Final Report: Development of brood pheromone for enhanced pollination activity.

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Tanya Pankiw, Department of Entomology, Texas A&M University

Reducing the Cost of Brood Pheromone

We were using high-grade, expensive chemical components to formulate brood pheromone (BP) for research purposes. However it was recognized that a less expensive formulation was necessary for commercial use. We hypothesize that less costly, "technical-grade", components would be biologically active because this has been the case for other insect pheromones that are commercially available. The most significant problem associated with using "technical-grade" components was that the proportion of components was not the same as is was in our high-grade formulation. As a consequence we tested 4 different tech-grade formulations before finding one that was not statistically different from the high-grade formulation. This was a significant technical break-through because using tech-grade components reduces the cost of pheromone formulation by approximately 93%.

Four of the 10 brood pheromone components are unstable at room temperature. Phero Tech and my lab have shown that removing all 4 of the unstable components eliminates all bioactivity of the pheromone. Two of the 4 unstable components are the most expensive of the 10 components. It is possible that removing 2 of the most expensive components will not eliminate bioactivity. We tested this hypothesis and found that all 10 components are necessary to stimulate increased foraging activity.

Brood Pheromone Delivery Device

Our objective was to develop an inexpensive brood pheromone slow-delivery device that delivered a biologically active amount of brood pheromone to a colony for about 4 weeks. The majority of our research efforts were focused on testing various pheromone delivery devices. In our original submission we proposed to test 3 delivery devices. We finally tested 8 different delivery materials none of which performed sufficiently satisfactorily for further development. We strictly adhered to testing inexpensive slow-release materials, however it is apparent that it will be necessary to relax cost constraints and move toward somewhat more costly but far more efficacious slow-release delivery devices to test. Our success in reducing pheromone formulation costs by 93% makes it possible for us to relax cost constraints.

Future Direction

Thanks to support from the Almond Board of California for many years, mostly to Dr. Robert Page and one year to Tanya Pankiw, the development of brood pheromone has progressed to a point where the burden of further funding is more appropriate from agencies such as USDA Small Business Innovative Research (SBIR) and private sources. The long-term support and encouragement from the Almond Board of California is greatly appreciated.