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Best Management Practices (BMPs) for
Bee Health in the Horticultural Industry

Version 1.0



Horticultural
Research Institute
The AmericanHort Foundation

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Acknowledgements

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Mission

The mission of the Horticultural Research Institute is to direct, fund, promote and communicate horticultural research, which increases the quality and value of plants, improves the productivity and profitability of the horticulture industry, and protects and enhances the environment.

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Introduction

Pollinators as a whole encompass a diverse population of thousands of different species, such as managed honey bees, wild bees, butterflies, birds, and bats. Protection of pollinators in general, especially bees, continues to be a major concern among the general public and within the green industry. Several culprits have been identified as factors contributing to managed honey bee losses, including Varroa mites, other pests/diseases of bees, loss of habitat and nutrition, and off-target effects of pesticides. Alternatively, wild, unmanaged bee populations are most greatly affected by landscape changes and habitat degradation.

In 2015, the Horticultural Research Institute (HRI) recognized the need for sound research to develop best production and management practices, educate, and empower the green industry. HRI, in collaboration with AmericanHort, continues to directly fund and leverage research to refine science-based guidance on horticultural practices and protecting bee and pollinator health. As part of the broad-based Horticulture Industry Bee & Pollinator Stewardship Initiative that includes industry and consumer outreach and the establishment of industry best practices, HRI has directly funded four important research projects, launched the Grow Wise, Bee Smart website, and joined the Million Pollinator Garden Challenge campaign. These projects are a continuation of HRI's longstanding commitment to fostering new information relevant to horticultural practices, techniques, and principles.

Updates to these recommendations will be made as additional research results regarding bee and pollinator health are released.

While the green industry is diverse, some common threads exist among greenhouse and nursery production and landscape management when pollinator safety is concerned.

🍷 Greenhouse and Nursery Production

Research is underway to assess risks to bee pollinators from the use of systemic insecticides in plant production. For example, a multi-year, multi-state federal grant was awarded to researchers to develop best management practices in the green industry. It is currently unclear how quickly systemic pesticides move from the treated area to pollen and/or nectar, how long their residues persist, and at what level residues may pose risk to bees. This group will further create a database of bee pollinator attractive plants to better guide use of systemic pesticides. Until this information is fully developed, some basic guidelines to plant production were crafted based on initial research results:

- Consider using Integrated Pest Management (IPM) strategies for pest control and avoid unnecessary preventive applications when possible. IPM focuses on pest prevention through inspections to identify pests of concern, monitoring of pest populations, and record keeping. Should pest populations approach unacceptable levels, tactics such as chemical, biological, cultural, and mechanical control are deployed for pest management. The goal is to better predict pest problems and reduce unnecessary use of pesticides.
- Avoid spraying pollinator-attractive plants with systemic insecticides toxic to bees the last three weeks before shipping and sale. Products that EPA deems potentially hazardous to bees are labeled with a Bee Advisory Box and feature a honey bee in a diamond shape. Also consult the 'Do Not' section of pesticide labels. In some instances, pesticides with a lower intrinsic toxicity to bees are available to use.
- Always read and follow label instructions and application restrictions. The label is the law, and these directions are intended to protect pollinators. This is true for all pesticides.
- Some alternative products that can be used the final three weeks of production include acetamiprid, Beauveria bassiana, Bacillus thuringiensis, insecticidal soap, and horticultural oils.
- Do not treat pollinator-attractive plants with a basal drench of clothianidin, dinotefuran, imidacloprid, or thiamethoxam.
- Do not apply product to blooming, pollen-shedding, or nectar-producing parts of plants if bees may be foraging during this period.
- Minimize direct exposure to foraging pollinators.

🍷 Woody Ornamentals

The list of woody plants that have both pests treated with neonicotinoids and are attractive to bee pollinators is relatively short. For example, Knock Out® and hybrid tea roses, boxwoods, and azaleas are often treated with pesticides, including neonicotinoids, but attract very few bees. Plants such as linden, single petal rose varieties, crape myrtle, crabapple, hawthorn, holly, and a few others, should not be treated with systemic neonicotinoids. These plants are highly attractive to bees, and early research has indicated that pesticide residues in nectar may be toxic to bees, even when applications were made the prior growing season. If neonicotinoid systemic insecticides must be used, pruning of flower buds prior to application will reduce bee pollinator exposure.

Additional work, by many different partners, is being done to better quantify residues and identify bee pollinator networks with ornamentals.

