LAB NOTES

The Effect of Neonicotinoids on Bees and the Environment

In late 2016, a report by the Xerces Society for Invertebrate Conservation was released, which concluded that the use of neonicotinoid insecticides has had an adverse effect on the bee population. An overview of the findings and link to the report can be found below.

Presence in the Environment[1]

- Tens of millions of acres of neonicotinoid-coated seed are planted annually in the United States and Canada. When applied systemically and taken up by plants, imidacloprid, thiamethoxam, and clothianidin can have residual activity within plants for months to years.
- Imidacloprid, thiamethoxam, and clothianidin are persistent in soil, with their residues present for months to years.
- Neonicotinoids can move into water and have been found in a range of water bodies, where they may also persist.

Exposure of Bees to Neonicotinoids[1]

- Neonicotinoid residues found in pollen and nectar are consumed by flower-visiting insects such as bees. Residue concentrations can reach levels that cause sublethal effects through a variety of application methods including use of coated seed and, in some situations, can reach lethal levels.
- Neonicotinoids can persist in soil for months or years after a single application. Residues have been found in woody plants up to six years after soil drench application.
- Untreated plants have been found to absorb the residues of some neonicotinoids that persisted in the soil from the previous year.
- Neonicotinoids applied to crops, even as seed coatings, can contaminate adjacent vegetation, including bee-attractive wildflowers.

Effects on Honeybees (Apis mellifera)[1]

- Clothianidin, dinotefuran, imidacloprid, and thiamethoxam are highly toxic to honeybees by contact and ingestion.
- Thiacloprid and acetamiprid are moderately toxic to honeybees.
- Neonicotinoids absorbed by plants are metabolized over time. Some of the resulting breakdown products are also toxic to honeybees and sometimes even more toxic than the original compound.
- Honeybees exposed to sublethal levels of neonicotinoids can experience problems with flight and navigation, reduced taste sensitivity, and slower learning of new tasks, all of which impact foraging ability and hive productivity.
- Larvae exposed to sublethal doses of imidacloprid in brood food had reduced survival and pupation, altered metabolism, and reduced olfactory response as adults.

MAC-MOD has three neonicotinoid applications that can be found below. Please check out the applications or contact us to see how our experts can help with your neonicotinoid separations.

Neonicotinoids in Honey by LC-MS/MS

Neonicotinoids

Pesticides Separation

1 "How Neonicotinoids Can Kill Bees: The Science Behind the Role These Insecticides Play in Harming Bees," 2nd Edition; Revised and Expanded; Jennifer Hopwood, Aimee Code, Mace Vaughan, David Biddinger, Matthew Shepherd, Scott Hoffman Black, Eric Lee-Mäder, and Celeste Mazzacano