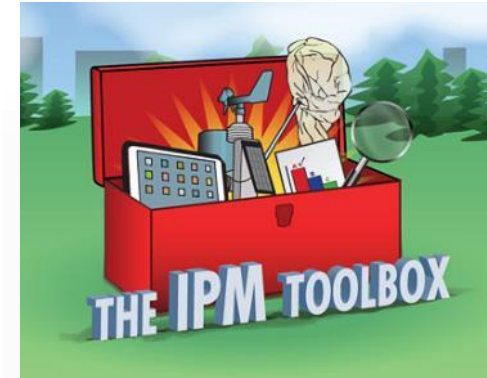


Exploring Alternatives to Neonicotinoid Seed Treatments: Case Studies in Vegetable Crops

Leo Salgado

Cornell University



**Northeastern
IPM
Center**

April 3, 2025



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Cornell AgriTech

New York State Agricultural
Experiment Station

Funding Acknowledgment



This presentation was funded by the Northeastern IPM Center through Grant #2022-70006-38004, Accession Number: 1017389 from the USDA National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Webinar Details

Webinar will end at 12:00pm



Live Transcription



A recording of this webinar will be
available within a week



<http://www.neipmc.org/go/ipmtoolbox>

We Welcome Your Questions

Please submit a question at any time using the Q&A feature to your right at any time

If you'd like to ask a question anonymously, please indicate that at the beginning of your query.

Webinar Presenter

Leo Salgado

PhD. Student, Brian Nault's Vegetable Entomology Lab
Cornell University



Some Questions for You





Exploring Alternatives to Neonicotinoid Seed Treatments: Case Studies in Vegetable Crops

Leonardo D. Salgado and Brian A. Nault

"The IPM Toolbox" Northeastern IPM Webinar Series

April 3, 2025

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Acknowledgements

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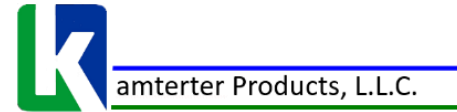
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Funding



Agriculture
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Dry Bean Endowment

New York Onion Research
& Development Program

New York Vegetable Growers Association

Outline

I. Neonicotinoid insecticides as seed treatments

II. Case studies in vegetable crops

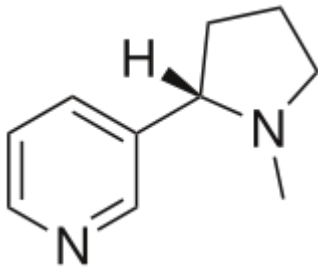
Outline

I. Neonicotinoid insecticides as seed treatments

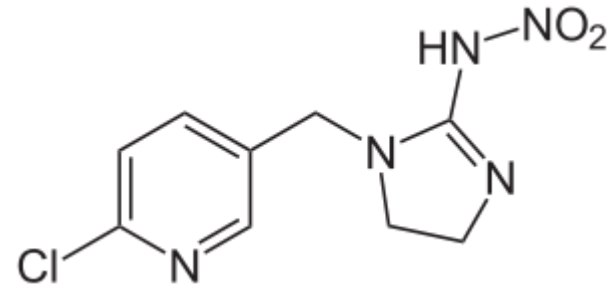
II. Case studies in vegetable crops

Neonicotinoid insecticides

- Chemical structure similar to nicotine



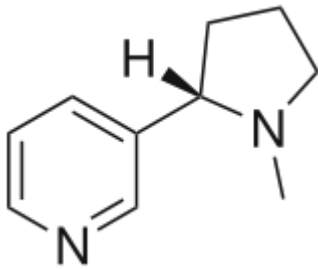
Nicotine



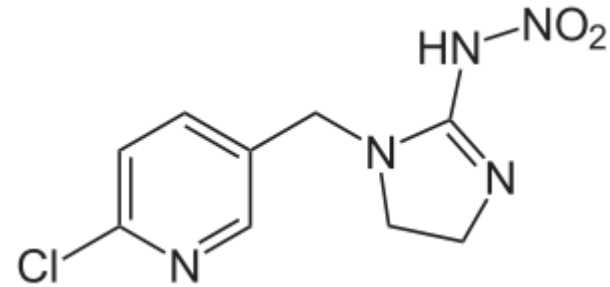
Imidacloprid

Neonicotinoid insecticides

- Chemical structure similar to nicotine
- Greater toxicity to insects than to mammals



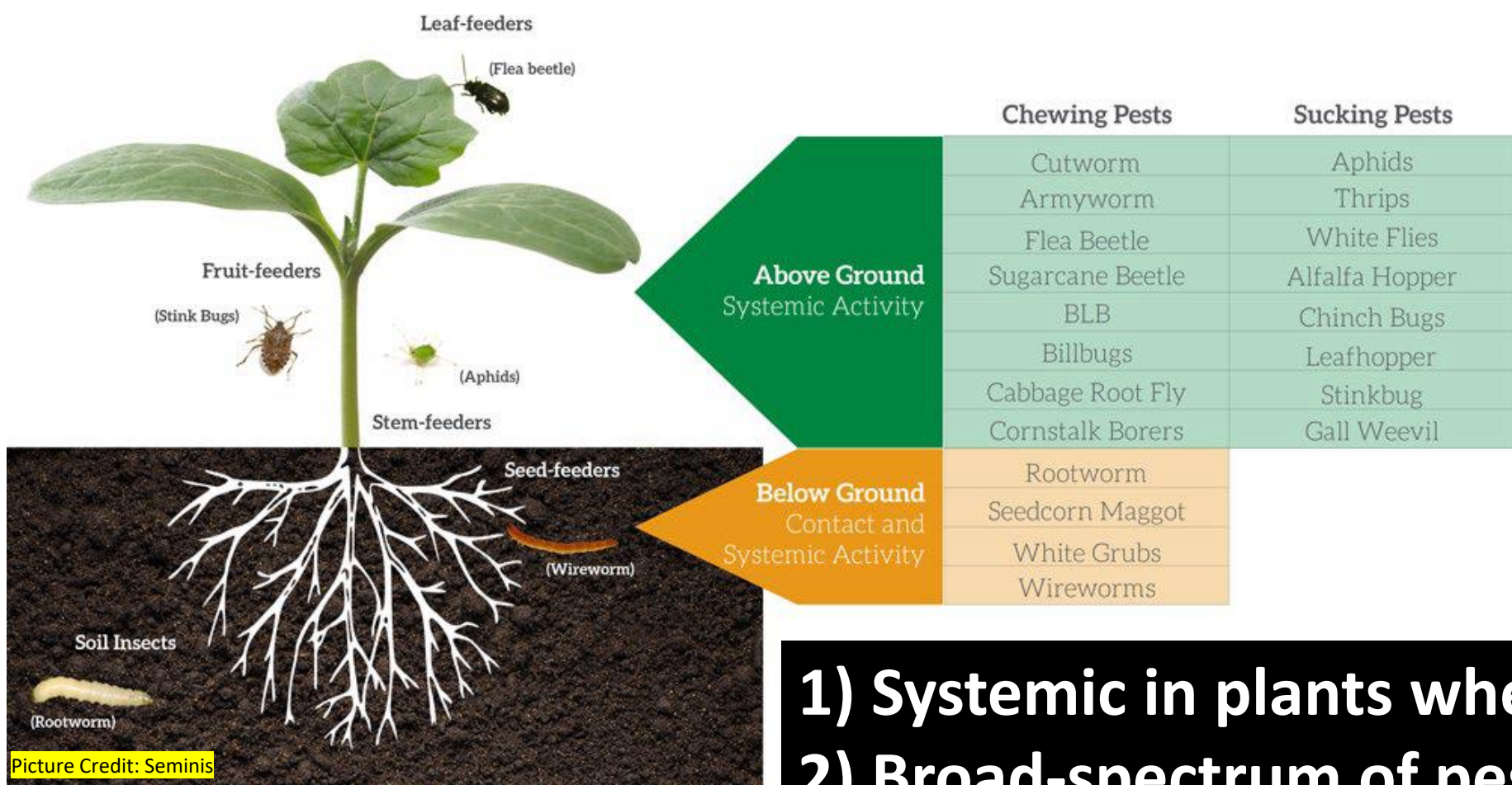
Nicotine



Imidacloprid

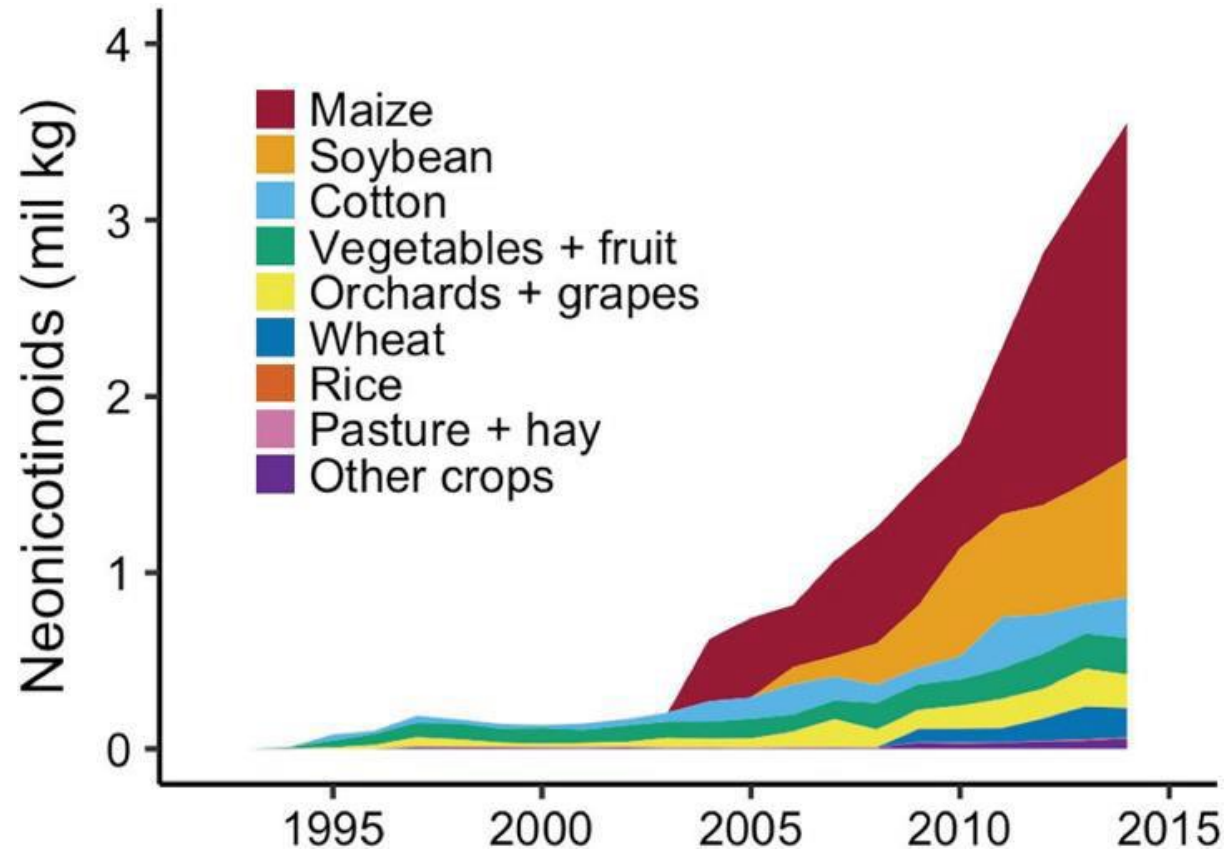
Why are **neonicotinoid insecticides so popular?**

Why are **neonicotinoid** insecticides so popular?



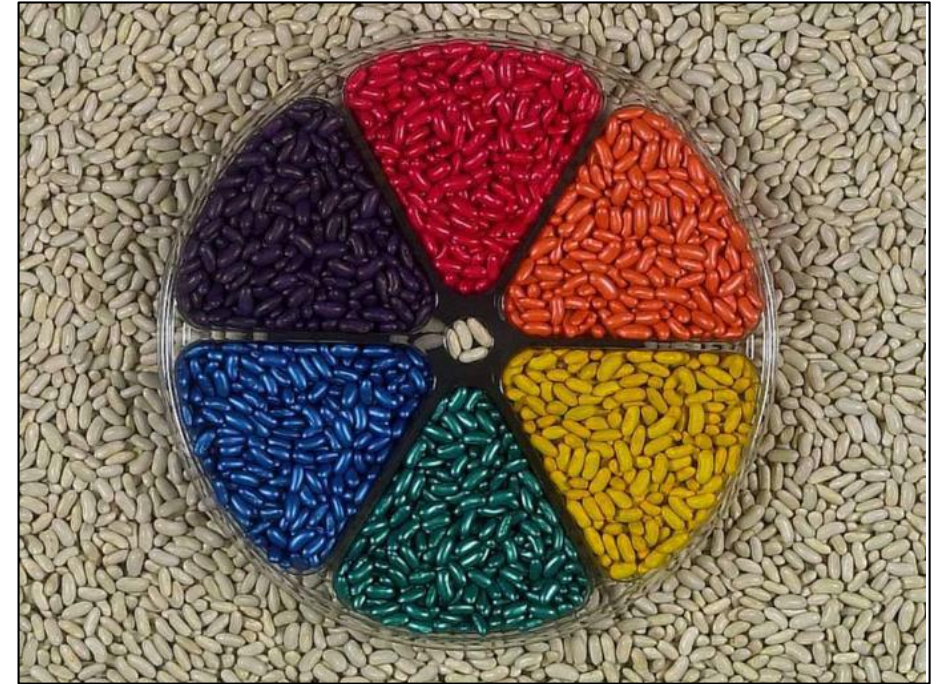
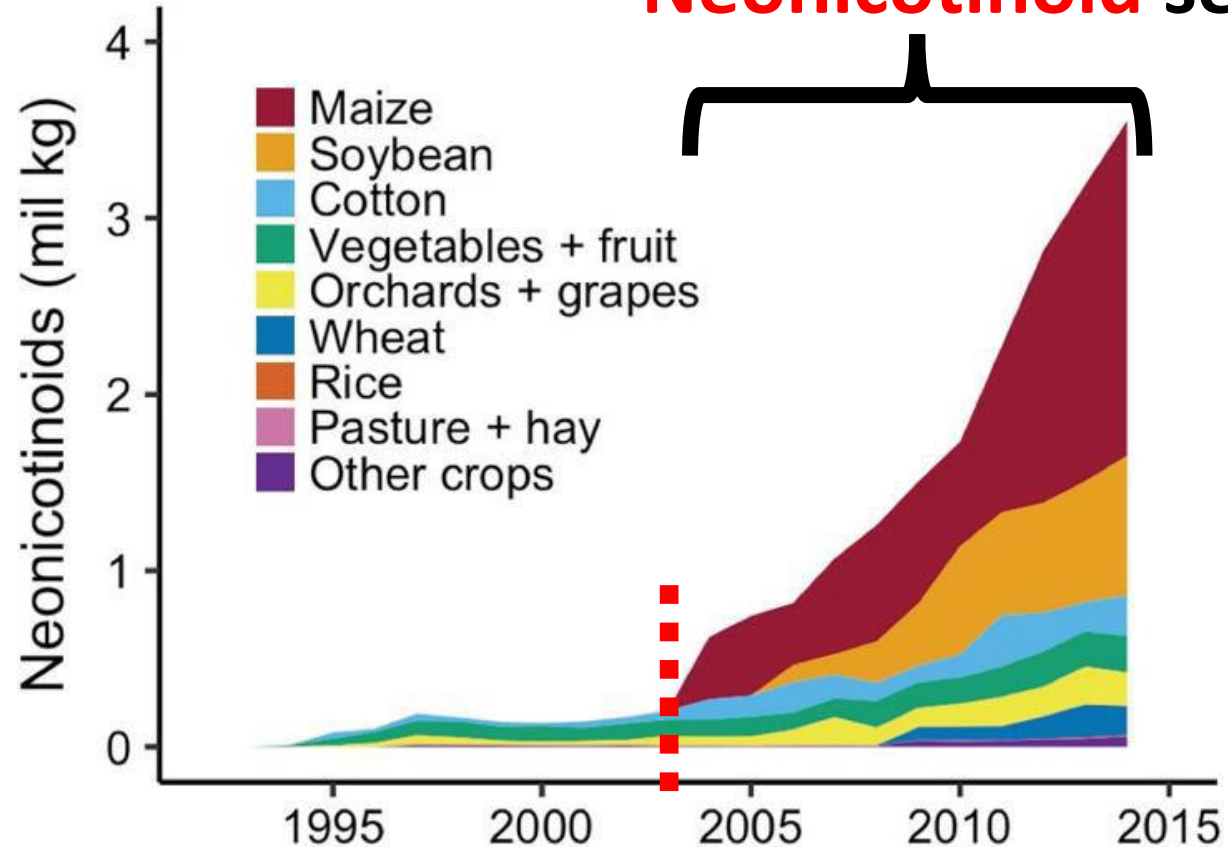
- 1) Systemic in plants when applied to soil
- 2) Broad-spectrum of pest activity

Why are **neonicotinoid** insecticides so popular?



Why are **neonicotinoid** insecticides so popular?

Neonicotinoid seed treatment revolution



Risks to consider when using **neonicotinoids**

Risks to consider when using **neonicotinoids**



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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 1970s. 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 Biology
Bee Anatomy
Beekeeping
Fast Lessons in Beekeeping
Honey Bee Health

Managed Pollinators: 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 advancements in growing 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. Factors affecting colony health predominantly in the United States. Most scientists agree that parasites, viruses, diseases, and bee husbandry practices are major factors. We strongly support further research into the role of various pesticides in bee health — including neonicotinoids — by working with many stakeholders.
- Bayer is actively involved in finding solutions to enhance honey bee health, including development of a protocol 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.

NEONICOTINOID SEED TREATMENTS — An important class of insecticide has been found to be highly effective against many pests that threaten food production and quality.

- A total of 147 million U.S. acres are planted with neonicotinoid treated seeds.
- Difficulties to approved by EPA for use on corn, cotton, sorghum, soybeans, and sugar beets. It is the active ingredient in "Pioneer" seed treatments. The leading seed-applied insecticide in corn in the United States, increasing corn yields by 5 to 14 bushels an acre. Over 30% of U.S. corn is treated with neonicotinoids (imidacloprid and thiamethoxam).

NEONICOTINOID SEED TREATMENTS IN THE U.S. CORN BELT

- There has been no documented effect on bee health associated with use of neonicotinoids or other neonicotinoid based insecticides. In fact, the United States Environmental Protection Agency (EPA) announced recently February 10, 2012, in a judgment, 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., thiamethoxam is widely used on various seed crops in Canada, where Bayer studies extensive field data to help large numbers of bees to the corn fields each year for pollination. No effect on bee colony health has been reported by these studies using the standard treatment with pollinating neonicotinoid treated corn seed.

FARM CHEMICALS INTERNATIONAL **Rainbow**
Basic Agrochemical Producer
Biggest Exporter in China

Glyphosate, 2,4-D, 2,4-DB,
Glufosinate, Dicamba, Pic
Isaflutrole, 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 Bendick

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 as 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.

Syngenta, in an email to Farm Chemicals International, called it "a dark day for French and European agriculture and in particular those in the Oil Seed Rape chain ... The intention to suspend has been taken on the basis of one experimental study which has not been validated by expert panels and is at odds with the reality in the field."

Related

- Bayer CropScience To Study Colony Collapse Disorder
- USDA, Nuthouse Enter Grain Seed Treatment Agreement
- Monsanto, Plant Health Care Partner on Seed Treatment
- US EPA Announces Pesticide Label

ARE NEONICOTINOIDS KILLING BEES?
A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action

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®), imidacloprid (Chouler®) and imidacloprid (Gaucho®). Active ingredient rates range from 0.25-1.25 milligrams per kernel (sold as 250-1,250 oxes).

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).

Jennifer Hodgson, Matt Vaughan, Matthew Shepherd, David Robinson, Eric Mader, Scott Hoffman Black, and Carlos Maccioni

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12/01/12 ISSUE

Yet another study links insecticide to bee losses
Findings point to treated corn seed — and corn syrup — as possible links to a pandemic affecting North American pollinators.

ShareThis | Tweet | Facebook | +1

By Janet Raloff
Web edition: April 3, 2012

Will **neonicotinoids be banned
in agricultural crops?**

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Yes and no... NY signed the
Birds & Bees Protection Act in 2023...



Will **neonicotinoids** be banned in agricultural crops?

Yes and no... NY signed the
Birds & Bees Protection Act in 2023...



This bill will limit the use of neonicotinoid seed treatments on **corn** (including sweet corn), **soybeans**, and **wheat by 2029!**



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Birds & Bees Protection Act in 2023...



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Some exceptions could apply...



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Birds & Bees Protection Act in 2023...



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Some exceptions could apply...



Vermont and Illinois are seeking to ban neonicotinoids in agricultural production, and are watching New York

Will **neonicotinoids** be banned in agricultural crops?



Large retail grocery stores have adopted policies to phase out pesticides harmful to bees on produce they will market

Will **neonicotinoids** be banned in agricultural crops?



Large retail grocery stores have adopted policies to phase out *pesticides harmful to bees* on produce they will market

Goal

- **Evaluate performance of non-neonicotinoid insecticide seed treatments for protecting vegetable crops from early-season insect pests**

Alternatives to neonicotinoid seed treatments group



- **USA**
 - California
 - Delaware
 - New York
 - Oregon
 - Washington
 - Wisconsin
- **Canada**
 - Ontario

Alternatives to neonicotinoid seed treatments in vegetable crops working group

Alternatives to neonicotinoid seed treatments group

Cornell University



Brian Nault



Alan Taylor



Ethan Grundberg



Christy Hoepting

University of Guelph



Mary Ruth McDonald



Kevin Vander Kooi

University of Delaware



David Owens

University of Wisconsin-Madison



Russel Groves

University of California



Rob Wilson

Washington State University



Tim Waters

Oregon State University



Stuart Reitz

Outline

I. Neonicotinoid insecticides as
seed treatments

II. Case studies in vegetable crops

Case Studies

- **Insect pest control in sweet corn**



- **Insect pest control in beans**



- **Insect pest control in onions**



Case Studies

- **Insect pest control in sweet corn**



- Insect pest control in beans

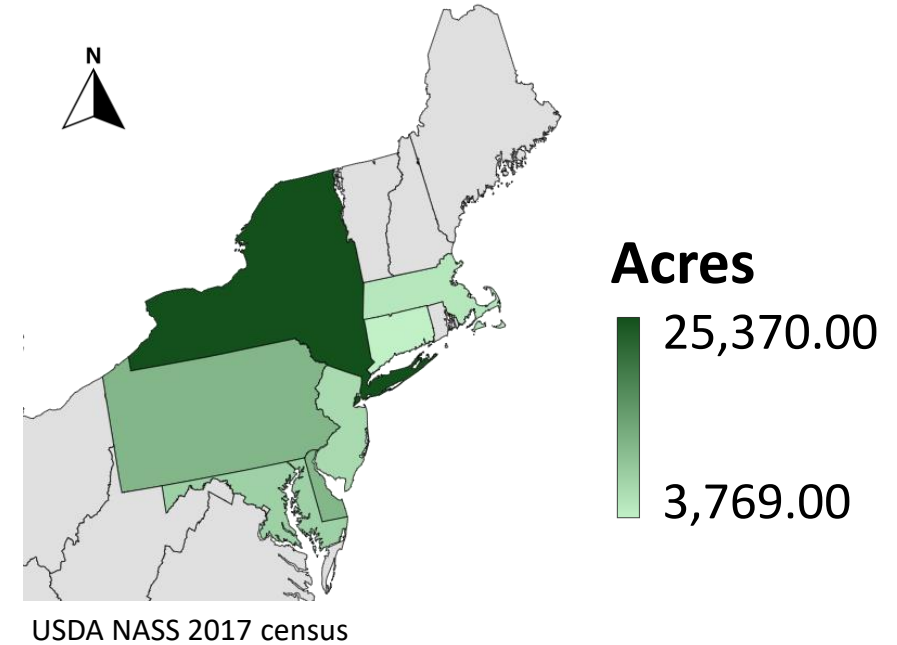


- Insect pest control in onions



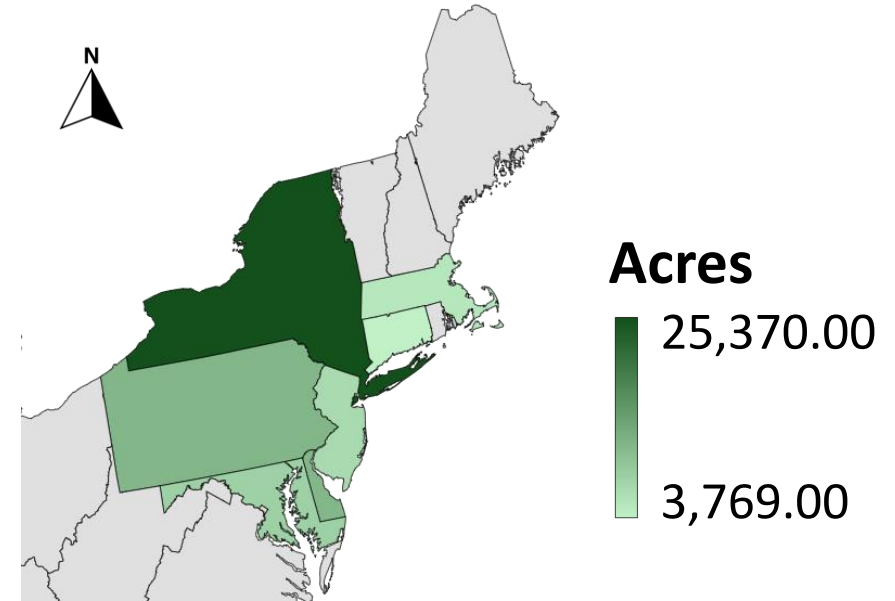
Sweet Corn Production in the Northeast

- In 2017, the Northeast produced over 72,000 acres of sweet corn (USDA NASS)



