

# Late-Season Stink Bug Management Impacts on Soybean Yield and Quality

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## Introduction

The stink bug complex, consisting mainly of southern green stink bugs *Nezara viridula* (Fig. 1A), green stink bugs *Acrosternum hilare* (Fig. 1B), and brown stink bugs *Euschistus servus* (Fig. 1C) are the primary soybean insect pests in Mississippi, reducing yields 3.5-6.0% and costing growers an estimated \$12.22 million in yield losses annually (A. Catchot, unpublished). In addition to direct losses, stink bug punctures provide an opening for pathogens, potentially increasing the losses associated with stink bugs. Insecticides are being increasingly applied to soybeans with 36% of acres being sprayed for stink bugs in 2005. Stink bugs cause the greatest direct damage from beginning pod (R3) to beginning seed (R5) (Yeargan, 1977). However, peak stink bug populations frequently occur during full seed (R6) and beginning maturity (R7) stages (McPherson, 1996). Therefore a common question by growers is when can they terminate management of stink bugs. The current action threshold for stink bugs in MS is 3 stink bugs per 25 sweeps from first bloom (R1) to mid pod fill (R5.5) and 9 stink bugs per 25 sweeps from mid pod fill (R5.5) to maturity (R8) (Catchot, 2006). However, few growers spray their crop after pods have begun to dry down (R7), regardless of stink bug density. In 2005, research was conducted to evaluate direct and indirect soybean losses from late infestations of stink bugs.

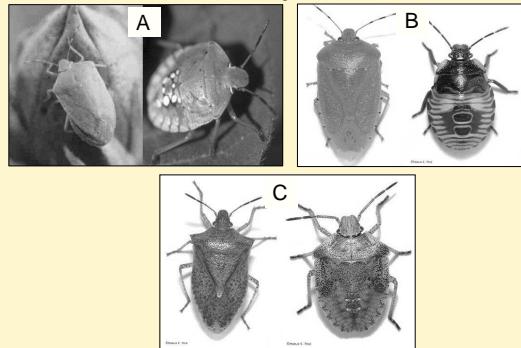


Fig. 1. Adults and nymphs of the primary stink bug species in MS. (A) Southern green stink bug, *Nezara viridula*; (B) Green stink bug, *Acrosternum hilare*; and (C) Brown stink bug, *Euschistus servus*.

## Materials and Methods

Soybeans were planted on 38" rows on May 5, 2005. When soybeans reached beginning maturity (R7), 12 field cages (20' x 20' x 6') were erected so that each cage covered 6 rows of soybeans (Fig. 2). Cages were infested with stink bugs, mainly southern green stink bug adults so that populations were ca. 5 times the current economic threshold (Fig. 3). One day after infestation, pesticide treatments were applied, using 4 treatments with 3 replications in a randomized complete block design. The treatments were:

- A. Insecticide alone: Karate ( $\lambda$ -cyhalothrin at 0.033 lb ai/ac)
- B. Fungicide alone: Quadris (azoxystrobin at 0.2 lb ai/ac)
- C. Both: Karate (0.033 lb ai/ac) + Quadris (0.2 lb ai/ac)
- D. Untreated control

After two weeks, stink bug populations were monitored (Fig. 3), cages were removed from the soybeans and all treatments were sprayed with an insecticide. When soybeans were dry enough to harvest, 2 rows from each plot were harvested and evaluated for quality. Two rows were also harvested 10 days and 24 days after the first harvest to evaluate the potential losses from pathogens. A sample from each harvest of each cage was evaluated for quality by a USDA grain inspection service.



Fig. 2. Field cage (20' x 20' x 6') used in this trial.

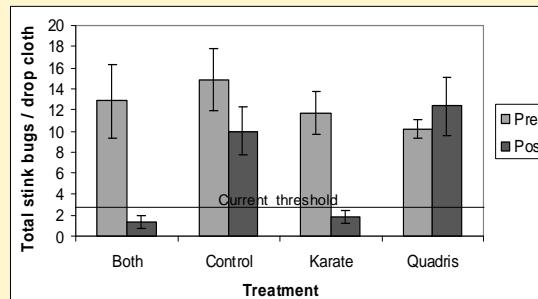


Fig. 3. Stink bug populations (adults and nymphs  $\pm$  SEM) before and 2-wk after treatment. Current threshold is 2.5 stink bugs per 2.5 ft drop cloth.

