

Are Neonicotinoids Killing Bees?

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Bee safety of currently approved products should be reassessed and all conditional registrations immediately suspended.

Neonicotinoid pesticides were first registered for use in the mid-1990s. Since then, these chemicals have become widely adopted for use on farm crops, ornamental landscape plants, and trees. Neonicotinoids are systemic chemicals; they are absorbed by the plant and are transferred through the vascular system, making the plant itself toxic to insects.

The impact of this class of insecticides on pollinating insects such as honey bees and native bees is a cause for concern. Because they are absorbed into the plant, neonicotinoids can be present in pollen and nectar, making these floral resources toxic to pollinators that feed on them. The long-lasting presence of neonicotinoids in plants makes it possible for these chemicals to harm pollinators even when the initial application is made outside of the bloom period. In addition, neonicotinoids persist in the soil and in plants for very long periods of time.

Across Europe and the United States, a possible link to honey bee die-offs has made neonicotinoids controversial. Several European countries have reexamined the use of neonicotinoids in crops such as corn, canola, and sunflower. In the United States and elsewhere, a number of opinion articles, documentary films, and campaigns have called for them to be banned.

This fact sheet presents a summary of the scientific report *Are Neonicotinoids Killing Bees? A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action*, which reviews research on the impact of these pesticides on bees.

Clearly Documented Facts

Exposure of bees to neonicotinoids

- Neonicotinoid residues found in pollen and nectar are consumed by flower-visiting insects such as bees. Concentrations of residues can reach lethal levels in some situations.
- Neonicotinoids can persist in soil for months or years after a single application. Measurable amounts of residues were found in woody plants up to six years after application.



Bees foraging on blooming crops, such as this long-horned bee on a sunflower, are at risk from nectar and pollen tainted with neonicotinoid insecticides. Photograph by Mace Vaughan/The Xerces Society.

- Untreated plants may absorb chemical residues in the soil from the previous year.
- Products approved for home and garden use may be applied to ornamental and landscape plants, as well as turf, at significantly higher rates (potentially 32 times higher) than those approved for agricultural crops.
- Neonicotinoids applied to crops can contaminate adjacent weeds and wildflowers.

Effects on honey bees

- Imidacloprid, clothianidin, dinotefuran, and thiamethoxam are highly toxic to honey bees.
- After plants absorb neonicotinoids, they slowly metabolize the compounds. Some of the resulting breakdown products are equally toxic or even more toxic to honey bees than the original compound.

- Honey bees exposed to sublethal levels of neonicotinoids can experience problems with flying and navigation, reduced taste sensitivity, and slower learning of new tasks, which all impact foraging ability.

Effects on bumble bees

- Laboratory studies demonstrate that imidacloprid and clothianidin are highly toxic to bumble bees.
- Bumble bees exposed to sublethal amounts of neonicotinoids exhibit reduced food consumption, reproduction, worker survival rates, and foraging activity.
- Bumble bees exposed to imidacloprid at levels found in seed-treated crops produced 85% fewer new queens and had significantly reduced colony growth rates. Exposure to neonicotinoids may have a substantial negative impact on bumble bee populations.

Effects on solitary bees

- Clothianidin or imidacloprid spray is toxic to blue orchard and alfalfa leafcutter bees.
- Imidacloprid spray residue on alfalfa foliage increases

rates of mortality of alfalfa leafcutter and alkali bees.

Inferences from Research

Effects on pollinators

- Pesticide residues from seed treatment have been found in honey bee hives. Neonicotinoid-treated corn seed is planted on millions of acres annually in the United States. Although we do not know the full scope of the impact of this exposure on bees, we do know that bees close to corn fields can come into contact with lethal levels of abraded seed coatings and dust, bees may collect contaminated pollen, and that plants (e.g., weeds) growing around seed-treated fields can become contaminated with systemic insecticides.
- There is no direct link demonstrated between neonicotinoids and the honey bee syndrome known as Colony Collapse Disorder. However, recent research suggests that neonicotinoids may make honey bees more susceptible to parasites and pathogens, including the intestinal parasite *Nosema*, which has been implicated as one causative factor in CCD.

Recommendations

Bees provide essential services in agriculture, in natural ecosystems, and in the support of overall biodiversity. A large—and growing—body of research demonstrates that neonicotinoid insecticides harm multiple bee species. Based on the findings of the report, the Xerces Society for Invertebrate Conservation makes six major recommendations:

1. The bee safety of currently approved uses of products containing neonicotinoid insecticides should be reassessed and all conditional registrations immediately suspended until we understand how to manage the risk to bees. The risk from exposure to neonicotinoid insecticides then needs to be scientifically evaluated against the risk posed to bees by alternative control measures. Uses of imidacloprid, clothianidin, dinotefuran, and thiamethoxam should be immediately suspended on insect-pollinated crops such as apples and blueberries, bee-visited crops such as corn, cotton, and soybeans, and seed-coated crops such as corn where evidence demonstrates that this insecticide is spread widely during the planting process.
2. All neonicotinoid products used by commercial and agricultural applicators should include a clear warning on the label about the hazard to bees and other pollinators, including the unique exposure issues posed by contaminated pollen and nectar. This is particularly important for products for garden and ornamental use, the labels of which do not currently list a hazard to bees.
3. Products marketed to homeowners for use on garden, lawn, or ornamental plants should all have a warning label that prominently states, “Use of this product may result in pollen and nectar that is toxic to pollinators.”
4. The U.S. Environmental Protection Agency should adopt a more cautious approach to approving all new pesticides, using a comprehensive assessment process that adequately addresses the risks to honey bees, bumble bees, and solitary bees in all life stages.
5. Before being registered for use on a specific crop or ornamental plant species, research facilities should investigate the influences of application rate, application method, target plant species, and environmental conditions on levels of neonicotinoid residues in pollen and nectar.
6. Legislators, regulators, and municipal leaders across the country should consider banning the use of neonicotinoid and other insecticides for cosmetic purposes on ornamental and landscape plants (as the ban now in force in Ontario, Canada). Approved application rates for ornamental and landscape plants, as well as turf, are often much higher than for farm crops.

To download the full report go to www.xerces.org.