Generating RNAi Pesticides to Specifically Target Invasive Species: A Case Study Examining Feasibility in the Red Fire Ant (Solenopsis invicta)

Borchert, Madeline (School: The Alabama School of Math and Science)

Fire ants cause billions of dollars of economic damage every year, and common control methods kill all insects in a given area, even advantageous ones. As my local community is highly effected by fire ant damage, I wanted to design a pesticide that could help address this issue. I hypothesized that there are sequences that can be targeted to generate a RNAi pesticide that will specifically kill fire ants but not any other organism. I began this by conducting a literature review to identify ~20 genes likely to prove lethal if knocked down by RNAi in adult ants then identified regions of these bearing low similarity to other species. In all, candidate sequences were identified in four distinct genes, and I designed RNAi molecules to target these. Fire ants and carpenter ants were collected, treated with distinct RNAi molecules, and survival recorded over the next seven days. I found that RNAi molecules targeting these essential genes were each independently capable of decreasing fire ant survival, but only one (a RNAi targeting the RPPO gene) did not affect closely related carpenter ant survival. In conclusion, my findings support my hypothesis that there are sequences that can be targeted to generate a RNAi pesticide that will specifically kill fire ants but no other organisms. Invasive species are a huge issue in our environment, and the control technique created in this project potentially represents a viable method for extermination of invasive insects without harming important native species.

Awards Won: