



## SOMETHING TO CEREBRATE

# Are genetically modified organisms killing the bees?

BY KATE MORSE, CCH, HMC

Colony Collapse Disorder (CCD) is the name given to the annual die-off of 20- to 40 percent of honeybee colonies in the United States and Europe. Recent research into the mysterious phenomenon, which has frightening consequences for agricultural crops that depend on bee pollination, blames a specific viral and fungal duo for CCD: *insect iridescent virus* (first found in India 20 years ago) and *Nosema ceranae*, a fungal spore the bees ingest.

The research, conducted by the University of Montana and Montana State University, in collaboration with the US Army's Edgewood Chemical Biological Center, was published October, 2010, in a scientific journal online at <http://www.plosone.org>. The team discovered these viral/fungal killers in every colony they studied. While neither pathogen alone is lethal, the research suggests they add up to a one-two punch that definitely kills bees.

### POLLINATION BY BEES

	Crop Value in Billions (2006)	% Pollinated by Bees
Soybeans	\$19.7	5
Cotton	5.2	16
Grapes	3.2	1
Almonds	2.2	100
Apples	2.1	90
Oranges	1.8	27
Strawberries	1.5	2
Peanuts	0.6	2
Peaches	0.5	45
Blueberries	0.5	90

Source: USDA

Still, questions abound as to why bees are suddenly such disease-prone weaklings. The prevailing viewpoint is that a combination of factors—pathogens, as well as pollutants, pesticides, global climate changes, mites, and maybe cell-phone radiation—are to blame.

David Mendes, the president of the American Beekeeping Federation, states, "There might be something that affects the bees' immune system in the first place that then allows these pathogens to infect them more easily." (<http://gmo-journal.com>) One of the newest "somethings" under consideration is genetically modified organisms, or GMOs.

Gmo-journal.com says GMOs cause CCD when they function as so-

called "terminator seeds." Terminator seeds, which give rise to plants that don't produce cultivatable seeds (necessitating that farmers keep purchasing seeds), or only reproduce with concomitant use of the producers' pesticides and fertilizers, are brutally hard on bees' digestion. Monsanto has patented "terminator seeds" for several varieties of corn.

Www.Globalresearch.com, a Canadian website that puts most of the blame on Monsanto, says: "The genetic modification of the plant leads to the concurrent genetic modification of the flower pollen. When the flower pollen becomes genetically modified or sterile, the bees will potentially go malnourished and die of illness due to the lack of nutrients and the interruption of the digestive capacity of what they feed on through the summer and over the winter hibernation process."

Gmo-journal.com echoes a much-held concern that GMOs also lead to CCD when they incorporate pesticides. The biggest suspected offender is *Bacillus thuringiensis*—a.k.a. Bt, a soil bacteria. More than a decade ago, scientists at Monsanto figured out how to insert the DNA of Bt into crop plants, so that every molecule of the plant contains it. Bt is insecticidal: bugs eat it and it kills them. *Indiscriminantly*, shout the critics. *Only a few targeted species*, the agrichemists shout back. [www.Monsanto.com](http://www.Monsanto.com) has more than five pages of press releases praising Bt-engineered crops, including the statement that it has "revolutionized corn production." [http://www.bt.ucsd.edu/bt\\_crop.html](http://www.bt.ucsd.edu/bt_crop.html) has a balanced comparison of risks and benefits of Bt.

Www.energygrid.com argues that Bt in the corn pollen "causes an immune system response in the bees, similar to if they had eaten the BT directly, and also causes holes and porosity in the gut. During the summer, the bees have enough protein to tolerate the immune response" and (use pollen proteins as neurochemicals for learning navigation to and from the hive).

However, in winter, when protein (pollen) is in short supply, things can change: If a bee's immune system is threatened, the protein normally invested in learning and remembering complex navigation has gone into immune reaction. Sick bees, therefore, get lost trying to return to the hive. Nature formalized this operation to preserve the hive, because it prevents infected bees from contaminating the entire hive, but it can get out of

balance. The "Bt-as-immune-devastator" theory accounts for several characteristics of CCD, according to [energygrid.com](http://energygrid.com):

1. "It was originally called 'Fall Dwindle Disease,' because bee disappearance is almost always worst just as winter sets in.

