The University of Hawaii Honeybee Project

About Us

The University of Hawaii Honeybee Project was created in June 2008 to assist the Hawaii Department of Agriculture with the control of the newly arrived varroa mite. Since its establishment, the program has expanded its goals to include: 1-honeybee colony health and management 2-agricultural pollination needs and the development of pollinator "friendly" farms, and 3- education and outreach to beekeepers and growers.

Honeybee health is a major concern for our research team. The local bees had thrived in the islands for over a hundred years. Recently, however, two devastating pests have arrived to Hawaii: the varroa mite which is associated with the transmission of viral diseases and the decline of honeybee colonies on the mainland, and most recently, the Small Hive Beetle, an aggressive new invader that consumes bee brood and hive products. The combination of these two new pests and the spread of a microsporidan disease (*Nosema*) has suddenly changed the idyllic nature of beekeeping in Hawaii.

The UH Honeybee Project provides information to beekeepers and farmers about pest control, encourages newcomers to beekeeping, and provides advice to growers who require bees for their crops. Our goal is to teach beekeepers and growers how to keep bees using organic methods, find alternative farming practices that reduce pesticide input, and promote pollinator friendly agro-ecosystems.

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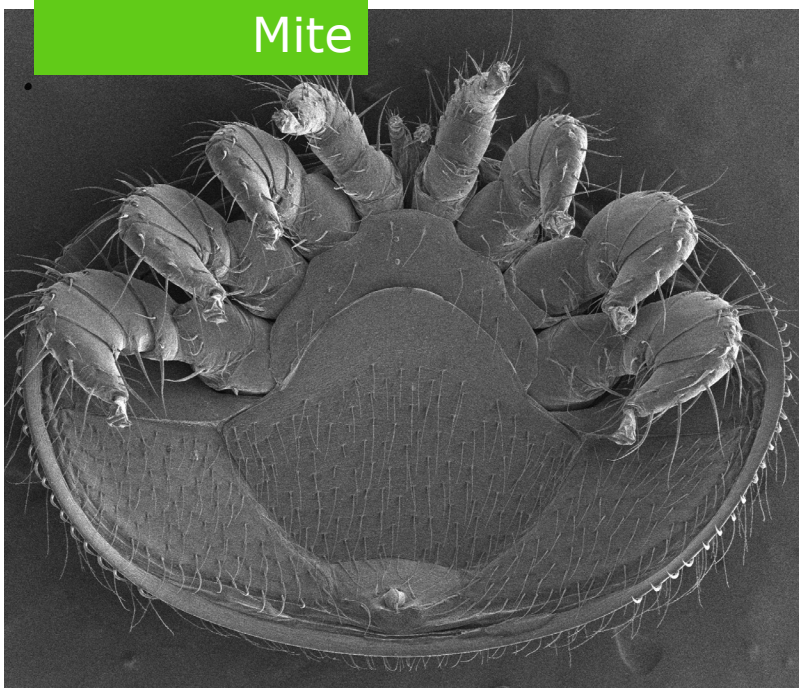
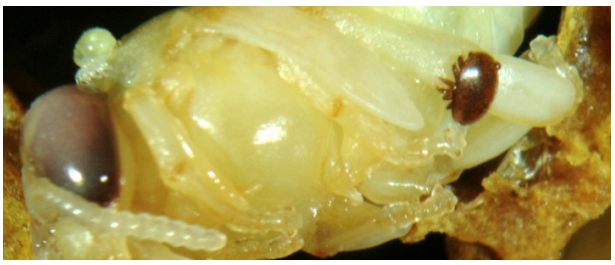
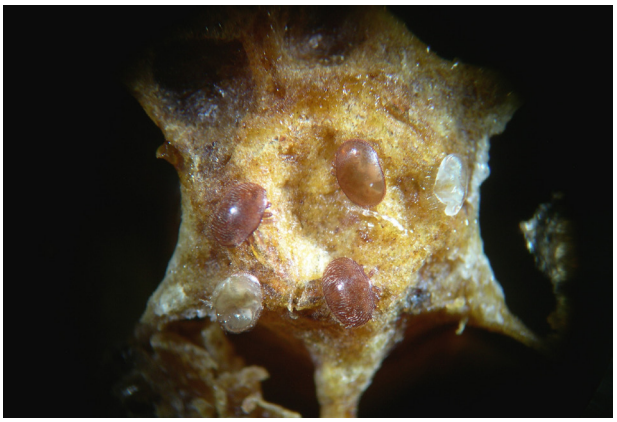
www.ctahr.hawaii.edu/wrightm/Honey_Bee_Home.html

