

MANAGEMENT OF REDBANDED STINK BUG IN SOYBEAN

Mary K. Huff

D.R. Cook

J. Gore

Mississippi State University

Stoneville, MS

A.L. Catchot

Mississippi State University

Mississippi State, MS

Abstract

Studies were performed to assess the management of redbanded stink bug in soybean. The current threshold recommendation is four bugs per 25 sweeps up to R7 and ≥ 10 per 25 sweeps during the R7 growth stage. Redbanded stink bug infestations have been sporadic over time in Mississippi and much of the management information is based on research conducted in Louisiana. Therefore, studies were conducted to evaluate/refine these strategies under Mississippi soybean production conditions. Threshold treatments ranging from weekly to 16 bugs per 25 sweeps were evaluated based on the number of redbanded stink bugs present, yield in bushels per acre, and percent damaged seeds. An additional test was conducted to determine an appropriate time to terminate redbanded stink bug management, these treatments ranged from weekly to various intervals during the mid- to late- pod filling stages (R5 to R8). Overall, weekly treatments resulted in the highest yield, lowest number of redbanded stink bugs present, and lowest percentage of damaged seeds. However, treating weekly for upwards of eight weeks is not economical. In general, the four bugs per 25 sweeps threshold at an interval of R5 to R7 produced results similar to that of the weekly treatments.

Introduction

Redbanded stink bug, *Piezodorus guildinii* (Westwood), is a non-native stink bug species that has been sporadically observed in the United States since the 1960s. In 2000, this insect was observed on Louisiana soybeans, with infestations reaching treatable levels by 2002 and has been an annual pest since. Infestations reaching treatable levels occurred in Mississippi during 2009, but were not observed in the following years. Following a relatively warm winter, large infestations that reached damaging levels occurred in central Mississippi during 2016. Following another relatively warm winter, treatment level infestations were observed not only in central Mississippi, but in the Mississippi Delta during 2017. This pest most often feeds on developing seeds by injecting a salivary secretion into the pod to form a slurry, which they then ingest. This feeding results in stained seeds, reduced seed size, and seed abortion or deformation (Vyavhare et al. 2015). The intensity of damage varies at different growth stages, during early seed development (R4-R5) feeding can result in flat pods, reduced seed weight, and ultimately delayed maturity and higher yield loss. Feeding during the later pod filling stages (R6-R8) often results in less damage, even though the population of insects is generally higher (Vyavhare et al. 2014, Vyavhare et al. 2015, Vyavhare et al. 2016).

Materials and Methods

Studies were conducted during 2017 in Mississippi to evaluate management strategies for redbanded stink bug in soybean. Treatments were arranged in a randomized complete block design with four replications, with a plot size of 8 rows (40 in centers x 40 ft.). The soybean variety Asgrow 4632, planted on 9 May (first study) and 28 Jun (second study), was used. Treatment thresholds in these studies included a non-treated control, a weekly automatic application treatment, and two, four, six, nine, twelve, and sixteen redbanded stink bugs per 25 sweeps. Redbanded stink bug infestations were observed early in the R5 growth stage. Plots were sampled approximately every seven days using a 15 in. diameter sweep net, when insecticide treatment was warranted (redbanded stink bugs densities reached or exceeded level for plots assigned to that treatment) the plots were sprayed with either bifenthrin, 6.4 oz./acre + acephate, 0.75 lb./acre or bifenthrin, 6.4 oz./acre + Belay, 5 oz./acre.

