Considerations for management of seedcorn maggot, potato leafhopper and European corn borer in conventional and organic snap beans

Empire State Producers EXPO
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Cornell University.

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Topics

- Damage by major pests
- Life history of major pests
- Current and alternative management tactics

Major Snap Bean Pests

Seedcorn Maggot (SCM)
(*Delia platura*)


Photo: J. Ogrodnik

Potato Leafhopper (PLH)
(*Empoasca fabae*)


Photo: Cornell Univ.

European corn borer (ECB)
(*Ostrinia nubilalis*)


Photo: F. Peairs

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SCM damage to snap bean

Photo: Univ. Minnesota

Undamaged

Damaged

Photo: J. Ogrodnick

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SCM damage to snap bean

Stand loss and delayed crop maturity can cause lower bean yields

Seedcorn Maggot

- Overwinters as a puparium in soil in NY (resident pest)
- Adults emerge in April and early May
- Eggs laid on decaying organic material as well as recently planted crops
- 3 - 5 generations; early generations are typically the most problematic

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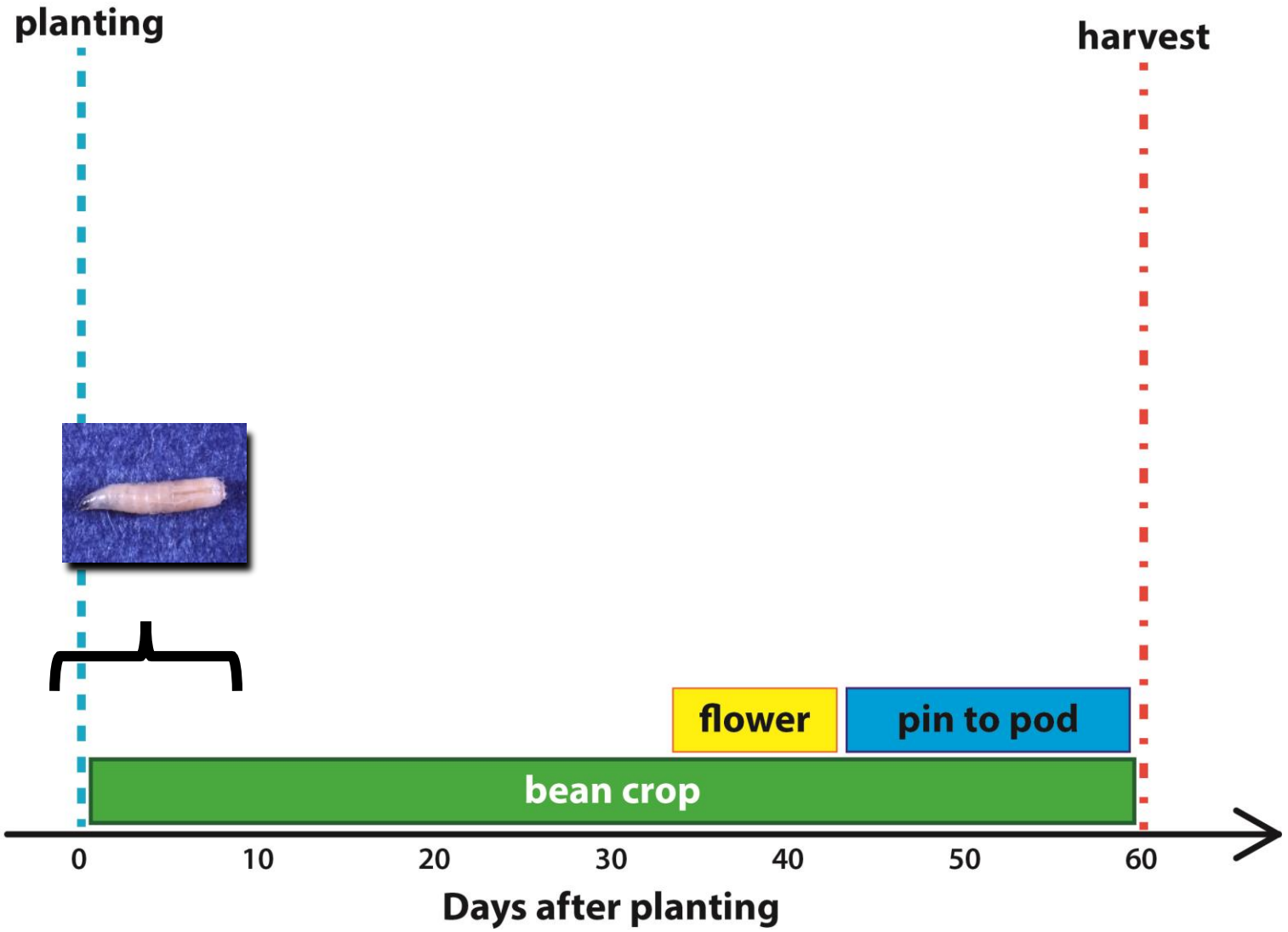
Risk period for SCM attacking snap bean



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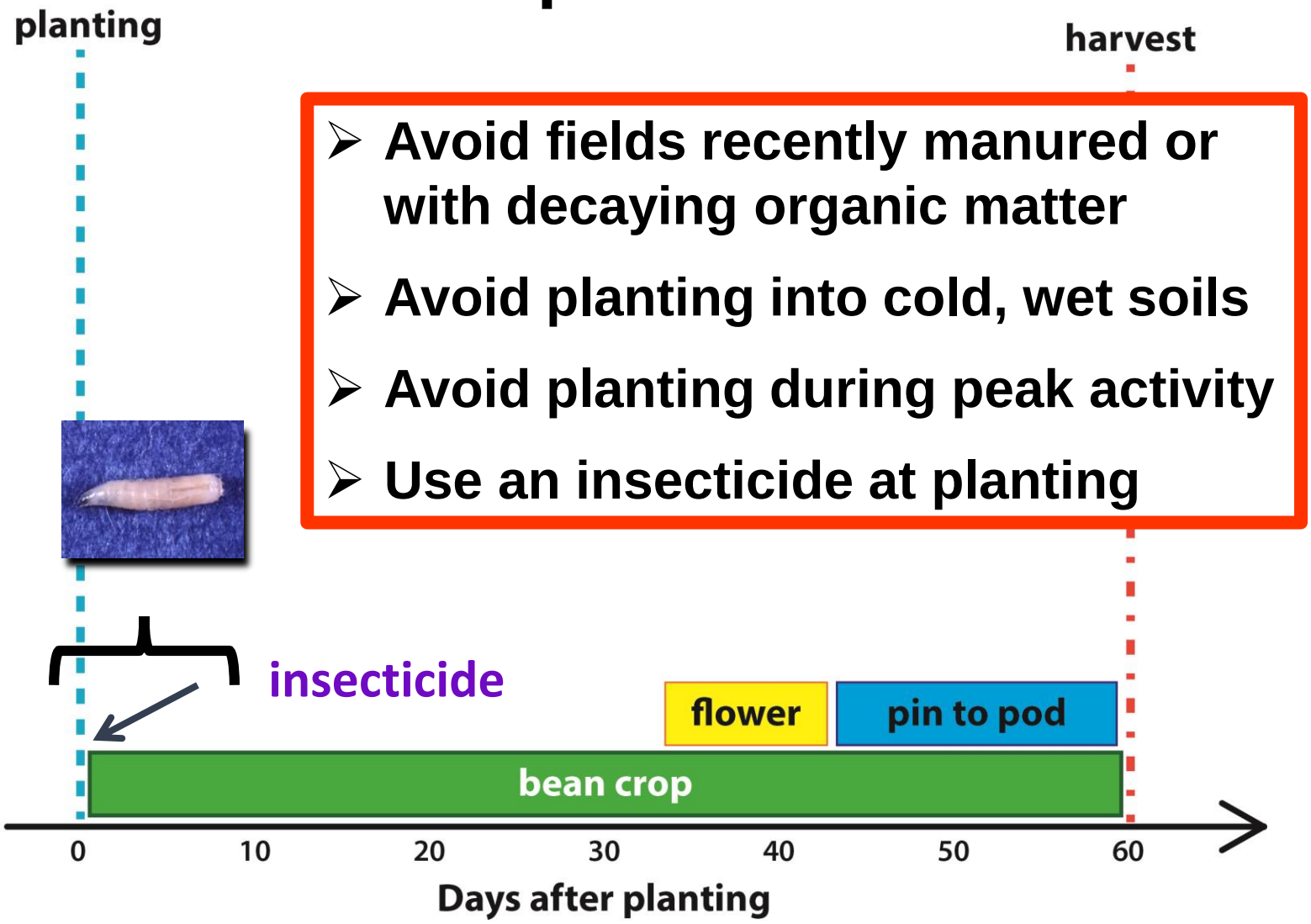
Management of SCM in <u>conventional</u> snap bean



- Avoid fields recently manured or with decaying organic matter
- Avoid planting into cold, wet soils
- Avoid planting during peak activity
- Use an insecticide at planting

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Conventional insecticide seed treatments evaluated for SCM control in NY in 2000s

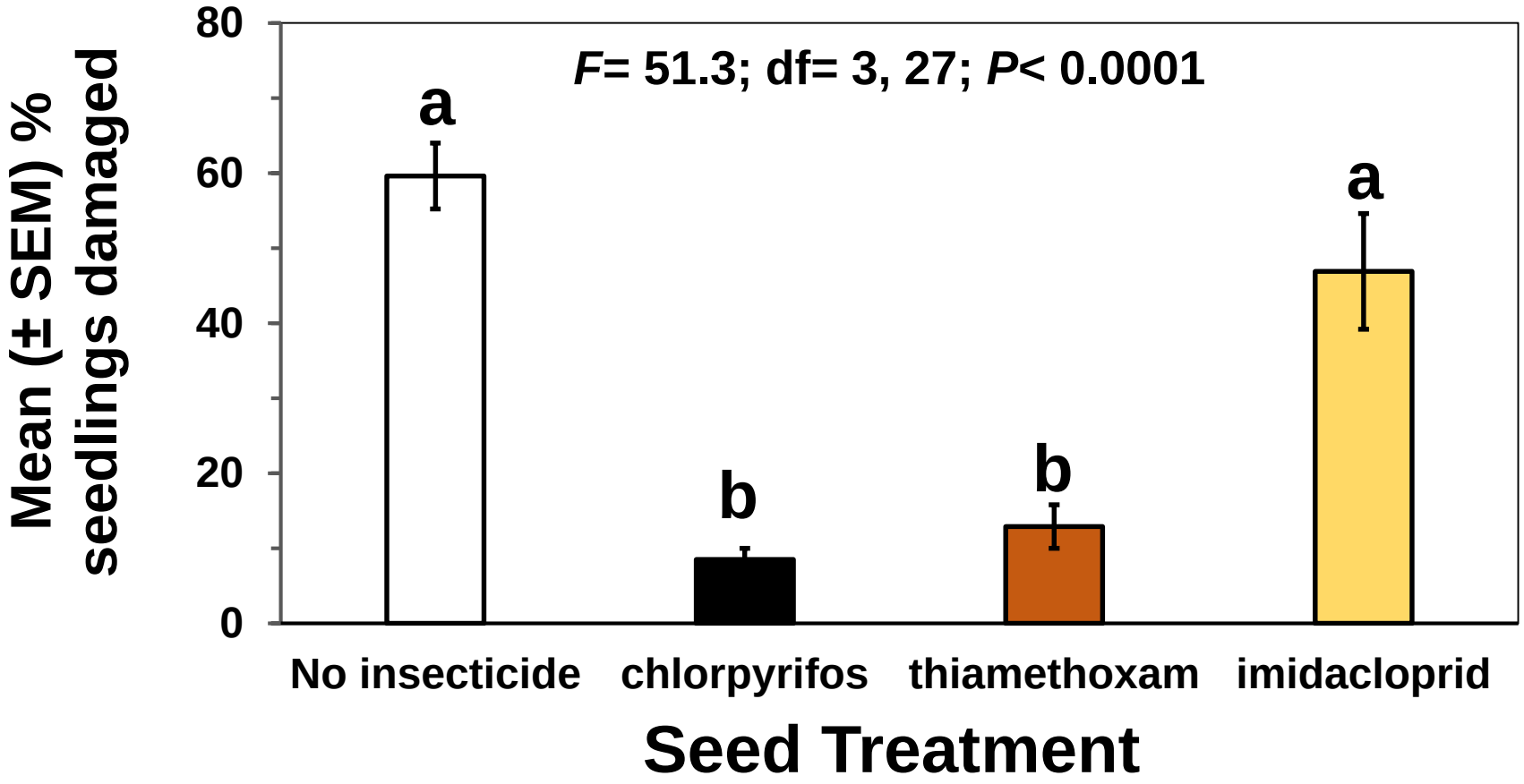
Product	Active Ingredient	Rate
No insecticide	-	-
Lorsban 50WP	chlorpyrifos	62 g a.i./ 100 kg of seed
Cruiser 5FS	thiamethoxam	50 g a.i./ 100 kg of seed
Gaucho 480	imidacloprid	60 g a.i./ 100 kg of seed

Note: Fungicides (e.g., Captan) also applied to seeds

2003-2008 (n = 11 data sets; central and western NY)

SCM control using conventional seed treatments in snap bean

2003-2008 (n = 11 data sets; central and western NY)



