Flies in the ointment: Update on onion maggot and Allium leafminer management

2020 Empire State Producers EXPO
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Brian Nault, Dept. of Entomology, Cornell University, Cornell AgriTech, Geneva, NY; ban6@cornell.edu

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Topics

Onion maggot

- Current insecticide options
- Insecticide resistance management guidelines

Allium leafminer

- Distribution and life history
- Current insecticide options

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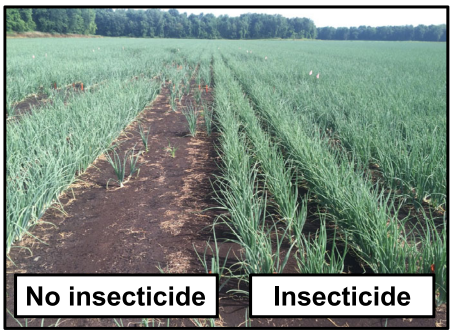
Onion maggot

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



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Insecticides registered on onion for onion maggot control

Product	Active Ingredient(s)	Class (IRAC[2] group)	Application Type
FarMore FI500	thiamethoxam + spinosad	Neonicotinoid **(4A)** + Spinosyn **(5)**	Seed treatment
Regard SC[3]	spinosad	Spinosyn **(5)**	Seed treatment
Sepresto 75WS	clothianidin + imidacloprid	Neonicotinoid **(4A)** + Neonicotinoid **(4A)**	Seed treatment
Trigard OMC	cyromazine	Triazine **(17)**	Seed treatment
Diazinon AG500 and OLF[1]	diazinon	Organophosphate **(1B)**	Pre-plant broadcast & incorporate
Lorsban Advanced and OLF[1]	chlorpyrifos	Organophosphate **(1B)**	At planting in-furrow, or Post-plant band

[1]OLF: other labeled formulation.
[2]IRAC: Insecticide resistance action committee
[3]OMRI-Listed

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EPA Environmental Protection Agency

- EPA has threatened to pull all food uses for chlorpyrifos (e.g., Lorsban), including onion.
- NY chose NOT to ban Lorsban, but its use will be further restricted. <u>Does it really matter for onion growers</u>?

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Is Lorsban needed for maggot control?

- Evaluate efficacy of Trigard OMC seed treatment alone, FarMore FI500 seed treatment alone and both co-applied with chlorpyrifos (Lorsban)

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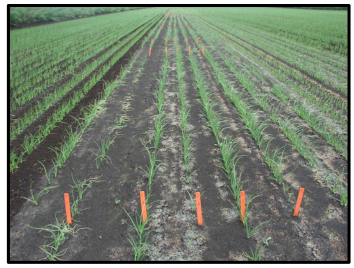
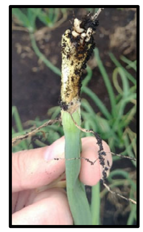
Seed treatment studies

- Plots were 30-ft long and treatments replicated 5 times
- **Chlorpyrifos (Lorsban Advanced) applied as a drench at planting @ 32 fl oz/acre**
- Seeds were treated commercially
- Numbers of field trials
  - **Trigard OMC** n=26 (2002-2016)
  - **FarMore FI500** n=5 (2012-2016)
- Numbers of onion plants dead or dying from maggots assessed 1-2 times per week during first generation





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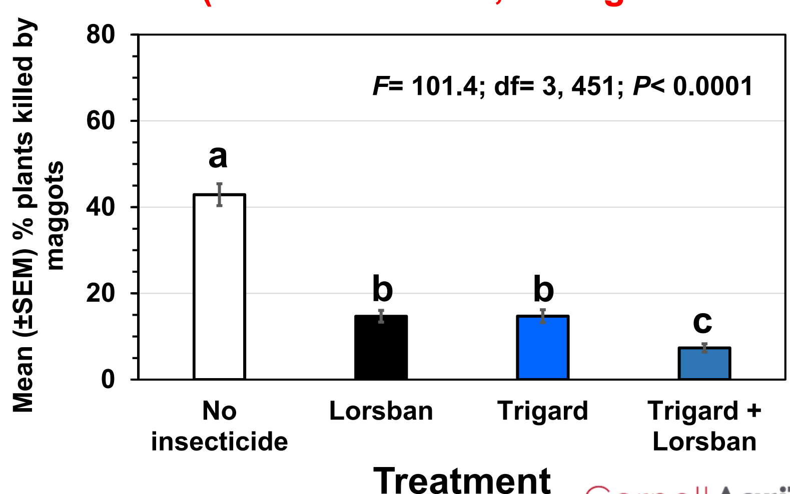
Onion maggot control using insecticides in direct-seeded onion

