

Insect pest management in vegetable crops: a glimpse into a future without neonicotinoids

2023 Cornell Pesticide Applicator Update

April 6, 2023

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Cornell AgriTech

New York State Agricultural Experiment Station

Outline

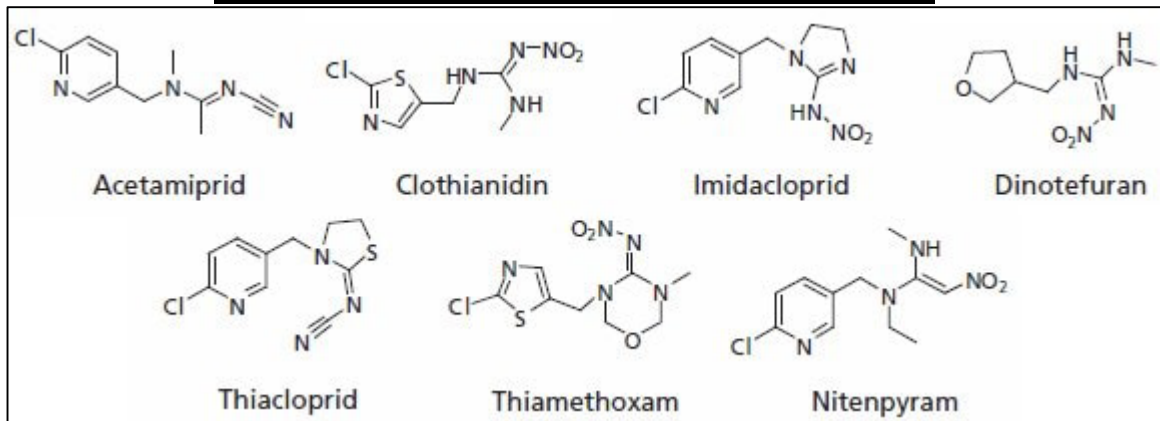
- **Neonicotinoids and their value to agriculture**
 - **Risks to consider when using neonicotinoids**
 - **Neonicotinoid alternatives for vegetable pest control**
-

Neonicotinoid Insecticides

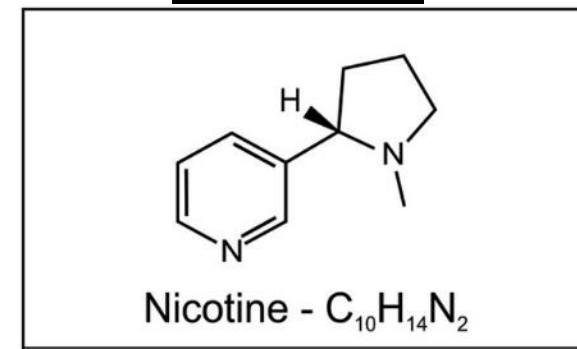
Q: What is a neonicotinoid insecticide?

**A: An insecticide chemically similar to nicotine.
“Neo”= new and “nicotinoid” = nicotine-like**

Neonicotinoid insecticides



Nicotine



Neonicotinoid Insecticides

N-Cyanoamidines

- Acetamiprid
- Thiacloprid

Nitroguanidines

- Clothianidin
- Imidacloprid
- Thiamethoxam

Neonicotinoid Insecticides

Q: How do neonicotinoids kill insects?

A: Affect the central nervous system of insects

Mode of Action (MoA): binds to nicotinic acetylcholine receptors (nAChRs), which block neural pathways and inhibits neuromuscular functions leading to paralysis and death.

Neonicotinoid Insecticides

Neonicotinoid insecticides = Class 4A

4

NICOTINIC ACETYLCHOLINE RECEPTOR (NACHR) COMPETITIVE MODULATORS



A

NEONICOTINOIDS



Acetamiprid

Imidacloprid

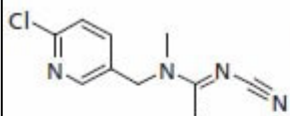
Thiamethoxam

Clothianidin

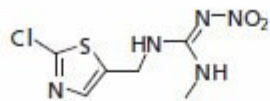
Nitenpyram

Dinotefuran

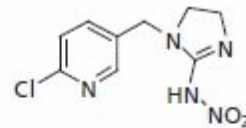
Thiacloprid



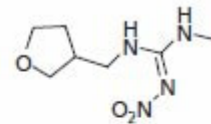
Acetamiprid



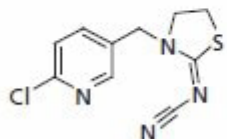
Clothianidin



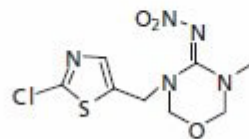
Imidacloprid



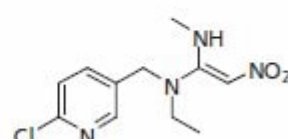
Dinotefuran



Thiacloprid



Thiamethoxam



Nitenpyram

IRAC

Insecticide Resistance Action Committee

Cornell AgriTech

New York State Agricultural Experiment Station

Neonicotinoid Insecticides

Neonicotinoid	Year first registered in US ¹
Imidacloprid	1994
Thiamethoxam	1999
Acetamiprid	2002
Clothianidin	2003
Thiacloprid	2003
Dinotefuran	2004
Nitenpyram	-

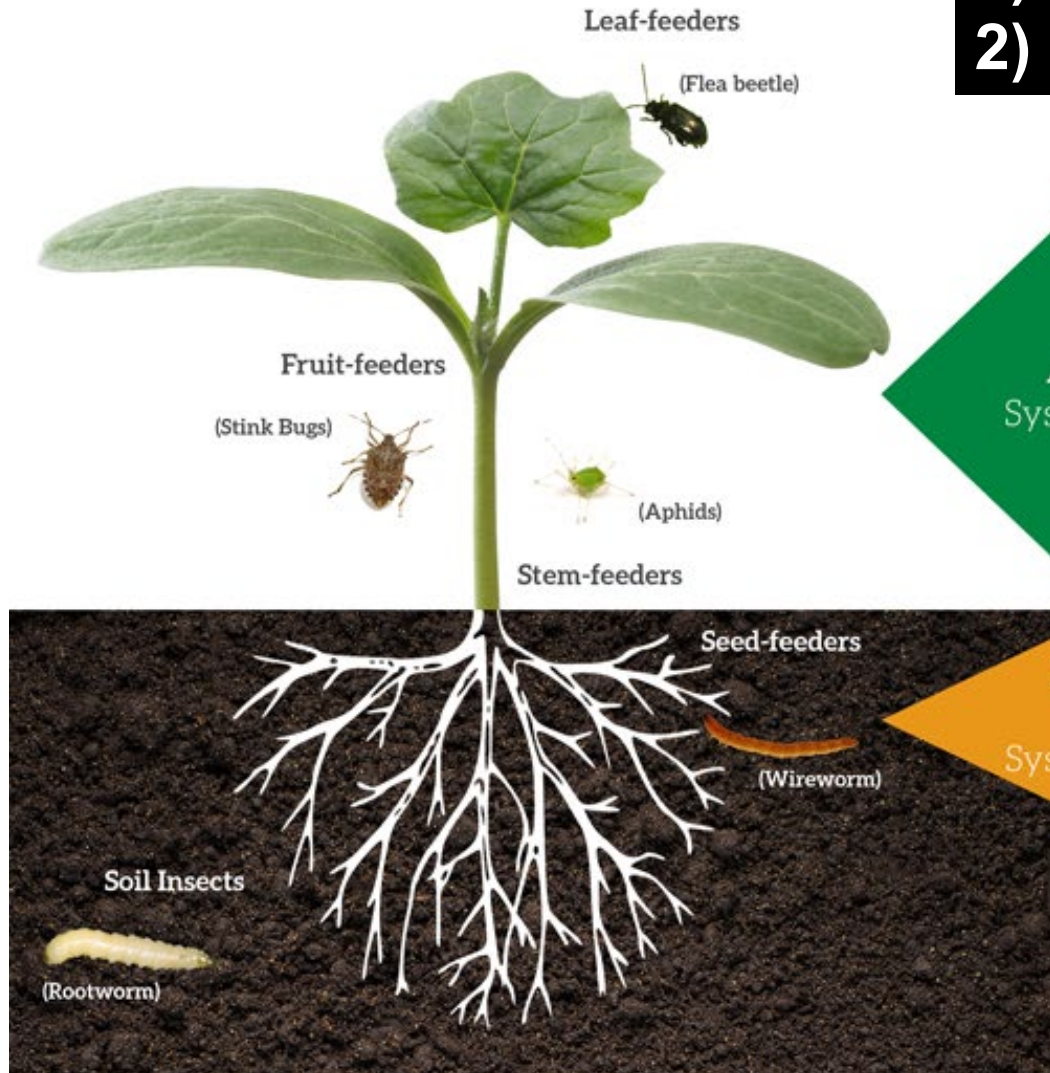
¹ Registered by EPA

Neonicotinoid Insecticides

Q: Why are neonicotinoid insecticides so popular?