An additional study was conducted to evaluate the proper timing to terminate the management of redbanded stink bug. Treatments for this study were arranged in a randomized complete block design with a plot size of 8 rows (40 in centers x 40 ft.). The soybean variety Asgrow 54X6, planted on 15 June, was used in this study. Plots were monitored weekly using a 15 in. diameter sweep net, and the study was initiated when redbanded stink bugs were first observed,

which was during the early R5 growth stage. Treatments included an untreated control, an automatic weekly application, and managing redbanded stink bug from R5 through R6, R5 through R7, R5 through R8, R6 through R7, R6 through R8, and R7 through R8. Following initiation of the study, plots were sampled approximately every seven days. Insecticides (bifenthrin, 6.4 oz./acre + acephate 0.75, lb./acre or bifenthrin, 6.4 oz./acre + Belay, 5oz/acre) were applied weekly during the prescribed range of growth stages for each treatment, regardless of redbanded stink bug density.

All insecticide treatments were applied with a high clearance sprayer calibrated to deliver 10 GPA through Teejet TX6 hollow cone nozzles. For both studies, 5 plants were removed per plot at harvest, the total number of seed and number of stink bug damaged seed were determined and used to calculate percent seed damage. Both studies were machine harvested using a small plot combine. Data were subjected to ANOVA procedures, with means separated according to Fisher's Protected LSD.

Results

The current threshold of four bugs per 25 sweeps (with two treatment applications) resulted in a similar number of redbanded stink bugs across all sampling dates compared to the two bugs per 25 sweeps threshold and the weekly application treatment. Redbanded stink bug densities were relatively low and somewhat variable in this study and no significant differences among treatments were observed for yield or percent damaged seed. In the second study redbanded stink bug were also first observed during the early R5 growth stage. Similar number of redbanded stink bugs was observed across all sampling dates for the current threshold treatment (4 bugs per 25 sweeps), the weekly application treatment and the 2 bugs per 25 sweeps treatment (Figure 1). The weekly application treatment resulted in a significantly higher yield than all other treatments, but these plots received 8 insecticide applications. Yields for plots treated at the current threshold (4 bugs per 25 sweeps) were similar to yields for plots treated at 2 or 6 bugs per 25 sweeps. (Figure 2). However, plots treated at the 6 bugs per 25 sweeps threshold had significantly higher percentage of damaged seeds than those at the 2 or 4 bugs per 25 sweeps threshold. Plots treated at 2 and 4 bugs per 25 sweeps threshold had similar levels of stink bug damaged seeds (Figure 3). Additionally, plots that received weekly applications and those at the 2 or 4 bugs per 25 sweep threshold matured properly to the R7-R8 growth stage, while plots treated at 6 bugs or greater per 25 sweeps and the untreated control never matured properly.

Studies to evaluate the timing for terminating management of redbanded stink bugs were also conducted. Plots were monitored weekly and the study was initiated when redbanded stink bugs were first observed, which was in the early R5 growth stage. Managing redbanded stink bugs from the R5 through R7 growth stage resulted in a total number of stink bugs across sampling dates similar to that observed in the plots that received weekly applications (Figure 4). Management of redbanded stink bug during R5 through R7 or R5 through R8 resulted in similar yields compared to the weekly application treatment, however, the R5 through R8 interval required an additional insecticide application compared to the R5 through R7 treatment (Figure 5). Similar levels of damaged seeds were observed in the weekly, R5 through R6, R5 through R7, R5 through R8, and R6 through R7 treatments. However, the R5 through R6 and R6 through R7 treatments resulted in significantly lower yields than R5 through R7 (Figure 6).

Overall, managing redbanded stink bugs at a threshold of 4 bugs per 25 sweeps between the R5 and R7 growth stages is the most economic option without sacrificing a significant amount of yield in these studies. However, the impact of infestations occurring during earlier reproductive growth stages needs to be investigated. Samples to determine percent damaged seed were hand harvested and hand shelled, and are probably higher than would be observed with machine harvested samples. All results from this study are preliminary and additional studies are planned for 2018. However, redbanded stink bug is sensitive to cold weather and prolonged freezing, so weather conditions in early January 2018 may substantially reduce populations.

