

PROJECT TITLE: Interrupting Varroa mite life cycle through dietary supplements in adult and larval populations of the honey bee colony.

Project Number 02-GW-02

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Objectives: To develop a dietary supplement for honey bee colonies based on essential oils that when fed to the larvae will enter the hemolymph and slow or stop mite reproduction.

- 1) **Determining the upper threshold for the amount of modified essential oil that can be incorporated into a dietary supplement and not repel or damage the bees.**
- 2) **Tracking labeled essential oils through the colony and brood population to insure the oils are getting to the hemolymph.**
- 3) **Determining the optimum concentration of oil necessary to impact mite reproduction through controlled feeding trials.**
- 4) **Field testing diets on full size colonies.**

Objective 1: Determining the upper threshold for the amount of modified essential oil that can be incorporated into a dietary supplement and not repel or damage the bees.

One of the most effective ways to control Varroa mites is to disrupt their reproductive cycle. In the past we had been working with a slow-release essential oil product, but in the last six months we have been able to successfully emulsify the complex essential oils and have attained a quicker release rate over the encapsulated. With this new emulsified product, we have determined the upper threshold for the amount of modified essential oil that can be incorporated into a dietary supplement to be 0.25%. Oils included in this study were thymol, origanum, cinnamon, and clove.

Objective 2: Tracking labeled essential oils through the colony and brood population to insure the oils are getting to the hemolymph.

Using fluorescent labeling techniques we have been successful in tracking the oils from the nurse bees to the larvae, into the pupa and finally to the newly emerged adults. The hemolymph of the newly emerged bees fluoresced in the frequency corresponding with the die mixed into the oil and diet. We are currently working with Dr. Judith Hooper of Pima Research Co. to develop a technique to quantify the amount of oil incorporated into the honey bee hemolymph.

Objectives 3 and 4: Determine the optimum oil concentration to impact the mites and field test the products.

While the field trials are ongoing, early observations indicate that the optimum concentration for impacting the mites is between 0.125 and 0.25 percent active ingredient in the diet. In addition to the whole oils, we are testing derivatives and fractions of the essential oils for efficacy against the mites.