Neonicotinoid Detection Levels in Processing Vegetables

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Green Bay, WI

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Neonicotinoid insecticides

- Replacement for more toxic OCs, OPs, Carbamates
- Imidacloprid registered in 1994
- Effective, long-lasting systemic insecticide
- Class now accounts for over 25% of pesticide market

Insecticide Resistance Action Committee
# Insecticide Seed Treatments for Vegetable Crops in the U.S.

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient(s)</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruiser 5FS</td>
<td>thiamethoxam</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>FarMore FI400</td>
<td>thiameth. + fungicides</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>FarMore FI500</td>
<td>thiameth. + spinosad + fungicides</td>
<td>Neonic + Spinosyn</td>
</tr>
<tr>
<td>Poncho</td>
<td>clothianidin</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>Sepresto 75WS</td>
<td>cloth. + imidacloprid</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>CAPS</td>
<td>Sepresto + fungicides</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>Trigard 75WP</td>
<td>cyromazine</td>
<td>Triazine</td>
</tr>
</tbody>
</table>

*Note: The active ingredients and their classes are provided for reference. The logos indicate the manufacturers.*
Insecticide Seed Treatments for Vegetable Crops in the U.S.

<table>
<thead>
<tr>
<th>Crop Group</th>
<th>Major Pests</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot</td>
<td>aster leafhopper</td>
<td>Sepresto 75WS</td>
</tr>
<tr>
<td>Bulb crops</td>
<td>onion maggot, seedcorn maggot</td>
<td>Trigard 75WP, CAPS, FarMore FI500</td>
</tr>
<tr>
<td>Legumes</td>
<td>seedcorn maggot, potato leafhopper, aphids, etc.</td>
<td>Cruiser 5FS</td>
</tr>
<tr>
<td>Cucurbits</td>
<td>seedcorn maggot, cucumber beetles, aphids, etc.</td>
<td>FarMore FI400</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>seedcorn maggot, corn flea beetle, corn rootworms, etc.</td>
<td>Poncho 600, Poncho 1250, Poncho VOTiVo, Cruiser 5FS</td>
</tr>
</tbody>
</table>
Annual Changes in Crop Uses in the U.S. 

Insecticide Seed Treatment Use Continues to be a Standard Agricultural Practice

### 2010 Seed Treatment

<table>
<thead>
<tr>
<th>CROP</th>
<th>% of Total Acres Planted with Treated Seeds</th>
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</thead>
<tbody>
<tr>
<td>Canola</td>
<td>100%</td>
</tr>
<tr>
<td>Cereals</td>
<td>42%</td>
</tr>
<tr>
<td>Corn</td>
<td>94%</td>
</tr>
<tr>
<td>Cotton</td>
<td>42%</td>
</tr>
<tr>
<td>Rice</td>
<td>51%</td>
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<tr>
<td>Sorghum</td>
<td>75%</td>
</tr>
<tr>
<td>Soybeans</td>
<td>32%</td>
</tr>
<tr>
<td>Sugar Beets</td>
<td>65%</td>
</tr>
</tbody>
</table>

TOTAL NEONICOTINOIDS (Clothianidin, Imidacloprid, Thiamethoxam)

*CTN 2010 Seed Treatment study
**A total of 147 million US acres are planted with neonicotinoid-treated seeds.
Neonicotinoid insecticides in the News
Key findings include:

**Parasites and Disease Present Risks to Honey Bees:**  
The parasitic Varroa mite and new virus species have been found in the U.S. and several of these have been associated with Colony Collapse Disorder (CCD).

**Increased Genetic Diversity is Needed:**  
Genetic variation improves bees thermoregulation, disease resistance and worker productivity.

**Poor Nutrition Among Honey Bee Colonies:**  
Bees need better forage and a variety of plants to support colony health.

**Need for Improved Collaboration and Information Sharing:**  
Best Management Practices associated with bees and pesticide use, exist, but are not widely or systematically followed by members of the crop-producing industry.

**Additional Research is Needed to Determine Risks Presented by Pesticides:**  
The most pressing pesticide research questions relate to determining actual pesticide exposures and effects of pesticides to bees in the field.
Just How Serious Is This Issue?

“Pollinator Health could be our LEGACY ISSUE.”

Quote from Jim Jones, Assistant Administrator of EPA’s Office of Chemical Safety and Pollution Prevention (nominated by President Obama), at the National Pesticide Applicator Certification and Training Workshop in St. Paul, MN on August 6, 2013.

blog.epa.gov/blog/2013/03/making-sure-chemicals-around-us-are-safe/
Current and Pending Product Cancellations

**Federal Register**

Chlorpyrifos; Cancellation Order for Certain Pesticide Registrations

A Notice by the Environmental Protection Agency on 07/03/2013

**Action**

Notice.

