Incorporating Reduced-Risk Insecticides into Carrot Pest Management

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Economic Impact of Wisconsin Specialty Crop Production and Processing

(Economic activity as $ millions per year)

<table>
<thead>
<tr>
<th></th>
<th>Total Economic Activity</th>
<th>Total Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable &amp; Fruit Production</td>
<td>$1,092</td>
<td>9,900</td>
</tr>
<tr>
<td>Potatoes</td>
<td>$349</td>
<td>2,770</td>
</tr>
<tr>
<td>Cranberries</td>
<td>$300</td>
<td>3,400</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>$83</td>
<td>660</td>
</tr>
<tr>
<td>Green Beans</td>
<td>$63</td>
<td>490</td>
</tr>
<tr>
<td>Green Peas</td>
<td>$26</td>
<td>200</td>
</tr>
<tr>
<td>Carrots, Cucumbers &amp; Onions</td>
<td>$28</td>
<td>220</td>
</tr>
<tr>
<td>Ginseng</td>
<td>$16</td>
<td>130</td>
</tr>
<tr>
<td>Specialty Crop Processing</td>
<td>$5,268</td>
<td>24,800</td>
</tr>
<tr>
<td><strong>Total Impact</strong></td>
<td><strong>$6,360</strong></td>
<td><strong>34,700</strong></td>
</tr>
</tbody>
</table>

Production estimates based on 2006-2008 average farmgate values; processing estimates based on 2007 Economic Census values. Note: Sum of impacts may not equal total impact due to rounding.

Wisconsin carrot production

**Acreage**: 4,300 acres produced annually (USDA-NASS, 2012)

**Yield**: 28 tons per acre

**Value**: Worth 10.4 million in revenue - ~$2500 per acre

**National rank**: 1st in processing production
Existing Insecticide Registrations in Carrot

- **MoA (1A)**: carbaryl, methomyl *(Sevin, etc.)*
- **MoA (1B)**: acephate, malathion, diazinon *(Orthene, etc..)*
- **MoA (3A)**: bifenthrin, beta-cyfluthrin, cyfluthrin, deltamethrin, esfenvalerate, gamma-cyhalothrin, lambda-cyhalothrin *(many registrations)*
- **MoA (4A)**: imidacloprid, thiamethoxam *(AdmirePro, Platinum)* - RR
- **MoA (4C)**: sulfoxaflor *(Transform)*
- **MoA (5)**: spinosad, spinetoram *(Blackhawk, Radiant)* - RR
- **MoA (9B & 9C)**: flonicamid, pymetrozine *(Beleaf, Fulfill)*
- **MoA (15)**: novaluron *(Rimon)*
- **MoA (18)**: methoxyfenozide *(Intrepid)*
- **MoA (28)**: chlorantraniliprole *(Coragen)* - RR
Aster yellows

Disease incidence: 1% - 15% in intensively managed carrot fields

Likely 80-100% if not managed

Variable symptoms: Above ground – leaf yellowing and reddening, twisting, witches' brooming; Below ground – stunted and malformed roots, adventitious root growth

Other crops affected: Lettuce, celery, cilantro, canola, parsnip, potato
Vector: Aster leafhopper (ALH)

- *Macroteles quadrilineatus* Forbes (Hemiptera: Cicadellidae)
- Target for AY management
- Small - approximately 4 mm long and weigh 1 mg
- Light greenish-yellow in color (seasonally variable)
- Polyphagous phloem feeding insect - uses many plant species for food, oviposition, and shelter - some are susceptible to AYP
- Overwintering, early feeding, and reproduction occur on cultivated grains and select weed species
<table>
<thead>
<tr>
<th><strong>Acquisition</strong></th>
<th><strong>Latency</strong></th>
<th><strong>Transmission and Retention</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>hours - days</td>
<td>days - weeks</td>
<td>weeks - lifetime</td>
</tr>
<tr>
<td>2-3 hours</td>
<td>2-3 weeks</td>
<td>Inoc. min-hrs; Retention - lifetime</td>
</tr>
</tbody>
</table>

