

Bumble Bee Deaths / Linden Trees Incidents and Responses

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Oregon Department of Agriculture (ODA)



Chemical Applicators Short Course
Wednesday, January 10th, 2018
Turf/Landscape/Ornamental Breakout

2013 - Dinotefuran



- Two incidents involving dinotefuran, the active ingredient in Valent / Safari, these occurred within a two week period in June 2013.
- Both incidents involved the death of a large number of bumble bees and linden trees (*Tilia cordata*).
- In one incident, it was estimated that 50,000 bumble bees died. Primary bee sp. *Bombus vosnesneskii*.
- The two incidents involved **different timing, and application methods** (foliar, drench and basal bark application).

2013 – Wilsonville. Primarily foliar application during bloom.

According to newspaper reports, “still living bees were acting like they were drugged, spinning on the asphalt while others clung and buzzed crazily among the flowers.”



Customers and other
community members were
concerned by the number
of dying and dead bees.

Community members held
a funeral.



Wilsonville trees netted after 50,000 bees die

By Elissa Harrington

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Oregon Department of Agriculture crews wrap European Linden trees sprayed with an insecticide that killed 25,000 bees in the parking lot of a Wilsonville Target store, June 21, 2013 (KOIN 6 News)

WILSONVILLE, Ore. (KOIN) — In the aftermath of what is being called the largest mass bumblebee death on record, crews from the Oregon Department of Agriculture wrapped the trees in netting to keep the bees away.

Action was taken to reduce additional exposure

Wilsonville Incident

- Applicators originally came to the site to treat other plant species for black vine weevils. But then noticed aphids on the linden trees.
- Linden trees were in bloom. Allegedly bees were not present at the time of application.
- Foliar (primarily) and soil drench applications were made early in the morning in June (approx. 6:30 a.m.). Shoppers at Target store started to complain - dead and dying bees were falling on their cars.



Wilsonville Incident

55 Linden trees were treated.
Trees were approx. 25-30 ft tall.



Wilsonville Incident

Foliar Application Rate

- Label allows for foliar application 4 - 8 oz. per 100 gallons of water.
- Application rate - 6 oz. per 100 gallons

ORNAMENTAL PLANTS

Foliar or broadcast spray application

For foliar insect control on ornamental plants in nurseries, green shadehouses and outdoor landscapes (commercial, industrial, recr

Crop	Pests	Product Rate
Ornamental plants including: Shrubs Bedding Plants Flowering Plants Foliage Plants Ground Covers Evergreens Ornamental Trees	Adelgids including: Hemlock Woolly Aphids (suppression) Japanese beetles (adults) Lacebugs including: Azalea Hawthorne Leaf beetles	Foliar Spray 1/4 to 1/2 lb per 100 gallons (4 to 8 oz per 100 gallons) (0.05 to 0.1 lbs a.i. per 100 gallons)

Note - A few trees that had cars parked nearby received a soil drench application.

GROUP

4A

INSECTICIDE



Safari®

20 SG INSECTICIDE



FOR FOLIAR AND SYSTEMIC INSECT CONTROL IN ORNAMENTAL PLANTS, VEGETABLE TRANSPLANTS IN ENCLOSED STRUCTURES.

For Greenhouse, Nursery, Interior Plantscape and Outdoor Landscape Use Only

Active Ingredient:

Dinotefuran, [N-methyl-N'-nitro-N''-(tetrahydro-3-furanyl)methyl] guanidine] 20%
Other Ingredients 80%
Total 100%

EPA Reg. No. 86203-11-59639 EPA Est. 67545-AZ-01

2013 Hillsboro Incident - Dinotefuran

- While ODA personnel and others were finishing bagging the trees in Wilsonville, we received a call regarding dead bees in the nearby city of Hillsboro.
- The majority of **bee deaths** were only **associated** with one **stressed tree**.
- To reduce further bee mortality, the stressed “Killer Tree” was bagged with shade cloth.
- The **application** to the tree trunk was made in **late March 2013**. None of the trees were leafed out at the time of application.
- This was the third year in a row that an application of Safari had been made.

ODA Concern – Were linden flowers (pollen/nectar) from a tree treated in March 2013 (bark), toxic to bumble bees in June 2013?

