EFFECT OF BOLL AGE ON STINK BUG FEEDING AND YIELD LOSS

J.K. Greene and C.D. Capps[1]

RESEARCH PROBLEM

Stink bugs will continue to be a part of the boll-feeding bug complex that injures cotton during mid -to-late season. Effective insecticides are still available for their control, along with adequate recommendations for when to initiate and continue treatment. Information concerning when to cease insecticide treatments for stink bugs in cotton is still limited and needs attention.

BACKGROUND INFORMATION

Stink bugs continue to be problem pests in cotton because of limited broad-spectrum insecticide use for traditional major pests. Widespread adoption of transgenic *Bt* cotton and impending use of second-generation *Bt* cultivars, enhanced in controlling worm pests, along with eradication of the boll weevil, *Anthonomus grandis* Boheman, and availability of selective, target-specific insecticides (primarily for control of worm [*Lepidoptera]* pests), have all brought about significant reductions in broad-spectrum foliar insecticide usage, and stink bugs have escaped coincidental control. The stink bug problem in cotton has received much attention in recent years and information concerning management of stink bugs in cotton is becoming more available (Greene et al., 1999; Greene et al., 2001a, b; Willrich et al., 2002, 2003; Greene and Capps, 2002, 2003).

Predominant phytophagous (plant-feeding) stink bugs in the Southeast and much of the Mid-South are similar and include the green stink bug (GSB), *Acrosternum hilare* (Say), the southern green stink bug.

RESEARCH DESCRIPTION

Adults and late instars of GSB were collected from soybeans with sweep net procedures and held until used in the experiments using procedures described previously. On 18 July 2003, insect cages (either 6 x 6 x 12 ft or 6 x 6 x 6 ft), constructed using 18 x 14 mesh screen and aluminum pipe frames, were placed over second-generation *Bt* cotton (*Gossypium hirsutum* L.) cultivar DP468 BIIRR

[1]Extension entomologist and pest management technical support specialist, respectively, Southeast Research Extension Center, Monticello.

(SGSB), *Nezara viridula* (L.), and the brown stink bug (BSB), *Euschistus servus* (Say). Several other species are part of the plant-feeding stink bug complex, but are of less importance. In 2003, we investigated the ability of GSB to injure bolls of varying ages in cage experiments designed to define the duration of susceptibility to bug injury, planted on 5 May near the Southeast Research and Extension Center in Monticello, Arkansas. On 24 July and 5 August, esfenvalerate (Asana XL 0.66EC at 0.05 lb ai/a), dicrotophos (Bidrin 8EC at 0.5 lb ai/a), and spinosad (Tracer 4 at 0.09 lb ai/a) were applied to caged plants, using a compressed-air backpack sprayer that delivered 10 gal/a at 50 psi, to kill arthropods present. White blooms on enclosed cotton were tagged with fluorescent flagging tape every 2 or 3 days (d) and dated. Small cages, designed to enclose a single boll, were constructed of 12 oz polystyrene foam cups, knee-high nylon hose, rubber bands, and wire ties (Greene et al., 1999). Bottoms of cups and toe-ends of nylon hose were removed, and cups were placed in the middle of the hose sleeves. The bottom end of a cup cage was placed over a boll to enclose it, and the sleeve was tied with a wire tie to the peduncle of the boll. An experiment was initiated by placing a single stink bug inside a cup with the boll, folding the other end of the sleeve over the top of the cup and securing it with a rubber band. Dead bugs were removed from cages and replaced daily.

The effect of boll age on stink bug feeding and yield loss was addressed by confining adults and late 5th instars of *A. hilare* singly with bolls aged 4, 8, 14, 18, 21, 27, and 32 days from white bloom using a completely randomized design. Paired bolls of corresponding age were caged without bugs as controls. After a 7-d exposure, bugs were removed from the cages. At maturity, cotton was manually harvested and weighed from each boll. Data were processed using SAS software, and means were separated using Least Significant Difference procedures following significant F tests using Analysis of Variance.

RESULTS AND DISCUSSION

As bolls aged, damage and yield loss decreased (Fig. 1). Significant yield loss did not occur with bolls aged 27 or 32 d from anthesis that had accumulated over 583 heat units (HU). In our earlier findings using a related species, the southern green stink bug, *Nezara viridula* (L.), results were almost identical where bolls aged 25 and 30 d that had accumulated 559 and 658 HU, respectively, did not incur yield loss (Greene et al., 2001a). In earlier tests with *N. viridula* (Greene and Herzog, 2000), bolls aged 21 d with over 405 HU accumulated did not suffer significant yield reduction. These results were similar to even earlier findings where bolls aged 18 d with over 380 HU did not display significant symptoms of feeding damage from SGSB (Greene et al., 1999). Results were obtained from cotton under field cages that provided ca. 18% shade to enclosed plants and with field-collected/laboratory-held stink bugs confined to single bolls for an entire week. Considering the effects of shading and extended length of exposure to bug injury, bolls are likely safe from significant yield loss due to stink bugs when they attain an age of 21-25 d from anthesis (ca. 3 wk old) and/or an

accumulation of 450-550 HU. Because bolls would likely increase in size and mature faster with full canopy exposure to solar radiation and because of the artificially intimate and intense exposure to stink bugs in the enclosures, this should be a conservative estimate. Because bolls become resistant to bug feeding and damage as they age, we should be better able to decide when to terminate insecticide use for stink bugs based on these results.

PRACTICAL APPLICATION

The ability of GSB to damage cotton bolls and reduce yield decreased as bolls aged, and yields from bolls that accumulated 583 HU at 27 d following anthesis were not significantly reduced. This estimate of a point at which cotton bolls are "safe" from significant yield loss due to stink bug injury is conservative. These results are similar to those found recently with BSB and SGSB and provide information concerning termination rules for insecticide applications late in the season for stink bugs.

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DISCLAIMER

The mention of trade names in this report is for informational purposes only and does not imply an endorsement by the University of Arkansas Cooperative Extension Service.

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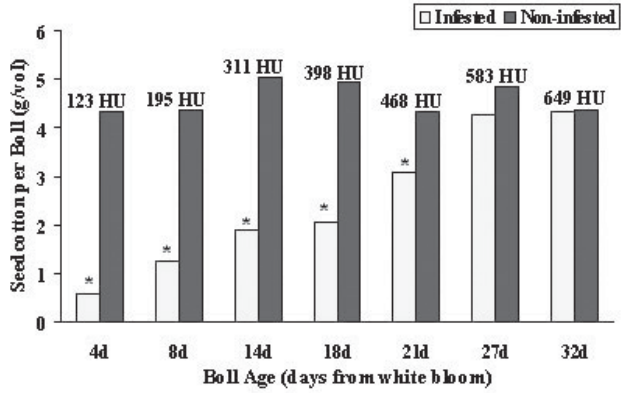

Fig. 1. Seedcotton yields following one week exposure of bolls of varying ages to adults and late 5th instars of green stink bug, *Acrosternum hilare* (Say), from DP468BIIRR cotton in 2003. *Significant difference P≤0.05. HU = heat units (calculated by averaging daily temperature °F- 60 for each day).