Sweet Corn Production in the Northeast

- In 2017, the Northeast produced over 72,000 acres of sweet corn (USDA NASS)
- **75% of sweet corn is produced for the fresh market, while 25% is for processing (frozen and canned).**



USDA NASS 2017 census



Photo credit: Burns' Sweet Corn



Major sweet corn pests



Seedcorn Maggot (SCM)
(Delia platura)



Major sweet corn pests



Feeding on seed



SCM damage



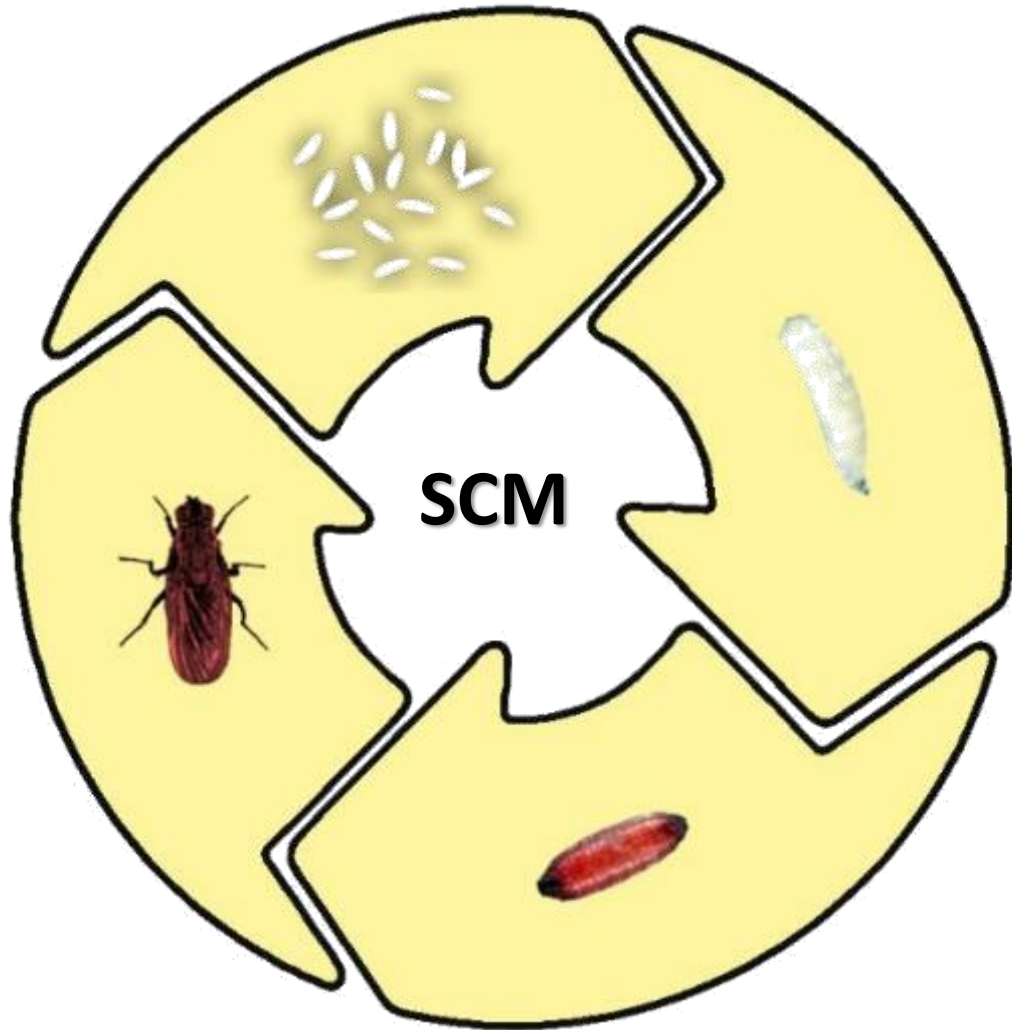
Seedcorn Maggot (SCM)
(Delia platura)



Corn flea beetle (CFB)
(Chaetocnema pulicaria)



Seedcorn maggot (SCM) (*Delia platura*)



3 to 5 generations per year

Overwinters as a puparium in soil

Eggs laid on decaying organic material as well as recently planted crops

Seedcorn maggot (SCM)

Diptera (Anthomyiidae)

Damage to Sweet Corn



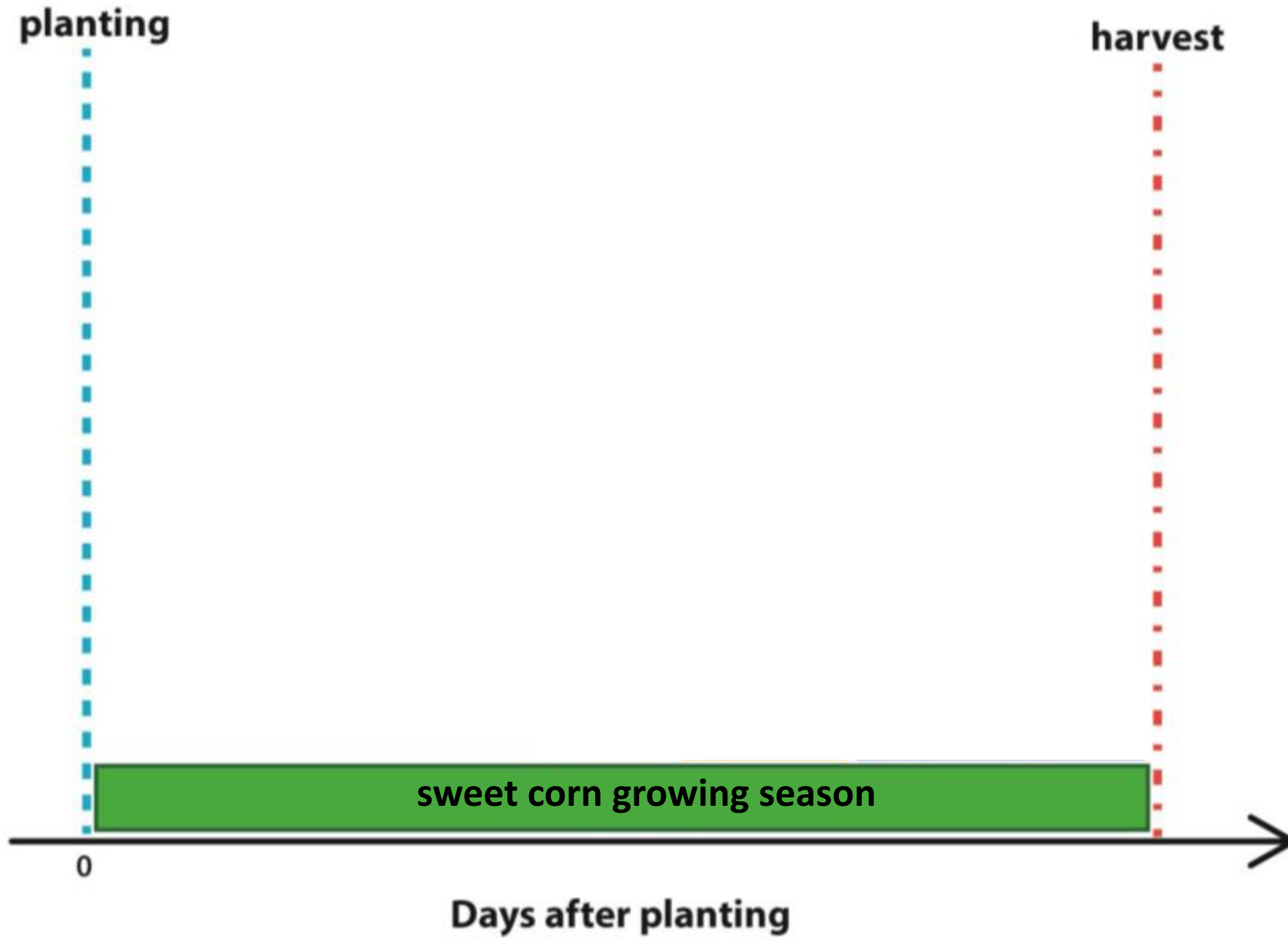
Photos: J. Ogradnick

SCM damage in sweet corn

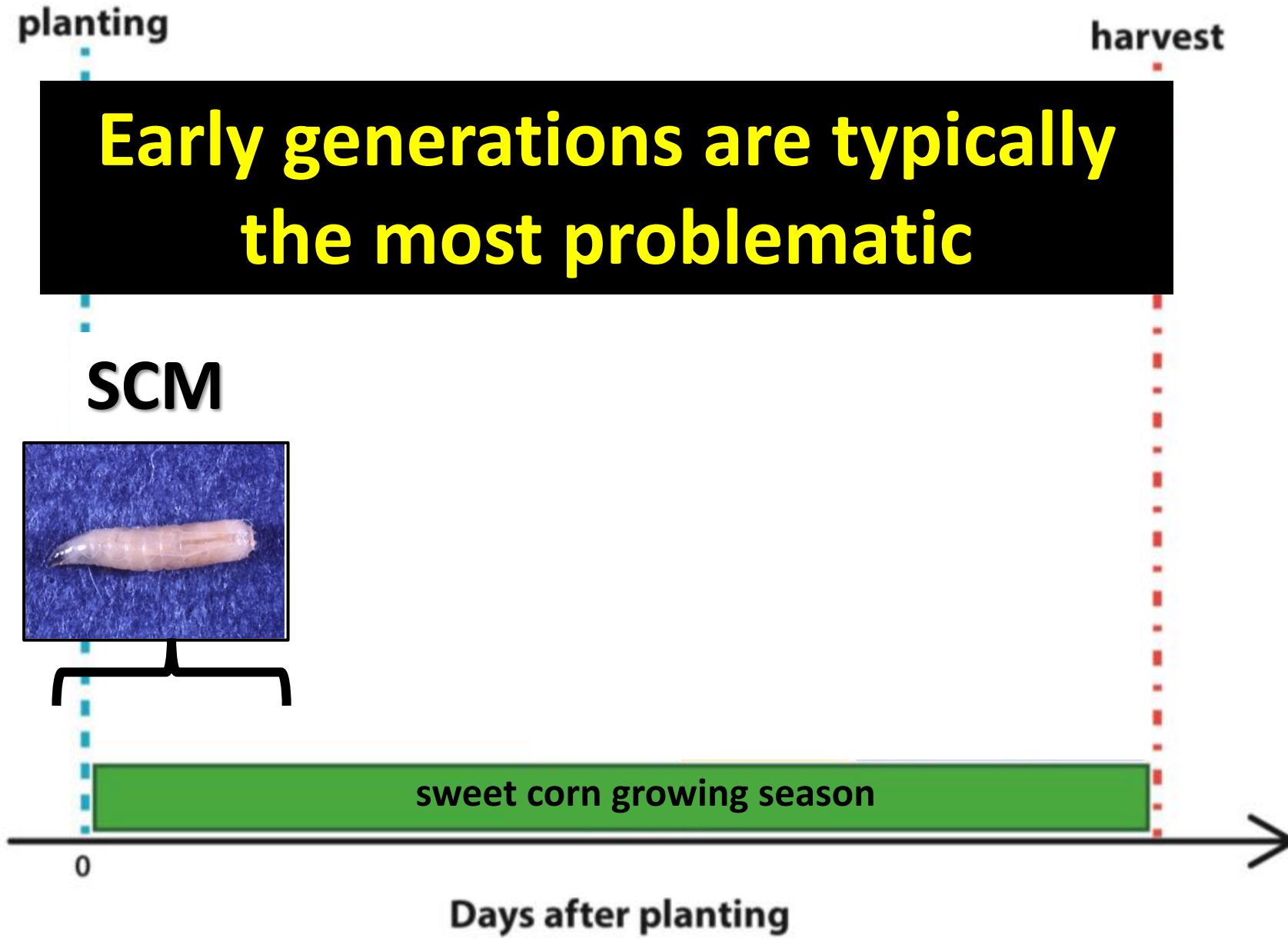


Stand losses

Risk period for SCM attacking sweet corn



Risk period for SCM attacking sweet corn



Management of SCM in vegetable crops

Integrated pest management

Plant Resistance

Chemical Control

Cultural Control

Biological Control



Management of SCM in sweet corn

Integrated pest management

Plant Resistance

➤ None known

Chemical Control

Cultural Control



Biological Control

Management of SCM in sweet corn

Integrated pest management

Plant Resistance

- None known

Chemical Control

Cultural Control

- Avoid fields recently treated with manure or has decaying organic matter
- Avoid planting into cold, wet soils
- Avoid planting during peak activity

Biological Control



Management of SCM in sweet corn

Integrated pest management

Plant Resistance

- None known

Chemical Control

Cultural Control

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Biological Control

- Some predators and entomopathogens



Management of SCM in sweet corn

Integrated pest management

Plant Resistance

- None known

Chemical Control

- Insecticide at planting
(no rescue treatments available)

Cultural Control

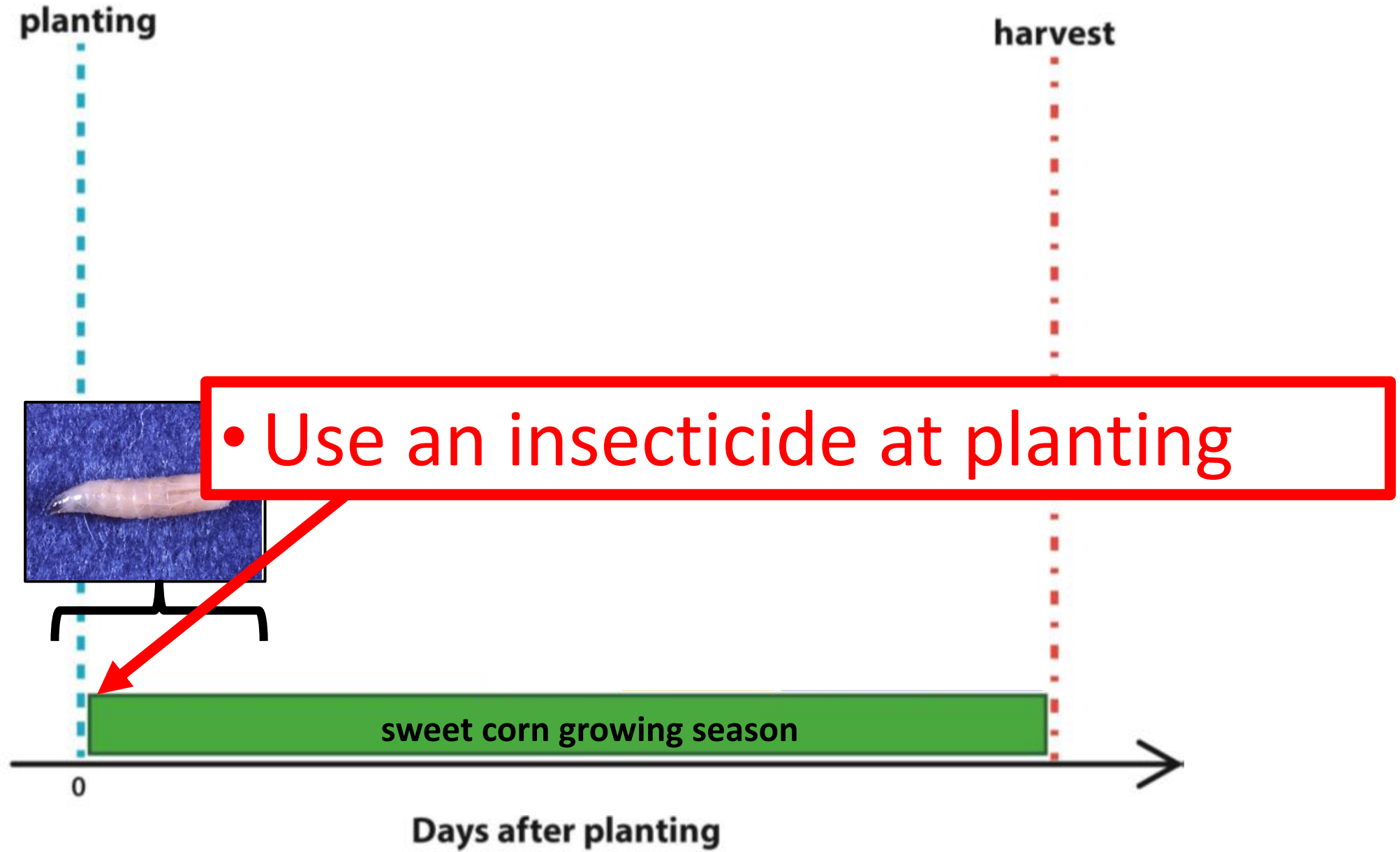
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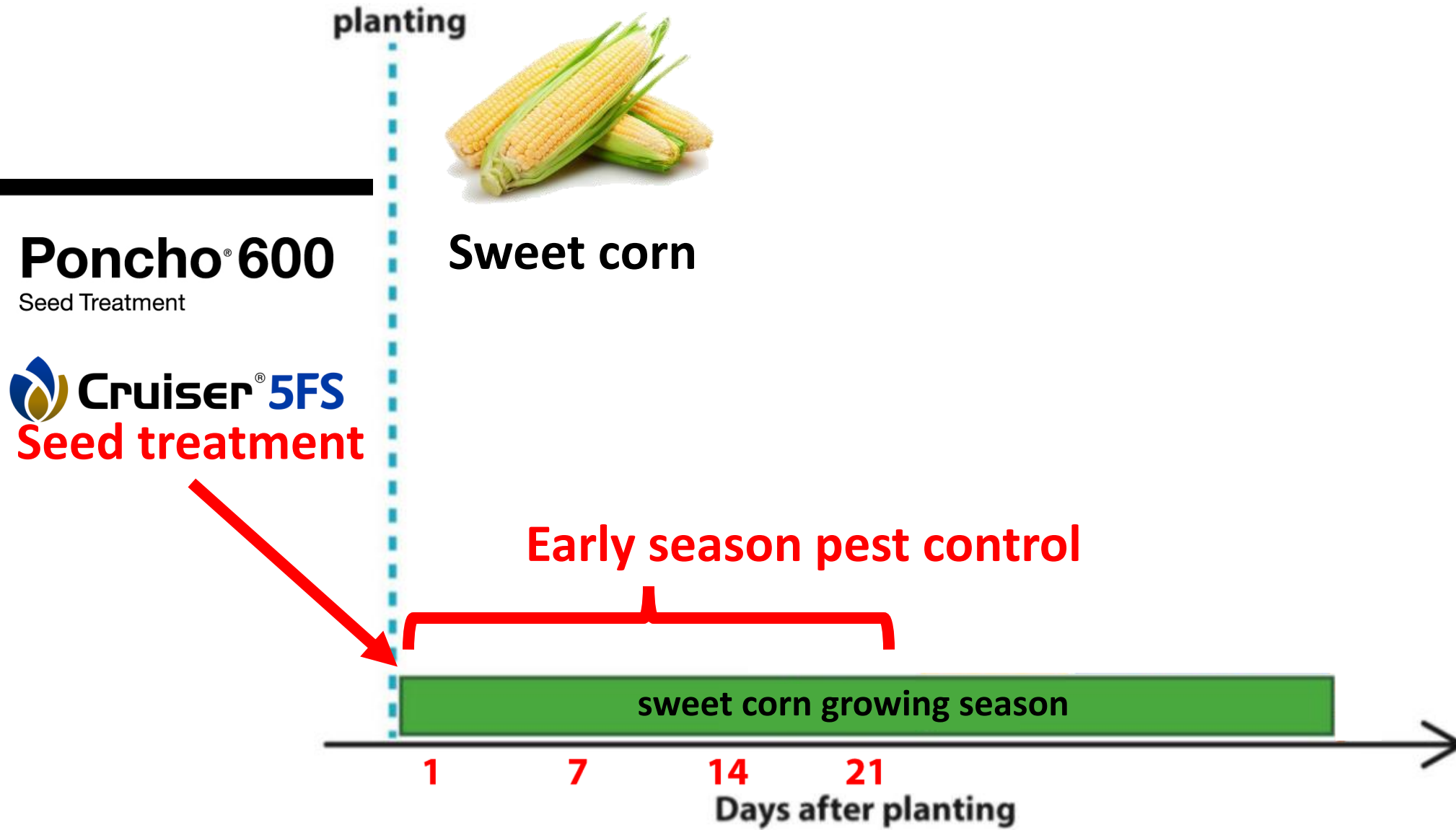
- Some predators and entomopathogens



Management of SCM in sweet corn



Neonicotinoid use in seeded vegetable crops





Insect pest control in sweet corn



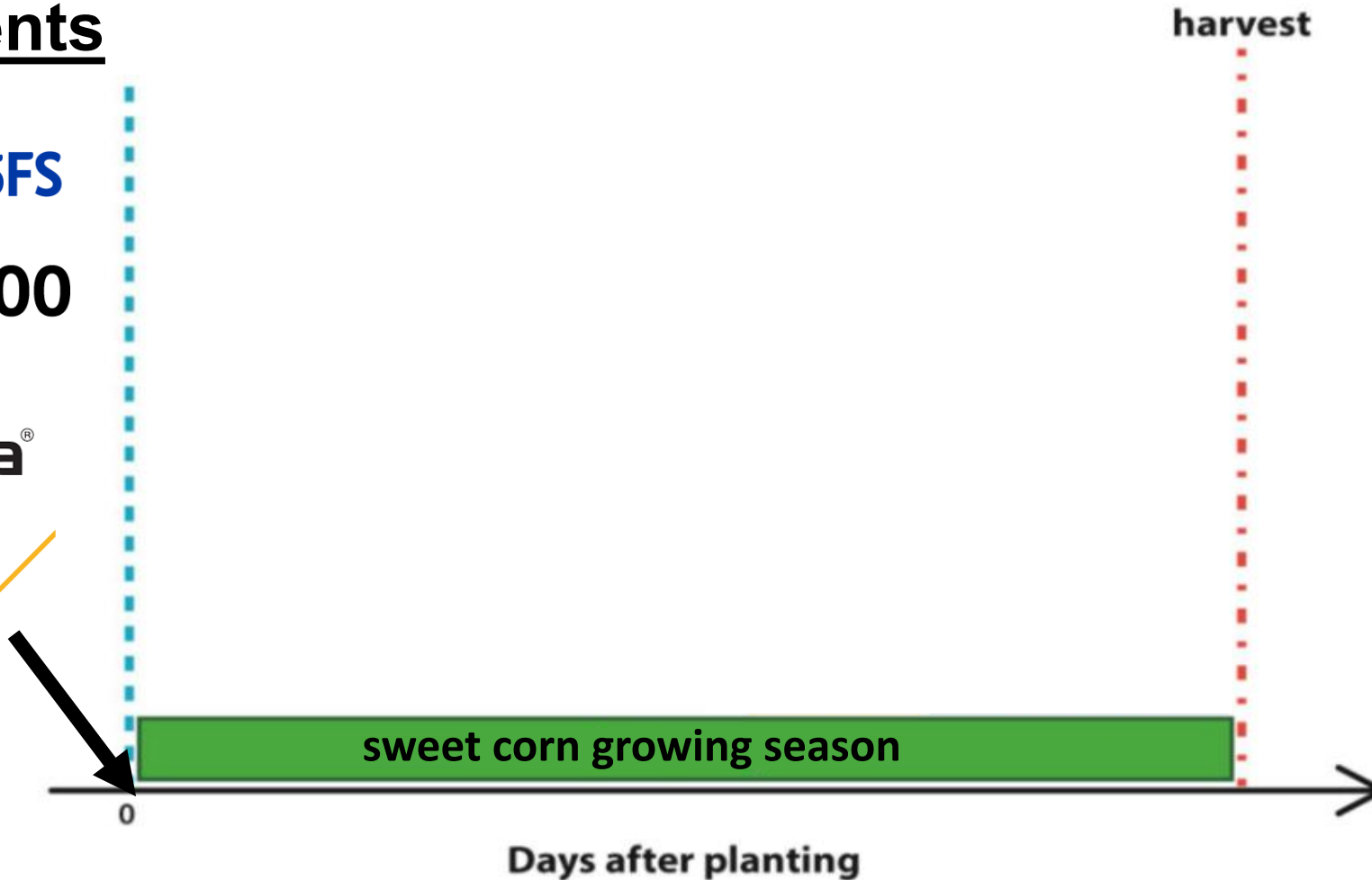
Seed treatments

1  **Cruiser[®] 5FS**

2 **Poncho[®] 600**
Seed Treatment

3  **Fortenza[®]**

4 **Lumivia[®]**
INSECTICIDE SEED TREATMENT





Insect pest control in sweet corn



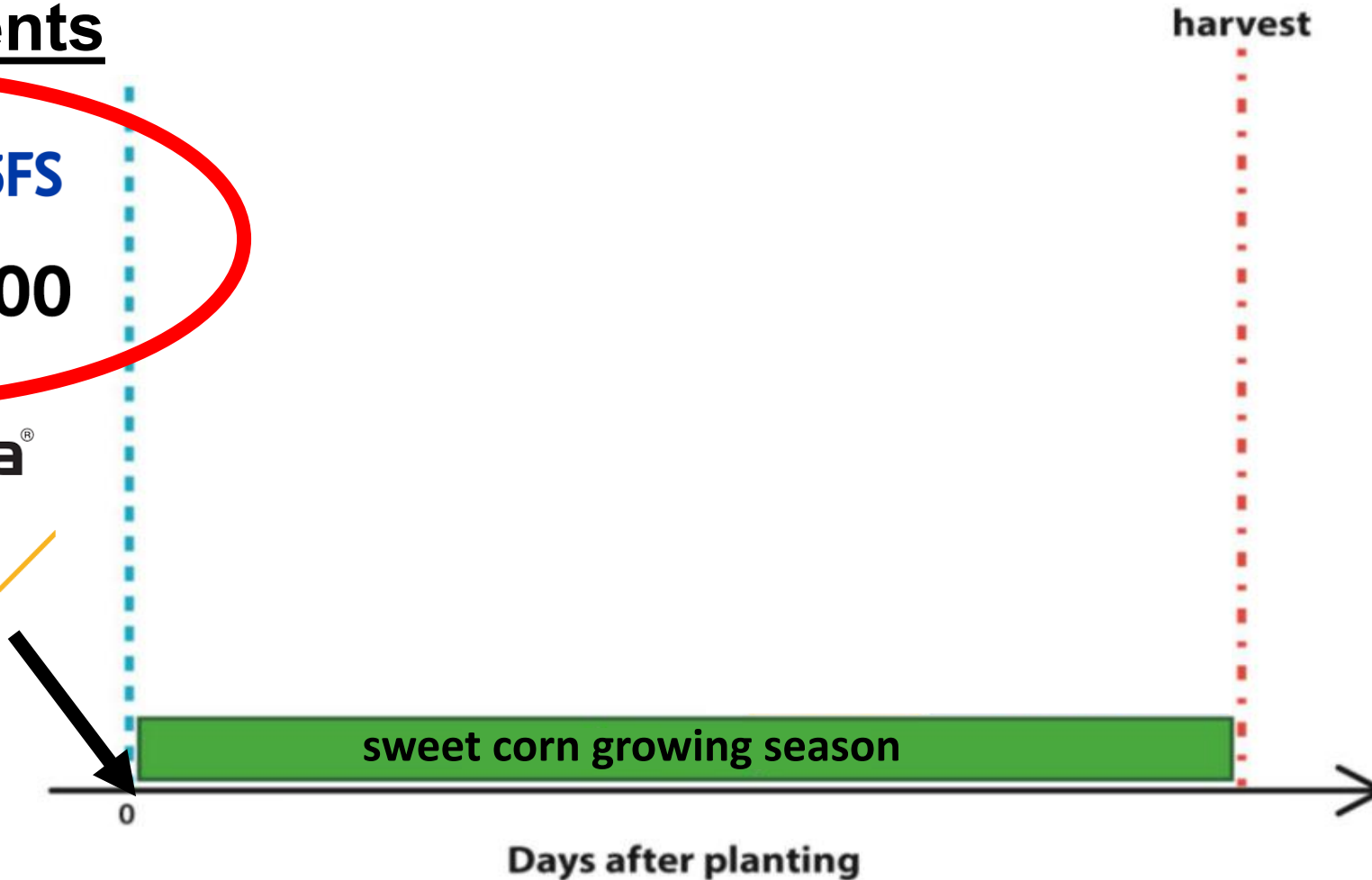
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Seed Treatment

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4 **Lumivia[®]**
INSECTICIDE SEED TREATMENT





Insecticide seed treatments evaluated for SCM control in sweet corn in 2022-2023



Treatments	Active ingredient	Rate	IRAC Class

^a All seeds were treated with the following fungicides: Vibrance Cinco (azoxystrobin, mefenoxam, fludioxonil, sedaxane, thiabendazole) at a rate of 30.5 g ai/100kg seed and Vayantis (picarbutrazox) at rate of 2.5 g ai/100 kg seed.