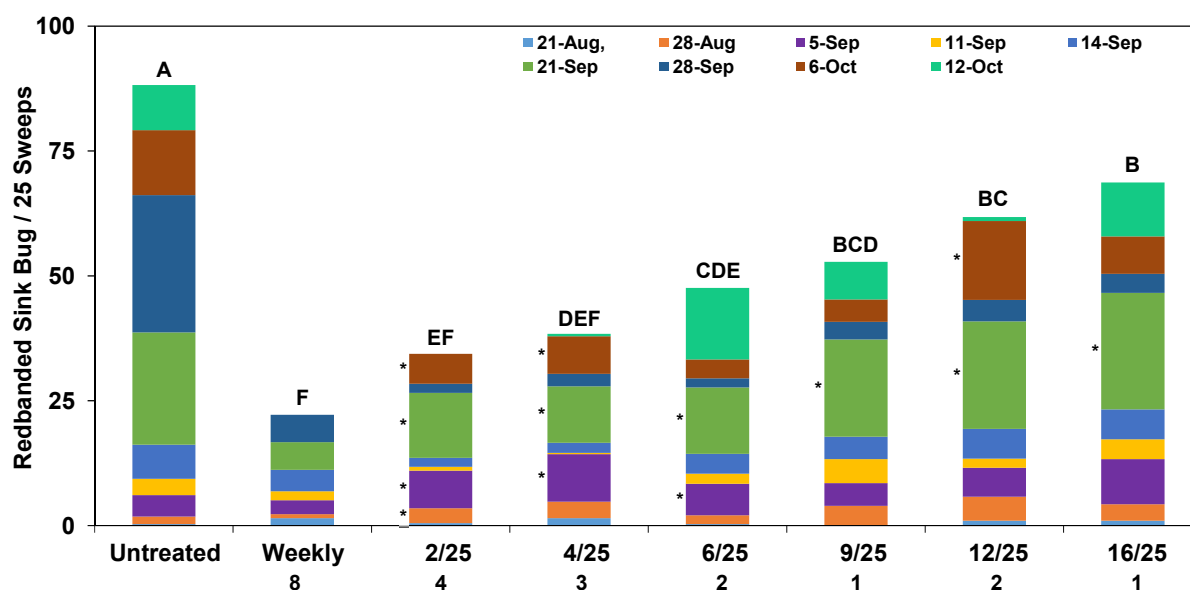


Figure 1. Evaluation of treatment thresholds for redbanded stink bug. The number below the treatments on the x axis indicates the number of insecticide applications for that treatment.