Neonicotinoid Insecticides

- 1) Systemic in plants when applied to soil
- 2) Broad-spectrum of pest activity



Above Ground
Systemic Activity

Below Ground
Contact and
Systemic Activity

Chewing Pests

Cutworm
Armyworm
Flea Beetle
Sugarcane Beetle
BLB
Billbugs
Cabbage Root Fly
Cornstalk Borers

Sucking Pests

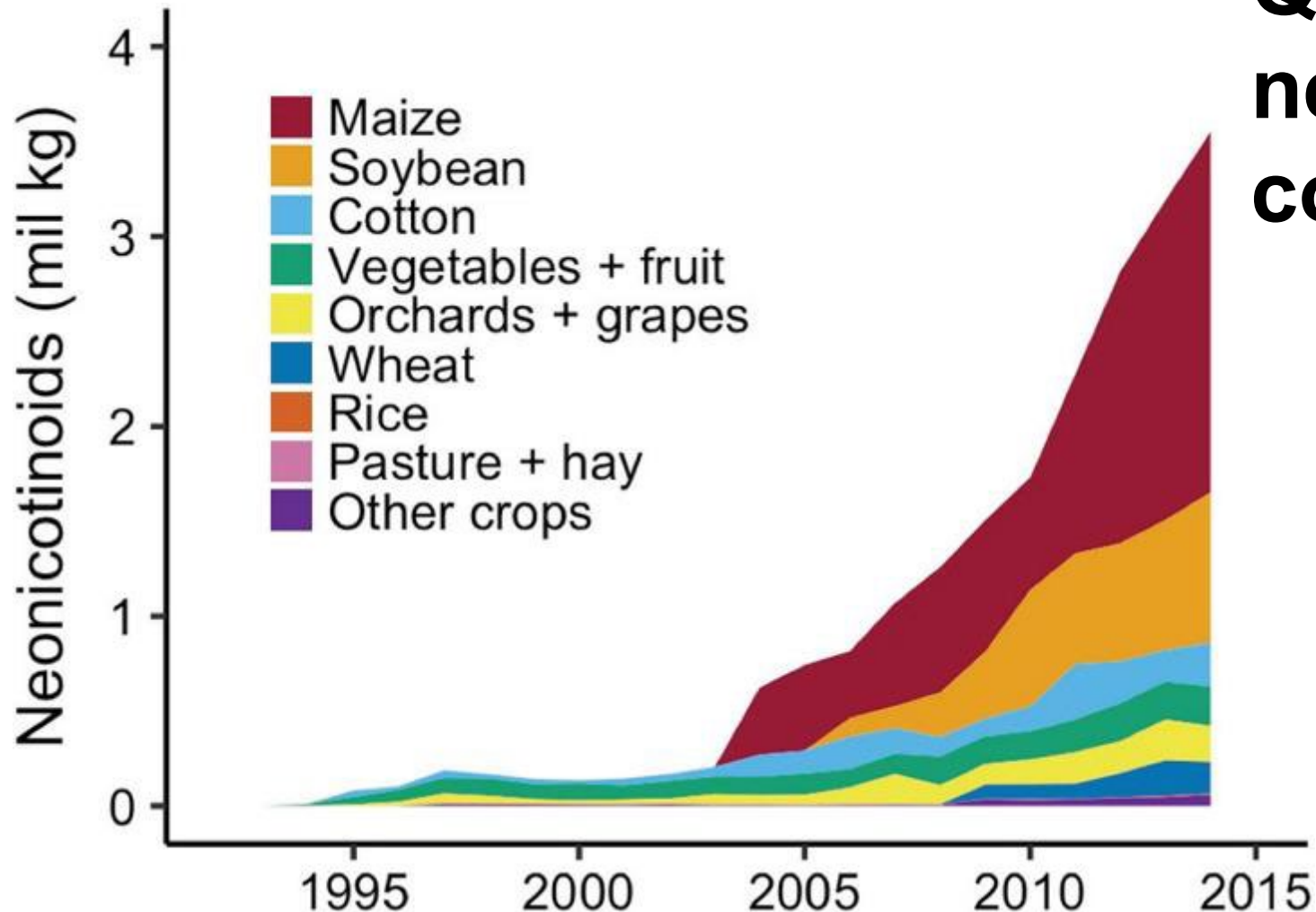
Aphids
Thrips
White Flies
Alfalfa Hopper
Chinch Bugs
Leafhopper
Stinkbug
Gall Weevil



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Neonicotinoid Insecticides

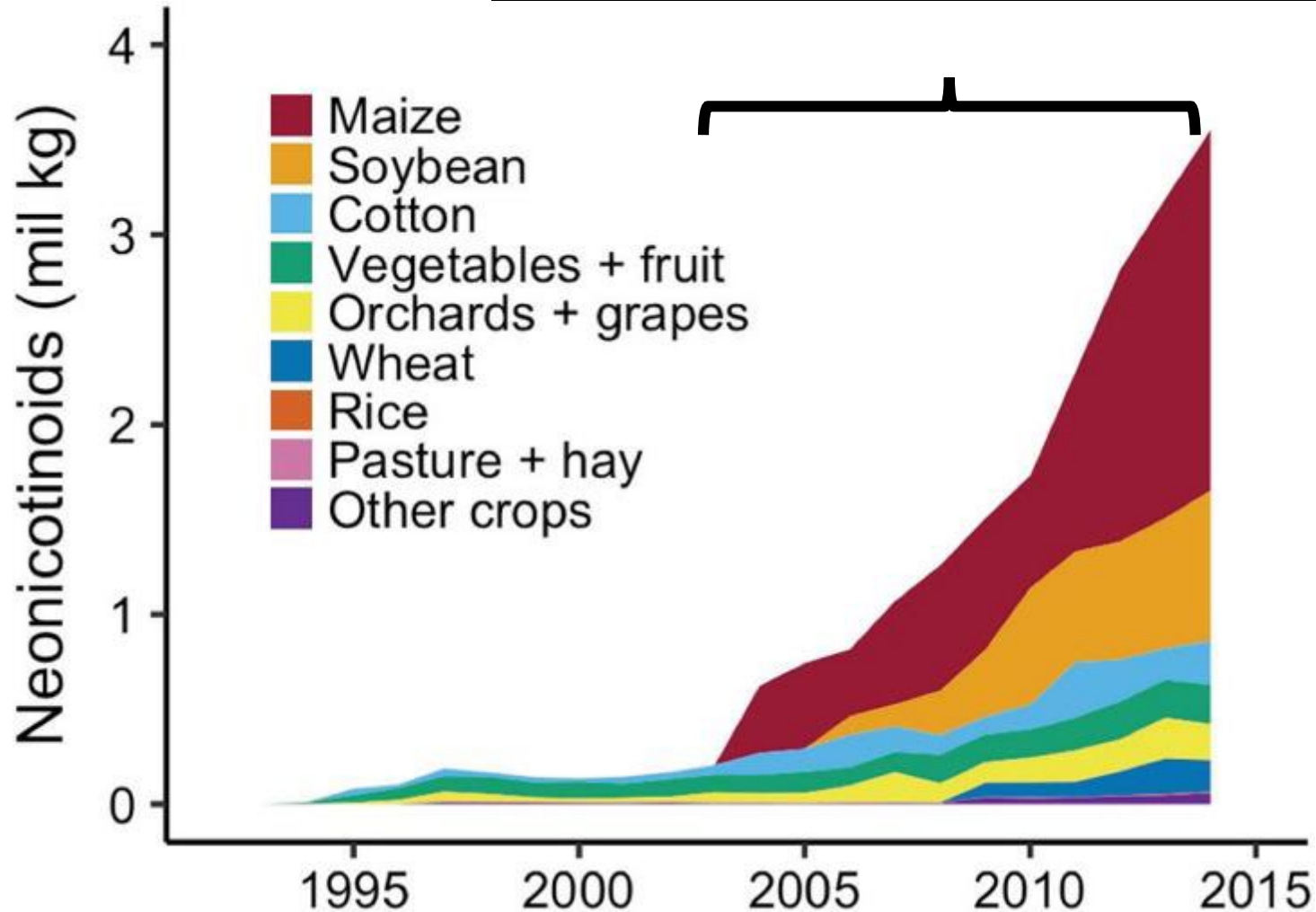
Q: Why an increase in neonicotinoid use in corn and soybean?