^b Not labeled on sweet corn



Insecticide seed treatments evaluated for SCM control in sweet corn in 2022-2023



Treatments	Active ingredient	Rate	IRAC Class
Poncho 600	clothianidin	0.5 mg a.i./ seed	4A
Cruiser 5FS	thiamethoxam	0.5 mg a.i./ seed	4A

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Lumivia	chlorantraniliprole	0.5 mg a.i./ seed	28
Lumiverd^b	 spinosad	0.2 mg a.i./seed	5


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Lumiverd^b	 spinosad	0.2 mg a.i./seed	5
PLINAZOLIN technology^b	isocycloseram	0.25 & 0.5 mg a.i./ seed	30

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^b Not labeled on sweet corn



Approach

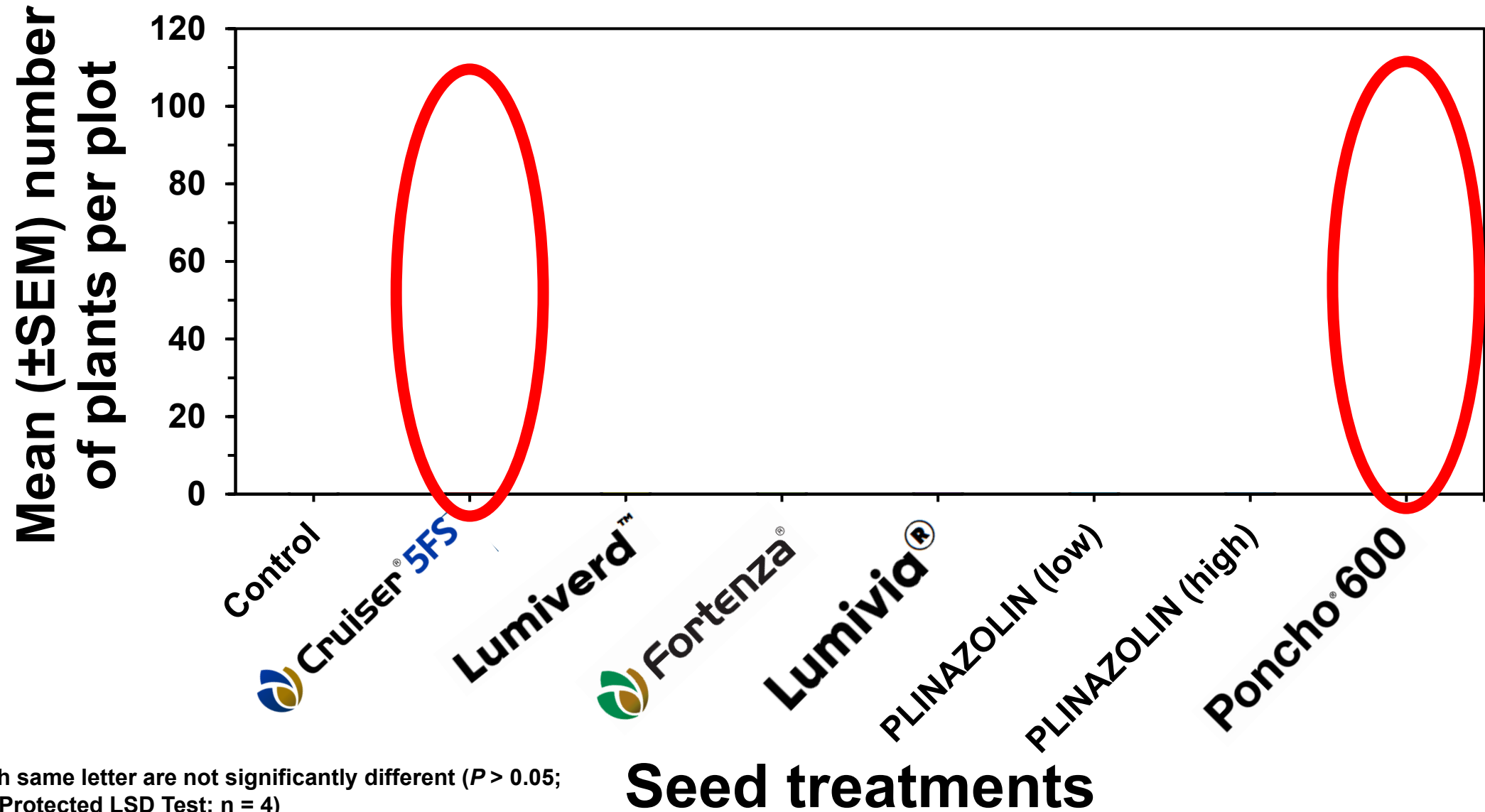


Photo: B. Nault

- Conducted in DE, NY, WA & WI in 2022 and 2023
- No soil amendments in WA
- Plant stand counts were made 16 d after planting (WA)



Efficacy of insecticide seed treatments for SCM control in sweet corn in WA in 2022



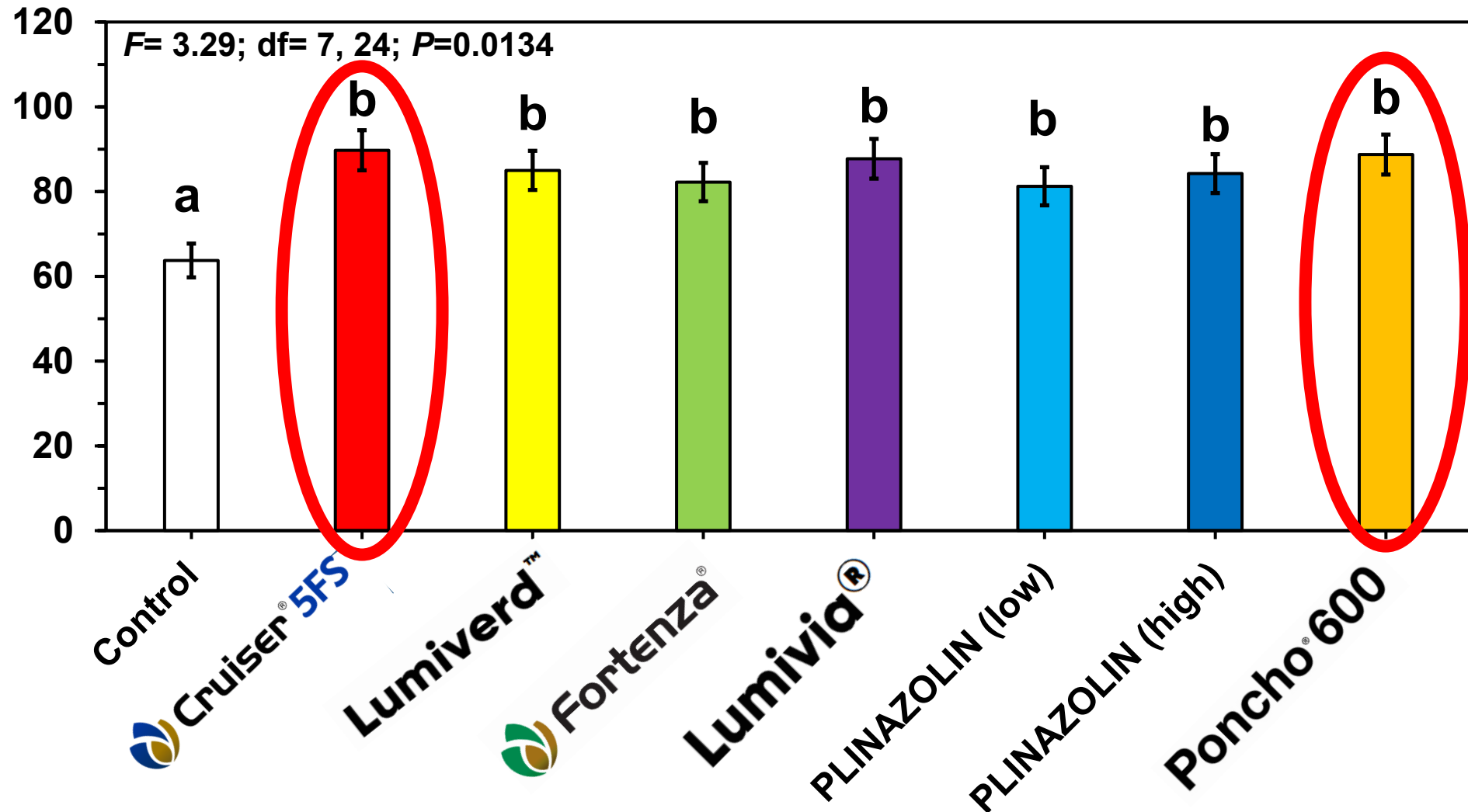
Means with same letter are not significantly different ($P > 0.05$;
Fisher's Protected LSD Test; $n = 4$)



Efficacy of insecticide seed treatments for SCM control in sweet corn in WA in 2022



Mean (\pm SEM) number
of plants per plot



Means with same letter are not significantly different ($P > 0.05$;
Fisher's Protected LSD Test; $n = 4$)

Alternatives to Cruiser[®] 5FS for SCM control in sweet corn

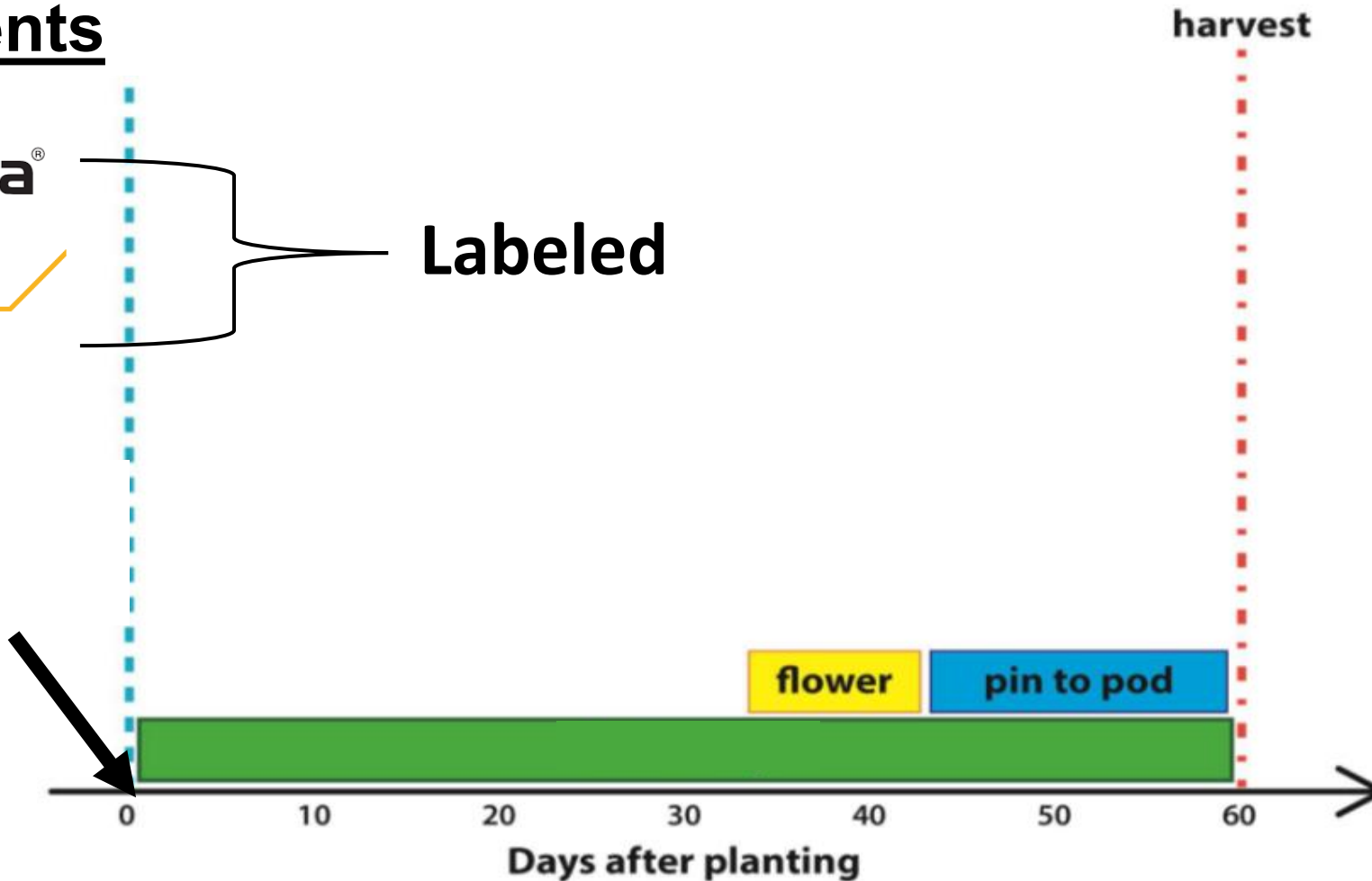


Seed treatments

1  Fortenza[®]

2 Lumivia[®]
INSECTICIDE SEED TREATMENT

Labeled



Alternatives to Cruiser[®] 5FS for SCM control in sweet corn



Seed treatments

1  Fortenza[®]

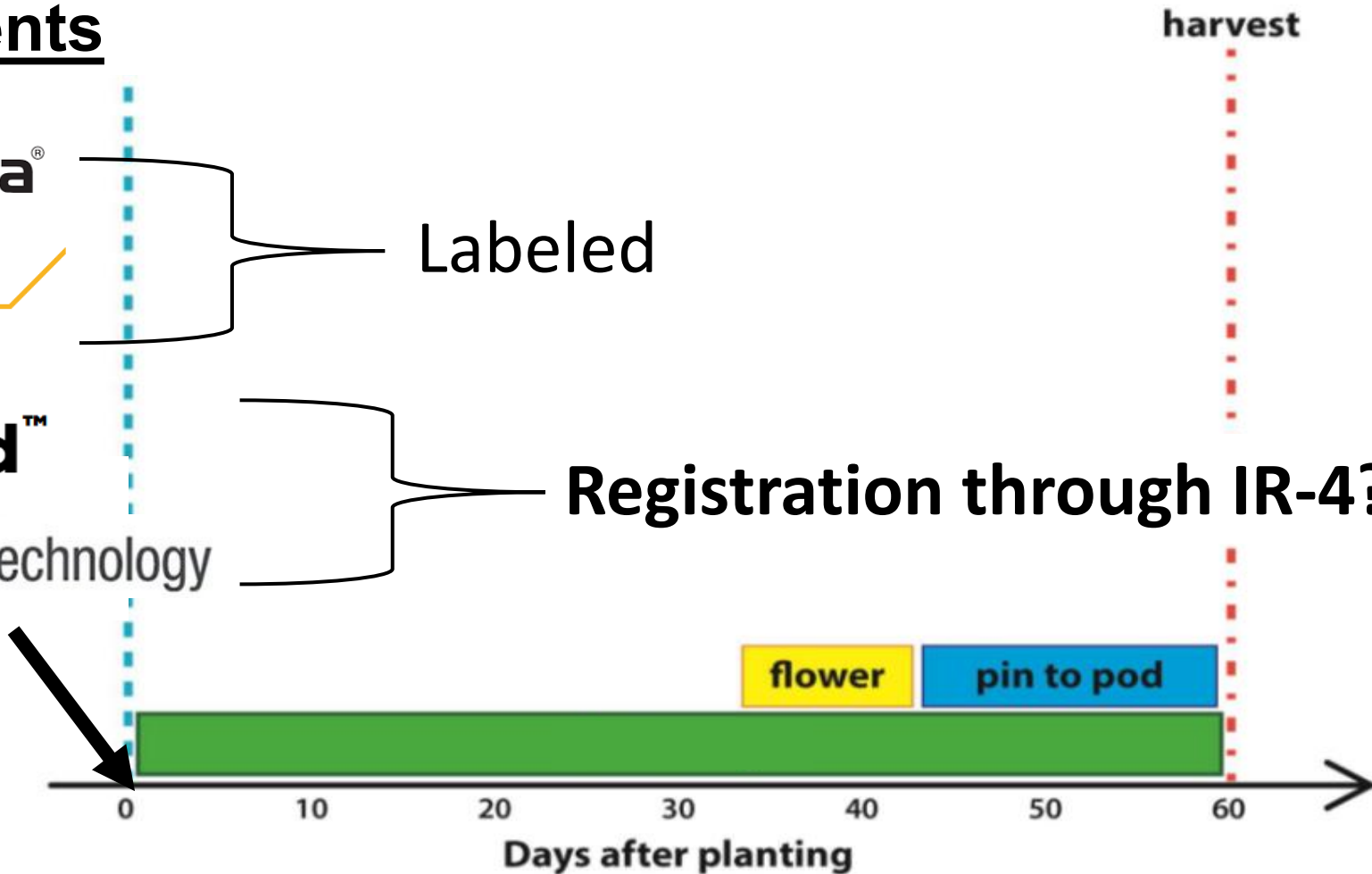
2 Lumivia[®]
INSECTICIDE SEED TREATMENT

3 Lumiverd[™]

4 PLINAZOLIN[®] technology

Labeled

Registration through IR-4?



Questions?



Case Studies

- Insect pest control in sweet corn



- **Insect pest control in beans**



- Insect pest control in onions



Bean Production in the Northeast

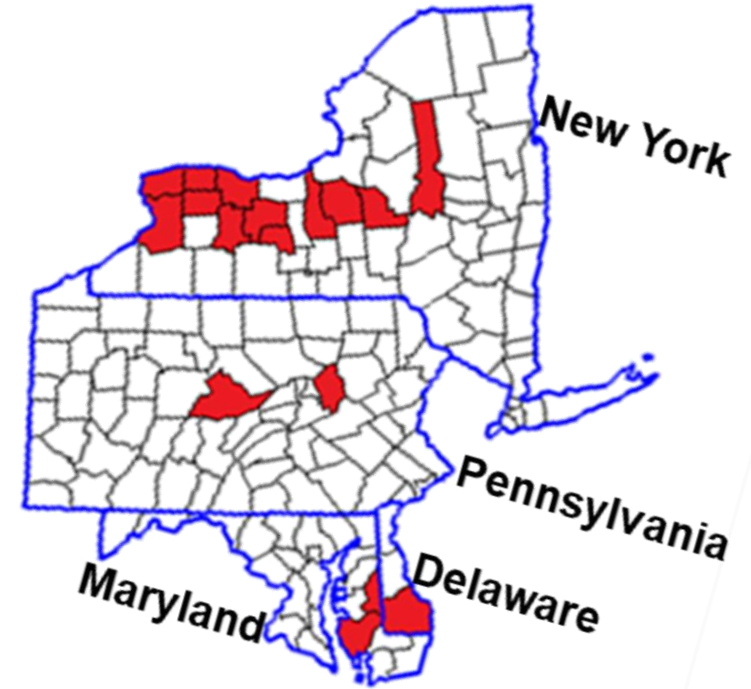
- In 2024, the Northeast produced over 21,500 acres of beans (USDA NASS)



Picture credit: Pavlovic et al. 2024

Bean Production in the Northeast

- In 2024, the Northeast produced over 21,500 acres of beans (USDA NASS)
- The majority is produced in New York and Pennsylvania



Picture credit: Pavlovic et al. 2024



Photo: Francesco Di Gioia, Penn State



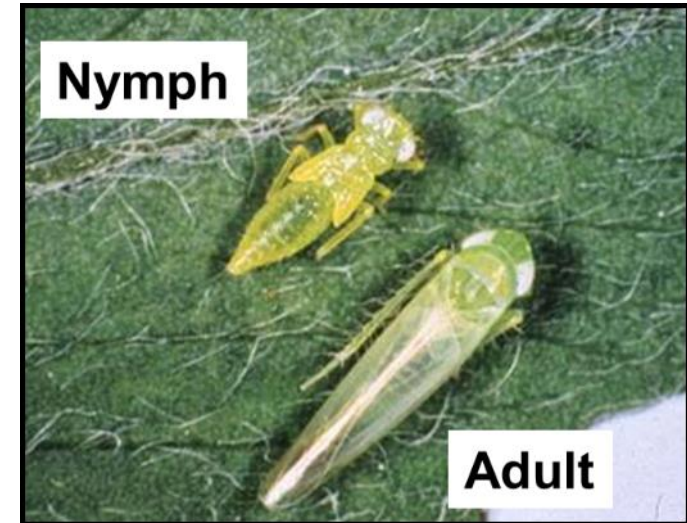
Major bean insect pests



Seedcorn Maggot (SCM)
(Delia platura)



Potato Leafhopper (PLH)
(Empoasca fabae)



Damage to beans



Damaged

Photo: J. Ogrodnick

SCM damage in vegetable crops



Stand losses

³ Miles(1948) – Bulletin of Entomological Research, 38(4), 559-574.⁴Yu et al. Env. Ent. (1975): 545-548.

