INTERRELATIONSHIPS AMONG STINK BUG MANAGEMENT, COTTON FIBER QUALITY AND BOLL ROT

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Abstract

Stink bug feeding and associated boll damage has become an important economic cotton production issue in the southeastern United States. Previous research showed that stink bug feeding directly resulted in increased lint staining, decreased lint yield, decreased gin turnout, and decreased lint value per unit area. Therefore, southeastern entomologists developed a new dynamic insecticide treatment threshold that weighs the potential for setting harvestable bolls during that week of bloom with observed damage in the field. However, estimated fiber losses attributed to stink bugs fluctuate widely across years. While differences in stink bug density are a factor in these losses, the incidence of internal boll rot pathogens transmitted by the insects is likely an overlooked factor. Here, we collected adult stink bugs in 2009 from Georgia corn and cotton fields and caged them on clean bolls growing in the greenhouse to access the incidence of pathogen transmission. Evidence from this study shows that stink bugs transmitted boll rot pathogens to clean bolls more than 50% of the time.

Introduction

Cotton growers, scouts, and consultants must classify the estimated level of stink bug damage in a given field relative to a treatment threshold. When the damage level reaches the threshold, insecticides are applied to preserve yield and prevent future losses in fiber quality (Greene et al. 2008). Although the incidence of boll rot pathogens was not evaluated as part of the threshold development process, thresholds were evaluated across a robust range of conditions that included multiple states, levels of stink bug pressure, environmental variation, and cultivar differences. Historically, the estimated number of cotton bales lost due to stink bug activity is highly variable relative to the production acres (Figure 1) (Williams 2009). One possible explanation for this disparity is that during years when a greater percentage of bales were lost to stink bugs, the insects may have acquired and transmitted boll rot pathogens.

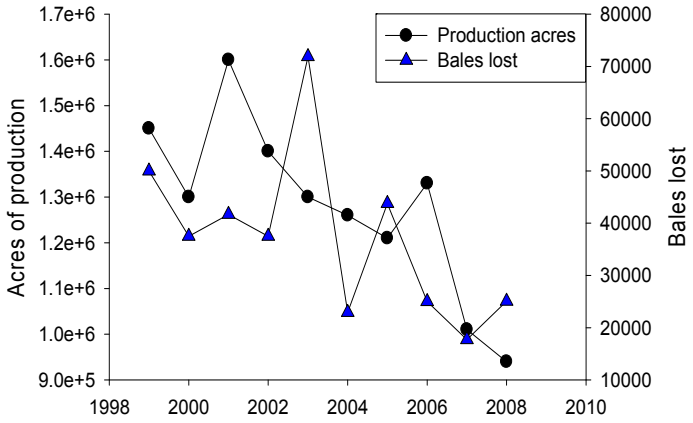

Figure. 1. Estimated stink bug damage and cotton production acreage in Georgia from 1999 through 2008.

A suite of stink bug species that include *Nezara viridula, Euschistus servus,* and *Acrosternum hilare* commonly infest cotton in the southeastern United States. These species damage developing cotton bolls by piercing the boll wall and feeding on the seed in immature bolls. Feeding symptoms include lint staining, fiber quality deterioration, yield loss, and decreases in gin out; each of these symptoms decreases the value of the commodity (Toews and Shurley 2009). Previous work showed that *N. viridula*, one of the most common stink bugs in Georgia, can acquire and transmit at least two boll rot pathogen species that have been isolated from diseased cotton bolls (Medrano et al. 2009a). The objective of this study was to examine the level of boll rot pathogens that may be present in field collected stink bugs from southern Georgia, an important cotton producing region in the southeastern US.

Methods

Adult stink bugs were collected in July (corn) and September (cotton). Fifty of the three stink bug species were targeted for collection. Insects from corn were collected using whole plant searches while a sweep net was used for collections in cotton. Immediately after collection, the insects were placed in sealed mailing tubes and delivered overnight to the USDA-ARS Southern Plains Agricultural Research Center (SPARC) located at College Station, TX. Following the methods of Medrano et al. (2009b), individual stink bugs were immediately caged for two days with green-house grown bolls at a maturity of 2 weeks post-anthesis. Dead stink bugs were discarded after the 2 day period. Surviving insects were surface sterilized, pulverized and then assayed for microbial flora. Two weeks after the caging period the bolls were excised from the plants, surface sterilized, and then examined for feeding damage on the inner carpel wall. Damaged lint and seed were then pulverized and assayed for the presence of known boll rot pathogens presumably transmitted by the caged, field collected stink bugs.