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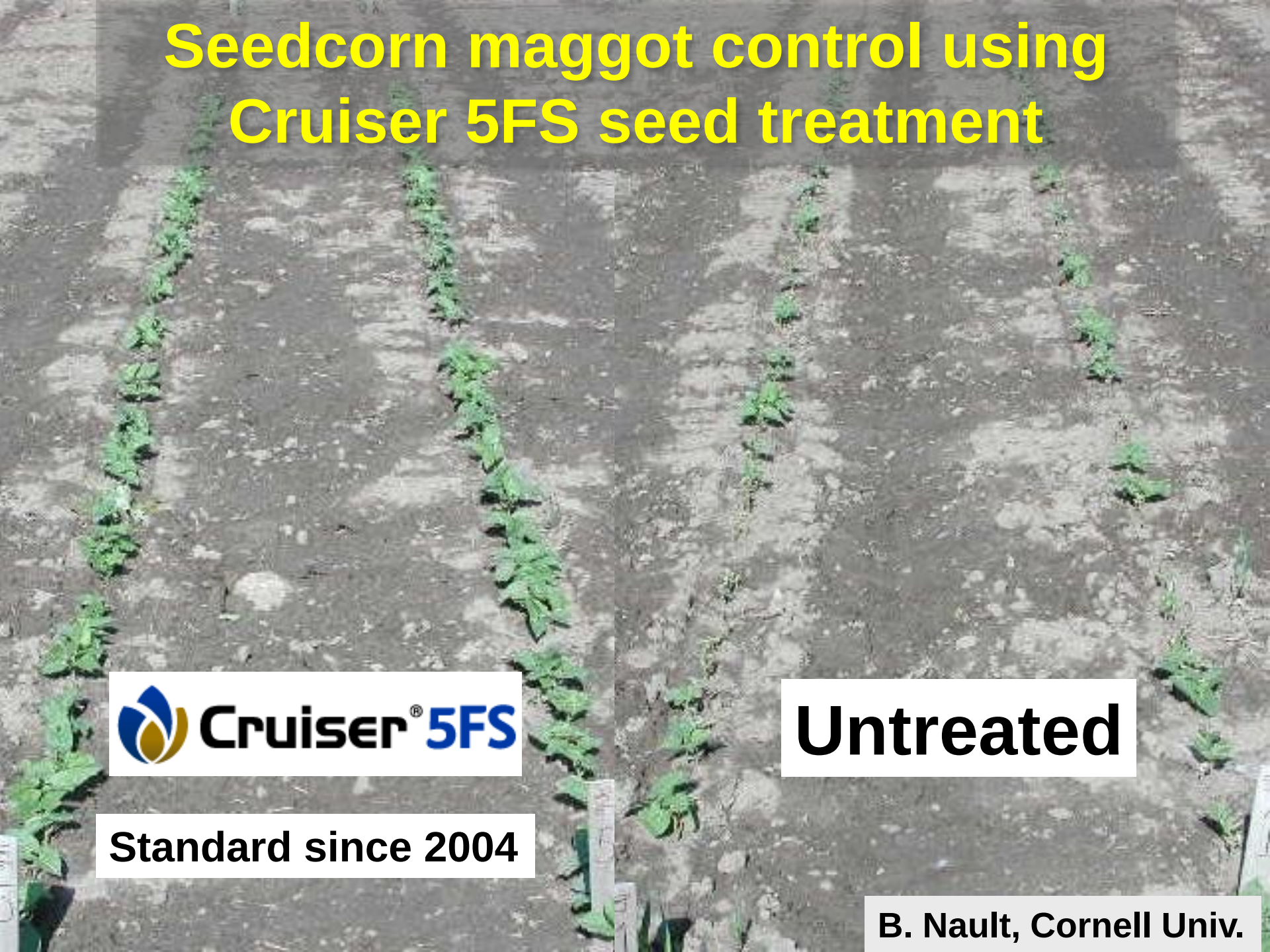
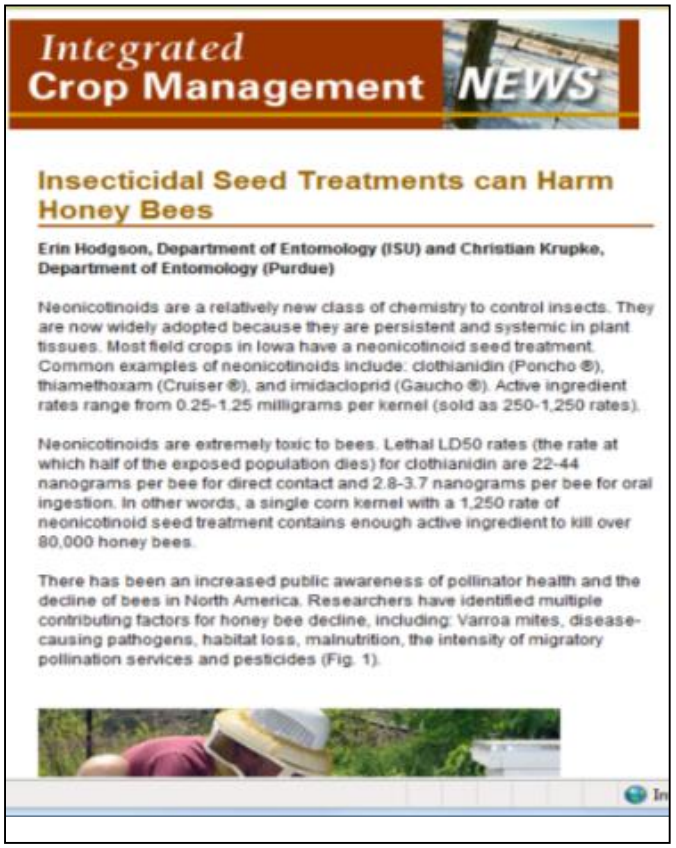
Seedcorn maggot control using Cruiser 5FS seed treatment



Concerns about neonicotinoid insecticide seed treatments harming bees

- **Risk of harming bees and other non-target organisms, bees?**



Integrated Crop Management NEWS

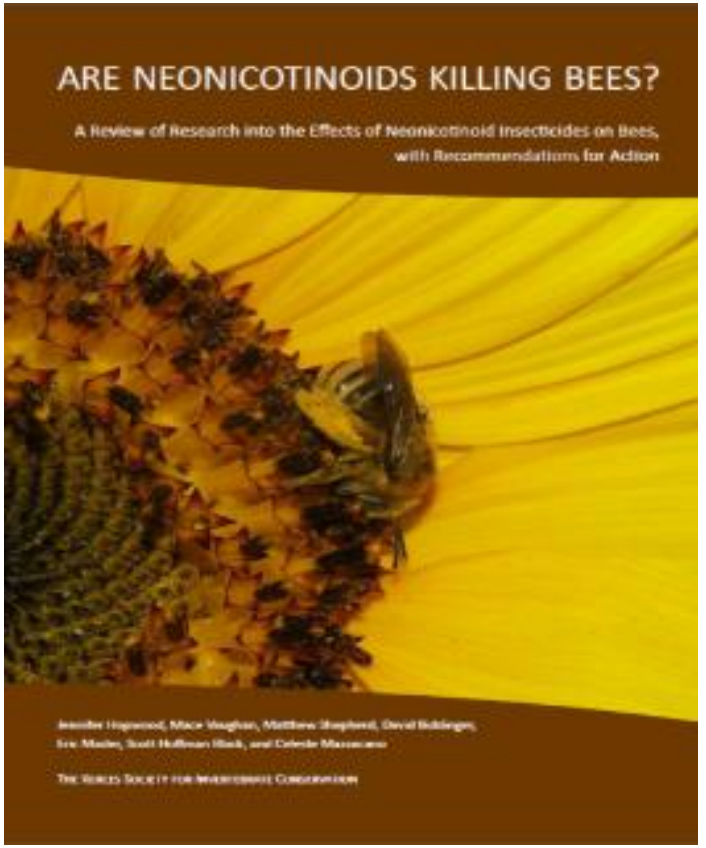
Insecticidal Seed Treatments can Harm Honey Bees

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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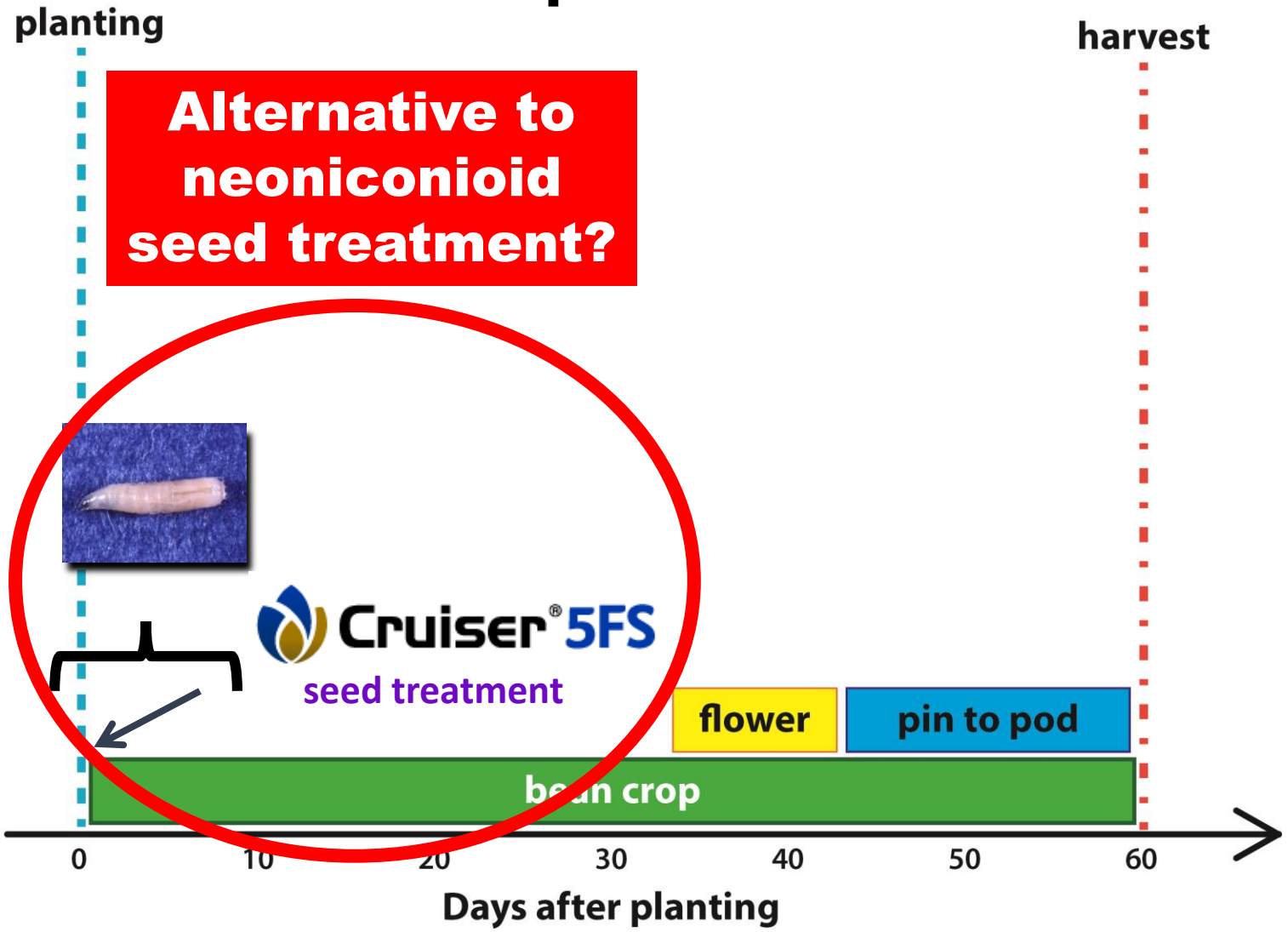
Management of SCM in <u>conventional</u> snap bean



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Conventional insecticide seed treatments evaluated for SCM control in NY in 2010

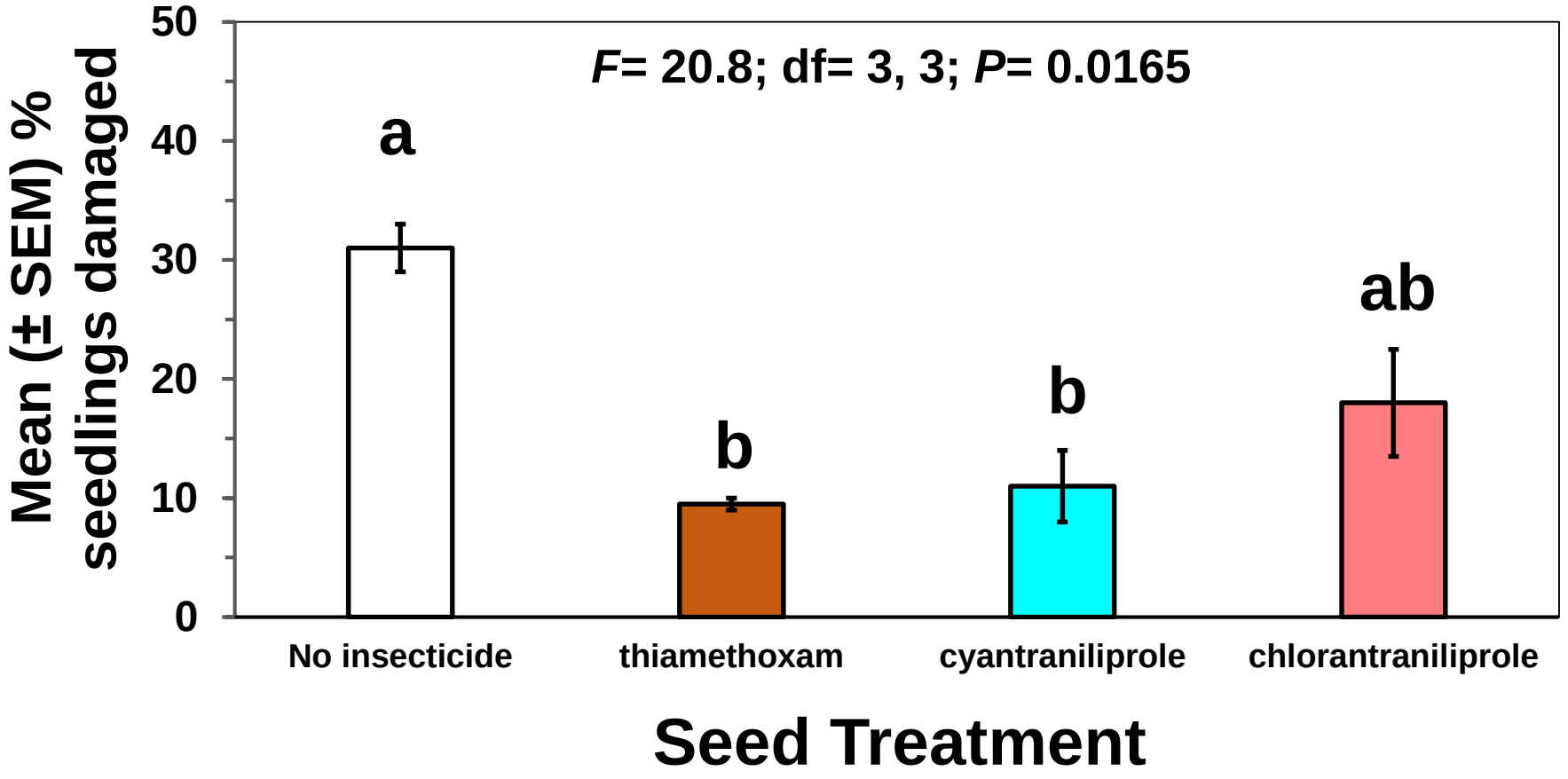
Product	Active Ingredient	Rate (per cwt of seed)
No insecticide	-	-
Cruiser 5FS	thiamethoxam	1.28 fl oz
DPX-E2Y45-273	chlorantraniliprole	3.84 fl oz
DPX-HGW86-273	cyantraniliprole	3.84 fl oz