SCM damage in beans



Stand losses



Delay in plant maturity

Management of SCM in beans

Integrated pest management

Plant Resistance

- None known

Chemical Control

- Insecticide at planting
(no rescue treatments available)



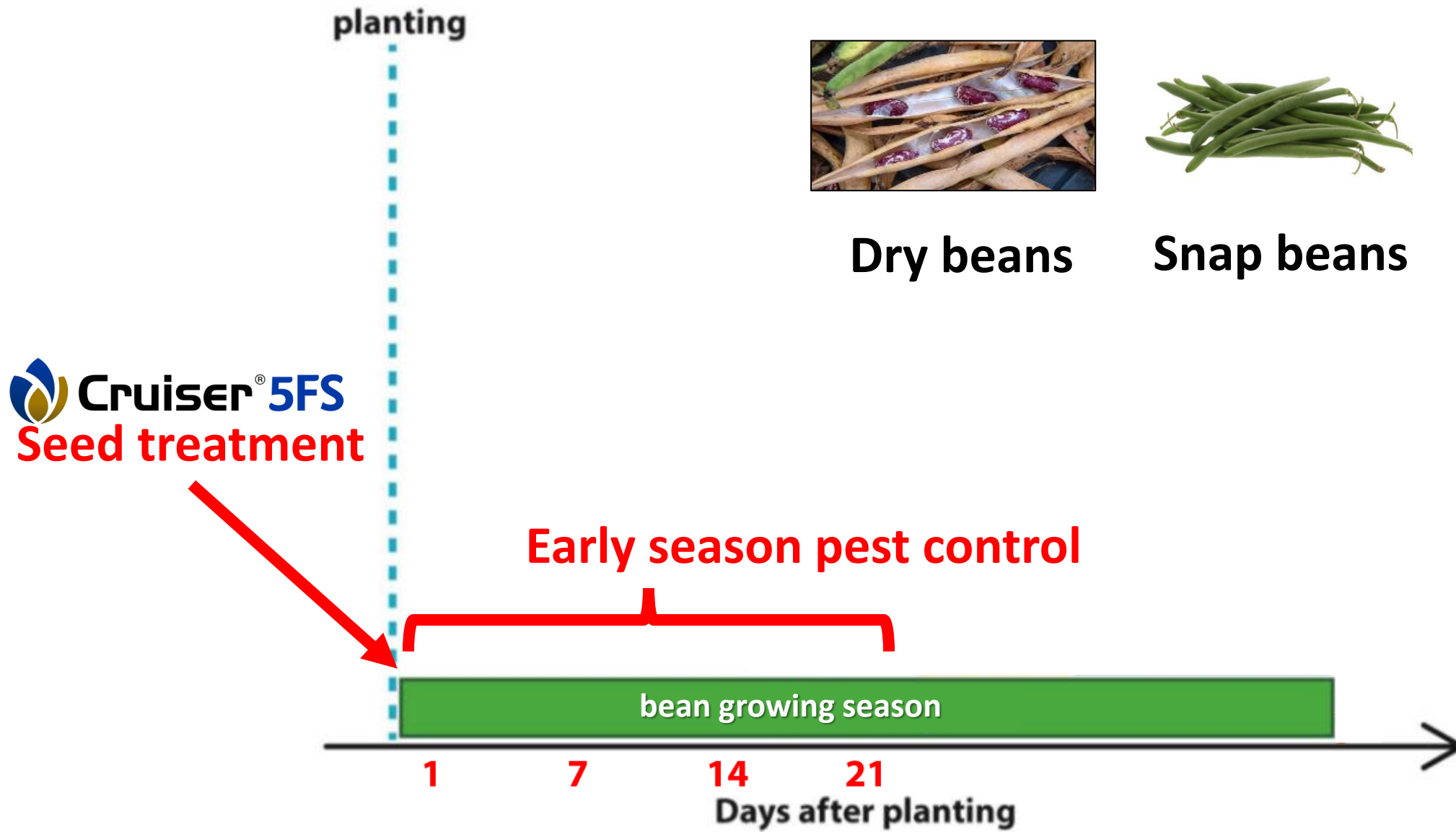
Cultural Control

- Avoid fields recently treated with manure or has decaying organic matter
- Avoid planting into cold, wet soils
- Avoid planting during peak activity

Biological Control

- Some predators and entomopathogens

Neonicotinoid use in seeded vegetable crops





Insecticide seed treatments evaluated for SCM control in snap bean and dry bean in 2022-2024



Treatments	Active ingredient	Rate	IRAC Class
Cruiser 5FS	thiamethoxam	0.5 mg a.i./ seed	4A

^a All seed was treated with the following fungicides Apron XL (mefenoxam) at a rate of 3.75 g a.i./ 100kg of seed, Vibrance (sedaxane) at a rate of 5 g a.i./ 100kg of seed, and Maxim 4FS (fludioxonil) at a rate of 2.5 g a.i./ 100kg of seed.

^b Not labeled on snap bean

^c Labeled on dry bean



Insecticide seed treatments evaluated for SCM control in snap bean and dry bean in 2022-2024



Treatments	Active ingredient	Rate	IRAC Class
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Lumivia^{b, c}	chlorantraniliprole	0.5 mg a.i./ seed	28

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Lumiverd^b	 spinosad	0.05 mg a.i./seed	5

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PLINAZOLIN technology^b	isocycloseram	0.25 & 0.5 mg a.i./ seed	30

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^b Not labeled on snap bean

^c Labeled on dry bean



Approach

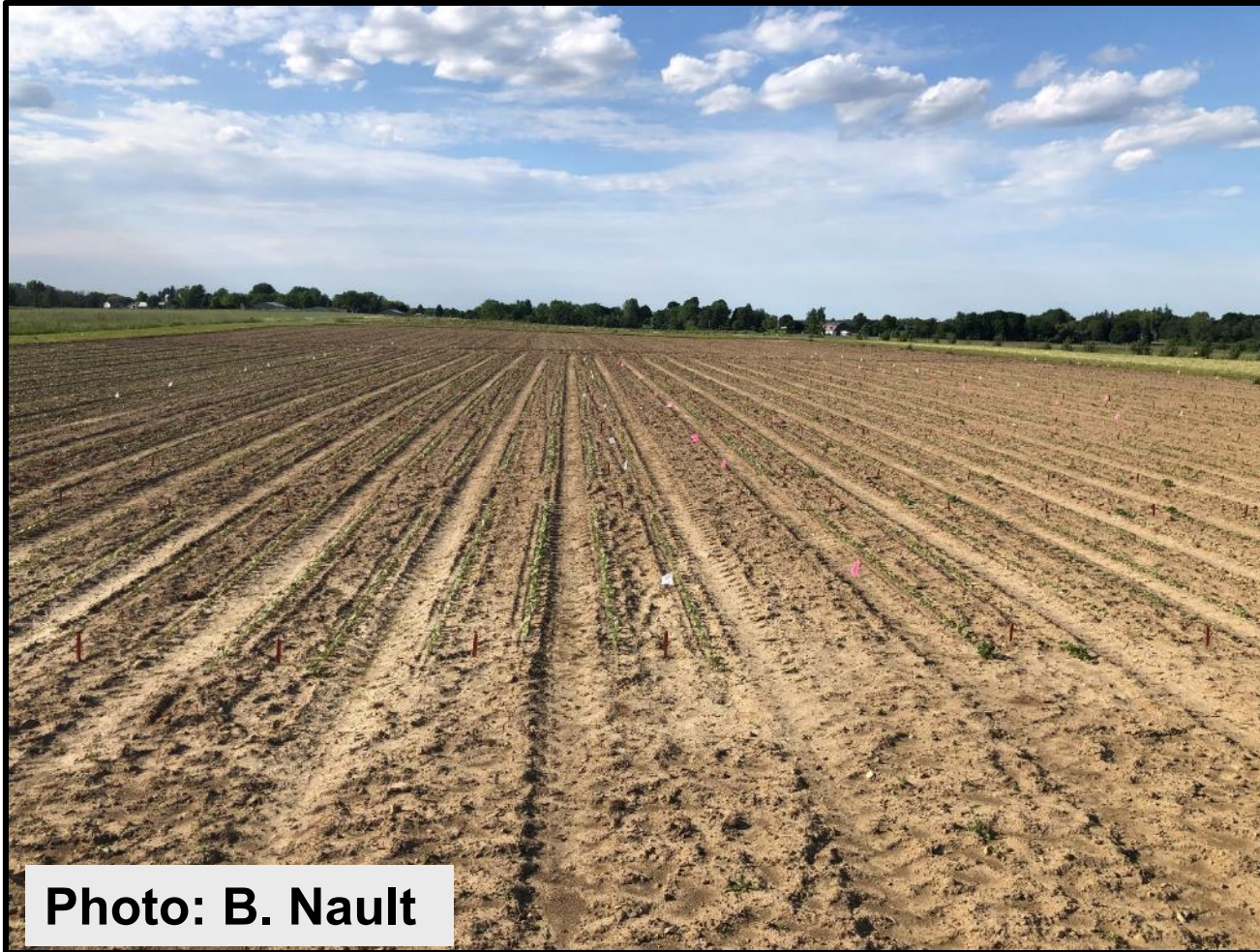


Photo: B. Nault

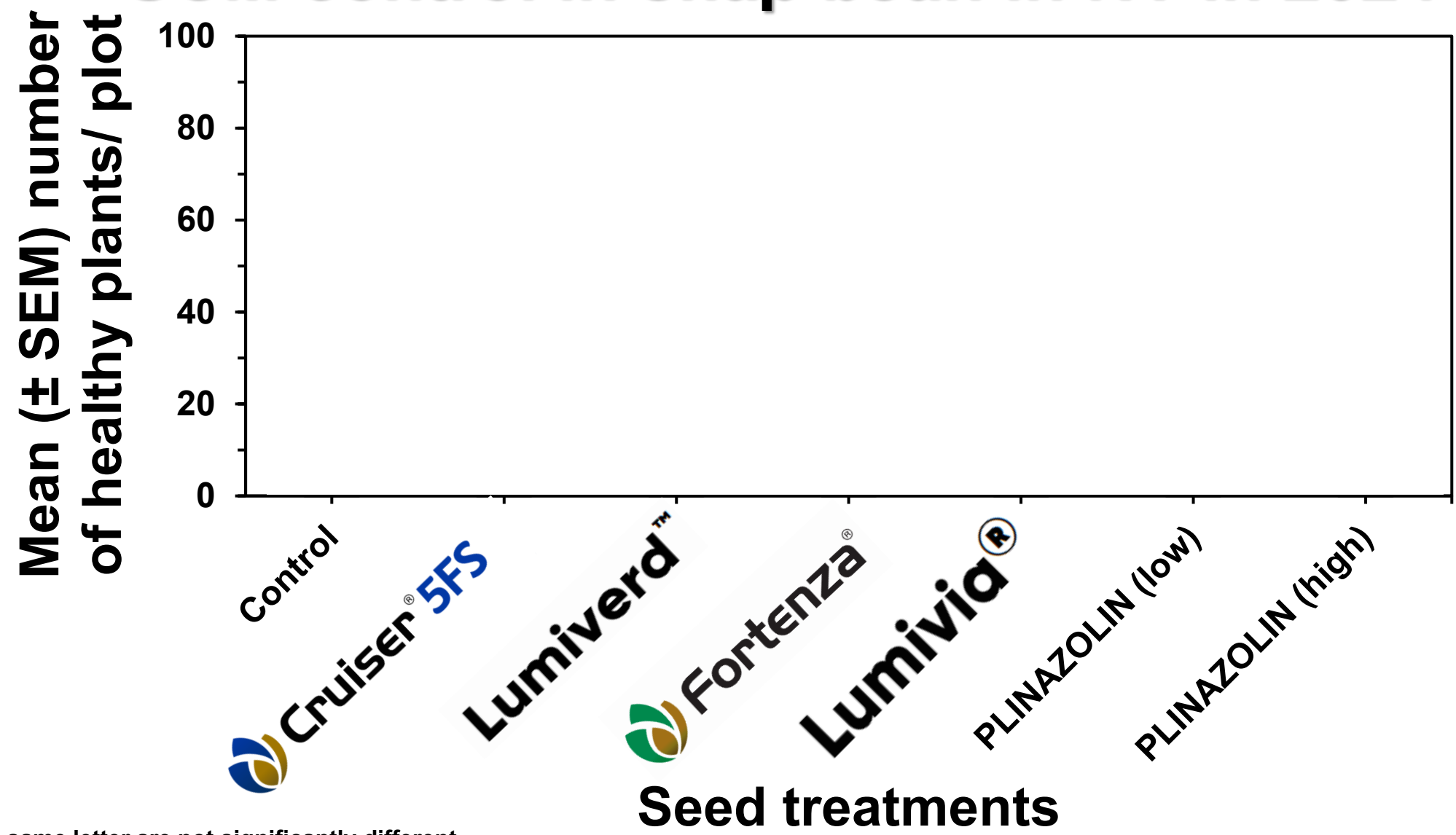
- Conducted in DE, NY, WA and WI in 2022 through 2024
- Bone and meat meal applied on top of furrow after planting
- Plant stand counts made 17 d after planting



SCM damage



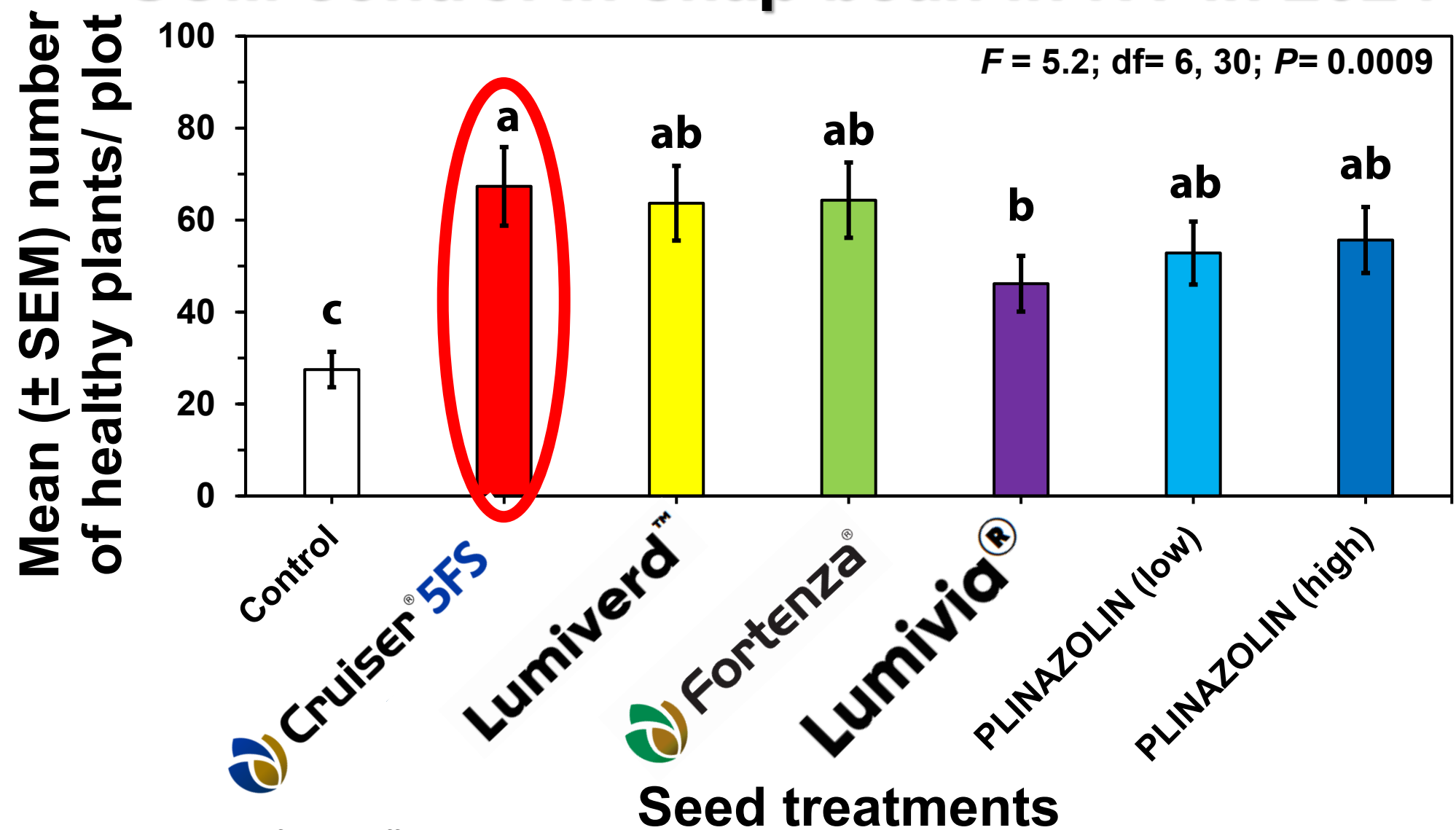
Efficacy of insecticide seed treatments for SCM control in snap bean in NY in 2024



Means with same letter are not significantly different
($P > 0.05$; Fisher's Protected LSD Test; $n = 6$)



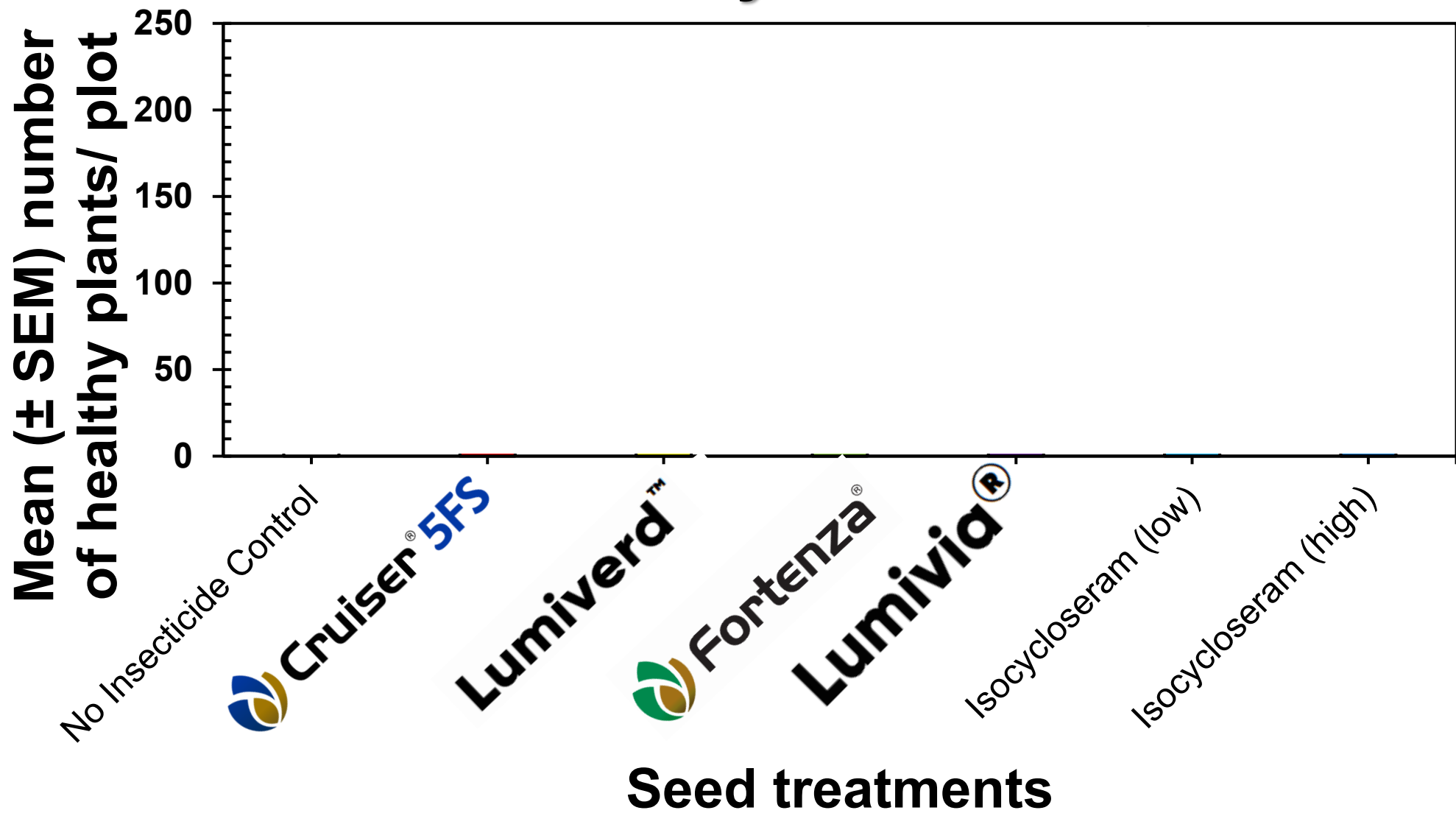
Efficacy of insecticide seed treatments for SCM control in snap bean in NY in 2024



Means with same letter are not significantly different ($P > 0.05$; Fisher's Protected LSD Test; $n = 6$)



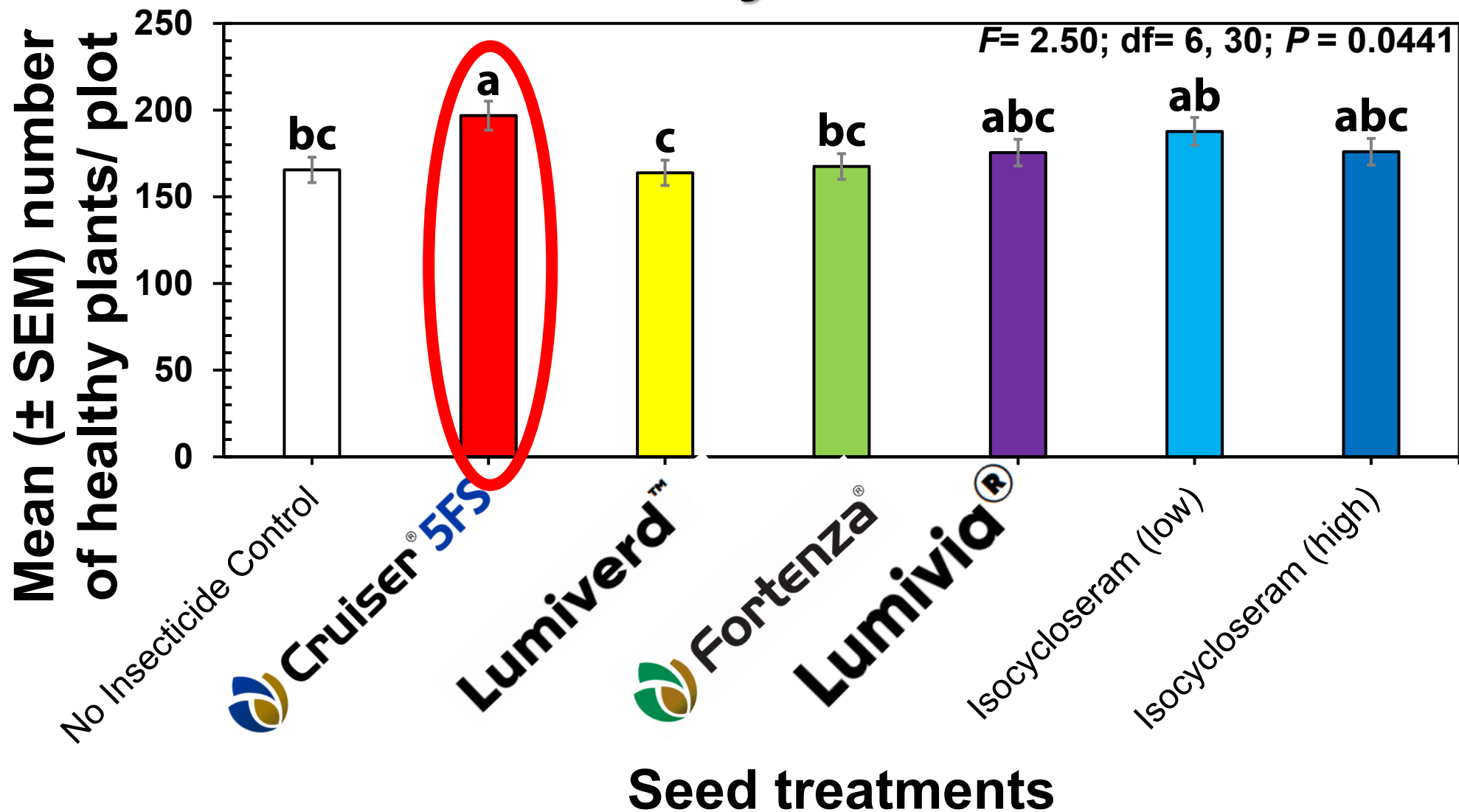
Efficacy of insecticide seed treatments for SCM control in dry bean in NY in 2022



Means with same letter are not significantly different
($P > 0.05$; Fisher's Protected LSD Test; $n = 6$)



Efficacy of insecticide seed treatments for SCM control in dry bean in NY in 2022



Means with same letter are not significantly different
($P > 0.05$; Fisher's Protected LSD Test; $n = 6$)