2002-2016 (n = 26 data sets; all regions in NY)



Note: Lorsban applied @ 1 qt/acre

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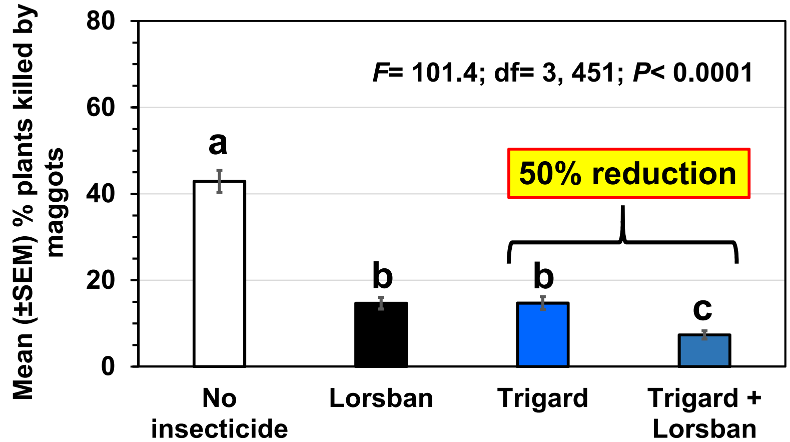

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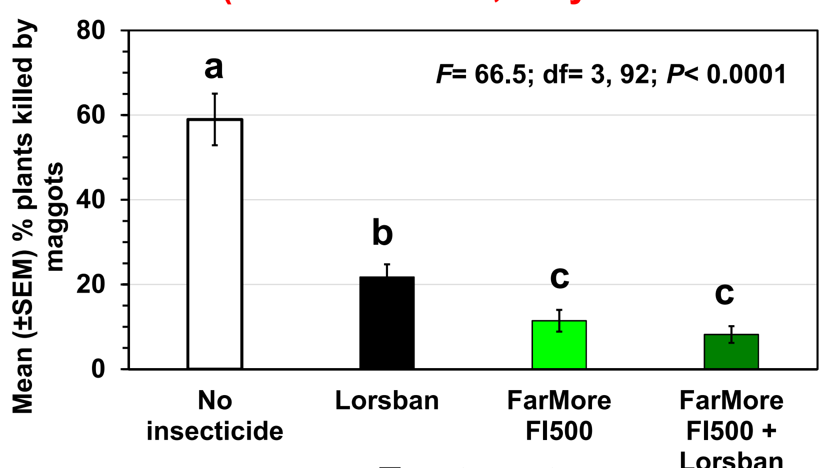

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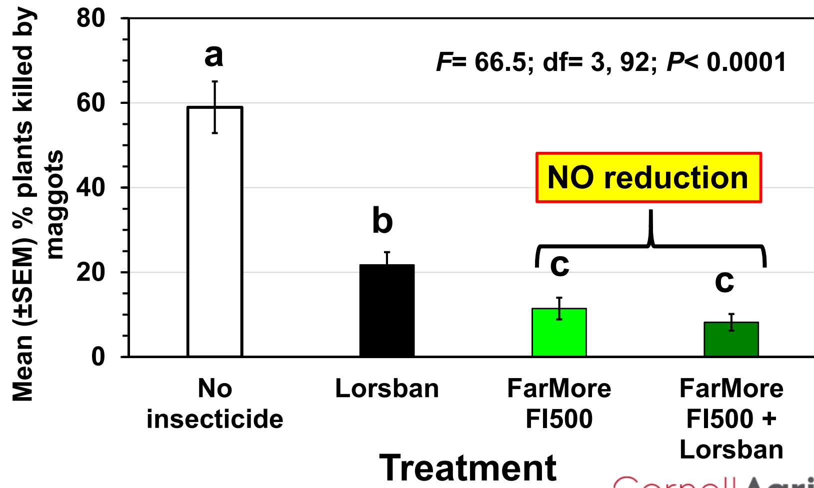

Note: Lorsban applied @ 1 qt/acre

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Is Lorsban needed for maggot control?