*For AYP*
Aster Leafhopper: two “sources” of the vector

Migratory insects: Early season obligatory flights from the Gulf-states to the Upper Midwest

Local insects: ALH overwinter as eggs - movement onto crops occurs after sufficient heat units have accumulated

Probable Aster Leafhopper Spring Migration Routes

Chiykowski, L.N. and R.K. Chapman. 1965
Carrot crop relative to ALH biology

<table>
<thead>
<tr>
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<tr>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Carrot

- **Planting**
- **Crop growth**
- **Harvest**

Aster Leafhopper

- **Migratory**
- **Local**
- **1st – 3rd Generation**

Aster Leafhopper Management (Current)

Foliar insecticide applied when Aster Yellows Index (AYI) exceeds values of 25, 50, 75 or 100:

\[
AYI = \% \text{ ALH infectivity} \times \# \text{ ALH} / 100 \text{ sweeps}
\]
Assessing AY risk

AYI = % ALH infectivity * # ALH / 100 sweeps

Abundance – # ALH / 100 sweeps

Infectivity - % ALH infectivity

Scouting records
Current AY management

Carrot
- Planting
- Crop growth
- Harvest

Aster Leafhopper
- Migratory
- Local
- 1st – 3rd Generation

Foliar insecticide applications:
5-13 per year

Aster Leafhopper Management (Current – Wait and see!):
Synthetic pyrethroids - backbone of AY control programs
Goal: Increasing the efficiency and profitability of carrot production...

Implement a comprehensive management program and introduce reduced-risk insecticides to manage AY

Specific Objectives:

1. To identify periods of “high risk” for spread of the Ayp
   - Target control to periods of higher risk for AYP spread
   - Reduce the number of applications to offset the higher cost of RR insecticides

2. To assess the feasibility of using reduced-risk insecticides to limit current season spread of AYP
Historical data: ALH abundance (2001 – 2011)

- Fields sampled weekly May – Sept.
- 2-13 sweep net transects
- Counts enumerated as ALH per 25 sweeps
- ~ 31 commercial fields/year
- > 4,600 field level observations
Historical data: ALH infectivity (1994-2008)

- Monitored weekly mid-May to August
- Multiple locations in Wisconsin
- 25 populations per year
- Infectivity determined using a bioassay
Annual and seasonal trends: abundance

**Annual**
- Estimates ranged from 0.08 to 1.27 ALHs per 25 sweeps
- Abundance decreasing since 2001

**Seasonal**
- Seasonal period of higher abundance between 160 and 220

**Relative risk** – holding infectivity constant – exposure of the crop to infectious ALHs
- Annual – 16-fold difference in risk
- Seasonal – 3-fold difference in risk
Annual and seasonal trends: infectivity

**Annual**
- Estimates ranged from 0.1 to 6.3 percent
- No apparent trend over 14 years

**Seasonal**
- Seasonal period of higher infectivity between 140 and 196

**Relative risk** – holding abundance constant – exposure of the crop to infectious ALHs:
- Annual – 70-fold difference in risk
- Seasonal – 9-fold difference in risk
Summary: AY relative risk

<table>
<thead>
<tr>
<th>Abundance</th>
<th>Infectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual – 16-fold difference in risk</td>
<td>70-fold difference in risk</td>
</tr>
<tr>
<td>Seasonal – 3-fold difference in risk</td>
<td>9-fold difference in risk</td>
</tr>
</tbody>
</table>

Taken together…

Annual – years when high ALH abundance occurs co-incidentally with high infectivity can result in 1000-fold greater exposure of the crop to infectious leafhoppers

Seasonal – Risk varies by 30-fold throughout the growing season on average

Consistent with the large annual variability of AY pressure previously reported in Wisconsin

We now have estimates of the magnitude and frequency of occurrence
Defining the ‘Treatment Window’