Douglas and Tooker 2015

Neonicotinoid Insecticides

Neonicotinoid seed treatment revolution



Douglas and Tooker 2015



Example in Vegetable Crops:

Snap bean pest control using a neonicotinoid seed treatment

Potato leafhopper



Seedcorn maggot



Example in Vegetable Crops:

Snap bean pest control using a neonicotinoid seed treatment

Potato leafhopper



Seedcorn maggot



Untreated



Example in Vegetable Crops:

Snap bean pest control using a neonicotinoid seed treatment

Potato leafhopper



* Since 2004, snap bean fields have been planted with Cruiser-treated seed.

* In NY, adoption of Cruiser has reduced insecticide use by 14,000 to 30,000 lbs/year!

Seedcorn maggot



Untreated



Outline

- Neonicotinoids and their value to agriculture
 - **Risks to consider when using neonicotinoids**
 - **Neonicotinoid alternatives for vegetable pest control**
-

Neonicotinoid Insecticides



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Bee Health Home

Neonicotinoid Seed Treatments and Honey Bee Health

Last Updated: August 16, 2012

by **Greg Hunt and Christian Krupke, Purdue University**

CAP Updates: 28

- Jointly published in the *American Bee Journal* and in *Bee Culture*, September 2012.

In the last 10-15 years, the EPA has gradually eliminated many uses of several "older" classes of pesticides. These include the widely used organophosphates, a staple of many agricultural systems. This left farmers and chemical companies looking for alternatives. A new class of pesticides called neonicotinoids, or neonics for short, were initially developed in the 1970's. The chemical structure of these is derived from nicotine (also an insecticide, keeps tobacco plants safe from caterpillars) and they are relatively non-toxic to most vertebrates. Most are water-soluble and

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Honey Bee Health

Managed Pollinator Coordinated Agriculture Program (CAP) Updates

A National Research and Extension Initiative to Reverse Pollinator Decline

Our Commitment to Bee Health
Providing Innovative Solutions for Agriculture Today and Tomorrow

As a company dedicated to crop production, Bayer is committed to environmental stewardship and sustainable agricultural practices, including protection of beneficial insects and honey bees.

Scientists are seeking the causes of declining bee health, including a phenomenon described as Colony Collapse Disorder that is affecting colony health predominantly in the United States. Most scientists accept that parasites, mites, diseases, and bee husbandry practices are major factors. We firmly support further research into the role of various pressures on bee health—including insecticides—by working with many stakeholders.

Bayer is actively involved in finding solutions to enhance honey bee health, including development of a product designed to control the varroa mite. The varroa mite—a relatively new parasite of the honey bee—has spread to most areas of the world within a short time period and is considered a significant factor in losses of honey bees in Europe and North America. At the same time, these mites are rapidly becoming resistant to available treatments.

NEONICOTINOIDS—An Important Class of Insecticides to Help Farmers Manage Harmful Pests That Limit Crop Production and Quality

- A total of 147 million U.S. acres are planted with neonicotinoid-treated seeds.
- Clothianidin is approved by EPA for use on corn, cotton, sorghum, soybean and sugar beets. It is the active ingredient in Poncho® seed treatments, the leading seed-applied insecticide on corn in the United States, increasing corn yields by 6 to 14 bushels an acre. Over 90% of U.S. corn is treated with neonicotinoids (clothianidin and thiamethoxam).

NEONICOTINOIDS NOT LINKED TO COLONY LOSS

- There has been no demonstrated effect on bee health associated with use of clothianidin or other neonicotinoid-based insecticides. In fact, the United States Environmental Protection Agency (EPA) commented recently (February 18, 2011) on clothianidin, affirming that the Agency is "not aware of any data that reasonably demonstrates that bee colonies are subject to elevated losses due to chronic exposure to this pesticide."
- In addition to its use on crops in the U.S., clothianidin is widely used on canola seed crops in Canada, where Bayer relates commercial beekeepers to bring large numbers of bees to the canola fields each year for pollination. No effect on bee colony health has been reported by these beekeepers during their extensive involvement with pollinating clothianidin-treated canola seed.

REDUCED TREATED AREA BY SEED TREATMENT
Neonicotinoid seed treatments reduce pesticide-treated area by 10,000% (estimated)

Field Treated
Neonicotinoid
Seed Treatment
Neonicotinoid
Seed Treatment

FARM CHEMICALS INTERNATIONAL
Basic Agrochemical Producer
Biggest Exporter in China

Glyphosate, 2,4-D, 2,4-DB, Glufosinate, Dicamba, Picloric Acid, Isoxaflutole, Mesotrione, I

Crop Inputs | Markets | Trade Summits | Crop Protection Database | Video

France Plans Ban on Seed Treatment, Escalating Bee Issue

Syngenta: 'Dark day for French and European agriculture.'

June 5, 2012
By Jaclyn Sindrich

Syngenta's Cruiser OSR seed treatment for oilseed rape faces suspension in France.

According to reports, the French government is set to ban the product on the recommendation of ANSES, the French agency for food, environmental and occupational health and safety. ANSES says it based its decision on one study, published in the journal *Science*, which highlights sub-lethal doses of the active ingredient thiamethoxam on the ability of forager bees to return to the hive.

Thiamethoxam is a neonicotinoid-class insecticide—the type increasingly blamed for the bee malady called Colony Collapse Disorder. However, the underlying causes of CCD are still unclear and most likely manifold, according to most published scientific research.

Related

- Bayer CropScience To Study Colony Collapse Disorder
- BASF, Nuthene Enter Onion Seed Treatment Agreement
- Monsanto, Plant Health Care Partner on Seed Treatment

ARE NEONICOTINOIDS KILLING BEES?

A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action

Jennifer Hopwood, Mace Vaughan, Matthew Shepherd, David Biddinger, Eric Mader, Scott Hoffman Black, and Celeste Muzzacaro

THE KENNES SOCIETY FOR INVERTEBRATE CONSERVATION

Integrated Crop Management NEWS

Insecticidal Seed Treatments can Harm Honey Bees

Erin Hodgson, Department of Entomology (ISU) and Christian Krupke, Department of Entomology (Purdue)

Neonicotinoids are a relatively new class of chemistry to control insects. They are now widely adopted because they are persistent and systemic in plant tissues. Most field crops in Iowa have a neonicotinoid seed treatment. Common examples of neonicotinoids include: clothianidin (Poncho®), thiamethoxam (Cruiser®), and imidacloprid (Gaucho®). Active ingredient rates range from 0.25-1.25 milligrams per kernel (sold as 250-1,250 rates).

Neonicotinoids are extremely toxic to bees. Lethal LD50 rates (the rate at which half of the exposed population dies) for clothianidin are 22-44 nanograms per bee for direct contact and 2.8-3.7 nanograms per bee for oral ingestion. In other words, a single corn kernel with a 1,250 rate of neonicotinoid seed treatment contains enough active ingredient to kill over 80,000 honey bees.

There has been an increased public awareness of pollinator health and the decline of bees in North America. Researchers have identified multiple contributing factors for honey bee decline, including: Varroa mites, disease-causing pathogens, habitat loss, malnutrition, the intensity of migratory pollination services and pesticides (Fig. 1).

