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

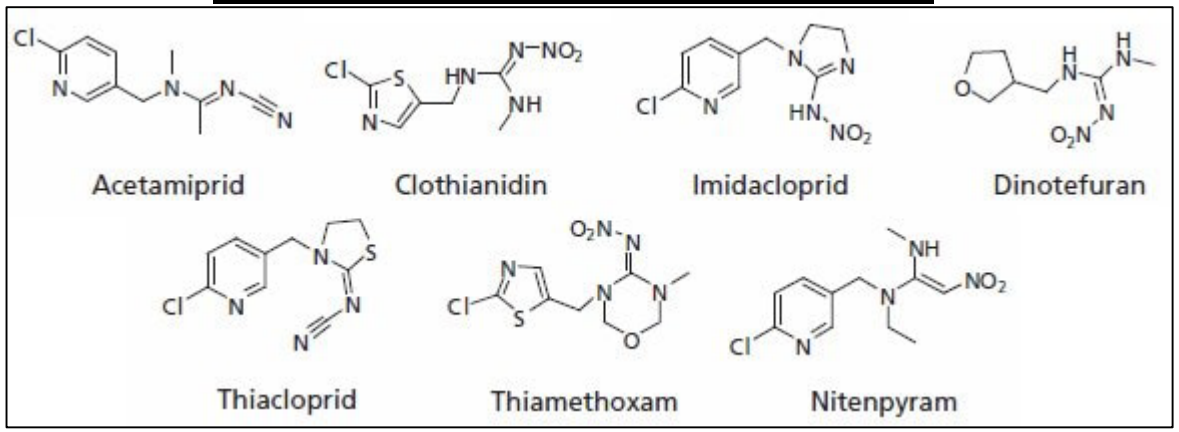
- Neonicotinoids and their value to agriculture
- Risks to consider when using neonicotinoids
- Neonicotinoid alternatives for vegetable pest control

Neonicotinoid Insecticides

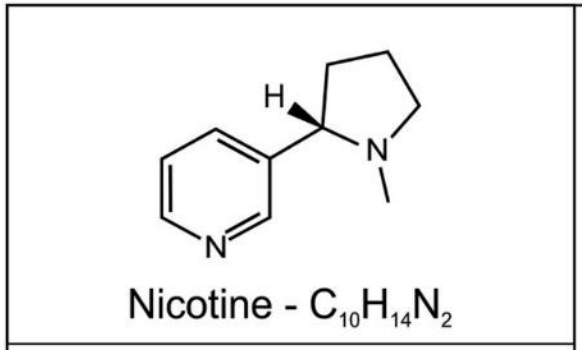
Q: What is a neonicotinoid insecticide?

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

Neonicotinoid insecticides



Nicotine



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Neonicotinoid Insecticides

N-Cyanoamidines

- Acetamiprid
- Thiacloprid

Nitroguanidines

- Clothianidin
- Imidacloprid
- Thiamethoxam

Neonicotinoid Insecticides

Q: How do neonicotinoids kill insects?

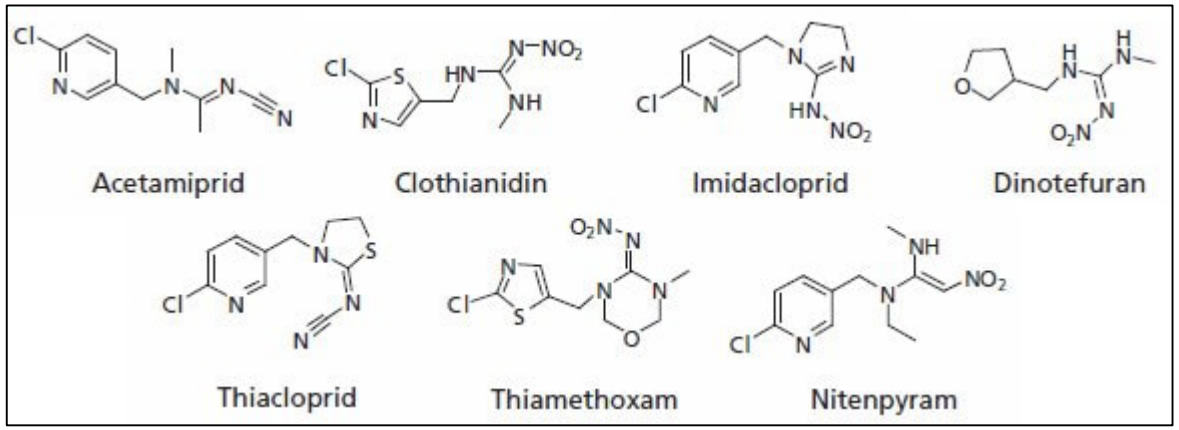
A: Affect the central nervous system of insects

<u>Mode of Action (MoA)</u>: 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*	



IRAC
Insecticide Resistance Action Committee

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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