**Summary**

This notice announces EPA's order for the cancellations, voluntarily requested by the registrant and accepted by the Agency, of products containing chlorpyrifos, pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This cancellation order follows a March 9, 2009 Federal Register Notice of Receipt of Request from the registrant listed in Table 2 of Unit II, to voluntarily cancel these product registrations. These are not the last products containing this pesticide registered for use in the United States. In March 9, 2009 notice, EPA indicated that it would issue an order implementing the cancellations, unless the Agency received substantive comments within the 60-day comment period that would merit its further review of these requests, or unless the registrant withdrew their request. The Agency did not receive any comments on the notice. Further, the registrant did not withdraw their request. Accordingly, EPA hereby issues in this notice a cancellation order granting the requested cancellations. Any distribution, sale, or use of the products subject to this cancellation order is permitted only in accordance with the terms of this order, including any existing stocks provisions.

**EPA**

United States Environmental Protection Agency

You are here: EPA Home → Pesticides → Cancellation Order Issued for Sulfoxaflor

Cancellation Order Issued for Sulfoxaflor

For Release: November 13, 2015

On November 12, 2015, EPA issued a cancellation order for all previously registered Sulfoxaflor products. This cancellation order is in response to the September 10, 2015, order of the Ninth Circuit Court of Appeals finding that EPA improperly approved the Federal Insecticide, Fungicide, and Rodenticide Act registrations of the pesticide sulfoxaflor; the court’s order became effective on November 12.

Pursuant to EPA’s cancellation order, and beginning November 12, 2015, distribution or sale by the registrant of cancelled sulfoxaflor products is prohibited, unless such distribution or sale is for the purpose of disposal or export. Also, stocks of cancelled products held by persons other than the registrant may not be commercially distributed in the United States, but instead may be distributed only to facilitate return to the manufacturer or for proper disposal or lawful export. Use of existing stocks by end users is permitted provided such use is consistent in all respects with the previously-approved labeling for the product.

The Federal Food, Drug, and Cosmetic Act tolerances, also known as maximum pesticide residue levels for sulfoxaflor are not affected by either the court’s decision or EPA’s cancellation order, so crops that have been properly treated with sulfoxaflor or that may be treated with existing stocks as described in the final cancellation order can still be sold legally.

View a copy of the cancellation order.
Schedule for Review of Neonicotinoid Pesticides

The dockets for all the neonicotinoid pesticides have been opened. Our goal is to review the pesticides in this class in the same timeframe so we can ensure consistency across the class.

<table>
<thead>
<tr>
<th>Chemical Name and Docket Number</th>
<th>Initiation</th>
<th>Data Generation</th>
<th>Completion</th>
</tr>
</thead>
</table>
Neonicotinoid Review Update

- No current label use changes
- Labeling changes
  - Bee advisory box (2013)
Neonicotinoid Review Update

- “Not Grant” letter sent to registrants, April 2015
  - Previously submitted label changes put on hold
    - No new uses
    - No label extensions
    - No new crops

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United States Environmental Protection Agency
Washington, D.C. 20460

APR 02, 2015

To: Registrants of Nitroguanidine Neonicotinoid Products

Subject: New and Pending Submissions for Outdoor Uses of Products Containing the Nitroguanidine Neonicotinoids Imidacloprid, Dinotefuran, Clothianidin or Thiamethoxam

Dear Registrant:

You are receiving this letter because your company has submitted an application for a new outdoor use and/or holds registrations for products containing imidacloprid, dinotefuran, clothianidin or thiamethoxam that have use directions for outdoor application.

I. Background

EPA is committed to developing a robust and science-based understanding of the implications of the use of nitroguanidine neonicotinoid pesticides. To that end, as you know, EPA has required that the registrants of these pesticides submit data (pollinator hazard and exposure) to inform this issue. EPA will specifically receive data on potential impacts of a pesticide on developing bees (larvae, pupae), oral exposures and data which examine potential adverse effects on honey bee colonies. These data are being generated now under the Registration Review program for this class of pesticides. The Registration Review schedule for these chemicals has been accelerated.
Neonicotinoid Review Update

- EPA issue a Data-Call-In to registrants
  - 2018 deadline
  - Residue studies
    - Pollen, nectar
    - All crops/uses on label
    - Expensive (>\$250,000 /study)
    - EPA Threshold: 5 ppb (floral structures)
      - Will pre bloom applications exceed threshold?
      - Post bloom applications will require pollen/nectar samples from the following year

Sublethal effects on wild and managed bees already demonstrated (0.5 – 3.0 ppb)
Neonicotinoid Review Update

Pollen/nectar studies:

• Many studies are done by private research companies
  • Are at capacity for next 4 years

• Will affect registration timeline for new products of other insecticide classes

• Some label decisions are being made now

• Alternatives:
  • Synthetic Pyrethroids
    • Broad crop/pest labels
    • Next in line for Registration Review(?)

  • Chlorpyrifos

  • Diamides (principally effective against Lepidopteran pests)
    • few labeled uses in field crops
Future of Insecticide Seed Treatments for Vegetables

- Anticipate continued effort by industry to investigate new insecticides that can be delivered via seed treatment.