<table>
<thead>
<tr>
<th>Window</th>
<th>Open</th>
<th>Close</th>
<th># Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptible carrot</td>
<td>May 25</td>
<td>Sept. 1</td>
<td>100</td>
</tr>
<tr>
<td>Aster Leafhopper</td>
<td>June 7</td>
<td>August 1</td>
<td>55</td>
</tr>
<tr>
<td>ALH infectivity</td>
<td>May 18</td>
<td>July 15</td>
<td>58</td>
</tr>
<tr>
<td>Crop Susceptibility (AYI = 25)</td>
<td>June 10</td>
<td>Aug. 1</td>
<td>52</td>
</tr>
</tbody>
</table>
Current AY management

---|---|---|---|---|---|---

**Carrot**
- Planting
- Crop growth
- Harvest

**Aster Leafhopper**
- Migratory
- Local
- 1st – 3rd Generation
- Foliar insecticide applications

**Current Management Strategy**
- Risk window 45 Days – 85 DAP

**Proposed Management Strategy**
- Seed treatments or in-furrow insecticide applications to protect through high risk period
Products Evaluated for Managing Aster Leafhopper and Aster Yellows Disease of Carrot in WI, 2013

- Four locations – Central Wisconsin (20 acre plots)
- Application – In-furrow and Liquid Fertilizer Pre-Mix

<table>
<thead>
<tr>
<th>Trt</th>
<th>Product</th>
<th>Active Ingredient</th>
<th>Delivery</th>
<th>Rate</th>
<th>Target</th>
<th>Cultivar</th>
<th>Toxicity (Field EIQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asana XL (Std)</td>
<td>Esfenvalerate (Pyrethroid)</td>
<td>Foliar</td>
<td>5 appl. @ 8.0 fl oz/acre</td>
<td>ALH</td>
<td>'Canada'</td>
<td>8.3</td>
</tr>
<tr>
<td>2</td>
<td>Platinum 75SG</td>
<td>Thiamethoxam (Neonicotinoid)</td>
<td>In-furrow</td>
<td>1 appl. @ 4.01 fl oz/acre</td>
<td>ALH</td>
<td>'Canada'</td>
<td>6.3</td>
</tr>
<tr>
<td>3</td>
<td>Platinum 75SG &amp; liquid fertilizer</td>
<td>Thiamethoxam (Neonicotinoid)</td>
<td>In-furrow</td>
<td>1 appl. @ 4.01 fl oz/acre</td>
<td>ALH</td>
<td>'Canada'</td>
<td>6.3</td>
</tr>
</tbody>
</table>

1 EIQ as calculated by New York State IPM program accessed 6/3/2013.
http://www.nysipm.cornell.edu/publications/eiq/equation.asp#table2
Products Evaluated for Managing Aster Leafhopper and Aster Yellows Disease of Carrot in WI, 2013

- Treatments planted in strips (~ 10 acre per treatment)
- Collected: ALH, disease ratings, large plot yields
- Many thanks to Miller Farms!
Adult ALH Numbers – At-Plant Treatments
Hancock, WI 2013

June 16 – Aug 22, 2013

P< 0.0001    N=10

Treatments

Asana (Standard)

Platinum 75SG (4 oz/ac) (Liq Fertilizer Pre-Mix)

Platinum 75SG (4 oz/ac) (Water Only)
Percent Symptomatic Plants – At-Plant Treatments
Hancock, WI  2013

June 16 – Aug 22, 2013

P= 0.0237    N=10

Percent Symptomatic Plants

Treatments

Asana (Standard)
Platinum 75SG (4 oz/ac) (Liq Fertilizer Pre-Mix)
Platinum 75SG (4 oz/ac) (Water Only)
Yields (tons/acre) – At-Plant Treatments
Hancock, WI 2013

October 29, 2013
P = 0.0417   N=10

Asana (Standard)
Platinum 75SG (4 oz/ac) (Liq Fertilizer Pre-Mix)
Platinum 75SG (4 oz/ac) (Water Only)

Mean Field Yields (tons/acre)

- Mean = 29.4
- Mean = 34.1 (+15%)
- Mean = 33.7 (+14%)
## 2013 Systemic Insect Control

