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COTTON BOLL SUSCEPTIBILITY TO MALE, FEMALE AND LATE INSTARS OF SOUTHERN GREEN STINK BUGS

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Abstract

A field study determined the influence of Southern green stink bug, *Nezara viridula* (L.) adults, (female and males), and nymphs (fourth-fifth) on boll abscission and yield loss. Cotton bolls of several age classes (0-50, 51-100, 101-150 through 451-500 heat units [HU]) were infested with one insect of each gender or life stage of Southern green stink bug for 72 h. Seed cotton yield of bolls infested with adults and late instar nymphs through ca. 500 HU beyond anthesis was significantly lowered compared to non-infested bolls. There were no significant differences in boll abscission and boll weights between adults and nymphs or between adult males and adult females compared to non-infested bolls.

Introduction

Widespread adoption of Bollgard cotton technology and an overall reduction in broad-spectrum insecticide use has increased the incidence of Hemipteran pests including tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), and stink bugs (Pentatomidae) in cotton. Three species of stink bugs including the Southern green stink bug, *Nezara viridula* (L.), the green stink bug, *Acrosternum hilare* (Say), and the brown stink bug, *Euschistus servus* (Say), are common in Louisiana cotton fields. Stink bug adults and late instar nymphs can be injurious to cotton bolls (Greene et al. 1999). The initial injury from stink bug feeding on cotton causes young bolls to abscise. These insect pests also can cause a significant reduction in seed cotton weights for individual bolls, inhibit seed germination, and decrease cotton lint and seed quality (Barbour et al. 1990, Bundy et al. 1999, Willrich et al. 2003).

The impact of Southern green stink bug on Louisiana field crops is much more severe compared to other species, and it is considered the primary stink bug pest of most row crops in the Southern United States (McPherson et al. 1994). Of the total acreage planted to cotton in Louisiana, 70% was infested with stink bugs in 2003 resulting in yield loss of 0.91% (Williams 2004). Little information is available to compare boll injury and yield loss between male and female stink bugs as well as adults versus nymphs. The objective of the study was to determine the influence of Southern green stink bug male adults, female adults, and fourth-fifth instar nymphs on bolls of various ages and their effect on yield loss.

Materials and Methods

The study was conducted at the Macon Ridge Research Station near Winnsboro, Louisiana, during 2004. The cotton variety, Stoneville 5599BR, was planted in a Gigger-Gilbert silt loam soil on 16 April and 24 May 2004. Cultural practices and integrated pest management strategies were followed as recommended by the LSU AgCenter. Southern green stink bugs were collected from field corn, *Zea mays*, and soybean, *Glycine max* L. Insects were collected using a standard 38.1 cm diameter sweep net and held in a polypropylene cage for 24 h. Insects without obvious signs of parasitism and physical injury were selected for the study.

Beginning during the first week of flowering, first position flowers were tagged at anthesis for the purpose of calculating the boll age using the HU accumulation method. Bolls of specific heat units (HU) were either caged individually with male, female, or fourth-fifth instar nymphs or caged with no insects (control) for 72-h. At the end of the infestation period, cages and insects were removed and boll abscission was recorded. Harvest aids were applied at crop maturity (NAWF=5 + 1100 HU). All bolls (infested and control) were manually harvested to determine individual seed cotton weights. Bolls were grouped into eight classes of 50 HU (0-50, 51-100, 101-150, 151-200, 201-250, 251-300, 301-350, 351-400, 401-450, 451-500 which correspond to 0-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 16-17, 19, 20-21 days, respectively).

Treatments were arranged in a completely randomized design. Boll abscission data for infested bolls was corrected for natural abscission in the non-infested bolls using Abbott's formula (Abbott 1925) and analyzed using regression analysis (PROC REG, SAS Institute 1998). Corrected abscission data were plotted against the accumulated HU to describe the relationship. Seed cotton yield was analyzed using a paired t-test by comparing seed cotton weight of infested bolls to non-infested bolls of the same age class (PROC TTEST, SAS Institute 1998).

Results

Boll abscission

There was a negative linear relationship describing abscission of infested bolls as a function of HU accumulation. Boll abscission was highest (60%) for bolls infested at 51 to 100 HU and decreased gradually with the boll age (Figure 1). The boll abscission ranged from 60% to 0% (≥250 HU). There was no significant difference in boll abscission between adult males and adult females of Southern green stink bugs.

Influence of Southern green stink bug on yield

Seed cotton yield was significantly reduced in bolls infested with stink bug adults and nymphs for age classes 151 through 500 HU beyond anthesis when compared to non-infested bolls. The adults and nymphs equally damaged bolls and resulted in similar injury and yield losses (Figure 2).

Both male and female Southern green stink bugs significantly reduced yields of bolls infested from 0 through 400 HU beyond anthesis when compared to non-infested bolls (Figure 3). There were no significant differences in yield reduction between male and female Southern green stink bugs within any of the HU classes.

Discussion

Results from this study indicated that young bolls are very sensitive to abscission by stink bugs. Stink bug adults induced abscission in bolls of ≤250 HU beyond anthesis. These data correspond similarly to that of Willrich et al. 2003.Seed cotton yields were significantly reduced in infested bolls of age classes from 0 to 500 HU when compared to non-infested bolls. There were no significant differences in yield reduction between late instar nymphs and adults or between adult males and females of Southern green stink bugs. Based on the results of this field study, it is evident that young bolls are vulnerable to stink bug attack and damage to bolls can continue until bolls accumulate ≥400 HU (21 d) after anthesis. Stink bug control measures should be initiated at early flowering and continue until the final harvestable boll population has accumulated ≥400 HU.

