MANAGING STINK BUGS IN COTTON: RESEARCH IN THE SOUTHEAST REGION

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Introduction

Beginning with the elimination of the boll weevil in the Southeast and accelerating with the introduction and widespread adoption of *Bt* cotton, insecticide use against bollworms and tobacco budworms has plummeted. As a result of this low spray environment, the pest status of green (*Acrosternum hilare*), southern green (*Nezara veridula*) and brown (*Euschistus servus*) stink bugs has increased markedly. This stink bug complex now constitutes the Southeast's most economically serious insect problem. From 2005-2007 Cotton Incorporated, through our state support committees, funded "Managing Stink Bugs in Cotton: Research in the Southeast Region" to investigate more efficient approaches to managing stink bugs in the Southeast. Selected aspects of this work and additional studies have continued through 2009.

Objectives

The major objectives of this research were:

- Investigate the impact of stink bug feeding on yield and fiber quality.
- Develop efficient detection methods for stink bugs or their damage.
- Develop practical treatment thresholds for stink bugs in cotton.
- Investigate spatial and temporal dynamics of stink bugs within farmscapes to determine predictable patterns of host utilization.

Methods

Species distribution: At 19 selected study sites, adult and immature stink bugs were collected via ground cloth and sweep sampling and identified to species.

Stink bug establishment: In 8 studies in North Carolina and Georgia, weekly samples of immature and adult stink bugs were collected weekly via ground cloth to assess the temporal establishment of stink bug moving into cotton fields.

Prominence of plant bugs in the Southeast: At 14 study sites in NC, SC and GA, the retention of upper squares was monitored weekly as an indirect indication of plant bug activity. In 16 study sites in NC, GA and SC, the number of "dirty blooms" was monitored during the first 5 weeks of bloom. Finally, at 16 study sites in NC and GA, immature and adult plant bugs were counted from ground cloths in 48 row feet during the first 5 weeks of bloom.

Impact of stink bug damage vs. fiber quality: Cotton samples from 43 replicated trials in AL, SC, NC and GA exposed to varying degrees of stink bug damage were taken to the UGA Microgin in Tifton, GA and analyzed for HVI fiber-quality analysis from 2005 to 2007.

Dynamic threshold development: Various degree of protection from stink bug damage were provided by creating plots that varied from essentially complete protection (weekly sprays with Bidrin 8E + Baythroid XL) to no protection (untreated) in 19 replicated "Progressive spray" tests in order to determine which week (s) of the bloom period were most susceptible to stink bug damage.

Threshold evaluations: A variety of damaged boll thresholds was evaluated in a series of 54 replicated tests from 2006 until 2009 in NC, SC and GA. Most tests included thresholds of 10%, 20%, 30%, a weekly spray, an untreated check and a "dynamic" in which the threshold changed by week of bloom: 50%, 30%, 10%, 10%, 10%, 30%, 30% and 50%.

Results

The major economic stink bug species found in VA and in NC is the green stink bug. In GA, and to a degree SC, the southern green stink bug predominates. All states experience the brown stink bug to varying degrees by year and location. Averaged over 8 trials, stink bugs became established in cotton fields gradually, with very few nymphs and adults present during the first 2 weeks of blooming.

Plant bugs are typically a very minor pest in the Southeast, as evidenced by 1) upper square retention often in the mid-90's four weeks into the bloom period, averaged over 14 tests, 2) dirty bloom levels in the 1% to 10% range in 16 replicated tests, and 3) plant bug levels averaging over 1 per row foot in only a single cotton field out of 16 averaged over the first 5 weeks of bloom.

By using the dynamic or the 20% threshold, no loss in fiber quality was observed, as opposed to the untreated check in which most cotton quality parameters were numerically or statistically adversely impacted.

The "progressive spray" tests strongly pointed to weeks 3-5 of the bloom period as being the most susceptible to stink bug damage, and provided the impetus for evaluating the dynamic threshold concept.

The dynamic threshold showed an economic advantage over the widely-used 20% internal damage threshold in low, low-moderate and high-moderate stink bug "pressure" situations averaged over 30 replicated tests (Table 2). Other thresholds are not shown due to their generally low economic returns.

New Developments

1. External Boll Damage - The counting of external lesions on quarter-sized bolls was well correlated with internal boll damage, and may provide a means of more rapid scouting for stink bug damage, resulting in either larger sample sizes or lowing the time needed to evaluate cotton fields. Additionally, a "hybrid threshold", utilizing external boll damage as a "triage approach" to quickly identify rule out or in if a threshold has been met, particularly early and late in the bloom period when thresholds are less likely to be met.

2. Landscape Considerations - Because densities of stink bugs are impacted by adjacent crops and wild hosts, and because their levels vary both temporarily and spatially within and around field perimeters, a knowledge of the impact of cropping patterns on the establishment and potential damage of stink bugs within cotton fields should result in better management decisions.

3. Field Decision Aid Template - A 2-sided field template showing the correct boll size for sampling and images of stink bug damage, recommended scouting procedures and listing the recommended thresholds by week of bloom is shown in Figs. 4.

Conclusions

- Stink bugs are far more of an economic pest of cotton than plant bugs in the Southeast.
- Although green stink bugs are more prevalent in VA and NC, southern green stink bugs more common in GA, and brown stink bug common to the region, management approaches for this complex were found to be similar.
- We found that the 3rd-5th week of bloom was the most susceptible period for economic injury from stink bugs.
- Insecticide applications based on using the dynamic threshold resulted in the highest net returns under various stink bug population levels.
- When poorly managed, stink bugs can reduce fiber quality. This is not the case when thresholds are followed.
- Assessments of external stink bug boll damage show promise as a means of either

  1) reducing the time spent scouting,
  2) increasing the sample size resulting in increased accuracy, or
  3) as a rapid indicator of whether further internal boll-damage assessments are indicated (a "hybrid" approach).

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