Hillsboro – March Treatment

Stressed Linden Tree / Dead Bumble Bees



434 SE Washington St, Hillsboro, OR

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Imagery Date: 8/15/2012 1990

lat 45.521598° lon -122.984283° elev 59 m

Eye alt 138 m

ODA Adopted a Temporary Administrative Rule OAR 603-057-0386

“Any application, regardless of application method*, of a pesticide product containing the active ingredient **dinotefuran on plants is prohibited**.

This includes, but is not limited to, applications on landscape trees and shrubs, nursery and greenhouse plants, turfgrass, forests and agricultural crops.”

In effect for 180 days (June 27 – December 24, 2013) .

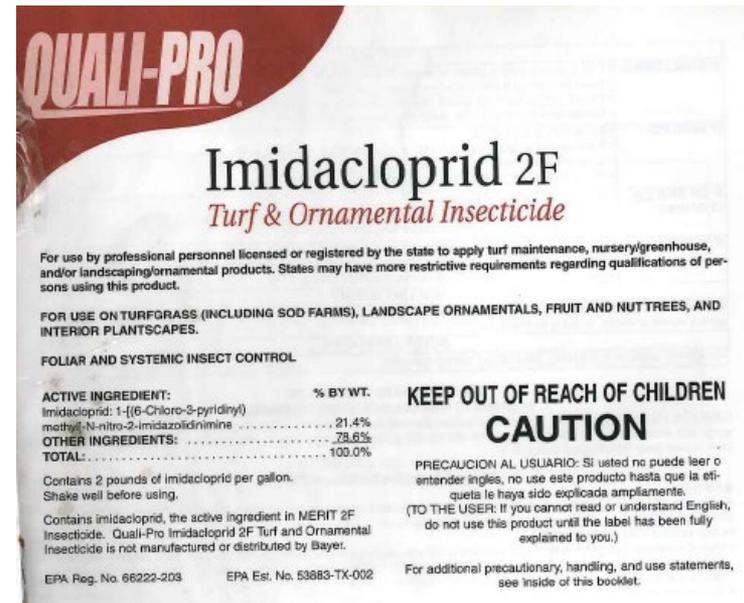
* Including soil application & chemigation

August 2013, Additional Incidents Portland – Two Locations (**Imidacloprid**)

Additional Bee Calls from Concerned Citizens generated follow-up investigations.

- Additional bee kills associated with linden trees at two more locations in August 2013.
- Product used at both locations, MANA **Imidacloprid** 2F (EPA Reg. No. 66222-203).
- Both applications were **soil drench applications**.

Timing: One application was made in **March** 2013, and the other **May** 2013.



There was concern about the potential of additional large bee kills during the summer due to additional applications.

The Director's Office spoke with agricultural interests about the seriousness of the cases and possible directions.



Four cases received a large amount of press

Questioning by public and elected officials:

Adequacy of pesticide labels*

EPA's ability to regulate pesticides

ODA's ability to regulate pesticides

ODA's licensing program, including exams

ODA's registration of "bee killing" pesticides

* EPA responded with improved label language for foliar applications.

Neonicotinoid labels

EPA changed non-ag and other labels. Current focus - foliar applications.

3. Non-Agricultural Products:



Do not apply [insert name of product] while bees are foraging. Do not apply [insert name of product] to plants that are flowering. Only apply after all flower petals have fallen off.

Ag Labels have more extensive statements for

1. CROPS UNDER CONTRACTED POLLINATION SERVICES
2. FOR FOOD CROPS AND COMMERCIALY GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS

The Department also began rewriting exams and making pollinator protection required study materials.



ODA – Response to Four Cases – ALL involving linden trees and bumble bee deaths?

- In 2014, as a condition of pesticide registration in Oregon, the following statement must be on dinotefuran and imidacloprid products newly released for sale:

“Do not apply this product, regardless of application method, on linden, basswood or other *Tilia* species in the State of Oregon.”

ODA also embarked on a significant educational campaign.

Were ODA's 2013 Actions Adequate? Apparently Not

Pollinator Week 2014 – Case 1

Licensed Commercial applicator made a foliar application of imidacloprid to linden trees in full bloom in Eugene Oregon (June 18). He is using an product with an older label.