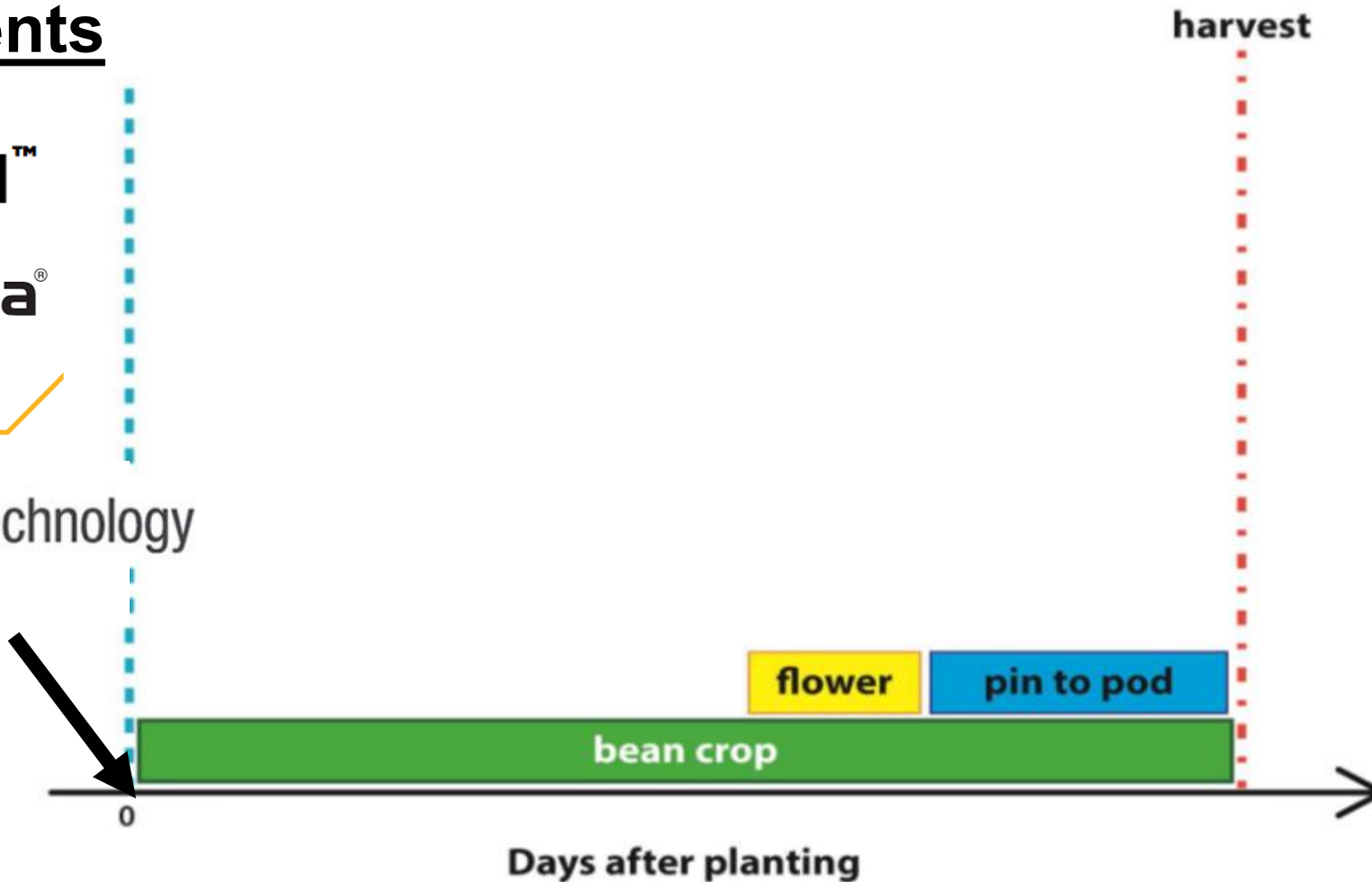


Future alternatives to Cruiser[®] 5FS for SCM control in beans



Seed treatments

- 1 **Lumiverd[™]**
- 2  **Fortenza[®]**
- 3 **Lumivia[®]**
INSECTICIDE SEED TREATMENT
- 4 **PLINAZOLIN[®]** technology





Future alternatives to Cruiser[®] 5FS for SCM control in beans



Seed treatments

1 **Lumiverd[™]**

2  **Fortenza[®]**

3 **Lumivia[®]**
INSECTICIDE SEED TREATMENT

4 **PLINAZOLIN[®]** technology

➤ Only labeled in dry bean





Future alternatives to Cruiser[®] 5FS for SCM control in beans



Seed treatments

1 **Lumiverd[™]**

2  **Fortenza[®]**

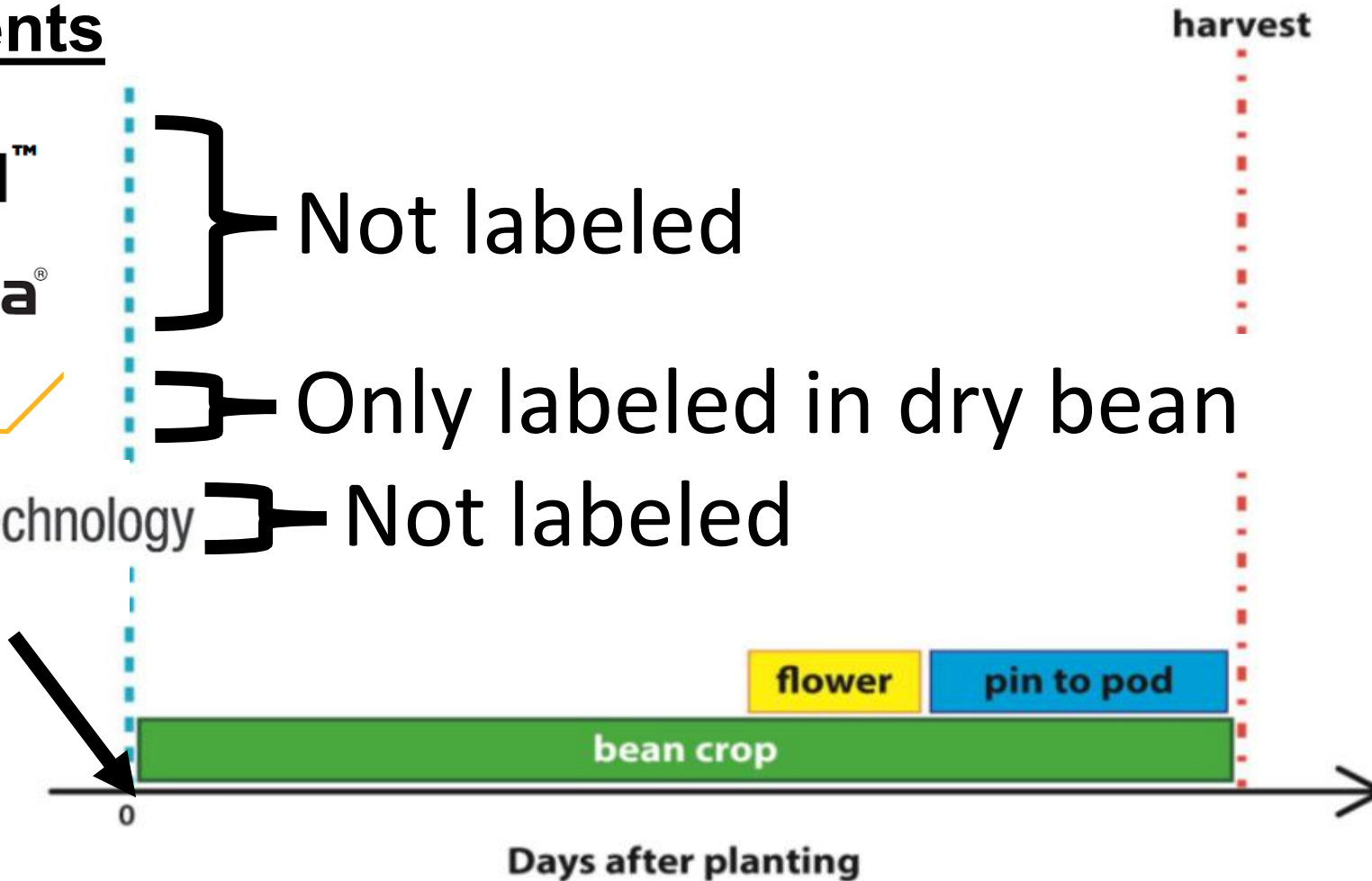
3 **Lumivia[®]**
INSECTICIDE SEED TREATMENT

4 **PLINAZOLIN[®]** technology

} Not labeled

} Only labeled in dry bean

} Not labeled





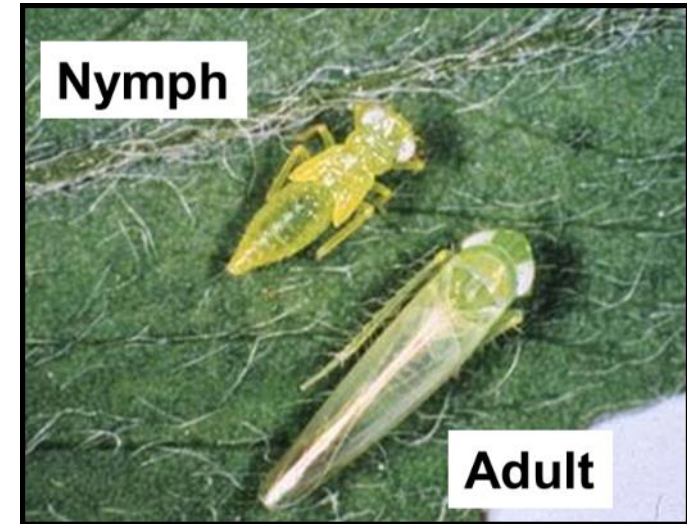
Major bean insect pests



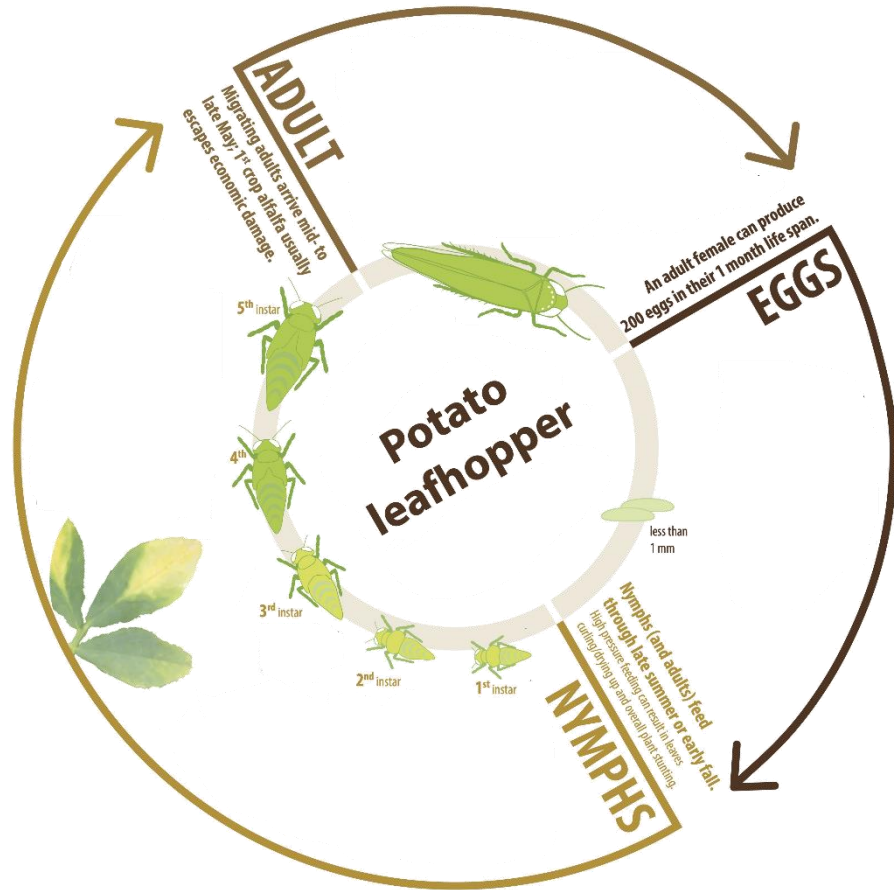
Seedcorn Maggot (SCM)
(*Delia platura*)



Potato Leafhopper (PLH)
(*Empoasca fabae*)



Potato leafhopper (PLH) (*Empoasca fabae*)



1 to 2 generations per year

Do not overwinter in NY and migrates from the southern US

Causes damage by feeding in plants

Potato leafhopper (PLH)



Potato leafhopper damage to beans



Leaf curling, yellow and brown leaf margins (“hopperburn”) and stunting can cause lower bean yields

Management of PLH in beans

Integrated pest management

Plant Resistance

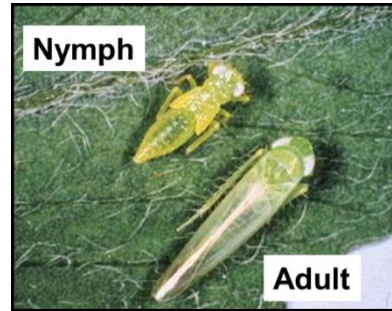
- None commercially used

Chemical Control

- Insecticide at planting and/or foliar sprays

Cultural Control

- Avoid fields adjacent to alfalfa

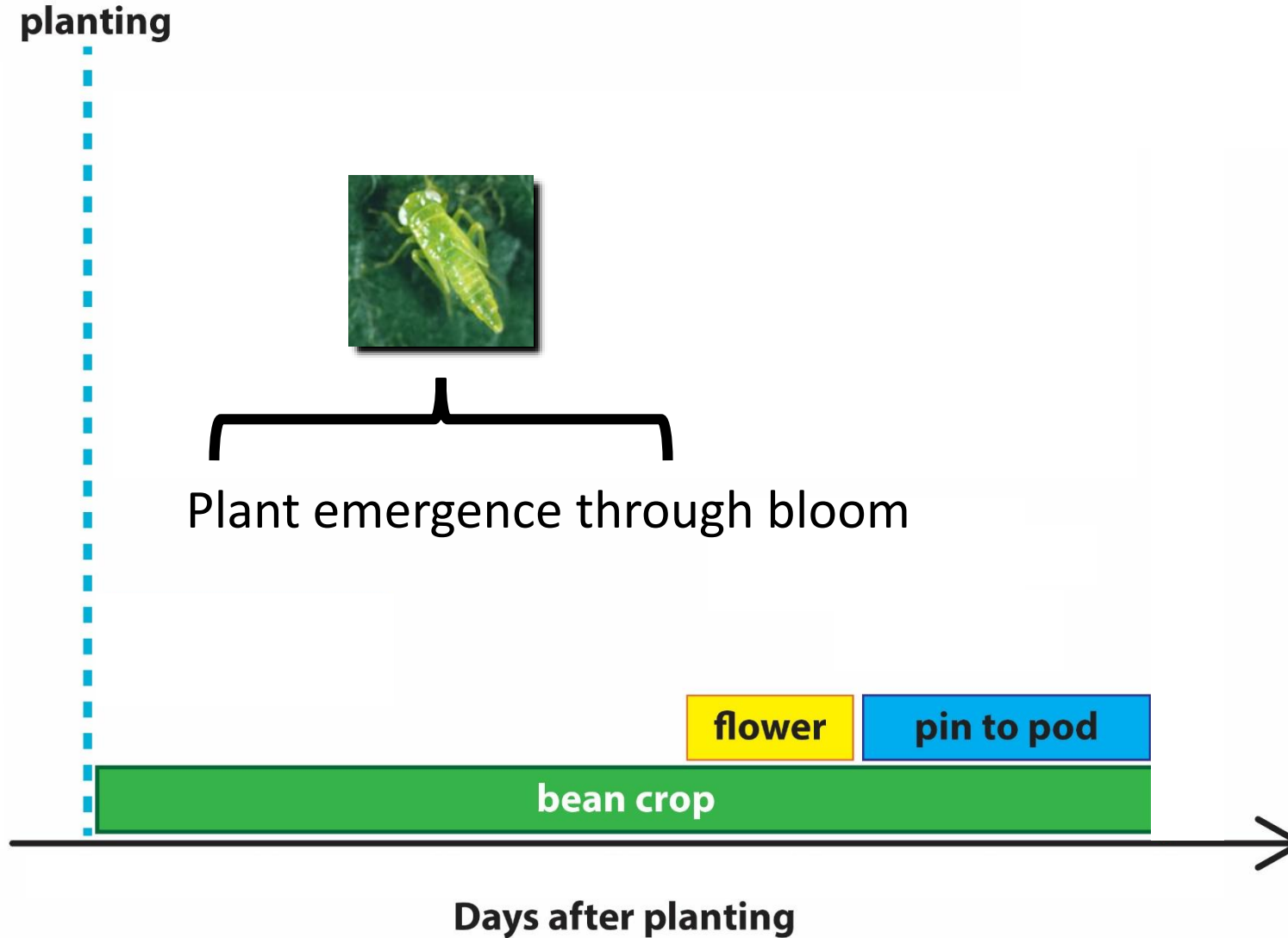


Biological Control

- None



Risk period for PLH attacking beans

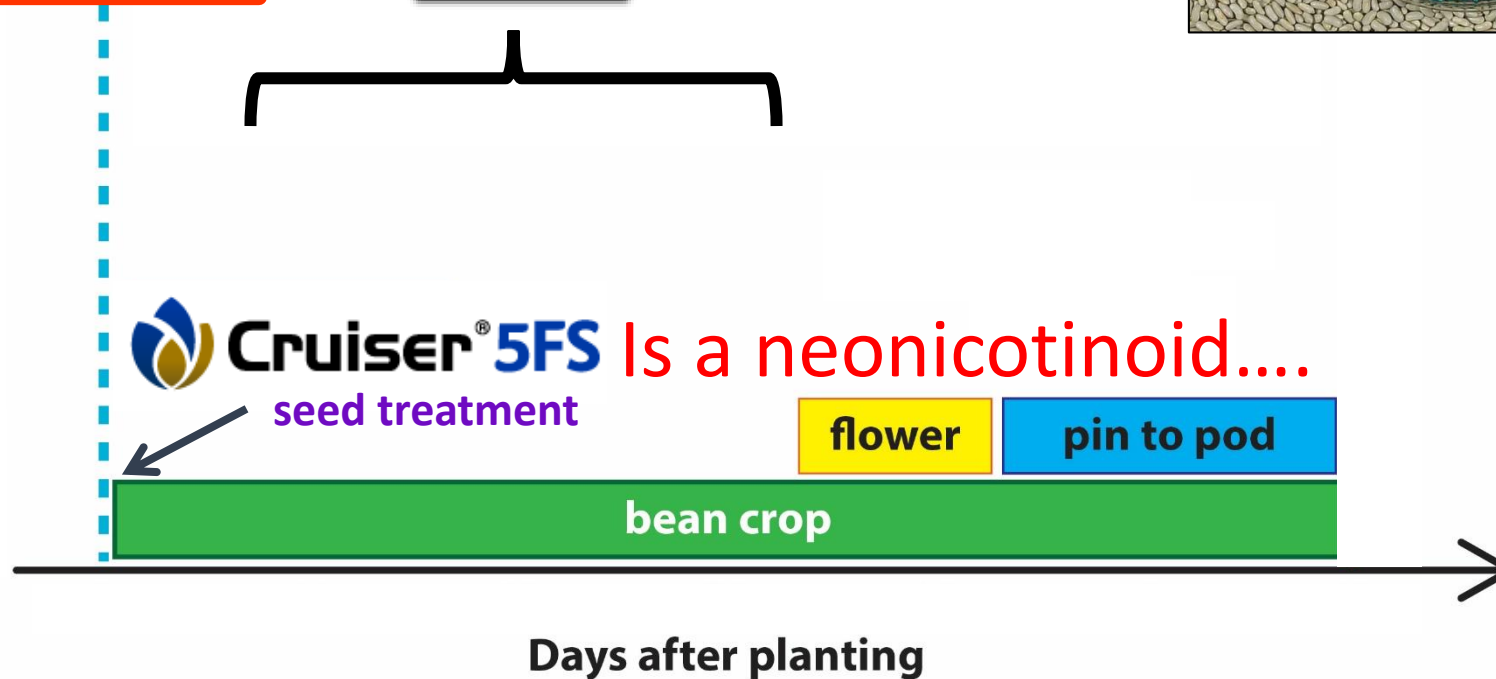




Management of PLH in conventional beans



- Use an insecticide seed treatment¹



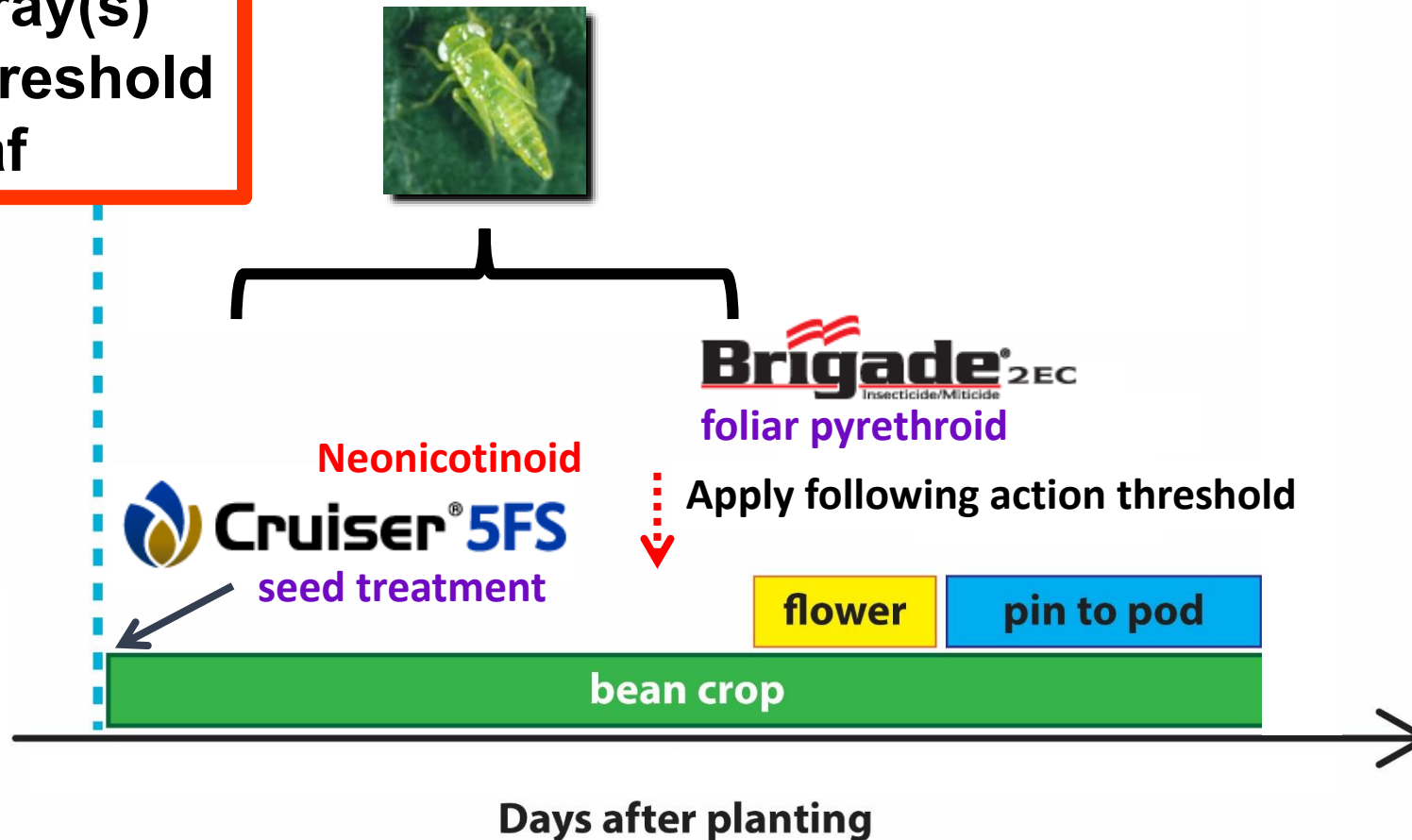
¹Nault et al. 2004, Crop Protection 23 147–154



Management of PLH in conventional beans



- Use an insecticide seed treatment¹
- Apply foliar spray(s) using action threshold of 1 nymph/ leaf




¹Nault et al. 2004, Crop Protection 23 147–154



Insecticide seed treatments evaluated for PLH control in snap bean and dry bean in 2022-2024



Treatments	Active ingredient	Rate	IRAC Class
Cruiser 5FS	thiamethoxam	0.5 mg a.i./ seed	4A
Fortenza 5FS^b	cyantraniliprole	0.5 mg a.i./ seed	28
Lumivia^{b, c}	chlorantraniliprole	0.5 mg a.i./ seed	28
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^b Not labeled on snap bean