Note: Fungicides (e.g., Captan) also applied to seeds

2010 (n = 2 data sets; central and western NY)

SCM control using conventional seed treatments in snap bean

2010 (n = 2 data sets; central and western NY)



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No diamide insecticide seed treatments are labeled on snap bean

- **Fortenza (cyantraniliprole)** 

A seed treatment product for protection against early-season insect pests on **rapeseed crop subgroup 20A**, **sunflower crop subgroup 20B, cottonseed crop subgroup 20C**, **corn**, **soybeans**, and **rice (dry-seeded)**

Diamide insecticide seed treatments are NOT labeled on snap bean

- **Fortenza (cyantraniliprole)** 

A seed treatment product for protection against early-season insect pests on **rapeseed crop subgroup 20A**, **sunflower crop subgroup 20B, cottonseed crop subgroup 20C**, **corn**, **soybeans**, and **rice (dry-seeded)**

NOTE: Syngenta would need to work with IR-4 and university faculty to conduct field residue and field efficacy studies before including snap bean on the Fortenza label

Conventional insecticide in-furrow application evaluated for SCM control in NY in 2014

Product	Active Ingredient	Rate
No insecticide	-	-
Cruiser 5FS	thiamethoxam	1.28 fl oz/ cwt seed
Verimark	cyantraniliprole	13.5 fl oz/ acre

Note: Fungicides (e.g., Apron Maxx) applied to seeds

VERIMARK® INSECT CONTROL **- is labeled on snap bean**

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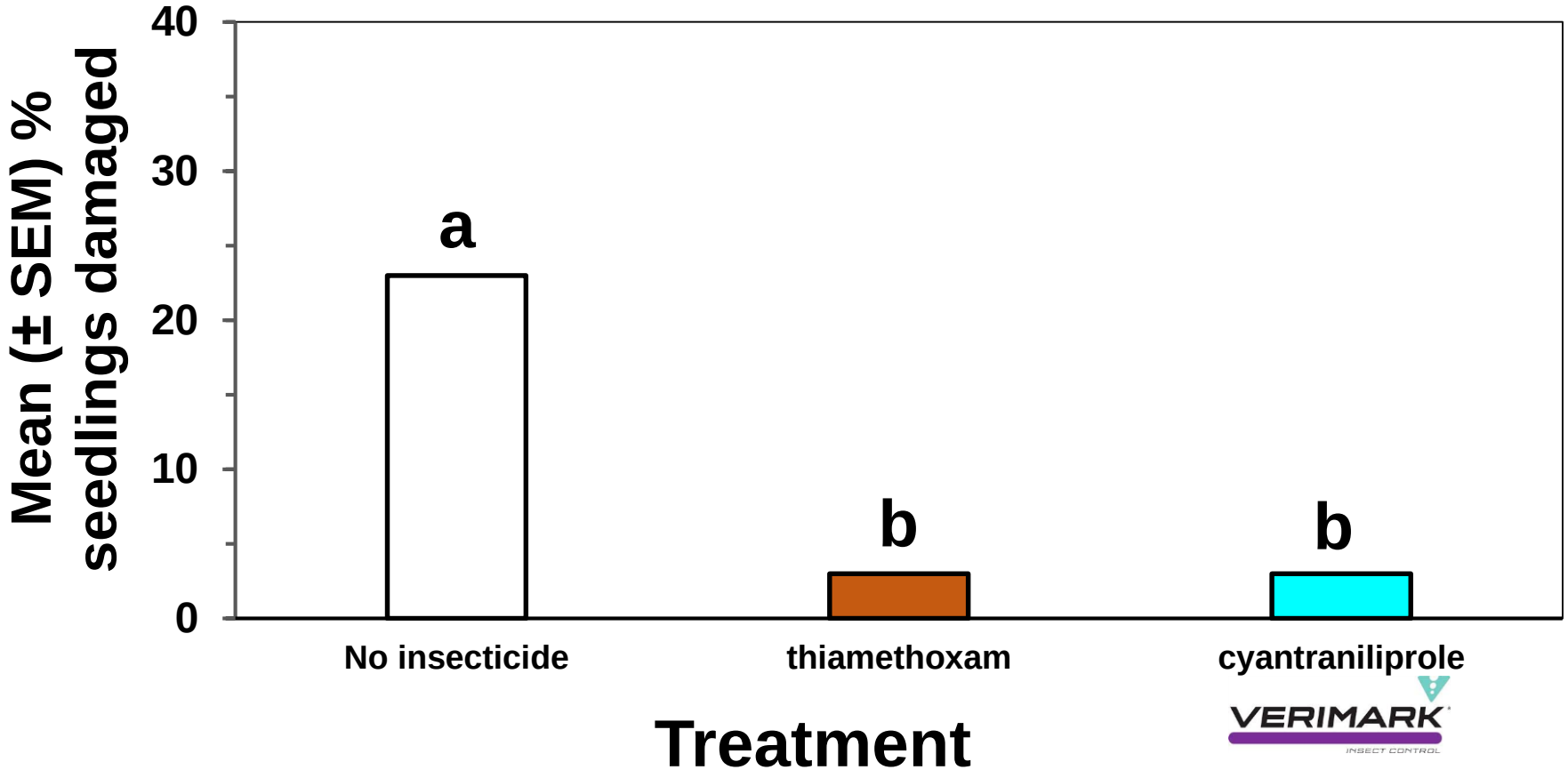
SCM control with Verimark in conventional snap bean

2014 Geneva, NY (n=6)



VERIMARK
INSECT CONTROL

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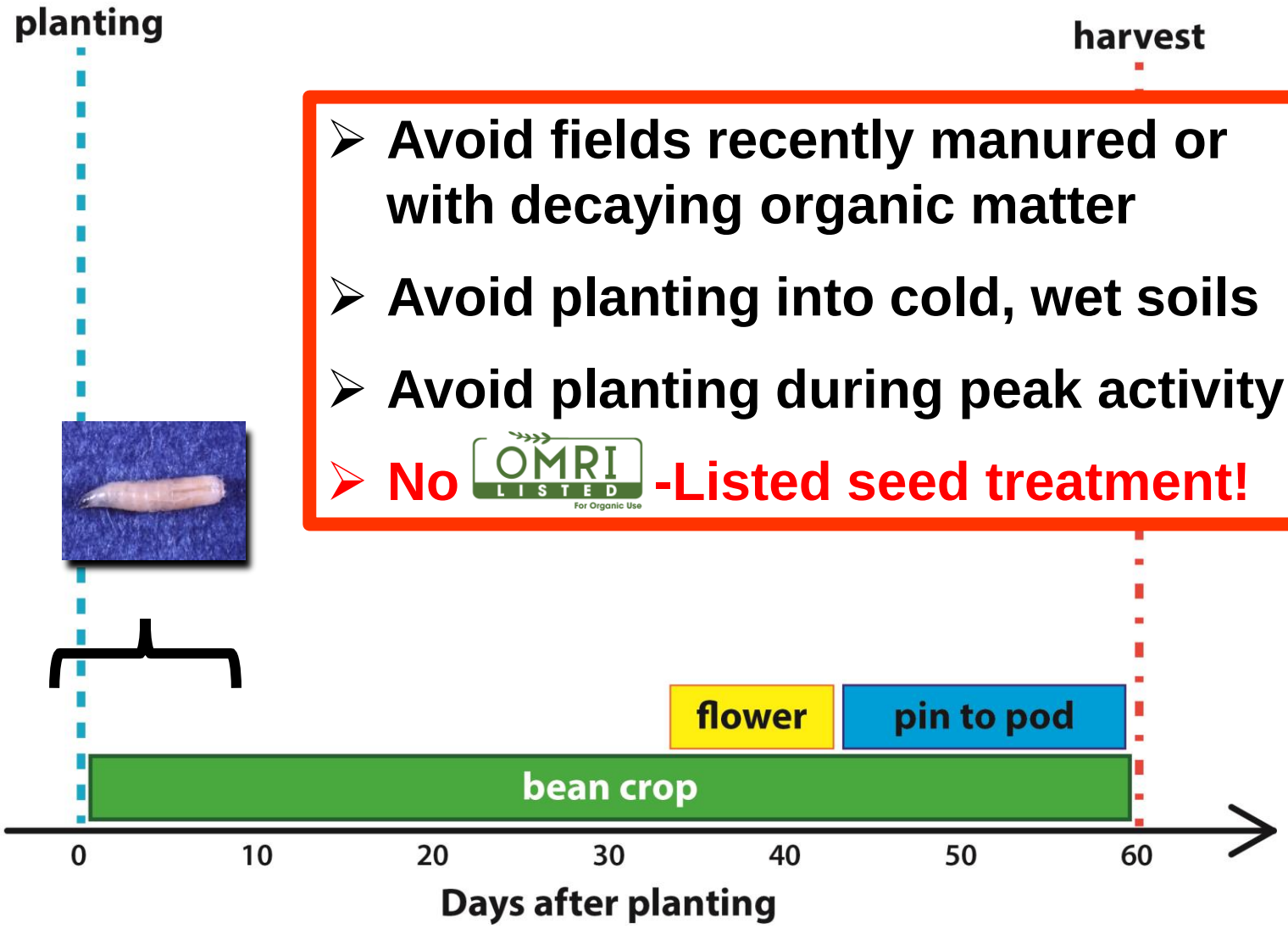
Management of SCM in organic snap bean



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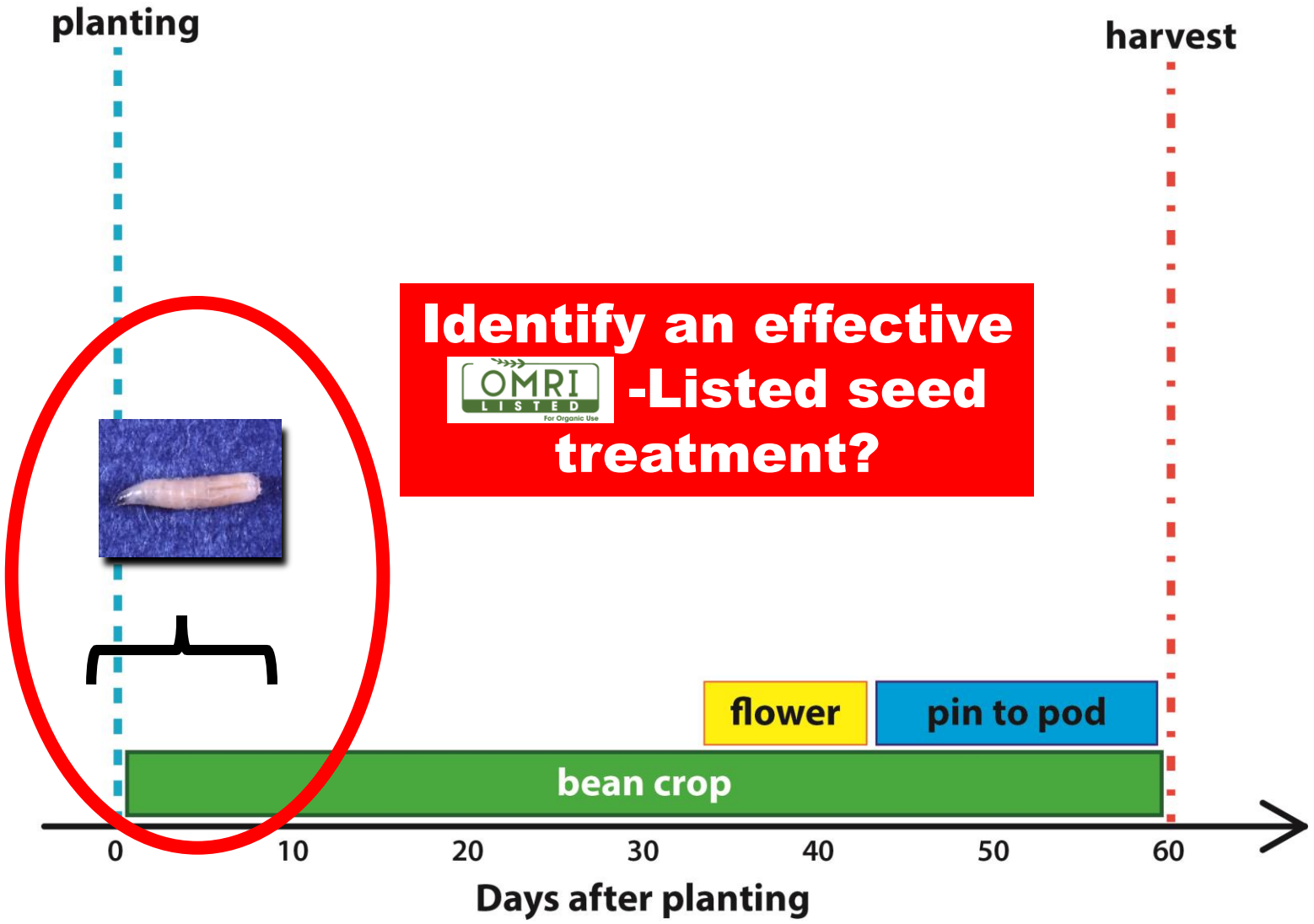
Management of SCM in organic snap bean