Acknowledgments

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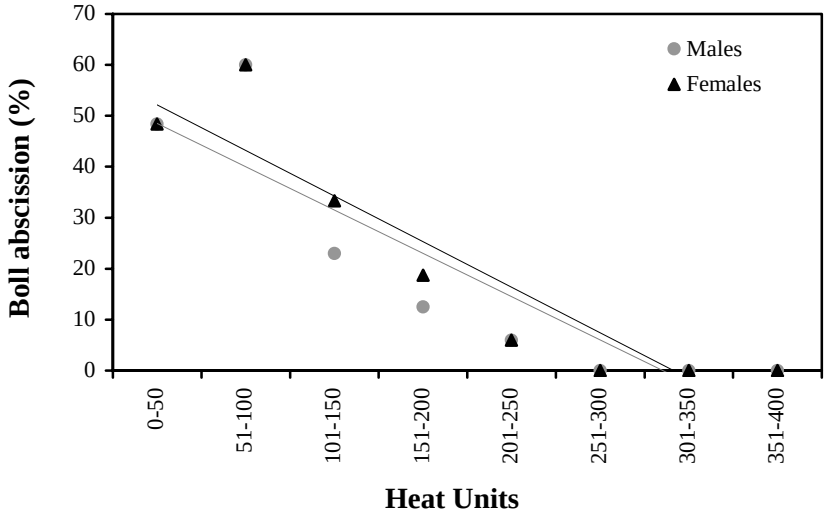

Figure 1. Relationship between boll abscission induced by Southern green stink bug adult males and females and accumulated heat units after anthesis. Equation parameters for adult males y = -12.68x+65.49, r^2 = 0.95; for adult females y = -11.93x+66.71, r^2= 0.96.

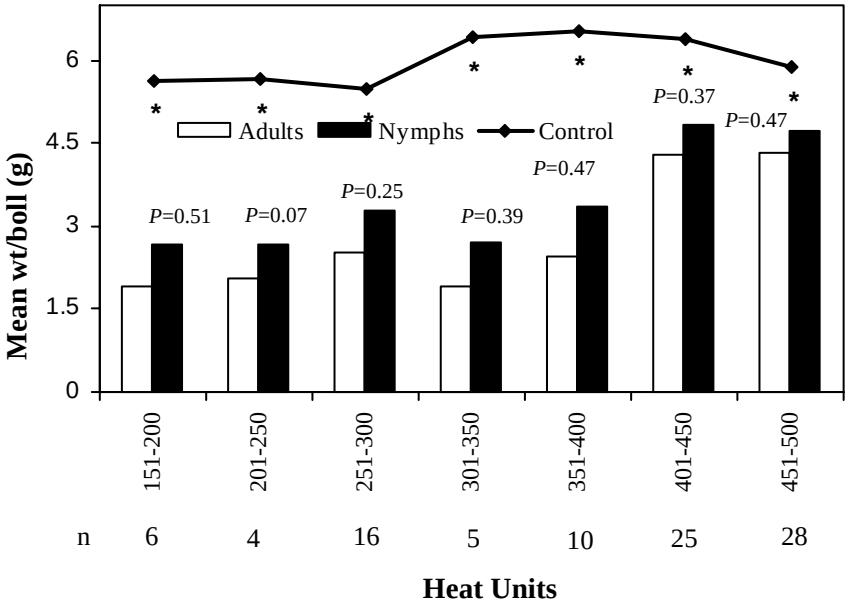

Figure 2. Seed cotton yields resulting from Southern green stink bug adults and late instar nymphs (4^{th}-5^{th}) at selected boll age classes (heat units). Asterisks indicate significant differences in yield (adults and nymphs) from the non-infested controls ($P<0.05$). n represents the sample size infested with the adults/nymphs at each age class.

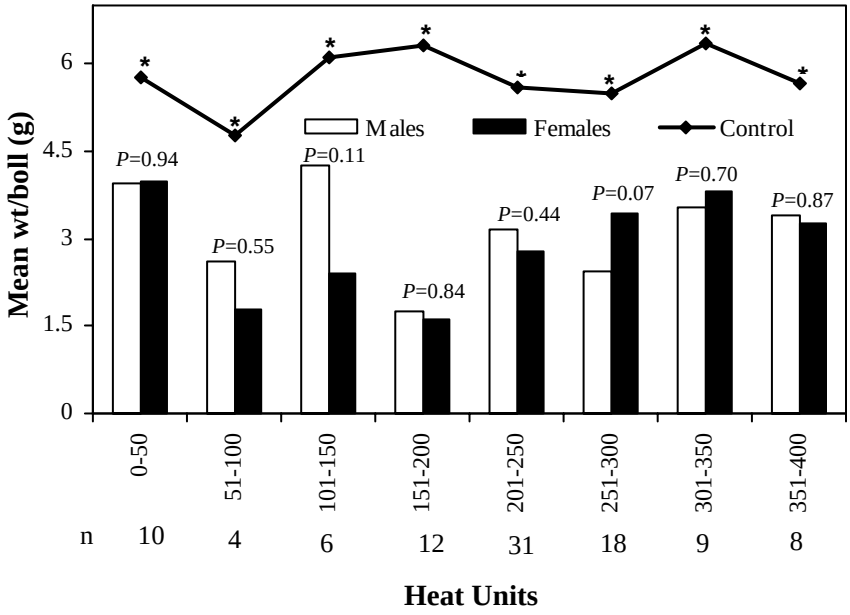

Figure 3. Seed cotton yields resulting from adult male and adult female Southern green stink bugs at various boll age classes (heat units). Asterisks indicate significant differences in yields (males and females) from the non-infested controls ($P<0.05$). n represents the sample size infested with the males/females at each age class.