Can Ants Help Save the Bees? Developing a Better Model for Screening Pesticide Effects on Honeybee Social Behavior

Sappington, James (School: Mathematics and Science High School at Clover Hill High School)

This study investigated for the first time whether ants could serve as a model organism for rapidly screening chemical effects on key social behaviors of honeybees. Current tests of honeybee colonies cannot keep pace with the thousands of chemicals in commerce because they require acres of land, cost thousands of dollars, and take years to complete. I hypothesized that ants, which share similar traits with honeybees, could be dosed in the laboratory to predict potential effects on honeybees. In my study, I examined how dietary exposures to environmentally-relevant levels (0.05, 0.1 and 0.5 ppm) of a neonicotinoid insecticide (imidacloprid) affected foraging and nest building of ant colonies over 14 days. I developed a maze for measuring impacts on ant navigation and their ability to locate food. I quantified nest building with digital imaging analysis. Using a replicated design, I observed statistically-significant reductions in ant foraging success (50% or greater) at concentrations as low as 0.05 ppm compared to controls. Ants exposed to 0.05 ppm also took 3 times longer than controls to find food. Importantly, this is the same level of imidacloprid (0.05 ppm) shown to impact honeybee foraging and colony health, and the first reported effects on ants at this level. Although more confirmation is needed, my results suggest that ant colonies may indeed be useful for advancing honeybee environmental protection efforts through efficient screening of chemical effects on navigation and foraging, two behaviors which are critical to maintaining honeybee colony health and the pollination services they provide.

Awards Won:

Arizona State University: Arizona State University Intel ISEF Scholarship

Second Award of $2,000