

Why are the Bees Dying?

-Suman Sahai

When I was at my university in Heidelberg this summer, the hot topic of discussion everywhere was the disappearance of honeybees. Media talked incessantly about the impending doom that would befall mankind if honeybees were to die. The quote of the month was Einstein's ... "If the bee disappeared off the surface of the globe, then man would have only four years of life left. . "No more bees, no more pollination, no more plants, no more animals, no more man." The immediate fact is that millions of bees have simply vanished. Over the last few months bees are dying in the US at an alarming rate. Beehives are emptying out as bees are disappearing in hordes. The problem is so severe that it has been called the Colony Collapse Disorder (CCD).

In most cases, the hives are empty and the dead bees are nowhere to be found .The bees exhibit a set of symptoms, which scientists say does not match anything in the known literature. In many hives, evidence of almost all known bee viruses were found in the few surviving bees. Some had five or six infections at the same time and were infested with fungi -- a sign, experts say, that the insects' immune system may have collapsed. Curiously, other insects that would normally raid abandoned hives for honey and pollen stores, do not go near the hives exhibiting CCD. This suggests that there is something toxic in the colony itself, which is repelling other insects.

The estimated economic value that bees generate, by pollinating fruit and vegetable plants, almond trees and animal feed like clover, is more than \$14 billion. Media reports on the extent of damage that will be caused to US agriculture if bees died out, has finally brought national recognition to a problem that beekeepers have been worried about for some time.

There is no understanding why the bees are dying. Several theories are mooted one being the varroa mite, introduced from Asia, another is the widespread practice in agriculture of spraying wildflowers with herbicides and practicing monoculture. Another possible cause, according to beekeepers is the controversial and growing use of genetic engineering in agriculture.

Walter Haefeker, Vice President of the European Professional Beekeepers Association speculates that besides a number of other factors, the fact that genetically modified, insect-resistant plants are now used in 40 percent of cornfields in the United States could be playing a role. The figure is much lower in Germany — only 0.06 percent. So the areas where the bees have disappeared are areas cultivating a lot of Bt crops. This is unlikely to be a coincidence.

A study conducted at the University of Jena from 2001 to 2004 provided evidence that bees infested with parasites and fed with Bt pollen were affected by the pollen and died at a high rate. In the Jena study researchers studied the

effects of pollen from a variety of Bt corn on bees. The study found that the pollen of Bt corn had no impact on healthy honeybee populations. But when the bees used in the experiments were infected with a parasite, they died in large numbers. It is possible that the parasitic infection either lowered the immunity of honeybees or altered the surface of the bees' intestine such that they became vulnerable to the Bt toxin.

The pest control strategy using the Bt gene is based on the action of the Bt endotoxin on the gut of pests like the bollworm. The Bt toxins kill the larvae of certain species of insects after being ingested by the larvae. These *Bt* toxins cause death by attaching to specific receptors in the larval gut, eventually rupturing the gut and killing the larvae in a few days. Bt toxins are thought to kill only the target pests because only the target pests contain the necessary binding receptors. However the experience of increased mortality in Monarch butterflies and lacewing beetles that were fed Bt pollen, show that what are considered non-target pests can also be susceptible to the Bt toxins.

US scientists working on transgenic crops are less willing to buy the theory of Bt pollen being responsible for the dying honeybees. Tracking the crisis of dying honeybees, scientists at the University of Maryland are of the view that the current use of Bt corn is not associated with CCD but concede that this possibility cannot be ruled out. They further admit that although there is no evidence so far of any lethal or sub-lethal effects of the currently used Bt endotoxins on honey bees, insecticidal products expressed by other transgenes in crops may need extended field testing to assess the longer term consequences of sub-lethal changes in colonies and subtle modifications in bee behavior. This kind of testing should be extended to other kinds of insects as well.