- **Answer: Yes and No**
  - **Better onion maggot control when Lorsban was combined with Trigard, but not when it was combined with FarMore FI500**

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So the realistic options for maggot control are…

- **FarMore FI500 seed treatment**
  (spinosad kills onion maggot and seedcorn maggot; thiamethoxam kills seedcorn maggot)

- **Trigard OMC + chlorpyrifos (Lorsban) drench**
  (anecdotally - Trigard kills onion maggot, while Lorsban kills seedcorn maggot)

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A"new" seed treatment option exists for onion maggot

"New" FarMore FI500 seed treatment package:

· Dynasty seed treatment fungicide
· Maxim 4FS seed treatment fungicide
· Apron XL seed treatment fungicide
· Cruiser 70WS seed treatment insecticide
· **Trigard OMC seed treatment insecticide**

*Lorsban not needed

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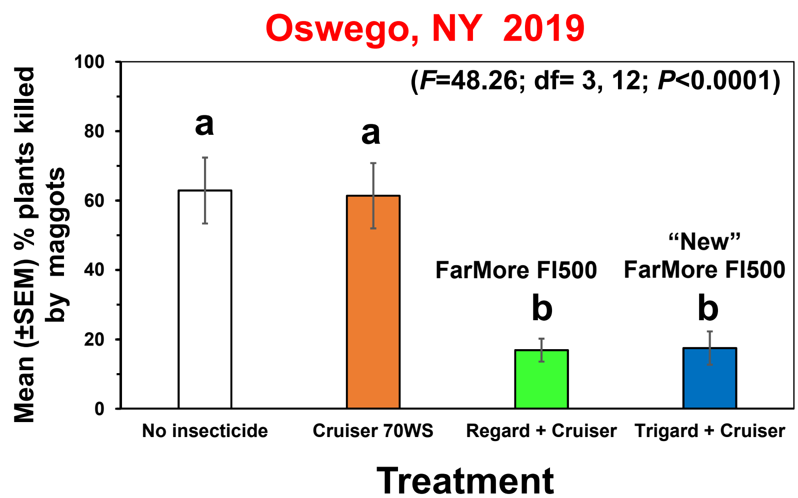

Notes: Apron XL, Maxim 4 FS and Dynasty on all; Dithane F-45 Rainshield used; Lorsban not included

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Insecticide Resistance Management (IRM) Principles

- **Minimize insecticide use; consider non-chemical tactics**
- **Do not use more than one class of chemistry per insect generation**
- **Rotate classes of chemistry (Regard & Trigard)**

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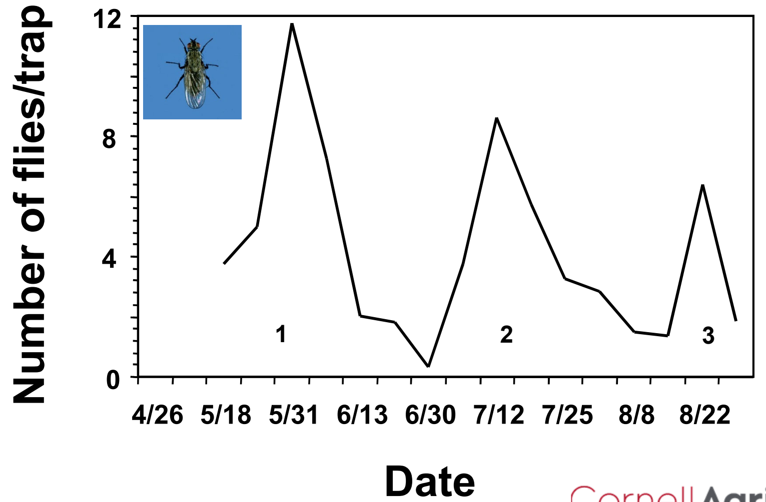
Seasonal Activity of Onion Maggot Adults In New York (3 generations)