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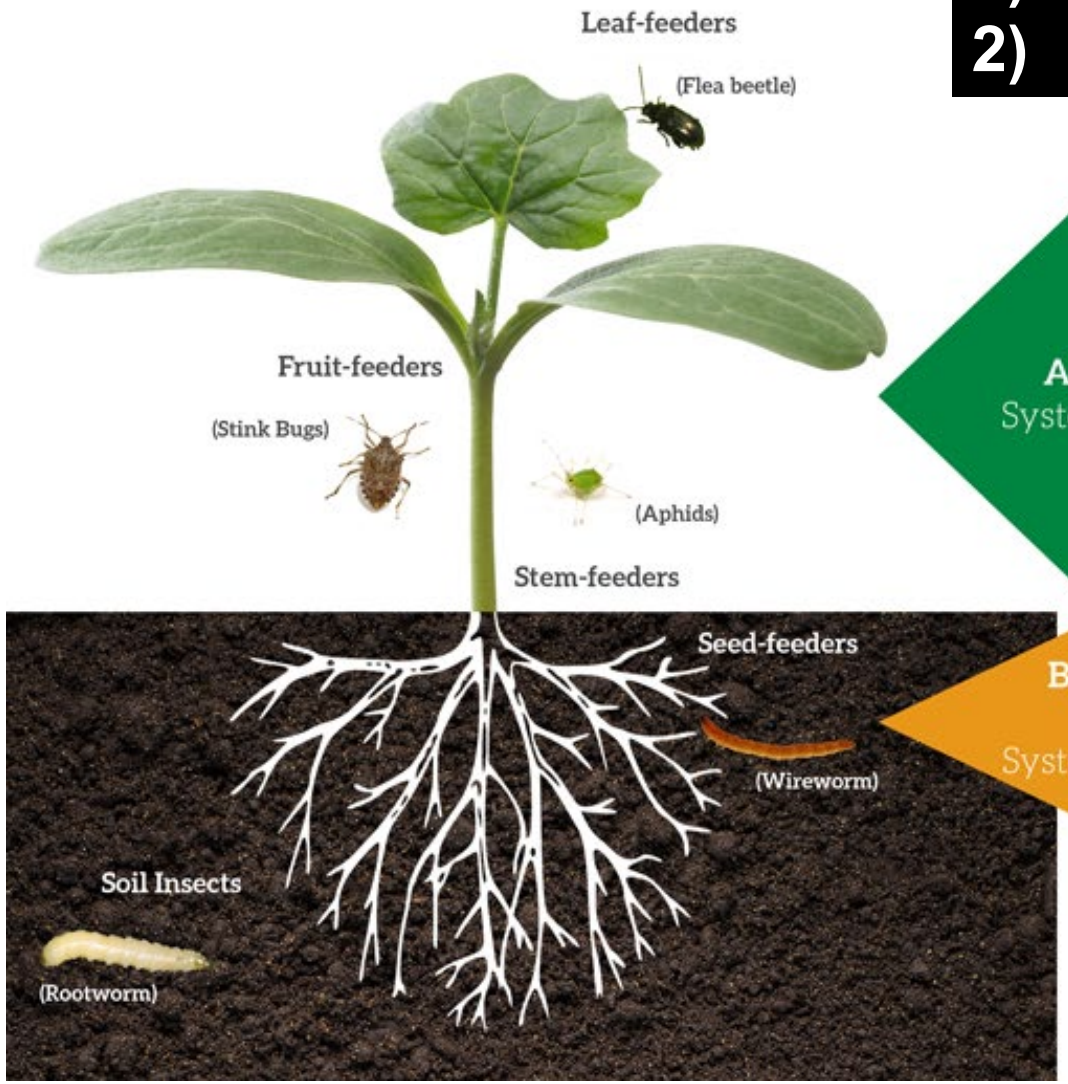
Neonicotinoid Insecticides

Q: Why are neonicotinoid insecticides so popular?

Neonicotinoid Insecticides

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



	Chewing Pests	Sucking Pests
Above Ground Systemic Activity	Cutworm	Aphids
	Armyworm	Thrips
	Flea Beetle	White Flies
	Sugarcane Beetle	Alfalfa Hopper
	BLB	Chinch Bugs
	Billbugs	Leafhopper
	Cabbage Root Fly	Stinkbug
	Cornstalk Borers	Gall Weevil
Below Ground Contact and Systemic Activity	Rootworm	
	Seedcorn Maggot	
	White Grubs	
	Wireworms	

Seminis

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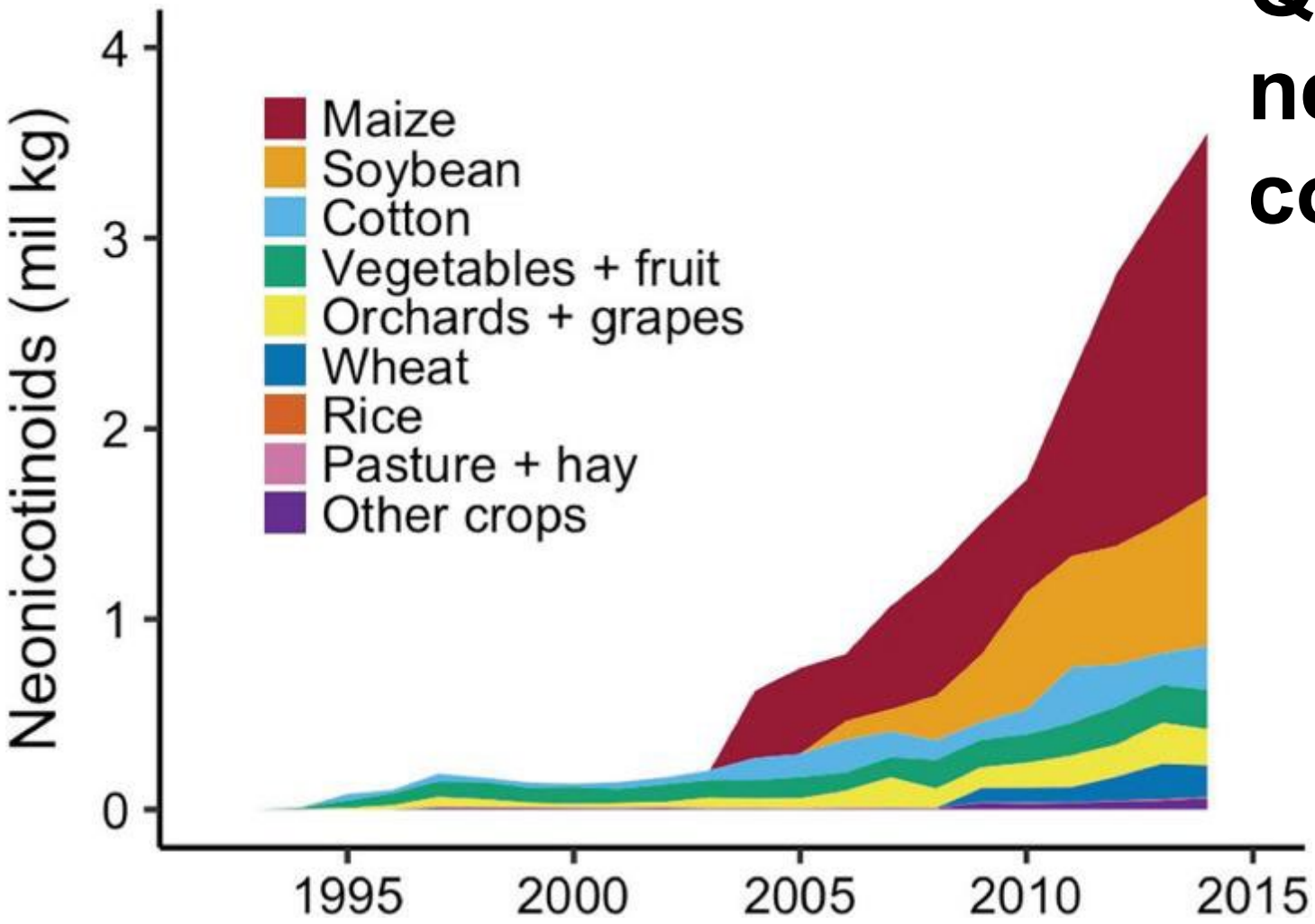
Neonicotinoid Insecticides



