Vegetable: Update on Organic Onion Pest and Disease Management

2020 NOFA-NY Winter Conference Workshop
January 17, 2020

Brian Nault, Dept. of Entomology
Lindsy Iglesias, Dept. of Entomology
Frank Hay, Dept. of Plant Pathology & Plant Microbe Biology

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New York State Agricultural Experiment Station

Topics of Workshop

I. Onion maggot & Allium leafminer

- Life history
- Management options

(B. Nault)

II. Onion thrips

- Life history
- Management options

(L. Iglesias)

III. Stemphylium leaf blight

- Biology
- Management options

(F. Hay)

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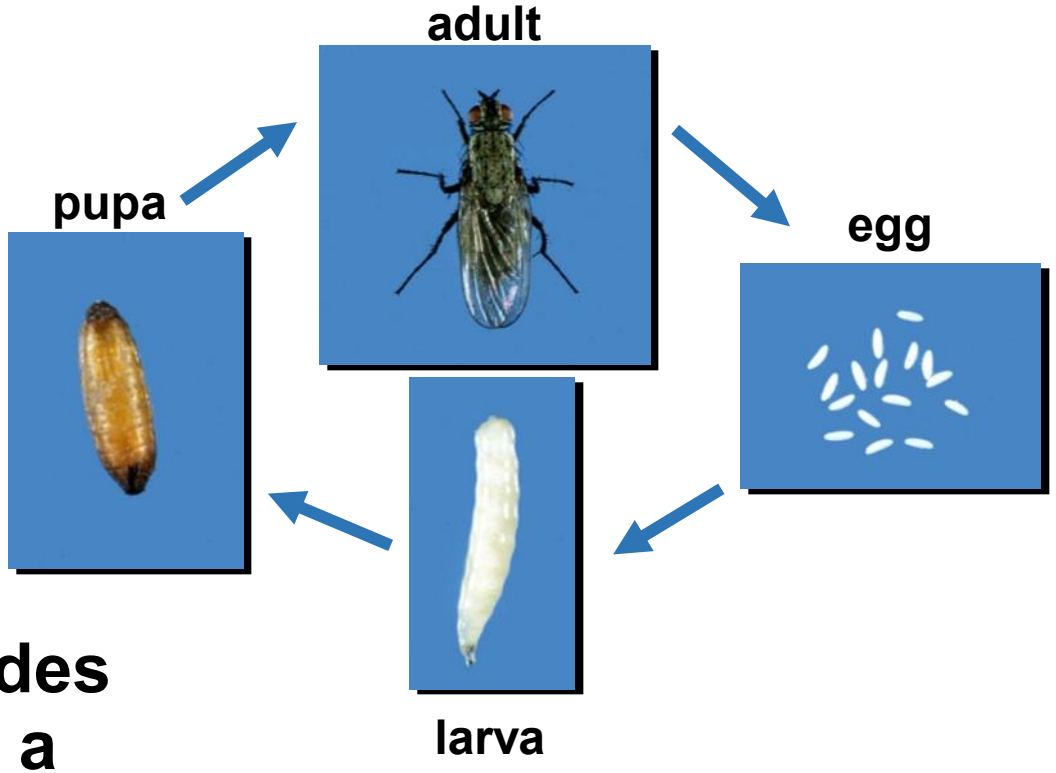
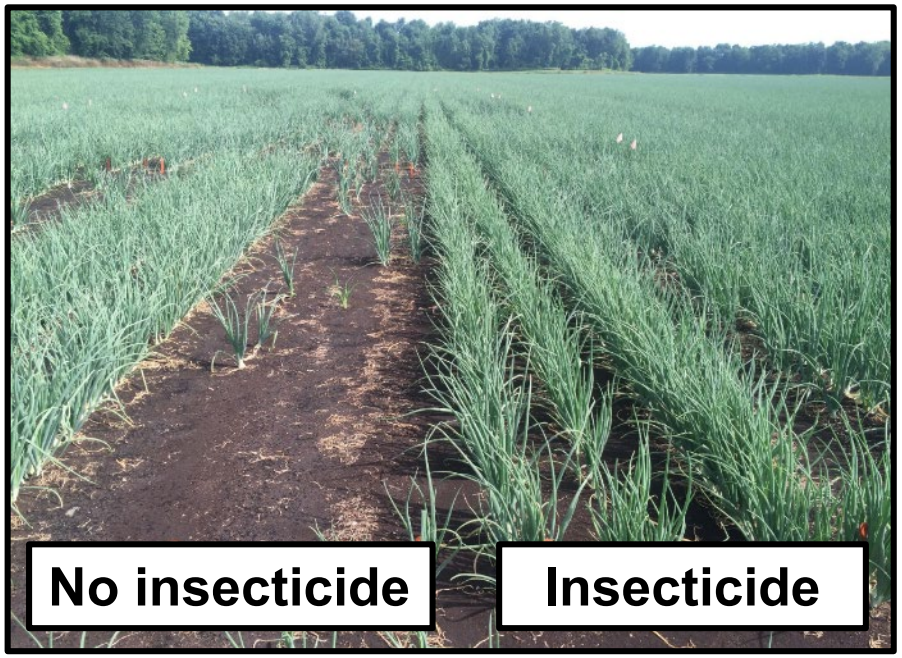
Onion maggot (*Delia antiqua*)

- Found in northern temperate regions worldwide
- Feeds only on *Allium spp.*
- Close relative includes seedcorn maggot – a generalist and sporadic pest of onion



Onion maggot

- Major pest of onion
- Can reduce plant stands by nearly 100%
- Three generations per year



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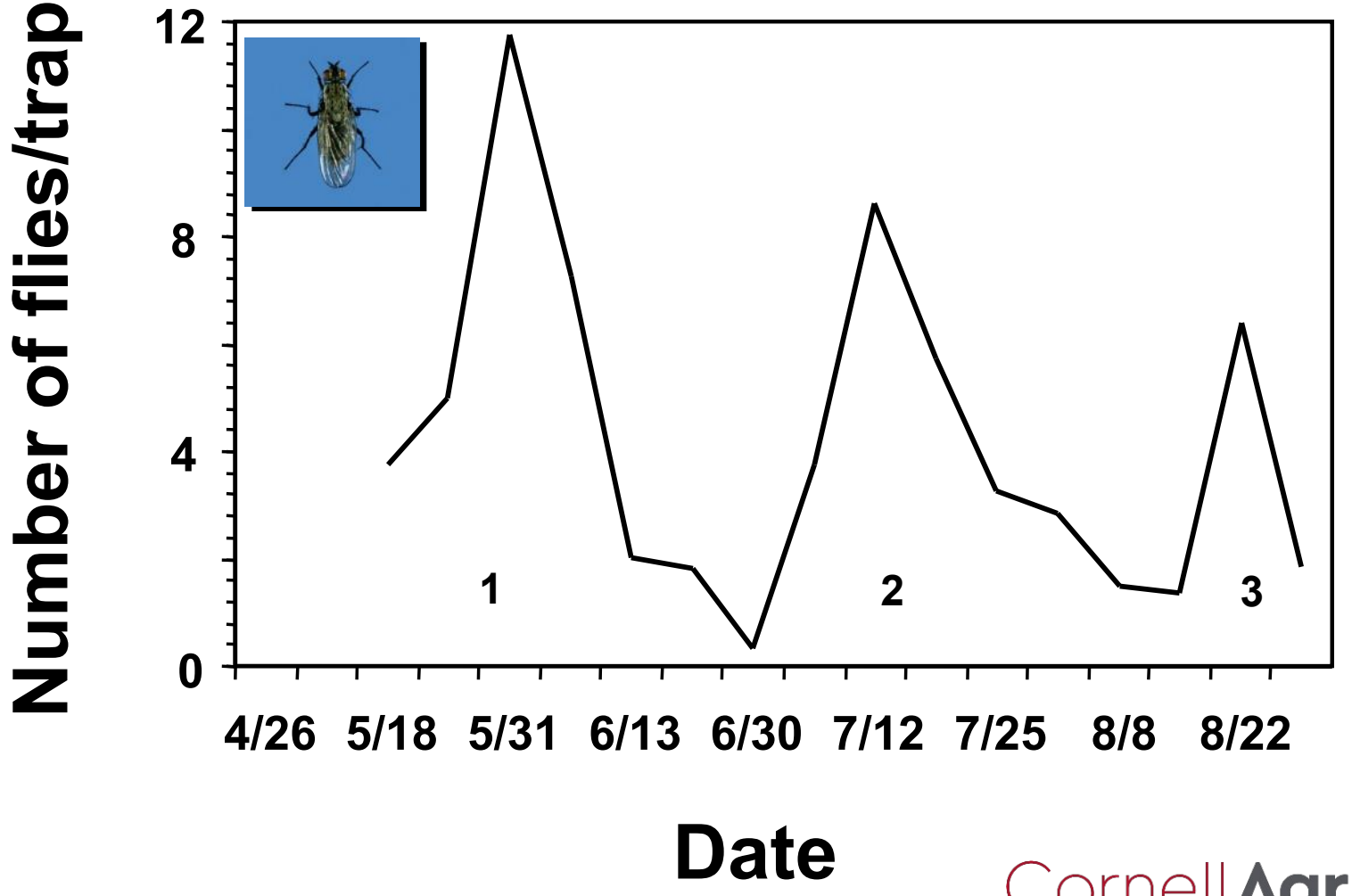
Seasonal activity of onion maggot adults in New York (3 generations)



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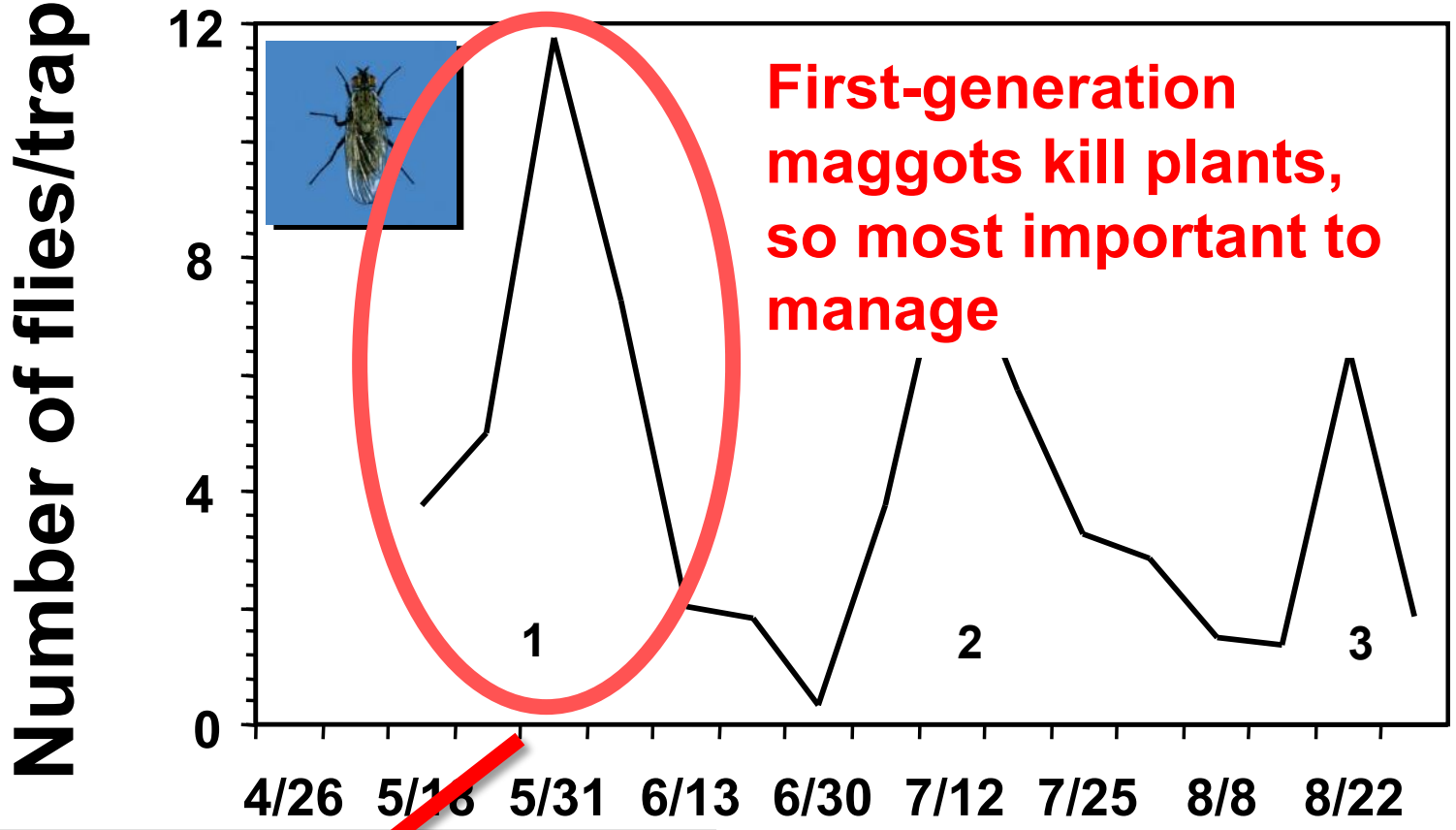

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How best to manage onion maggot?