2. It explains why the few dead bees that are found have the same blackened and porous guts as bees responding directly to Bt.

3. It also explains why the global bee die-off generally followed the spread of GMO corn, and did not reach Brazil until just after they let in Monsanto's GMO corn."

More about Bt and GMOs

At [www.naturalnews.com](http://www.naturalnews.com), John McDonald, a beekeeper with a background in biology, agrees that crops genetically modified with Bt could play a role in CCD. "The primary toxin is a protein called Cry1Ab. In the case of field corn, the targeted insects are stem and root-borers and butterfly larvae. Although scientists assure us that bees are not affected, there are Bt variants available that target beetles, flies and mosquitoes, as well as proof that Cry1Ab is present in beehives. Beekeepers spray Bt under hive lids to control the wax moth because the larvae cause messy webs on the honey. Canadian beekeepers have noted the disappearance of this moth even in untreated hives, apparently the result of bees ingesting Cry1Ab while foraging in GM canola plants. Bees forage heavily on corn flowers to obtain pollen for the rearing of young bees." McDonald believes it may be possible that while Cry1Ab isn't fatal to young bees, it might suppress immunity and act as a "slow killer."

All this attention to what goes on in a bee's gut may be just what's needed. But there is scant research examining the GMO/CCD link. A couple of studies have found enough evidence to support further research. One study conducted by Penn State University and published in the *Public Library of Science* found "remarkably high" level of pesticide and other toxicant contamination that *could* be from GMOs.

According to [www.spiegel.de.international.com](http://www.spiegel.de.international.com), the electronic version of the German newspaper Spiegel, research conducted at the University of Jena from 2001 to 2004 examining the effects of pollen from a Bt-modified corn on bees found no evidence of a "toxic effect of Bt corn on healthy honeybee populations. But when the bees used in the experiments

## How much Bt is out there?

Insect-resistant crops containing the gene from the soil bacterium Bt (*Bacillus thuringiensis*) have been available for corn and cotton since 1996. Plantings of Bt corn grew from about 8 percent of U.S. corn acreage in 1997 to 26 percent in 1999...then climbed to 63 percent in 2010. Plantings of Bt cotton expanded more rapidly, from 15 percent of U.S. cotton acreage in 1997 to 37 percent in 2001 and 73 percent in 2010.

These figures include adoption of "stacked" varieties of cotton and corn, which have both HT (herbicide tolerant) and Bt traits. Adoption of stacked varieties has accelerated. Stacked cotton reached 58 percent of cotton plantings in 2010. Plantings of stacked corn made up 47 percent of corn acres in 2010.

Adoption of all genetically engineered cotton, taking into account the acreage with either or both HT and Bt, reached 93 percent in 2010, versus 93 percent for soybeans (soybeans have only HT varieties). Adoption of all biotech corn was 86 percent in 2010.

From USDA Economic Research Services: [www.ers.usda.gov/data/biotechcrops/adoption.htm](http://www.ers.usda.gov/data/biotechcrops/adoption.htm)

were infested with a parasite, a significantly stronger decline in the number of bees occurred among the insects that had been fed a highly concentrated Bt poison."

Hans-Hinrich Kaatz, director of the study, believes "the bacterial toxin in the genetically modified corn may have altered the surface of the bee's intestines, sufficiently weakening the bees to allow the parasites to gain entry—or perhaps it was the other way around. We don't know."

According to the Spiegel.com, Kaatz wanted to continue studying the phenomenon but lacked the necessary funding. "Those who have the money are not interested in this sort of research," says the professor, "and those who are interested don't have the money."

Should home gardeners purchase Bt insecticides, or avoid them until a definitive answer on the Bt/CCD link comes to light?

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