^c Labeled on dry bean



Approach

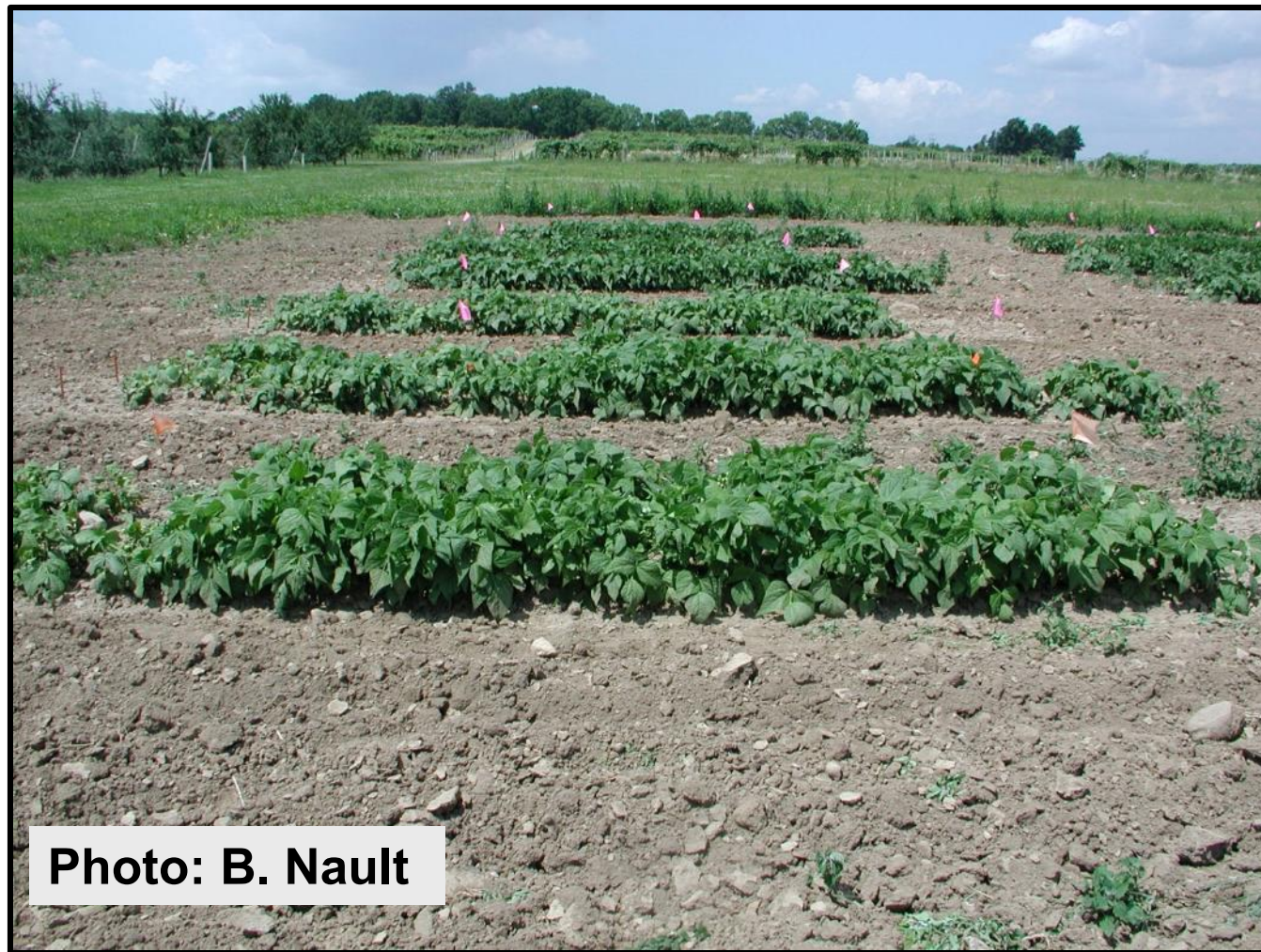
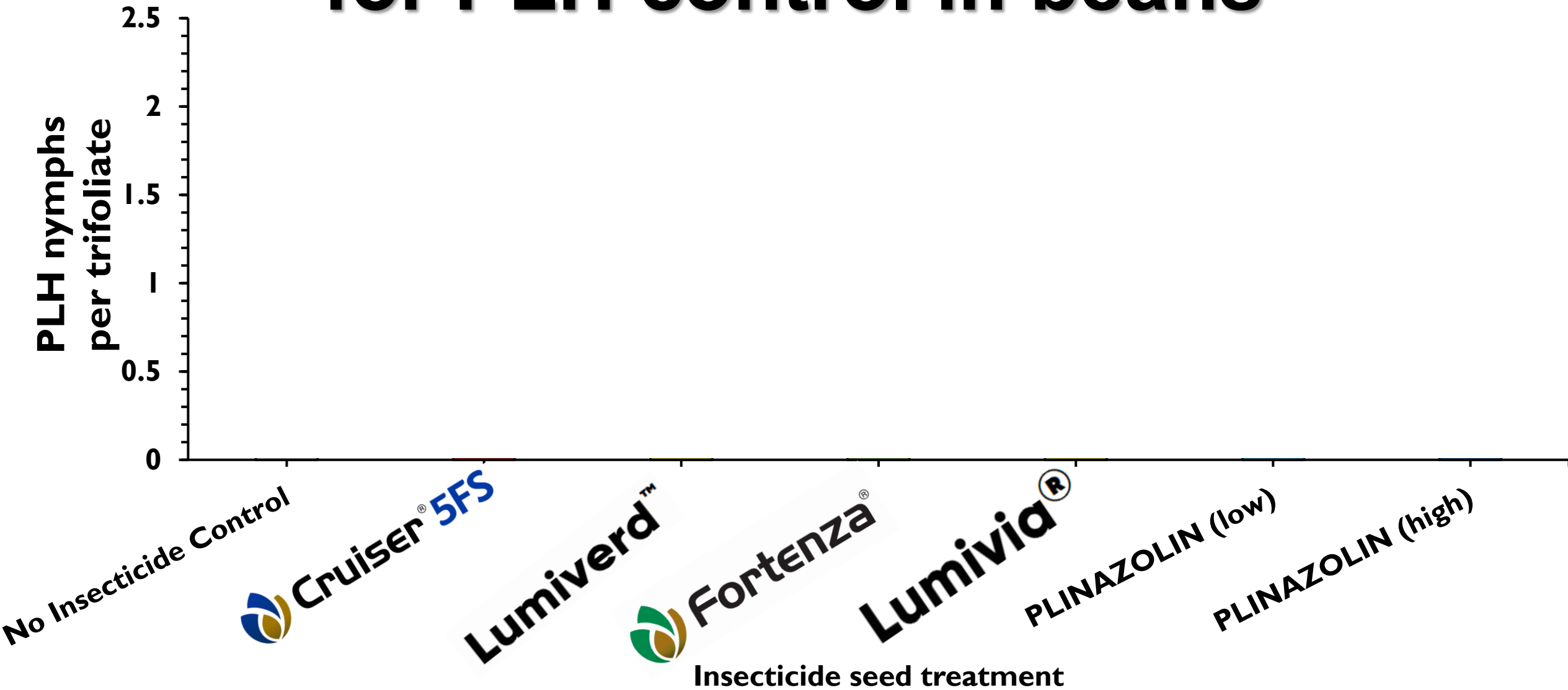


Photo: B. Nault

- Planted in NY in 2023 and 2024
- Counted PLH nymphs on 20 trifoliate leaves

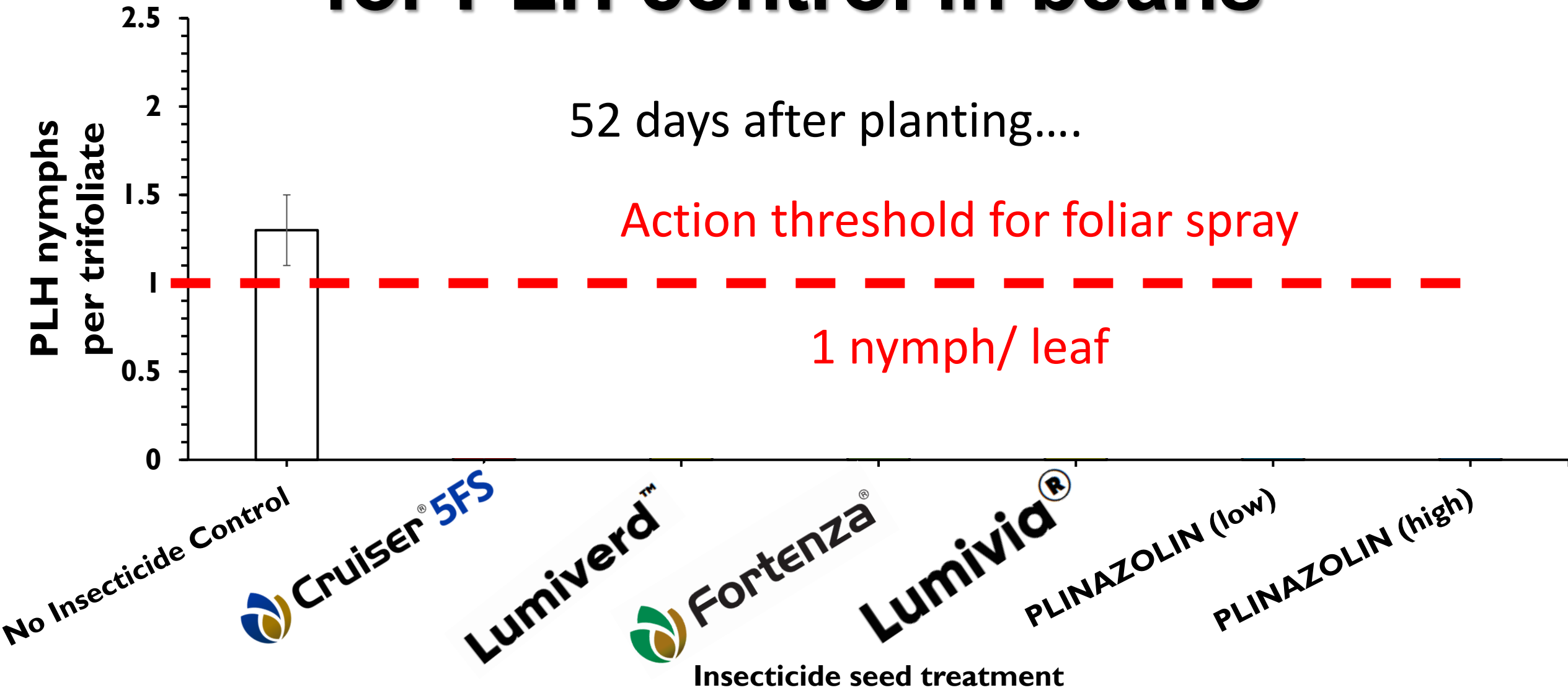


Insecticide seed treatments evaluated for PLH control in beans



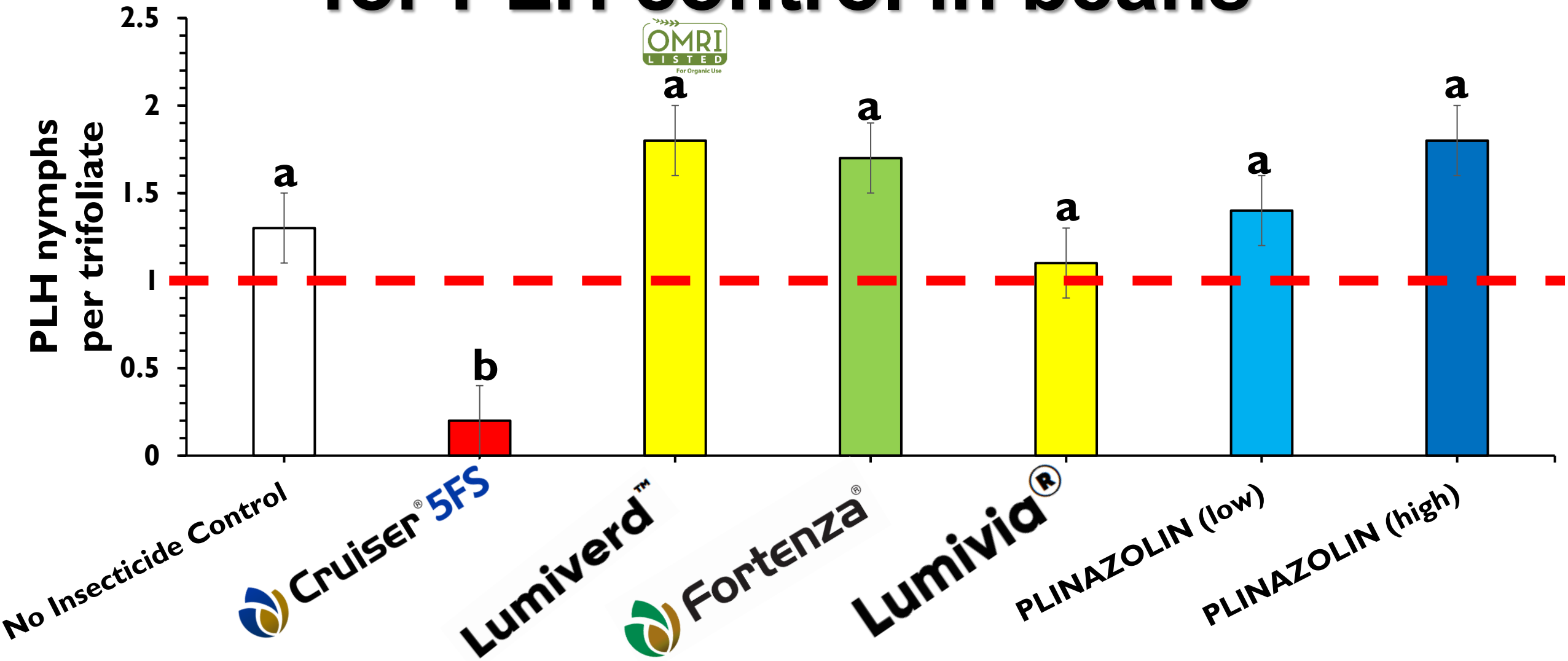
Geneva, NY 2023

Insecticide seed treatments evaluated for PLH control in beans



Geneva, NY 2023

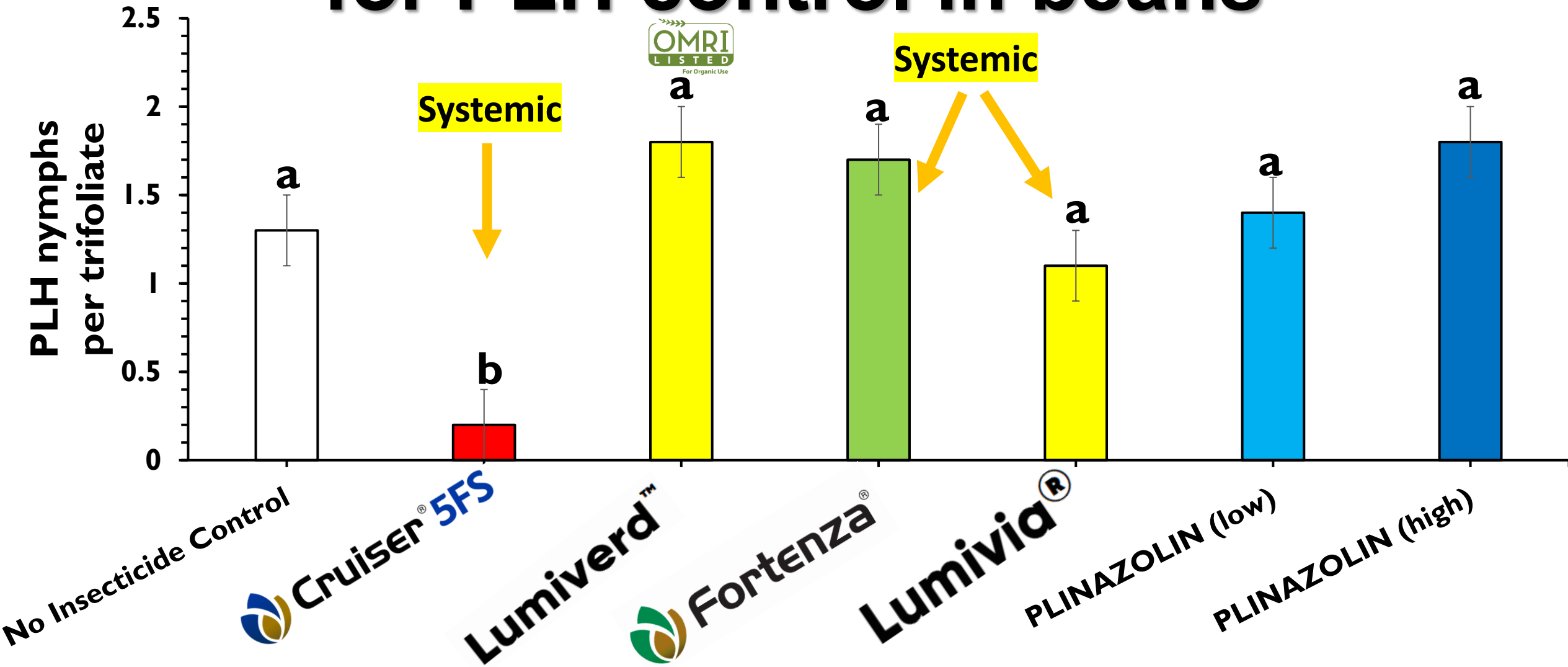
Insecticide seed treatments evaluated for PLH control in beans



Insecticide seed treatment
 $F = 8.0$; $df = 6, 30$; $P < 0.0001$

Geneva, NY 2023

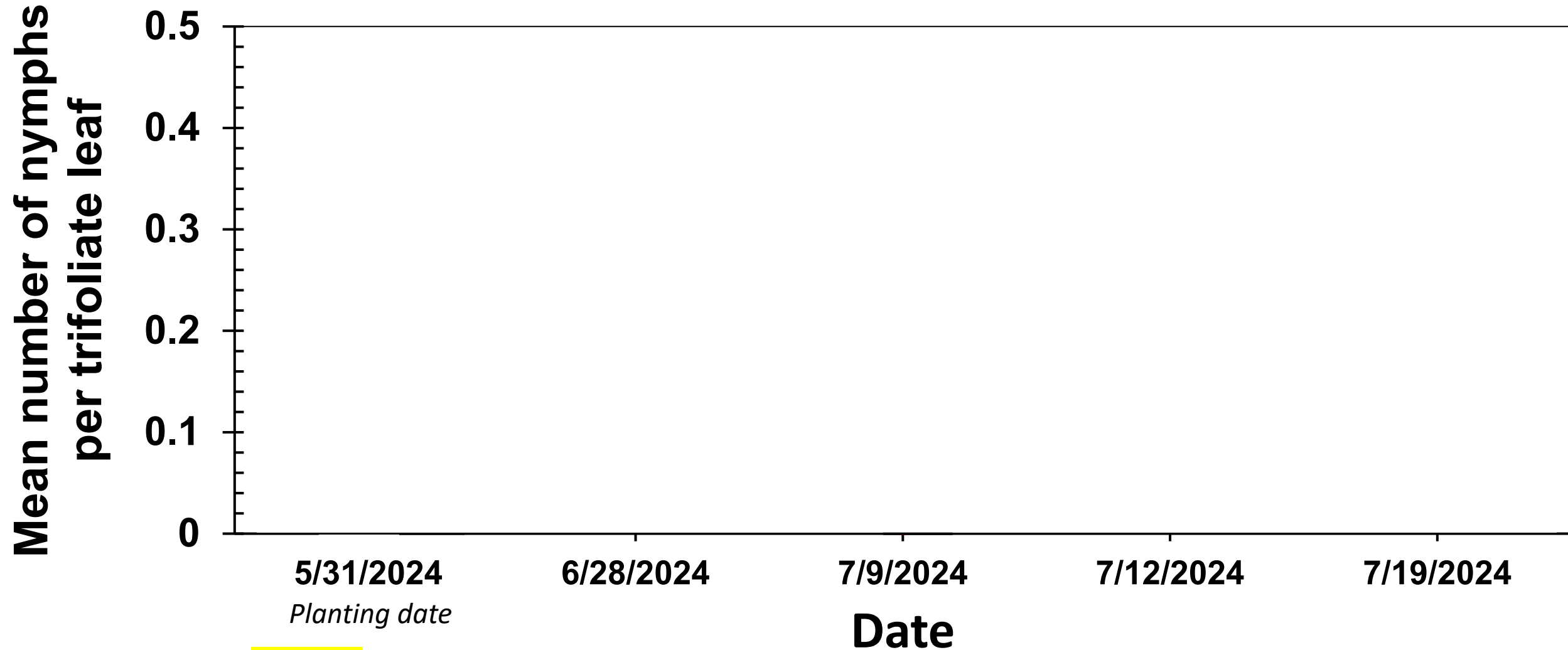
Insecticide seed treatments evaluated for PLH control in beans