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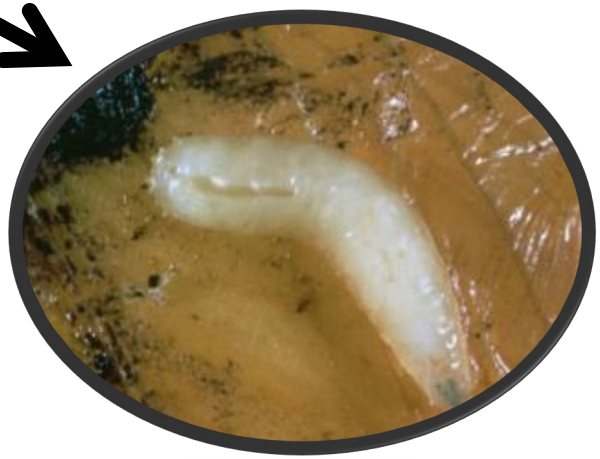
Plant Resistance

- None known
- Transplants



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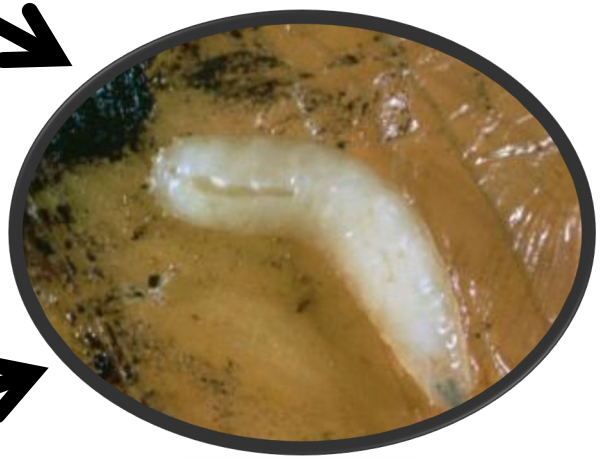

Cultural Control

- Crop rotation
- Sanitation
- Row covers

Row covers protect plants from egg-laying flies

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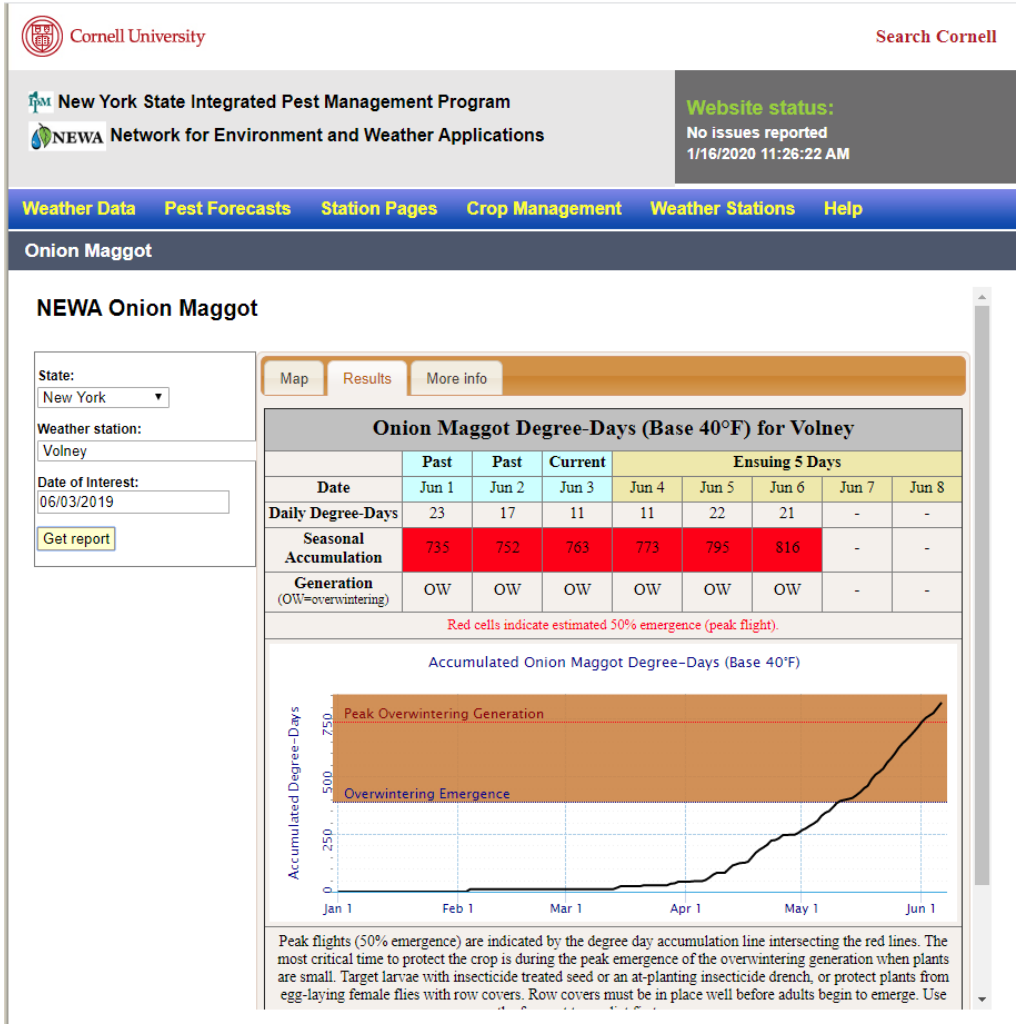
NEWA onion maggot degree-day model for predicting fly activity



http://www.newa.cornell.edu/

- **Degree-day model will generate information to help determine when to cover onions**

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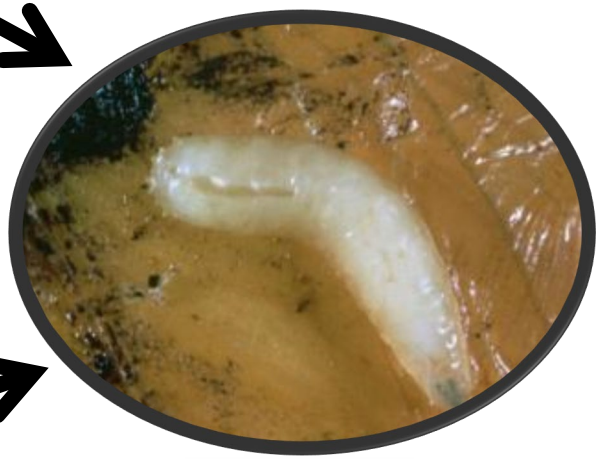

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Sterile Insect Technique

- Sterile male release

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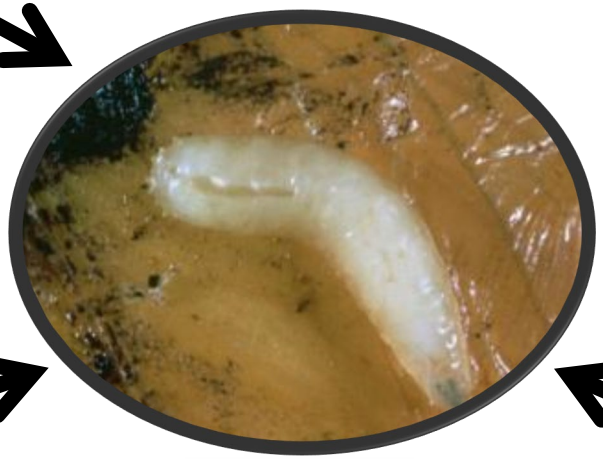

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Biological Control

- Entomopathogens

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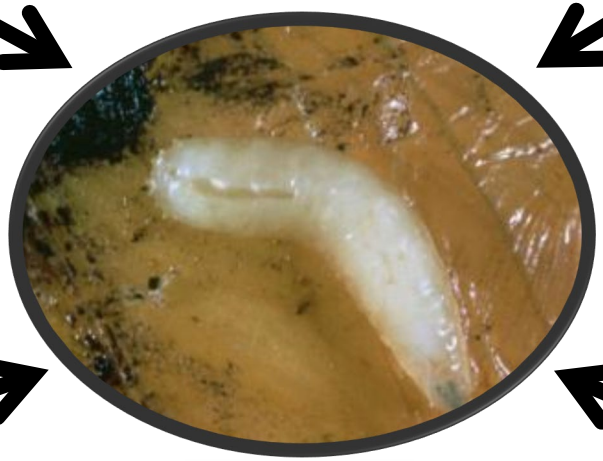
Chemical Control

- Insecticides



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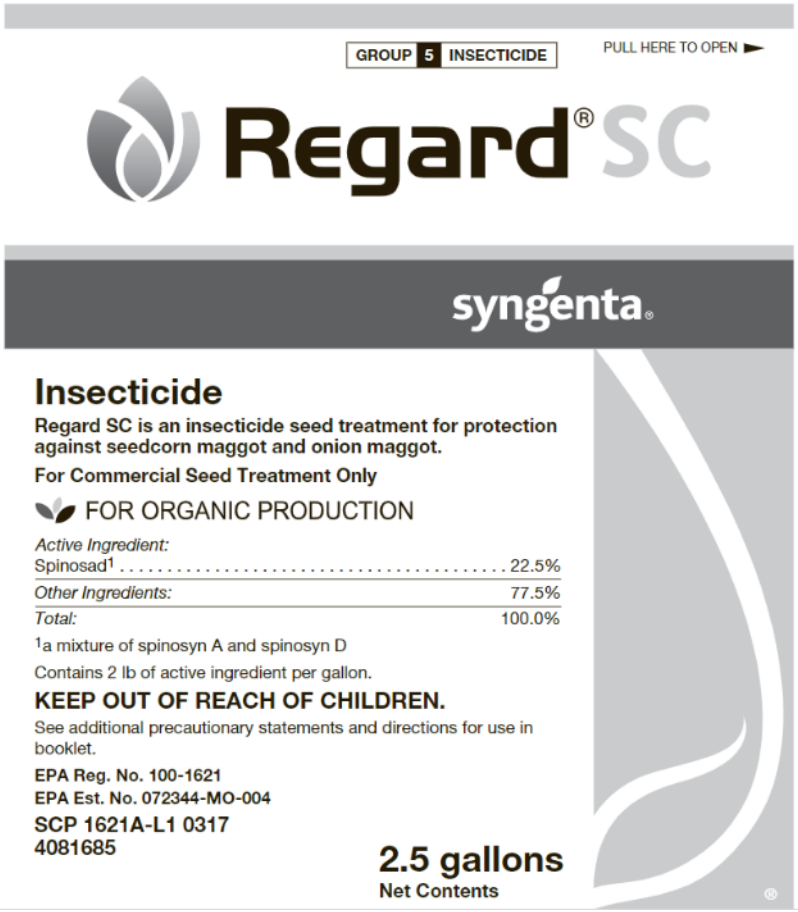
Insecticide seed treatment for onion maggot control in organic production