Douglas and Tooker 2015

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

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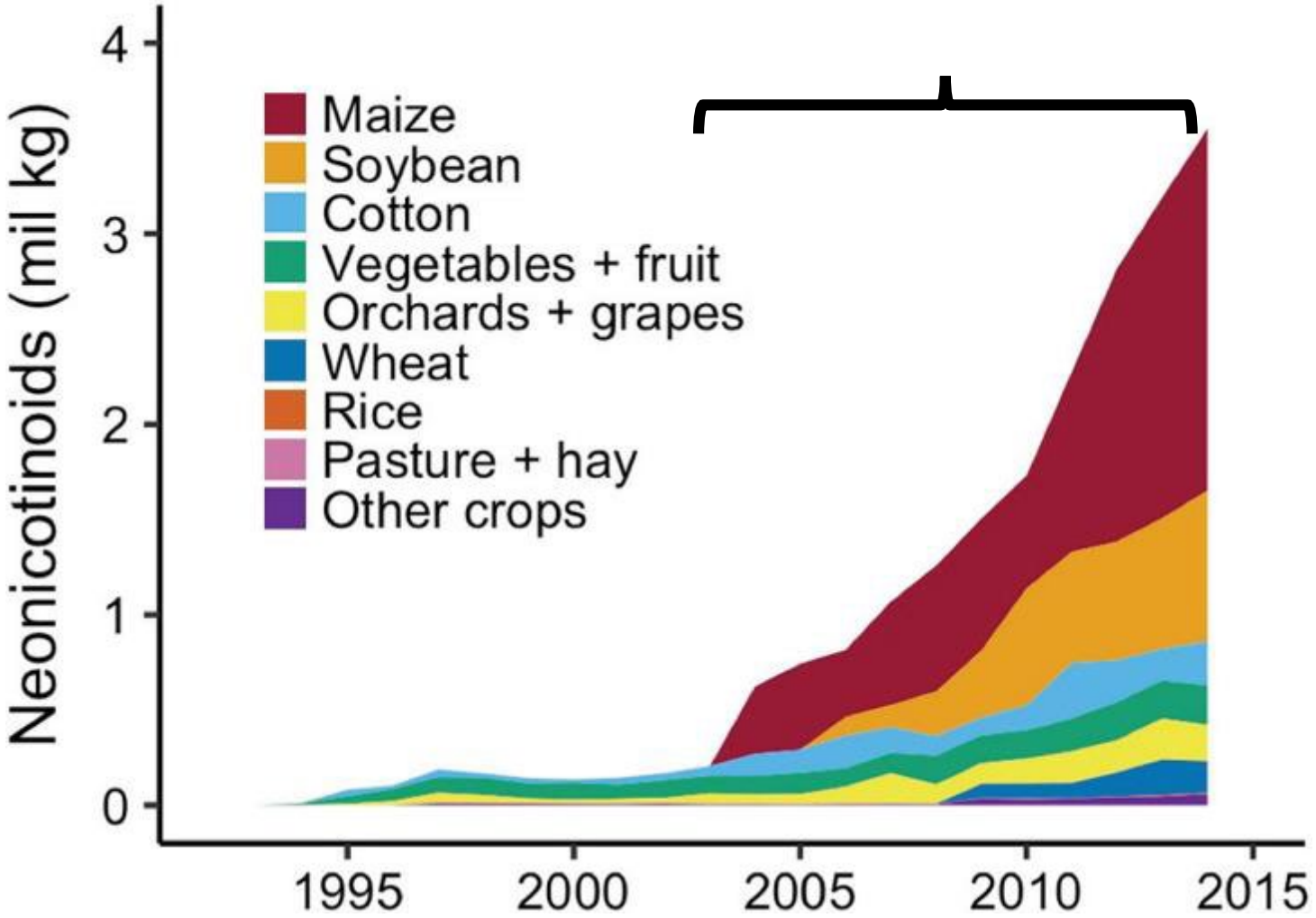
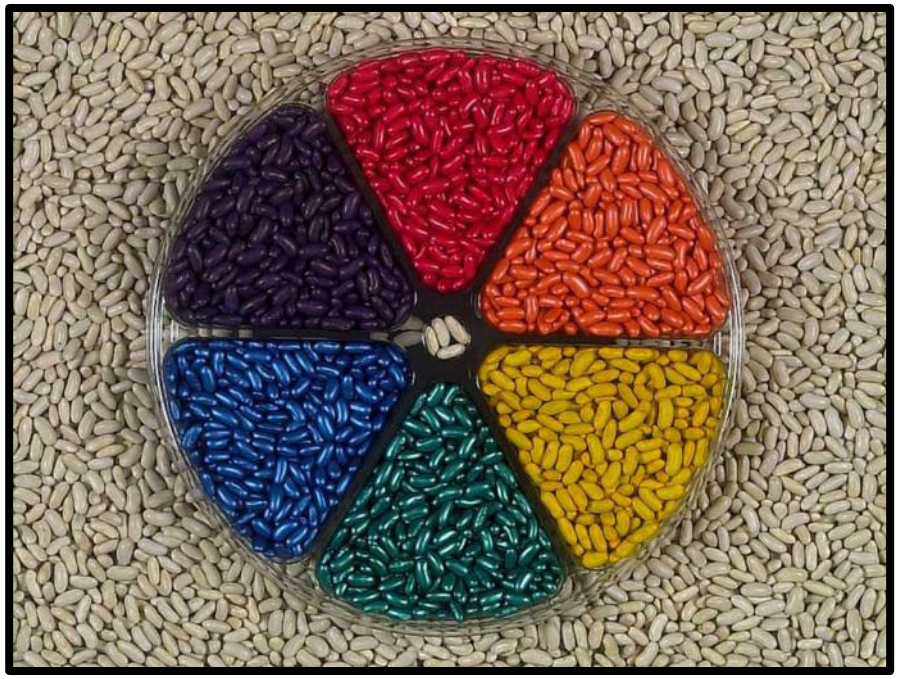
Neonicotinoid Insecticides

Neonicotinoid seed treatment revolution



Douglas and Tooker 2015



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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

Cruiser® 5FS

Example in Vegetable Crops:

Snap bean pest control using a neonicotinoid seed treatment

* 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!