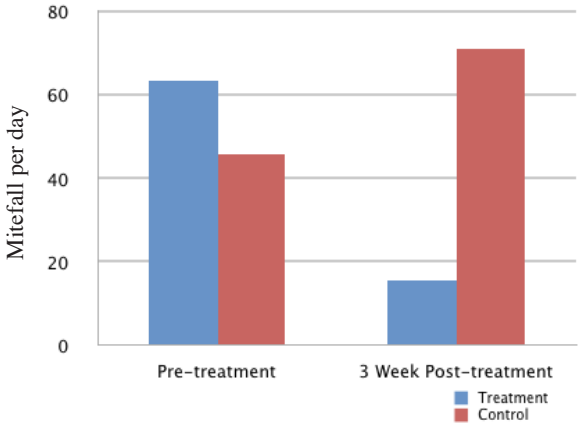
The Varroa Mite



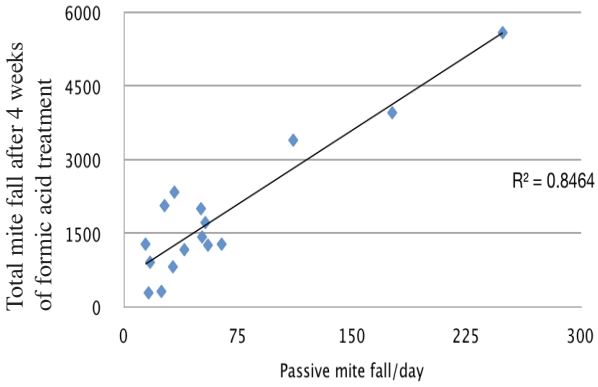




Mite levels before and after treatment with formic acid



Relationship between passive mite fall and colony infestation



Future Plans

We contineu to gather information on mite seasonality patterns which will help us determine the most effective schedule for formic acid treatments.

In April 2007 the beekeeping community of Hawaii received some very bad news; the varroa mite (*Varroa destructor*), a devastating parasite of the honeybee, was widespread on Oahu. A year later the mite invaded the Big Island of Hawaii. This February however, the research conducted by CTAHR's Honeybee Project helped bring good news to the local beekeepers and farmers: a new formic acid based miticide, Mite Away Quick Strip ™ (MAQS), has now been approved by the HDoA. The CTAHR bee team, led by Dr. Villalobos and Dr. Wright, worked in collaboration with local beekeepers, the manufacturer, and the HDoA to evaluate the efficacy of this new bio-pesticide and to assess the impact of the treatment on honeybee colony health.

Varroa destructor is an external parasitic mite that feeds on the haemolymph of pupae and adult bees and transmits pathogens such as deadly bee viruses. The field research conducted by the PEPS team (Ethel Villalobos, Mark Wright, Scott Nikaido, Tyler Ito, and Jane Tavares) provided data needed for a local needs registration of the MAQS, and thus made it possible for the beekeeping community to employ a treatment that provides effective mite control, does not leave chemical residues in the hive nor interferes with honey collection, and is designed to work well in the warm climates. Hoping to avoid the pesticide treadmill experienced in the mainland the UH Honeybee team and Hawai'i's beekeepers are now leading the way at a national level in the use of non-synthetic chemicals to control the destructive mite. The approval of MAQS will contribute to safeguard the health of Hawai'i's honeybee colonies and to the sustainability of food production in the islands.