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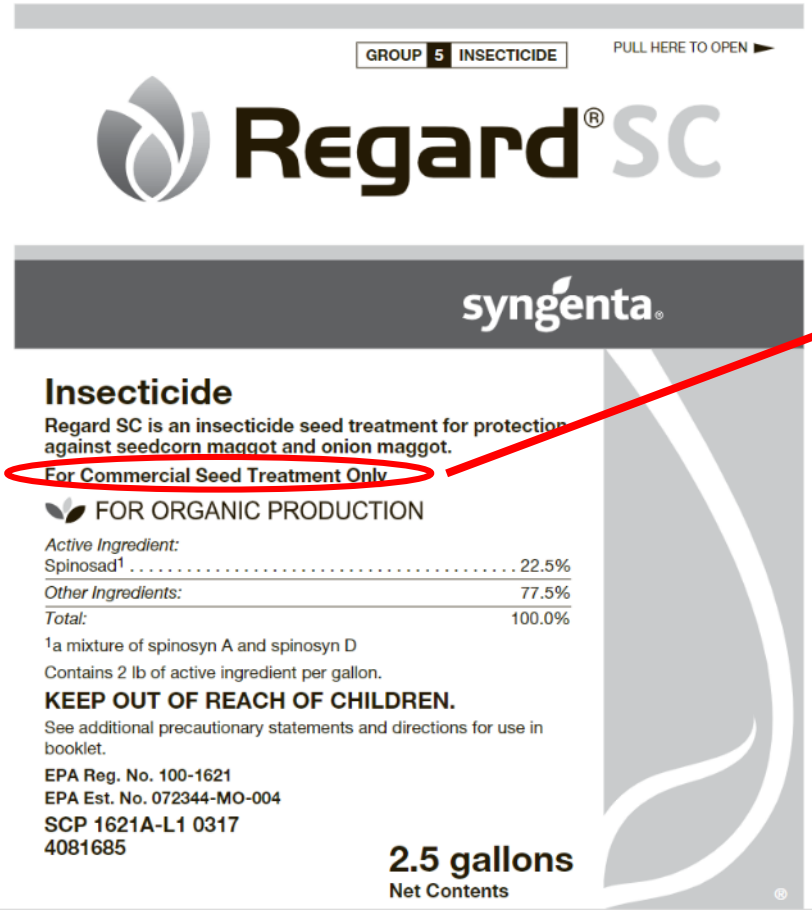
Insecticide seed treatment for onion maggot control in organic production



Must have onion seed treated by commercial seed treatment company

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Seed treatment studies

- Seeds were treated by Dr. Alan Taylor (Horticulture, Cornell AgriTech)
- Test site in Oswego Co. where maggots were not controllable
- Onion seeds planted in April 2017 and April 2018
- Plots were two rows, 30-ft long and treatments replicated 5 times
- Numbers of onion plants dead or dying from maggots assessed 1-2 times per week during first generation (May through July)

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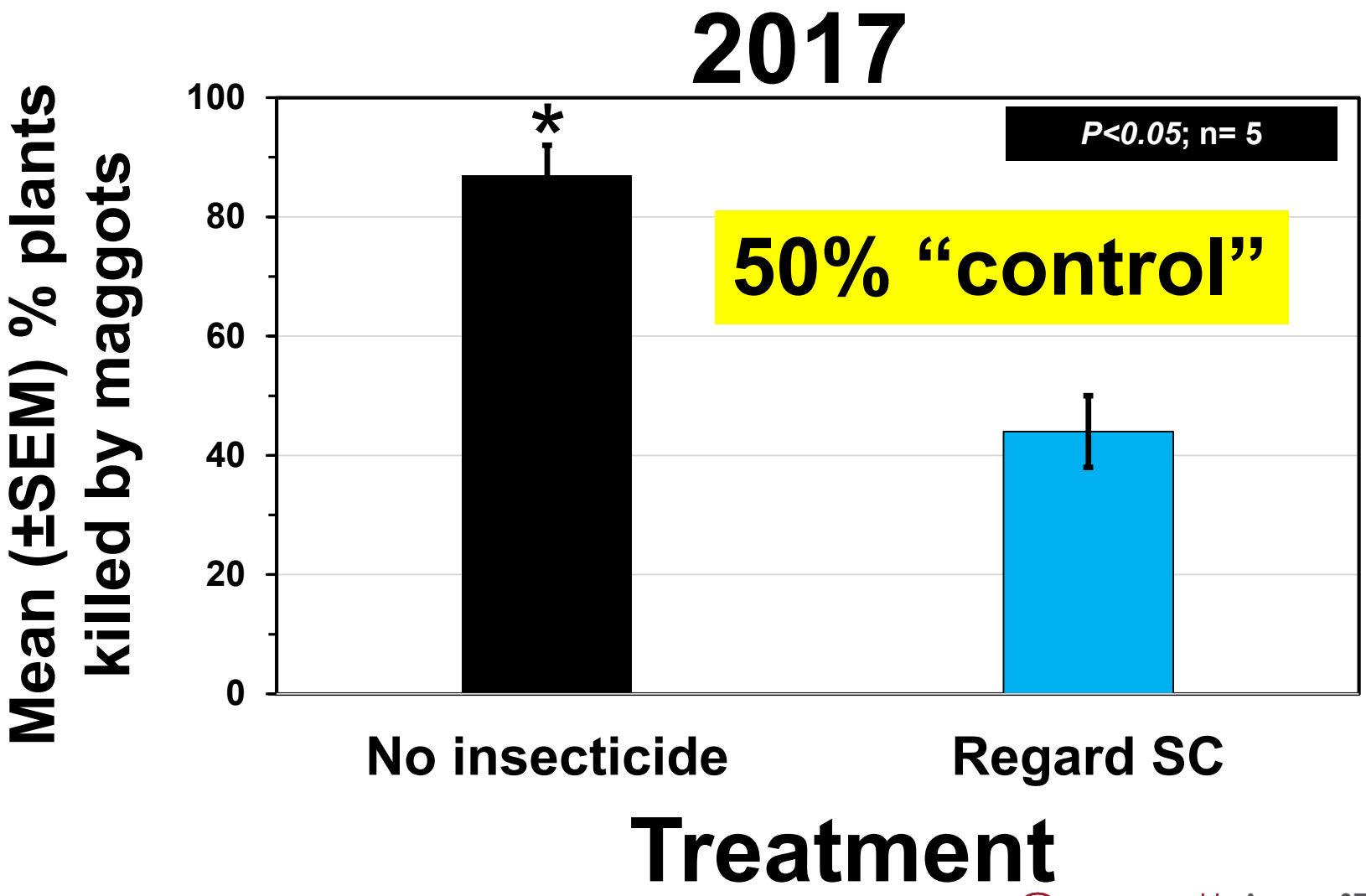
RESULTS: Efficacy of Regard SC seed treatment for onion maggot control in bulb onions



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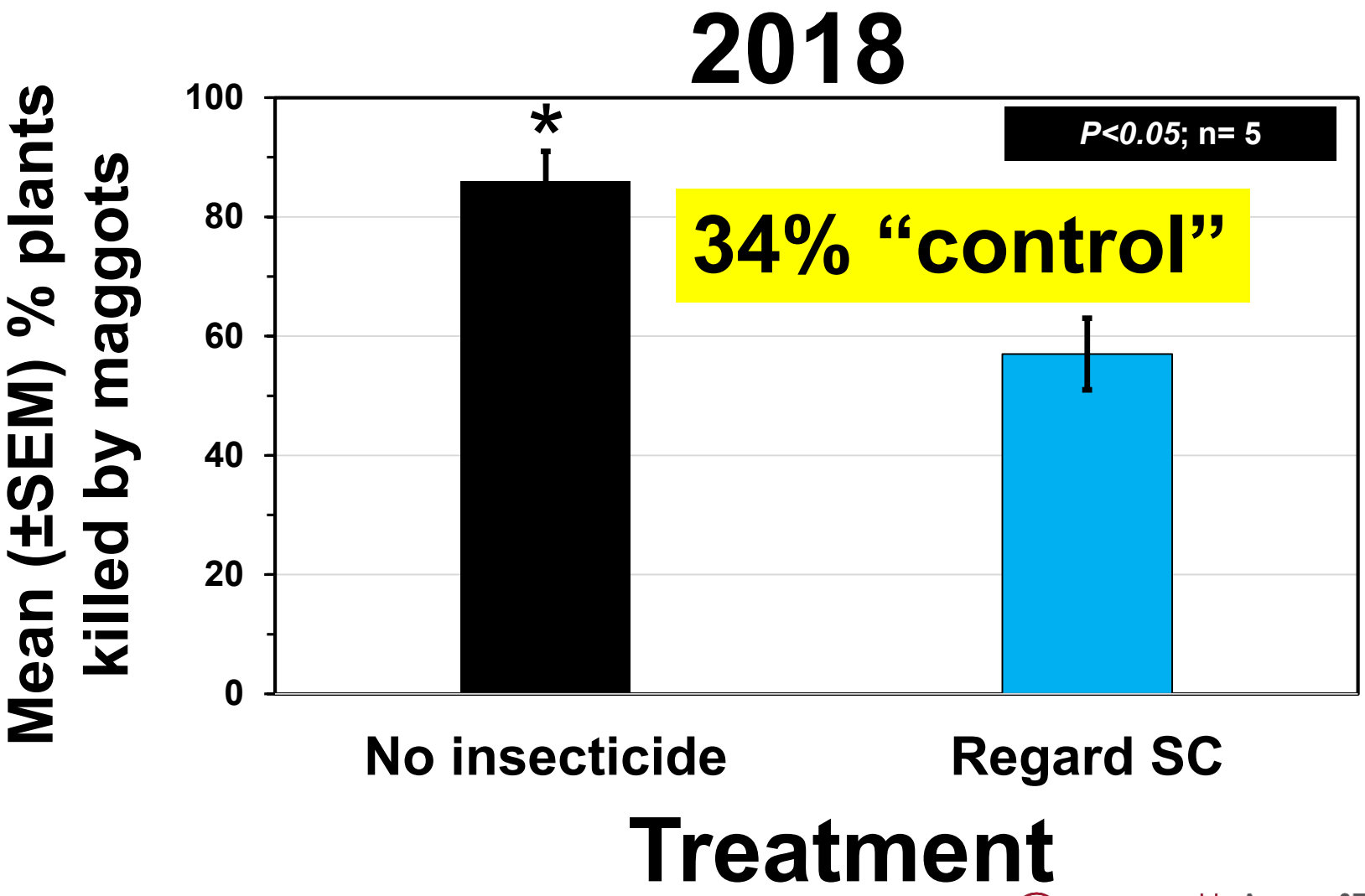

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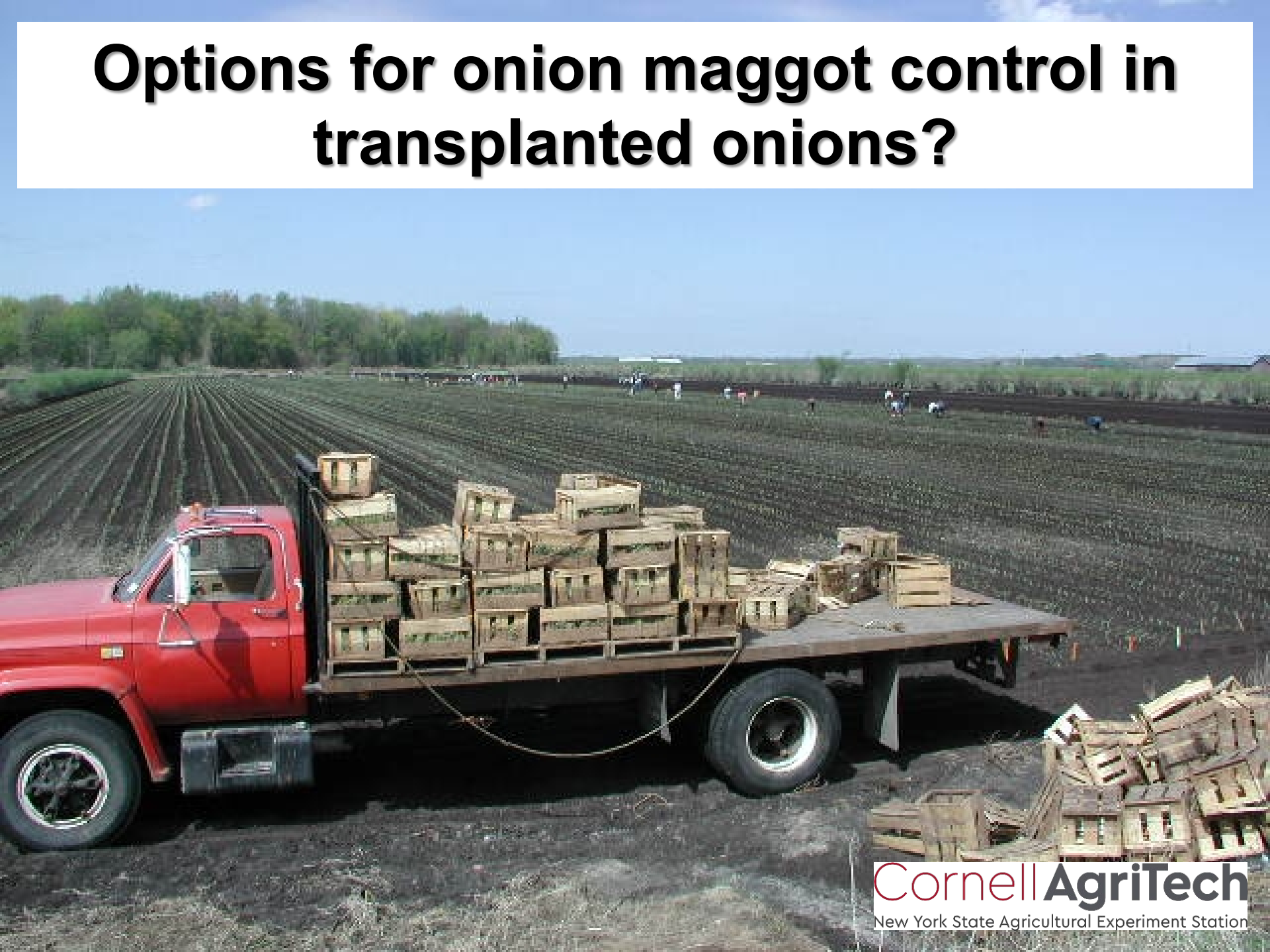
Options for onion maggot control in transplanted onions?



