Pesticides have knock-on effect for bees, study finds

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A honey bee robs a comb. Photo by Lynn Ketchum

Chronic exposure to pesticides has a bigger knock-on effect on bees than conventional probes suggest, according to a new study on Sunday touching on the mysterious collapse of bee colonies.

Biologists at the University of London carried out an exceptional field study into bumblebees exposed to two commonly used agricultural insecticides.

They sought to mimic what happens in a real-life setting, where different crops are sprayed with different pesticides at different dosages and times.

Because bees get their food both from sprayed crops and wild plants, such variations make it hard to calculate the insects' total exposure to the chemicals.

In addition, very little is known about what happens to bees once they return to the colony after foraging, possibly passing on pesticide-laden food to larvae.

A team led by Richard Gill monitored 40 bumblebee colonies, tagging 259 bees with radio frequency identification (RFID) to time exactly when the insects left home or returned.

The colonies were divided into four groups.

Three were allowed to access feeder boxes, set up in the path of their nest boxes, that had a sugary syrup spiked with imidacloprid insecticide and/or a filter paper laced with another agricultural chemical, gamma-cyhalothrin.

The bumblebees were not constrained to visit the treated material—they could forage freely in the surrounding landscape for pollen and nectar.

The fourth group of colonies was a "control" or comparison group that did not have the feeder boxes.

In the colonies exposed to imidacloprid, fewer adult workers emerged from larvae and a higher proportion of foragers failed to return to the nest, the investigators found.

In those exposed to gamma-cyhalothrin, there was a higher death rate among worker bees.

And colonies that were exposed to both kinds of pesticides were likelier

to fail.

The experiment was exceptionally long and detailed, the scientists say.

It lasted four weeks, whereas current guidelines test pesticides on bees for only up to 96 hours.

In addition, it looked at what happened when bees were exposed to two chemicals at the same time and at the changes in a colony's social structure.

"Our findings have clear implications for the conservation of insect pollinators in areas of agricultural intensification, particularly social bees, with their complex social organisation and dependence on a critical threshold of workers," says the study, published in *Nature*.

Beekeepers in Europe, North America and elsewhere are worried by so-called colony collapse disorder, a phenomenon which has been blamed on mites, a virus or fungus, pesticides or a combination thereof.

Bees are vital because they account for 80 percent of plant pollination by insects. Without them, many crops would be unable to bear fruit or would have to be pollinated by hand.

Another big concern is for honeybees given their commercial value.

Bumblebees too are important pollinators, but their colonies are far smaller than those of honeybees, usually with just a few dozen workers, which made it far easier for Gill to follow them.

Outside scientists who commented on the study hailed its innovation but noted that bumblebees could not be directly compared with honeybees, as they were biologically different.

"This new work adds another substantial boulder to the rapidly growing mound of evidence which now points to a significant and worrying impact of these chemicals on our wild bumblebees," David Goulson, a professor of biology at Stirling University in Scotland, told Science Media Centre.

But, he cautioned, the impact remains "rather poorly understood."

More information: Paper: DOI: 10.1038/nature11585