

Stewardship Guidelines and Best Management Practices for

Soil and Foliar-applied Agricultural Neonicotinoid Insecticides

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Insecticides are valuable tools that can be used in conjunction with other insect control methods to provide effective management of insect pests, saving crops from unnecessary loss of yield and quality. If insecticides are not used in accordance with the product label, there could be damaging effects on ecosystems, water ways, beneficial insects (such as pollinators) and other non-target organisms. To minimize unintended impacts and encourage proper use, the Minnesota Department of Agriculture (MDA) has developed best management practices (BMPs) for soil and foliar applications of neonicotinoids to agricultural crops.

The BMPs address specific label restrictions, directions for use, and means of reducing effects on non-target organisms. In addition, storage, transportation, and disposal requirements are summarized.

Neonicotinoid Foliar and Soil-applied Insecticides

Neonicotinoids (e.g.: clothianidin, dinotefuran, imidacloprid, and thiamethoxam) are insecticides that can be systemically translocated throughout the plant. Neonicotinoids are used to control many insect pests including some that have developed resistance to other insecticide classes (e.g., organophosphates and pyrethroids). They are effective against a broad-spectrum of insect pests, usually lack cross-resistance with other insecticides, and have low toxicity to mammals.

The same selective toxicity properties that make neonicotinoids such a valuable pest management tool all contributes to potential impacts on beneficial non-target insects such as pollinators (wild and managed). Pollinators may be exposed to neonicotinoids via treated plants, spray drift, or surface water contamination. Like many systemic pesticides, neonicotinoid products are water soluble, making them more likely to appear in Minnesota's ground and surface waters.

BMPs for Soil and Foliar-applied Neonicotinoid Insecticides

Required (label mandated) and guideline best management practices (BMPs) allow an applicator to safely and effectively apply an insecticide to the target area. By following the BMPs laid out in this document, an applicator can maximize the benefits of the insecticide investment while reducing impacts on pollinators, other non-target organisms, and the environment. BMPs are also comprised of voluntary actions which are not required by the federal label, but can help minimize potential negative impacts. These have been developed in consultation with the University of Minnesota, the Ag community, and other stakeholders. For foliar or soil-applied neonicotinoids, the recommended BMPs are as follows.

Adopt an Integrated Pest Management (IPM) Program

- Scout and/or use population estimation methods to help determine if/when to apply insecticide or some other insect management method. See your local extension agent or independent crop consultant for more information.
- Utilize multiple, and diverse methods of control (pest-resistant varieties, chemical, cultural, and biological), when possible. By doing so, you can protect beneficial insects (including pollinators), minimize costs, and delay the development of insect resistant pests, while protecting the environment.

Follow the Product Label

- The label is the law, and should always be the final source to consult prior to applying pesticides. Labels accompanying the product must be followed for all requirements (see below for some commonly included requirements).
- Note whether directions are mandatory (“must” and “do not”) or advisory (“should”, “may”, and “recommend”).

Consider Chemical Options and Insecticides with Low Toxicity to Pollinators

- Contact insecticides (e.g. Preveathon®)¹
- Effective but with low residual activity (e.g. Nealta Miticide)¹
- Granules over spray (e.g. Acelepryn G)¹

Avoid Interactions with other Pesticides

Avoid mixing pesticides known for synergistic effects on pollinators or plant toxicity effects (information found within label), for example, trifloxystrobin fungicides (e.g. Flint or Stratego) increases thiamethoxam toxicity to bees.

Use Application Equipment Appropriately

- Check for any leaks or malfunctions prior to application and calibrate multiple times each season (pesticidestewardship.org/calibration/).
- If applying aerially, check the nozzle orientation, wing span in relation to the boom size, and make a note of local terrain (www.agaviation.org/spraynozzlemodels).

Prevent Drift

- To reduce drift and provide uniform coverage, use large nozzles which produce coarse to very coarse droplets.
- Booms must not be more than 4 feet above the canopy for most ground applications and no more than 10 feet above the canopy for most aerial applications, as stated on most labels.
- Monitor wind speed and air temperature. Application of insecticides should occur between wind speeds of 3 and 15 mph.
- Vegetative buffer zones (minimum of 10 feet wide) must be constructed and maintained along water ways at the application site. For ground application: a spray buffer zone of 25 feet between the application area and surface water is required. For aerial application, a spray buffer zone of 150 feet required between the application area and the water way.