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Could Entrust SC protect transplants from onion maggot?

Dipping* bare-root onion plants in Entrust solution

***Currently NOT labelled**

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Onion maggot control using insecticide dip treatments for transplants

cv. 'Bradley' Oswego, NY (n = 5) 2018-2019

Treatment	Active ingredient	Rate[a]
No insecticide	-	-
Entrust SC	spinosad	1 fl oz/10,000 plants
Entrust SC	spinosad	2 fl oz/10,000 plants
Radiant SC[b]	spinetoram	1 fl oz/gal of water

[a] 1.25 gallons of solution treats 10,000 bare-root plants

[b] Not OMRI-Listed

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Onion maggot control using insecticide dip treatments for transplants

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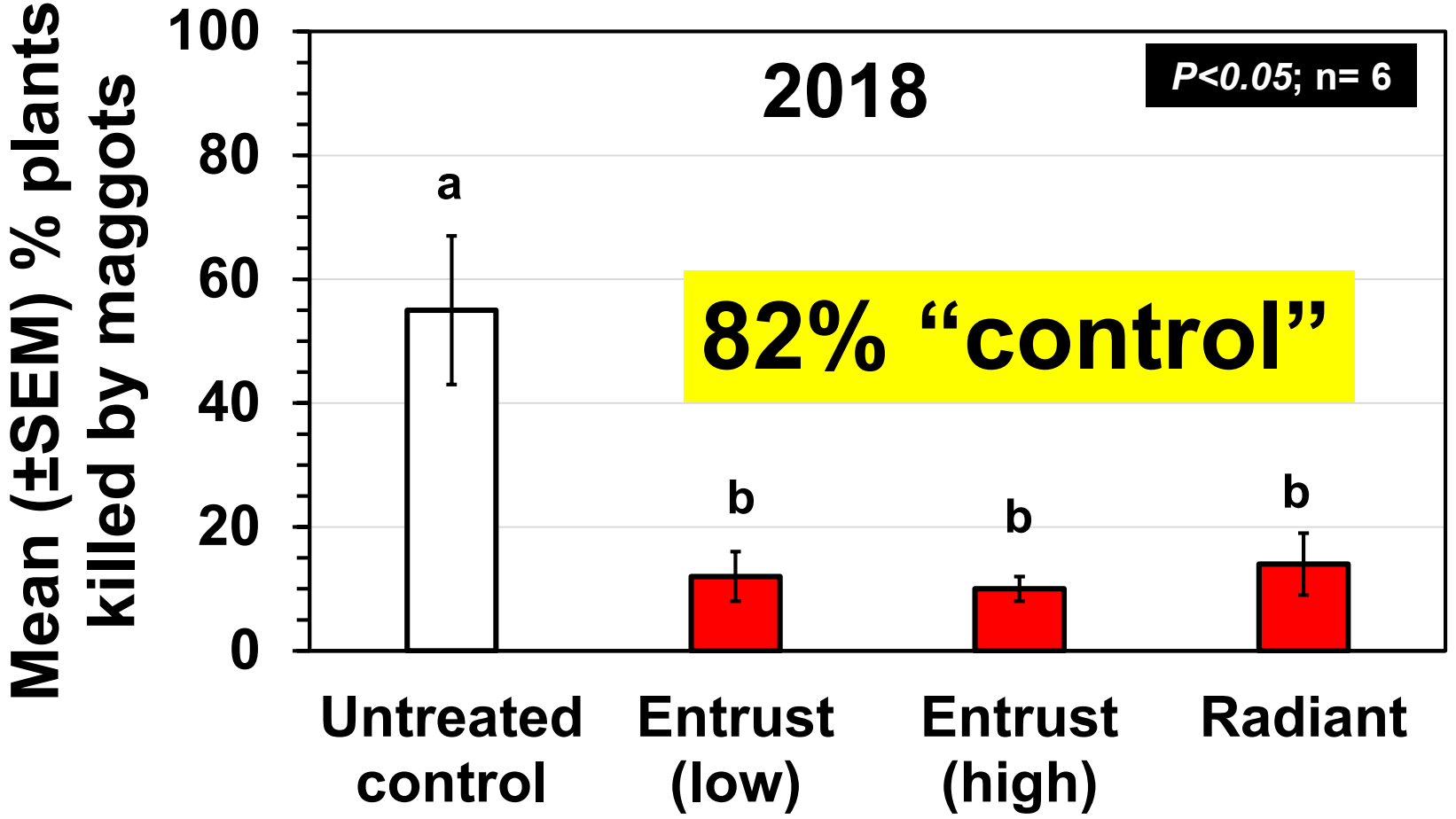

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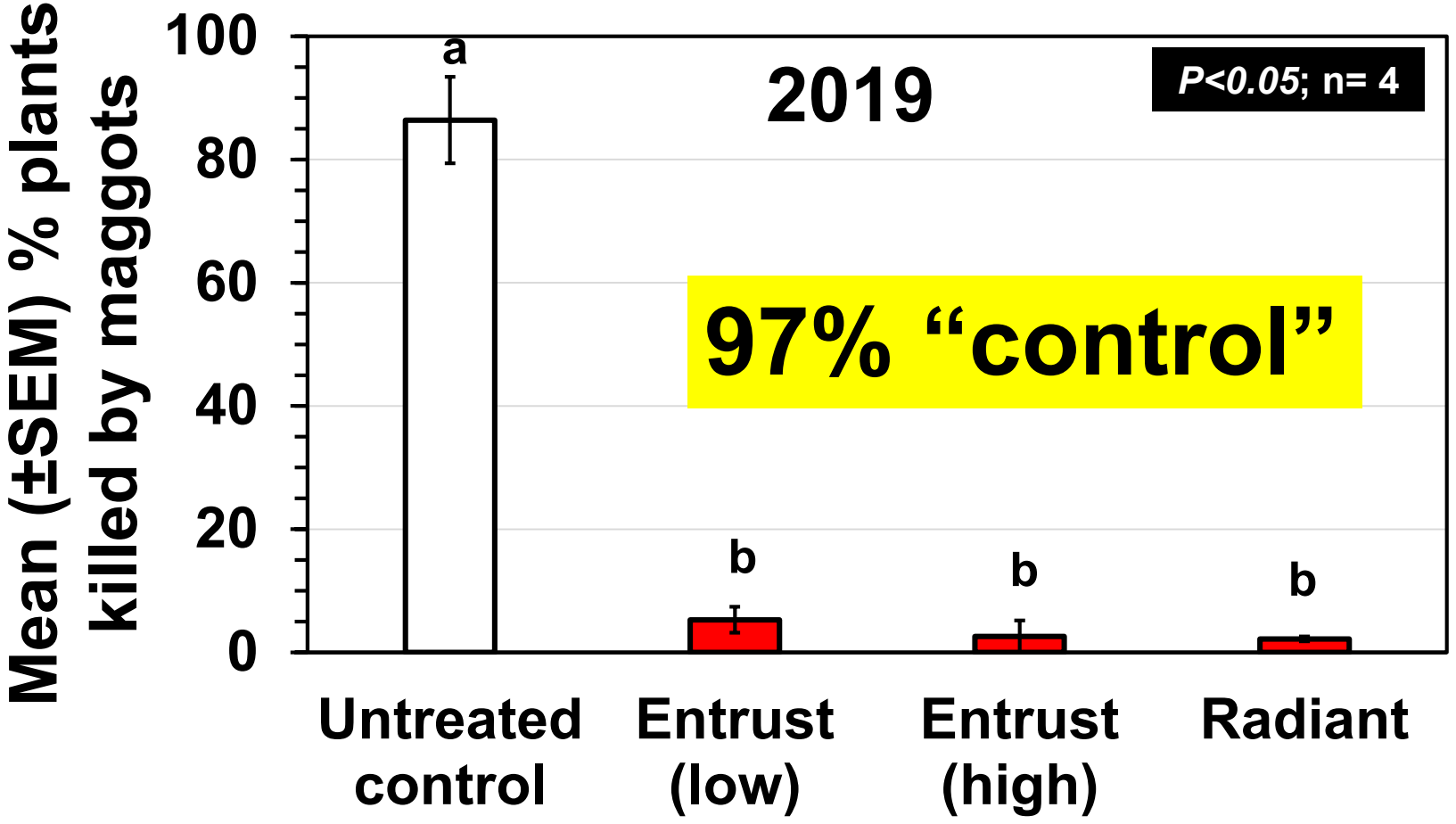

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Onion maggot control summary

- Important to use multiple management tactics, especially crop rotation
- Regard SC seed treatment is the only option for direct-seeded onions
- Entrust SC may be a future option for transplanted onions

Allium leafminer (ALM), *Phytomyza gymnostoma*

- **First detected in North America in 2015**
- **New invasive pest of crops in the *Allium* genus**
- **Related to *Liriomyza* spp., but is monophagous**

Photo: Andre Megroz

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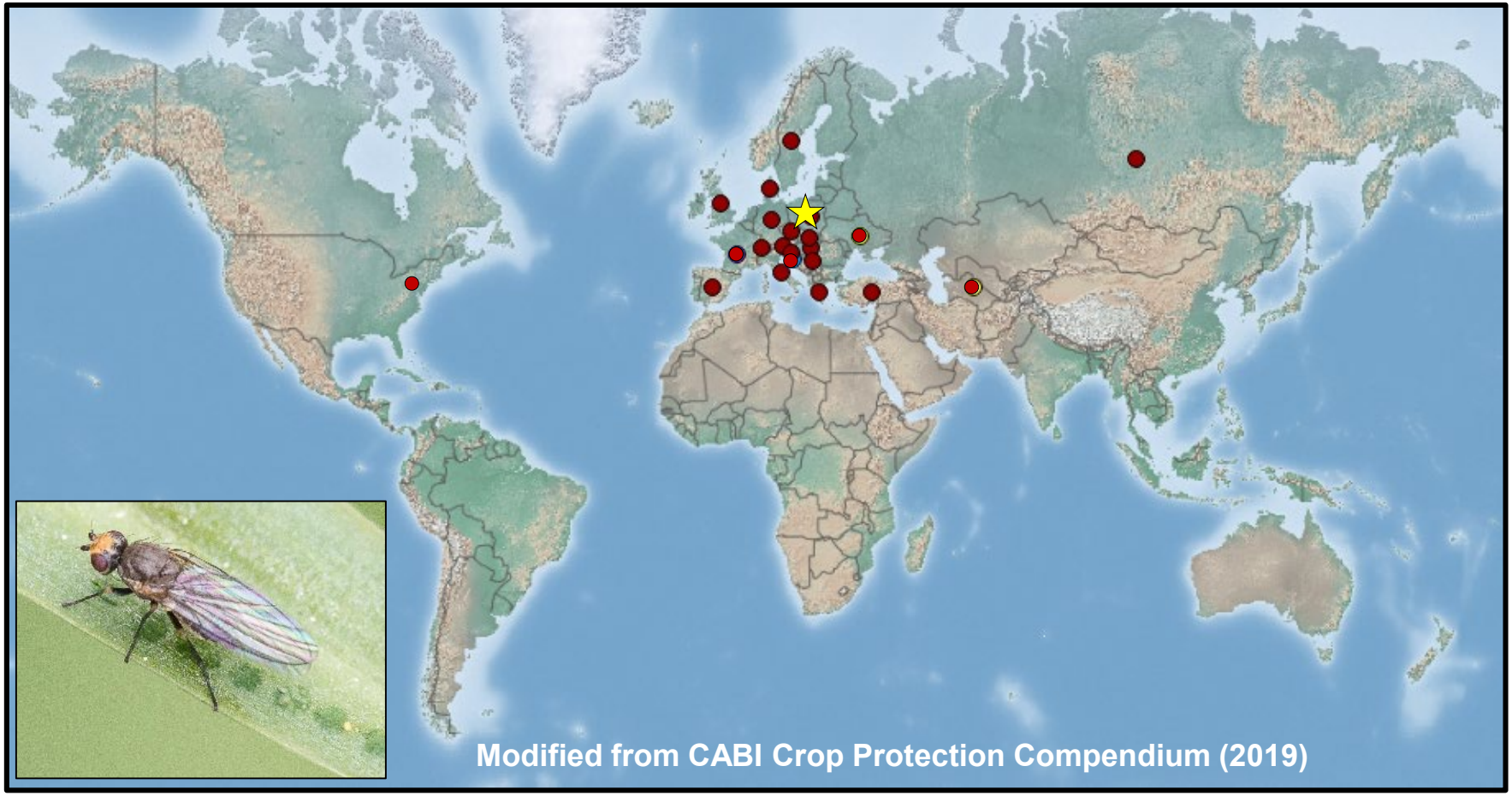
World distribution of Allium leafminer