Insecticide seed treatment
 $F = 8.0; df = 6, 30; P < 0.0001$

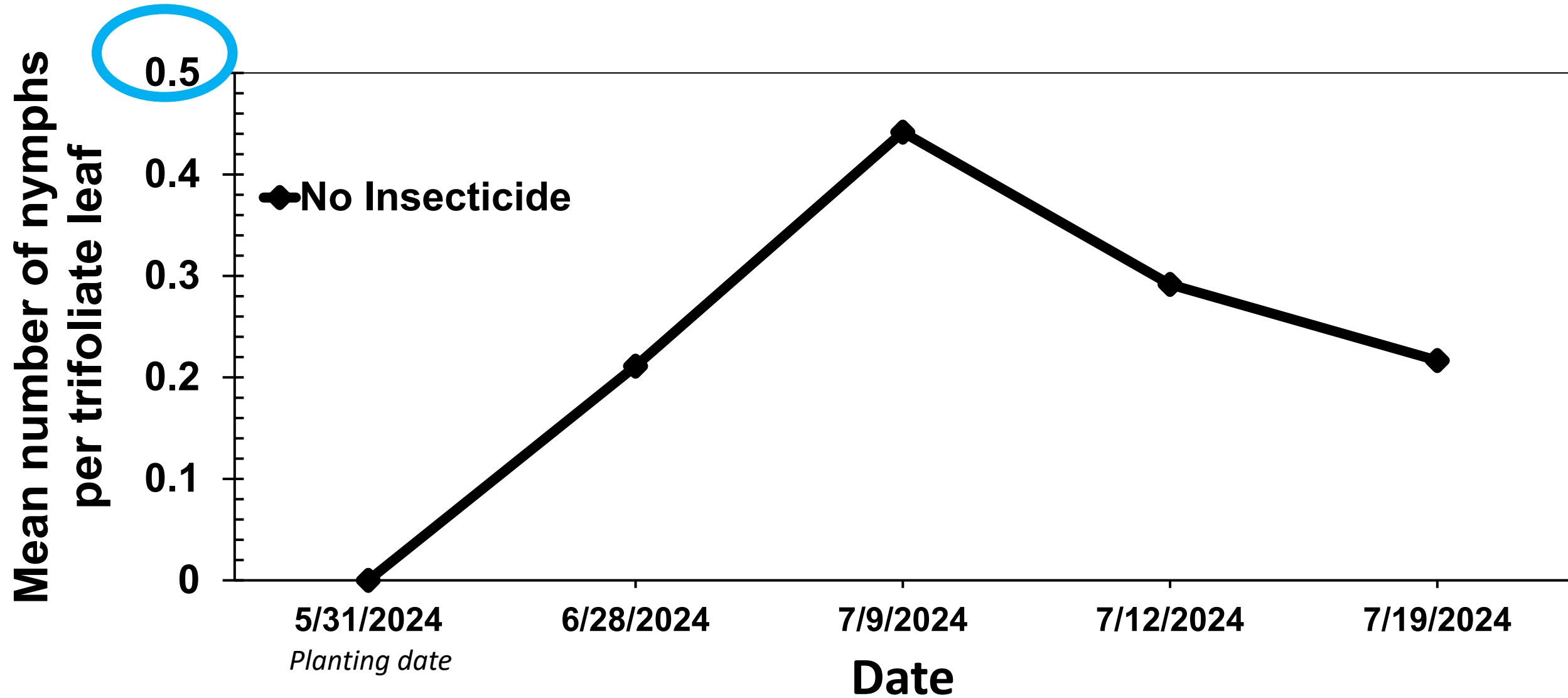
Geneva, NY 2023

Insecticide seed treatments evaluated for PLH control in dry bean



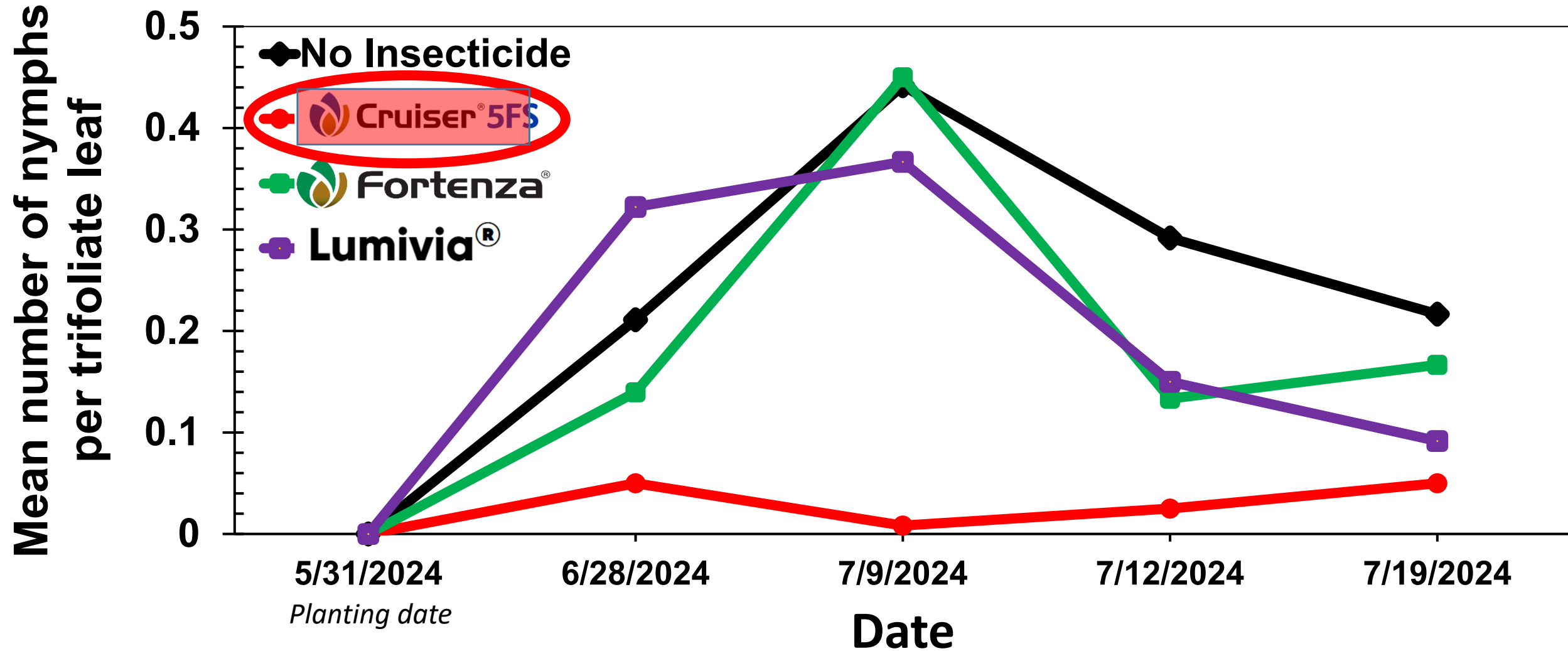
Geneva, NY 2024

Insecticide seed treatments evaluated for PLH control in beans



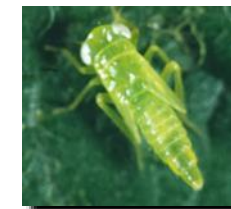
Geneva, NY 2024

Insecticide seed treatments evaluated for PLH control in beans



Geneva, NY 2024

Scenario without Cruiser[®] 5FS

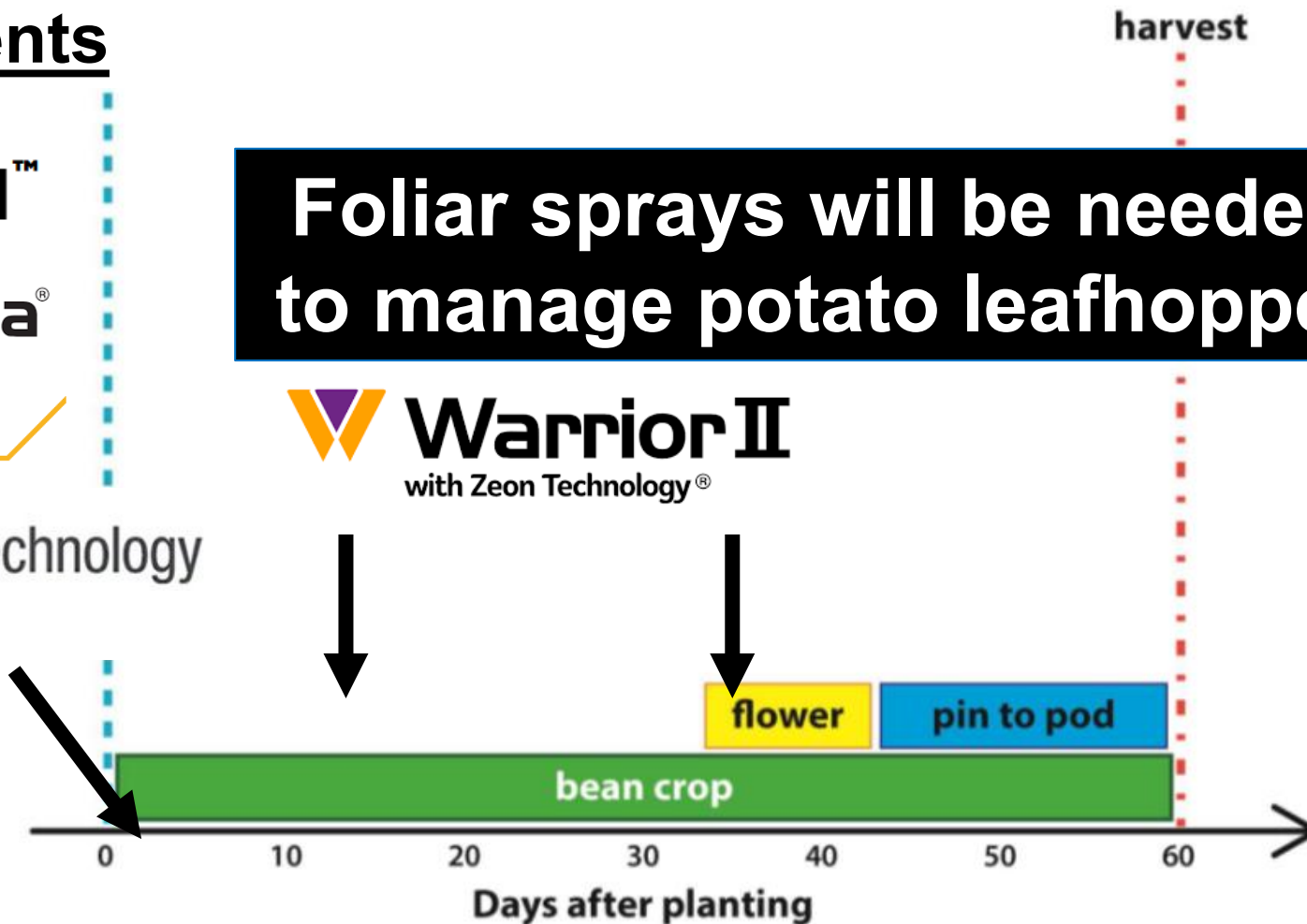


Seed treatments

- 1 **Lumiverd[™]**
- 2  **Fortenza[®]**
- 3 **Lumivia[®]**
INSECTICIDE SEED TREATMENT
- 4 **PLINAZOLIN[®]** technology

**Foliar sprays will be needed
to manage potato leafhopper**

 **Warrior II**
with Zeon Technology[®]



Case Studies

- Insect pest control in sweet corn



- Insect pest control in beans

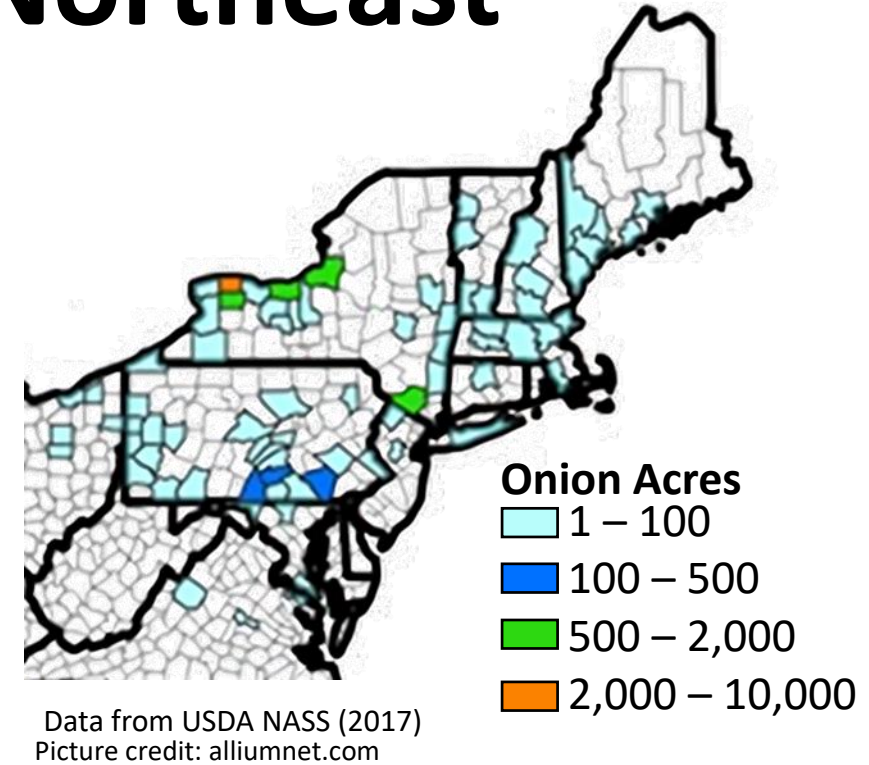


- **Insect pest control in onions**



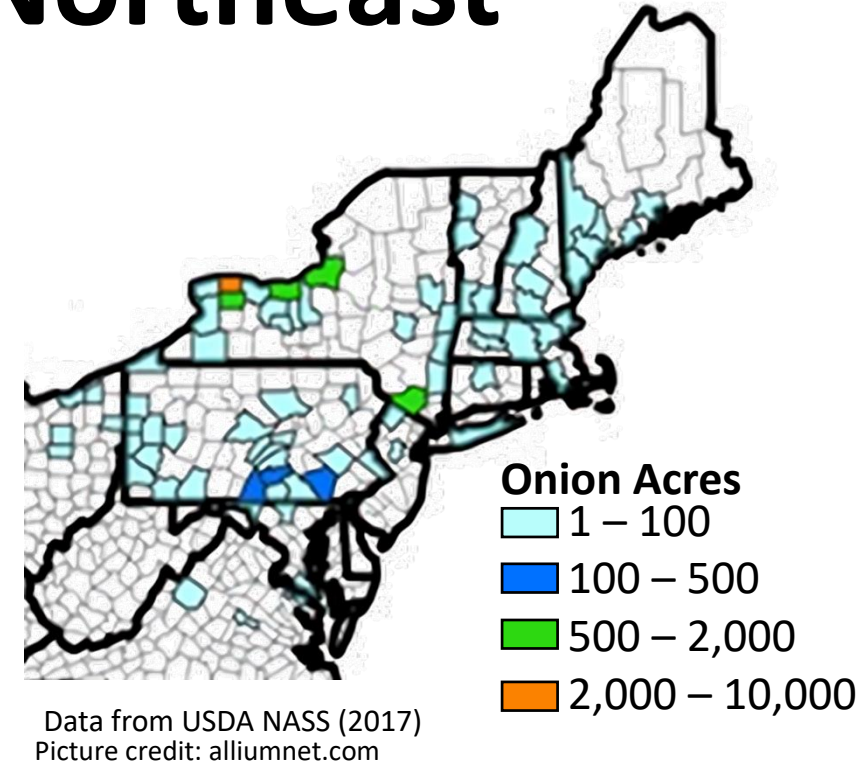
Onion Production in the Northeast

- In 2017, the Northeast produced over 8,000 acres of onions on over 3,000 farms (USDA NASS)



Onion Production in the Northeast

- In 2017, the Northeast produced over 8,000 acres of onions on over 3,000 farms (USDA NASS)
- Almost 97% of onion production occurs in New York, primarily in muck (organic) soils





Maggot complex

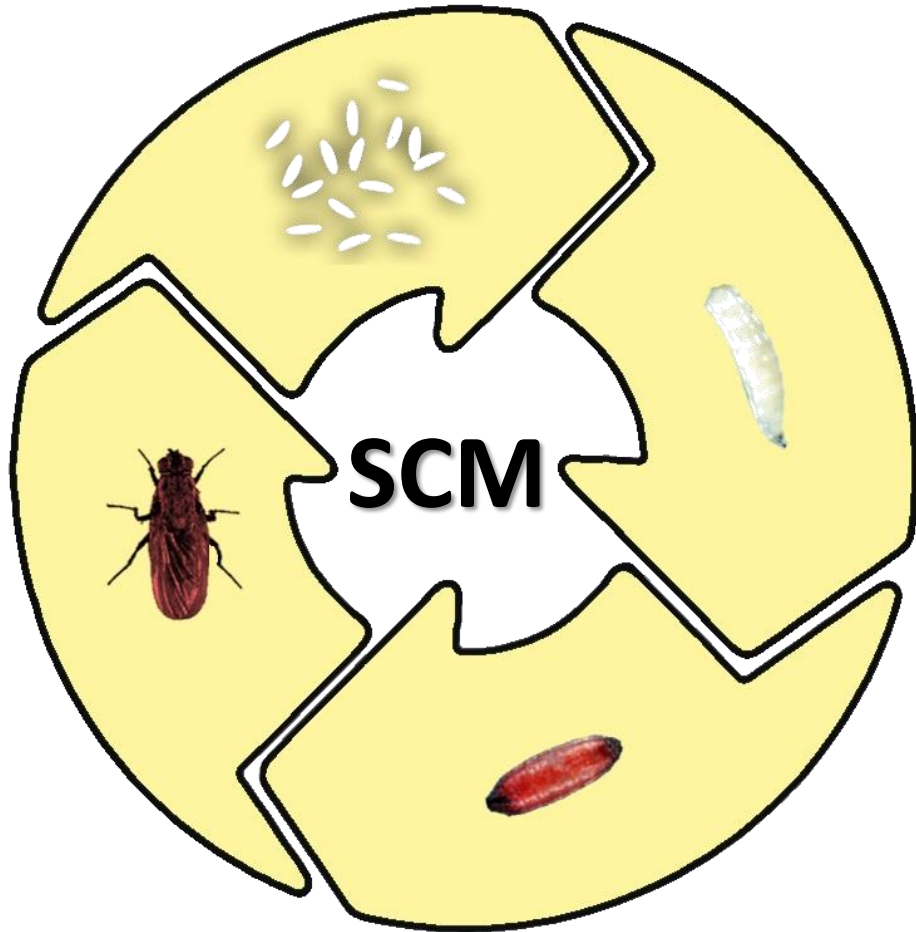
Diptera: Anthomyiidae





Maggot complex

Diptera: Anthomyiidae

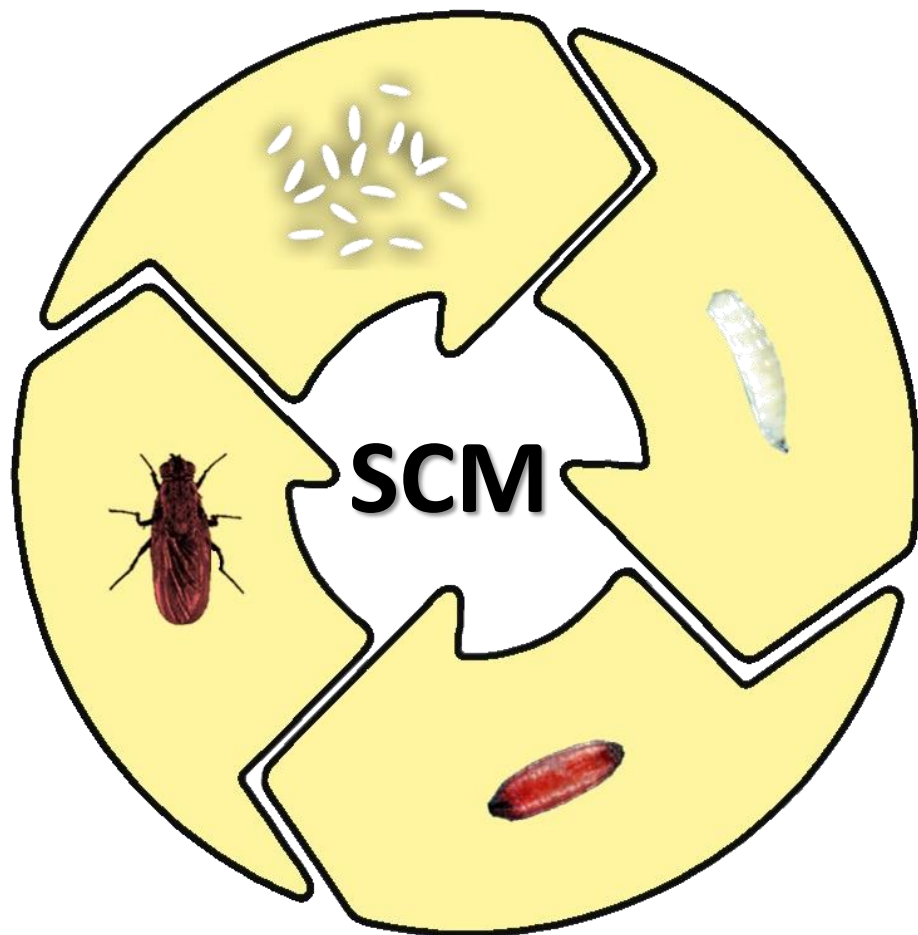


Seedcorn maggot (*Delia platura* Meigen)

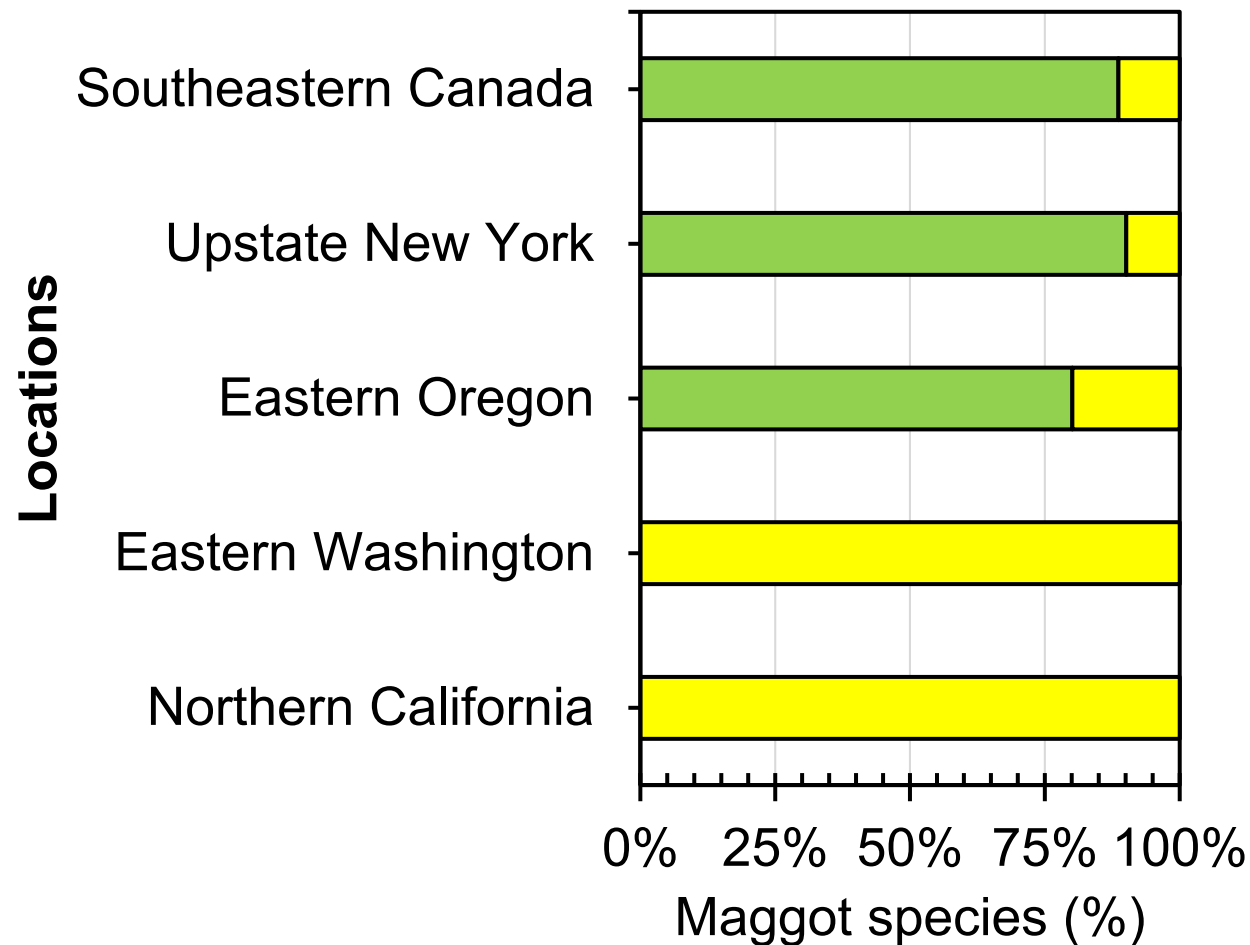


Maggot complex

Diptera: Anthomyiidae



Seedcorn maggot (*Delia platura* Meigen)



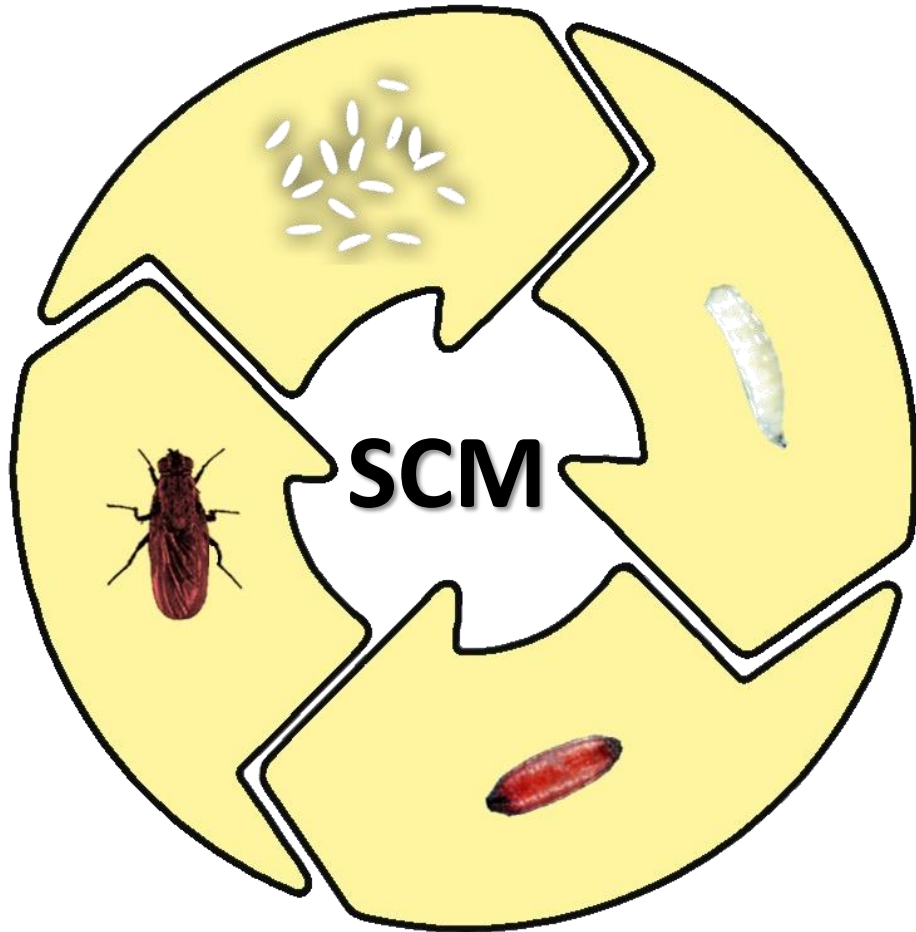
■ *D. antiqua* ■ *D. platura*

Salgado et. al unpublished data

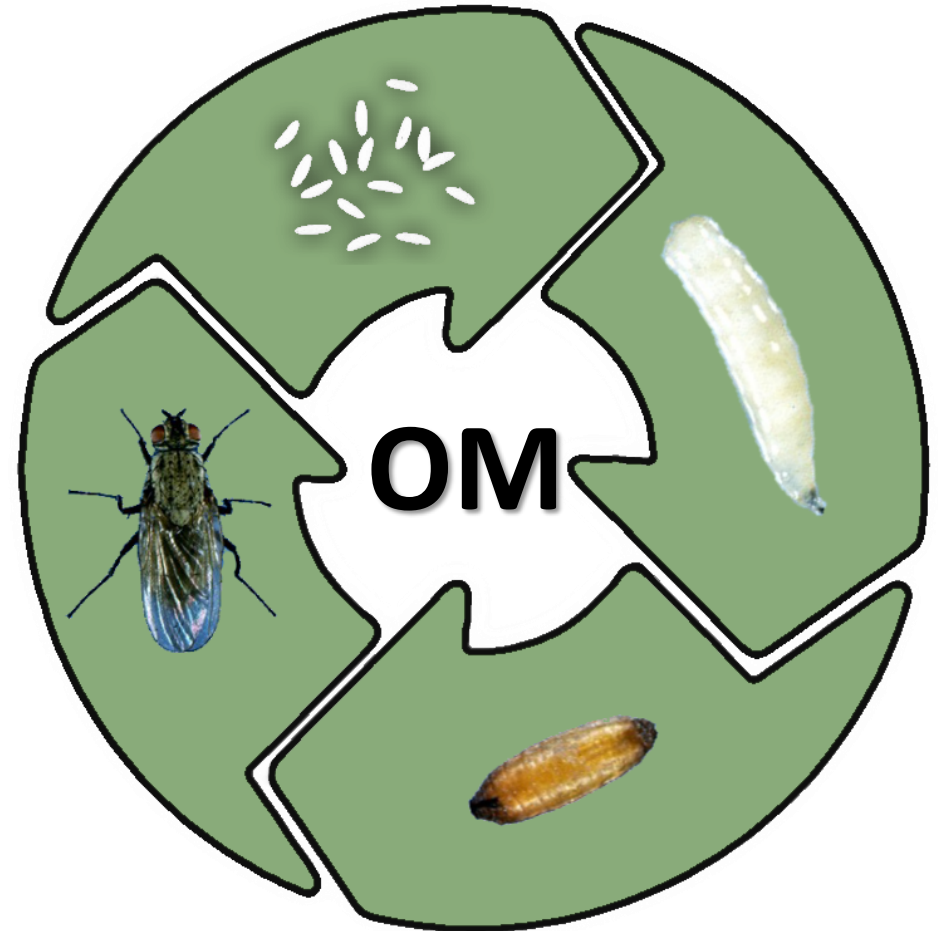


Maggot complex

Diptera: Anthomyiidae



Seedcorn maggot (*Delia platura* Meigen)



Onion maggot (*Delia antiqua* Meigen)

Damage to Onions





One maggot can kill 10 plants¹



Picture Credit: Christy Hoepting



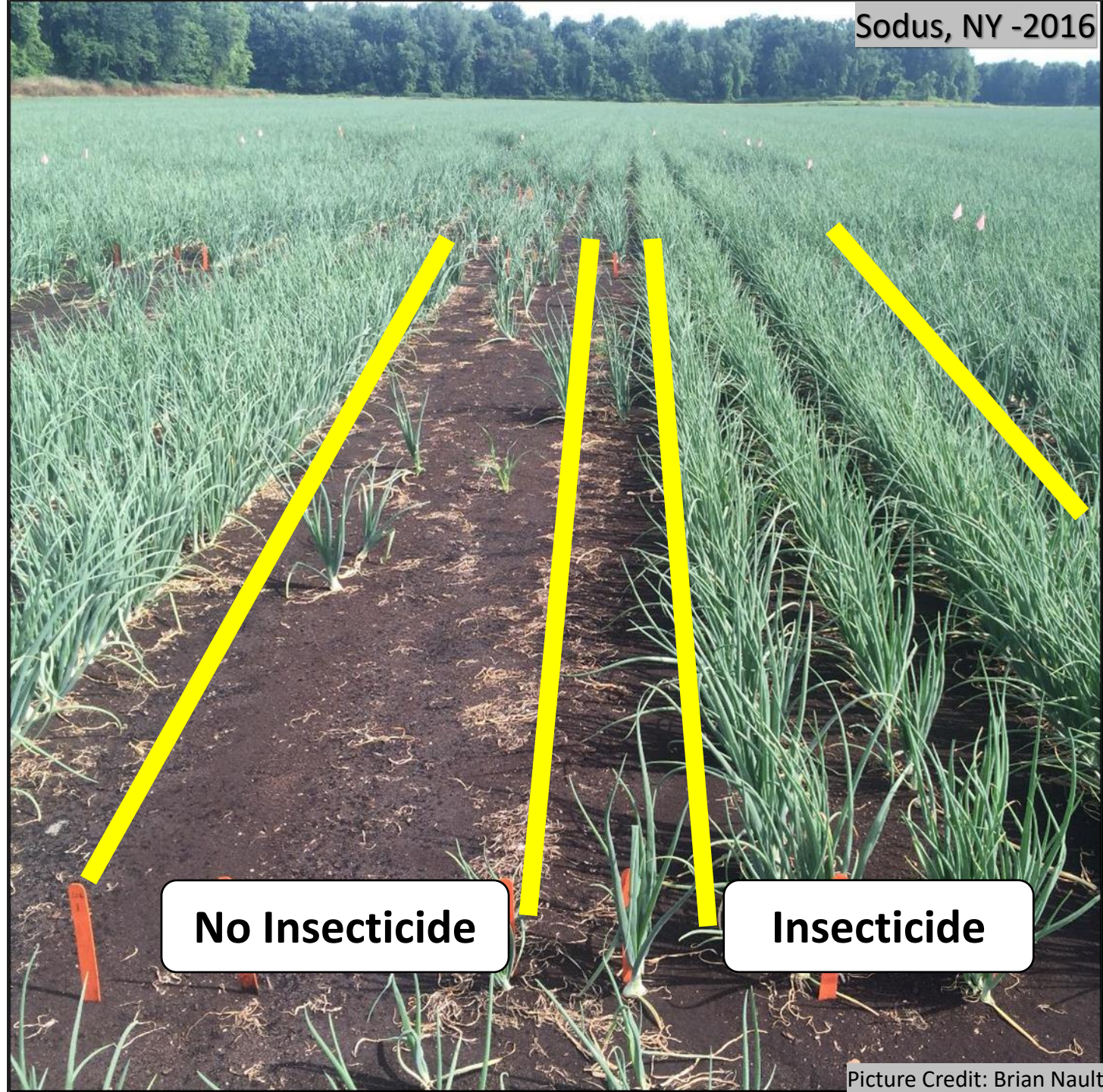
Picture Credit: Erica Moretti

¹ Workman 1958. PhD Dissertation Oregon State College.