Potato leafhopper

Seedcorn maggot

Untreated

Cruiser® 5FS

Outline

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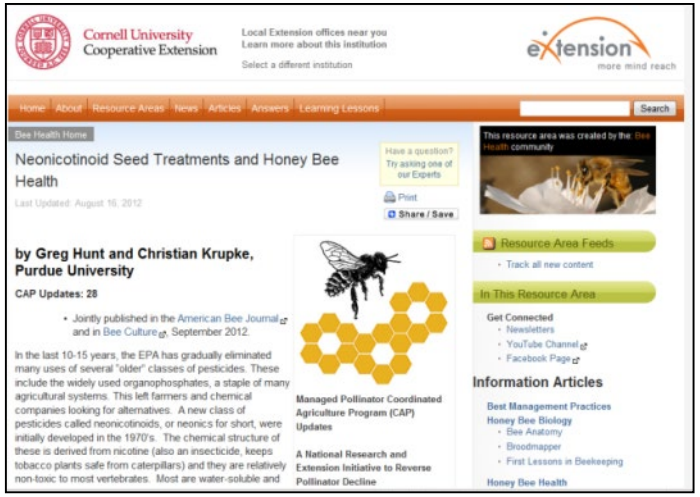
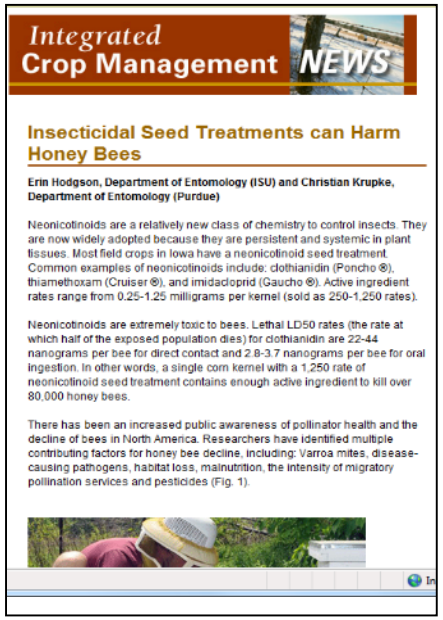
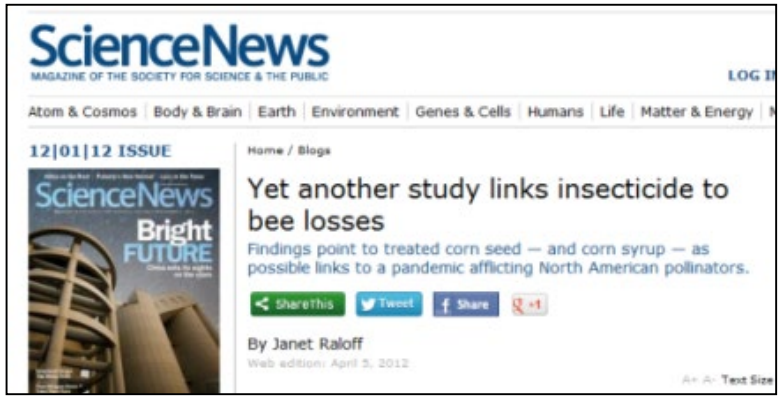
- **Risks to consider when using neonicotinoids**
- **Neonicotinoid alternatives for vegetable pest control**

Neonicotinoid Insecticides







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Neonicotinoid 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 COMMERCIALLY 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.

➢ New labelling on some insecticides

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When Using This Product Take Steps To:

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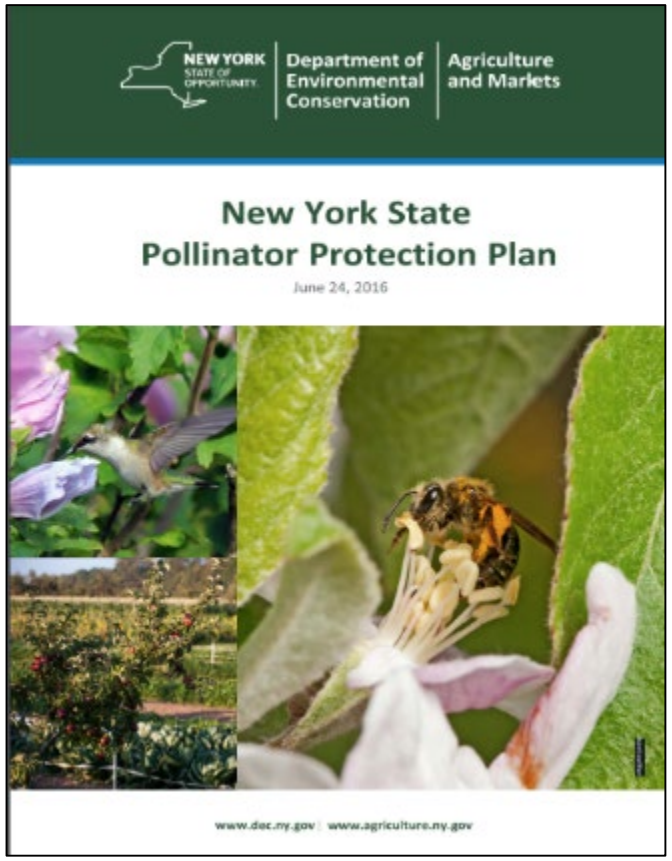
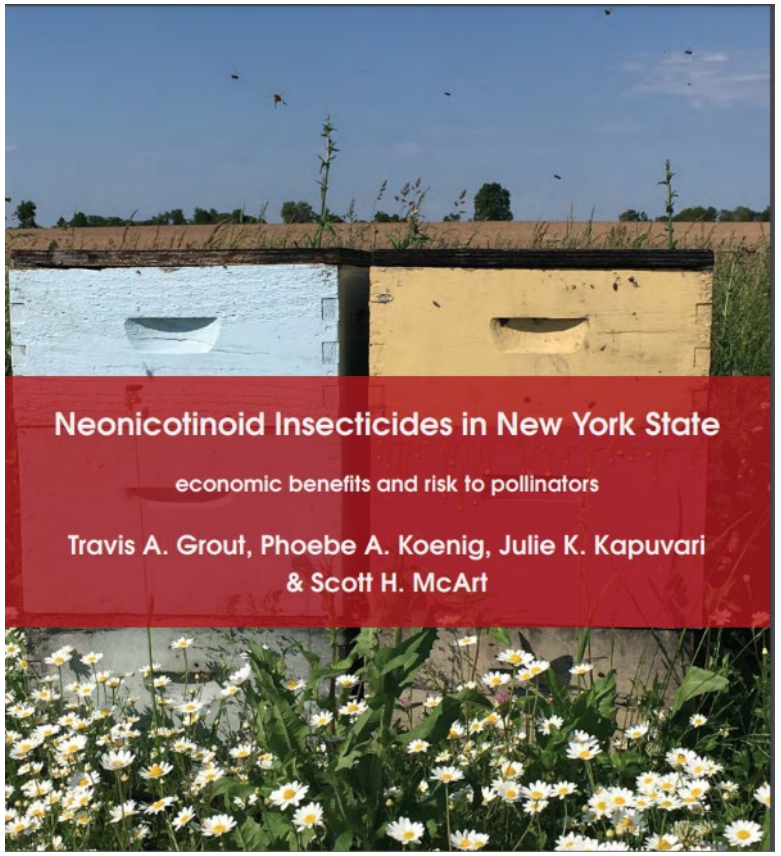
Neonicotinoid Insecticides