- ★ Origin – Poland (1858)
- 21 countries in Europe; 2 in Asia; 1 in NA

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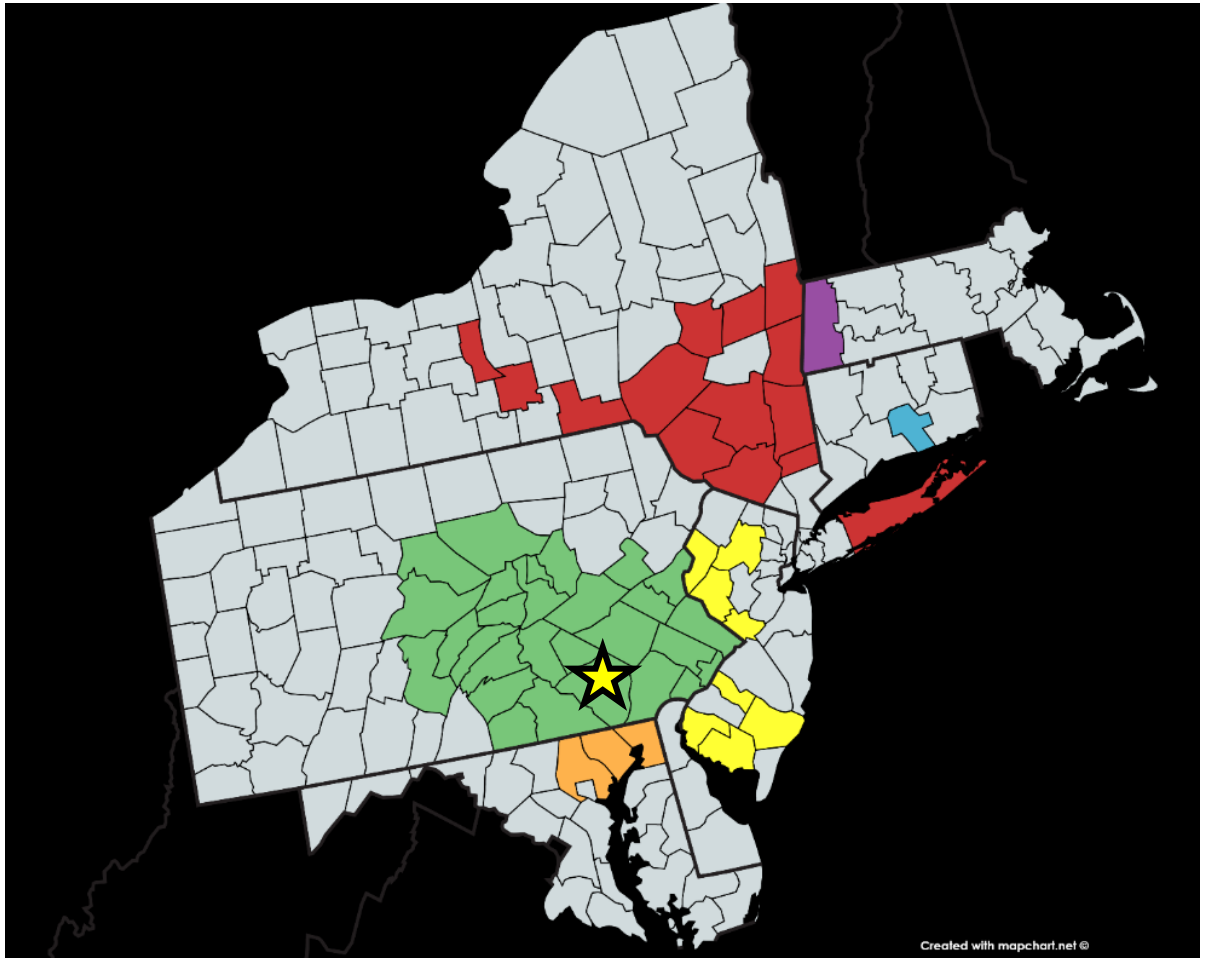
North American distribution of Allium leafminer



- ★ First detected in Lancaster County, PA (2015)
- Confirmed in CT, MA, MD, NJ, NY & PA (as of Nov. 2019)

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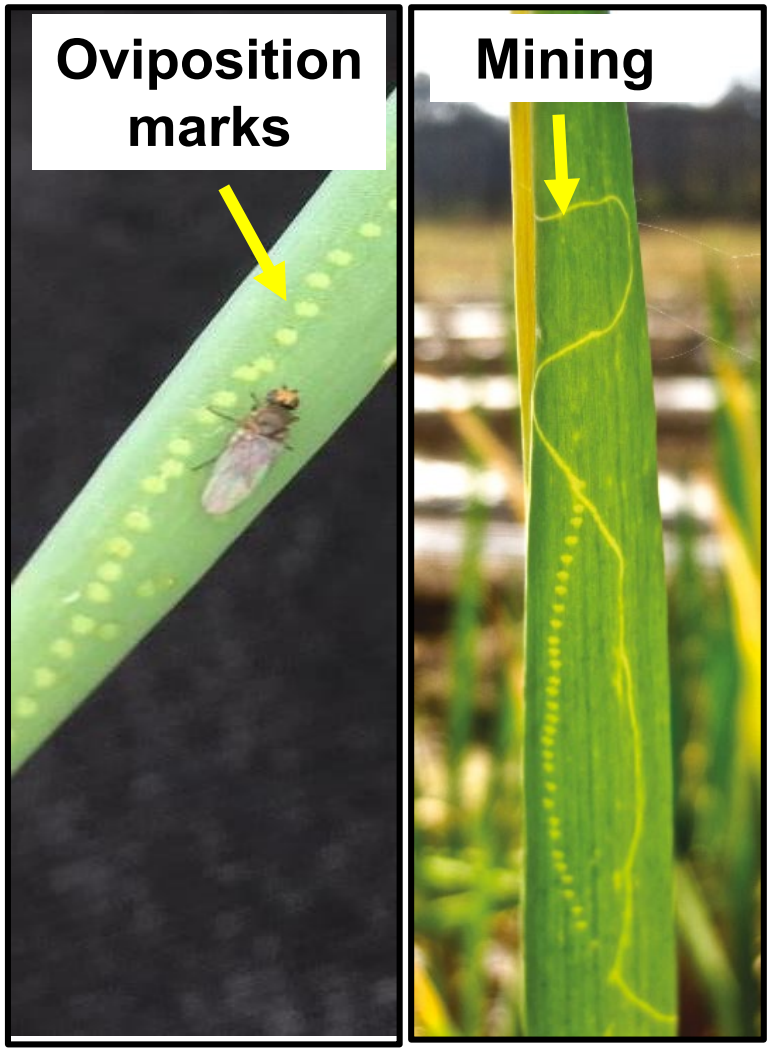
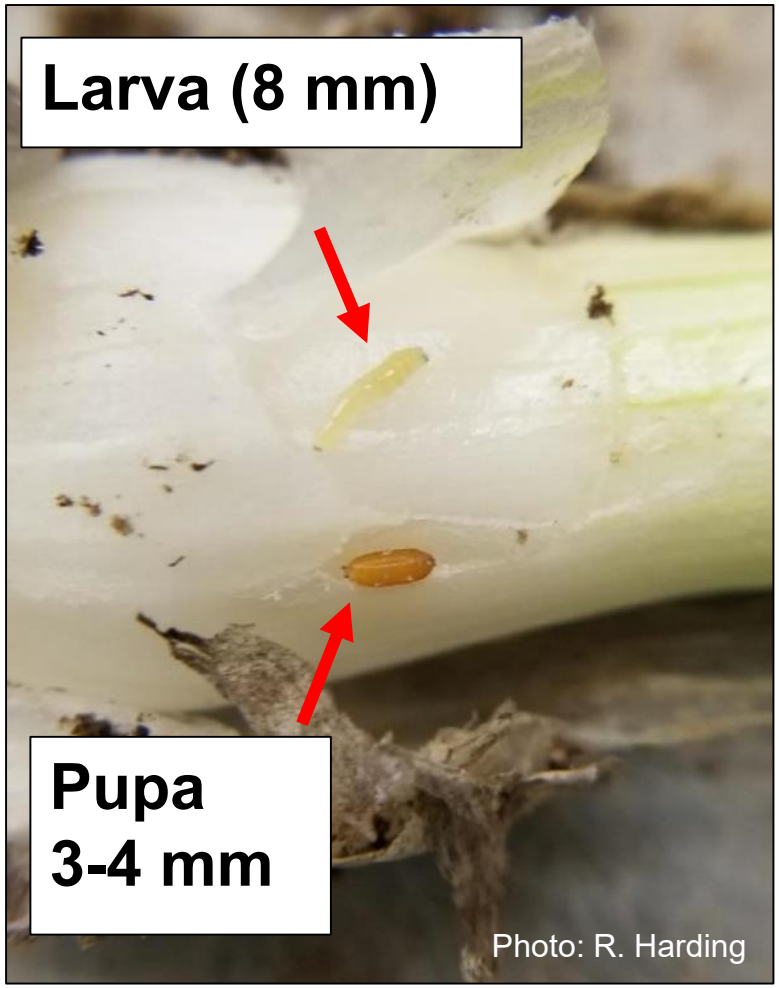
Diagnostic features of an Allium leafminer infestation



- Larvae mine down the leaf to the lower portions of the plant where they will pupate

Damage by Allium leafminer



- Relatively large leafminer
- Infested plants often associated with bacterial rot

Allium leafminer has caused catastrophic crop losses on small farms

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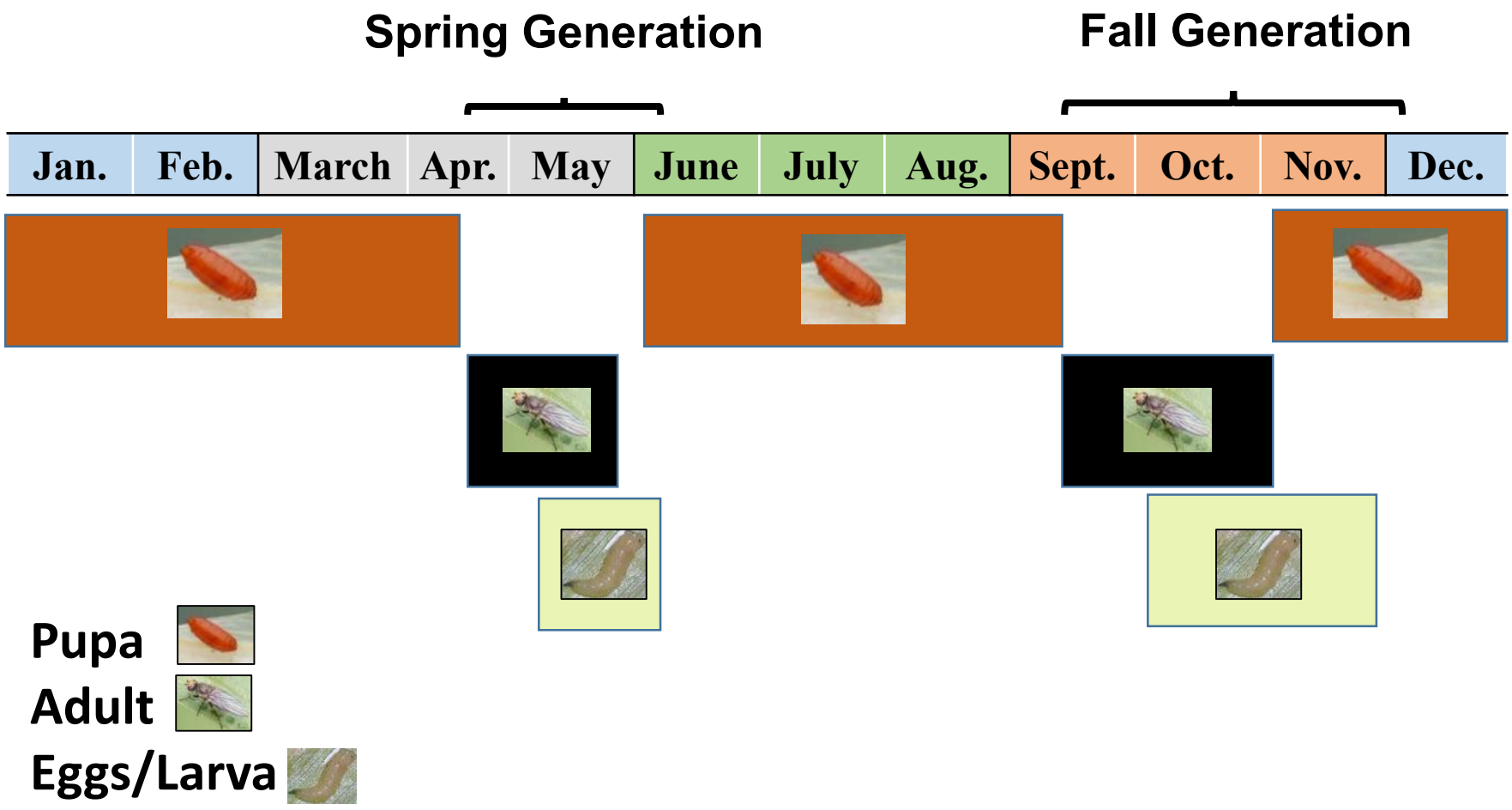
Life Cycle of Allium leafminer in Northeastern US



