

Hives ferment a yeasty brew, attract beetle pest

May 16 2007

The honeybee's alarm signal may not only bring help, but also attract the small hive beetle. Now, an international team of researchers has found that small hive beetles can detect some alarm pheromones at levels below that detected by honeybees.

The beetles associate the alarm chemicals with a good food source and head for the hive. In Africa, where the small hive beetle is a minor honeybee pest, bees quickly isolate an invading beetle, but domesticated European honeybees are not as diligent in cleaning their hives. The beetles are also aided in their invasion by a yeast that naturally occurs on pollen and produces, as a fermentation product, the alarm chemical that draws the beetles.

"It is possible that bees are being habituated to a low level of alarm hormone," says James H. Tumlinson, the Ralph O. Mumma Professor of Entomology and director of the Penn State Center for Chemical Ecology.

While small hive beetles are common in Africa and pose little threat to African honeybee hives, it appears that domesticated European honeybees have a much harder time containing the beetles in their hives. European honeybees were bred to be docile and easy to work with, while African honeybees are noted for aggression and a propensity to sting. The beetles were first seen infesting U.S. beehives in Florida in the late 1990s.

The researchers tested the response of both the small hive beetles and honeybees to isopentyl acetate (IPA), the major chemical in the bee's alarm pheromones. The first tests showed that when worker bees become alarmed, they produce from 1,500 to 10,000 times more IPA than found in an undisturbed hive. Next the researchers used a gas-chromatograph-electroantennogram to analyze the chemical sensitivity of the insects' antennae.

They report in a recent online issue of the *Proceedings of the National Academy of Sciences* that the beetles could detect the equivalent of 2 nanograms of IPA at the entrance to an undisturbed honeybee colony, but, the antennae of guard and forager bees did not detect this level of IPA.

"This indicates strongly that the heightened sensitivity of the beetles to volatiles released from the hive entrance allows them to key in on the bee colonies without bees responding to their attack," the researchers report. Complicating the issue is the yeast that grows in the hives. The researchers found that this yeast only produced IPA when it grew on pollen. Even pollen substitute, a food sometimes provided for bees, did not increase the amounts of IPA produced.

"We are not really sure how the yeast gets into the colony," says Tumlinson. "Perhaps one beetle finds and carries the yeast in and it reproduces, or, because the yeast grows on pollen in nature, perhaps bees bring it into the hive."

This combination of domestic honeybees, small hive beetles and yeast produced IPA leads to combs so messy that the bees eventually decide to abandon the hive, leaving the beetle larvae to consume all the stored food, reproduce and multiply.

"If beekeepers can reverse the trend and eliminate the beetles, the hive

can be saved," says Tumlinson. "If they can stop the beetles and remove eggs in the hive, the hive recovers." Honeybees are of major economic importance in agriculture as the major pollinating force for much orchard fruit and vegetables. Many of these fruits and vegetables will not produce without honeybees. The small hive beetle can destroy many commercial hives.

"If we can find out how this system works, there is a good possibility we will figure out ways to protect against the beetle," says Tumlinson.

Honeybees in the U.S. and Europe have been suffering from a variety of invaders and ailments including varroa mite infestations, fungal infections and beetles. Recently, beekeepers in the U.S. reported occurrences of Colony Collapse Disorder, a syndrome where hives are found abandoned, except for the queen and a few workers. Beekeepers and researchers are unsure of the cause of CCD.

"Whether or not it has anything to do with Colony Collapse Disorder, a multitude of things are all attacking bees today, these beetles are just one more thing to add to an already embattled species," says the Penn State researcher.

Source: Penn State

Citation: Hives ferment a yeasty brew, attract beetle pest (2007, May 16) retrieved 25 April 2024 from <https://phys.org/news/2007-05-hives-ferment-yeasty-brew-beetle.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.