ODA Increases Response

- **License Suspended**
- Needed to retake pesticide applicator's Exam
- Company needed to develop policies, protocols, training to prevent recurrences
- **Faced Civil Penalty**

The screenshot shows a news article from KVAL.com. The headline is "Company linked to bee deaths: 'We fully accept the sanctions'". The byline is "By Vanessa Paz and News Staff | Published: Jun 24, 2014 at 11:22 AM PDT | Last Updated: Jun 24, 2014 at 4:59 PM PDT". Below the headline are social media sharing options: "Recommend 318-1", "Tweet 6", "6 Comments", "Print", and "Email". The main image shows several trees covered in black plastic sheeting. A "PLAY VIDEO" button is visible over the image. Below the image is a caption: "The company put tents up around the trees to prevent the bees from coming in further contact with the pesticide".

Once again shade cloth needs to be applied to trees

Were ODA's 2013 Actions Adequate? Apparently Not

Pollinator Week 2014 – Case 2

Licensed Commercial applicator **injects** imidacloprid into linden trees on **May 30**, 2014.

Bees are dying June 23, 2014.

New Label



Applicator used a product with an older label.

ARBORICULTURE IN MOTION®

IMA-jet

DIRECTIONS FOR USE: *It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.* **IMPORTANT:** Read the entire label before use. Failure to follow label directions may result in poor control or plant injury. Failure to follow label directions may cause injury to people, animals and environment. The buyer accepts and understands that failure to follow label directions is the responsibility of the buyer.

Do not apply this product, by any application method, to linden, basswood or other Tilia species in the State of Oregon.

APPLICATION EQUIPMENT: IMA-jet is designed for use with the Arborjet Tree Injection Systems or with other tree injection devices that meet the label requirements and are chemically resistant. For all injection systems, read carefully and follow manufacturer's directions for use.

USE OF IMA-JET:

Use as formulated. Do not mix with water.

WELCOME TO REGON



SPRINGERO 2014
springercreative.com

"She Flies with Her Own Wings."

ODA Response

On June 26, 2014, the Oregon Department of Agriculture (ODA) enacted an emergency (temporary) rule prohibiting the use of any product containing the neonicotinoid insecticides dinotefuran or imidacloprid, regardless of application method, on linden trees.

Side issue involving various sugars in linden tree nectar

Unclear if there was some type of stress on bees, or interaction with neonicotinoids

In an abundance of caution, in 2014 ODA resampled 3 of the 4 sites treated in 2013.

Unclear how to interpret these exploratory data, ODA has asked for EPA's guidance.

No evidence of “over-label” rates used in 2013.
These same sites were not retreated in 2014.



According to ODA Pesticide Investigator (sample collector): “Flower samples consisted of the flower stem, the bract, and the flower.”

Pesticide levels in the nectar or pollen are unknown.

Exploratory Data: Dinotefuran- Foliar Application; Soil drench

Table 1. Linden Tree Samples Associated with 2013 Bumble Bee Kill
June 15, 2013 Foliar or Soil Drench Applications of Dinotefuran
Wilsonville, Oregon

	6/21/2013		6/18/2014	
Tree – Foliar Application	Tree #1	Tree #2	Tree #1	Tree #2
Flowers	11.0 ppm	7.4 ppm	Non-detect	Non-detect
Leaves	3.8 ppm	5.4 ppm	Non-detect	Non-detect
Tree –Soil Drench	Tree #3	Tree #4	Tree #3	Tree #4
Flowers	0.012 ppm	0.12 ppm	0.024 ppm	0.076 ppm
Leaves	0.97 ppm	0.39 ppm	0.63 ppm	0.65 ppm

- The same two trees were sampled in 2013 and 2014.
- In 2013, trees received either a foliar application, or a drench application.
- Trees were not treated in 2014.
- No unusual bee deaths were detected in 2014, only in 2013.
- **Laboratory results for 2013 dead bees, 0.93 ppm, MDL 0.004 ppm**

Foliar broadcast application, 6 oz./100 gallons of water
Soil drench application, 1/3 inch DBH per 4 gallons of water

Unclear how to interpret data, ODA has asked for EPA's guidance.

