

Bee Colony Collapse and GE crops

by Peter Olson B.A., Dip Ed

GENETICALLY modified (GM) crops often contain a bacterium called *Bacillus thuringiensis* (Bt). Most of the research on Bt has looked at the directly lethal effects of Bt and little research has looked for indirectly lethal effects of Bt. Some insects have been shown to survive the Bt poison by having a strong immune response to the Bt poison. Insects generally, and bees specifically, have been shown to experience learning impairment and memory disorder if they have an immune response. A learning impairment or memory disorder would mean that bees could not navigate back to their beehive. Thus a learning impairment or memory disorder is lethal to a foraging bee.

Colony Collapse Disorder (CCD) of bees was originally called Fall Dwindle Disease, meaning the disease occurred in the cold months of the year. Bees use protein to construct a memory and their protein

.....
Since learning and memory are impaired in bees that have an immune response, bees with an immune response get lost, run out of honey fuel, fall to the ground and are then carried away by ants.
.....

comes from pollen, but in winter there is no pollen. Bees also use protein to achieve an immune response so an immune response in winter means all protein reserves are rapidly used up and none are left for memory formation. Have you ever noticed that when you are sick you can't think quickly and clearly? If a bee gets sick and can't think properly, it will not be able to return to its beehive.

Studies below [read the entire article at www.commonground.ca] show that learning in bumblebees is impaired if the bumblebee has an immune response. The insecticide Bt is incorporated into many genetically modified crops and Bt causes an immune response to a wide range of creatures in nature even if it does not kill those creatures. It is a virtual certainty that the bumblebee does have an immune response to the Bt present in the pollen of genetically modified plants.

Bees only carry enough honey with them to fly directly to the target flowers and straight back to the beehive. The navigation to and from those flowers is extremely complex and requires the bee to have a very good memory. Since learning and memory are impaired in bees that have an immune response, bees with an immune response get lost, run out of honey fuel, fall to the ground and are then carried away by ants. Thus, if a bee gets lost, for even a few minutes, it is dead.

The *Encyclopedia Britannica* states of CCD that "it appears that the disorder affects the adult bees' ability to navigate." Thus suggesting that worker bees fly out from the high hive to collect food, but get lost and never return. In the case of the viruses and pathogens that have been suggested as causes of CCD, those viruses and pathogens result in large numbers of dead bees either inside or outside of the beehive. Dead bees are found outside the hive because worker bees carry dead bees outside.

In CCD, the symptoms are that no dead bees are found inside or outside the beehive, rather all the "worker bees from a beehive or European honey bee colony abruptly disappear." One of the most common traits inserted into man-made genetically modified crops is resistance to caterpillars, which is given by inserting a gene for a

naturally occurring insecticidal bacterium called *Bacillus thuringiensis* (Bt).

In crops that are genetically modified to contain this Bt gene, the Bt will be present not only in the plant's leaves and fruit, but also in the pollen of the flowers. Thus bees that take pollen from genetically modified crops are ingesting significant quantities of Bt insecticide. Many scientists have assured the public that Bt is safe because Bt is not directly lethal to bees. However, alcohol is also not directly lethal to a car driver, yet many car drivers have died from alcohol even though alcohol is not directly lethal to a car driver. Scientists looking for a cause for CCD have generally looked for a direct cause, something such as virus or parasite that is directly killing the bees. Discovering an indirect cause of mortality in bees would be much more difficult and would only occur after scientists had first exhausted examining the most probable direct causes of mortality in bees.

The Jenna University study showed that mortality in bees exposed to a parasite was far greater in bees that had previously been fed BT, compared to bees that were not previously fed BT. Meaning that BT increased the susceptibility of bees to the pathogen and thus Bt multiplied the mortality caused by the pathogen. In regard to that increased mortality from a pathogen combined with Bt ingestion, the authors concluded, "The significant differences indicate an interaction of toxin and pathogen on the epithelial cells of the honeybee intestine. The underlying mechanism which causes this effect is unknown."

This is a highly significant finding because when GM crops containing BT were being approved the universal assumption was that GM crops containing Bt would be totally safe because Bt has no effect on bees. Thus, government scientists who approved GM Bt crops, would clearly have objected to those crops if they thought that GM crops containing Bt would adversely affect bees.

The results of a growing number of studies now show clear and substantial, non-lethal effects and cofactor effects of Bt on bees; a dramatic change from the previous scientific view that Bt has no effect on bees. Even so, the non-lethal effects and cofactor effects of Bt on bees still remain scantily studied and more research on these subtle kinds of effects is urgently required.

In order to understand CCD, or the disappearance of bees, one needs to understand something about the specialized lifestyle of the bee. In order to save weight and increase performance, bees only carry enough fuel (honey) to fly directly to the target flowers and then straight back to the beehive. If a bee gets lost, or encounters unexpected headwinds, it will not have enough fuel reserves to make it back to the beehive. Instead, it will fall to the ground and die. Ants will then carry the dead bee down into the ant nest.

Memory is also crucial to bees because a bee has to learn from other bees in the beehive where the target flowers are located. The bee must memorize the directions from the hive to the target flower and back again so a perfect memory is essential for the survival of bees. Other insects like mosquitoes are less reliant on a good memory and simply "follow their nose" to the food, whereas bees rely on memorizing complex navigation tasks and memorizing specific aromas to find specific food and then to find their way back to the beehive.

Bees are insects and an "immune response inhibits associative learning in insects." Bees are now eating GM Bt pollen and Bt is toxin known to cause a non-lethal immune response in a wide variety of creatures.

Adapted from an article originally published in the Northern Star, NSW, Australia.