Development of Novel Methods of Controlling *Varroa* Mite Based on Isolating Attractants and Arrestants from Brood-Host Volatiles

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PROJECT SUMMARY

Objectives:

- Evaluate volatile substances—other than the attractant compounds known as CA and CB—that are emitted by brood hosts (bee larvae near capping) and function as potential semiochemical cues (that is, signaling chemical cues) for the brood-host-seeking Varroa mite and as potential synergists of CA and CB.
- Develop an in-hive attracticide trap for Varroa mite by employing identified attractants and arrestants isolated from brood-host volatiles.
- Develop techniques to effectively flood the hive with high concentrations of identified semiochemicals isolated from brood-host volatiles that will serve to disrupt the mite's cell-invasion behaviors.

Background and Discussion:

Around the world, the most destructive parasite of the honey bee is the aptly named Varroa mite (*Varroa destructor*), and the conventional way of controlling the bee parasite is to expose it to miticides.

In recent years, though, there has been rising concern among beekeepers, almond growers, and other food producers about both the spread of mite resistance to miticides and the effects of miticides on bees.

Consequently, researchers are taking various approaches to developing alternative methods of controlling the mite. One such approach centers on identifying the chemical compounds that prompt the female mite to leave its adult bee host and invade a brood cell containing a bee larva nearing capping.

Previous studies have identified a variety of such chemical cues. However, compounds which work as attractants in bioassays conducted with isolated mites do not have the same effect in the hive environment, where native material is present.

The further challenge for researchers is to ascertain whether the chemical cues obtained from a few isolated mites can be taken as representative of the full array of odors associated with unstressed host larvae.

This project is designed to explore those and related issues, and to develop a full understanding of the semiochemical mechanism, and thereby find ways to both disrupt cell invasion by the mite and to trap the female mite.

The goal of this project is arrive at a pesticide-free way of controlling the mite without compromising the honey bee using the above novel approaches.

We have begun to evaluate the movements of mites in response to other brood volatiles with an EthoVision behavioral analysis system.

One volatile specifically associated with non-host larvae, termed CC, acts as a repellent to Varroa mites at high concentrations.

The limited response of mites to lower concentrations of the three active volatiles indicates that these three compounds probably affect mite behavior toward larvae at contact or near-contact distances, if at all.

In Arizona, our 2011 spring and summer research was delayed by severe drought and hard freezes which reduced mite responsiveness to potential brood hosts.

We will continue to work on identification of mite signaling chemicals and develop volatiles as flooding agents and trap lures as fully responsive mites become available in fall 2011.

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- Poster location 44, Pollination Pavilion, Session **3**; or on the web (after January 2012) at AlmondBoard.com/AICposters
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