Exploratory Data: Dinotefuran- Basal Bark

Linden Tree Samples Associated with 2013 Bumble Bee Kill
March 26, 2103 Basal Bark Application of Dinotefuran
Hillsboro, Oregon

	6/21/2013	6/18/2014
Tree – Bee Mortality Documented		
Flowers	1.6 ppm	0.1 ppm
Leaves	24 ppm	2.1 ppm
Tree –Bee Mortality Not Detected		
Flowers	0.027 ppm	Non-detect
Leaves	0.630 ppm	0.19 ppm

Dinotefuran -
still present
over one-year
post application

Does this level
pose a risk?

- 2013 records, all trees were treated with the same amount of dinotefuran. **However, only a “stressed” tree was associated with dead bees.**
- The same two trees were sampled in 2013 and 2014.
- Trees were not treated in 2014.
- Bee deaths were not detected at the Hillsboro location in 2014, only in 2013.
- 2013 Basal bark application, 16 oz./gallon
- **Laboratory results for 2013 dead bees, 0.18 ppm, MDL 0.004 ppm**

Unclear how to interpret data, ODA has asked for EPA’s guidance.

Exploratory Data: Imidacloprid Soil Drench

Table 3. Linden Tree Samples Associated with 2013 Bumble Bee Kill
May 13, 2013, Soil Drench Application of Imidacloprid
Portland (OGC), Oregon

	7/2/2013	6/18/2014
Tree – Bee Mortality Documented		
Flowers	0.069 ppm	0.031 ppm
Leaves	0.440 ppm	0.160 ppm

The same tree was sampled in 2013 and 2014.

Trees were not treated in 2014.

Bee deaths were not detected at the OGC location in 2014, only in 2013.

**Laboratory results for 2013 dead bees, 0.0039 ppm,
MDL 0.0020 ppm**

Unclear how to interpret data, ODA has
asked for EPA's guidance



Imidacloprid - still
present over one
year post application

Does this level
pose a risk?

In January 2014, Proposed Oregon Legislation

Depending on version:

- Make thiamethoxam, imidacloprid, clothianidin, and dinotefuran Restricted Use Pesticides.
- Make Pollinator Health one of the exam categories available for licensure and continuing education.
- Potential legislation transformed into the development of a **Pollinator Health Task Force** to allow for adequate time to study the matter more fully.

Many Recommendations

Consensus

General Agreement

Split Opinion

REPORT TO THE OREGON LEGISLATIVE ASSEMBLY

Task Force on Pollinator Health

November 2014

Consensus

ODA should encourage EPA to develop a system to convey risk to pollinators on pesticide labels.

Task Force members, as well as many pesticide users, find label statements related to **RT25 values** useful.

Clothianidin (Arena)

This product is toxic to bees exposed to treatment, and for more than 5 days following treatment.

Dinotefuran

This product is toxic to bees exposed to residue for more than 38 hours following treatment.

Task Force on Pollinator Health

November 2014

Many Recommendations

Consensus

General Agreement

Split Opinion

Split Opinion

(a) ODA should expand the ban on the use of certain neonicotinoids on Linden trees to include two additional neonicotinoids (clothianidin and thiamethoxam).

(b) Expand temporary ban on the use of dinotefuran and imidacloprid on linden trees to other key, non-crop pollinator host and forage plants.

Comparative Toxicity

Table 1. Neonicotinoid Pesticide Toxicity (numbers may vary widely in literature)

Common Name	EFED/other studies half-life	Half-life	RT25*	Bee Toxicity 48-hr LD50 Oral	Bee Toxicity 48-hr LD50 Contact
Imidacloprid	Non-ag soil 188-997 days	191 days	2-8 hours	0.0037 ug/bee	0.081 ug/bee 0.0039 ug/bee
Clothianidin	Soil dependent 148-6931 days	545 days	0.07lb a.i./A=4.7days to 0.21lb a.i./A=21.3days	0.004 ug/bee	0.028 ug/bee
Thiamethoxam	Aerobic soil, type matters- clay loam 112 days, sandy loam 385 days-408 days	50 days	1-3 days	0.005 ug/bee	0.024ug/bee
Dinotefuran	50-100 days	82 days	39 hours	0.0076-0.032 ug/bee	0.023 ug/bee
Acetamiprid		<1-8 days		14.53 ug/bee	8.09ug/bee

*Dependent on various factors, including: Application rate, formulation, plant material and weather conditions

Proposed Permanent Rule*

Prohibiting the use of four active ingredients, instead of two on linden trees

Part of ODA's Explanation to Public

Because of ODA's outreach efforts regarding the hazards to pollinators when using dinotefuran or imidacloprid on *Tilia*, pesticide applicators began using the insecticides thiamethoxam, or clothianidin as replacements.