Be Aware of Temperature Inversions

- Temperature inversions may occur when the air is stable and wind is below 3 mph.
- During inversions, temperature is cool near the ground and increases with height, resulting in little air movement and potential for long distance movement of the insecticide. The most common time for inversions is early morning and evenings.
- Northwest and Central Minnesota can monitor for inversions with NDAWN. Please visit <https://ndawn.ndsu.nodak.edu/> for more information.

Minimize Runoff

- Runoff of neonicotinoid insecticide or leaching through the soil profile can occur. Proper precautions must be taken to prevent contamination of surface waters.
- Topography, slope, soil texture, organic matter, compaction, and pH can all impact runoff of insecticides.
- Granular insecticides have high potential for runoff, if not properly incorporated into the soil properly.
- Avoid applying foliar insecticides if rain is predicted in the following 24 hours.

Avoid Exposing Pollinators to Insecticides during Application:

- Use the "three Cs": Communication, Cooperation, and Collaboration among growers, beekeepers, and other parties to reduce risk.
- A useful website, www.fieldwatch.com, allows applicators to track areas nearby where bees (or other sensitive crops) are located and provides contact information so that communication can easily take place.
- Document the need for the insecticide prior to use. Documentation of the need can provide justification of its use should an issue with the application arise.
- Follow the label requirements for certain foliar neonicotinoids. If present, along with the bee icon (pictured below) these conditions must be followed: Do not apply insecticide while pollinators are foraging in or around the application site.
- Do not apply the product until flowering is complete and all petals have fallen, unless one of the following conditions are met:
 - The application is made to the target site after sunset.
 - The application is made to the target site when temperatures are below 55°F.
 - The application is made in accordance with a government-initiated public health response.
 - The application is not made prior to notification of beekeepers. Beekeepers must be notified 48 hours prior to application in order to be allowed time to cover or move the bees.
 - The application is made due to imminent threat of significant (economic) crop loss.
- The MDA investigates bee death reports of suspected pesticide drift.



Prevent Resistance:

- Development of resistance to insecticide active ingredients by pests may occur when there are frequent, consecutive uses of products within the same insecticide mode of action group.
- In order to minimize insect resistance to insecticides:
 - Monitor pest populations and only apply the insecticide when the threat of an economic loss is reached.
 - Rotate consecutive applications with different effective modes of action, especially when a previous application did not provide the anticipated level of control. Follow resistance management strategies given on the product label.

Storage, Transportation and Disposal:

- Store pesticides in a secured area with proper diking capabilities.
- When transporting, do not place containers within the cab of the vehicle. Secure the containers and transport them in their original packaging. Pesticide Environmental Stewardship Pesticide Environmental Stewardship guidelines (pesticidestewardship.org/transportation) can provide additional information on the transportation of pesticides.
- The MDA has a pesticide disposal service which can be utilized for old or unused pesticide (www.mda.state.mn.us/pesticide-fertilizer/waste-pesticide-collection-program). For detailed information

¹ Products or trade names mentioned in this guide serve as an example and do not represent an endorsement or discrimination by the MDA.



Additional Information and References

Special Reports on Neonicotinoids and Pollinators

Special Registration Review of Neonicotinoid Insecticides
www.mda.state.mn.us/neonicsreview

How Neonicotinoids Can Kill Bees – Xerces Society

www.xerces.org/wp-content/uploads/2016/10/HowNeonicsCanKillBees_XercesSociety_Nov2016.pdf

Best Management Practices for foliar and soil-applied neonicotinoids

Best Management Practices for Pollinators
www.mda.state.mn.us/pollinators

Buffer Strips: Common Sense Conservation

www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023568

Pesticide Environmental Stewardship
pesticidestewardship.org/resistance/

50 Ways to Treat Your Pesticide – Aerial Application Edition

www.syngentacropprotection.com/env_stewardship/sustainable_ag/50_ways_aerial.pdf

USDA-ARS Aerial Spray Nozzle Models

www.agaviation.org/spraynozzlemodels

Suspect Pesticide Drift? What to do and how to prevent it from occurring

blog-crop-news.extension.umn.edu/2017/06/suspect-pesticide-drift-what-to-do-and_21.html

Miscellaneous

Pesticide Investigation into Honey Bee Death:

www.mda.state.mn.us/beekillcompensation

Insecticide Resistance Action Committee

www.iraac-online.org/modes-of-action/

Transportation of Pesticides

pesticidestewardship.org/transportation