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Yet another study links insecticide to bee losses

Findings point to treated corn seed—and corn syrup—as possible links to a pandemic afflicting North American pollinators.

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By Janet Raloff
Web edition: April 3, 2012

Neonicotinoid Insecticides

➤ New labelling on some insecticides

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.

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 onto beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives or off-site to pollinator attractive habitat 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 should also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND DIRECTIONS AND WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

BEE HAZARD

See individual crops for specific pollinator protection application restrictions. If none exist under the specific crop, for foliar applications, follow these application directions for crops that are contracted to have pollinator services or for food/feed that are attractive to pollinators:

FOR CROPS UNDER CONTRACTED POLLINATION SERVICES

Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless the following condition has been met.


If an application must be made when managed bees are at the treatment site, the beekeeper providing the pollination services must be notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying.

Bees must be removed, covered or otherwise protected for 5 days following application.

FOR FOOD CROPS AND COMMERCIAL GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS


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

Do not apply this product to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period.



PROTECTION OF POLLINATORS

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- o Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.

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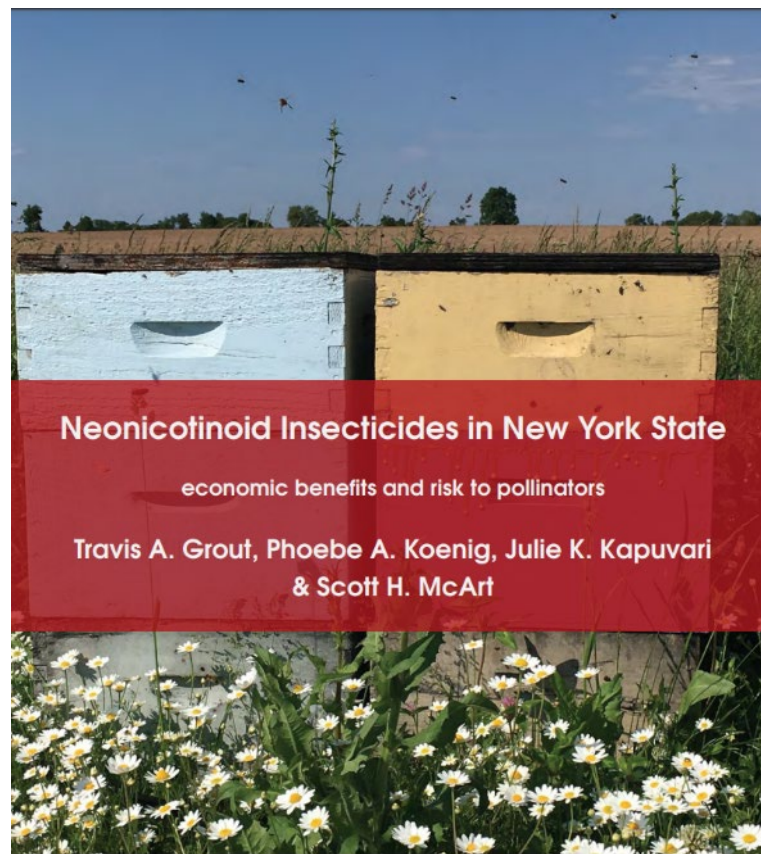
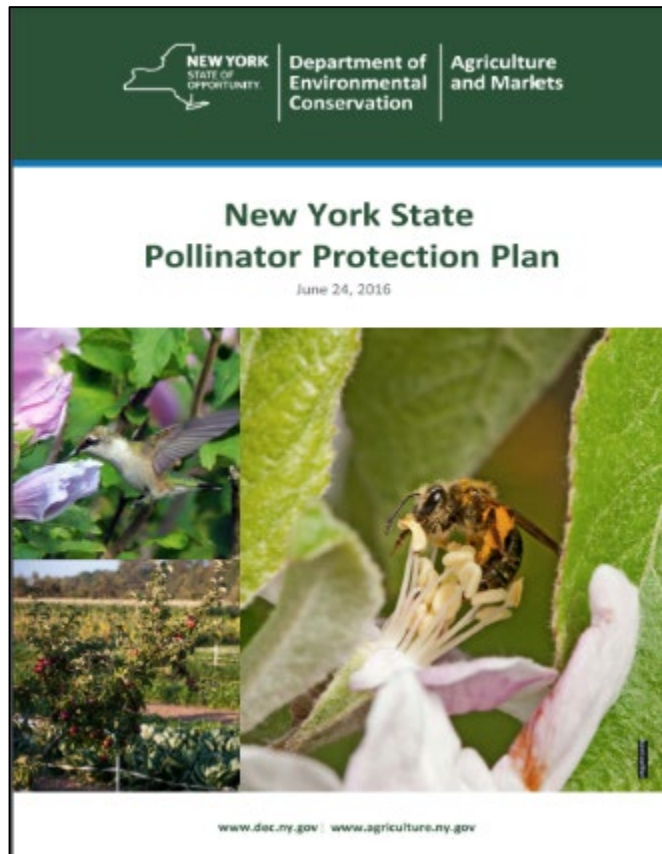
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Neonicotinoid Insecticides

- 
- Comprehensive assessments of neonicotinoid risk to bees in New York crops, ornamentals, turf and forestry



Neonicotinoid Insecticides

- Policy changes including neonicotinoids becoming “restricted use” products in New York as of January 1, 2023

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Home » Public Involvement and News » Press Releases » 2022 Press Releases » DEC Announces Actions to Protect New York's Pollinators by Restricting Use of 'Neonic' Pesticides

For Release: Monday, January 24, 2022

DEC Announces Actions to Protect New York's Pollinators by Restricting Use of 'Neonic' Pesticides

New Requirement for Neonicotinoids Will Help Prevent Potentially Harmful Exposure to Honeybees and Other Beneficial Insects

New York State Department of Environmental Conservation (DEC) Commissioner Basil Seggos today announced actions to limit the unrestricted use of pesticides that can harm bee and other pollinator populations. DEC is reclassifying certain products containing the neonicotinoid (neonic) insecticides imidacloprid, thiamethoxam, and acetamiprid as “restricted use” to ensure applications are limited to trained pesticide applicators in specific situations. Restricting the use of these pesticides enables DEC to collect new data to determine where, when, and how they are used, as well as their potential impacts.

“Protecting pollinators is a top priority, and today’s action to restrict the use of these neonicotinoid pesticides is another important step in our ongoing efforts to safeguard these species that are crucial to New York’s environment, agricultural economy, and biodiversity,” **Commissioner Seggos** said. “Reclassifying these pesticides will ensure they are only used in targeted instances by qualified professional applicators, and only available for sale to certified applicators which will further protect public health and the environment.”

New York is committed to promoting the health and recovery of pollinator populations, as highlighted in the State’s [Pollinator Protection Plan](#) (PDF). Pollinators contribute substantially to New York’s environment and economy. According to the U.S. Department of Agriculture, pollinators provide approximately \$344 million worth of pollination services to New York and add \$29 billion in value to crop production nationally each year. The state’s ability to produce crops such as apples, grapes, cherries, onions, pumpkins, and cauliflower relies heavily on the presence of pollinators.

Pesticides represent one of many factors that stress pollinators, and neonicotinoids in particular have been identified as a group of pesticides that, in general, are highly toxic to pollinators. While commercial application of all pesticides is reported to DEC as part of the State’s stringent regulatory oversight, residential applications and sales of general use products to consumers are not. The reclassification ensures proper use by trained applicators and enables DEC to collect sales and use data to estimate and monitor the quantities and locations where these products are used.

The reclassification will take effect on Jan. 1, 2023, allowing time for registrants, distributors, and retailers to prepare for the change in classification. Neonics will be reclassified under DEC’s pesticide regulation authority and pesticide registrants have been notified of the intent to reclassify the applicable products. Products labeled for “limited directed application” to tree trunks and the ground at the base of trees, shrubs, and plants are not included in the reclassification. These products provide cost-effective and unique pest control for residential applications, particularly for invasive species, and limit potential exposure to pollinators.

