



STINK BUG ECOLOGY IN SOUTHEASTERN FARMSCAPES

Michael D. Toews

Department of Entomology

University of Georgia

Tifton GA

ABSTRACT

Phytophagous stink bugs comprise a complex of insect pests affecting row crop, vegetable, tree fruit, and tree nut production in the southeastern USA. Common stink bugs in this geographic area include the brown stink bug, green stink bug, southern green stink bug, and dusky stink bug. These species overwinter as adults and then feed on a large number of non-cultivated and cultivated plant hosts throughout the spring and early summer. By late July and August, stink bugs can be found feeding and reproducing in row crops like cotton and soybeans. This research project was designed to document where stink bugs were commonly found throughout the year and where they may be overwintering. A regular grid of sample locations (~500 feet apart) was overlaid on a contiguous 402-acre farmscape in southern Georgia comprised of cotton, grain sorghum, peanut, pecan, soybean, and watermelon. Sample locations were sampled weekly for stink bugs using a sweep net from mid June through early November. The study site included two pecans orchards, one regularly mowed and one not mowed until harvest time. Results show that stink bugs were commonly captured in field margins early in the year, in row crops like cotton and peanuts during the summer, and in late planted soybean and grain sorghum from mid September through mid October. Throughout the entire year, stink bugs were commonly captured in the pecan orchard that was not mowed.

INTRODUCTION

Studies of insect dispersal across the agricultural landscape are important for understanding the role of alternative host plants and estimating population density. Furthermore, understanding the temporal sequence of host utilization (both wild and agronomic) and movement triggers (ex. host plant phenology, insect maturity, or weather changes) will enable growers

to spatially and temporally develop and target more effective management strategies. Some species of stink bugs species appear to colonize different plants throughout the growing season. For example, the brown stink bug overwinters as an adult, develops a first generation in weeds such as mullein, and then develops a second generation in agronomic crops. Better knowledge of the exact sequence of host utilization at a given site may provide opportunities for pest management before the later generations increase to damaging levels and then move into late season crops. Anecdotal evidence from Georgia suggests that stink bugs colonize peanuts and then immigrate into adjacent cotton fields, followed by late maturing soybeans.

The average number of insecticide applications to Georgia cotton helps document the changing nature of modern agricultural production methods. Prior to the eradication of the boll weevil (started in 1987 in Georgia), insecticide applications on cotton averaged 12 to 14 sprays per year. In 1986, Georgia growers applied 7 applications for control of boll weevil and 7.3 applications for budworm/bollworm complex. Entomologists now believe that these frequent insecticide applications gave coincidental control of boll-feeding bugs such as leaf-footed bugs and stink bugs. Throughout the 1990's, cotton experienced a dramatic decline in insecticide use due to the impact of the Boll Weevil Eradication Program and widespread adoption of *Bt* cotton. The new *Bt* cotton varieties provide excellent control of many caterpillar pests. Currently, the number of insecticide applications averages less than three per year. In the absence of insecticide applications, emerging pests including stink bugs and numerous other sucking bugs have rapidly risen in economic importance. Crop losses to stink bugs in cotton alone rose from 10 million dollars in 1998 to nearly 60 million dollars in 2001.

There is a critical need to elucidate the biology of emerging insect pests, such as stink bugs and other potential sucking pests, to develop appropriate sampling and management schemes. Insect pest management has typically centered on the crop rather than the whole farm or farmscape. However, stink bugs utilize field margins, roadways, and alternative host crops during their lifecycle. Holistic pest management of these pests will require a broader perspective than just at the field level. For example, research in the Mississippi Delta has shown that early season reduction of broadleaf weeds in field margins prevented population increases during the early season of tarnished plant bugs. Roadside vegetative management could be accomplished through timely mowing, native reseeding, use of selective herbicides, or biological control. Admittedly, management at the farmscape level requires much greater knowledge of non-target insects and other animals, but could decrease chemical inputs and contribute to a more biologically balanced and stable ecosystem to the benefit of all agricultural producers.

