MISSISSIPPI SOYBEAN PROMOTION BOARD
PROJECT NO. 17-2016 (YEAR 1)
2016 ANNUAL REPORT

Title: Kudzu Bug Management in Soybeans

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BACKGROUND AND OBJECTIVES

Kudzu bug, *Megacopta cribraria*, was first reported in the U.S. near Atlanta, GA during 2009, and has since become a major pest in Georgia and the Carolinas. It has spread from Louisiana to Delaware. It was first observed in Mississippi during 2012 and is now found throughout the state, often at high densities. Based on the rapid increase in density observed in Southeastern states, it is possible that kudzu bug will become an annual pest in Mississippi soybean.

The kudzu bug overwinters as an adult in protected cracks and crevices in homes, trees, and leaf litter. In spring adults migrate to host plants such as kudzu and wisteria to feed and oviposit. After one generation has passed, a second migration event happens, and this is typically when soybeans become infested in the Southeast. The kudzu bug reproduces prolifically in soybeans, building up large populations. They feed on the stems of the soybean plant, removing sugars from the plant. Yield losses from untreated plots have been as much as 47% and have averaged 18%. From these trials, a threshold of 1 nymph/sweep has been established. Following the second generation, the kudzu bug seeks out overwintering sites.

Mississippi growers often plant soybeans during April, which are in early vegetative stages during the spring migration of the kudzu bug. The yield risk from kudzu bugs feeding on soybeans at this time is unknown, so insecticides are being applied early in the season without research to justify these applications. Early season insecticide applications can have negative consequences on the overall system, so it is important to only apply insecticides when required. Another option may be the use of seed treatments for early-season management of this pest, but these have not been evaluated. Some soybeans are also planted during June. These late-planted soybeans may still be in vegetative stages when the second dispersal occurs. As with the early-seeded soybeans, we have minimal knowledge about the best management practices to address kudzu bug infestations in vegetative soybeans.

The threshold developed in the southeastern states for kudzu bug management during soybean reproductive growth also needs to be validated in Mississippi, since Mississippi typically grows higher yielding, earlier-maturing varieties than grown in the southeastern states.

Objectives

1. Develop action thresholds for kudzu bug during vegetative growth stages.
2. Evaluate existing action thresholds for kudzu bug during reproductive stages.
3. Evaluate seed treatment efficacy against early-season kudzu bug.
4. Evaluate foliar insecticide efficacy on kudzu bug.

REPORT OF PROGRESS

These data are from the first year of research and should be considered preliminary. Similar trials are planned for 2017.

Objective 1. Develop vegetative stage threshold

Methods. Maturity group 5 soybeans were planted at the MSU research farm during April using standard practices with 8 seeds/row ft. on 38-in.-wide rows. Kudzu bugs were collected from kudzu and placed in 6 ft x 6 ft cages covering two rows of soybeans to create an infestation by first generation adults.

Insect densities of 0, 1, 3, 5, and 10 insects/plant were infested at VC, V2, and V4 growth stages of soybeans. Due to unknown causes, the kudzu bugs did not survive in adequate numbers inside the cages so no data were collected. The trial was attempted again by planting soybeans in June. The same collection and infestation procedures were used as before. This time the infestations made during VC and V4 stages were successful with the majority of the insects surviving.

The V2 infestation again had high mortality shortly after being infested so no data were collected for the V2 infestation. Cages were kept on the plants for 21 days. Measurements consisting of plant height, leaf area index, and plant growth stage were recorded beginning one week after infestation. Measurements continued to be taken every two weeks throughout the growing season. Plants were harvested at maturity to evaluate which components of yield were impacted by the infestation.

Results. Within each growth stage, there were no differences in the plant growth measurements as impacted by kudzu bug density. In both the VC and V4 infestations, the number of insects that were infested had no impact on soybean yield (Fig. 1).

Objective 2. Evaluate reproductive-stage threshold

No data could be collected for this objective. Natural kudzu bug populations crashed at the time when this trial was to be implemented due to a Beauveria bassiana epizootic. By the time populations recovered so that sufficient kudzu bugs could be collected, soybeans were in late reproductive stages, so the trial was never implemented.

