Growing Flowering Plants That are Safe for Pollinators in the Yard and Garden
David Smitley, September 30, 2014
Michigan State University

A type of native bee, one of 4,000 spp. of native bees in the USA.

Neonicotinoid Insecticides Used for Pest Control on Ornamentals

<table>
<thead>
<tr>
<th>Neonicotinoid Insecticides Used for Pest Control on Ornamentals</th>
<th>Honey bees</th>
<th>Honey bees</th>
<th>Bumble bees</th>
<th>Bumble bees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute level</td>
<td>Chronic level</td>
<td>Acute level</td>
<td>Chronic level</td>
</tr>
<tr>
<td>Acetamiprid</td>
<td>442,000</td>
<td>ND</td>
<td>5,000</td>
<td>ND</td>
</tr>
<tr>
<td>Clothianidin</td>
<td>&gt;190</td>
<td>ND</td>
<td>24</td>
<td>ND</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>&gt;380</td>
<td>ND</td>
<td>24</td>
<td>ND</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>1.0 - 10</td>
<td>ND</td>
<td>120</td>
<td>ND</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>&gt;250</td>
<td>ND</td>
<td>50</td>
<td>ND</td>
</tr>
</tbody>
</table>

1From the 2012 Xerces Society Report: 'Are Neonicotinoids Killing Bees?'

How Neonicotinoids and Bees Became a Crisis for Greenhouse and Nursery Growers: the Last 16 Months

Start: June 20, 2013
Buzzkill: Huge bee die-off in Oregon parking lot blamed on insecticide spraying
- 25,000 dead bumble bees and honey bees found in the parking lot of the Wilsonville Target Store
- Linden trees in full bloom had been sprayed with Safari (dinotefuran)

- Scott Hoffman Black, executive director of the Xerces Society, said he has confirmed the bees died from pesticide poisoning. "Evidently they didn’t follow the label instructions. This should not have been applied to the trees while they’re in bloom.”

Feb 2014
Organic Consumers Association Website

Bee Science Articles
02/11/14 - GMO Soybeans Are Bad for Mexico’s Beekeepers
02/20/12 - Study Says Insecticide Used with GM Corn Toxic to Bees
01/21/11 - Call to Ban Pesticides Linked to Bee Deaths
12/24/08 - Bee Learning Affected by Eating Toxin from GE Corn
08/26/08 - New Research Finds Higher-Than-Expected Levels of Pesticides in Hives
05/08/08 - Honeybee Hives in U.S. Seeing Continued Decline
05/05/08 - Air Pollution Impedes Bees’ Ability to Find Flowers
09/07/07 - Study Points to Virus in Collapse of Honeybee Colonies
05/04/07 - What’s The Buzz? Scientists Explore Pesticide Poisoning of Bees
04/26/07 - Requiem for the Honeybee

February 7, 2014
Join One of these Five Home Depot ‘Swarms’ to Help Save the Bees! Organic Consumers Association

For related articles and more information, please visit OCA’s Honey Bee Health page and our Millions Against Monsanto page.

If you live in Eugene, Ore., the Bay Area ( Calif.), Minneapolis, Minn., Washington D.C., or Chicago, Ill., you’re in luck. You can join activists from the OCA and other bee-friendly groups to help deliver valentines to local Home Depot store managers with this message: "Give Bees Some Love! Stop Selling Bee-Killing Plants!" You can download your valentine, and add your own personal message. We even have buttons you can print and hand out.
March 2014

Buyers from Home Depot and Lowes contact nursery and greenhouse growers to announce that they may NOT be accepting plants treated with neonicotinoid insecticides, or that treated plants will need to be labeled.

How can they do that?

The large retail stores control the lion-size of the flower and nursery market. Contracts with these buyers are highly competitive and may involve millions of dollars in sales per year.

May 2, 2014

A New Documentary Film Exploring "Colony Collapse Disorder" and the Fate of Agriculture

May 9, 2014

Harvard School of Public Health > News > Press Releases

Study strengthens link between neonicotinoid and collapse of honey bee colonies (by Dr. Lu)

For immediate release: May 9, 2014
Boston, MA — Two widely used neonicotinoids—a class of insecticide—appear to significantly harm honey bee colonies over the winter, particularly during colder winters, according to a new study from Harvard School of Public Health (HSPH). The study replicated a 2012 finding from the same research group that found a link between low doses of imidacloprid and Colony Collapse Disorder (CCD), in which bees abandon their hives over the winter and eventually die.
May 2014. 2nd Lu paper receives a lot of attention in the media


Discussion of Lu papers

In a recent review, Cresswell suggests that “the field-realistic range of imidacloprid concentrations is assumed to be 0.7–10 μgL⁻¹ (ppb).” Dosages in first Lu paper: 20, 40, 200, or 400 ppb fed constantly to bees in sugar water. Also, symptoms of affected colonies may not match CCD. Dosage in second Lu paper: 136 ppb fed constantly to bees in sugar water.