In May 2010 the Small Hive Beetle (*Aethina tumida*) was reported on the Big Island and it is now widespread across the island. In Nov 2010 the beetle was found in farmland around the central part of Oahu and, at the time of writing, the beetle is not yet widespread. The Small Hive Beetle (SHB), is a honeybee pest indigenous to South Africa. Adult beetles are considered opportunist scavengers and seem to prefer weakened or "stressed" colonies to lay their eggs, however on occasion, the beetles can attack strong colonies, and cause their rapid collapse.

Small Hive Beetle

The life cycle is centered around honeybee colonies where the adult beetle lays her eggs. Female beetles seek crevices between hive components or unattended areas of the comb to lay groups of eggs (top left). These eggs will hatch within two days and the larva will consume honey, pollen, and brood for about 10-14 days. Feeding by the beetles results in the destruction of the immature bees, pollen, and the spoilage of honey (middle left). If the beetle infestation is high the colony may abscond or die. The mature beetle larvae crawl out of the hive to pupate in the ground. The warm climate of Hawaii, along with the relatively high soil humidity, provide the right environmental conditions to support large Small Hive Beetle populations. Pupation takes about 3 weeks and upon emergence the beetles are reddish in color but quickly turn a dark black shinny color. The adult beetle can be distinguished by its clubbed antennae and short wing covers that leave the abdomen exposed (bottom left)

Control methods for the SHB fall into two broad categories: pesticides or beetle traps. Synthetic chemicals, specifically coumaphos, can be introduced in the hive to kill the beetle, and pesticides can be used to treat the soil near the hive to kill the beetle larvae. Pesticides however, can cause damage to bees even at sub-lethal levels , and it is also possible that beetles may develop resistance to a chemical control, especially if treatments need to be applied year round. Oil based beetle traps provide an alternative to synthetic chemical use, but some hives require physical modifications to hold the traps, servicing the traps requires more labor, and the application can be messy.

Future Plans

The UH Honeybee Project is currently working in collaboration with the USDA bee lab in Baton Rouge, to determine the role played by local fruits as alternative hosts for the beetle. We are also interested in determining how soil characteristics may affect pupation success, and may relate to local beetle density. Finally, we are interested in investigating the efficacy of oil beetle traps as a control method in Hawaii. Beekeepers in temperate regions find that beetle populations are severely reduced by the cold weather, but local beekeepers are apparently facing high infestation levels without this seasonal relief.

Outreach and Extension

Honeybees pollinate many tropical fruits and nuts and are key to the production of vegetable crops. Therefore honeybees constitute a natural link between beekeepers, growers, and the public. Our team is working to raise awareness about bee health and sustainability among producers and consumers

The UH team is aware of the widespread impact of pollinator decline and is working with beekeepers and honeybee queen breeders, as well as growers of bee dependent crops to safeguard the health of Hawaii's honeybee colonies and the sustainability of food production. We offer training workshops on Varroa management and teach growers how to keep bees on their farms. We have received funds from EPA to conduct a pesticide reduction project with cucurbit farmers. Cucurbit crops, which are dependent on bees for pollination, are also very susceptible to insect pests and thus are often sprayed with pesticides by growers. This kind of outreach/research project provides an opportunity for local research transfer and helps promote healthier agro-ecosystems.

Current work:

- Development of an IPM strategy for Varroa and the Small Hive Beetle.
- Collaborating with Sheffield University, UK in viral studies and the role of varroa in viral transmission.
- Documenting the seasonality of varroa levels in tropical conditions.
- Conducting research on the effectiveness of biomechanical methods of varroa control.
- Collaborating with the USDA bee lab in Baton Rouge, LA. in preliminary studies on the reproductive success in tropical fruits and pupation success on lava rocks.
- Conducting research on the impact of honeybee pollination on macadamia and coffee production.
- Collaborating with public schools to develop a bee/ pollinator curriculum.