Impacts of Insecticides and Fungicides Found in Migratory Honey Bee Colonies on Immune Function and Varroa Population Levels

Project Leader: James L. Frazier
Penn State University, 501 ASI Building, University Park, PA 16802
(814) 863-7345, jfrazier@psu.edu

PROJECT SUMMARY

Objectives:

The primary focus of this project is to determine if the pesticide loads typically found in pollen and wax of migratory colonies reduces their fitness based on a number of different criteria.

Background and Discussion:

Honey bees, especially those engaged in the pollination of various agricultural crops, are exposed to diverse numbers and levels of pesticides, especially fungicides throughout the year. Studies have found higher levels of virus and Nosema in association with bees exposed to pesticides. In addition we have unpublished data showing down-regulation of specific immune genes in adult bees fed selective combinations of fungicides and insecticides and also 3 years of field data from apples showing shortened adult longevity and atrophied hypo-pharyngeal glands in nurse bees reared on fungicide and insecticide treated pollen.

Our study will use verified combinations and levels of pesticides in pollen and wax found in migratory beekeeper colonies as the basis of controlled feeding studies. There will be 7 treatments: 1) control diet+clean wax, 2) control diet+control wax, 3) dimethoate diet+clean wax (positive control), 4) insecticide diet+clean wax, 5) insecticide diet+pesticide wax, 6) fungicide diet+clean wax, and 7) fungicide diet+pesticide wax. The insecticide diet mix is made up of 8 insecticide components at 388ppb total. The fungicide diet mix is made up of 2 fungicide components at 12,908ppb total. The pesticide wax mix is made up of 11 components at 19,593ppb. These mixtures and levels are typical of the pesticide profiles found in commercial migratory colonies that we have measured. All pesticides are formulated materials not just active ingredients, to account for the additive impacts of formulation ingredients.

We will measure the following: Queen egg laying rate (before and after treatment and during recovery); Larval development (following the queen egg laying rate); Varroa mite levels assessed by a sugar roll before, during and for successive generations after exposure; Colony assessments of the amount of capped and open brood, pollen, honey, nectar, and empty comb/foundation per frame; Weight of each colony; and number of frames of adult bees.

We will measure the following in adult bees that were reared as larvae on the pesticide diets and treated comb as well as control diets and comb: Adult bee longevity (caging newly emerged bees and tracking longevity); Hypo-pharyngeal gland volume in adult bees (microscopic measurement of acini diameter); DWV levels in adult bees (PCR); Nosema levels (spore counts before, during and after treatment); Immune genes (quantative PCR).

This field work will also provide information used for validating model parameters assessing honey bee biology and activity within the hive.

Project Cooperators: Wanyi Zhu, Maryann Frazier, Diana Cox-Foster, and Chris Mullin, Penn State University

For More Details, Visit

- Poster location **36**, Exhibit Hall A & B; or on the web (after January 2013) at AlmondBoard.com/AICposters
- Related Project: 12.POLL12.Hooven