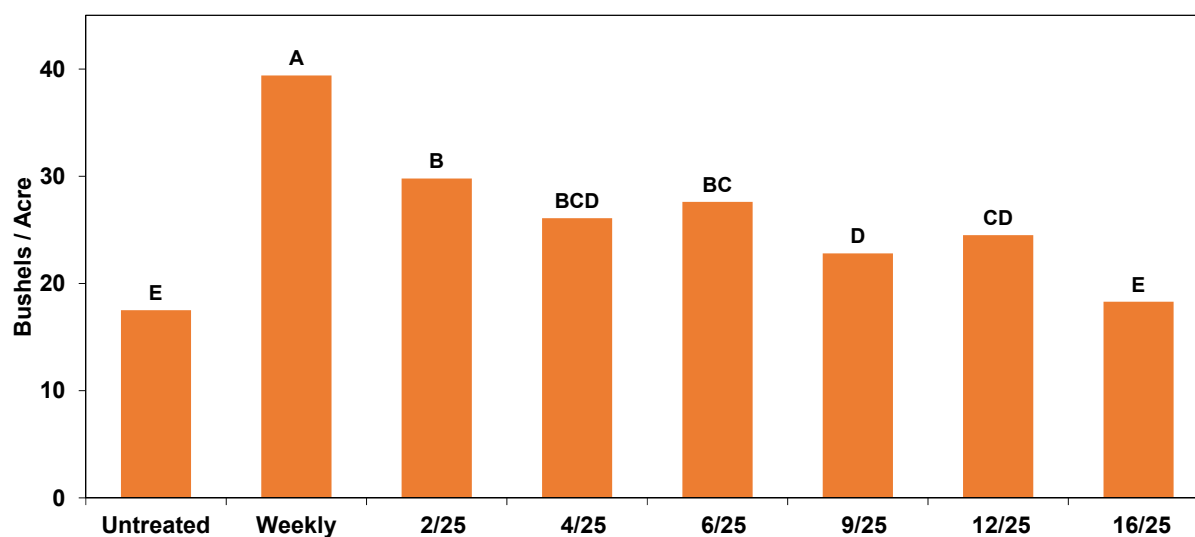


Figure 2. Impact of redbanded stink bug treatment threshold on soybean yield.

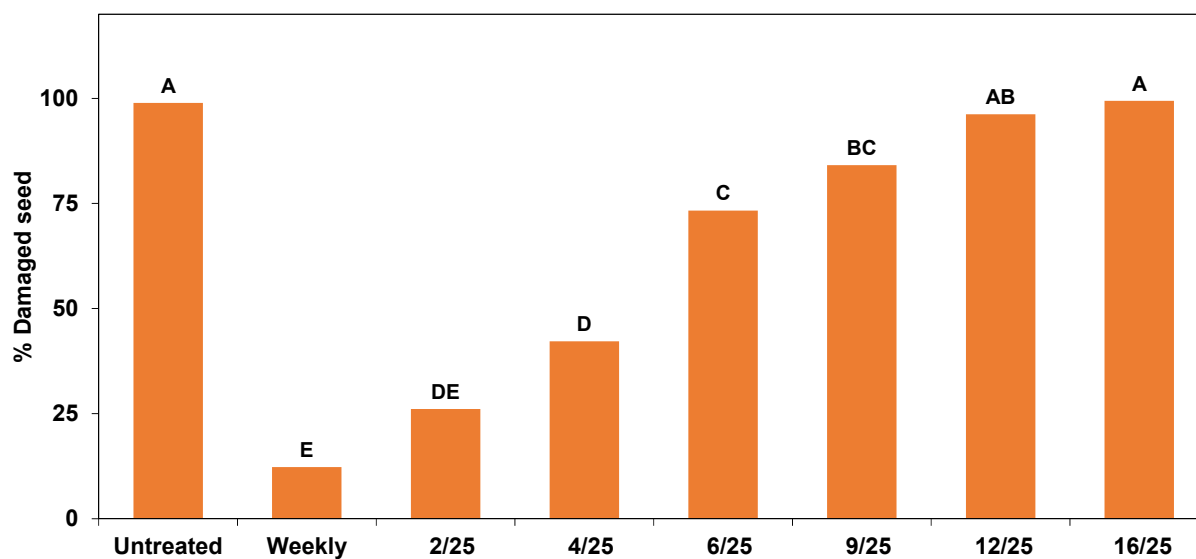


Figure 3. Impact of redbanded stink bug thresholds on percent stink bug damaged seed.