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OMRI-Listed insecticide seed treatment evaluated for SCM control

Product	Active Ingredient	Rate
No insecticide	-	-
Lorsban 50WP	chlorpyrifos	62 g a.i./ 100 kg of seed
Cruiser 5FS	thiamethoxam	50 g a.i./ 100 kg of seed
Entrust[1]	spinosad	0.5 mg a.i./ seed

[1]Entrust SC is similar to Regard SC

Note: Fungicides (e.g., Captan) also applied to seeds

2003-2008 (n = 3 data sets; central and western NY)

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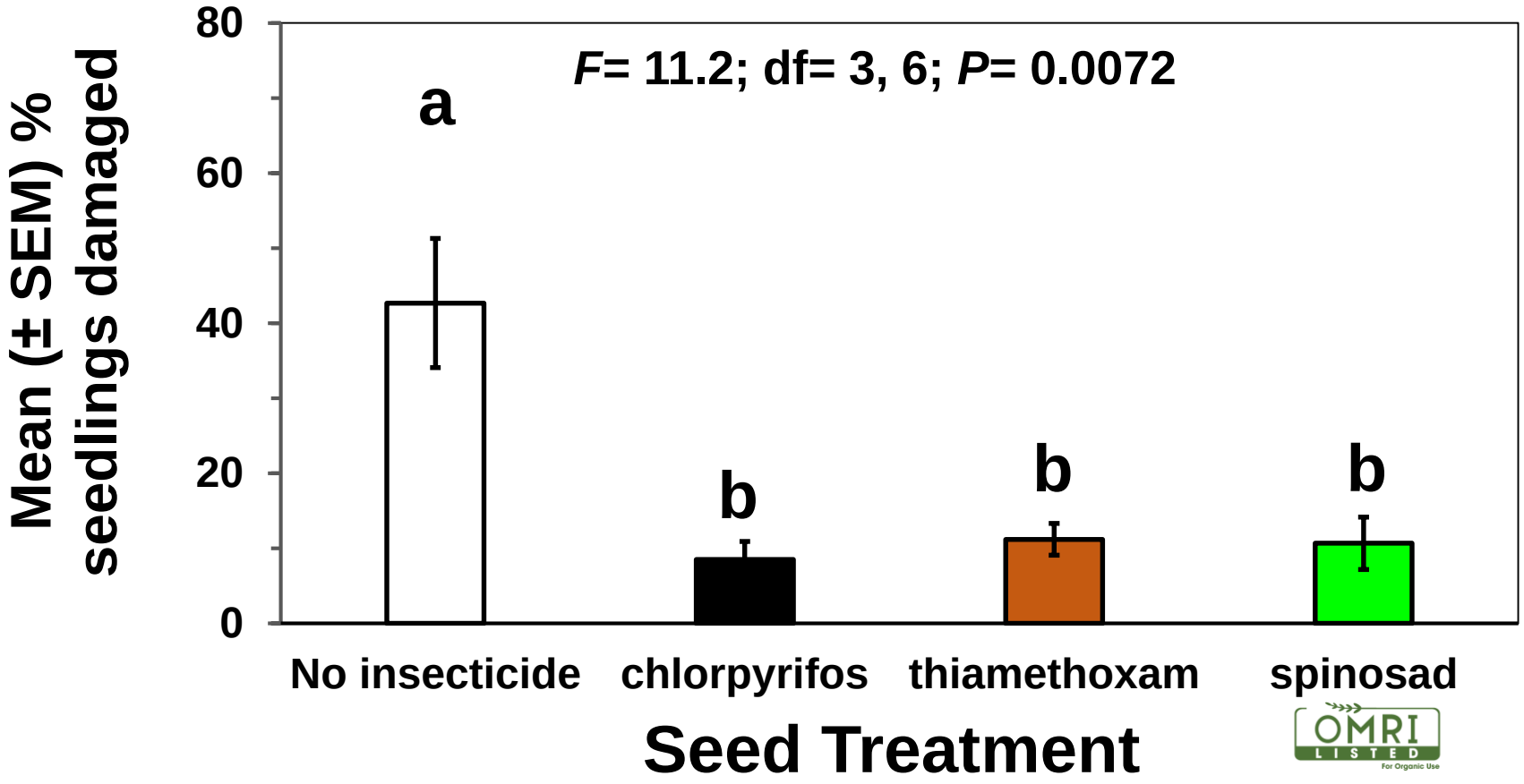
SCM control using OMRI-Listed seed treatment in snap bean

2003-2008 (n = 3 data sets; central and western NY)



OMRI LISTED For Organic Use

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Spinosad insecticide seed treatment is NOT labeled on snap bean

- **Regard SC (spinosad)**

Designed for Commercial Seed Treatment, Regard™ SC is an insecticide that offers protection for **dry bulb onion** against seedcorn maggot and onion maggot

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Designed for Commercial Seed Treatment, Regard™ SC is an insecticide that offers protection for **dry bulb onion** against seedcorn maggot and onion maggot

NOTE: Syngenta, IR-4 and university faculty are working together to conduct field residue and field efficacy studies in 2021 (California) before including snap bean on the Regard SC label

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Seedcorn Maggot (SCM)
(*Delia platura*)


Photo: J. Ogrodnik

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(*Empoasca fabae*)


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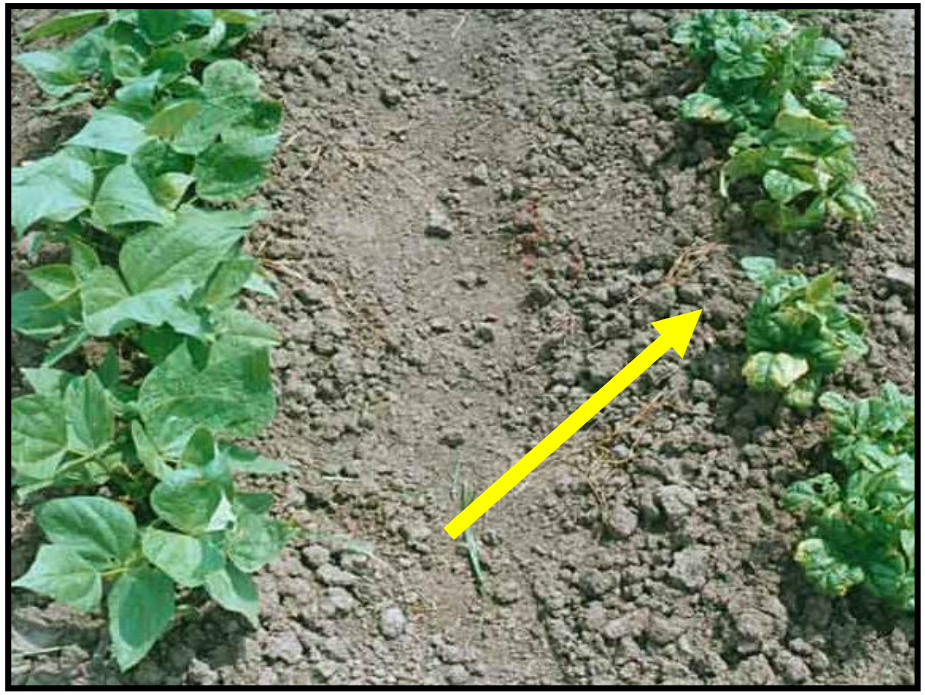
PLH damage to snap bean

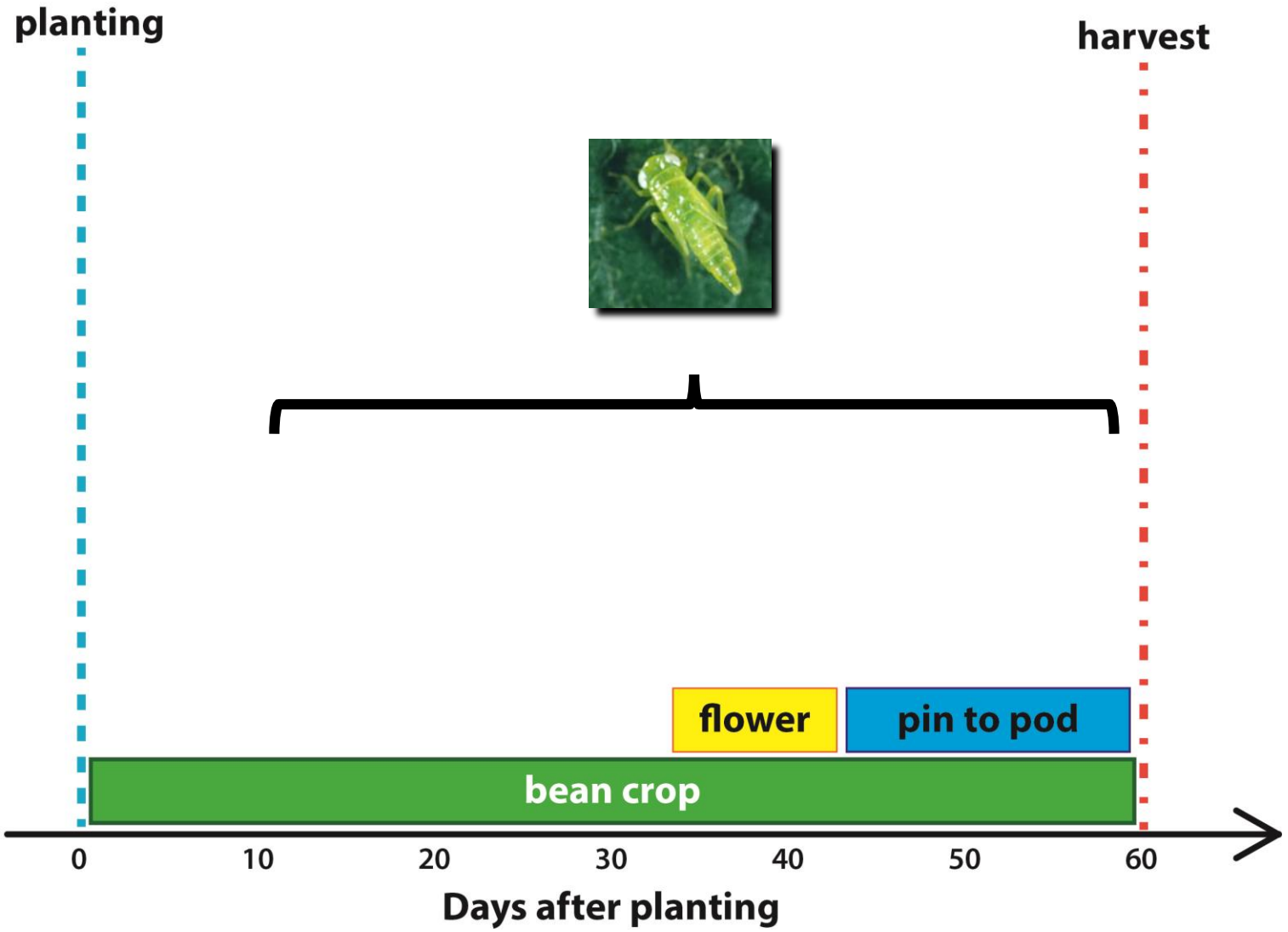


Leaf curling, yellow and brown leaf margins ("hopperburn") and stunting can cause lower bean yields

Potato Leafhopper

- Overwinters in southern US (migrant pest)
- Adults migrate into NY in spring in late April to early May
- Typically will initially infest alfalfa in early spring
- Subsequent generations move from alfalfa after cutting into snap bean