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





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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.

Contact for this Page

DEC Press Office
625 Broadway
Albany, NY 12233
518-402-8000
518-402-8000
email us

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All of New York State

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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:

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

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

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

b. (1) No person shall apply or treat outdoor ornamental plants and turf, except for the production of agricultural commodities, with a 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*.]

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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

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Pollinator Protection

UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES
UC IPM
Statewide Integrated Pest Management Program

UC IPM

Bee Precautionary Pesticide Rating*

I	“Danger”
II	“Caution”
III	“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

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Pollinator Protection

N-Cyanoamidines

- Acetamiprid
- Thiacloprid

II **“Caution”**

Nitroguanidines

- Clothianidin
- Imidacloprid
- Thiamethoxam

I **“Danger”**

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UC IPM

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 → Insecticide → THIAMETHOXAM Add to list

✖	Common name (Example trade name)	Type	Mode of action	Rating	Other effects on bees	Toxic to honey bee brood	Toxic to other bee species
✖	ACETAMIPRID (Assail)	Insecticide	4A	II	FRAC3	—	✔
✖	THIAMETHOXAM (Actara, Platinum)	Insecticide	4A	I	FRAC3	—	✔

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

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Frequently asked questions (FAQs) about this tool.

◉ Common name ○ Trade name → Insecticide → CYANTRANILIPROLE Add to list

✖	Common name (Example trade name)	Type	Mode of action	Rating	Other effects on bees	Toxic to honey bee brood	Toxic to other bee species
✖	CHLORANTRANILIPROLE (Altacor, Coragen)	Insecticide	28	III	FRAC2 FRAC3	✔	—
✖	CYANTRANILIPROLE (Exirel, Verimark)	Insecticide	28	I	—	✔	✔

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

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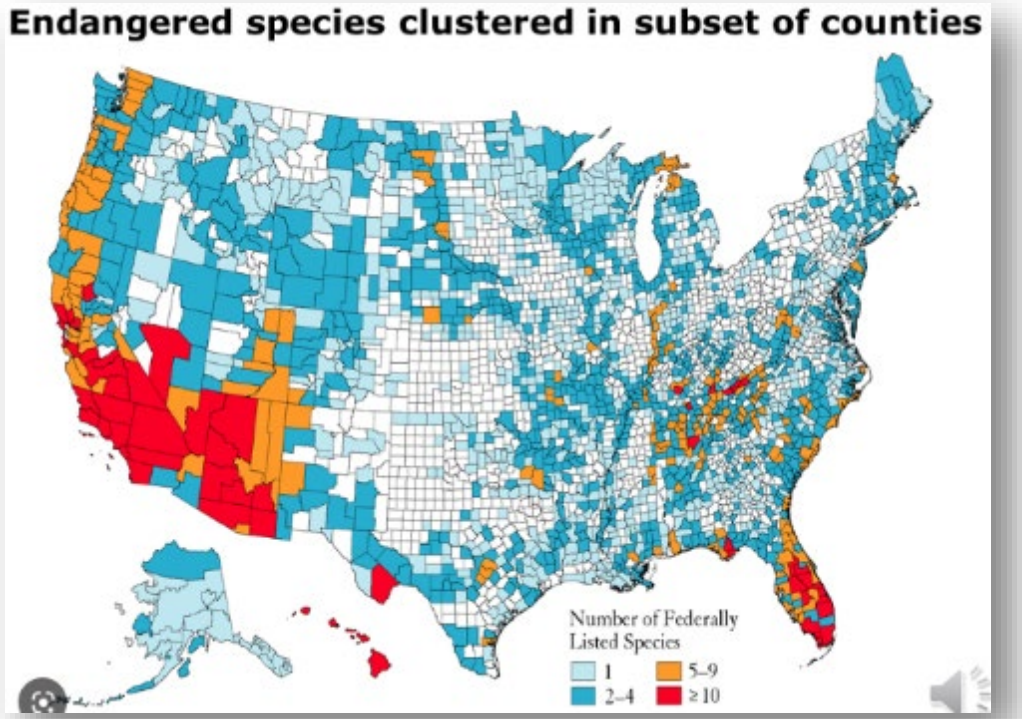
Endangered Species Protection

US EPA - Endangered Species Act (1973)



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Endangered Species Protection

EPA United States Environmental Protection Agency

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Pesticides

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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

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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…

<u>Goal</u>: 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

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Possibilities and criteria considered