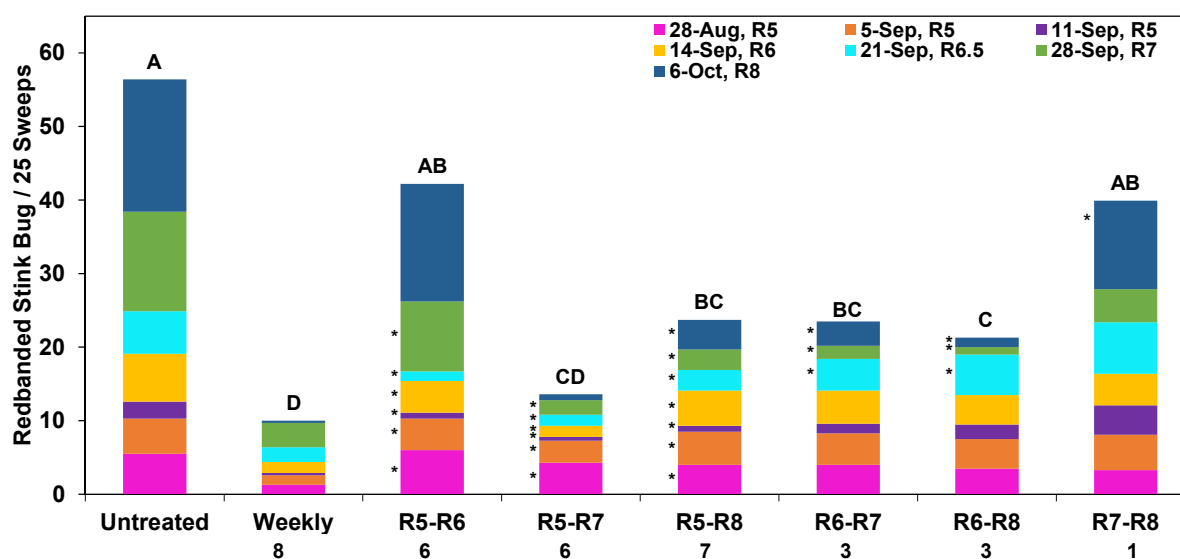


Figure 4. Evaluation of redbanded stink bug management initiation and termination timings. Growth stages following sampling dates in legend are for the weekly application treatment. The number below the treatment on the x axis indicates the number of insecticide applications for that treatment.

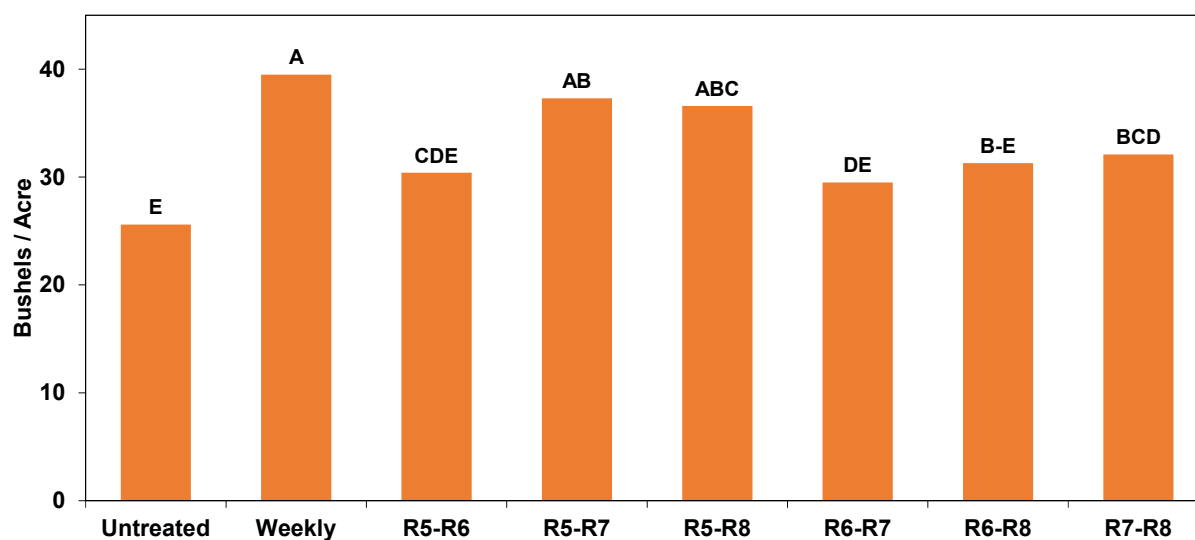


Figure 5. Impact of redbanded stink bug management initiation and termination timings on soybean yield.

