Neonicotinoids, Native Pollinators, and Greenhouse Production

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Note: The New England Greenhouse Floriculture Guide contains an expanded version of this article. Contributors to the section of the guide "Protecting Bees and Pollinators from Pesticides" are Dr. Richard Cowles, The Connecticut Agricultural Experiment Station, Dr. Raymond Cloyd, Kansas State University, Dr. Kimberly Stoner, The Connecticut Agricultural Experiment Station and Dr. Lois Berg Stack, University of Maine. The new guide is available from the UMass Extension Bookstore: https://umassextensionbookstore.com/products/category/57

Populations of honey bees and native pollinators have declined worldwide in recent years. According to current research, a wide range of factors have contributed to their decline including parasites, disease, low genetic diversity, poor nutrition, loss of habitat, management stress and pesticides applied to crops.

The current state of honeybee health has been detailed in a joint comprehensive report released by the USDA and EPA: http://1.usa.gov/1kBLeJI (this is case sensitive).

About Neonicotinoids

The role of pesticides including neonicotinoid insecticides have been implicated as a potential contributing factor. Neonicotinoid insecticides are insect neurotoxins. They are primarily systemic, which means that the active ingredient may be absorbed by the roots and move through the entire plant including pollen and nectar. There is evidence that foraging bees may receive sublethal doses in pollen and nectar which may make bees more vulnerable to other stressors (such as diseases), or may combine with exposure to other pesticides that enhance toxicity.

Neonicotinoids are variably persistent in the environment based on the active ingredient and application method. Pollinators are particularly vulnerable to exposure to neonicotinoids that are sprayed on open flowers of insect pollinated plants or applied at high dosages and move systemically into pollen and nectar at concentrations that may be toxic to polinators.

Neonicotinoids that are labeled for greenhouse ornamentals include Group 4 A insecticides:
imidacloprid (AmTide Imidacloprid, Marathon); thiamethoxam, (Flagship); acetamiprid (TriStar) and dinotefuran (Safari). Another neonicotinoid, clothianidin, is not currently used in greenhouses, but is used in other green industries. Many neonicotinoid products are also currently available to home gardeners. See the link to the fact sheet "Protecting Honey Bees from Pesticides in Home Gardens and Landscapes" at the end of this article for trade names of products available to home gardeners.

Steps to reduce pesticide exposure to pesticides

In addition to neonicotinoids, many other pesticides are also toxic to bees and native pollinators, including some pesticides used in organic production. Pesticides applied to protect crops can affect pollinators through multiple routes of exposure: direct contact with sprays, contact with treated surfaces, pesticide-contaminated dust or pollen particles that are collected or adhere to the body of the insect (and may be taken back to hive), and ingestion of pesticide-contaminated pollen and nectar.

Growers' decisions make a difference in the level of exposure of bees and other beneficial insects to pesticides. Taking precautions to minimize pesticide poisoning of pollinators in all crops is an important responsibility of all pesticide applicators.

Reduce or eliminate the use of neonicotinoid insecticides

The Environmental Protection Agency (EPA) or state governments may ban or restrict the use of neonicotinoid insecticides in the future. Therefore, growers should consider reducing the use of and reliance on neonicotinoid insecticides. Only use neonicotinoid insecticides when other effective products do not exist and use neonicotinoids in

ways that are protective of pollinators. Monitor crops for pests and spot-treat pests when they are first observed. Use environmentally sound alternatives whenever possible.

Avoid treating "Bee Friendly" plants

Avoid treating plants that are attractive to bees with neonicotinoid insecticides. These include many perennial and native plants and also annual bedding plants. Many retailers now market plants as "Bee Friendly". These plants should never be treated with neonicotinoids, even during production.