Risk period for PLH attacking snap bean



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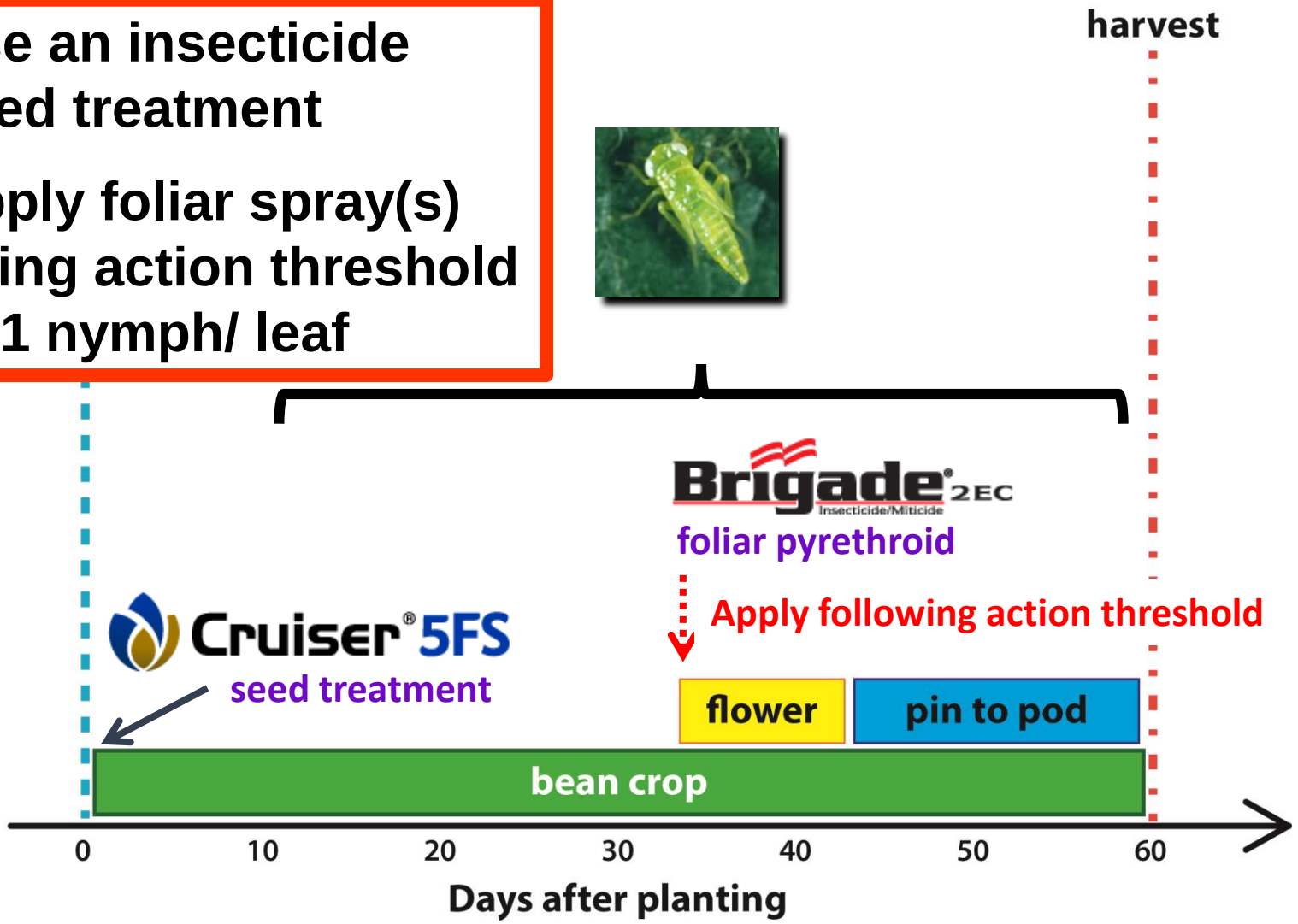
Management of PLH in <u>conventional</u> snap bean

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



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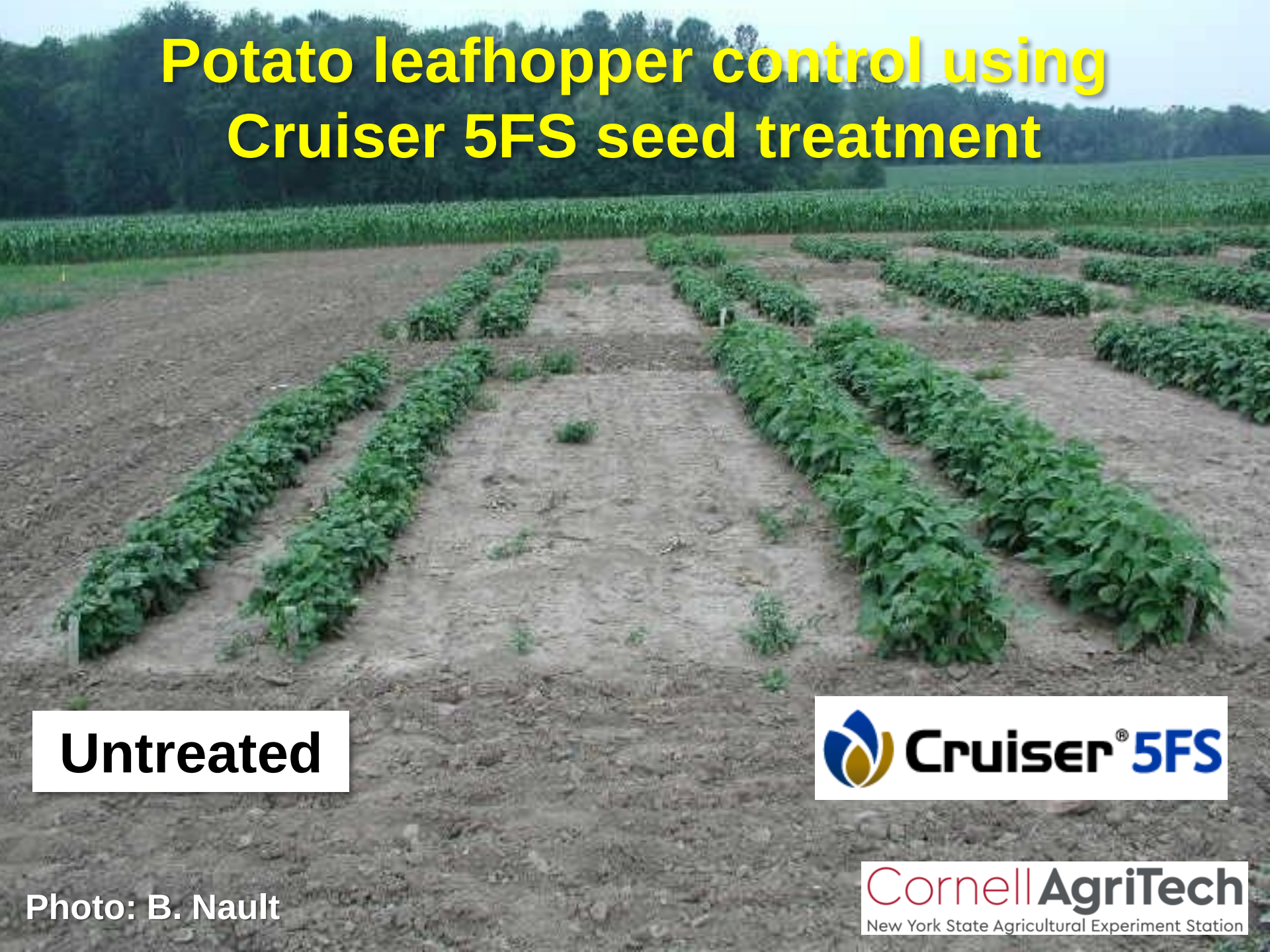
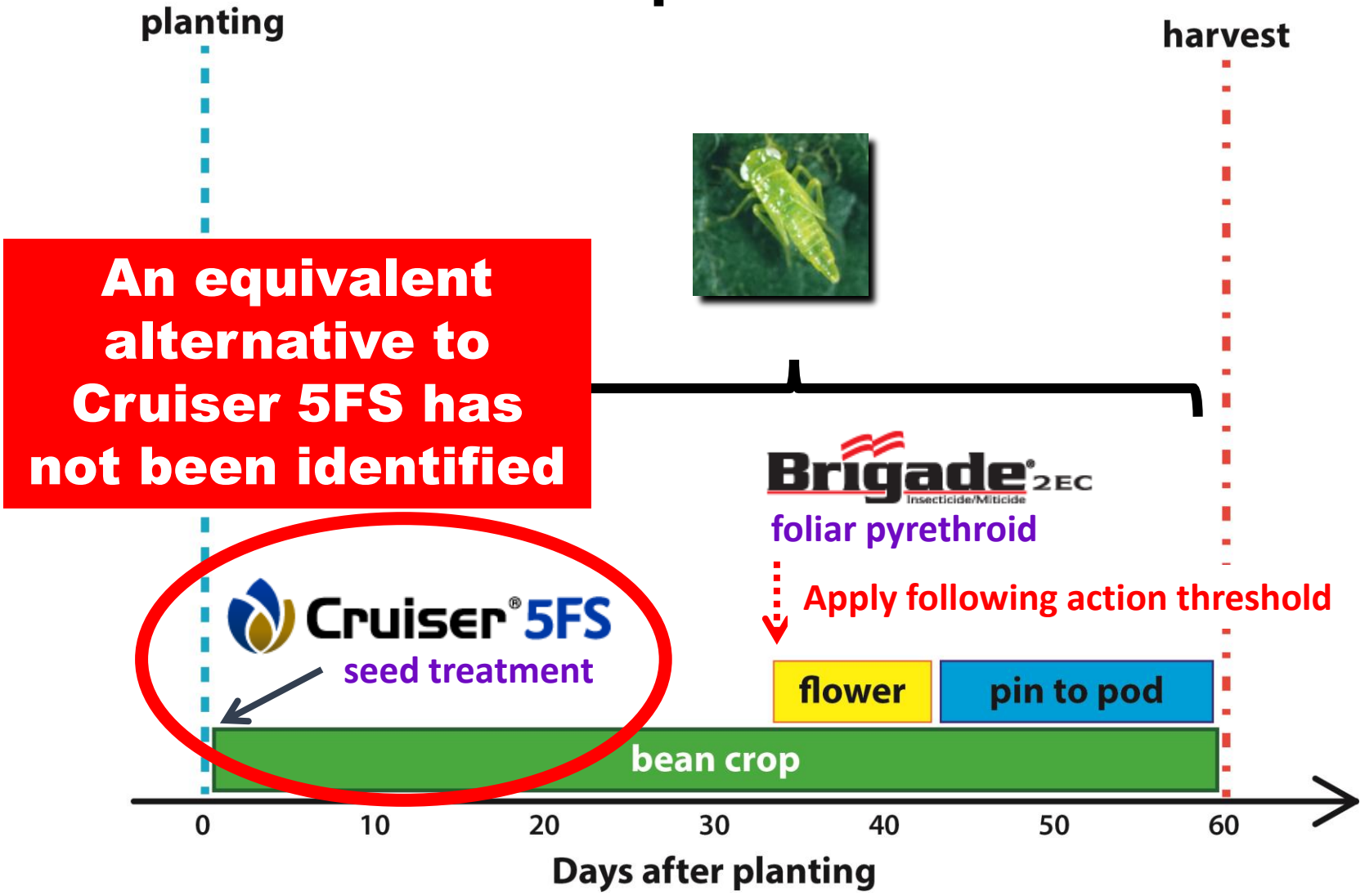
Potato leafhopper control using Cruiser 5FS seed treatment



Management of PLH in <u>conventional</u> snap bean



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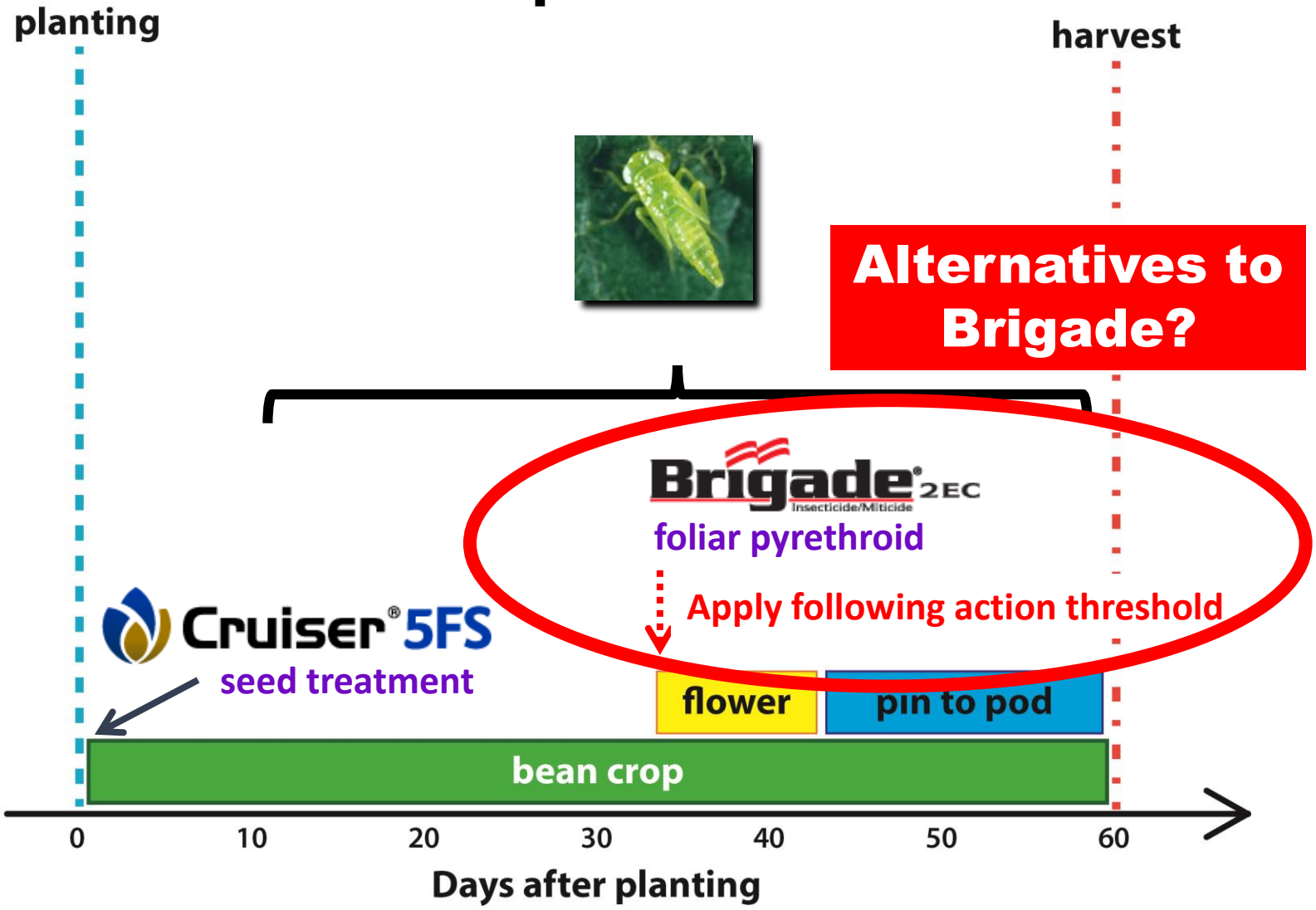
Management of PLH in <u>conventional</u> snap bean



