

Bees Need Protection from Pesticides

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NEWARK, Del. — Protecting bees from pesticide poisoning is a challenge for farmers and home gardeners alike. Without bees, people couldn't grow apples, pears, melons, cucumbers, squash and many other crops. And seed companies wouldn't be able to produce many kinds of seeds. Even crops that are less dependent on bees, such as soybeans and lima beans, yield better when foraged by them. In controlled studies at the University of Delaware Agricultural Experiment Station, researchers have documented up to a 16 percent increase in the yield of some soybean varieties that were foraged by bees.

Pesticides are equally essential in crop production. To achieve marketable yields, farmers must protect plants from harmful insects, diseases and weed competition. Though less economically dependent on what they grow, home gardeners, too, must sometimes protect plants by using chemicals. Herbicides and fungicides generally pose no danger to honeybees and other beneficial insects, but some insecticides will kill them along with the targeted pests.

"Pesticides are very much a necessity," says Dr. Dewey Caron, an apiculture specialist at the university. "The challenge is to use them in ways which don't endanger bees. In some situations the bees are in a field or orchard for their pollination services. Sometimes, they're just there collecting nectar and pollen — trespassers of a sort. Either way, when they come in contact with chemicals applied to protect a crop, they may be poisoned."

Two Types of Exposure

Exposure occurs either because the bees are foraging at the time sprays are applied, or because they begin collecting nectar and pollen before pesticide residues have had time to break down. Many bees are poisoned, not while pollinating the crop itself, but while foraging in nearby contaminated weeds. Their death is usually accidental. Caron says

most people recognize the value of honeybees both as pollinators and as producers of wax and honey and don't intend to kill them.

Early in the growing season, heavy infestations of mustard in treated orchards are a common hazard to bees, which like to forage the flowers. Later in the summer, on the Delmarva peninsula, sprays on commercial lima beans pose another serious threat. But the danger to pollinators exists in any treated crop that's in bloom — including soybeans, early season potatoes and corn.

Chemical formulation and means of application affect pesticide toxicity to bees, Caron says. Soil incorporated chemicals are safe because honeybees don't come in contact with them. Granular materials are also usually safe. However, powders and liquid sprays can be a problem.

Pesticides kill bees in two ways. Some, like parathion and malathion, kill them on contact if the bees are present during treatment. But the materials of greatest concern to beekeepers are insecticides like Sevin and Penn-cap-M which, because of their small particle size, are collected with pollen and carried back to the hive, contaminating pollen stores and other bees. When this happens, all or a large part of the colony may die.

"In commercial agriculture, large aerial applications pose one of the more serious pesticide threats to bees," the scientist says, "especially where there are lots of weeds and the crop itself is not in bloom. Though the bees may be foraging weed flowers, when the crop reaches a certain stage it's got to be sprayed to protect it. In the process flowering weeds, and thus bees, get contaminated."

Timing Is Important

Timing of pesticide applications can reduce the danger to bees, as can choice of materials. "Late afternoon or early evening sprays are generally preferable because honeybees and other beneficial insects are less likely to be foraging then," Caron says. "Aside from direct contact, the

critical factor is whether the insecticide gets onto or into flowering plants. For example, you can spray your lawn without endangering bees provided no dandelions, clover or other weeds are blooming there at the time."

Given a choice, Caron suggests farmers and home gardeners use pesticides known to be less toxic to bees. Pesticide labels contain this information, along with advice on protecting honeybees.

Biological insecticides such as *Bacillus thuringiensis* and milky spore disease are completely safe for bees, the apiculturist says. *B. thuringiensis* is a bacteria which destroys the digestive tract of leaf-feeding insects. It is used to control worms on cabbage and other cole crops and is also favored for use in large scale aerial applications to control gypsy moths in forested areas. Milky spore, another bacteria, is used to treat lawns infested with Japanese beetle grubs.

A recent study at the Delaware Agricultural Experiment Station has helped refine information on the impact of several chemicals on bees. During the 1985 growing season, insect ecologist Dr. Charles E. Mason compared knockdown and mortality effects on honeybees of seven commonly used insecticides, including Sevin, malathion, Lannate, Vydate, Ambush, Zolone and Penn-cap-M. He also studied the effect of mixtures of Penn-cap-M with several of these materials.

Mason found that when sprayed directly on honeybees in a manner simulating field exposure, each insecticide combination had an effect similar to that of the most toxic chemical in the mixture. His results also suggest that Vydate — previously considered only moderately toxic to bees — is actually highly toxic to them.

Bee protection is a season-long challenge, Caron says. Pesticide treatment generally starts in early spring with fruit tree sprays. Orchardists apply some materials prebloom, then treat again immediately after flowering, spraying at intervals throughout the summer.

Renting Pollination Services

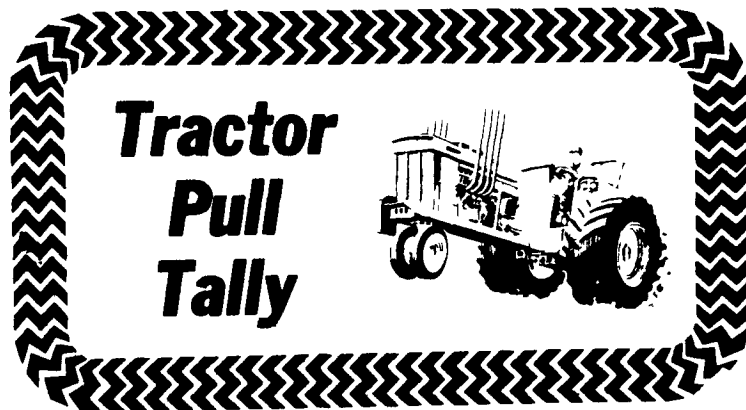
"Apple, melon and cucumber growers know they must rely on bees for pollination," he says, "so they don't put insecticides on any of these crops while they're in bloom. Most of these growers rent bees, paying a beekeeper to move his colonies to the site for the period of bloom and then removing them. You wouldn't want to keep a bee colony in an apple orchard through the season," he explains, "because of the need to follow up with post-bloom sprays. You also don't want the bees around during harvest when they'll go after fallen fruit and create a problem for picking crews."

Caron says home gardeners, like commercial gardeners, can help protect bees and other beneficial insects by applying insecticides in late afternoon or early evening. He recommends treating only those plants which need protection and avoiding anything that's in bloom

to lessen the chance of exposure.

"Where there is a continual problem with pesticides," Caron concludes, "the only solution for beekeepers may be to relocate hives. Trying to confine bees to a hive can be risky during warm weather because the colony may overheat and suffocate."

E. L. Adkins, an entomologist at the University of California's Riverside campus, has screened many chemicals for their effect on bees. Out of this research he has developed a list, "Comparative Toxicity of Pesticides to Bees," which Caron recommends to anyone concerned about protecting this highly beneficial insect. Residents of the mid-Atlantic region can obtain copies of Adkins' list from Caron by writing the Department of Entomology and Applied Ecology, Townsend Hall, University of Delaware, Newark, DE 19717-1303.



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