## Results

There was no rain during the harvest period, so there were no differences in yield or quality between harvest dates. Therefore averages from all harvest dates are presented. There were no significant differences in yield among treatments (Fig. 4). However, there were significant differences in soybean quality (Fig. 5). Stink bug damage was less in treatments receiving an insecticide treatment than in the other treatments ( $P=0.002$ ). Total damage, which includes stink bug damage plus other types of seed damage, was also reduced where insecticides were applied ( $P=0.013$ ). However, because only 1/4 of stink bug damaged kernels are counted in total damage (USDA, 2001), the differences between treatments were less.

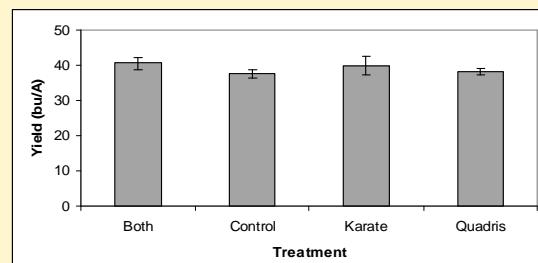


Fig. 4. Soybean yield ( $\pm$ SEM) as affected by treatments. There were no significant differences in yield ( $P=0.67$ ).

Sale price begins to be discounted when total damage exceeds 2%, so there was more economic loss from treatments not receiving insecticide. After including the cost of the insecticide, the insecticide treatment was still more profitable than not treating, while the treatments receiving fungicide were not profitable in 2005 when the weather was dry during harvest (Fig. 6).

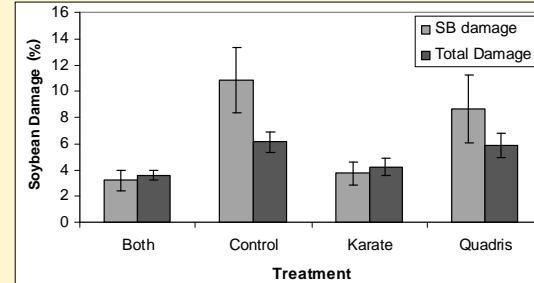


Fig. 5. Stink bug (SB) and total damage ( $\pm$  SEM) at harvest. One-fourth of stink bug damage is included in total damage as per standard inspection service protocol.

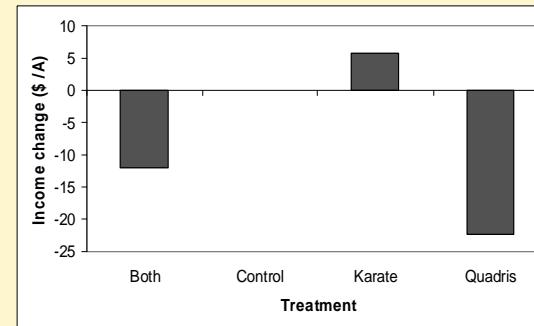


Fig. 6. Net economic impact of treatments compared to the untreated control based on \$5.75/bu for soybeans, a commercial discount schedule and treatment costs for a single application of Karate and/or Quadris.

## Discussion

From this trial it is apparent that economic damage can still occur during the early maturity period (R7) from direct damage of the insect on the seed. Due to a dry harvest period in 2005, secondary pathogens were not a problem, so timely harvest was not a serious management consideration. In a wetter year it is expected that direct stink bug damage would lead to increased indirect damage from opportunistic pathogens, resulting in a greater economic benefit from control and an impact of timely harvest on soybean quality. More research is planned to identify an economic threshold for stink bugs during this period based on both direct and indirect damage.

## References

- Catchot, A. 2006. Soybean Insect Management Guide. MSU Extension Service Pub. 883.
- McPherson, R. M. 1996. Relationship between soybean maturity group and the phenology and abundance of stink bugs (Heteroptera: Pentatomidae): Impact on yield and quality. J. Entomol. Sci. 31:199-208.
- USDA. 2001. U.S. Soybean Inspection. Grain Inspection, Packers and Stockyards Administration, Technical Services Division. <http://archive.gipsa.usda.gov/reference-library/brochures/soyinspec.pdf>
- Yeargan, K. V. 1977. Effects of green stink bug damage on yield and quality of soybeans. J. Econ. Entomol. 70:619-622.