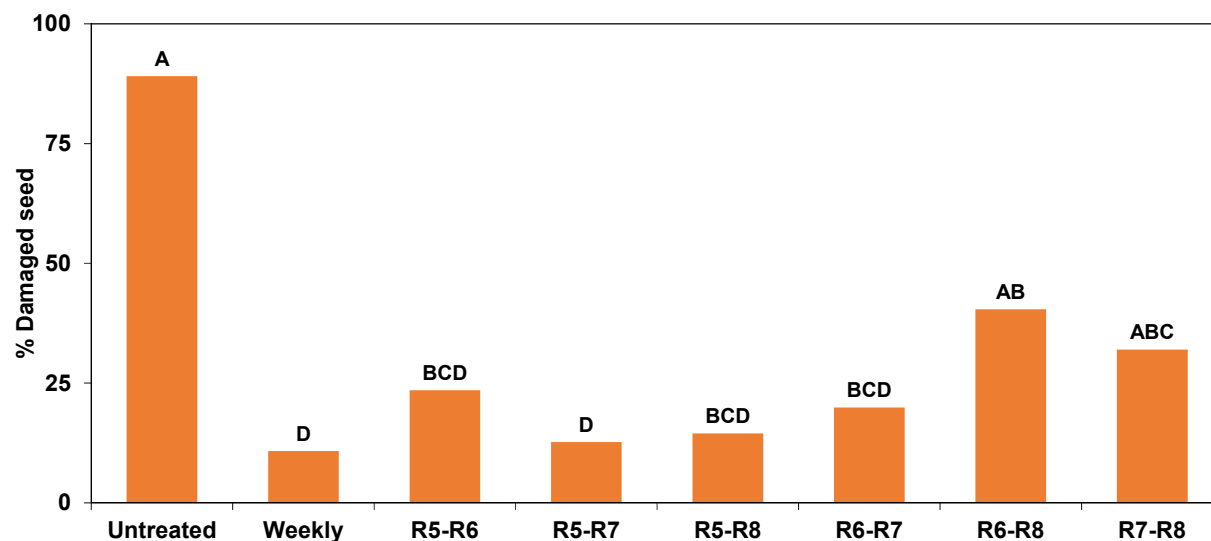


Figure 6. Impact of redbanded stink bug management initiation and termination timings on percent stink bug damaged seed.

Acknowledgements

The authors wish to thank the technicians and summer employees of the entomology program at the Delta Research and Extension Center for their assistance with these studies, and the Mississippi Soybean Promotion Board for financial support.

References

- Baur, M.E., D.R. Sosa-Gomez, J. Ottea, B.R. Leonard, I.C. Corso, J.J. Da Silva, J. Temple, and D.J. Boethel. 2010. Susceptibility to Insecticides Used for Control of *Piezodorus guildinii* (Heteroptera: Pentatomidae) in the United States and Brazil. J. Econ. Entomol. 103: 869-876.
- Temple, J.H., J.A. Davis, S. Micinski, J.T. Hardke, P. Price, and B.R. Leonard. 2013. Species Composition and Seasonal Abundance of Stink Bugs (Hemiptera: Pentatomidae) in Louisiana Soybean. Environ. Entomol. 42: 648-657.
- Vyavhare, S.S., M.O. Way, and R.F. Medina. 2014. Stink Bug Species Composition and Relative Abundance of the Redbanded Stink Bug (Hemiptera: Pentatomidae) in Soybean in the Upper Gulf Coast Texas. Environ. Entomol. 43: 1621-1627.
- Vyavhare, S.S., M.O. Way, and R.F. Medina. 2015. Determination of Growth Stage-Specific Response of Soybean to Redbanded Stink Bug (Hemiptera: Pentatomidae) and its Relationship to the Development of Flat Pods. J. Econ. Entomol. 108: 1770-1778.
- Vyavhare, S.S., M.O. Way, R.A. Pearson, and R.F. Medina. 2015. Redbanded Stink Bug (Hemiptera: Pentatomidae) Infestation and Occurrence of Delayed Maturity in Soybean. J. Econ. Entomol. 108: 1516-1525.