Neonicotinoid Facts for the Landscape Industry

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For the past decade neonicotinoid insecticides, such as imidacloprid and dinotefuran, have been an essential part of landscape and turfgrass pest management programs because of the wide range of common pests they control. These products have been widely adopted due to their ease of use, relatively low price and safety to the general public. Unfortunately, use of these products in the agricultural sector as seed treatments has caused concern about their impact on the health of pollinators. Several unfortunate and widely publicized events, including the death of bumble bees foraging on linden trees have placed neonicotinoid use at the forefront in newspaper articles about the causes of pollinator decline. This, along with a market basket survey in June 2014 that found residues of these pesticides in flowers at levels that could be toxic to bees has made the use of neonicotinoids unpopular among consumers. With stores like Home Depot announcing that it will require plants in their stores to be labeled as treated with a neonicotinoid in 2015, you can be sure that this will be a hot button issue next season with your customers.

At a September 2014 meeting of ornamental researchers, the following facts have become clear:

1. Neonicotinoid insecticides are toxic to bees at low doses on flowering plants. These products have the capacity to kill bees outright, or make them disoriented and unable to return to the hive. When worker bees fail to return, colonies die from lack of food.
2. Although bee researchers agree that neonicotinoid use can contribute to bee decline, Varroa mites, and other maladies are more important contributors to what has been commonly called colony collapse disorder (CCD). Evidence for this largely comes from observations that suggest that CCD started before the widespread use of neonicotinoid insecticides.
3. Not nearly enough research has been be conducted to show that the use of neonicotinoids in greenhouses produces plants that are safe, or toxic to bees because it is quite expensive, costing over $100,000 to evaluate an individual plant and growing practice. The few rigorous studies (Krischik 2011) that have been conducted suggest that use of products like Marathon at the labeled rate (300 mg/ 3 gal pot) result in toxic levels of imidacloprid in the nectar of Agastache, Asclepias, and Esperanza, as well as in the pollen of roses. The impact of these levels on pollinator health depend on the proportion of floral resources available to pollinators in the landscapes in which these plants are planted.
4. In the absence of hard data, and in the presence of a media storm that continues to connect the use of neonicotinoids to CCD, it is very likely that regulatory changes and customer demands will reduce the ability of nursery and greenhouse producers to sell plants treated with neoniconitoids in the future.

General Guidelines: Clearly, honeybees, bumble bees and their wild relatives provide vital services to the environment and are critical to safeguard our food supply. Any insecticide that can kill a wasp, will kill a bee. This includes a wide majority of the insecticides on the market today. A careful read of any insecticide label will include a warning that prohibits product use where bees are actively foraging. For most insecticides, this means flowers should not be sprayed with insecticides during the day when bees are actively foraging. But to be really safe, it is important not to apply foliar pesticides to any plant that is flowering, since residues can also be toxic. Because soil applications of neonicotinoid pesticides can be long lasting it is important to use the following guidelines.

DO NOT apply neonicotinoids:

1. To the soil of annual and perennial flower beds. Many other short-lived products are available that can be applied to the foliage to protect these plants from caterpillars, aphids and chewing beetles.
2. On flowering trees and shrubs until after the plant has stopped flowering. If a neonicotinoid must be used on a flowering tree or shrub, it is best to use one that has a lower toxicity to bees like acetamiprid (Tri-star). Although dinotefuran is more soluble than other neonics and shorter lasting in its effectiveness against pests, like emerald ash borer, the ability of this compound to persist in the flowers of trees one year after application is not known.

DO apply neonicotinoids:

1. To nonflowering trees and shrubs. This includes most pines, junipers, spruce and other conifers.
2. To wind pollinated plants, such as ash and birch, where neonics are important tools for managing key pests like emerald ash borer and bronze birch borer.

