RESISTANCE EVALUATIONS IN ARKANSAS COTTON

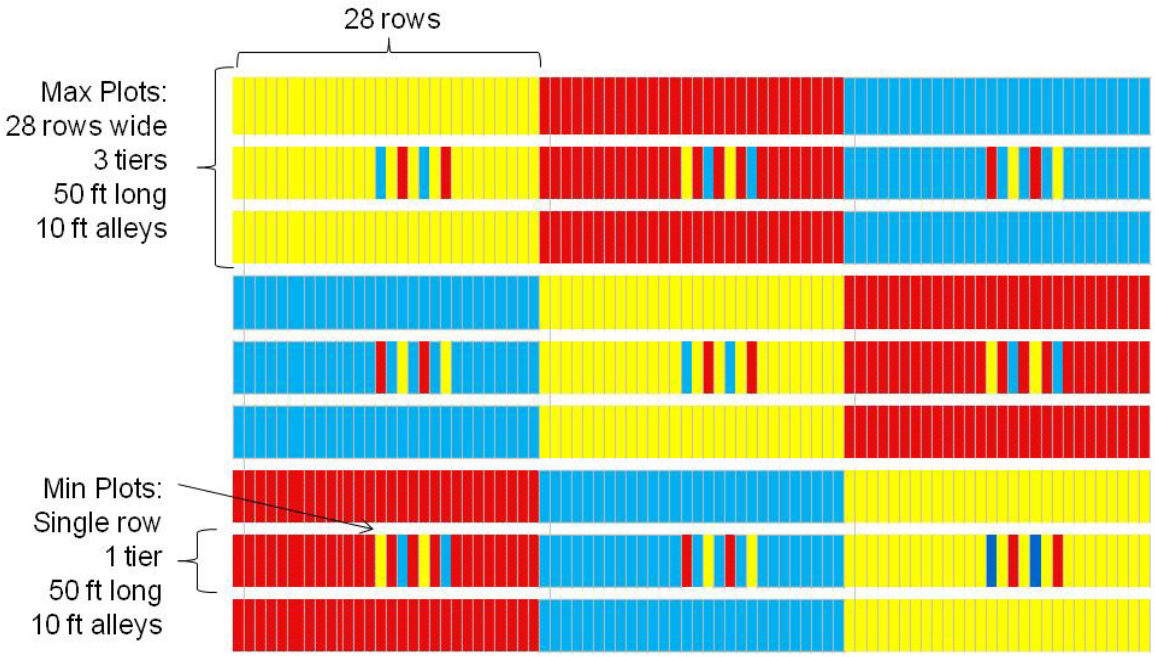
Tina Gray Teague
Arkansas State University
University of Arkansas Agricultural Experiment Station
Jonesboro, AR
Jeffrey L. Willers
USDA, ARS, CSRL
Mississippi State, MS
Fred M. Bourland
University of Arkansas NEREC
Keiser, AR
George Milliken
Kansas State University
Manhattan, KS

Abstract

Insecticides remain the chief method for managing tarnished plant bugs ((*Lygus lineolaris* (Palisot de Beauvois) in Midsouth cotton, but on-going research programs are directed at improving host plant resistance (HPR) to this important pest. One focus in the University of Arkansas cotton breeding program includes a Cotton Incorporated sponsored project to expedite screening procedures for identifying plant bug feeding preferences. A simple technique to evaluate response of genotypes is to monitor the "dirty blooms" resulting from plant bug induced injury. In larger squares plant bugs typically direct their feeding at the nitrogen-rich anthers. Such squares rarely shed, but when the flower opens, anther injury is apparent as a "dirty" bloom (Pack and Tugwell 1976) . In HPR screeening tirals in Arkansas, cotton lines are planted in single row plots replicated 12 times.. A highly susceptible frego bract cotton line is included in every trial to provide a standard for measuring of plant bug feeding activity (Bourland and Jones 2008). Damaged flower counts (dirty blooms) are made daily as plant approach peak flower and continue several days until physiological cutout. Results from these measurements over years and locations have shown relatively stable levels of bug preference for the frego type, and this measure along with counts from other standard cultivars provide a rapid means of evaluating plant bug preferences for new genotypes (Bourland 2004, Bourland, unpublished).

A field trial conducted in 2008 and 2009 was designed to investigate whether field plot size of HPR field experiments affects incidence of white flowers with anther injury. The experiment was conducted at the Cooperative University Research Farm at the Judd Hill Plantation in Poinsett County, in NE Arkansas near Trumann. Dates of planting were 8 May 2008 and 19 May 2009. A highly susceptible frego line, RBCDHGPIQH-1-97 (frego) was planted along with two standards, Deltapine 393, (DP393), and SureGrow 105 (SG105). The field layout (Fig 1) was such that there were 9 max plots to which one of the three cotton lines was assigned using a Latin Square arrangement. Each max plot consisted of 28 planted rows (180 ft) divided into three tiers of 50 row feet with 10 feet of alley (180 ft) separating tiers. The center tier of each of the max plot consisted of a set of mini plots where the two lines not assigned to the max plot were each inserted between two rows of the line assigned to the max plot. Within this middle tier, rows 13, 15, 17 and 19 consisted of the line assigned to the max plot and rows 14, 16, 18, and 20 were alternately assigned to the other two lines. An additional factor consisted of insecticide applications assigned to the first eight rows of each column of the Latin Square, i.e., the insecticide was applied in a strip down the first eight rows of each column.

White flower anther injury assessments were made after initiation of flowering by daily inspections of 10 white flowers per plot. For max sprayed and max non-sprayed plot, 3 samples of 10 flowers were taken per day. Injury was categorized as either (0) no anther injury or (1) anther injury present. Counts were made 1) across all 3 tiers of rows 24, 25, 26 of max plots, 2) in rows 4, 5, 6 in all 3 tiers of max (sprayed) plots, and 3) in each of the 8 min rows. Count data were kept separate for each row. Also, samplers took care to minimize touching plants. Counts of white flowers with anther injury were made 5 to 7 times weekly during the first 4 weeks of flowering.



A Logistic Regression Model was used to model the trends in undamaged white flowers among the cotton lines for different days after planting (DAP). The parameters for the Logistic Regression Model were estimated with Proc Glimmix in SAS®.

Figure 1. Plot diagram of the Max and Min plot size comparison with the 3 cotton lines planted displayed as either red (frego), blue (SG105) or yellow (PSC 355) in the 2008 trial. Cotton lines were re-randomized in 2009.

In 2008 and 2009, counts of flowers with discolored anthers associated with plant bug feeding were not different between single rows compared to large plot plantings under unsprayed conditions. Spraying reduced injury in the max plots. White flower injury from plant bug feeding in the frego cotton line was significantly greater than in SG105 and DP393 in both single row and large plots. Observations were made under low (2008) and moderate pest pressure (2009).

Monitoring levels of white flower anther injury is a simple and rapid technique for assessing plant bug preferences in host plant resistance research. The objective of this experiment was to determine if plant bug feeding preferences would be altered by plot sizes. The results say there is no effect of plot size, which is an advantageous finding.

References

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