Concentration of imidacloprid or clothianidin in sugar water fed to bees continuously for 13 weeks is much higher than what is expected in the pollen of seed-treated field crops. But overall, these results are consistent with other papers where bees are fed neonicotinoid tainted sugar water.

June 2014

Gardeners Beware 2014: Bee-Toxic Pesticides Found in “Bee-Friendly” Plants Sold at Garden Centers Across the U.S. and Canada

©Copyright June 2014 by Friends of the Earth

Report Summary (of a 60 page report):

- Plants were purchased from retail nurseries, including Home Depot, Lowe’s, Walmart, and Orchard Supply Hardware in 18 cities across the U.S., as well as three provinces in Canada.
- They then sent the plants off to a laboratory to measure the presence and concentration of pesticides in the greenery.
- Testing showed that 51 percent of store-bought plants had levels of a group of harmful pesticides known as neonicotinoids that were high enough to kill honey bees, bumble bees, and other pollinators outright.

Table 2. Summary of imidacloprid concentrations detected in flowers collected from various bottlebrush and mint, and plants for the seeds of seedless watermelons

<table>
<thead>
<tr>
<th>Location</th>
<th>Shasta Daisy</th>
<th>Gerbera Daisy</th>
<th>English Daisy</th>
<th>Overall</th>
<th>Imidacloprid Equivalent Conc. (μg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>10</td>
<td>43</td>
<td>1,775</td>
<td>532</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>283</td>
<td>123</td>
<td>598</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>34</td>
<td>123</td>
<td></td>
<td>157</td>
<td></td>
</tr>
<tr>
<td>ME</td>
<td>5</td>
<td>123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA</td>
<td>40</td>
<td>588</td>
<td></td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

180 ppb, acute
50 ppb, chronic

Salvia

<table>
<thead>
<tr>
<th>Location</th>
<th>Flowers</th>
<th>Stones &amp; Leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN</td>
<td>19</td>
<td>59</td>
</tr>
<tr>
<td>GA</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>DC</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>BC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Imidacloprid Equivalent Conc. (μg/kg)

Gardeners Beware 2014: Bee-Toxic Pesticides Found in “Bee-Friendly” Plants Sold at Garden Centers Across the U.S. and Canada

©Copyright June 2014 by Friends of the Earth

Report Summary (of a 60 page report):

- Plants were purchased from retail nurseries, including Home Depot, Lowe’s, Walmart, and Orchard Supply Hardware in 18 cities across the U.S., as well as three provinces in Canada.
- They then sent the plants off to a laboratory to measure the presence and concentration of pesticides in the greenery.
- Testing showed that 51 percent of store-bought plants had levels of a group of harmful pesticides known as neonicotinoids that were high enough to kill honey bees, bumble bees, and other pollinators outright.

Table 2. Summary of imidacloprid concentrations detected in flowers collected from various bottlebrush and mint, and plants for the seeds of seedless watermelons

<table>
<thead>
<tr>
<th>Location</th>
<th>Shasta Daisy</th>
<th>Gerbera Daisy</th>
<th>English Daisy</th>
<th>Overall</th>
<th>Imidacloprid Equivalent Conc. (μg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>10</td>
<td>43</td>
<td>1,775</td>
<td>532</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>283</td>
<td>123</td>
<td>598</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>34</td>
<td>123</td>
<td></td>
<td>157</td>
<td></td>
</tr>
<tr>
<td>ME</td>
<td>5</td>
<td>123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA</td>
<td>40</td>
<td>588</td>
<td></td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

180 ppb, acute
50 ppb, chronic

Salvia

<table>
<thead>
<tr>
<th>Location</th>
<th>Flowers</th>
<th>Stones &amp; Leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN</td>
<td>19</td>
<td>59</td>
</tr>
<tr>
<td>GA</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>DC</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>BC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Imidacloprid Equivalent Conc. (μg/kg)
Questions Raised

- Is the widespread use of imidacloprid and other neonicotinoids causing the decline of managed honey bees? Impact on butterflies?
- Are flowering plants sold in garden centers harmful to bees because of the use of pesticides during production?

Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields
Christian H. Krupke1,*, Greg J. Hunt1, Brian D. Eitzer2, Gladys Anderson3,1, Kriyan Goven4,1

1 Department of Entomology, Purdue University, West Lafayette, Indiana, United States of America
2 Department of Analytical Chemistry, The Connecticut Agricultural Experiment Station, New Haven, Connecticut, United States of America

- Most of the 92 million acres of corn planted across the U.S. this year will have been treated with either clothianidin or thiamethoxam as a seed treatment.
- Plants visited by foraging bees (dandelions) growing near these fields were found to contain neonicotinoids.
- Dead bees collected near hive entrances during the spring sampling period were found to contain clothianidin.
- We also detected clothianidin in pollen collected by bees and stored in the hive.
- Maize pollen from treated seed was found to contain clothianidin (3.5 ppb) and other pesticides; and honey bees in our study readily collected maize pollen.

Negative Effects of Neonicotinoids on Honey Bees

Several Key Papers Demonstrate Negative Effects of Neonicotinoids on Honey Bees

Insecticides can Harm Honey Bees

When neonicotinoids are applied to crops, they are often labeled for use only by professional applicators, but beekeepers have been using them without such restrictions. A new study suggests that neonicotinoids, which are commonly applied to corn and other crops, may be harmful to bees, even at levels below the legal limits. The study found that honey bees living near fields treated with neonicotinoids had significantly reduced colony size and activity levels compared to bees living in areas not treated with the insecticides. The researchers recommend that future studies should focus on understanding the effects of neonicotinoids on honey bee populations and developing alternative pesticides that are safer for bees and the environment.
As the use of neonics increased by 0.8 million pounds from 1995 to 2009, the use of carbamates and organophosphates decreased by 20 million pounds. Randy Oliver
Dietary traces of neonicotinoid pesticides as a cause of population declines in honey bees: an evaluation by Hill’s epidemiological criteria

James E Cresswell1,*, Nicolas Desneux2 and Dennis vanEngelsdorp3

Pest Management Science
Volume 68, Issue 6, pages 819–827, June 2012

* 72 papers cited. Most of them are journal articles report the results of experiments with bees that relate to the neonic pesticide issue directly or indirectly.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Brief description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Experimental evidence</td>
<td>Mixed results</td>
<td>−1</td>
</tr>
<tr>
<td>2. Coherence</td>
<td>Fails to contradict established knowledge</td>
<td>+3</td>
</tr>
<tr>
<td>3. Plausibility</td>
<td>Probable given established knowledge</td>
<td>+2</td>
</tr>
<tr>
<td>4. Analogy</td>
<td>Similar examples known</td>
<td>+3</td>
</tr>
<tr>
<td>5. Temporality</td>
<td>Cause precedes effect</td>
<td>−4</td>
</tr>
<tr>
<td>6. Consistency</td>
<td>Cause is widely associated with effect</td>
<td>−4</td>
</tr>
<tr>
<td>7. Specificity</td>
<td>Cause is uniquely associated with effect</td>
<td>−5</td>
</tr>
<tr>
<td>8. Biological gradient</td>
<td>Monotonic dose–response relationship</td>
<td>−4</td>
</tr>
<tr>
<td>9. Strength</td>
<td>Cause is associated with a substantive effect</td>
<td>−2</td>
</tr>
</tbody>
</table>

CONCLUSION: Dietary neonicotinoids cannot be implicated in honey bee declines, but this position is provisional because important gaps remain in current knowledge.

The United Kingdom Report
An assessment of key evidence about Neonicotinoids and bees
March 2013
• Three recent studies with neonicotinoids showed sub-lethal effects on bees
• These results contrast with a growing body of evidence from field studies that fail to show an effect of neonicotinoids when bees are allowed to forage naturally in the presence treated crops.

The Australia Report
Overview report on bee health and the use of neonicotinoids in Australia
February 2014
• The introduction of the neonicotinoids has led to an overall reduction in the risks to the agricultural environment from the application of insecticides.
• Australian honeybee populations are not in decline, despite the increased use of neonicotinoids in agriculture and horticulture since the mid-1990s.

USDA Bee Research Lab
Extensive research on Colony Collapse Disorder suggests that there are many causes of this syndrome, with the most important causes being the interaction of several bee diseases with other stressors (USDA ARS 2014). At this time neonicotinoids are NOT considered to be a primary cause of Colony Collapse Disorder. However, recent research indicates that bees exposed to neonicotinoid insecticides may have suppressed immune systems, which could make them more susceptible to some bee diseases (Di Prisco et al. 2013).