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Bulb onion foliage availability for ovipositing Allium leafminer in Northeastern US

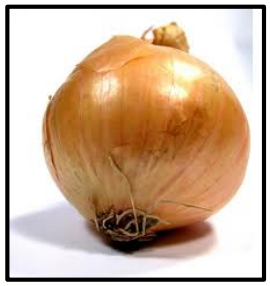
Transplanting

Sowing seeds

Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.

seeded onion

transplanted onion



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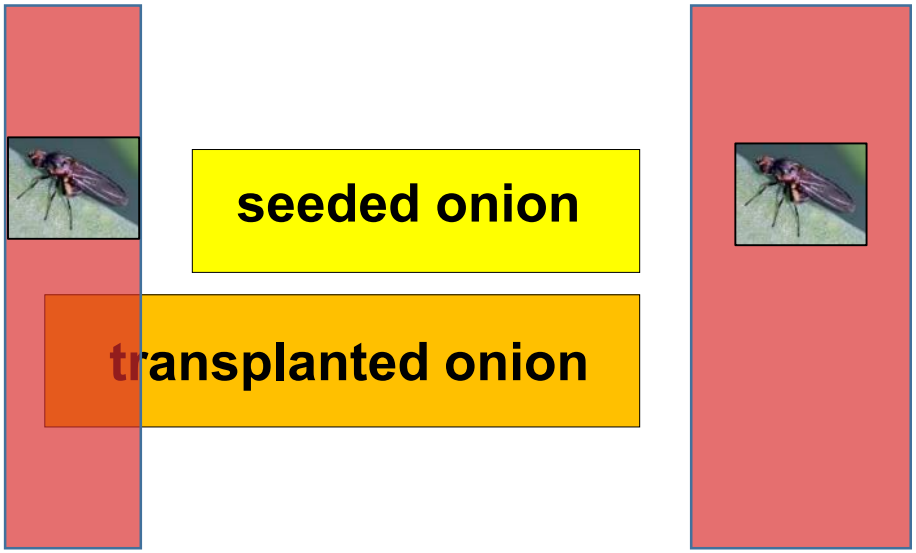
Bulb onion foliage availability for ovipositing Allium leafminer in Northeastern US

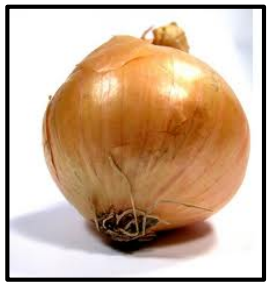
Spring Generation

Fall Generation

Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.



*Transplanted onions are at risk for Allium leafminer infestation only in the spring



Other Allium crop foliage availability for ovipositing Allium leafminer in Northeastern US

Spring Generation

Fall Generation

Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.

Scallions and wild *Allium* spp.

leek

garlic

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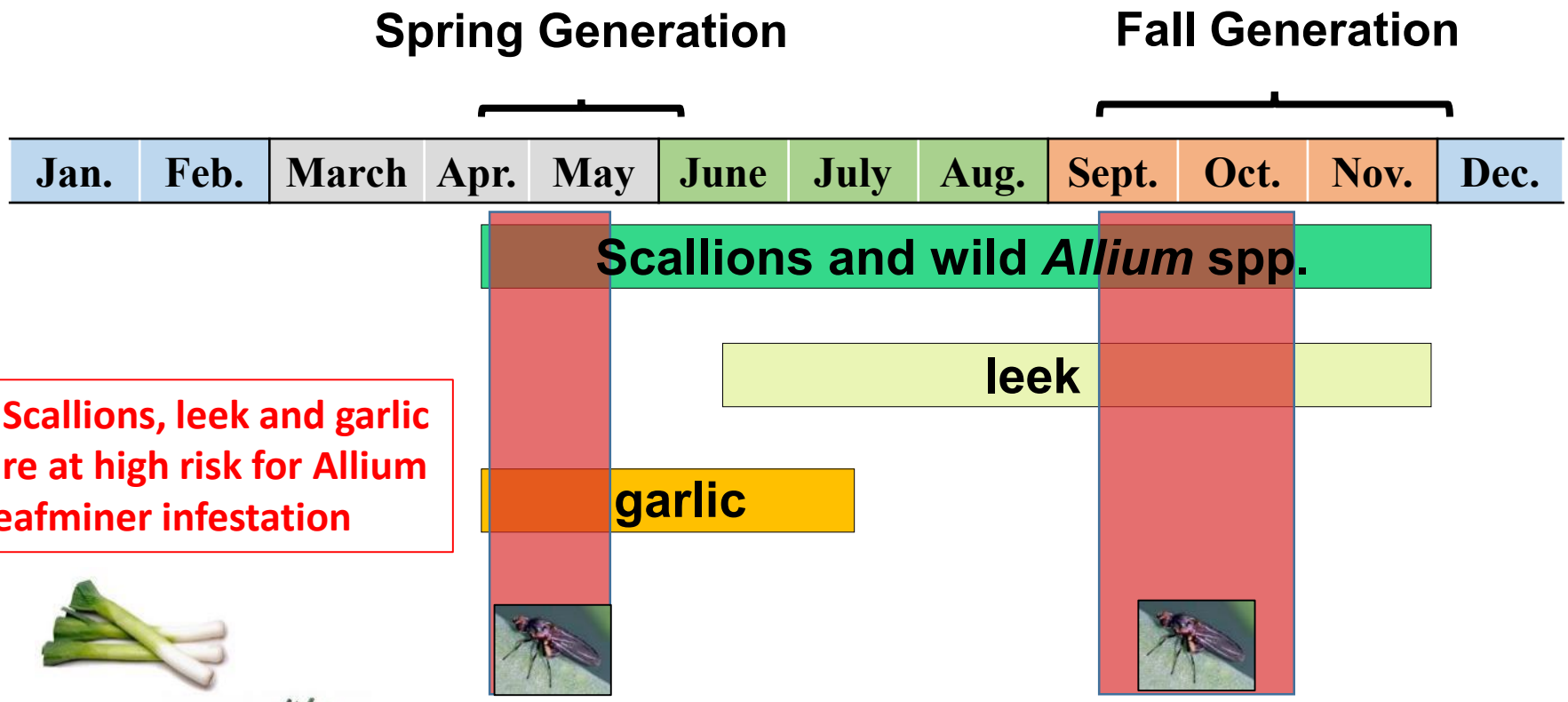
Other Allium crop foliage availability for ovipositing Allium leafminer in Northeastern US



*Scallions, leek and garlic are at high risk for Allium leafminer infestation

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How best to manage Allium leafminer?

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Plant Resistance

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Cultural Control

- Reflective mulch
- Delayed planting
- Crop rotation
- Row covers

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Biological Control

- Parasitoids

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Chemical Control

- Insecticides

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Needed an immediate, highly effective solution

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Insecticides for Allium leafminer control in Europe

- **Effective active ingredients**

Active ingredient (IRAC classification)

- abamectin (6)
- acetamiprid (4A)
- cypermethrin + chlorpyrifos (3A + 1B)
- cyromazine (17)
- dimethoate (1B)
- imidacloprid w and w/o deltamethrin (4A + 3A)
- spinosad (5)
- fenitrothion (1B)
- novaluron (15)

(Coman and Rosca 2011; Tallotti et al. 2003, 2004)

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Registered on bulb vegetable crops in US and OMRI-Listed

(Coman and Rosca 2011; Tallotti et al. 2003, 2004)

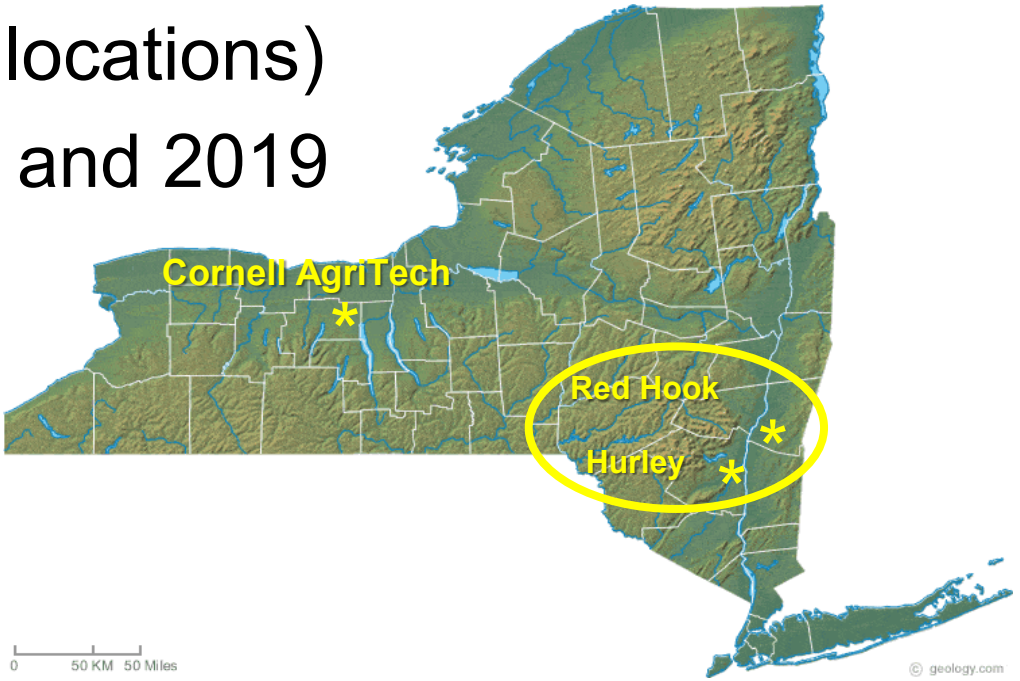
What insecticides and delivery strategies control ALM?