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This Page Covers

All of New York State

Neonicotinoid Insecticides

Birds & Bees Protection Act - 2023



Senator Brad Hoylman-Sigal

STATE OF NEW YORK

1856

2023-2024 Regular Sessions

IN SENATE

January 17, 2023

Introduced by Sens. HOYLMAN-SIGAL, ADDABBO, BAILEY, BRESLIN, BRISPORT, BROUK, CLEARE, COMRIE, GOUNARDES, HARCKHAM, JACKSON, KAVANAGH, KENNEDY, KRUEGER, LIU, MAYER, MYRIE, RIVERA, RYAN, SALAZAR, SANDERS, SEPULVEDA, SERRANO, STAVISKY -- read twice and ordered printed, and when printed to be committed to the Committee on Environmental Conservation

AN ACT to amend the environmental conservation law, in relation to enacting the birds and bees protection act

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

1 Section 1. Short title. This act shall be known and may be cited as
2 the "birds and bees protection act".

3 § 2. Section 33-1301 of the environmental conservation law is amended
4 by adding a new subdivision 13 to read as follows:

5 13. a. Beginning January first, two thousand twenty-six, for any
6 person to sell, offer for sale or use, or distribute within the state
7 any corn, soybean or wheat seeds coated or treated with pesticides with
8 the active ingredients clothianidin, imidacloprid, thiamethoxam, dinote-
9 furan, or acetamiprid; provided, however, that the commissioner may, by
10 written order, temporarily suspend the provisions of this paragraph at
11 any time based on the commissioner's determination, after consulting
12 with the commissioner of agriculture and markets, that there is a lack
13 of commercially available seed that has not been treated with pesticides
14 with the active ingredients clothianidin, imidacloprid, thiamethoxam,
15 dinotefuran or acetamiprid or the purchase of seed that complies with
16 the requirements of this paragraph would result in undue financial hard-
17 ship to agricultural producers. Any such temporary suspension shall
18 specify the type of seed included.

19 b. (1) No person shall apply or treat outdoor ornamental plants and
20 turf, except for the production of agricultural commodities, with a
21 pesticide containing:

EXPLANATION--Matter in italics (underscored) is new; matter in brackets
[-] is old law to be omitted.

LBD02118-02-3

➤ Bill passed in Senate & Assembly to further restrict neonicotinoid use in NY

[...by 2026, corn, soybean or wheat seeds coated or treated with pesticides with the active ingredients clothianidin, imidacloprid, thiamethoxam, dinotefuran, or acetamiprid.]

Pollinator Protection

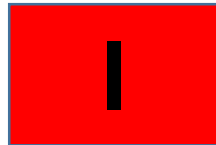


Large retail grocery stores like Wal-Mart, Kroger, Costco, Albertsons, Giant Eagle, Aldi and Rite Aid have adopted policies to phase out pesticides harmful to bees on produce they will market

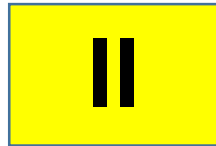
Pollinator Protection



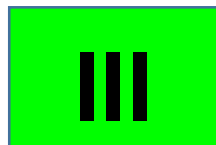
Bee Precautionary Pesticide Rating*



“Danger”



“Caution”



“Safe”



<https://ipm.ucanr.edu/bee-precaution-pesticide-ratings/>

* **NOT** the language on the pesticide label; These are **GENERAL** terms to refer to levels of precaution taken with products relative to bee safety

Pollinator Protection



N-Cyanoamidines

- Acetamiprid
- Thiacloprid

II

“Caution”

Nitroguanidines

- Clothianidin
- Imidacloprid
- Thiamethoxam

I

“Danger”



Bee precaution pesticide ratings

Guidance on how to reduce bee poisoning, based on reported pesticide effects on adults and brood of honey bees and other bee species. Ratings are for the pesticide active ingredient, the common name.*

- I** Do not apply or allow to drift to plants that are flowering including weeds. Do not allow pesticide to contaminate water accessible to bees including puddles.
- II** Do not apply or allow to drift to plants that are flowering including weeds, except when the application is made between sunset and midnight if allowed by the pesticide label and regulations. Do not allow pesticide to contaminate water accessible to bees including puddles.
- III** No bee precaution, except when required by the pesticide label or regulations.

Note: These are not the pollinator precautionary statements on the pesticide labels. Some of the listed pesticides are not registered, or approved, for use. Make sure the pesticide use is legal and appropriate before making any application. Always read the label and know and follow the applicable laws and regulations before making any pesticide application. Follow [best management practices to protect bees from pesticides](#).

[Frequently asked questions \(FAQs\)](#) about this tool.

☒ Common name → →

☐ Trade name

<input checked="" type="checkbox"/> Common name (Example trade name)	Type	Mode of action	Rating	Other effects on bees	Toxic to honey bee brood	Toxic to other bee species
<input checked="" type="checkbox"/> ACETAMIPRID (Assail)	Insecticide	4A	II	FRAC3	—	✓
<input checked="" type="checkbox"/> THIAMETHOXAM (Actara, Platinum)	Insecticide	4A	I	FRAC3	—	✓



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 →

☐ Trade name

<input checked="" type="checkbox"/> Common name (Example trade name)	Type	Mode of action	Rating	Other effects on bees	Toxic to honey bee brood	Toxic to other bee species
<input checked="" type="checkbox"/> CHLORANTRANILIPROLE (Altacor, Coragen)	Insecticide	28	III	FRAC2 FRAC3	✓	—
<input checked="" type="checkbox"/> CYANTRANILIPROLE (Exirel, Verimark)	Insecticide	28	I	—	✓	✓

Endangered Species Protection

EPA United States Environmental Protection Agency

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CONTACT US

Protecting Endangered Species from Pesticides

Progress for Endangered Species

See EPA's workplan: [Balancing Wildlife Protection and Responsible Pesticide Use \(pdf\)](#) (37.51 MB)

[Press Release](#)

About

- [About the endangered species program](#)
- [Assessing pesticides under the ESA](#)
- [Litigation and associated pesticide limitations](#)
- [Implementing NAS Report Recommendations on Ecological Risk Assessment for Endangered and Threatened Species](#)
- [Conventional Pesticide Registration](#)

Endangered Species Act Workplan

- [EPA's workplan and progress toward better protections for endangered species](#)
- [Implementing EPA's Workplan to Protect Endangered and Threatened Species from Pesticides Pilot Projects](#)
- [Assessing effects of new pesticides on listed species](#)

Biological Evaluations (BEs)

- [Final BE Chapters for Chlorpyrifos, Malathion, Diazinon, Carbaryl, Methomyl, Atrazine, Simazine, Glyphosate, Clothianidin, Imidacloprid, Thiamethoxam](#)
- [Draft BE Chapters for Propazine, Sulfosulfuron, Imazethabenzil](#)
- [Provisional Models and Tools Used in EPA's Pesticide Endangered Species Biological Evaluations](#)
- [Models and Tools for National Level Listed Species Biological Evaluations of Neonicotinoid Insecticides](#)

Recent Highlights

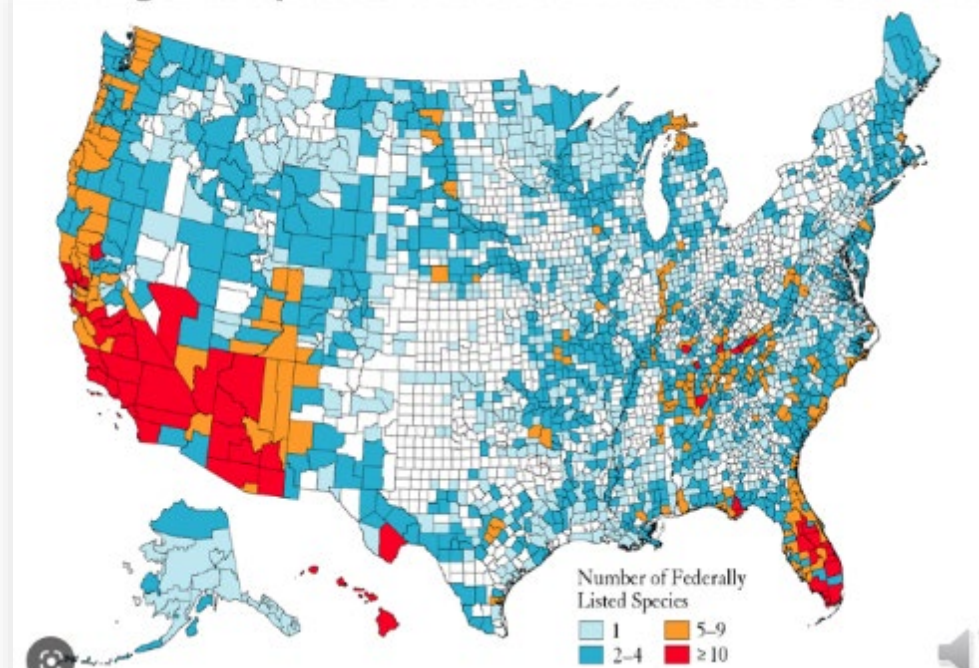
- [EPA's workplan and progress toward better protections for endangered species](#)
- [Reports to Congress on Improving Consultation Process Under Endangered Species Act Section 7 for Pesticide Registration & Registration Decisions](#)