Bee Lab Objectives:
1) diagnosing and mitigating disease, 2) reducing the impacts on bees of pesticides and other environmental chemicals, and 3) improving bee health through better nutrition

What do the Beekeepers Think?
http://scientificbeekeeping.com
Randy Oliver

As Dr. Eva Crane…has pointed out “the best that beekeepers can hope for, in the light of the great need to kill pest insects, is an acceptable level of mortality among their bees.”

Beekeepers realize that in order to get locations, that they need to get along with the landowners, who are often farmers (or friends of the farmers). If the beekeeper raises a stink, he may lose his welcome. So in general, commercial beekeepers accept the occasional bee kill as a normal cost of doing business.

Figure 2. If you add up all the blue dots (each representing 10,000 acres treated with insecticides), it’s easy to see why in some areas it’s hard for beekeepers to find “safe” places for their hives. Source USDA.
http://scientificbeekeeping.com  Randy Oliver
Honey yield per hive in Iowa, where GM crops are most intensively used, 1974 – 2010. Randy Oliver

Overall: How much do trace amounts of neonic in the pollen and nectar of crops planted with treated seed impact bees? Unresolved. An equivalent concentration in sugar water fed to bees causes problems. Pesticide study found clothianidin in bee pollen, but field data showing decline of colonies due to seed-treated field crops is still lacking.

What about planter box dust during planting? Definitely a problem if bees visit weed flowers along the edge of field at planting time or shortly after.

What About Neonic/DMI Synergism?

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Fungicide pretreatment</th>
<th>LD50 (µg/bees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetamiprid</td>
<td>None</td>
<td>7.07</td>
</tr>
<tr>
<td>Acetamiprid</td>
<td>Propiconazole</td>
<td>0.07</td>
</tr>
<tr>
<td>Thiacloprid</td>
<td>None</td>
<td>14.6</td>
</tr>
<tr>
<td>Thiacloprid</td>
<td>Propiconazole</td>
<td>0.03</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>None</td>
<td>0.018</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>Propiconazole</td>
<td>0.012</td>
</tr>
</tbody>
</table>

• DMI pretreatment makes Acetamiprid and Thiacloprid as toxic to bees as Imidacloprid (otherwise they are 200-fold less toxic).
• Little effect on Imidacloprid

Beekeeper Survey - 2011 Winter Loss Report for Apiculture in Ontario

Based on research from the University of Guelph (Guzman et al., 2010) and reports and field observation from other provinces (Currie et al., 2010), varroa is still the main factor in colony mortality. The overall virulence of Nosema ceranae in honey bees is somewhat unclear and there are many other pathogens such as viruses that have a further impact on honey bees.

Paul Kozak
Provincial Apiarist
Ontario Ministry of Agriculture, Food and Rural Affairs
Email: Paul.Kozak@ontario.ca

What is Nosema? A protozoan in honey bees that is associated with colony collapse disorder. It is spread by varroa mites and can be controlled by managing varroa populations. It is not a direct cause of colony collapse disorder and is not the main factor in colony mortality. Other factors include pesticides, disease, parasites, and stress from other management practices.

What is Varroa? A mite that attacks honey bees and is associated with colony collapse disorder. It is not a direct cause of colony collapse disorder and is not the main factor in colony mortality. Other factors include pesticides, disease, parasites, and stress from other management practices.

What is Nosema? A protozoan in honey bees that is associated with colony collapse disorder. It is spread by varroa mites and can be controlled by managing varroa populations. It is not a direct cause of colony collapse disorder and is not the main factor in colony mortality. Other factors include pesticides, disease, parasites, and stress from other management practices.

What is Varroa? A mite that attacks honey bees and is associated with colony collapse disorder. It is not a direct cause of colony collapse disorder and is not the main factor in colony mortality. Other factors include pesticides, disease, parasites, and stress from other management practices.

Investigation of honey bee winter mortality in Ontario

Figure 1: Estimated mortality of honey bees in Ontario. The light colored horizontal bar represents the normal level of mortality derived from a literature review.