Timing

When greenhouses are "opened up" for ventilation, for example side-walls rolled up, be aware of bee activity on plants, especially if pesticide applications are made during the day. Avoid applications when bees are actively foraging in a greenhouse. Make applications in the early morning, late in the day or at night when pollinators are not foraging, which will also allow residues to dry before foraging begins. Control weeds under benches where bees may forage. Some products are highly toxic when wet, but much less so after the pesticide is dried. Apply when there will be adequate drying time before pollinator activity.

Formulation

Wettable powders, dusts and microencapsulated products have a greater toxic hazard than emulsifiable concentrates (or other liquid formulation with active ingredient in solution).

Drift

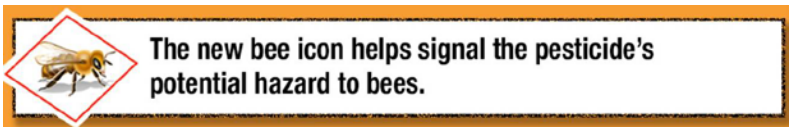
If applying a pesticide in an outdoor production yard, avoid drift on non-target areas particularly onto clover and other flowering plants including weeds near the yard. Prior to treatment, mow weedy areas to reduce flowers that may be attractive to pollinators. Temperature inversion conditions, wind speed, application equipment characteristics and operator skill may influence drift.

Pesticide toxicity

Do not apply insecticides rated as 'High' or 'Moderate' directly to bees that are actively foraging on blooming crop or weeds. EPA registration includes an acute, single-dose laboratory study designed to determine the quantity of pesticide that causes 50% mortality (LD50) in a test population of bees.

Read the label for bee hazard rating

The EPA introduced a label change for insecticides used outdoors that contain one or more of the neonicotinoids in order to protect bees. Some of these pesticides are also be labeled for greenhouse use.



The EPA bee toxicity groupings and label statements are as follows:

High (H) Bee acute toxicity rating: LD50 = 2 micrograms/bee or less. The label has the following statement: "This product is highly toxic to bees and other pollinating insects exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees or other pollinating insects are visiting the treatment area." If the residues phrase is not present, this indicates that the pesticide does not show extended residual toxicity.

Moderate (M) Product contains any active ingredient(s) with acute LD50 of greater than 2 micrograms/bee, but less than 11 micrograms/bee. Statement: "This product is moderately toxic to bees and other pollinating insects exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product if bees or other pollinating insects are visiting the treatment area."

Low (L) All others. No bee or pollinating insect caution required. Not all important routes of harmful exposure are measured with the acute toxicity rating. For example, insect growth regulator products can affect development of larval

bees even though the product has low acute toxicity to adult bees. Therefore, it is advisable to avoid direct exposure of bees to sprays or fresh pesticide residues.

In addition, specific use restrictions are placed in the "Directions for Use section." See the full EPA text: http://www2.epa.gov/pollinator-protection/new-labeling-neonicotinoid-pesticides .

References and Resources

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- New England Vegetable Guide: Protecting Honeybees and Native Pollinators. https://nevegetable.org/protecting-honeybees-and-native-pollinators
- Pesticide Environmental Stewardship – Pollinator Protection. www.pesticidestewardship.org/PollinatorProtection
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- Pollinator Protection - EPA Actions to Protect Pollinators. www.epa.gov/opp00001/ecosystem/pollinator/risk-mgmt.html
- Stoner K. Planting Flowers for Bees in Connecticut. http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/entomology/planting_flowers_for_bees_in_connecticut.pdf
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- The Xerces Society for Invertebrate Conservation. http://www.xerces.org/pollinator-conservation/
- USDA Report on the National Stakeholder Conference on Honey Bee Health, National Honey Bee Health Stakeholder Conference Steering Committee. 2013. http://www.ars.usda.gov/news/docs.htm?docid=15572
- White A. http://pollinatorgardens.org/

Fact Sheet available to be printed and distributed to home gardeners.

"Protecting Honey Bees from Pesticides in Home Gardens and Landscapes"

http://ag.umass.edu/fact-sheets/home-lawn-garden/protecting-bees-and-pollinators-pesticides-home-gardens-and-landscapes