Kansas Soybean Commission

4th Quarter & Final Progress Report

April 15, 2019

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Project Title: Development of Genetic, Chemical and Population-Based Tactics to Manage Key Kansas Soybean Insect Pests

Amount of Funding: $64,260

Progress Report: December 1, 2018 – February 28, 2019

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**Objective 1. Create soybean plants resistant to soybean stem borer by inserting borer RNA into soybean plants to interfere (RNAi) with genes necessary for borer survival.** Lina Aguirre, the PhD student conducting this sub-objective, determined that the borer-resistant plant introduction (PI)165673 slows larval development and reduces survival of first instar larvae. However, surviving larvae reach the final larval stage and the potential for them to girdle stems before harvest. Therefore, PI165673 resistance must be reinforced to further impair development of surviving larvae. A series of experiments in 2018 explored the feasibility of developing soybean plants expressing double-stranded RNA targeting genes in borer larvae to be silenced. Results indicated that several genes used in digestion are likely used by larvae to survive on soybean, as these genes are uniquely upregulated in larvae feeding on soybean pith compared to those fed sunflower or giant ragweed. Additional experiments are in progress using more replications and larger sample sizes to validate the results from preliminary gene silencing experiments.

**Objective 2. Improve insecticide efficacy by using host plant developmental stages and other environmental cues or conditions to adjust timing of application**. All soybean stems harvested in fall 2018 have been processed and evaluated by node (n = 15,097 total) to assess feeding damage within the canopy by soybean podworm, *Helicoverpa zea*. Treatments evaluated included the effect of row spacing, genotype, and seed density as well as carrier volumes on soybean podworm distribution within the soybean canopy. We are currently lining up fields for field studies for the 2019 field season; our plan is to identify cooperators from Sumner, Harvey, Clay, and Washington Counties. This winter, Stepehn Losey, current PhD candidate on the project, examined the effects of sugar source and mate availability on the potential fecundity and longevity of soybean podworm. To date, Stephen has completed several laboratory experiments that show a significant increase in fecundity (i.e., number of eggs deposited) when female moths were allowed to feed on sugar water versus just water. Statistically, there were no differences between types of sugar used. Additional experiments were conducted to determine how the timing of mating events affects the potential fecundity and longevity of female moths. Consequently, female that were given access to males for the first 4 days of the experiment led to a significant increase in number of eggs oviposited but a decrease in the lifespan of the female. This result was accomplished by adding a male on day four of the experiment for the life of the experiment, which was not statistically different from the control (female only). Following another block of laboratory experiments we plan to conduct field and greenhouse experiments to answer questions regarding soybean podworm feeding choices on soybean flowers and non-floral resources. Our goal is to understand factors affecting soybean podworm severity under field conditions and potential risks of managed and unmanaged resources.

**Objective 3. Expand web pages and other educational materials associated with soybean insect pests.** Co PI Whitworth presented up-to-date information relative to soybean pests at KSU/and County Extension Soybean Schools in 6 different locations around the state from February thru March. The 2019 KSU Soybean Insect Management Guides is now available to all stakeholders at: https://www.bookstore.ksre.ksu.edu/pubs/MF743.pdf.