Plant stands can be reduced by nearly 100% if left unprotected¹

Management is preventive because once the damage occurs, nothing can be done!

¹Nault et al. 2006 – Crop Prot., Salgado and Nault 2023 – AMT





Main risk period for maggots in onion



**Seedcorn maggot
& Onion maggot**

Planting

Direct seeded
(late March – mid May)

Harvest

(late July – Sept.)

ONION GROWING SEASON

APRIL

MAY

JUNE

JULY

AUG

SEPT



Main risk period for maggots in onion



**Seedcorn maggot
& Onion maggot**

Sepresto 75 WS



Planting
Direct seeded
(late March – mid May)

Harvest
(late July – Sept.)

ONION GROWING SEASON

APRIL

MAY

JUNE

JULY

AUG

SEPT



Approach



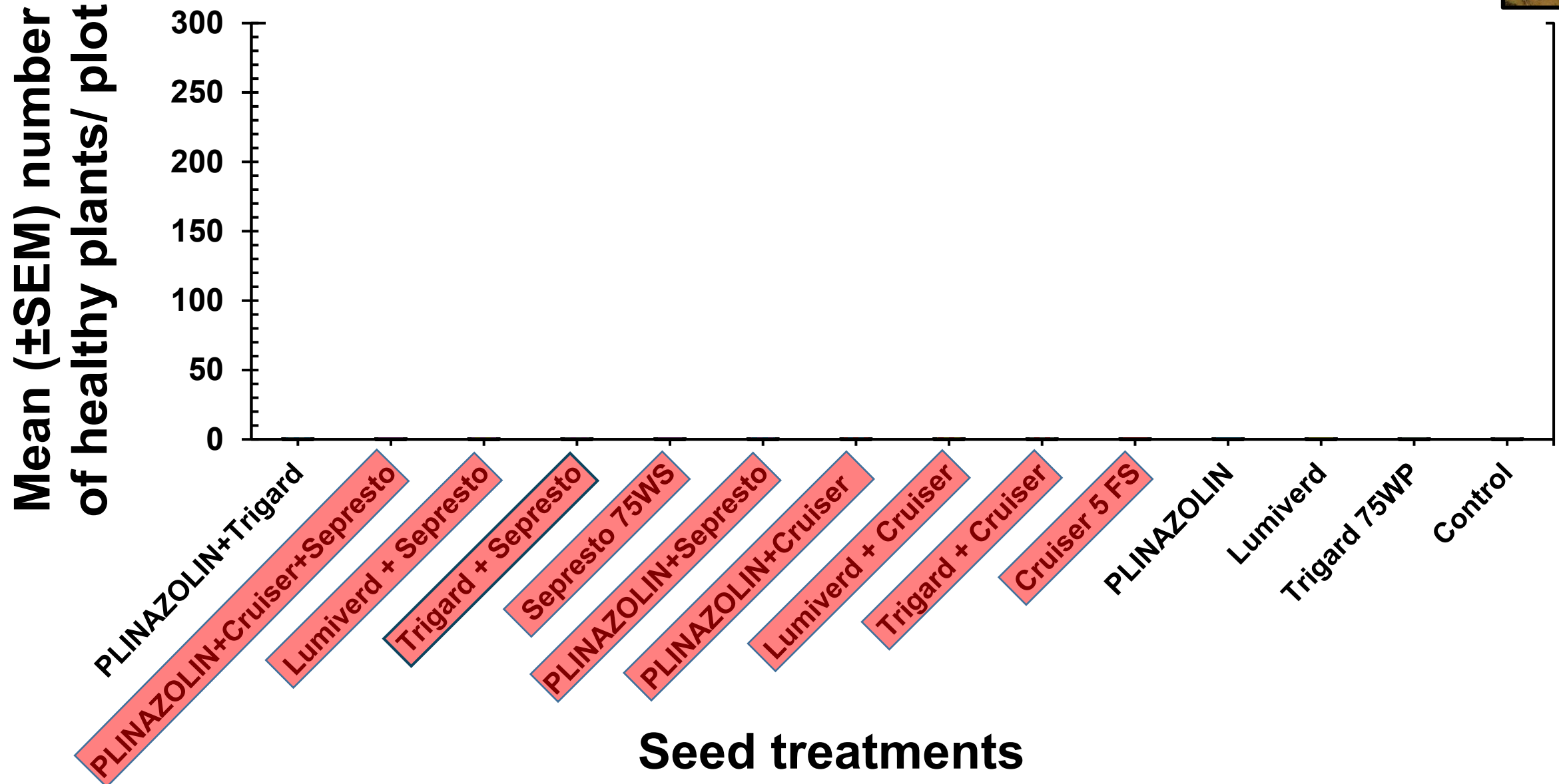
- Research conducted in CA, NY, ON, OR and WA from 2022 through 2024
- No soil amendments
- Recorded number of maggot damaged plants 1-2 times/ week until early July & recorded final plant stand

Insecticide seed treatments evaluated in 2024

Trt#	Product(s)	Insecticide Active ingredient(s)	Rate (mg ai/seed)
1	No insecticide	N/A	N/A
2	Trigard 75WP	cyromazine	0.225 mg ai/seed
3	Lumiverd	spinosad	0.2 mg ai/seed
4	PLINAZOLIN technology	isocycloseram	0.0909 mg ai/seed
5	Cruiser 5 FS	thiamethoxam	0.2 mg ai/seed
6	Sepresto 75WS	clothianidin + imidacloprid	0.32 mg ai/seed
7	Trigard + Cruiser	cyromazine + thiamethoxam	0.225 mg ai/seed + 0.2 mg ai/seed
8	Trigard + Sepresto	cyromazine + clothianidin + imidacloprid	0.225 mg ai/seed + 0.32 mg ai/seed
9	Lumiverd + Cruiser	spinosad + thiamethoxam	0.2 mg ai/seed + 0.2 mg ai/seed
10	Lumiverd + Sepresto	spinosad + clothianidin + imidacloprid	0.2 mg ai/seed + 0.32 mg ai/seed
11	PLINAZOLIN + Cruiser	isocycloseram + thiamethoxam	0.0909 mg ai/seed + 0.2 mg ai/seed
12	PLINAZOLIN + Sepresto	isocycloseram + clothianidin + imidacloprid	0.0909 mg ai/seed + 0.32 mg ai/seed
13	PLINAZOLIN + Cruiser + Sepresto	isocycloseram + thiamethoxam + clothianidin + imidacloprid	0.0909 mg ai/seed + 0.2 mg ai/seed + 0.32 mg ai/seed
14	PLINAZOLIN + Trigard	isocycloseram + cyromazine	0.0909 mg ai/seed + 0.225 mg ai/seed



Efficacy of insecticide seed treatments for SCM & OM control in onion in NY in 2024



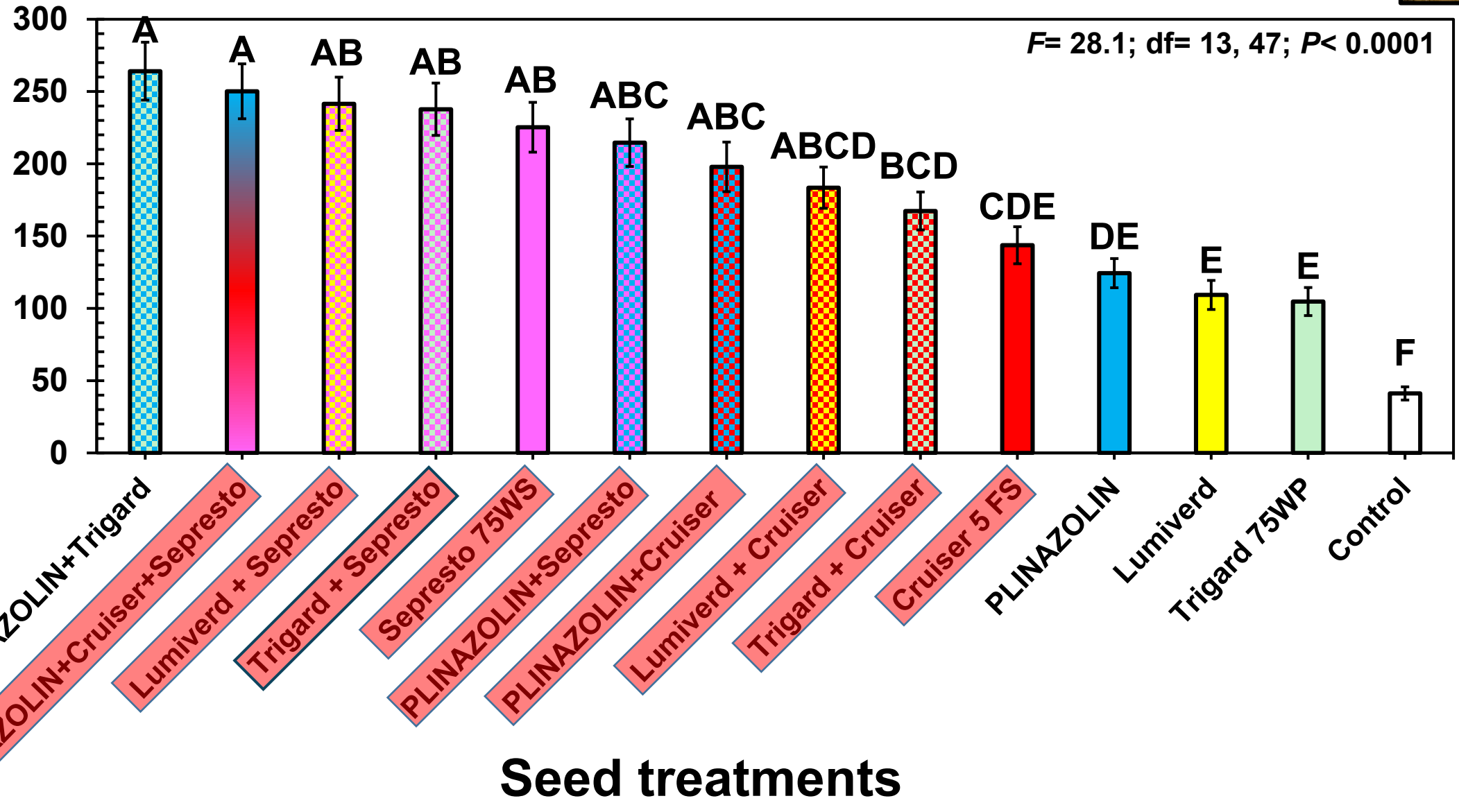
Means with same letter are not significantly different ($P > 0.05$; Tukey-Kramer Pairwise Test; $n = 5$)



Efficacy of insecticide seed treatments for SCM & OM control in onion in NY in 2024



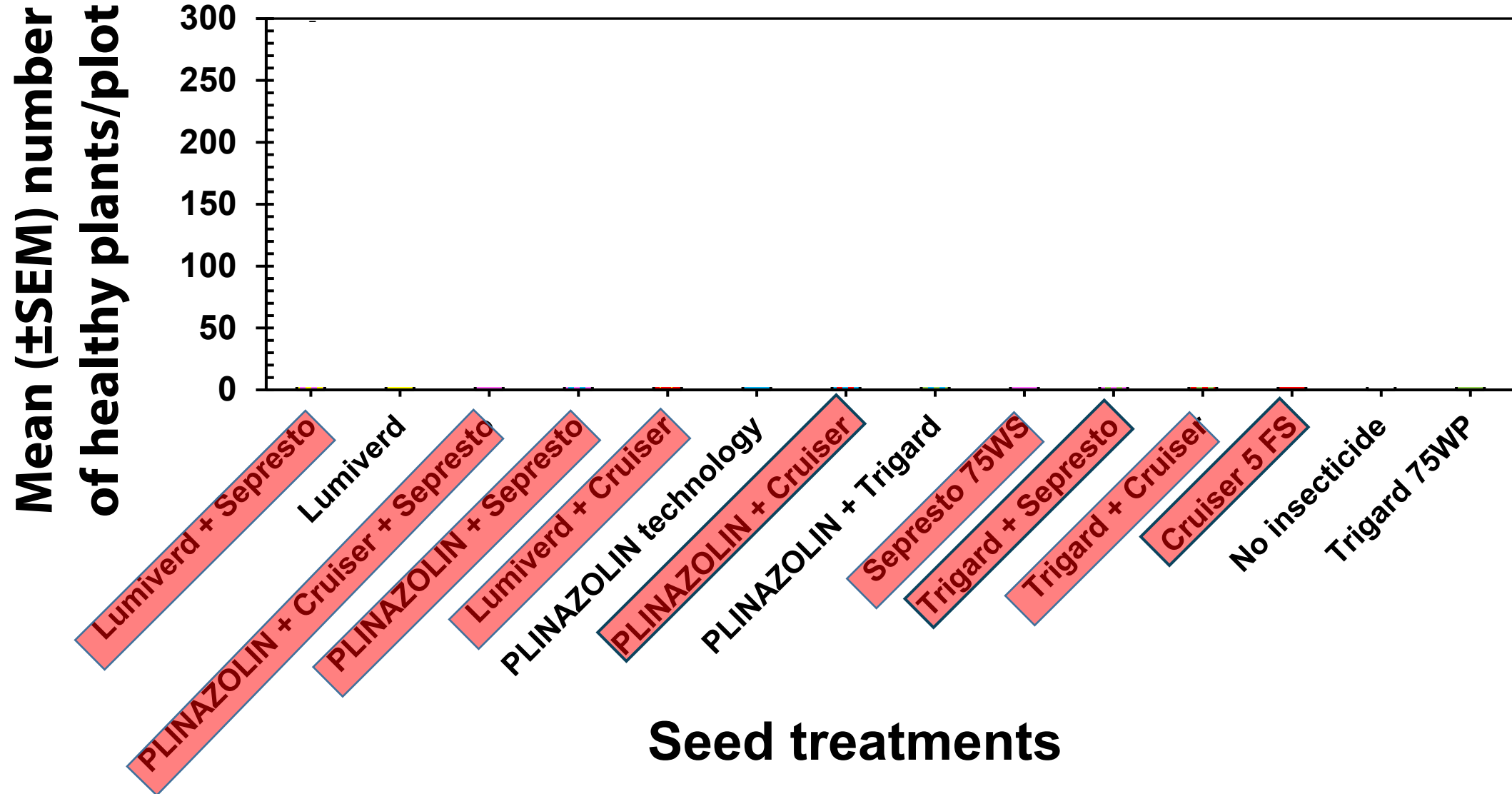
Mean (\pm SEM) number
of healthy plants/ plot



Means with same letter are not significantly different ($P > 0.05$; Tukey-Kramer Pairwise Test; $n = 5$)



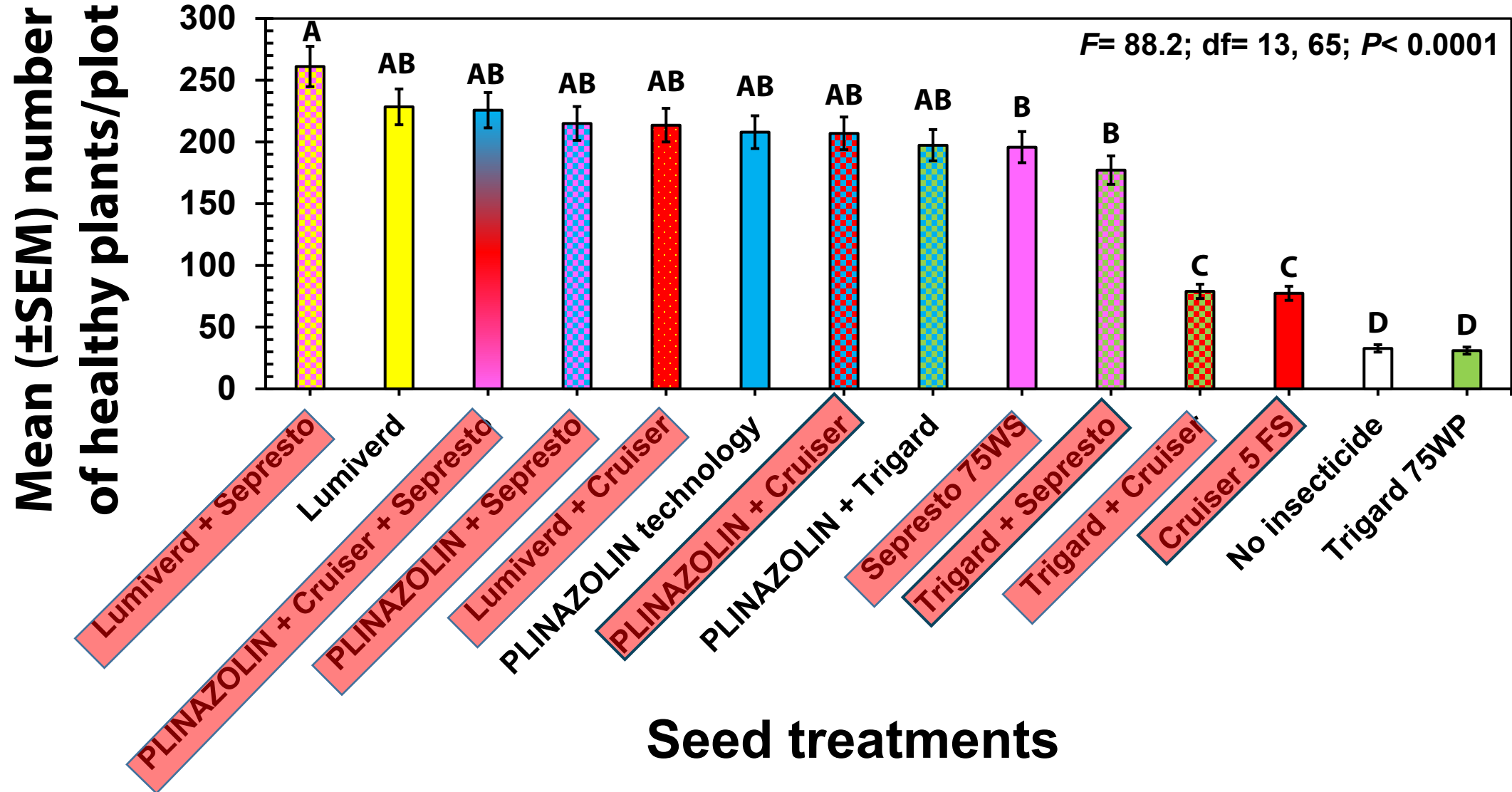
Efficacy of insecticide seed treatments for SCM control in onion in CA in 2024



Means with same letter are not significantly different ($P > 0.05$; Tukey-Kramer Pairwise Test; $n = 5$)



Efficacy of insecticide seed treatments for SCM control in onion in CA in 2024



Means with same letter are not significantly different ($P > 0.05$; Tukey-Kramer Pairwise Test; $n = 5$)

Seed treatments





1 **Lumiverd[™]**

2  **Trigard[®]**

} Labeled on onion, but typically not effective enough alone



Guidelines for seed treatment use in NY 2025

Trade name of insecticide	Active Ingredient(s)	Group IRAC	Activity on Target Pests ¹	
			Seedcorn maggot	Onion maggot
 Lumiverd™	spinosad	5	Excellent	Fair*
 Trigard®	cyromazine	17	Poor	Fair
 Cruiser® 5FS	thiamethoxam	4A	Poor	Good
 Sepresto 75 WS	clothianidin + imidacloprid	4A	Very good	Excellent

* Onion maggot resistance to spinosad may occur in some locations

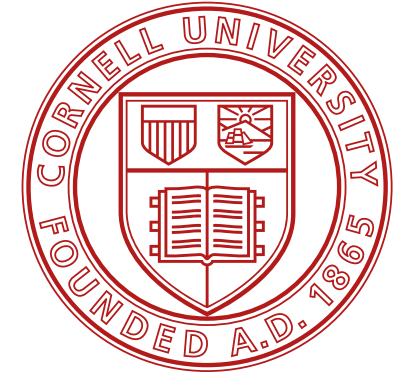
Seed treatment packages (insecticides + fungicides) to consider

Low maggot pressure			Moderate to high maggot pressure	
Package 1	Package 2	Package 3	Package 1	Package 2
Trigard	Lumiverd	Sepresto	Sepresto	Sepresto
Cruiser	Cruiser	**FarMore F300	Trigard	Lumiverd
**FarMore F300	**FarMore F300	**EverGol Prime	**FarMore F300	**FarMore F300
**EverGol Prime	**EverGol Prime		**EverGol Prime	**EverGol Prime

** **Fungicides:** FarMore 300 includes Apron® XL (mefenoxam) + Maxim® 4FS (fludioxonil) + Dynasty® (azoxystrobin) to control damping off; EverGol® Prime (penflufen) controls onion smut.

Takeaway message

- **Neonicotinoids continue to be highly effective for managing many vegetable insect pests**
- **Alternatives to neonicotinoids are not always effective for managing early-season vegetable insect pests**
- **Without neonicotinoids, insecticide use will increase in some vegetable crops and control will be more expensive**



THANK YOU

GRACIAS
ARIGATO
SHUKURIA
JUSPAXAR

DANKSCHEEN
TASHAKKUR ATU
YAQHANYELAY
SUKSAMA
EKHMET
BIYAN
SHUKRIA
TINGKI
GRAZIE
MEHRBANI
PALDIES
BOLZİN
MERCI

GOZAIMASHITA
EFCHARISTO

SPASSIBO
NUHUN
SNACHALHUYA
CHALTU
WABEEJA
MAITEKA
HUI
YUSPAGARATAM
ATTO
ANHA
SPASIBO
DENKAUJA
NENACHALHYA
UNALCHEESH
HATUR
GUI
EKOJU
SIKOMO
MANETAJ
MIMMONCHAR
FAKAAUE
AGUYJE
LAH
MAAKE
KOMAPSUMNIDA
SANCO
GAETHO
MERASTAWHY
TAVTAPUCH
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lds223@cornell.edu

Questions?



Some Questions for you



Upcoming Webinars

<https://www.northeastipm.org/ipm-in-action/the-ipm-toolbox/>

GROW: Bringing Research and Tools for Integrated Weed Management to Farmers

April 8, 2025, 11:00 a.m.

Presenters: Emily Unglesbee, Michael Flessner, John Wallace

Pesticide Label Changes Brought On by the Endangered Species Act

April 29, 2025 – 11:00 a.m. (eastern)

Presenters: Niranjana Krishna, Kurt Vollmer, Bill Chism, Mark VanGessel



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