Protections for Endangered Species

- [Effects determinations](#)
- [Pesticide restrictions](#)
- [Bulletins List Two](#)
- [Information for pesticide users](#)

US EPA - Endangered Species Act (1973)

Endangered species clustered in subset of counties



Endangered Species Protection



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[Pest Control and Pesticide
Safety for Consumers](#)

[Pesticide Registration](#)

EPA Finalizes Biological Evaluations Assessing Potential Effects of Three Neonicotinoid Pesticides on Endangered Species

Release on June 16, 2022

EPA has released its final biological evaluations (BEs) for clothianidin, imidacloprid, and thiamethoxam, part of a group of insecticides known as neonicotinoids, and its responses to comments received on the draft BEs. These neonicotinoids are used on a variety of crops, turf, and ornamentals, and for other residential and commercial indoor and outdoor uses.

In these BEs, EPA evaluated clothianidin, imidacloprid, and thiamethoxam to determine whether they may affect one or more federally listed endangered or threatened (listed) species or their designated critical habitats. These evaluations, which encompass all registered uses and approved product labels for pesticide products containing these chemicals, are part of EPA's efforts to meet its obligations under the Endangered Species Act (ESA). This work furthers the goals outlined in [EPA's April 2022 ESA Workplan](#) to provide practical protections from pesticides for listed species.

The BEs evaluate the effects of clothianidin, imidacloprid, and thiamethoxam on over 1,700 listed species and over 800 designated critical habitats in the United States, determining that:

Nitroguanidines

- Clothianidin
- Imidacloprid
- Thiamethoxam

Endangered Species Protection

- Clothianidin:

- Will have no effect on 14 percent of species and 17 percent of critical habitats;
- May affect but is not likely to adversely affect 19 percent of species and 27 percent of critical habitats; and
- Is likely to adversely affect 67 percent of species and 56 percent of critical habitats.

- Imidacloprid:

- Will have no effect on 11 percent of species and 10 percent of critical habitats;
- May affect but is not likely to adversely affect 9 percent of species and 7 percent of critical habitats;
- Is likely to adversely affect 79 percent of species and 83 percent of critical habitats.

- Thiamethoxam:

- Will have no effect on 12 percent of species and 11 percent of critical habitats;
- May affect but is not likely to adversely affect 11 percent of species and 7 percent of critical habitats; and
- Is likely to adversely affect 77 percent species and 81 percent of critical habitats.

The Agency anticipates releasing amended PIDs in 2023, which will include updates to some of the previously proposed mitigations, and early mitigation measures to reduce neonicotinoid exposures for listed species. Mitigation measures will be finalized in the interim decisions, which EPA expects to release in 2024. EPA and the Services will consider these final mitigations during consultation.

Nitroguanidines

- Clothianidin
- Imidacloprid
- Thiamethoxam

Neonicotinoid Insecticides

Q: Will neonicotinoids be banned in New York?

A: Not in the near future, but the clock is ticking...

**Goal: Must identify alternatives to neonicotinoids
AND identify those that are safe to bees and other
non-target organisms**

Outline

- Introduction to neonicotinoids
- Factors to consider when selecting a product
- **Alternatives to neonicotinoids for vegetable pest management**



Disclaimer



-
- Information should be considered as a guideline
 - List of insect pests and registered products covered is not comprehensive
 - No generic products listed
 - Somewhat biased against using pre-mixes
 - Goal to identify a product to control multiple pests
 - Control and suppression not differentiated
 - Guidelines did not consider restrictions for Long Island

Possibilities and criteria considered

Neonics NOT banned



Neonics banned



No new restrictions for pollinators



“Danger”



New restrictions for pollinators



“Caution”



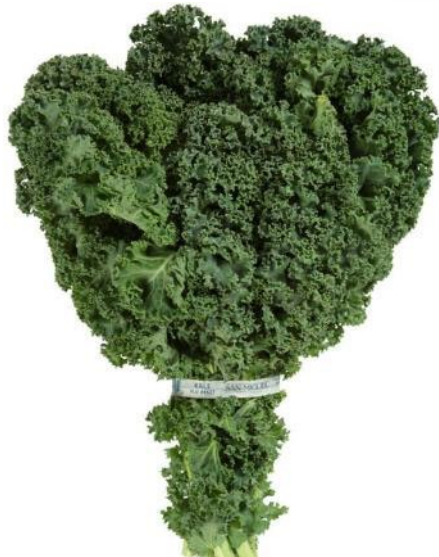
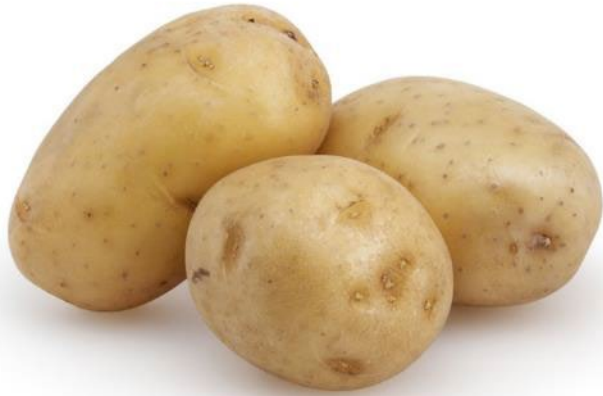
“Safe”



Categories of possibilities

- I. Neonics NOT banned; No new restrictions for pollinators
- II. Neonics NOT banned; New restrictions for pollinators
- III. Neonics banned; No new restrictions for pollinators
- IV. Neonics banned; New restrictions for pollinators

Major Vegetable Crops in New York



Major Vegetable Pests in New York



Potato



Potato

Colorado potato beetle



Potato leafhopper



















Aphids



Wireworms


















Insecticides for Pest Control in Potato

Product	Example	Active ingredient	IRAC class ¹	Application	 Potato beetles	 Potato leafhopper	 Aphids	 Wireworm	Bee toxicity ² 
CruiserMaxx		thiamethoxam	4A	Seed treatment	X	X	X	X	I
Platinum		thiamethoxam	4A	Soil application	X	X	X	X	I
Admire Pro		imidacloprid	4A	Soil application	X	X	X	X	I
Verimark		cyantraniliprole	28	Soil application	X				I
Mocap EC		ethoprop	1B	Soil application				X	II
Actara		thiamethoxam	4A	Foliar	X	X	X		I
Agri-Mek SC		abamectin	6	Foliar		X			I
Assail 30SG		acetamiprid	4A	Foliar	X	X	X		II
Avaunt		indoxacarb	22A	Foliar	X				I
Beleaf		flonicamid	29	Foliar			X		III
Besiege		chlorantraniliprole + lambda-cyhalothrin	3A+28	Foliar	X	X	X		I










¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Potato

Product	Example	Active ingredient	IRAC class ¹	Application	 Potato beetles	 Potato leafhopper	 Aphids	 Wireworm	Bee toxicity ² 
Fulfill		pymetrozine	9B	Foliar			X		II
Movento		spirotetramat	23	Foliar			X		II
Radiant SC/ Delegate		spinetoram	5	Foliar	X				II
Rimon		novaluron	15	Foliar	X				I
Sefina/Versys		afidopyropen	9D	Foliar			X		N/A
Sevin XLR		carbaryl	1A	Foliar		X			I
Sivanto		flupyradifurone	4D	Foliar	X	X	X		II
Trigard		cyromazine	17	Foliar	X				II
Vantacor/ Coragen		chlorantraniliprole	28	Foliar	X				III
Warrior II		lambda-cyhalothrin	3A	Foliar		X	X		I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Potato