- Identify effective OMRI-Listed products
- Optimize frequency of foliar applications
- Evaluate at-plant transplant treatments

Locations

New York

- ✓ Bulb onions in spring 2018
- ✓ Leeks in fall 2018 (2 locations)
- ✓ Scallions in fall 2018 and 2019



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Insecticides evaluated for Allium leafminer control

Active ingredient[1]	Product	IRAC Group	# trials
azadirachtin	Aza-Direct	unknown	4
azadirachtin + pyrethrin	Azera	unknown + 3A	1
kaolin clay	Surround WP	unknown	1
pyrethrin	PyGanic Specialty	3A	4
spinosad	Entrust SC	5	3

[1] Co-applied with either Nu-Film or M-Pede

Foliar application strategy

- Two-row plots (10-ft long)
- Plots sprayed with a **hand-held CO_2 -backpack sprayer** (twin-flat fan nozzles, 48 gpa @ 40 psi)
- **Applications made weekly either in May (n=4) or Sept/Oct (n=5 or 6)**
- Ten to 50 plants per experimental unit were removed, **dissected and inspected for larvae and pupae**

RESUTS: Foliar application strategy for Allium leafminer control

Active ingredient	Product	% trials significantly reduced damage	Mean % control
spinosad*	Entrust SC	25 (n=4)	70
kaolin clay*	Surround WP	0 (n=1)	44
azadirachtin + pyrethrin*	Azera	0 (n=1)	22
azadirachtin*	Aza-Direct	0 (n=4)	10
pyrethrin*	PyGanic Specialty	0 (n=4)	0

NOTE: Results for each trial are available at:
http://nault.entomology.cornell.edu/extension/

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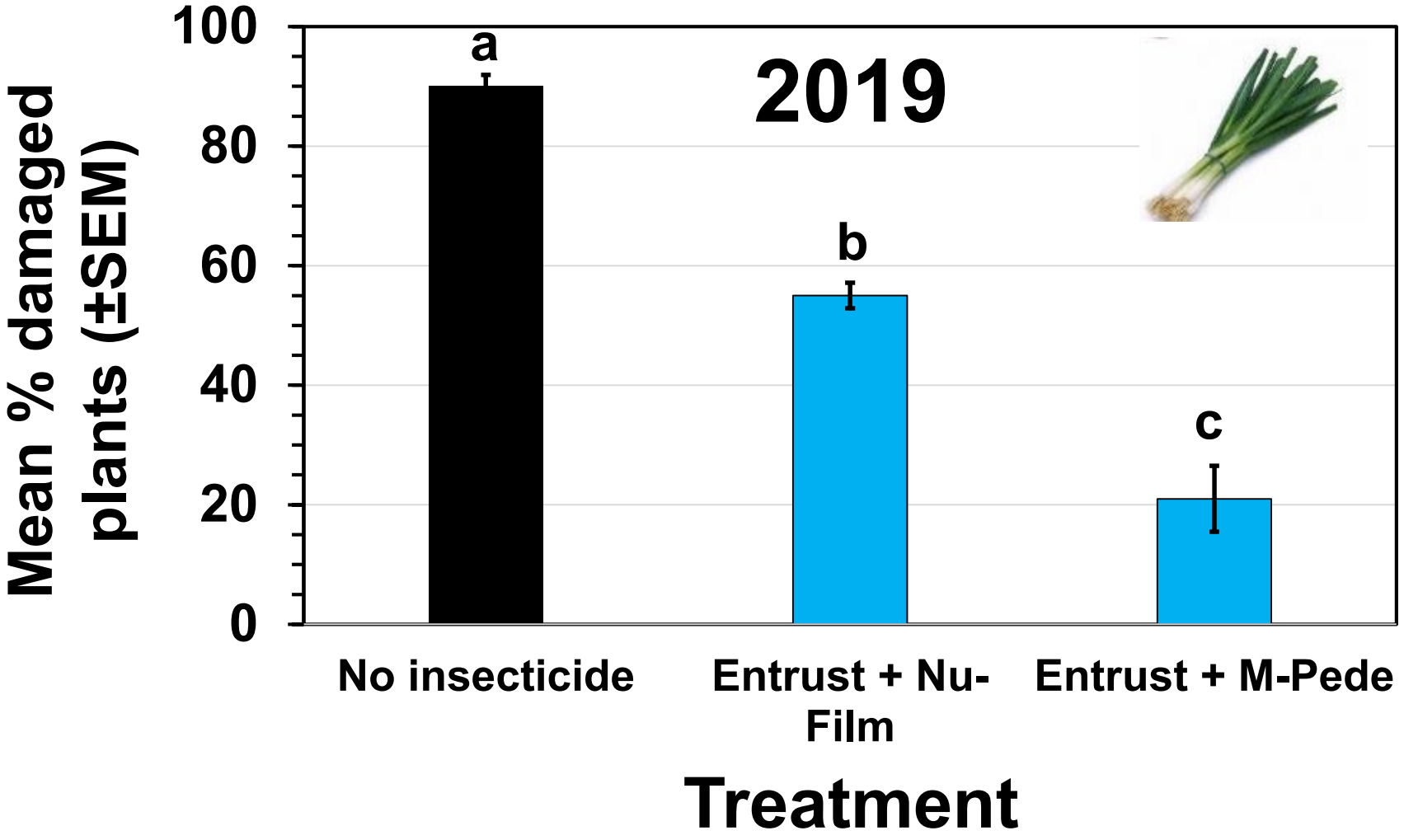
Efficacy of Entrust SC with Nu-Film or M-Pede for ALM control in scallions



F=67.6; df= 2, 6; *P*<0.0001; n= 4

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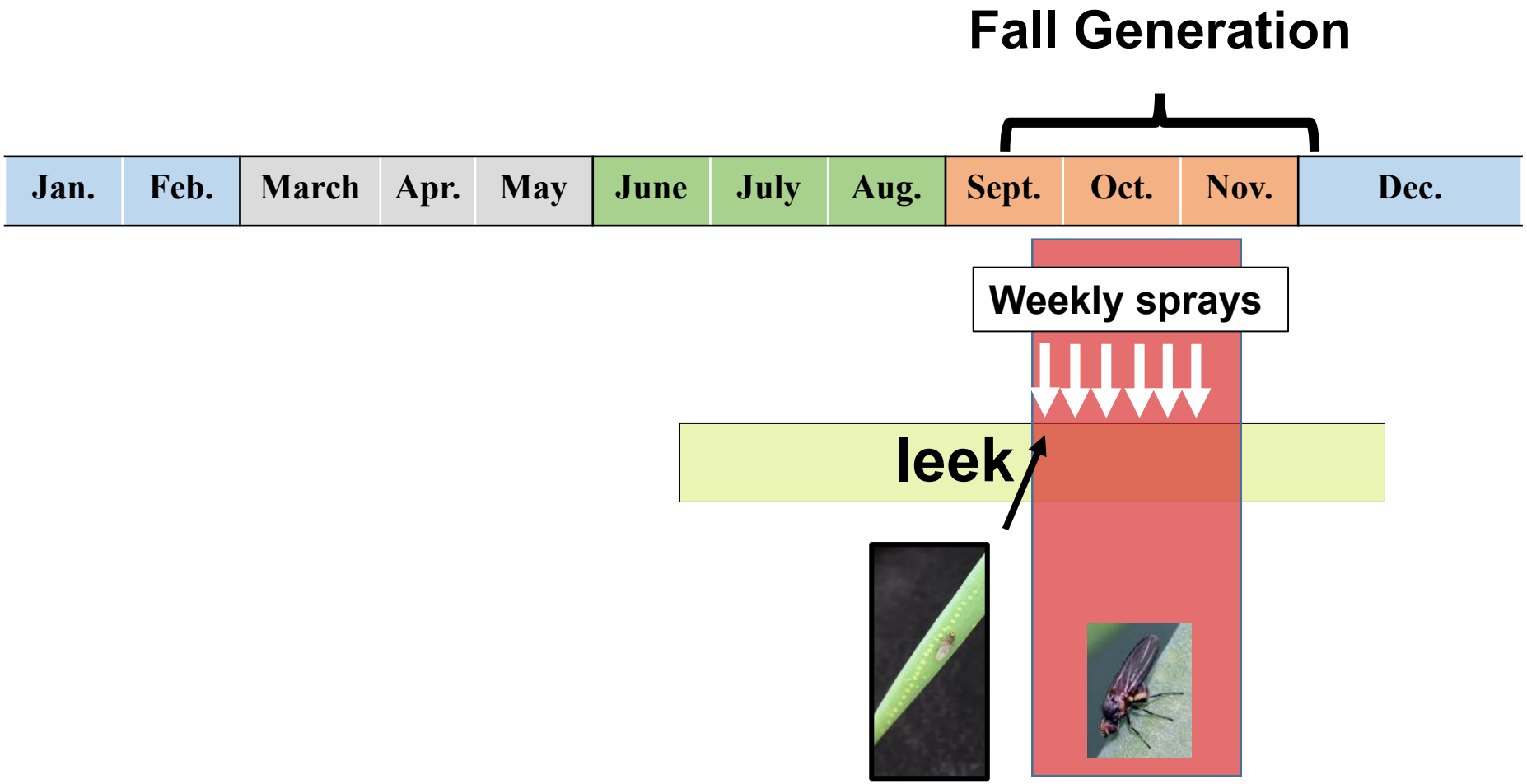
Optimize number of Entrust SC applications for ALM control



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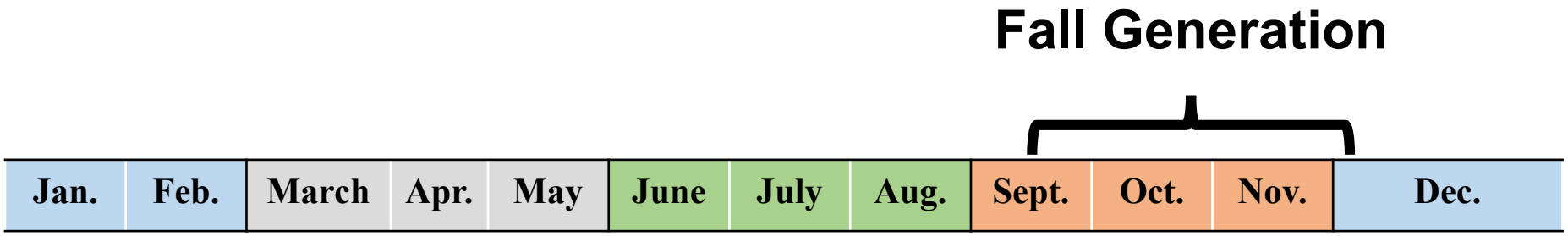
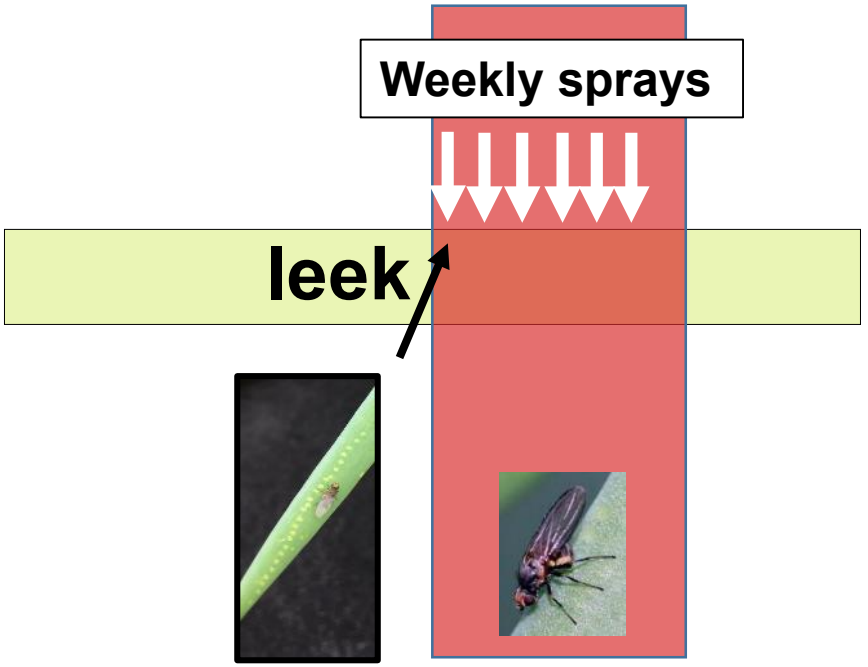


- Number of applications for each product is limited (< 6 sprays)
- Weekly sprays are expensive
- Weekly sprays may not be needed; females likely do not lay eggs in earliest oviposition marks



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Optimizing Entrust applications in leeks for ALM control Hurley, NY 2018

Insecticide timing treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total # sprays
A							
B							
C							
D							
E							
F							
G							
H							
Untreated							

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Optimizing Entrust applications in leeks for ALM control Hurley, NY 2018

Insecticide timing treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total # sprays
A	X	X	X	X	X	X	6
B							
C							
D							
E							
F							
G							
H							
Untreated	-	-	-	-	-	-	0

- Entrust SC applied at 6 fl oz/acre with M-Pede @ 1.5% v:v
- Spray dates Sept. 14, 21, 28 and October 5, 12 and 19

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Optimizing Entrust applications in leeks for ALM control Hurley, NY 2018

Insecticide timing treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total # sprays
A	X	X	X	X	X	X	6
B	X	X					2
C		X	X				2
D			X	X			2
E				X	X		2
F							
G							
H							
Untreated	-	-	-	-	-	-	0

- Entrust SC applied at 6 fl oz/acre with M-Pede @ 1.5% v:v

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RESULTS: Mean % ALM maggot damage in leeks

cv. 'Megaton' Hurley, NY (n = 4) 2018

Insecticide timing treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Mean % damaged plants
A	X	X	X	X	X	X	10 e
B	X	X					91 ab
C		X	X				53 bcd
D			X	X			31 de
E				X	X		48 cd
F	X		X				71 abc
G		X		X			43 cd
H			X		X		46 cd
Untreated	-	-	-	-	-	-	99 a

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Grundberg & Rusinek (unpublished) ***P*<0.0001**

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Transplant application strategies