Neonics NOT banned

Neonics banned

No new restrictions for pollinators — I — **“Danger”**

New restrictions for pollinators — II — **“Caution”**

III — **“Safe”**

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Categories of possibilities

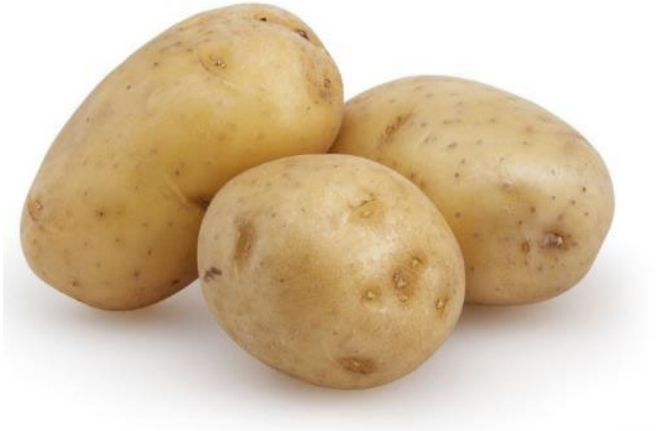
I. Neonics NOT banned; No new restrictions for pollinators

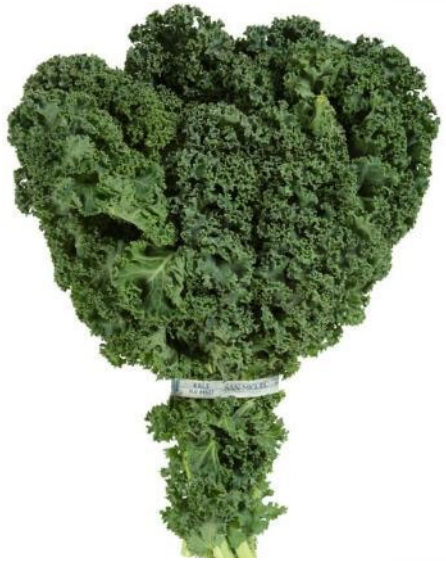
II. Neonics NOT banned; New restrictions for pollinators

III. Neonics banned; No new restrictions for pollinators

IV. Neonics banned; New restrictions for pollinators

Major Vegetable Crops in New York





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Major Vegetable Pests in New York

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Potato

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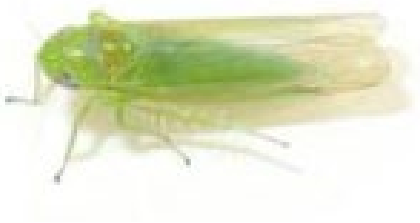
Potato

Colorado potato beetle

Potato leafhopper



Aphids

Wireworms

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Insecticides for Pest Control in Potato

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

[1]IRAC 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	Fulfill® INSECTICIDE	pymetrozine	9B	Foliar			X		II
Movento	MOVENTO	spirotetramat	23	Foliar			X		II
Radiant SC/ Delegate	Radiant / Delegate® WG INSECTICIDE	spinetoram	5	Foliar	X				II
Rimon	Rimon 0.83EC insecticide	novaluron	15	Foliar	X				I
Sefina/Versys	Sefina™ Inscalis® Insecticide	afidopyropen	9D	Foliar			X		N/A
Sevin XLR	Sevin® XLR PLUS	carbaryl	1A	Foliar		X			I
Sivanto	SIVANTO	flupyradifurone	4D	Foliar	X	X	X		II
Trigard	Trigard®	cyromazine	17	Foliar	X				II
Vantacor/ Coragen	VANTACOR / CORAGEN	chlorantraniliprole	28	Foliar	X				III
Warrior II	Warrior II with Zeon Technology®	lambda-cyhalothrin	3A	Foliar		X	X		I

[1]IRAC 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	Entrust SC NATURALYTE INSECT CONTROL	spinosad	5	Foliar	X				II
JMS Stylet Oil	JMS STYLET-OIL The Premiere White Mineral Oil Giving Growers A Clear Choice	mineral oil	UN	Foliar			X		N/A
Neemix 4.5	Neemix 4.5 INSECT GROWTH REGULATOR	azadirachtin	UN	Foliar	X	X	X		II
PyGanic EC	PyGanic	pyrethrins	3A	Foliar	X	X			I

[1]IRAC 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) Platinum®


*

II. Neonics NOT banned; New restrictions for pollinators

Assail (acetamiprid) (4A) ASSAIL 30SG INSECTICIDE


*

Mocap (ethoprop) (1B) mocap EC nematicide · insecticide

*Must rotate to a new MoA for second generation

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Possibilities

III. Neonics banned, No new restrictions for pollinators

Besiege (chlorantraniliprole + 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

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Fruiting Vegetable Crops

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Fruiting Vegetable Crops

Colorado potato beetle

Caterpillars

Aphids

Stink bugs

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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	ADMIRE PRO	imidacloprid	4A	Soil application	X		X	X	I
Platinum	Platinum	thiamethoxam	4A	Soil application	X		X	X	I
Actara	Actara	thiamethoxam	4A	Foliar	X		X		I
Agri-Mek SC	Agri-Mek SC	abamectin	6	Foliar	X				I
Assail 30SG	Assail 30SG	acetamiprid	4A	Foliar	X		X	X	II
Avaunt	Avaunt eVo	indoxacarb	22A	Foliar		X			I
Beleaf	Beleaf	flonicamid	29	Foliar			X		III
Besiege	Besiege	chlorantraniliprole + lambda-cyhalothrin	3A+28	Foliar	X	X	X	X	I
Coragen	Coragen	chlorantraniliprole	28	Foliar	X	X			III
Danitol	Danitol 2.4EC Spray	fenpropathrin	3A	Foliar				X	I
Exirel	Exirel	cyantraniliprole	28	Foliar	X			X	I

[1]IRAC 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	Fulfill® INSECTICIDE	pymetrozine	9B	Foliar			X		II
Lannate	DuPont™ Lannate® LV INSECTICIDE	methomyl	1B	Foliar		X		X	I
Movento	MOVENTO	spirotetramat	23	Foliar			X		II
Proclaim	Proclaim®	emamectin benzoate	6	Foliar		X			I
Radiant SC	Radiant SC	spinetoram	5	Foliar	X	X			II
Sivanto	SIVANTO	flupyradifurone	4D	Foliar	X	X	X		II
Warrior II	Warrior II with Zeon Technology®	lambda-cyhalothrin	3A	Foliar		X	X	X	I