Product	Example	Active ingredient	IRAC class ¹	Application	 Potato beetles	 Potato leafhopper	 Aphids	 Wireworm	Bee toxicity ² 
Entrust SC		spinosad	5	Foliar	X				II
JMS Stylet Oil		mineral oil	UN	Foliar			X		N/A
Neemix 4.5		azadirachtin	UN	Foliar	X	X	X		II
PyGanic EC		pyrethrins	3A	Foliar	X	X			I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe



Possibilities



I. Neonics NOT banned; No new restrictions for pollinators

Platinum (thiamethoxam) (4A)



II. Neonics NOT banned; New restrictions for pollinators

Assail (acetamiprid) (4A)



Mocap (ethoprop) (1B)



***Must rotate to a new MoA for second generation**



Possibilities



III. Neonics banned, No new restrictions for pollinators

Besiege (chlorantraniliprole +  **Besiege**[®]
lambda-cyhalothrin) (28 + 3A)



Mocap (ethoprop) (1B)



IV. Neonics banned, New restrictions for pollinators

Sivanto (flupyradifurone) (4D) 



Mocap (ethoprop) (1B)



***Must rotate to a new MoA for second generation**

Fruiting Vegetable Crops



Fruiting Vegetable Crops

Colorado potato beetle



Defoliation & Fruit damage

Caterpillars



















Aphids



Stink bugs















Insecticides for Pest Control in Fruiting Veg Crops

Product	Example	Active ingredient	IRAC class ¹	Application	 Potato beetles	 Caterpillars	 Aphids	 Stink bugs	Bee toxicity ² 
Admire		imidacloprid	4A	Soil application	X		X	X	I
Platinum		thiamethoxam	4A	Soil application	X		X	X	I
Actara		thiamethoxam	4A	Foliar	X		X		I
Agri-Mek SC		abamectin	6	Foliar	X				I
Assail 30SG		acetamiprid	4A	Foliar	X		X	X	II
Avaunt		indoxacarb	22A	Foliar		X			I
Beleaf		flonicamid	29	Foliar			X		III
Besiege		chlorantraniliprole + lambda-cyhalothrin	3A+28	Foliar	X	X	X	X	I
Coragen		chlorantraniliprole	28	Foliar	X	X			III
Danitol		fenpropathrin	3A	Foliar				X	I
Exirel		cyantraniliprole	28	Foliar	X			X	I










¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Fruiting Veg Crops

Product	Example	Active ingredient	IRAC class ¹	Application	 Potato beetles	 Caterpillars	 Aphids	 Stink bugs	Bee toxicity ² 
Fulfill		pymetrozine	9B	Foliar			X		II
Lannate		methomyl	1B	Foliar		X		X	I
Movento		spirotetramat	23	Foliar			X		II
Proclaim		emamectin benzoate	6	Foliar		X			I
Radiant SC		spinetoram	5	Foliar	X	X			II
Sivanto		flupyradifurone	4D	Foliar	X	X	X		II
Warrior II		lambda-cyhalothrin	3A	Foliar		X	X	X	I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Fruiting Veg Crops

Product	Example	Active ingredient	IRAC class ¹	Application	 Potato beetles	 Caterpillars	 Aphids	 Stink bugs	Bee toxicity ² 
Entrust SC		spinosad	5	Foliar	X	X		X	II
JMS Stylet Oil		mineral oil	UN	Foliar			X		N/A
Neemix 4.5		azadirachtin	UN	Foliar	X	X	X		II
PyGanic EC		pyrethrins	3A	Foliar	X	X		X	I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe



Possibilities



I. Neonics NOT banned; No new restrictions for pollinators

Platinum (thiamethoxam) (4A)



Lannate LV (methomyl) (1B)



II. Neonics NOT banned; New restrictions for pollinators

Coragen (chlorantraniliprole) (28)



Assail (acetamiprid) (4A)



***Must rotate to a new MoA for second generation**



Possibilities



III. Neonics banned; No new restrictions for pollinators

Besiege (chlorantraniliprole +
lambda-cyhalothrin) (28 + 3A)



IV. Neonics banned; New restrictions for pollinators

Coragen (chlorantraniliprole) (28)



Beleaf (flonicamid) (29)



Nothing ☹️

***Must rotate to a new MoA for second generation**

Vine Crops

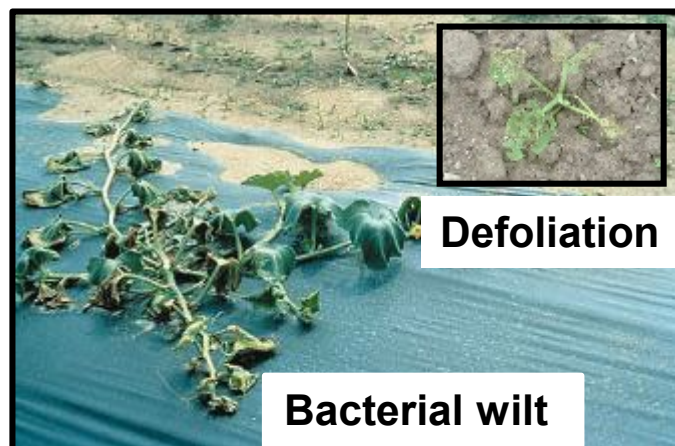


Major Pests of Vine Crops

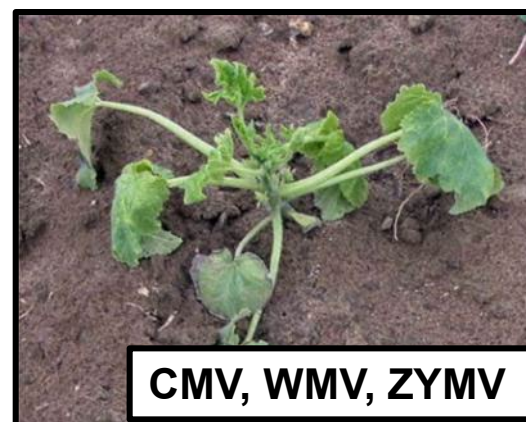
**Seedcorn
maggot**



**Cucumber
beetles**



















Aphids



Squash bug












Insecticides for Pest Control in Vine Crops

Product	Example	Active ingredient	IRAC class ¹	Application	 Maggots	 Cucumber beetles	 Aphids	 Squash bug	Bee toxicity ² 
Cruiser 5FS	 FarMore® FI400 Cucurbits	thiamethoxam	4A	Seed treatment	X	X	X		I
Platinum	 Platinum®	thiamethoxam	4A	Soil application	X	X	X		I
Admire Pro	 ADMIRE® PRO SYSTEMIC PROTECTANT	imidacloprid	4A	Soil application	X	X	X		I
Verimark	 VERIMARK INSECT CONTROL	cyantraniliprole	28	Soil application	X	X	X		I
Actara	 Actara®	thiamethoxam	4A	Foliar		X	X		I
Assail 30SG	 ASSAIL 30SG INSECTICIDE	acetamiprid	4A	Foliar		X	X	X	II
Beleaf	 Beleaf INSECTICIDE	flonicamid	29	Foliar			X		III
Fulfill	 Fulfill® INSECTICIDE	pymetrozine	9B	Foliar			X		II
Sevin XLR	 Sevin® XLR PLUS Carbaryl Insecticide	carbaryl	1A	Foliar		X		X	I
Sivanto	 SIVANTO®	flupyradifurone	4D	Foliar			X	X	II
Warrior II	 Warrior II with Zeon Technology®	lambda-cyhalothrin	3A	Foliar		X	X	X	I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Vine Crops

Product	Example	Active ingredient	IRAC class ¹	Application	 Maggots	 Cucumber beetles	 Aphids	 Squash bug	Bee toxicity ² 
Neemix 4.5		azadirachtin	UN	Foliar				X	II
M-pede		Insecticidal soaps	UN	Foliar			X		N/A
PyGanic EC		pyrethrins	3A	Foliar				X	I
Surround WP		Kaolin clay	UN	Foliar		X			III