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Conventional insecticides evaluated for PLH control in NY in 2012

Product	Active Ingredient	Rate
No insecticide	-	-
Coragen	chlorantraniliprole	3.5 fl oz/acre
Coragen	chlorantraniliprole	5 fl oz/ acre
Exirel	cyantraniliprole	6.75 fl oz/ acre
Exirel	cyantraniliprole	13.5 fl oz/ acre
Exirel	cyantraniliprole	20.5 fl oz/ acre
Brigade 2EC	bifenthrin	3 fl oz/ acre

Note: Application made on 16 July and data recorded on 23 July

PLH control using foliar-applied treatments in conventional snap bean in 2012

Untreated — a
Coragen (3.5 fl oz) — ab
Coragen (5 fl oz) — a
Exirel (6.75 fl oz) — abc
Exirel (13.5 fl oz) — bcd
Exirel (20.5 fl oz) — d
Brigade (3 fl oz) — e

threshold

Geneva, NY

n=6

0 0.5 1 1.5 2 2.5 3

Mean Number of Nymphs/ Leaf

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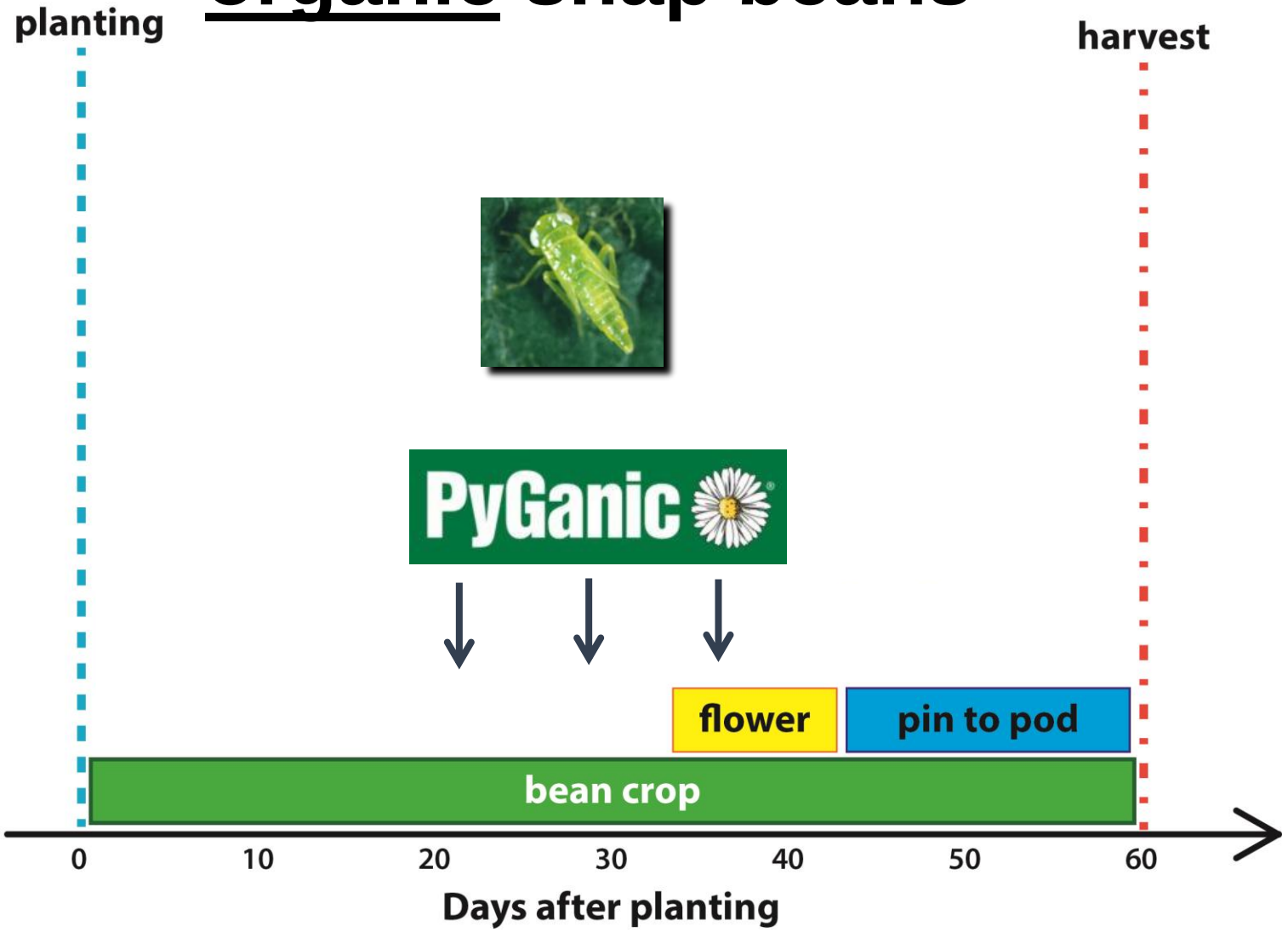
Typical management of PLH in organic snap beans



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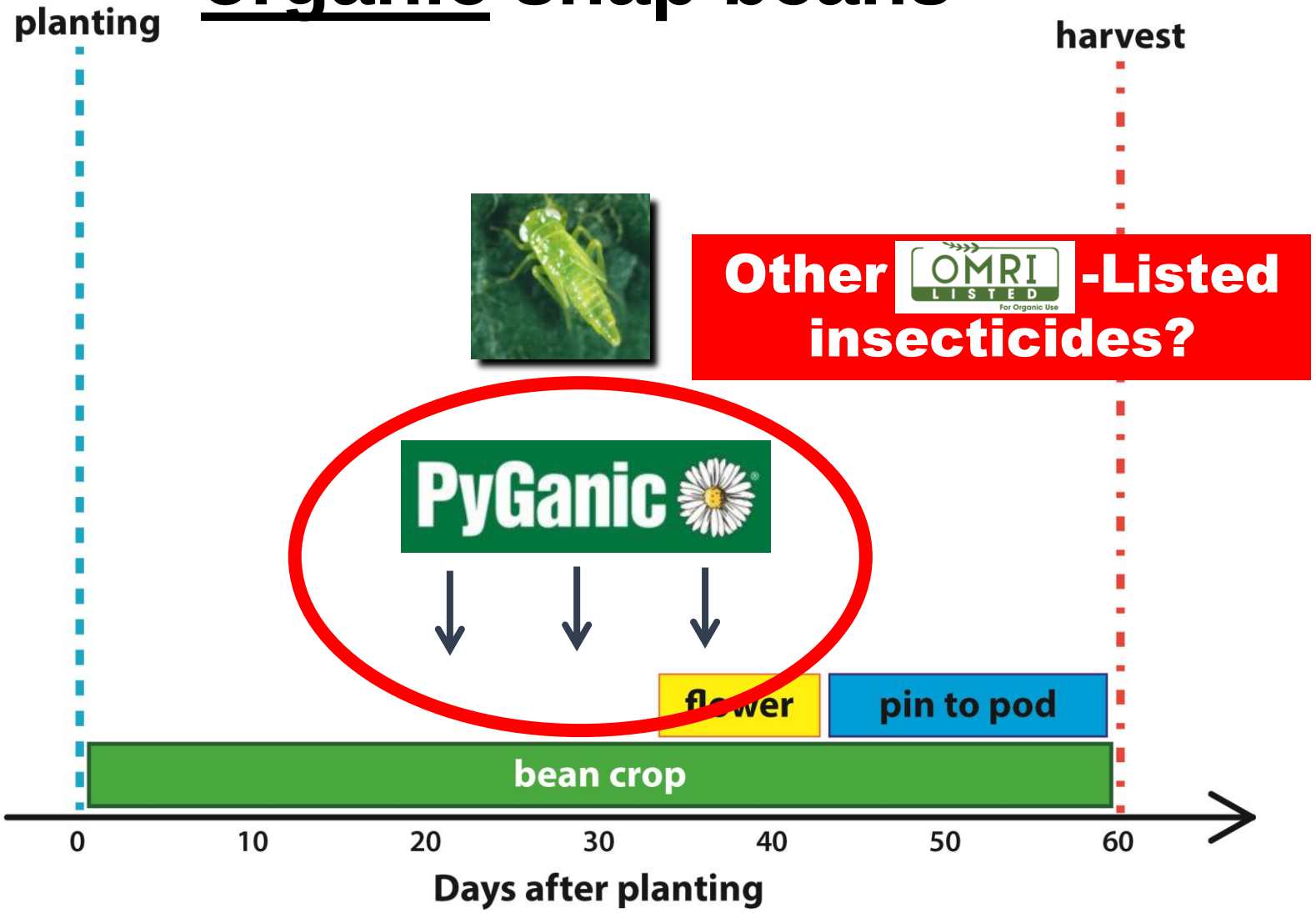

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OMRI-Listed insecticides evaluated for PLH control in NY in 2019

Product	Active Ingredient	Rate
Untreated control	-	-
Aza-Direct	azadirachtin	32 fl oz/acre
Azera	pyrethrin + azadirachtin	40 fl oz/acre
Pyganic Specialty	pyrethrins	17 fl oz/acre
Venerate XC	Heat-killed *Burkholderia* spp. strain A396	128 fl oz/acre
*Warrior II w/zeon	lambda-cyhalothrin	1.92 fl oz/A

Note: No insecticide used on seeds; only fungicide
Each OMRI-Listed product was evaluated after 2 and 3 applications
***NOT OMRI-Listed**

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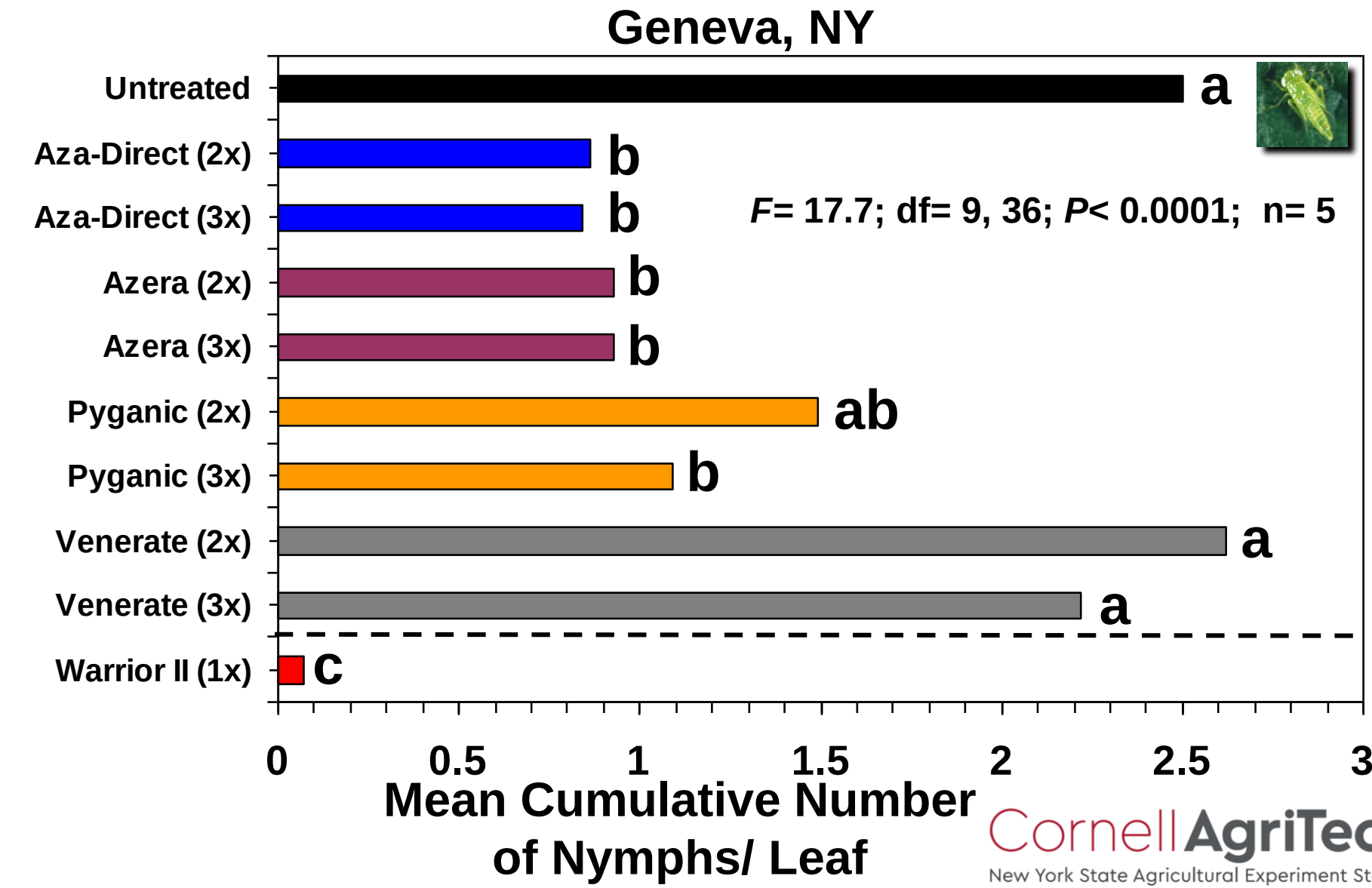
PLH control using 2 or 3 sprays of OMRI-Listed products in snap bean in 2019



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Major Snap Bean Pests

Seedcorn Maggot (SCM)
(*Delia platura*)


Photo: J. Ogrodnik

Potato Leafhopper (PLH)
(*Empoasca fabae*)


Photo: Cornell Univ.