[1]IRAC 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	Entrust SC NATURALYTE INSECT CONTROL	spinosad	5	Foliar	X	X		X	II
JMS Stylet Oil	JMS STYLET-OIL The Premiere White Mineral Oil Giving Growers A Clear Choice	mineral oil	UN	Foliar			X		N/A
Neemix 4.5	Neemix 4.5 INSECT GROWTH REGULATOR	azadirachtin	UN	Foliar	X	X	X		II
PyGanic EC	PyGanic	pyrethrins	3A	Foliar	X	X		X	I

[1]IRAC 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) Platinum®


*

Lannate LV (methomyl) (1B) DuPont™ Lannate® LV INSECTICIDE

II. Neonics NOT banned; New restrictions for pollinators

Coragen (chlorantraniliprole) (28) CORAGEN INSECT CONTROL


*

Assail (acetamiprid) (4A) ASSAIL 30SG INSECTICIDE

*Must rotate to a new MoA for second generation

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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

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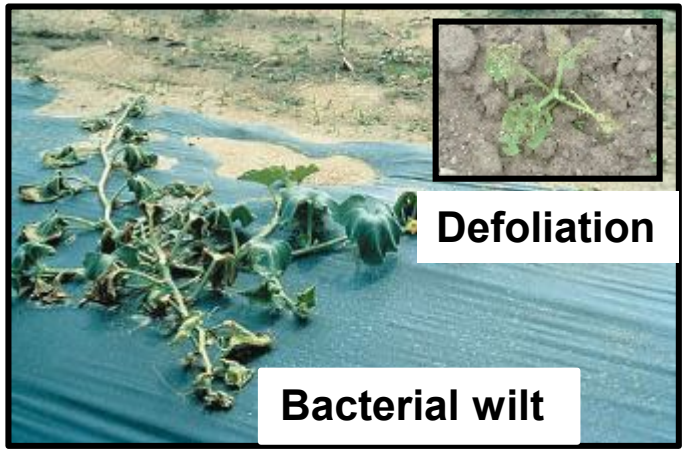
Vine Crops

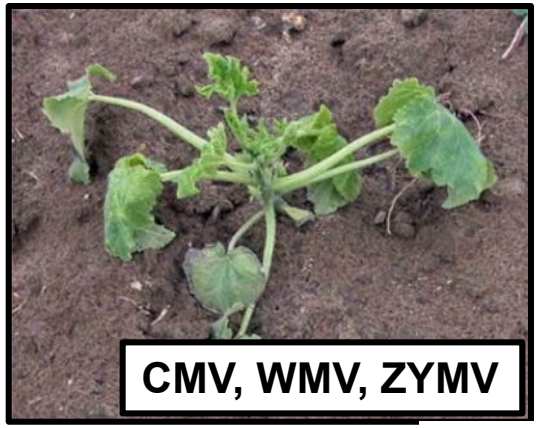
Major Pests of Vine Crops

Seedcorn maggot

Cucumber beetles



Aphids



Squash bug

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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	imidacloprid	4A	Soil application	X	X	X		I
Verimark	VERIMARK	cyantraniliprole	28	Soil application	X	X	X		I
Actara	Actara	thiamethoxam	4A	Foliar		X	X		I
Assail 30SG	Assail 30SG	acetamiprid	4A	Foliar		X	X	X	II
Beleaf	Beleaf	flonicamid	29	Foliar			X		III
Fulfill	Fulfill® INSECTICIDE	pymetrozine	9B	Foliar			X		II
Sevin XLR	Sevin XLR PLUS	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

[1]IRAC 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	Neemix 4.5 INSECT GROWTH REGULATOR	azadirachtin	UN	Foliar				X	II
M-pede		Insecticidal soaps	UN	Foliar			X		N/A
PyGanic EC	PyGanic	pyrethrins	3A	Foliar				X	I
Surround WP		Kaolin clay	UN	Foliar		X			III

[1]IRAC 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) Platinum®



Warrior II w/zeon tech **(lambda-cy) (1B)** Warrior II with Zeon Technology


II. Neonics NOT banned; New restrictions for pollinators

Nothing ☹

Assail (acetamiprid) (4A) ASSAIL 30SG INSECTICIDE



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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)

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Cole Crops

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Major Pests of Cole Crops

Flea beetles

Caterpillars

Aphids

Thrips

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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	ADMIRE PRO	imidacloprid	4A	Soil application	X		X	X	I
Platinum	Platinum	thiamethoxam	4A	Soil application	X		X	X	I
Verimark	VERIMARK	cyantraniliprole	28	Soil application	X	X	X	X	I
Actara	Actara	thiamethoxam	4A	Foliar	X		X	X	I
Assail 30SG	Assail 30SG	acetamiprid	4A	Foliar			X	X	II
Avaunt	AVAUNT eVo	indoxacarb	22A	Foliar		X			I
Beleaf	Beleaf	flonicamid	29	Foliar			X		III
Besiege	Besiege	chlorantraniliprole + lambda-cyhalothrin	3A+28	Foliar	X	X	X	X	I
Coragen	CORAGEN	chlorantraniliprole	28	Foliar		X			III
Exirel	EXIREL	cyantraniliprole	28	Foliar	X			X	I
Fulfill	Fulfill® INSECTICIDE	pymetrozine	9B	Foliar			X		II

[1]IRAC 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	MOVENTO	spirotetramat	23	Foliar			X	X	II
Mustang Maxx	MUSTANG MAXX INSECTICIDE	Z-cypermethrin	3A	Foliar	X	X		X	I
Proclaim	Proclaim®	emamectin benzoate	6	Foliar		X			I
Radiant SC	Radiant® SC INSECTICIDE	spinetoram	5	Foliar		X		X	II
Sevin XLR	Sevin® XLR PLUS	carbaryl	1A	Foliar	X				I
Sivanto	SIVANTO	flupyradifurone	4D	Foliar			X		II
Versys	Versys Insecticide Powered by Inscalis®	afidopyropen	9D	Foliar			X		N/A
Warrior II	Warrior II with Zeon Technology®	lambda-cyhalothrin	3A	Foliar	X	X		X	I

