Year 4: Evaluating the Efficacy of Novel Volatile Beer Blend and Coumaphos Acaricide for Small Hive Beetle Treatment Within Honey Bee Hives

Manaswi, Atreya (School: Orlando Science Schools)

Honeybees perform 80% of global crop pollination. Over 50% of commercial honeybee hives have died since 1947, with scientific literature identifying pests as a leading cause. Small hive beetles (SHBs) are a major virulent honeybee pest. However, coumaphos is the gold-standard and only EPA-approved in-hive chemical, being unaffordable and highly toxic (environment and organisms). The 1st year of SHB research investigated 7 inexpensive organic baits, with beer demonstrating the highest SHB attractiveness by tremendous margin. The 2nd year of SHB research fabricated a novel oil blend based on the volatile components of beer. Beer's volatile composition was discerned using gas chromatography-mass spectrum. SHB neurophysiological responses were also tested to candidate beer odors through electroantennography. Both lab and field trials demonstrated an oil blend as 5 times more effective and 2 times cheaper than beer. The current 3rd year of SHB research is a comparative trial between coumaphos and the oil blend. Field trials were conducted on 24 hives for 12 weeks and in-vitro olfactometry assays were run. Results indicate the oil blend (8 cents/hive) is as effective and 80 times cheaper than coumaphos ($6.40/hive). The blend will save the global industry $1 billion annually. After continuing to integrate this blend into a novel 3-D printed pre-filled trap with sensor-based beetle detection, beekeepers can use an iOS application to remotely monitor SHB trapping. The past three years of laboratory and field studies highlight this novel blend's potential to become a revolutionary, organic treatment while offering many health, environmental, and economic advantages.

Awards Won:
Third Award of $1,000
NC State College of Engineering: Scholarship to attend NC State Engineering Summer Camp