Figure 4: A bee kill in an almond orchard this spring. Surprisingly, no neonicotinoids were involved! These bees were killed by a tank mix of herbicides, spray oil, and liquid fertilizer. A number of colonies were killed outright and others were weakened. http://scientificbeekeeping.com Randy Oliver
What about endangered species of butterflies?
Example: The Poweshiek Skipperling

Recent Activity of Poweshiek Skipperling

So, the role of neonicotinoids in causing bee decline is being intensely debated and researched without a clear answer at this point.

But it doesn’t matter – the public eye has been focused on garden center plants, and we need to grow plants that are safe for bees and other pollinators.

Note: Greenhouses in Europe are exempt from the temporary ban on neonicotinoids.
What Do We Know About the Safety of Neonics Used on Greenhouse and Nursery Plants?

- Two studies with ladybird beetles and butterflies on soil drenched nursery plants by Vera Krischik
- Two studies with clover in turf by JL Larson, CT Redmond, DA Potter
- Two experiments with greenhouse-grown flowers for garden centers by Smitley

Landscape rates of soil-applied imidacloprid translocated to flowers reduces survival of Coleomegilla, Hippodamia, and Coccinella ladybeetles, but not Harmonia ladybeetles, Danaus plexippus, and Vanessa cardui, butterflies.

Vera A. Krischik, Mary Rogers, Garima Gupta, and Aruna Varshey

- Survival and fecundity of both butterfly species was not reduced in free-ranging or force-fed experiments (0 ppm (C), 15 ppm (1X), or 30 ppm (2X) imidacloprid) experiments.
- However, butterfly larval survival was significantly reduced on 1X and 2X imidacloprid treatments.
- Three (Coleomegilla maculata, Harmonia axyridis, and Hippodamia convergens) of the four lady beetle species had significantly reduced survival at day 12 from both 1X and 2X treatments.

Objectives of Potter Study

- Evaluate hazards of lawn insecticides to bees in the field
- Find ways to reduce the risks of harm

Assessing Insecticide Hazard to Bumble Bees Foraging on Flowering Weeds in Treated Lawns

Jonathan L. Larson, Carl T. Redmond, Daniel A. Potter*
Department of Entomology, University of Kentucky

Results of Kentucky Study

When bumble colonies were caged 24 h after turfgrass with clover was sprayed, and kept their for 2 weeks:

- For Clothianidin - the number of foraging bees was reduced by 75% and no new queens produced (compared with 35 queens in control plots)
- For chlorantraniliprole (Acelepryn) - No difference from control treatment
- For lawns mowed before spraying - No effect on the bees

For Garden Center Plants:

What are the biggest potential problems for bees if neonicotinoids are used?

- Spraying open flowers during the last few weeks before shipping (with any insecticide).
- Soil drenches in greenhouses with imidacloprid, primarily used in hanging baskets
- Soil drenches of flowering trees (Tilia) in nurseries or in yards for Japanese beetle, etc.

Three Experiments With Greenhouse and Nursery Plants

1. Evaluate the impact of an imidacloprid soil drench applied to 12” diameter hanging baskets
2. Determine the amount of dislodgable residue of imidacloprid on flowers purchased in a garden if the flowers received a foliar spray of imidacloprid at 1, 2 and 4 weeks prior to the shipping date.
3. Determine the impact of an imidacloprid soil drench applied around the base of Tilia trees after petal-fall on bumble bees the following year.

Methods:

- Hanging baskets were drenched at 4 weeks before shipping
- 5 weeks after the drench plants were put in screen cages with colonies of bumble bees
- Bumble bees remained in screen cages for 3 weeks
- Colonies were counted three times, at 1, 3 and 6 weeks after being put in screen cages
The only way to count bumble bees is to paint each one when it is counted!

Counting bumble bees in the cold room with a red light

Bumble Bees Per Colony After Soil Drench With Imidacloprid or Water (Control)

<table>
<thead>
<tr>
<th>Date</th>
<th>Treatment</th>
<th>Number of Bees Counted Per Colony</th>
<th>New Queens Produced Per Colony</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 14</td>
<td>Imidacloprid</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>July 14</td>
<td>Control</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>July 28</td>
<td>Imidacloprid</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>July 28</td>
<td>Control</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>August 18</td>
<td>Imidacloprid</td>
<td>22</td>
<td>0.6</td>
</tr>
<tr>
<td>August 18</td>
<td>Control</td>
<td>18</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Results:
- No significant differences in the total number of bees counted on any sample date
- No differences in number of queens produced at the end of the summer

Problems:
- Poor survival of all colonies after being put into the field

Questions:
- Are there any sublethal effects?
- How important is nutrition (flowers available)

Experiment II
- Determine the last time that foliar sprays can be applied to open flowers, and still be safe for bees
- Flowers were sprayed with imidacloprid at 4, 2 and 1 week before shipping.
- Flowers were sampled 1 week after the shipping date
Results of Experiment II

- Dislodgable residues were measured on 4 types of flowers
- > 20 ppb were only found on dislodgable residue samples from flowers sprayed 1 or 2 weeks before shipping.