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Class</th>
<th>Rate</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Control</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>*Verimark 20SC</td>
<td>cyazypyr</td>
<td>MoA 28</td>
<td>6.75 fl oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
<tr>
<td>*Verimark 20SC</td>
<td>cyazypyr</td>
<td>MoA 28</td>
<td>10.2 fl oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
<tr>
<td>*Verimark 20SC</td>
<td>cyazypyr</td>
<td>MoA 28</td>
<td>13.5 fl oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
<tr>
<td>AdmirePro 4.6SC</td>
<td>imidacloprid</td>
<td>MoA 4A</td>
<td>8.0 fl oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
<tr>
<td>AdmirePro 4.6SC</td>
<td>imidacloprid</td>
<td>MoA 4A</td>
<td>10.5 fl oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
<tr>
<td>Platinum 75SG</td>
<td>thiamethoxam</td>
<td>MoA 4A</td>
<td>3.0 oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
<tr>
<td>Platinum 75SG</td>
<td>thiamethoxam</td>
<td>MoA 4A</td>
<td>4.0 oz/ac</td>
<td>IF &amp; Pre-Mix</td>
</tr>
</tbody>
</table>

* Not labeled on carrot in Wisconsin
In-Furrow and Fertilizer Pre-Mix Treatments for Control of Adult Aster Leafhopper

Mean ALH adults (May 2013) (Jun 15 & 22)

- UTC
- Vermark (6.8) IF
- Vermark (6.8) PM
- Vermark (10) IF
- Vermark (10) PM
- Vermark (13.5) IF
- Vermark (13.5) PM
- AdmirePro (8) IF
- AdmirePro (8) PM
- AdmirePro (10.5) IF
- AdmirePro (10.5) PM
- Platinum (3) IF
- Platinum (3) PM
- Platinum (4) IF
- Platinum (4) PM

P = 0.0083

In-furrow (IF) - Blue
Pre-mix (PM) - Black

Treatments with different letters are significantly different.
In-Furrow and Fertilizer Pre-Mix Treatments for Control of Immature Aster Leafhopper

Mean ALH nymphs (June 2013)

- In-furrow (IF)
- Pre-mix (PM)

P < 0.0001
In-Furrow and Fertilizer Pre-Mix Treatments
Incidence of Aster Yellows

Mean Incidence of AY (October 2013)
(Jun 15 & 22)

P = 0.0386
In-furrow (IF)  Pre-mix (PM)
Systemic program feasibility

Systemic (seed and in-furrow) program seems promising:

- At-plant application is convenient
- No yield loss
- Reduced leafhoppers
- Reduced symptoms

What is the most cost-effective management strategy?
Distribution of prescribed foliar insecticide applications to WI fields

Adding price data:

- Cost of 1 application of systemic neonicotinoid = 2.6 applications of foliar pyrethroid
- Potential for savings if more than 3 sprays prescribed
- Can calculate Probability that a foliar program will cost more than a systemic
Can growers be adaptive?

What is the most cost-effective management strategy?
For a single year (short term) - $$
For all years (long term) – annually variable with declining costs
If we allow for choice among management programs

Adaptive management
Iterative process of decision making despite uncertainty – aims to reduce uncertainty by system monitoring

Decision making can be improved in the future by development of transport aerial models to describe inter-annual variability

The adaptive management framework, or process, is complementary to an ecoinformatics approach

*Adaptive environmental assessment and management. 1978 Ed. CS Holling*
Aster yellows ecoinformatics: current work...

Geographic distribution of small grains
I. Estimations based on past acreages

Where are suitable overwintering habitats for the ALH in the Southern Latitudes?

ALH development model
I. Temperature data from NOAA (1200 weather stations)
II. Calculation of day-degree accumulations
III. Predict ALH life stage for gridded points in the Midwest

Where are the ALHs with wings?
Aster yellows ecoinformatics: current work...

HYSPLIT air parcel trajectory model
I. Simulated transport and deposition of ALH “particles”
II. Transported by bulk air flow from regions where winged ALH may be present

Where did the ALHs come from and where might they be going?