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

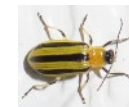


Possibilities

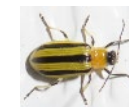


I. Neonics NOT banned; No new restrictions for pollinators

Platinum (thiamethoxam) (4A)



Warrior II w/zeon tech (lambda-cy) (1B)



II. Neonics NOT banned; New restrictions for pollinators

Nothing ☹️



Assail (acetamiprid) (4A)



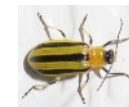


Possibilities



III. Neonics banned; No new restrictions for pollinators

Verimark (cyantraniliprole) (28)



Sivanto (flupyradifurone) (4D)



IV. Neonics banned; New restrictions for pollinators

Nothing ☹️

Kaolin clay (UN)



Beleaf (flonicamid) (29)



Cole Crops



Major Pests of Cole Crops

Flea beetles



Caterpillars



















Aphids



Thrips
















Insecticides for Pest Control in Cole Crops

Product	Example	Active ingredient	IRAC class ¹	Application	Flea beetles 	Caterpillars 	Aphids 	Thrips 	Bee toxicity ² 
Admire Pro		imidacloprid	4A	Soil application	X		X	X	I
Platinum		thiamethoxam	4A	Soil application	X		X	X	I
Verimark		cyantraniliprole	28	Soil application	X	X	X	X	I
Actara		thiamethoxam	4A	Foliar	X		X	X	I
Assail 30SG		acetamiprid	4A	Foliar			X	X	II
Avaunt		indoxacarb	22A	Foliar		X			I
Beleaf		flonicamid	29	Foliar			X		III
Besiege		chlorantraniliprole + lambda-cyhalothrin	3A+28	Foliar	X	X	X	X	I
Coragen		chlorantraniliprole	28	Foliar		X			III
Exirel		cyantraniliprole	28	Foliar	X			X	I
Fulfill		pymetrozine	9B	Foliar			X		II











¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Cole Crops

Product	Example	Active ingredient	IRAC class ¹	Application	Flea beetles 	Caterpillars 	Aphids 	Thrips 	Bee toxicity ² 
Movento		spirotetramat	23	Foliar			X	X	II
Mustang Maxx		Z-cypermethrin	3A	Foliar	X	X		X	I
Proclaim		emamectin benzoate	6	Foliar		X			I
Radiant SC		spinetoram	5	Foliar		X		X	II
Sevin XLR		carbaryl	1A	Foliar	X				I
Sivanto		flupyradifurone	4D	Foliar			X		II
Versys		afidopyropen	9D	Foliar			X		N/A
Warrior II		lambda-cyhalothrin	3A	Foliar	X	X		X	I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Insecticides for Pest Control in Cole Crops

Product	Example	Active ingredient	IRAC class ¹	Application	Flea beetles 	Caterpillars 	Aphids 	Thrips 	Bee toxicity ² 
Agree WG		<i>B.t. aizawai</i>	11A	Foliar		X			III
Dipel/Javelin		<i>B.t. kurstaki</i>	11A	Foliar		X			III
Entrust SC		spinosad	5	Foliar	X	X		X	II
Neemix 4.5		azadirachtin	UN	Foliar		X	X		II
PyGanic EC		pyrethrins	3A	Foliar	X	X		X	I

¹IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe



Possibilities



I. Neonics NOT banned; No new restrictions for pollinators

Platinum (thiamethoxam) (4A)



Radiant SC (spinetoram) (5)



II. Neonics NOT banned; New restrictions for pollinators

Entrust SC (spinosad) (5)



Assail (acetamiprid) (4A)





Possibilities



III. Neonics banned; No new restrictions for pollinators

Verimark (cyantraniliprole) (28)



Besiege (chlorantraniliprole +
lambda-cyhalothrin) (28 + 3A)



IV. Neonics banned; New restrictions for pollinators

Entrust SC (spinosad) (5)



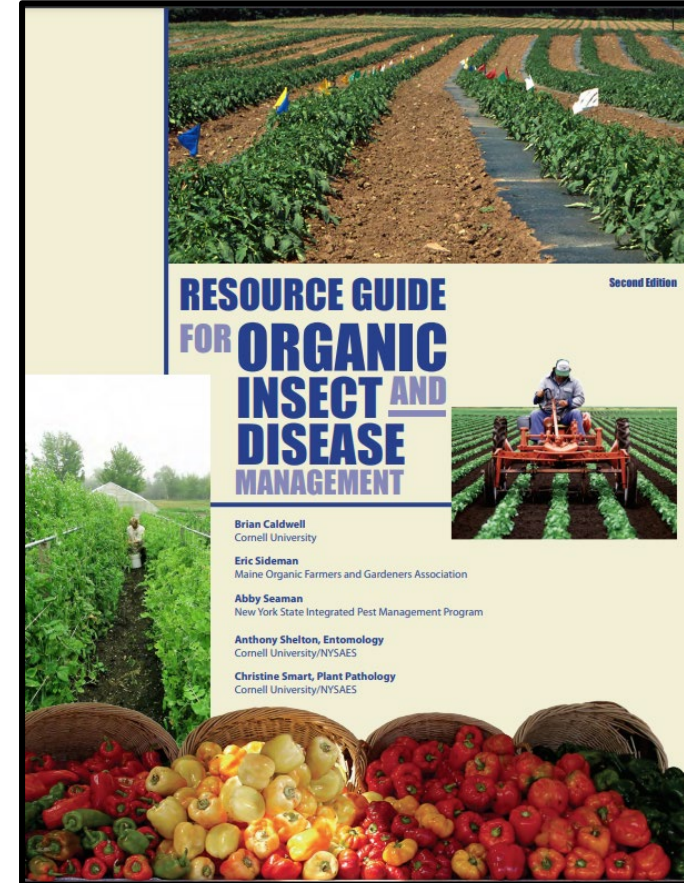
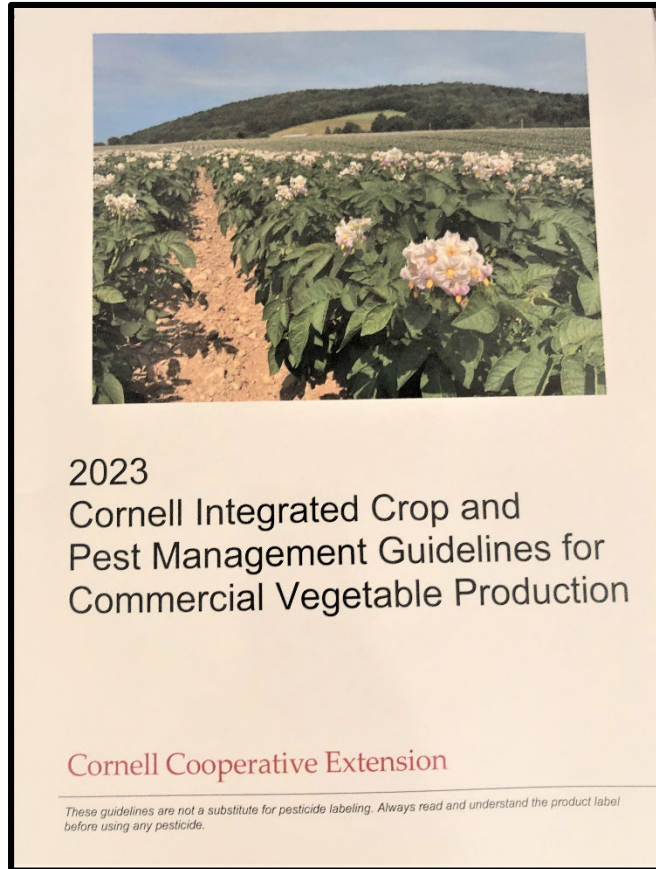
Movement (spirotetramat) (23)



Final Thoughts

- **A neonicotinoid ban would often result in more insecticide use in most vegetable crops**
- **There are few insecticides that are considered highly to moderately safe for pollinators**
- **More research is needed to identify alternatives to insecticides that are safe for beneficial insects, especially pollinators**

Resources



Questions?



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