Objective 3. Evaluate seed treatment efficacy against early season kudzu bug

Methods. A trial with 2 planting dates was conducted at the Delta Research and Extension Center in Stoneville, MS to evaluate seed treatment efficacy against adult kudzu bugs. The first soybean planting was 30 June 2016 and the second was 15 July 2016. Each planting had three insecticide seed treatments (Gaucho, Poncho, Cruiser) along with non-treated soybean.

Seeds were planted in each plot at a density of 9 seed/row foot. One cage that covered 10 plants was erected in each plot and was infested with adult kudzu bugs at a rate of two bugs/plant (20 per cage). This infestation was done at 7, 15, and 21 days after soybean emergence. The insects were kept on the

plants for 48 hours. After this time, the cages were removed from the plants and kudzu bug mortality was recorded.

Results. There were no significant interactions between planting date, rating date, and/or seed treatment on insect mortality. Seed treatment was a significant factor on kudzu bug mortality when data were pooled across both planting dates and all rating dates (Fig. 2). While Cruiser seed treatment resulted in statistically higher mortality, average mortality was only 14% greater than the untreated check (48% vs. 34%), so based on these data, seed treatments are unlikely to be an effective early-season management tool for kudzu bug.

Objective 4. Evaluate foliar insecticide efficacy

Methods. Studies were conducted at the MSU research farm to determine efficacy of foliar insecticides using insecticides common to Mississippi soybean operations. There were 6 insecticide treatments along with an untreated check. Each plot was 30 ft. long by 4 rows wide, and trreatments were replicated 4 times.

The plots were sprayed with a Mudmaster sprayer with multiple 4-row spray booms. Compounds tested included organophosphates, pyrethroids, and a neonicotinoid. Bioassays were used to test the efficacy as well as the residual of the insecticides. Soybean petioles were removed from the plots at a specific time after insecticide application and placed in a 100-mm diameter x 15-mm petri dish along with two adult kudzu bugs. The petri dishes were sealed with parafilm to retain moisture and prevent escape. The bugs were left in the dishes to feed for 48 hours and then mortality was assessed. The assay was performed 1 hr and 1 day after spraying. Unfortunately, the wild adult kudzu bug population crashed at this time so we were unable to collect enough kudzu bugs to assay 3, 5, and 7 days after application.

Results. There was no significant difference in efficacy between 0 and 1 day; therefore, the means over both ratings are presented. All 6 insecticide treatments provided significant efficacy compared to the untreated control (Fig. 3). Belay at 4oz./acre, Brigade at 3.2 oz./acre, and Brigade at 6.4 oz./acre were the best treatments, and they were not significantly different from each other. Interestingly, there was no significant difference between the half rate of Brigade (3.2 oz/ac) compared to the full rate (6.4 oz/ac).

IMPACT AND BENEFITS TO MISSISSIPPI SOYBEAN PRODUCERS

Kudzu bug is expected to become established throughout Mississippi, but will likely become most important in regions near kudzu. The results of this research will impact all growers as it will give guidance on thresholds and effective management strategies for a new pest.

END PRODUCTS

Results from these studies will be used to develop insect management strategies for kudzu bug, resulting in more economical pest management practices. Results will be presented at grower meetings and at scientific meetings. Results will also be published as a graduate student thesis, scientific journal articles, and incorporated into the Insect Control Guide published by the MSU Extension Service.

