Creating a Buzz for Disease-Resistant Bees

Stu Jacobson, Rochester, Illinois

Northern Production of Disease and Mite Resistant Queen Honeybees

Coordinator: Stu Jacobson

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Stu Jacobson and fellow beekeeper Steven Staley raised and marketed a line of honeybee queens that are resistant to the most problematic parasitizing mites, the Varroa destructor and Trachial mites.

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Beekeeper Stu Jacobson compares it to having a family of roaches living in your lungs. That is what it is like for a honeybee when it is parasitized with Tracheal mites, one of a pair of mites plaguing Midwest beekeepers. The other problematic mite, Varroa destructor, parasitizes developing bee pupae and feeds on hemolymph (insect blood) of both the pupae and adults.

"Varroa mites are like little vampires," says Jacobson, who is also a retired researcher for the University of Illinois at Springfield.

Thanks to a SARE grant, Jacobson has been raising and marketing a line of mite- and disease-resistant honeybee queens—a safer alternative to battling the mites with hazardous chemicals.

Colonies of honeybees stay warm in the winter by beating their wings rapidly and clustering together, Jacobson says. But when a bee is parasitized with Tracheal mites, the mites take up residence in its breathing tube and also feed on the bee's blood. As the mites do damage, it becomes harder for the honeybee to beat its wings at a rapid rate. And when a considerable number of bees suffer from these parasitic mites, it is very difficult for the cluster to stay warm, especially in the cluster's core, where the rearing of offspring takes place.

Varroa mites, meanwhile, can spread viruses such as Deformed Wing Virus when they feed on honeybee blood and have been shown to spread the virus associated with Colony Collapse Disorder. In addition, Jacobson explains, the adult bees that survive being parasitized as pupae emerge weakened and often unable to fly, making them nearly worthless to the survival of the colony. Eventually, the colony will die due to the inability of its small population to store sufficient honey or keep warm enough during winter.

Honeybees are tropical insects, but they are able to adapt to more temperate climates by residing in cavities in trees and by keeping the core temperature of their cluster at 90 to 93 F while raising offspring, a process that inconveniently begins in late January.

"It could be 20 below outside, but the interior of the cluster, where the offspring is being raised, requires 90-degree temperatures," says Jacobson, who gives talks around the Midwest on the subject.

The Tracheal mites showed up in the United States about 15 years ago, soon followed about five years later by the Varroa destructors. Scientists do not know how the mites arrived in the United States, he says, although one possibility is that they came in along with the Africanized bees from Mexico. Regardless of how they got here, they spread like wildfire.

Initially, scientists developed hard chemicals to combat them, such as fluvalinate and coumaphos, but they had negative effects on honeybee reproduction. Even the "soft," or naturally occurring chemicals, such as thymol and menthol, are stressful on the bees, he says. What's more, the mites can build a resistance to the chemicals.

Jacobson worked with fellow beekeeper Steven Staley to produce queens from the Minnesota hygienic line. The Minnesota hygienic is an Italian bee that "has a noticeable capability to remove pupae that are parasitized by mites, as well as those with serious diseases like American Foulbrood," Jacobson says.

He also says "you can go a long way to reducing chemical usage" if you combine Minnesota hygienic bees, or other resistant lines, with additional strategies, such as placing a screen on the bottom of the hive instead of a solid board.

To raise the queens, Staley transfers very young female larvae from selected breeder colonies and places them in artificial queen cells. Next, he puts 40 of these cells into a very large colony lacking a queen, so the workers will develop the larvae into queens. When a queen is almost ready to hatch, he shifts her cell to a small colony that needs a queen. A few days after the queen hatches, she goes out on mating flights.

The second part of their project was marketing the queens. Jacobson and Staley had fair success in 2007, although they got a late start and produced only 75 to 80 queens. Their earliest queens did not come out until mid to late June and they primarily sold them to local beekeepers. Jacobson believes they will have more success if they shoot for mid to late May.

According to Jacobson, there is a major need to promote and explain the advantage of disease-resistant lines to beekeepers across the country. What makes promotion difficult is that when most local beekeepers need new honeybee queens, they're usually just looking for a "warm body" to keep the colony from collapsing. Disease resistance isn't at the forefront of their minds.

"That's why I'm beating the disease-resistant drum," he says.

By Jason Peterson