- Registration of insecticide seed treatments on minor crops (vegetables) will continue to occur, but slowly.
1. Concentration of neonicotinoids in plant tissue over time (foliage / flowers)

2. Which bees are present in the Central Sands -relationship to the local landscape
Systemic movement of water-soluble insecticides
Guttation water and floral nectaries
Del Monte Experimental Site, Plover, WI

- Two Years (2014 – 2015)
- Sweet corn, green beans, field peas (RCBD, 6 Reps)
- At-plant seed treatments (THMX)
- Weekly sampling
  - (150 mg foliar tissues)
  - (200 mg flower tissues)
- Ultra Performance Liquid Chromatography (UPLC - MS/MS)
# UPLC MS - MS

## Table: thiamethoxam

<table>
<thead>
<tr>
<th>#</th>
<th>ID</th>
<th>Name</th>
<th>Type</th>
<th>Std. Conc</th>
<th>RT</th>
<th>Area</th>
<th>IS Area</th>
<th>Response</th>
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<td>9.458650</td>
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</tr>
</tbody>
</table>

## Graphs:

1. **Calibration:**
   - Date: 10 Nov 2015 15:09:37
   - Coefficient of Determination: $R^2 = 0.981505$
   - Calibration curve: $y = -215.505 - 9083.47 \times x - 680.785$
   - Response type: External Std, Area
   - Curve type: 2nd Order, Origin: Exclude, Weighting: 1x, Axis trans. None

2. **Chromatogram:**
   - Compound: thiamethoxam
   - Method: Syngenta thiamethoxam standard in 90:10 acetonitrile:water 11/9/15
   - F1: SIR of 1 channel. ES+
   - TIC: 8.739e+004
   - Peaks:
     - 7.15
     - 7.34
     - 7.78
     - 8.01
     - 8.05
     - 8.10
     - 8.54
     - 8.55
     - 8.62
     - 8.67
     - 8.73
Neonicotinoid Concentrations – Foliage (2014)

Average (means±SE) thiamethoxam concentrations (mg kg⁻¹ tissue)

- Week 1
- Week 3
- Week 5
- Week 7
- Week 9
- Week 11

May
June
July

P=0.0038
Neonicotinoid Concentrations – Flower (2014)

Average (means±SE) thiamethoxam concentrations (mg kg⁻¹ tissue)

<table>
<thead>
<tr>
<th>Week</th>
<th>May</th>
<th>June</th>
<th>July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Week 3</td>
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<td>Week 5</td>
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<td>Week 7</td>
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<td></td>
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<tr>
<td>Week 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 11</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

EPA Proposed Threshold (5.0 ppb)

$P<0.0001$
USDA – SCRI SCBG, MWFPA Study goals

1. Concentration of neonicotinoids in plant tissue over time (foliage / flowers)

2. Which bees are present in the Central Sands -relationship to the local landscape
2014

- Green peas
  - 7 fields
  - 677 acres

- Snap beans
  - 9 fields
  - 1,176 acres

- Sweet corn
  - 10 fields
  - 1,399 acres

2015

- Green peas
  - 9 fields
  - 847 acres

- Snap beans
  - 9 fields
  - 856 acres

- Sweet corn
  - 9 fields
  - 1,181 acres
Bee Species within fields in the Central Sands

- Honeybees (*Apis mellifera*)
  - 40% of individuals captured

- Wild bees
  - 60% of individuals captured
  - 66 species
Generalist *Lasioglossum* species were most prevalent
Bee diversity in fields and edges was comparable (with honey bees omitted)
Species richness is highest at the peak of summer.

Number of Active Species

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0</td>
</tr>
<tr>
<td>February</td>
<td>0</td>
</tr>
<tr>
<td>March</td>
<td>0</td>
</tr>
<tr>
<td>April</td>
<td>36</td>
</tr>
<tr>
<td>May</td>
<td>54</td>
</tr>
<tr>
<td>June</td>
<td>54</td>
</tr>
<tr>
<td>July</td>
<td>60</td>
</tr>
<tr>
<td>August</td>
<td>60</td>
</tr>
<tr>
<td>September</td>
<td>54</td>
</tr>
<tr>
<td>October</td>
<td>36</td>
</tr>
<tr>
<td>November</td>
<td>0</td>
</tr>
<tr>
<td>December</td>
<td>0</td>
</tr>
</tbody>
</table>
Most species were soil-nesting

- Field Pea
  - Soil: n = 29
  - Hive
  - Cavity
  - Wood
  - Soil Parasite

- Green Bean
  - Soil: n = 42

- Sweet Corn
  - Soil: n = 33
Summary

- Vegetable processing crops in Central Wisconsin provide significant resource and potential habitat for wild bees
- Neonicotinoids are present in concentrations to effectively control and repel pest insects
- Preliminary concentrations in selected floral structures may pose future registration challenges
Acknowledgements

Research Grant Funding:

- Midwest Food Processors Association
- IR-4 Regional Project
- USDA SCRI – SCBG Program

In-kind support for this program provided by:

- Del Monte Foods (Plover, WI): Brian Flood, Don Caine
Questions?