Figures

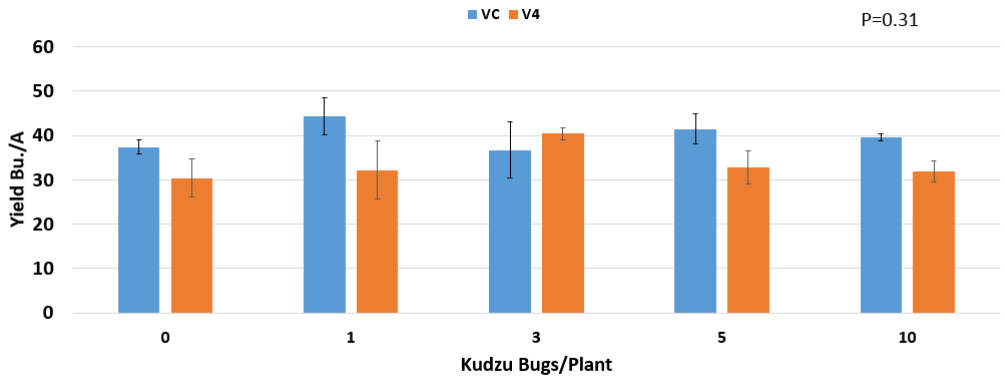

Figure 1. Yield (± SEM) of soybeans when infested with kudzu bugs for 3 weeks beginning at VC (blue bars) or V4 (orange bars) growth stages. Starkville, MS, 2016.

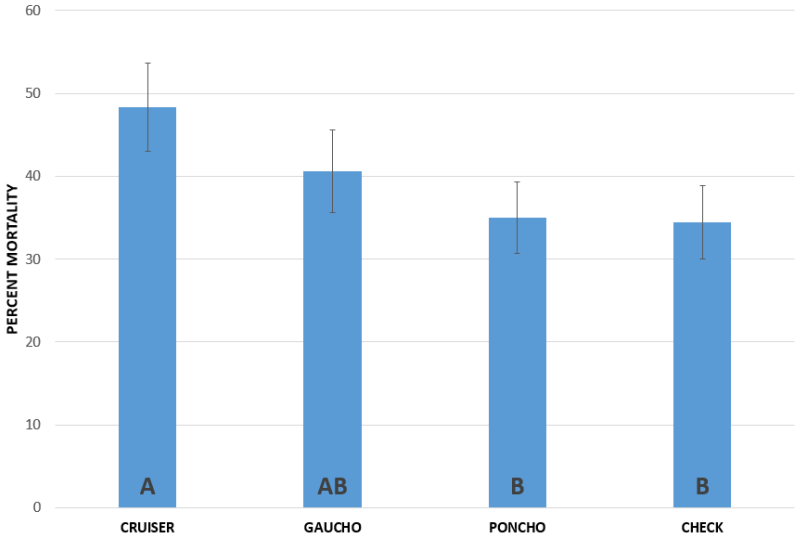

Figure 2. Average percent adult kudzu bug mortality (± SEM) as affected by seed treatments 7-21 days after soybean emergence. Treatments containing the same letter are not significantly different (Fishers Protected LSD, α=0.05).

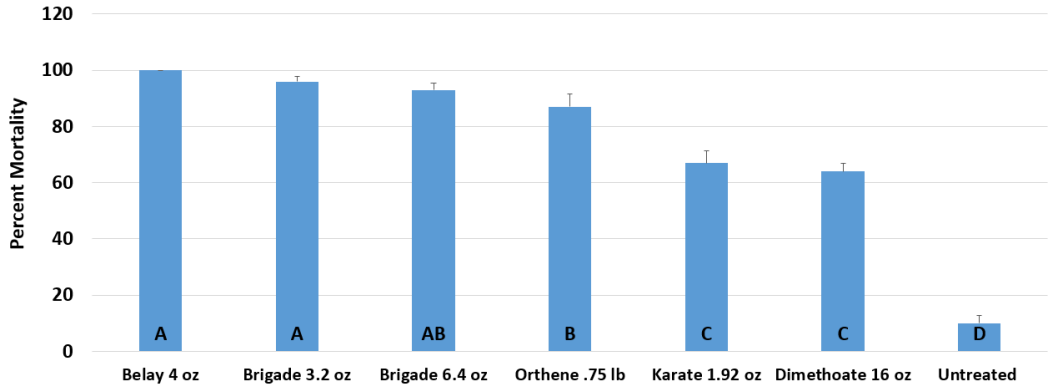

Figure 3. Average mortality of adult kudzu bugs (+SEM) when fed treated soybean petioles 1 to 24 hrs after insecticide application. Treatments containing the same letter are not significantly different (Fishers Protected LSD, α=0.05).