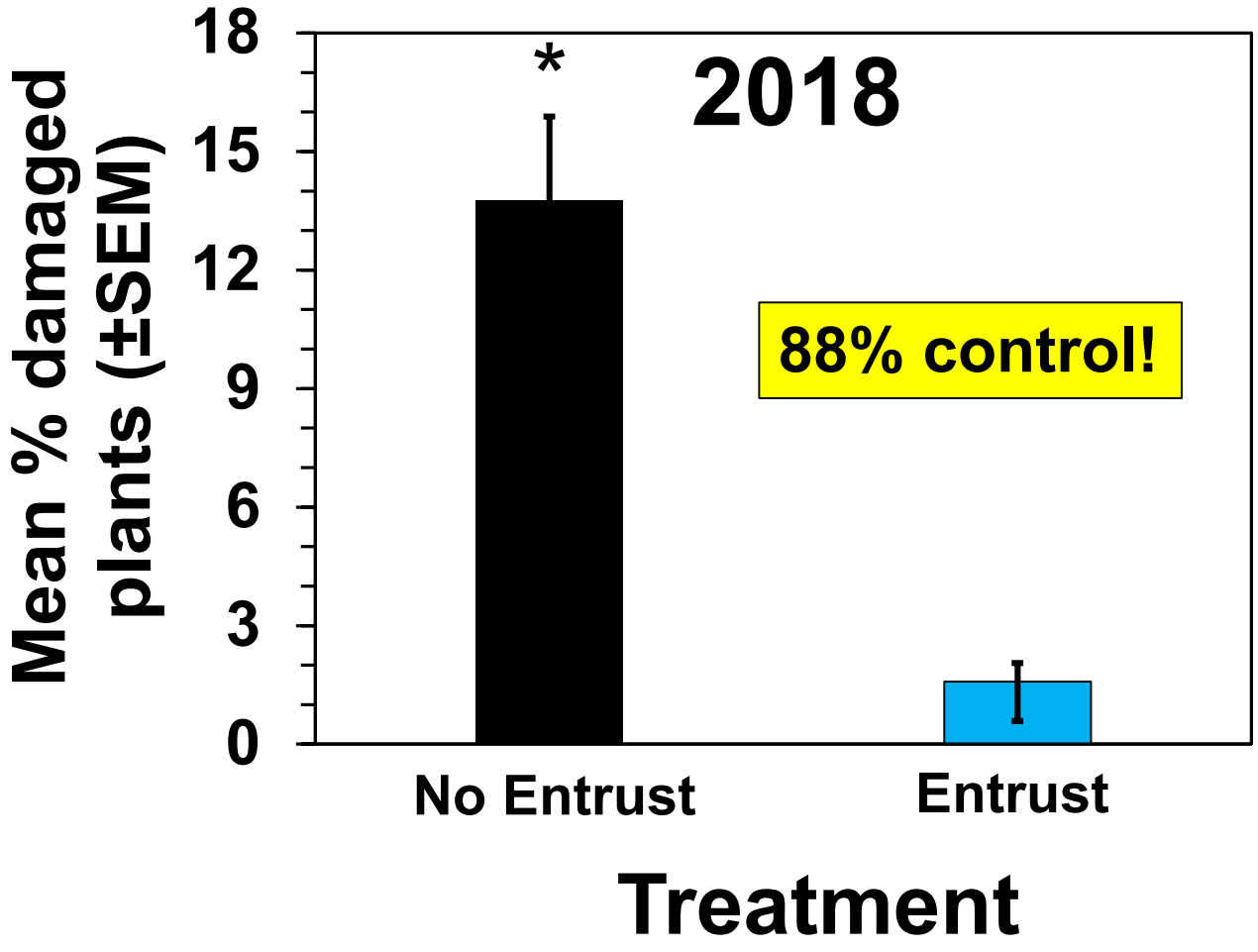
- **Spinosad** (**Entrust SC**) used in all trials @ a rate of 1 fl oz/ 10,000 plants (***this use is not currently labelled***)

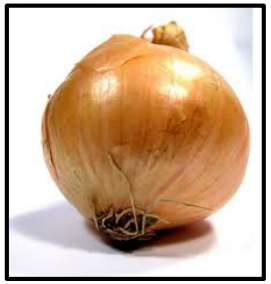
- Two most common **transplant types**

Bare root

Plug plant

RESULTS: Transplant application strategy (bare-root dip) for Allium leafminer control in bulb onions





F=90.6; df= 1, 45; *P*<0.0001

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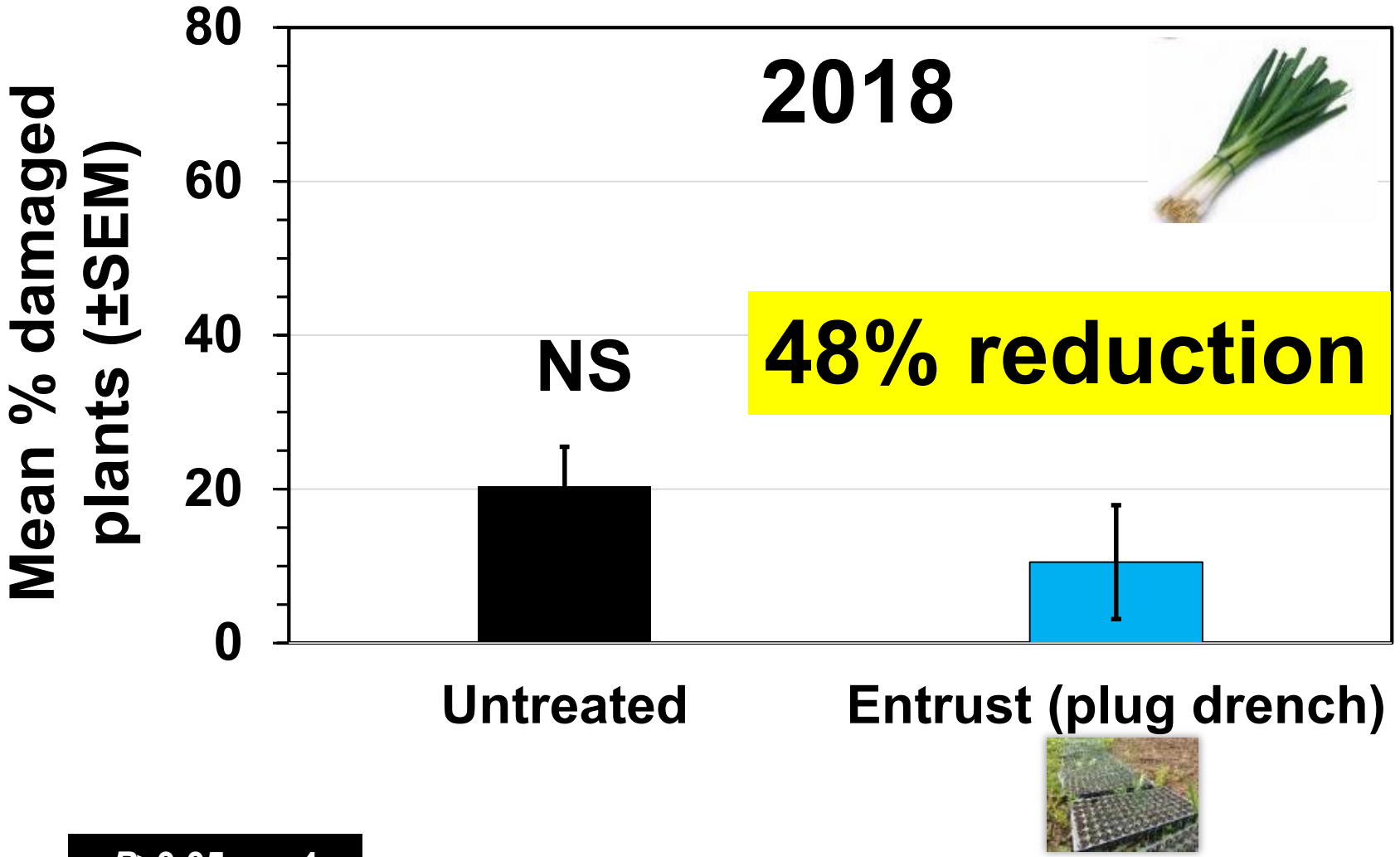
RESULTS: Transplant strategies (plug plant & bare-root) for Allium leafminer control in scallions



P>0.05; n= 4

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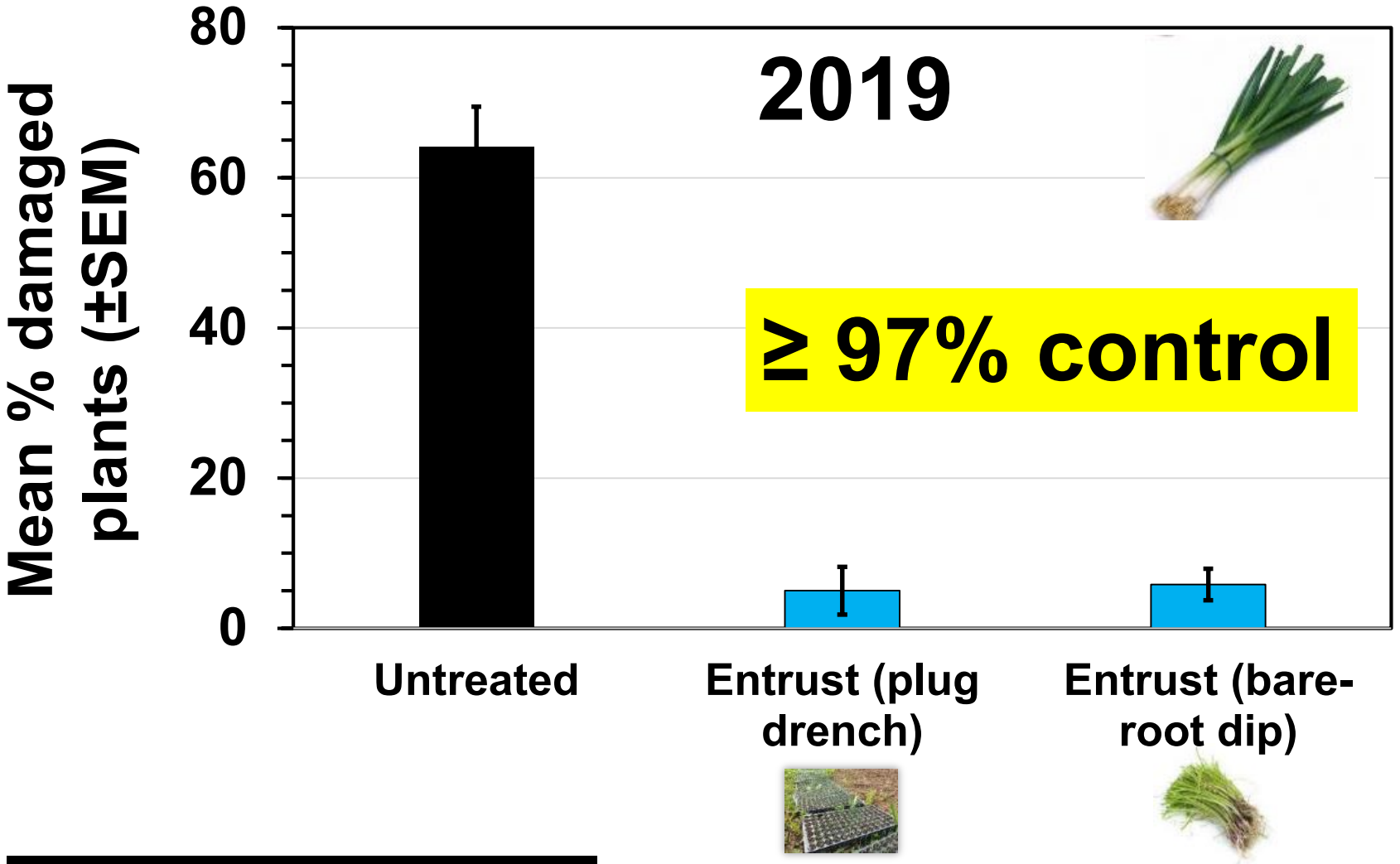
RESULTS: Transplant strategies (plug plant & bare-root) for Allium leafminer control in scallions



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Allium leafminer control summary

- **Important to use multiple management tactics, especially crop rotation and planting date selection**
- **Most consistently effective foliar-applied insecticides**
  - **spinosad (Entrust) [labeled for leafminers on bulb vegetables]**
- **Two well-timed Entrust SC applications were effective**
- **Spinosad (Entrust SC) was effective as a bare-root dip and plug plant drench treatment (*but not labeled for this use…yet*)**

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