# Research looks at impact on honeybees from chemicals and mites

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(Phys.org) -- University of Florida honeybee researcher Jamie Ellis is interested in what happens to bees that encounter chemicals and Varroa mites — but he's even more interested in how younger bees fare long-term after facing those challenges.

Scientists have been trying to explain the bee-killing malady known as Colony Collapse Disorder, which causes honeybees to abandon their hives, become ill and die. Ellis' lab has been studying how combinations of environmental factors — chemicals, pathogens, natural enemies — affect bees.

Since widespread honeybee die-offs began to be reported around the U.S. in 2006, researchers have been working to pin down a cause. Bee pollination is critical for much of the food we eat and some estimates suggest the U.S. bee industry is responsible for pollinating as much as $15 billion worth of crops every year.

In the Ellis lab's most recent study, outlined recently in the *Journal of Insect Physiology*, researchers reared honey bees from young larvae to the pupal stage.

The UF researchers then exposed the immature bees to a variety of chemicals used in agriculture and beekeeping, including two fungicides, two herbicides and five insecticides. They also exposed them to Varroa mites, which weaken bee colonies.

During the experiment, a control group of bees wasn't exposed to anything, others were exposed only to the chemicals, or only to mites, and some of the bees were exposed to a combination of chemicals and mites.

The researchers gauged the effects on larvae by analyzing the activity of about 50 genes associated with stress, immune response and bee development.

Ellis, an assistant professor of entomology in UF's Institute of Food and Agricultural Sciences, stressed that the scientists were only able to screen for expression in some — but not all — genes. They had expected that exposing the bees to the combination of mites and chemicals might produce a more pronounced negative impact, but they didn't find any.

But their results did suggest, among other things, that two common fungicides — chemicals used to protect crops from fungal infections — apparently have more influence on bees than previously believed. By examining the selected genes, researchers found the fungicides had pronounced effects on the larvae, although they are generally considered non-toxic to bees.

"The data suggest that fungicides are not innocuous to bees," he said.

Ellis' next study will go much further, with scientists preparing to raise the bees from larvae to adulthood, labeling and following each individual bee.

"In most studies, investigators treat a field with a product, put bee colonies adjacent to the field and then sample whole colony strength after pesticide exposure. At the end of the day, all you are able to say is 'this colony is responding in this way to the field treatment.' You don't know why it's responding in that way. When we begin to label bees, it

will permit us to investigate an area that has yet to be studied. We'll be able to follow individual bees throughout their entire lives, thus allowing us to determine long-term impacts of pesticides on bees." Besides Ellis, the research team members included former UF postdoctoral research fellow Aleš Gregorc; Michael Scharf, a former UF entomologist and now the O. Wayne Rollins/Orkin Endowed Chair in Urban Entomology at Purdue University, and Jay D. Evans, research entomologist with the USDA's Agricultural Research Service in Beltsville, Md.

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