Maryland Soybean Board Final Report 2018

Title: Developing a management program for the *Dectes* stem borer (*Dectes texanus*) by finding and targeting its weak link

Principal Investigator: Alan Leslie
Co-Principal Investigators: Kelly Hamby
Emily Zobel
Veronica Johnson
Cerruti Hooks

Dectes stem borer (DSB; *Dectes texanus*) is a native species of long-horned beetle that can be a sporadic pest of soybeans. Damage to soybean plants is caused by the larvae, which feed internally on soybean stems. As the plant matures, the larvae girdle the stem at the base of the plant, which can cause lodging before soybeans are harvested. Recently, Maryland soybean producers have reported increased incidences of yield loss from lodging caused by DSB infestations. Management options for this pest are limited, as the eggs, larvae, and pupae are protected from insecticides by tunneling inside of the soybean plant. The main objective of our research was to learn more about the biology of DSB and quantify the damage caused by larval feeding to develop management options for soybean farmers and to estimate yield increases that would be possible under different management options.

The first objective of our research was to determine the amount of yield loss incurred from feeding by DSB larvae in the absence of soybean plant lodging. To do this, we sampled approximately 250 soybean plants from six different farms with varying levels of DSB infestation. For each plant, we measured total height, maximum stem diameter, and number of main branches of each plant, and then counted and weighed pods and seeds. We then split the stems of each plant to determine whether that plant contained a DSB larva. Analysis showed that, within a field, larger diameter soybean plants are more likely to be infested with DSB than smaller diameter plants. After correcting for differing plant size, our analysis determined that feeding by DSB larvae did not cause a significant reduction in yield of individual soybean plants. This result is contradictory to the previous year's data, which showed a 10% reduction in yield when plants were infested with DSB. Differences in findings from the two years are likely due to major differences in planting dates and growing conditions between the two field seasons. We did, however measure that plants infested with DSB produce seeds that are on average 5% lighter than seeds of un-infested plants within the same field (Fig. 1).

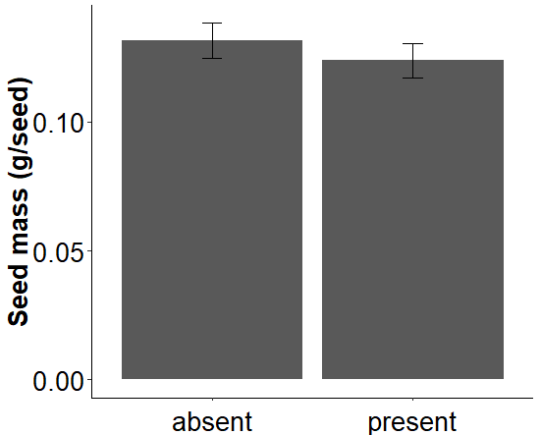

Figure 1 Mean mass of individual seeds of plants with and without DSB infestation

Our second objective was to determine periods of peak DSB adult emergence as a way to inform soybean farmers of the best time to best apply insecticides to control the adult beetles. To do this, we monitored adult populations weekly using visual and sweep net samples at eight field sites. In addition, we collected soybean stems from the previous year's soybean crop at 9 field sites in early March and placed them in the field to monitor emergence of adults through the season. From sweep net monitoring, we found that adults are detectable in soybean fields at relatively low numbers (~5 adults per 100 sweeps) over an extended period of time with no apparent synchrony in emergence (Fig. 2). In addition, monitoring infested stems from the previous season showed that adults appear to emerge from overwintering larvae and pupae over an extended period of time, which contributes to their prolonged presence in soybean fields. The earliest adult emergence from stubble was measured on June 27, and the final emergence on August 6. Field populations did begin to dwindle in early August, and very few adults were captured after the first week of August. We also collaborated with Dr. Jocelyn Millar at the University of California Riverside to determine whether chemicals produced by adult DSB function as a long-distance pheromone to attract mates, as they do in other species within this beetle family. We deployed Japanese beetle traps baited with either the putative pheromone or a solvent control, since we found in the previous year that DSB were rarely caught in traps that were not in contact with soybean plants. We found some support for the attractiveness of the pheromone compared to the control, however overall captures were low, with only 10 beetles captured. Other trap configurations may produce better results, as the Japanese beetle traps were prone to filling with water during repeated rain events.

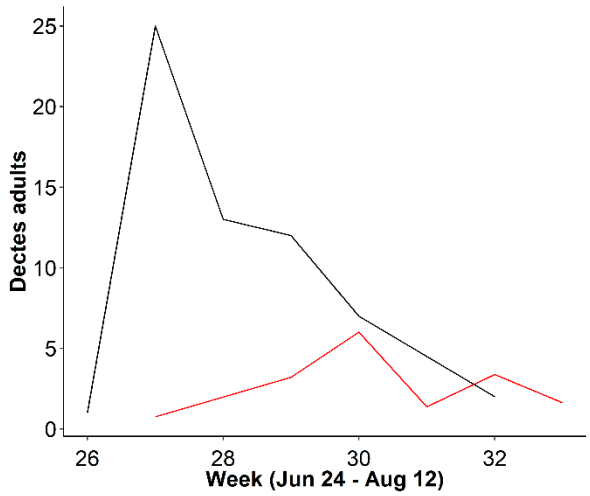

Figure 2 Adult abundances measured from emergence cage (black) and sweep net (red) samples

Studies of DSB in other states have found several parasitic wasp and fly species that will attack and kill DSB larvae. We carried out two studies to determine whether parasitoids could be a significant source of mortality among DSB larvae in soybeans. First, DSB larvae collected during the first objective were reared in the lab using an artificial diet, and were monitored for parasitoid emergence. Second, we carried out a field experiment to determine how different post-harvest practices in crop fields impact abundance and diversity of overwintering natural enemies. Older studies of DSB found that fall tillage could inflict significant mortality on overwintering DSB larvae. However, this tillage may also disrupt overwintering parasitoids and other natural enemies that could attack different stages of DSB. Results of the field experiment show fewer parasitic wasps emerge from fields that were chisel plowed the previous fall when compared to no-till and planting cover crops. However, we found no evidence of any mortality inflicted by parasitoids in the DSB larvae reared in the lab. Parasitic wasps and flies are not likely to inflict high levels of mortality on DSB, and are not likely to provide adequate biological control.