METHODS

This research project was designed to document where stink bugs over-

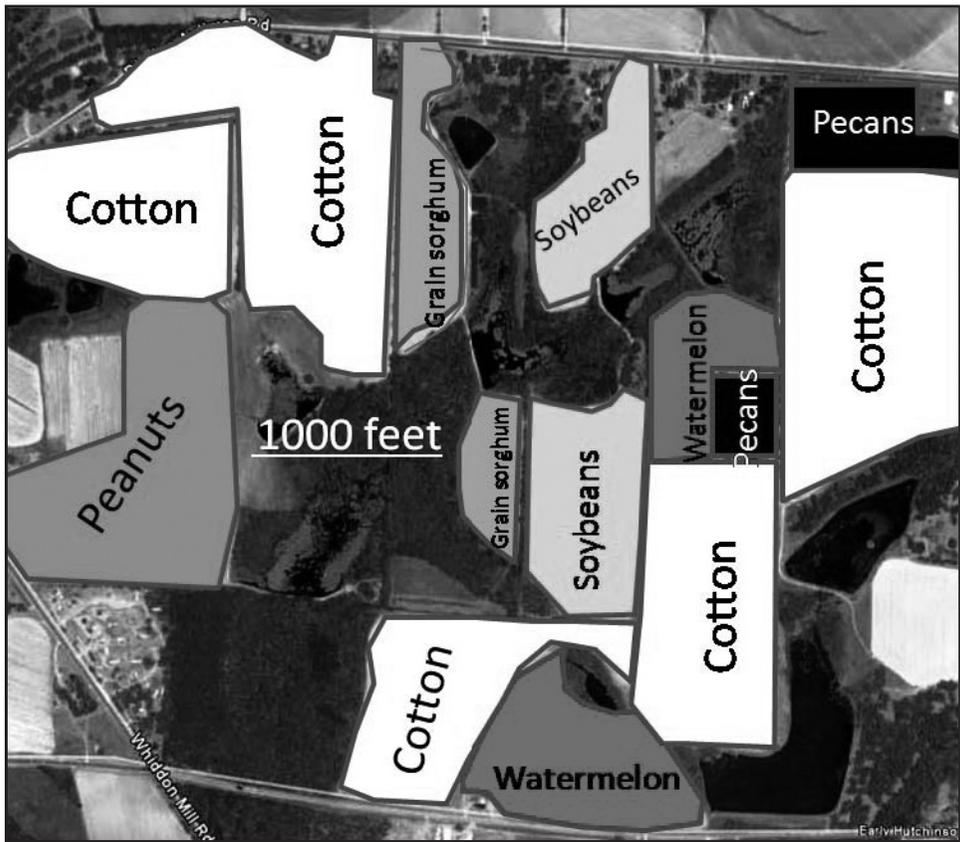


Fig. 1. Layout of agricultural fields in a 402-acre commercial farmscape monitored for stink bug activity during 2009.

wintered, developed, and fed during the entire year. The study was conducted in a contiguous 402-acre farmscape in southern Georgia comprised of cotton, peanut, pecan, watermelon, and late planted grain sorghum and soybean (Fig. 1). Stink bugs in the pecan orchards were sampled at the ground level only as opposed to sampling in the tree canopies. A regular grid of sample locations (~500 feet apart) was overlaid on the farmscape using a GPS enabled data logger. Sample locations were marked using bicycle flags so that technicians would sample the same general area. Starting in mid June, teams of four technicians walked the entire farmscape and took 50 sweeps with a 15-inch sweep net at each prescribed sampling location. Sampling lasted until no more stink bugs were captured in early November. Stink bugs captured during the project were stored in labeled vials and brought to the lab for identification and enumeration. Raw insect counts, summed across all species and life stages, were then plotted using ArcView GIS spatial mapping software.



Fig. 2. Number of stink bugs captured and location of captures on 29 June 2009. Increasing diameter of red dots indicate more stink bugs, white dots indicate no captures.

RESULTS AND DISCUSSION

Plots of stink bug captures by location suggest that stink bugs moved between agronomic hosts and field margins throughout the year. The overall maturity of the plant community appeared to be the dominant feature governing stink bug presence. For example, at the end of June the largest number of stink bugs was captured in unmowed field margins, watermelon fields, and in the pecan orchards (Fig. 2). Watermelon fields in this study were abandoned in late July and the unmowed pecan field harbored numerous mature grasses and weed species. Preflowering cotton and soybean fields harbored few stink bugs at this time; furthermore, the stink bugs that were captured in these crops were close to the field margin.

In mid July, stink bugs began to appear in the earliest planted cotton. These data also show that captures occurred in the middle of cotton fields as well as on the margins (Fig.3). Stink bug captures persisted for the duration of the summer in the unmowed pecan orchard, but were not observed for the rest of the summer in the regularly mowed pecan orchard. The first stink bug capture



Fig. 3. Number of stink bugs captured and location of captures on 12 July 2009. Increasing diameter of red dots indicate more stink bugs, white dots indicate no captures.

in the peanut field occurred on 20 July. Captures were generally not observed in the watermelon fields after August.

Stink bugs were commonly captured in the late planted grain sorghum and soybeans starting in late September. By October, nearly all captures across the entire farmscape were concentrated in these two crops and in field margins; in addition, there were stink bugs captured in the unmowed pecan orchard (Fig. 4). There were no captures in cotton or peanuts during this time. These data suggest that the bugs moved out of defoliated cotton in search of green plants that were still producing flowers and seeds.

Throughout the summer, there were always more stink bugs in the unmowed pecan orchard compared to the mowed orchard. However, we did not measure stink bug damage to the nuts so it is unclear whether this decrease in stink bug activity was correlated with a decrease in observed damage. One of the problems with stink bug management is that the adult insects are highly mobile. It is possible that even highly managed orchards could experience heavy stink bug damage if the orchard was surrounded by crops like cotton and soybeans. The role of each crop or weed in the development



Fig. 4. Number of stink bugs captured and location of captures on 2 October 2009. Increasing diameter of red dots indicate more stink bugs, white dots indicate no captures.

of stink bugs populations is currently unclear. In the future, we would like to develop mitigation strategies for each crop to help decrease the overall number of stink bugs at the end of the season.

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