For management of established plants in the landscape, consider:

- Before treating the plant, determine its level of bee pollinator attractiveness.
- As a guideline, plants not highly attractive to bee pollinators include:
 - Wind pollinated plants, such as ash
 - Fly pollinated plants, such as boxwood
 - Have double flowers, such as 'Kwanzan' cherry
 - Have showy sterile florets, such as some big leaf hydrangeas
 - Have inaccessible pollen and nectar, such as hybrid tea roses
- If you are in doubt or uncertain that plants are highly attractive to bee pollinators, and the plants must be treated with an insecticide,
 - Do not treat during the bloom period.
 - Consider using an insecticide with lower toxicity to bee pollinators and/or shorter residual (see above for examples).
 - Employ IPM strategies.

In urban environments, loss of habitat and a lack of good foraging sources contribute significantly to bee pollinator decline. The green industry is primed to improve urban landscape diversity with plants that both attract and serve as a source of good nutrition for bee pollinators. Seek to diversify the landscape with bee pollinator attractive plants that are also virtually pest free (and therefore pesticide free!), such as St. John's wort, Clethra, dwarf fothergilla, Itea, glossy abelia, Vitex, seven sons flower tree, and Caryopteris. These will be regionally specific. A mix of plants that flower throughout the entire growing season is key to increasing habitat and floral resources.

BMPs are intended to inform horticulture professionals about the green industry's impact on bee health. Through the use of BMP guidelines, horticulture can continue to play an important role in pollinator health.

There is no question that horticulture is beneficial to bees and pollinators. After all, the best way to support bees is to plant healthy and bee-friendly plants. Professional growers of tree, plants, and flowers provide the very thing pollinators need to thrive: diverse and ample sources of forage.

🔗 Managed Landscapes

Lawn maintenance encompasses the majority of landscape services, and grub control is often needed. Neonicotinoids are commonly used for grub control. Many flowering turf weeds attract bee pollinators, such as clover and dandelions. These two in particular are highly attractive to bees and provide valuable nutrition. Under certain circumstances, grass flowers can attract bees as well.

There are some steps landscape managers can take to reduce bee pollinator hazards in lawn situations, such as:

- Do not apply pesticides toxic to bee pollinators on lawns with flowering clover, dandelions, and/or other flowering weeds.
- Chlorantraniliprole is an alternative to neonicotinoids that effectively controls grubs and features low bee toxicity.
- Some customers may be open to education about alternative lawn management practices that encourage bee habitat. In this case, pesticide choice should consider bee pollinator safety.
- If controlling grubs with neonicotinoids, control flowering lawn weeds with herbicides before applying turf insecticides. Alternatively, mow off weed flower heads before or immediately after applying liquid applications of neonicotinoids and/or pyrethroids.
- Granular turf insecticide products are less hazardous to bee pollinators than liquids. This includes neonicotinoids.
- Grub treatments should be watered-in as soon as possible after application to reduce exposure to bee pollinators.

Professional growers of trees, plants, and flowers have been stewards of the environment and champions of sustainable practices for generations. We know and grow plants. They are our passion. We work to provide the best plants and information to the buying public.

🔗 In Conclusion

Everything we do has an impact on something else, and nothing is absolute. When it comes to deciding whether or not to treat a plant with an insecticide that may be hazardous to managed honey bees or other bee pollinators, a cost-benefit analysis should be considered.

If the pest management concern is great enough, even bee pollinator attractive plants may need to be treated with a hazardous insecticide. The potential of exposure should be considered. A good example is emerald ash borer (EAB). Ash trees are wind pollinated, yet bees are known to collect pollen from ash if other pollen sources are scarce. However, certain invasive pests, such as EAB, must be treated, or ash trees will die. A common EAB treatment includes neonicotinoid insecticides. Certain insecticides, neonicotinoids in particular, have great value in preventing the introduction and further spread of invasive species to gardens and landscapes. Neonicotinoid insecticides have many benefits, including broad spectrum control and a positive worker safety profile. In some instances, a neonicotinoid is the product of choice for insect pest control. If one is used (or other insecticides for that matter), steps can be taken to better ensure bee pollinator safety.

🔗 Other resources:

Grow Wise, Bee Smart:
<http://www.growwise.org>

Million Pollinator Garden Challenge
<http://www.millionpollinatorgardens.org>

Protecting and Enhancing Pollinators in the Urban Landscape, for the US North Central Region; Dr. Dave Smitley; Michigan State University Extension Bulletin E3314.

Pollinator Partnership:
<http://www.pollinator.org>

The Horticultural Research Institute, the AmericanHort Foundation, proudly supports scientific research and students for the advancement of the horticultural industry.

HRI's work strengthens and improves the horticulture community for the benefit of all industry segments and our professional collaborators.



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HEART. RESULTS. INNOVATION.

As the research affiliate of AmericanHort, the Horticultural Research Institute responds to the research needs of the green industry through its competitive grants program and indirectly through partnerships with other green industry associations and government agencies.

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