European corn borer (ECB)
(*Ostrinia nubilalis*)


Photo: F. Peairs

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No tolerance for ECB contamination in processed beans

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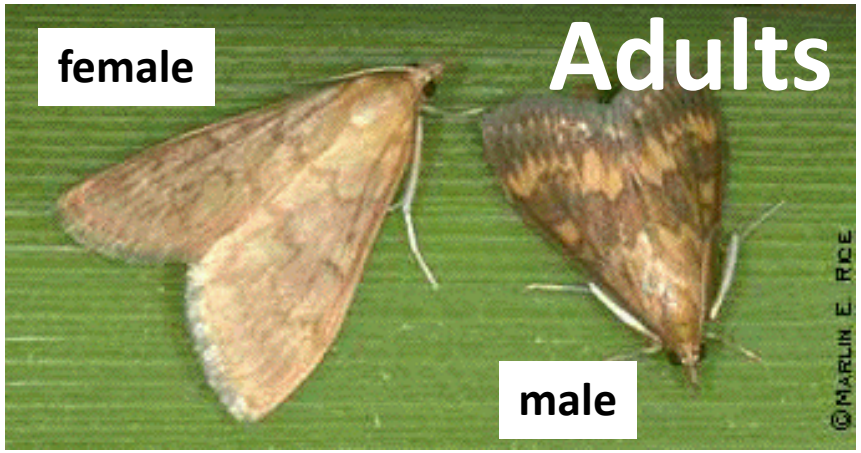
European Corn Borer

- Overwinters as 5th instar in stems/stalks in NY
- Adults emerge in May and June
- Over 100 hosts, but highly prefers corn
- Bivoltine *E*-race, bivoltine and univoltine *Z*-races



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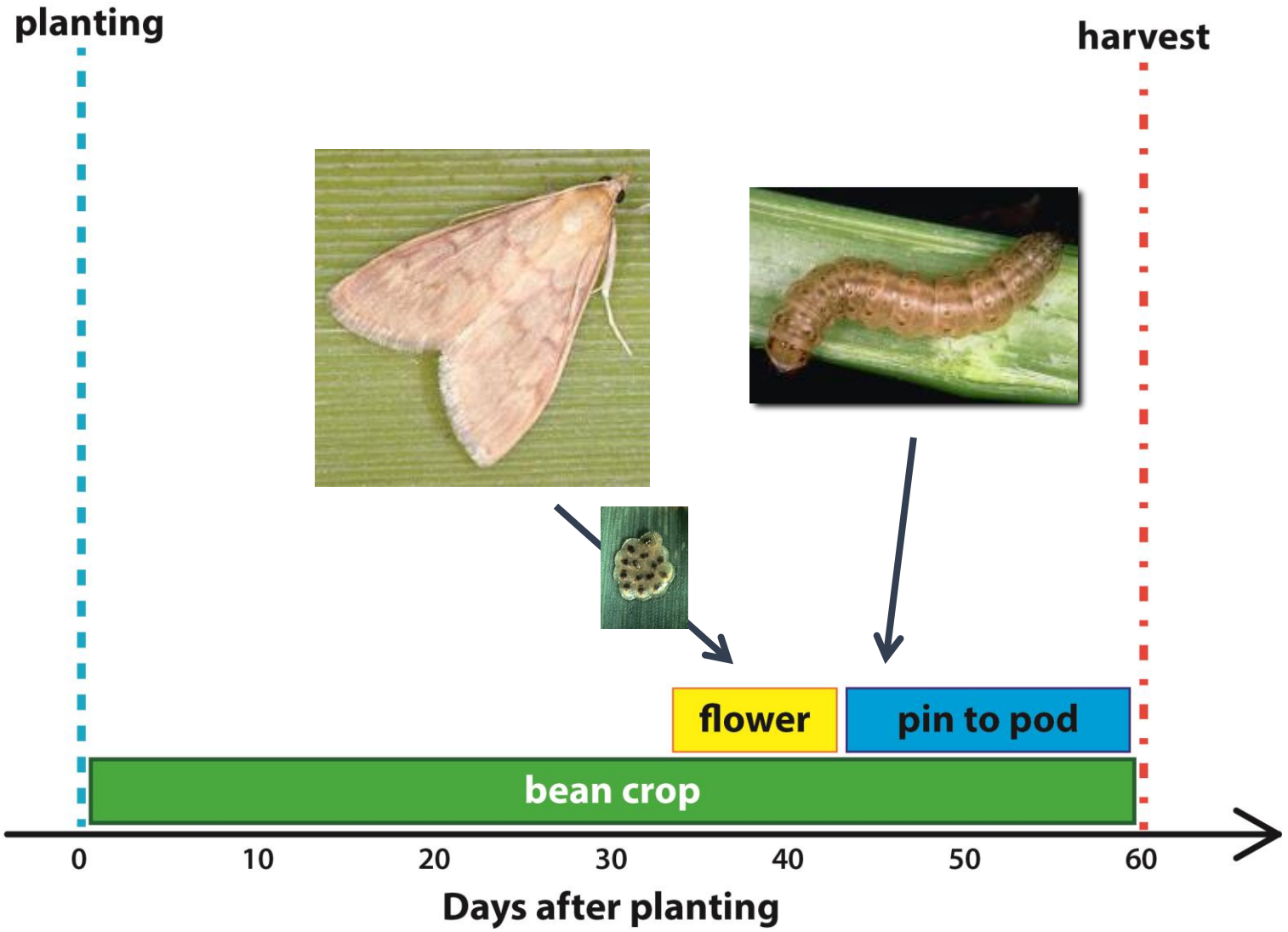
Risk period for ECB attacking snap bean



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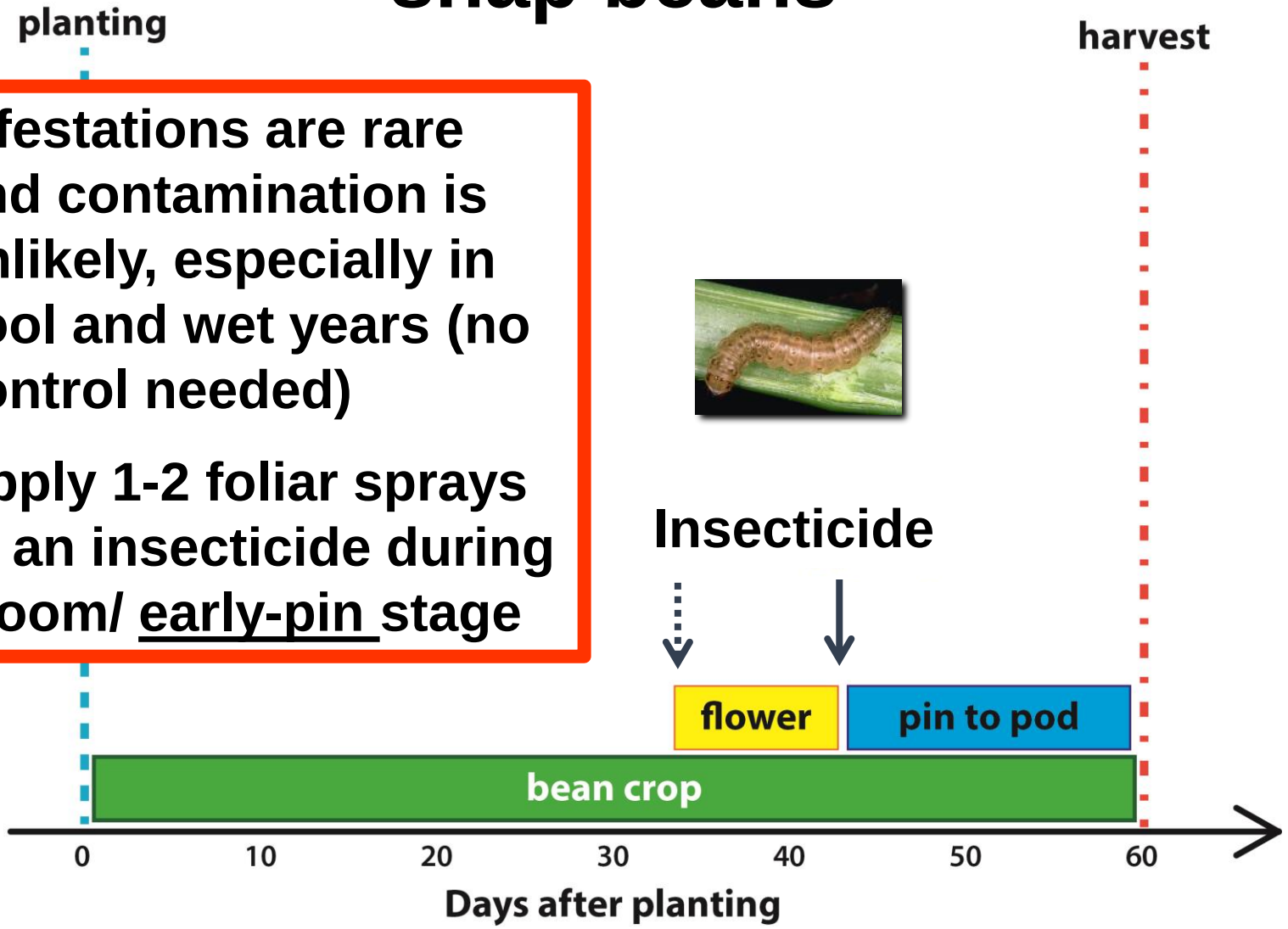
Management of ECB in <u>conventional</u> snap beans

- Infestations are rare and contamination is unlikely, especially in cool and wet years (no control needed)
- Apply 1-2 foliar sprays of an insecticide during bloom/ <u>early-pin</u> stage



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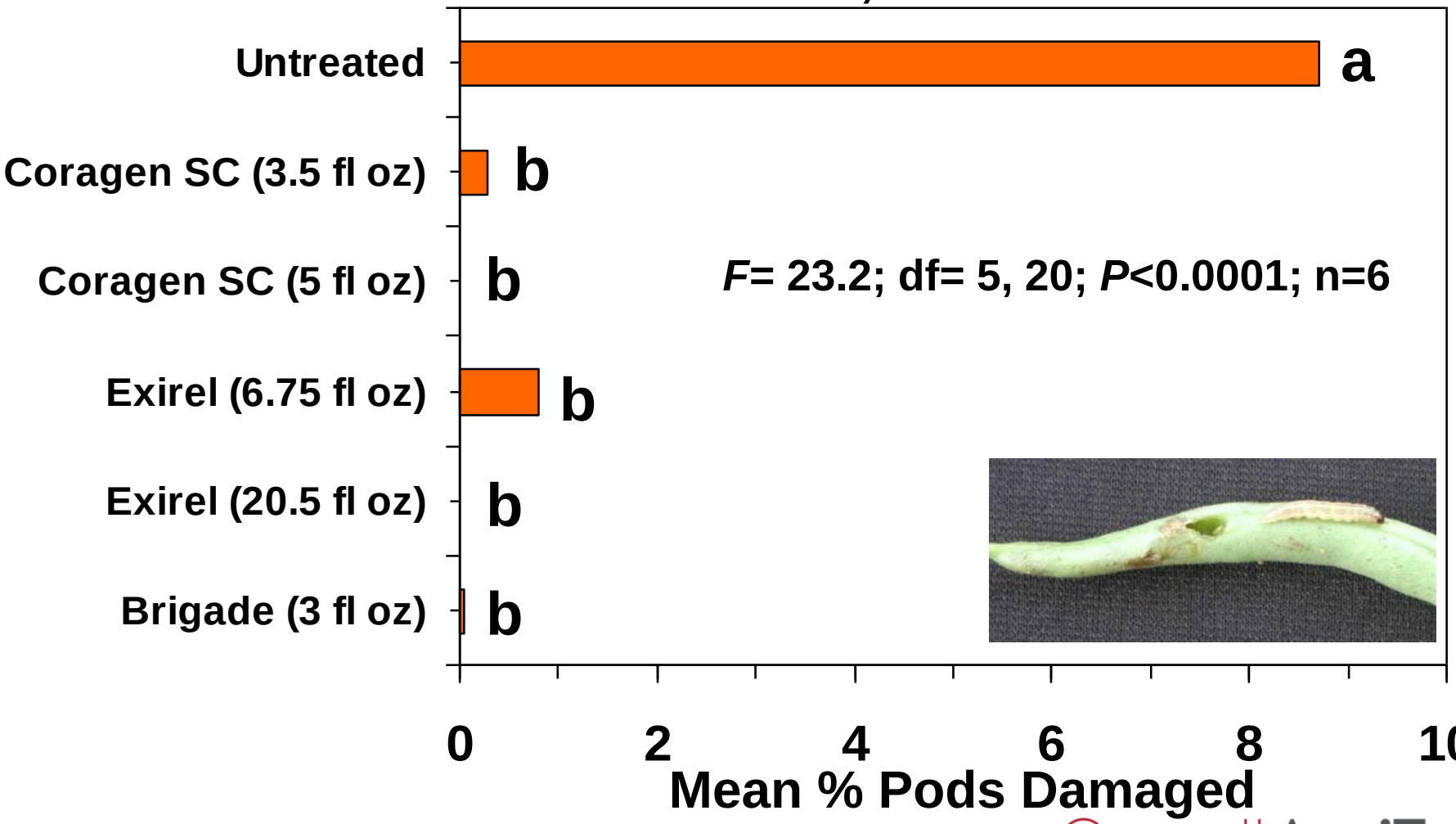
Conventional insecticides evaluated for ECB control in NY in 2012

Product	Active Ingredient	Rate
No insecticide	-	-
Coragen SC	chlorantraniliprole	3.5 & 5 fl oz/ acre
Exirel	cyantraniliprole	6.75 & 20.5 fl oz/ acre
Brigade 2EC	bifenthrin	3 fl oz/ acre