> Conclusion- Avoid spraying open flowers the last 2 weeks before shipping.

Note: Samples were also collected for whole-flower tissue analysis pending funding of the Specialty Crop Block Grant.

<table>
<thead>
<tr>
<th>Weeks Before Shipping</th>
<th>Plant Type</th>
<th>Olefin (ppb)</th>
<th>Imidacloprid (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Portulaca</td>
<td>70</td>
<td>110*</td>
</tr>
<tr>
<td>1</td>
<td>Verbena</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>1</td>
<td>Salvia</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>1</td>
<td>Marigold</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>Portulaca</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Verbena</td>
<td>30</td>
<td>430</td>
</tr>
<tr>
<td>2</td>
<td>Salvia</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Marigold</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Portulaca</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Verbena</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Salvia</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Marigold</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Data are means of 10 replications

Can we make guidelines that if followed can be used to label plants as bee-friendly?

Yes, guidelines will be based on the first year of on-going research, and they will include:

- Do not spray flowers in the last 2 – 3 weeks before shipping
- Do not apply soil drenches of imidacloprid to hanging baskets any later than 5 weeks before shipping. Do not exceed the label rate.
- Do not use imidacloprid soil drenches on flowering trees and shrubs attractive to bees.
- Read bee warning information on pesticide labels and avoid practices that are harmful to bees.

In response, WenkeSumbelt Greenhouses has devised a proactive plan of action:

- Reduce or eliminate the use of neonicotinoids. Hanging baskets and potennias are our only crops that could potentially need them.
- Follow the MSU recommendations:
  - Avoid spraying open flowers during the last 2-3 weeks of production, prior to shipping
  - Avoid drenching during the last 5 weeks of production, prior to shipping
- Follow the new EPA Bee Advisory Guidelines
- Fund research with MSU and AmericanHort
- Preventative scouting and maintaining plant-free facilities

Remember... This research has also shown that bees and other pollinators benefit from having flowers as a food source. Our plants are truly Bee Friendly!

We’re glad you care about bees. We do too.

A Brief Timeline:

- A deadly bee virus related to antibiotic resistance was introduced to the U.S. about 1987
- The disease has continued since 1987, when the neonicotinoid use of these pesticides was introduced. In 1987, 70% of the world’s crops were sprayed with pesticides. In 2013, this figure reached 90%.
- In 2013, the Honeybee Action Group (HBAG) was formed to protect the honeybee from pesticides and to support the United States Department of Agriculture (USDA) in protecting the honeybee from pesticides.
- HBAG has been working to protect the honeybee from pesticides and to support the United States Department of Agriculture (USDA) in protecting the honeybee from pesticides.

What are neonicotinoids? Neonicotinoids are a class of insecticides that are similar in structure to nicotine and a significant improvement over older insecticides because they are more targeted and do not harm honey bees and non-targeted insects, including bees. This class of insecticide is used to protect crops from aphids, Japanese beetles, corn borers, and other pests.

THE NEW EPA BEE ADVISORY BOX

- The new EPA Bee Advisory Box is the first of its kind. The box is designed to help growers identify and avoid the use of pesticides that are harmful to bees.
- The box includes a list of pesticides that are harmful to bees, as well as a list of pesticides that are safe for bees.
- The box also includes a list of plants that are harmful to bees, as well as a list of plants that are safe for bees.
- The box is available online at the EPA website and can be downloaded for free.
From the new ‘bee box’ on EPA pesticide labels:

“The science says that there are many causes for a decline in pollinator health, including pesticide exposure. EPA’s new label will help protect pollinators”.

If bee-friendly management strategies are followed then—

Planting annual flowers, perennial flowers, and flowering trees and shrubs should help bees by providing more food for them. Encouraging wildflowers and flowering weeds is also good for bees.

Media Attention to Bee Issues Also Has Some Benefits:

• People are more aware of the role of pollinators and their diversity
• Where flowers are present, bees are indicators of the health of the insect community. Protecting bees protects all beneficial insects and biological control.

This Power Point file can be downloaded at:
http://www.ent.msu.edu/directory/david_smitley