Results

A total of 34 *N. viridula*, 13 *E. servus*, and 23 *A. hilare* collected from corn survived the caging on bolls. Similarly, a total of 37 *N. viridula* and 36 *E. servus* collected from cotton survived the caging period. Technicians did not find any *A. hilare* on cotton. Pertaining to the bolls damaged by stink bugs originally collected on corn, putative boll rot pathogens were isolated in 70% of the *N. viridula* caged bolls, 78% of *E. servus* bolls, and 75% of *A. hilare* bolls based on seed and lint disease symptoms (Figure 2). Similarly, putative boll rot pathogens were isolated from 78% of seed and lint tissues of *N. viridula* caged bolls and 55% of seed and lint tissues of *E. servus* caged bolls with stink bugs originally collected from cotton (Figure 3).

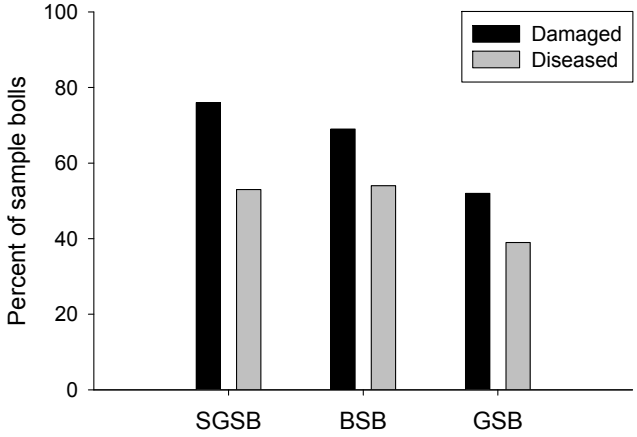

Figure 2. Percentage of damaged and diseased bolls resulting from caging stink bugs originally collected in corn. Labeling: SGSB (*N. viridula*, southern green stink bug), BSB (*E. servus*, brown stink bug), GSB (*A. hilare*, green stink bug).

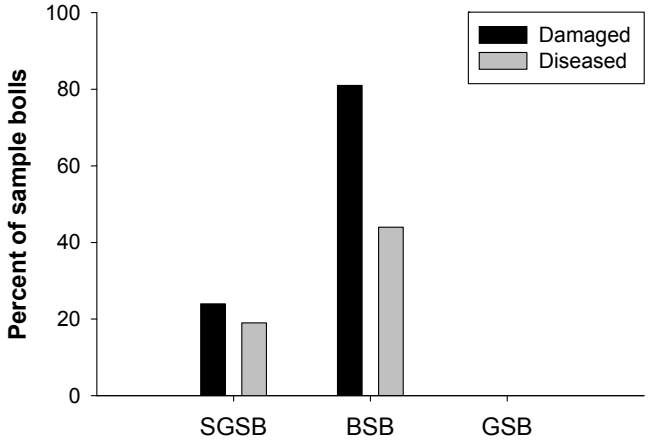

Figure 3. Percentage of damaged and diseased bolls resulting from caging stink bugs originally collected in cotton. Labeling: SGSB (*N. viridula*, southern green stink bug), BSB (*E. servus*, brown stink bug), GSB (*A. hilare*, green stink bug).

Discussion

Although limited in sample number and collection sites, these data show that boll rot pathogens were transmitted into cotton bolls by the majority of stink bugs collected in corn and cotton. There were few obvious differences among species in the rate of pathogen transmission. Potentially, years when the incidence of stink bug harboring boll rot pathogens is high could result in the need for lower stink bug treatment thresholds to preserve yield and fiber quality. Thus, future studies warranted to determine the incidence of these pathogens in stink bugs collected throughout the growing season, from multiple hosts/reservoirs, and across years.

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