Maryland Soybean Board Final Report 2017

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

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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 larvae 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 five 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, feeding by DSB larvae causes a 10% reduction in yield of individual soybean plants, even in the absence of lodging.

 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 four of the five sites used to measure yield loss. These samples show that sweeping for adult beetles is a much more effective way to detect adult beetles than visual counts. We also found that adults are present in soybean fields over an extended period of time with no apparent synchrony in emergence. Adults appear to emerge from overwintering larvae and pupae over an extended period of time, which contributes to their prolonged presence in soybean fields. 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 adult DSB use a long-distance pheromone to attract mates. We tested generic long-horned beetle sex pheromones for activity in adult DSB, and found limited activity of generic compounds using a trap designed for tree-feeding long-horned beetles. The Millar lab was able to isolate two known beetle pheromones from an adult male DSB, and we plan to test these compounds using an updated trap design this summer. If effective, these pheromones may be a useful tool for timing insecticide treatments for this insect.

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.