NOTE: Plots sprayed 1 time @ early-pin stage

ECB control using insecticides in conventional snap bean

Geneva, NY 2012



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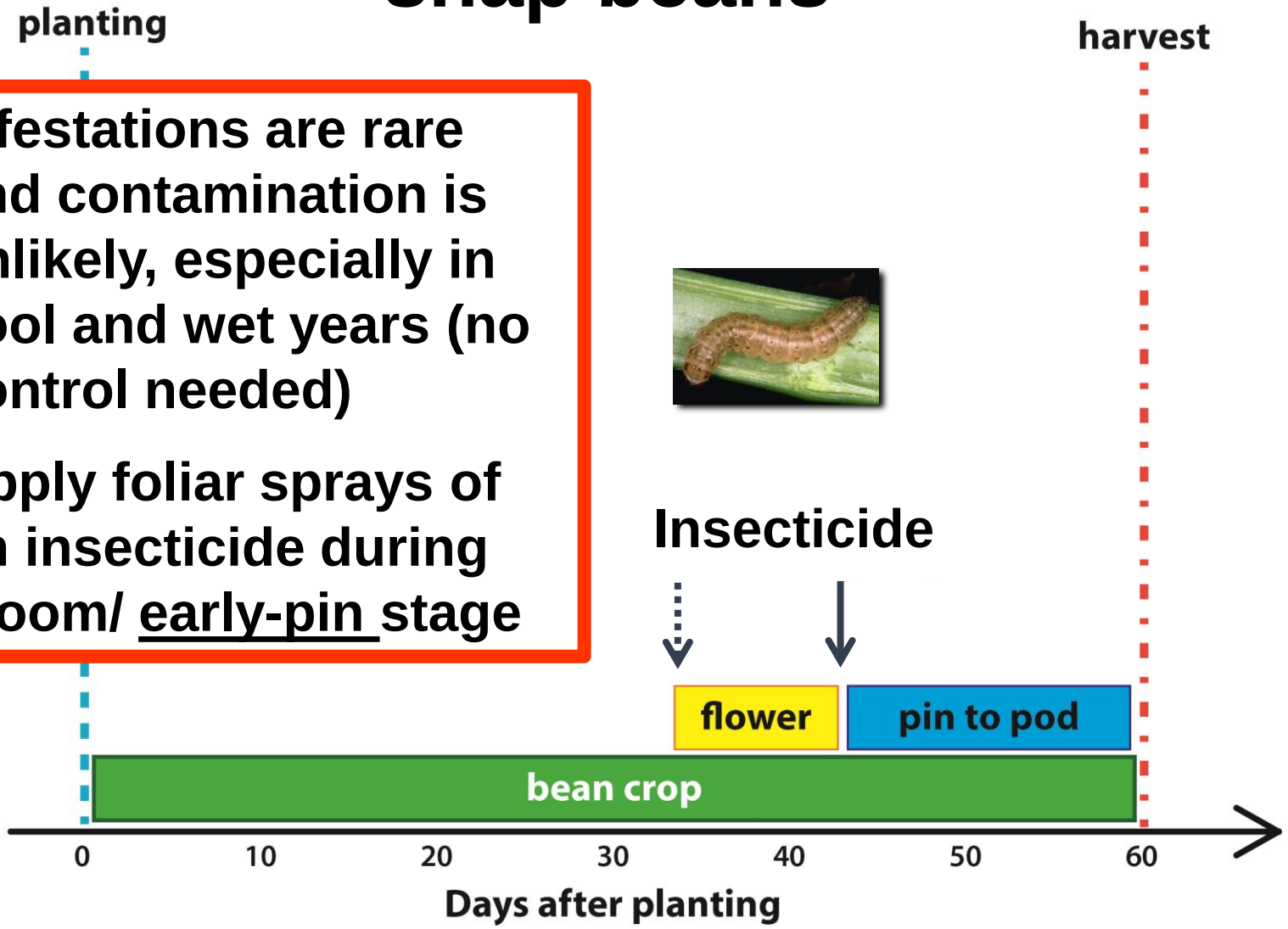
Management of ECB in organic snap beans

- Infestations are rare and contamination is unlikely, especially in cool and wet years (no control needed)
- Apply foliar sprays of an insecticide during bloom/ early-pin stage



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OMRI-Listed insecticides evaluated for ECB control in NY in 2014

Product	Active Ingredient	Rate
Untreated control	-	-
Venerate XC	Heat-killed *Burkholderia* spp. strain A396	128 fl oz/acre
Grandevo	*Chromobacterium subtsugae* strain PRAA4-1	3 lbs/acre
Veratran D	Sabadilla extract	15 lbs/acre
*Exirel	cyantraniliprole	13.5 fl oz/A

Note: No insecticide used on seeds; only fungicide
Each OMRI-Listed product was applied only 1 time, during early-pin stage
*NOT OMRI-Listed

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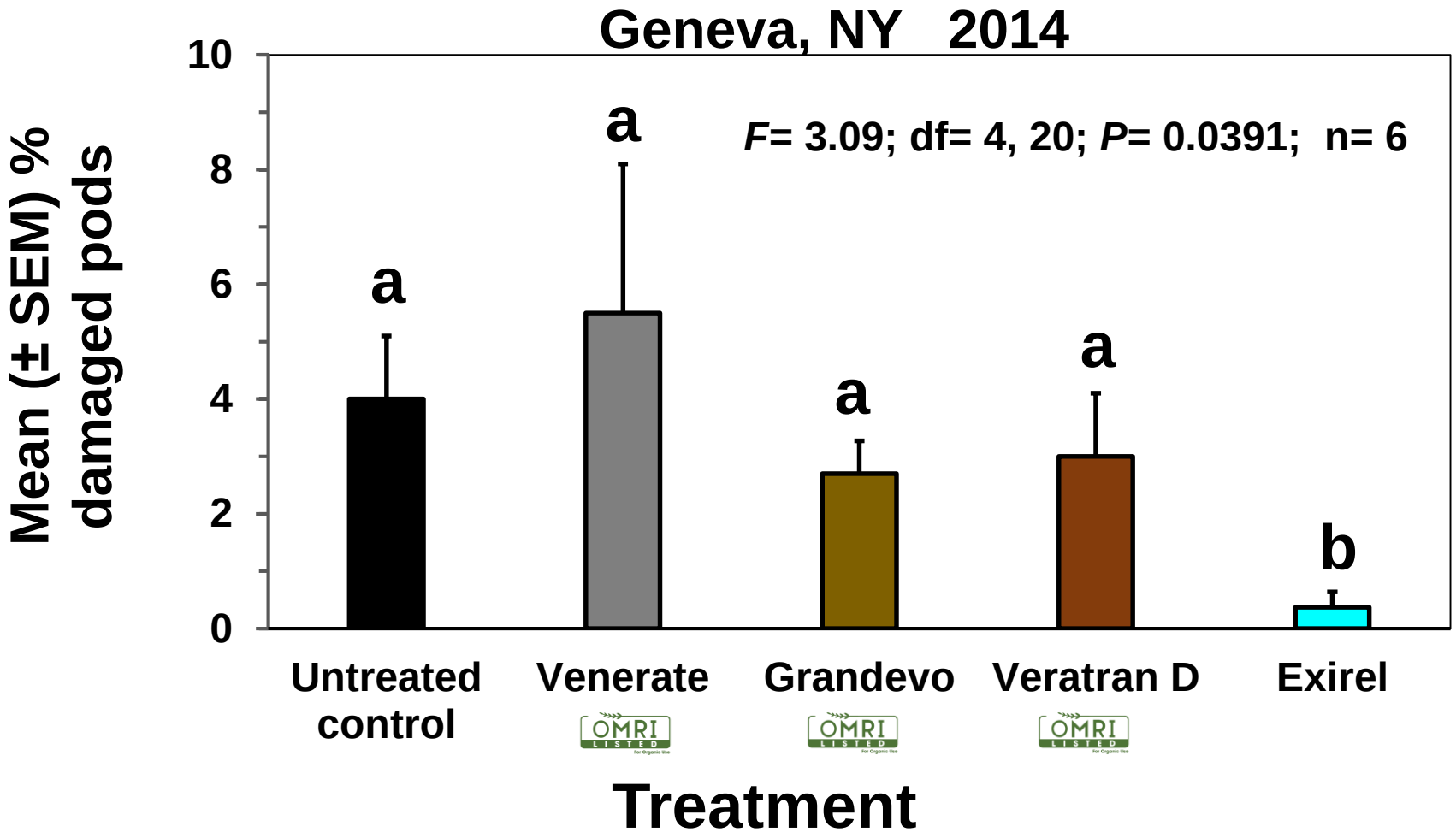
ECB control using OMRI-Listed products in snap bean



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Summary
Seedcorn maggot

- **Conventional management**
  - ✓ **Regard SC (spinosad) seed treatment** provides equivalent control as Cruiser 5FS; snap bean should be added to the Regard SC label, maybe by 2023
  - ✓ **Verimark (cyantranilprole)** applied in-furrow provides equivalent control as Cruiser 5FS; currently labeled
  - ✓ **Fortenza (cyantraniliprole) seed treatment** not available on snap bean; possible registration via IR-4?
- **Organic management**
  - ✓ **Regard SC (spinosad) seed treatment** is OMRI-Listed and provides excellent control; snap bean should be added to Regard SC label by 2023

Summary

Potato leafhopper

- **Conventional management**
  - ✓ No non-neonicotinoid seed treatment identified that will substitute for Cruiser 5FS
  - ✓ **Exirel (cyantraniliprole)** provides control at high rates, but not as effective as a pyrethroid
  - ✓ **Coragen (chlorantriliprole)** is ineffective
- **Organic management**
  - ✓ No seed treatment is available
  - ✓ **Aza-Direct and Azera (azadirachtin w or w/o pyrethrin)** are optimally effective when 2 applications are timed 7 days apart
  - ✓ **Pyganic Specialty (pyrethrin)** is optimally effective when 3 applications are timed 5 days apart
  - ✓ **Venerate XC** was not effective in our field trial

Summary
European corn borer

- **Conventional management**
  - ✓ **Coragen SC (chlorantraniliprole)** and **Exirel (cyantraniliprole)** provide equivalent ECB control as **Brigade (bifenthrin)**
  - ✓ **Coragen** and **Exirel** have longer residual activity and provide longer protection of the crop than pyrethroid (data not shown)
- **OMRI-Listed products**
  - ✓ One application of either Venerate XC, Grandevo or Veratran D was not effective
  - ✓ More research needed

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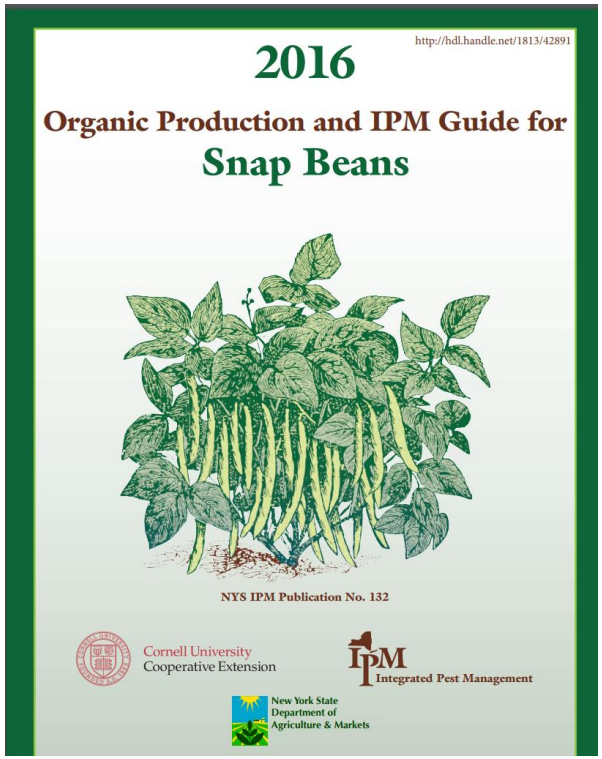
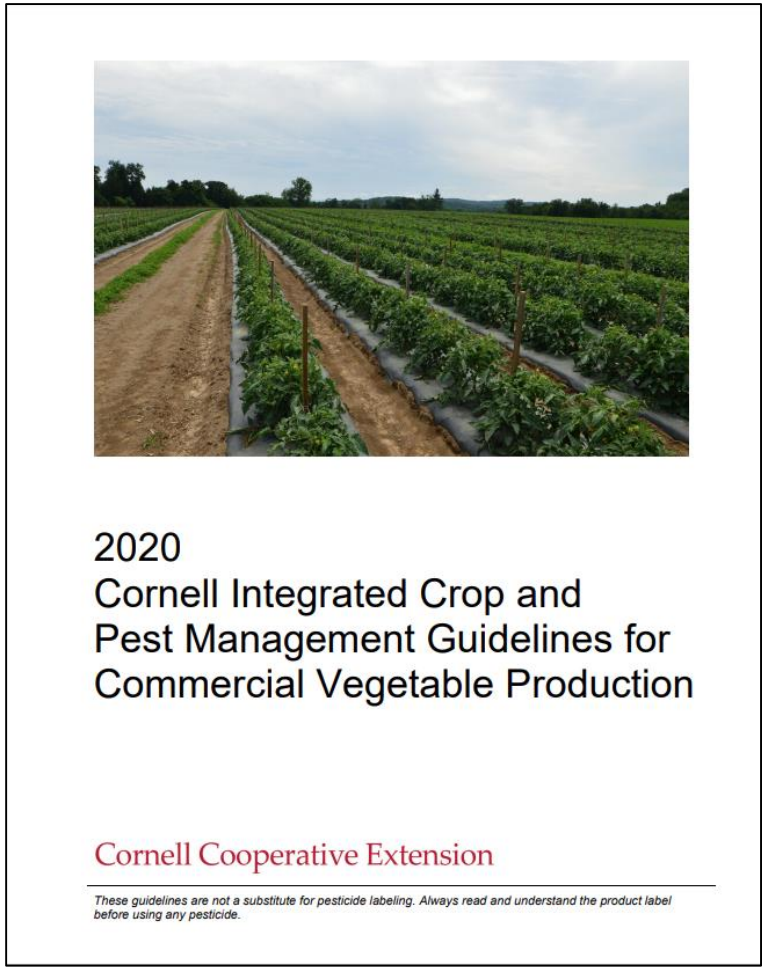
Resources





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