Please review attached table 1 for the kinds of insects killed by neonicotinoids. Then refer to attached table 2 for alternatives to these compounds. Please note that these tables refer to insects by common name of their taxonomic group. For specific pests, please see the listings for individual pests in the Purdue Plant Doctor Series at https://www.purdueplantdoctor.com/

Background Reading

Gardeners Beware 2014: Bee-toxic pesticides found in “Bee-Friendly” plants sold at garden centers across the US and Canada. Although this study does not demonstrate that plants in the landscape are the cause of CCD it raises many questions. It also has a very good bibliography of much of the research that has been published in scientific journals.
http://libcloud.s3.amazonaws.com/93/88/f/3354/Gardeners-Beware-Report-11.pdf

Table 1. Common arthropod pests killed by neonicotinoids on landscape plants[1.]

Trade names	Active Ingredient	Class	Caterpillars	Sawflies	Beetle grubs	Beetle adults	Aphids	Scales	Lace bugs	Thrips	Spider Mites	Flies
Tri-Star	Acetamiprid	Neonicotinoid		x	x	x	x	x	x	x		x
Aria, Arena	Clothianidin	Neonicotinoid		x	x	x	x	x	x	x		x
Merit, Xytect, others	Imidacloprid	Neonicotinoid		x	x	x	x	x	x	x		x
Safari	Dinotefuran	Neonicotinoid	x	x	x	x	x	x	x	x		x

[1.] For specific pests, please see the listings for individual pests in the Purdue Plant Doctor Series at https://www.purdueplantdoctor.com/

Table 2. Alternative chemistries to neonicotinoids for key arthropod pests of landscape plants. [1]

Trade names	Active Ingredient	Class	Caterpillars	Sawflies	Beetle grubs	Beetle adults	Aphids	Scales	Lace bugs	Thrips	Spider Mites	Flies
Avid	Avermectin	Avermectin	x	x	x	x	x	x	x	x	x	x
Tree-Age, Arbormectin	Emamectin Benzoate	Avermectin	x	x	x	x	x					
Neem oil	Neem oil	Botanic	x	x			x	x	x		x	
Sevin	Carbaryl	Carbamate	x	x	x	x						x
Mesurol	Metaldehyde	Carbamate					x			x		
Floramite	Bifenazate	Carbazate									x	
Hexagon	Hexythiazox	Carboxamide									x	
Azatrol, Azatin	Azadirachtin	Insect growth regulator	x	x			x	x				x
Dimilin	Diflubenzuron	Insect growth regulator	x									x
Provaunt	Indoxacarb	Insect growth regulator	x	x								
Distance	Pyriproxyfen	Insect growth regulator					x	x				
Confirm	Tebufenozide	Insect growth regulator	x									
Forbid	Spiromesefin	Keto-enol					x				x	
Thuricide	Bacillus thuringiensis(K)	Microbial	x									
Conserve	Spinosad	Microbial	x	x						x		x
Oil	Horticultural oil	Oil	x	x			x	x	x	x	x	
Orthene, Precise	Acephate	Organophosphate	x	x	x	x	x	x	x	x	x	x
Diazinon	Diazinon	Organophosphate	x	x	x	x	x	x	x	x		x
Malathion	Malathion	Organophosphate	x	x	x	x	x	x	x	x		x
Talstar, Onyx + more	Bifenthrin	Pyrethroid	x	x	x	x	x	x	x	x	x	x
Tempo	Cyfluthrin	Pyrethroid	x	x	x	x	x	x	x	x		x
Deltaguard	Deltamethrin	Pyrethroid	x	x	x	x	x	x	x	x		x
Mavrik	Fluvalinate	Pyrethroid	x	x	x	x	x	x	x	x	x	x
Scimitar, Battle	Lambda-cyhalothrin	Pyrethroid	x	x	x	x	x	x	x	x	x	x
Astro, Perm-x	Permethrin	Pyrethroid	x	x	x	x	x	x	x	x	x	x
Pyrethrin	Pyrethrin	Pyrethroid	x	x	x	x	x	x	x	x	x	x
Resmethrin	Resmethrin	Pyrethroid	x	x	x	x	x	x	x	x	x	x
Acelepryn	Chlorantraniliprole	Ryanidine Inhibitor	x	x	x		x		x			x
Insecticidal soap	Insecticidal soap	Salt of fatty acid	x	x			x	x	x	x	x	

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