[1]IRAC 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	Agree WG BIOLOGICAL INSECTICIDE	*B.t. aizawai*	11A	Foliar		X			III
Dipel/Javelin	DiPel® DF BIOLOGICAL INSECTICIDE	*B.t. kurstaki*	11A	Foliar		X			III
Entrust SC	Entrust® SC NATURALYTE® INSECT CONTROL	spinosad	5	Foliar	X	X		X	II
Neemix 4.5	Neemix® 4.5 INSECT GROWTH REGULATOR	azadirachtin	UN	Foliar		X	X		II
PyGanic EC	PyGanic	pyrethrins	3A	Foliar	X	X		X	I

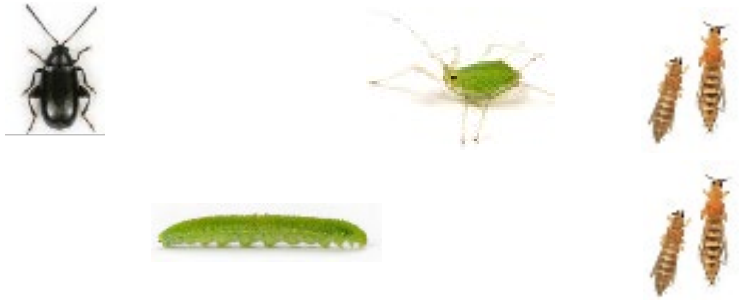
[1]IRAC class 4A includes neonicotinoids; Bee toxicity precaution ratings: I danger; II caution; III safe

Possibilities

I. Neonics NOT banned; No new restrictions for pollinators

Platinum (thiamethoxam) (4A)

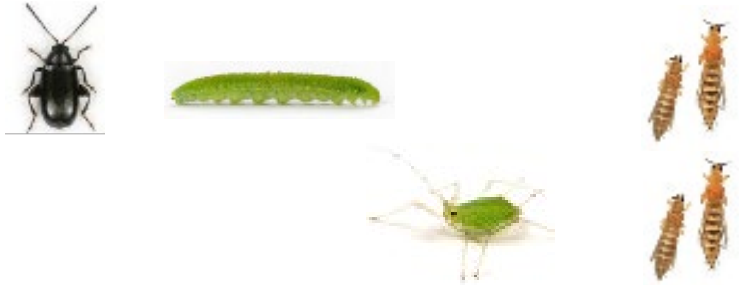
Radiant SC (spinetoram) (5)



II. Neonics NOT banned; New restrictions for pollinators

Entrust SC (spinosad) (5)

Assail (acetamiprid) (4A)



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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)

Movento (spirotetramat) (23)

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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

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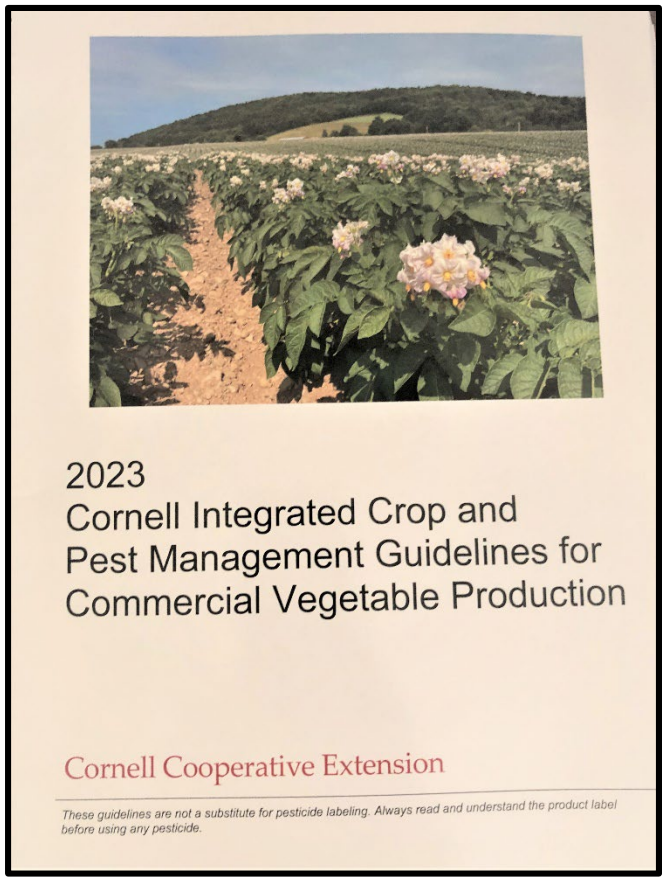
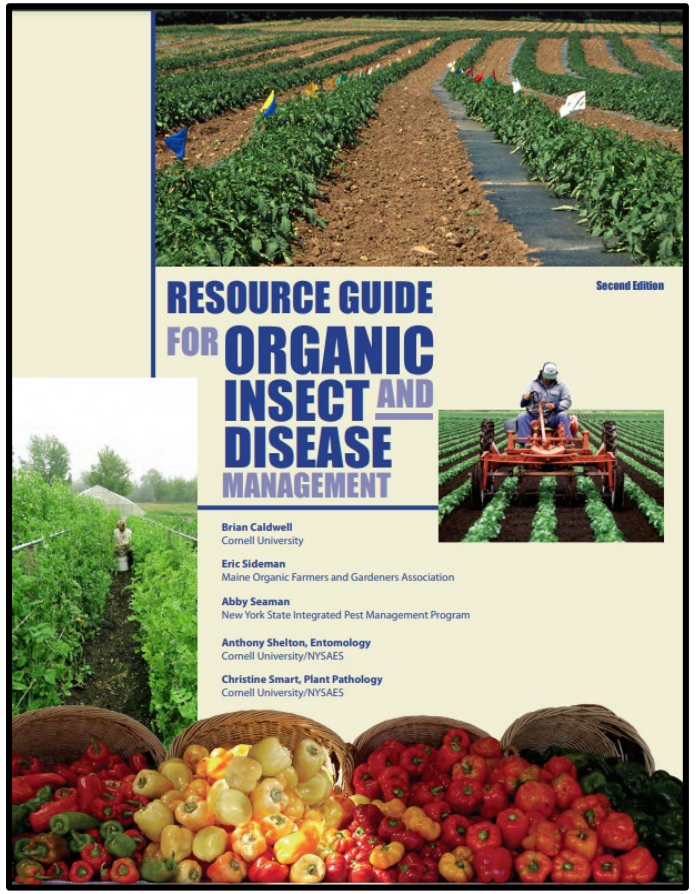
Resources





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Questions?

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