However, thiamethoxam, and clothianidin can be equally or possibly more hazardous to bumble bees.

Therefore, to prevent the strong likelihood of additional bumble bee deaths, the Department is also prohibiting the application of thiamethoxam, and clothianidin, regardless of application method, to linden trees, basswood trees or other *Tilia* species.

*Filed the Notice of Administrative Rulemaking Hearing on December 12, 2014

A Public Hearing was held on January 21, 2015.

Many pro and con comments including from: applicators, grower and industry groups such as RISE, beekeepers, citizens, Xerces Society, numerous environmental groups, and the City of Wilsonville.

A factor in ODA's decision making is that only two bee incidents could be related to faulty, careless or negligent applications (such as spraying during bloom).

Most incidents occurred from pre-bloom applications, and there was not evidence of a label violation*.

*One case was submitted to EPA for an ECR because it was unclear to ODA how to correctly assess the per acre rate in an urban environment. There was not a per tree label violation, but there was a per acre violation.

OAR 603-057-0388
Permanent Rule became final on
February 27, 2015

(1) It is prohibited to apply any product containing dinotefuran, imidacloprid, thiamethoxam, or clothianidin, regardless of application method, to linden trees, basswood trees or other *Tilia* species.

(2) Failure to comply with section (1) above may result in one or more of the following actions:

- (a) Revocation, suspension or refusal to issue or renew the license or certification of an applicant, licensee or certificate holder;
- (b) Imposition of a civil penalty;
- (c) Any other enforcement action authorized under any law.

ODA sent a letter to registrants of thiamethoxam and clothianidin, regarding the additional of a label statement.

- **Not all bee deaths were attributed to applicator error – most were not. This is why ODA prohibited use of four neonics.**
- The higher application rates for soil drench and basal bark applications should be evaluated by EPA.
- More research is needed to determine if and how pesticides move or perhaps sequester in stressed trees, at certain times of the day or during growth periods. MANY unknowns.
- Possibly naturally occurring toxins in linden trees, which may interact with pesticides, or make bees less able to withstand pesticide exposure. MANY unknowns.
- Currently, ODA and EPA are focused on developing understandable and enforceable label language which reduces risk to pollinators.

Oregon State University, in consultation with ODA:

Design requirements to ensure that pesticide applicators are knowledgeable regarding pesticide use that may impact pollinating insects. Alternatives.

Develop

Educational materials, including pesticide license exam materials

Best management practices for avoiding impacts on bees and other pollinating insects.

Pollinator health outreach and education plan, and means of communicating the strategy.

Pesticide use safety plan to educate the public, including licensed applicators regarding best practices in the use of pesticides.

OSU, ODA, ODF and others have formed the Oregon Bee Project, and we are developing a comprehensive (not only pesticides) strategic plan to address pollinator health, including reducing possible pesticide exposure. **OAN is a partner.**

Oregon Legislation HB 3362 (2015)



DRAFT

STRATEGIC PLAN

A Strategic Plan for Keeping Oregon's
Bee Pollinators Healthy



Neonicotinoids Status Update

In 2016 and 2017, EPA released draft risk assessments - Imidacloprid.

A preliminary **pollinator-only analysis** in January 2016 (closed April 2016)
~ 400,000 comments were received

Preliminary pollinator risk assessments in May 2017: Clothianidin, thiamethoxam, dinotefuran

- 35,000 - 60,000 comments were received depending on active ingredient. Comment period closed July 24, 2017

Results from the preliminary pollinator assessments show:

- Potential on-field risk from some use patterns appears to be low, include some seed treatments.
- However the potential risk from some other use patterns remain uncertain, including foliar and soil.
 - More data to be reviewed in 2017-18, and further analysis will reduce these uncertainties.

Neonicotinoids Status Update

2018/2019

For all four neonicotinoids, OPP plans to revise the pollinator/ecological risk assessments (as needed) and propose interim decisions that may include risk mitigation (as needed).

**Following the registration review schedule,
EPA plans to issue
final Interim Decisions on these chemicals in 2019.**





Thank you
Rose Kachadoorian
Oregon Department of
Agriculture (ODA)