From Sandstrom et. al. 2007 Proc. N. C. B. Ent. Soc. America
We have narrowed the risk window in time – can we also narrow it in space?
Insecticide Seed Treatment Use Continues to be a Standard Agricultural Practice

<table>
<thead>
<tr>
<th>CROP</th>
<th>% of Total Acres Planted with Treated Seeds</th>
</tr>
</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>
</tr>
<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.
Global Insecticide Seed Treatment Use is Increasing

The global insecticide seed treatment market is projected to reach nearly $1.6 billion by 2016, growing at a CAGR of 11.4%.”

Why are Seed Treatments so Popular?

- Saves time – just plant treated seed
- Less exposure to active ingredient (a.i.)
- Precise amount of a.i. applied to seed
- Often use considerably less a.i. per acre
- Less risk of killing non-target organisms
Neonicotinoid insecticides in the News

Colony Collapse Disorder: European Bans on Neonicotinoid Pesticides

Integrated Crop Management NEWS

Insecticidal Seed Treatments can Harm Honey Bees

France Plans Ban on Seed Treatment, Escalating Bee Issue

ARE NEONICOTINOIDs KILLING BEES?

Our Commitment to Bee Health

Neonicotinoid Seed Treatments and Honey Bee Health

Australia's Enteral Seed-Ban: An Example of Overregulation and Misunderstanding
That fine pales in comparison to Foti's losses, which he says include $240,000 in honey, not to mention the cost to local ecosystems.

"Fifteen hundred dollars ain't nothin to the grove people".
Rich Hatfield, a biologist with the Xerces Society, estimates that over 50,000 bumble bees were killed, likely representing more than 300 wild colonies. “Each of those colonies could have produced multiple new queens that would have gone on to establish new colonies next year. This makes the event particularly catastrophic.”
Unintended Consequences of Corn Dust

Honey Bees and the Corn Dust Research Consortium

Corn Dust Research Consortium Formed to Address Honey Bee Questions

Unique Stakeholder Consortium Sponsors Research to Reduce Honey Bee Exposure to Corn Planting Dust
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.
### 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>Gaucho</td>
<td>imidacloprid</td>
<td>Neonicotinoid</td>
</tr>
</tbody>
</table>
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, Gaucho 480 &amp; 600 (generics)</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.

Annual Changes in Crop Uses in the U.S.

Annual Changes in Crop Uses in the U.S.

Future of Insecticide Seed and In-furrow 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
THE NEW EPA BEE ADVISORY BOX
On EPA's new and strengthened pesticide label to protect pollinators

PROTECTION OF POLLINATORS

APPLICATION RESTRICTIONS exist for this product because of risk to bees and other insect pollinators. Follow application restrictions found in the directions for use to protect pollinators.

Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

This product can kill bees and other insect pollinators.
Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar.

This product can kill bees and other insect pollinators can be exposed to this pesticide from:
- Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
- Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.

When Using This Product Take Steps To:
- Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site
- Minimize drift of this product on to bees or to off-site pollinator attractive habitat. Drift of this product onto bees can result in bee kills.

Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at: http://pesticidestewardship.org/pollinatorprotection/Pages/default.aspx

Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state/tribe, go to: www.aapco.org. Pesticide incidents can also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beeiki@epa.gov

Alerts users to separate restrictions on the label. These prohibit certain pesticide use when bees are present.

The new bee icon helps signal the pesticide’s potential hazard to bees.

Makes clear that pesticide products can kill bees and pollinators.

Bees are often present and foraging when plants and trees flower. EPA’s new label makes it clear that pesticides cannot be applied until all petals have fallen.

 Warns users that direct contact and ingestion could harm pollinators. EPA is working with beekeepers, growers, pesticide companies, and others to advance pesticide management practices.

Highlights the importance of avoiding drift. Sometimes, wind can cause pesticides to drift to new areas and can cause bee kills.

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.

Read EPA's new and strengthened label requirements: http://go.usa.gov/jHH4
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/
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