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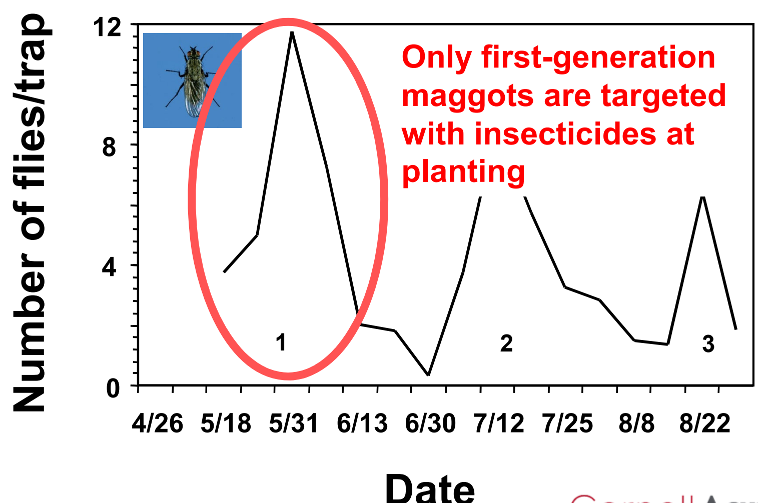

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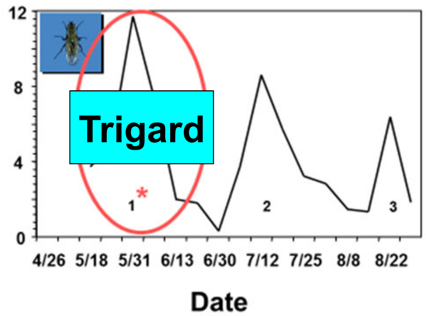
Annually rotate insecticide seed treatments to slow down resistance

2020



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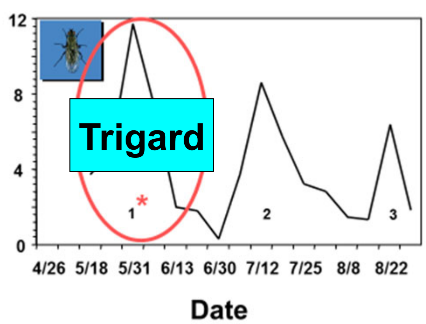
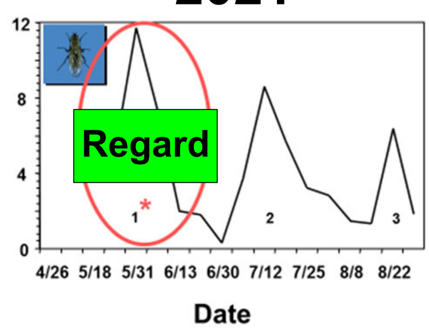
Annually rotate insecticide seed treatments to slow down resistance

2020 **2021**





*** Only 1 of 6 generations will be exposed to the same insecticide in 2 yrs**

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Onion Maggot IRM Plan

Year 1	Year 2	Year 3	Year 4
Trigard	Regard	Trigard	Regard

- Annually rotate onion seed treated with Trigard OMC and Regard SC
- Coordinate these efforts in locations where neighboring fields are planted by multiple growers

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Options for onion maggot control in transplanted onions?

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Insecticide options for onion maggot control in <u>transplanted</u> onions

- Lorsban Advanced or OLF
  - not effective (i.e., resistance)
  - likely banned soon

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Could Entrust SC protect transplants from onion maggot?

Dipping bare-root onion plants in Entrust solution

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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*
No insecticide	-	-
Entrust SC	spinosad	1 fl oz/10,000 plants
Entrust SC	spinosad	2 fl oz/10,000 plants
Radiant SC	spinetoram	1 fl oz/gal of water

* 1.25 gallons of solution will treat 10,000 bare-root plants

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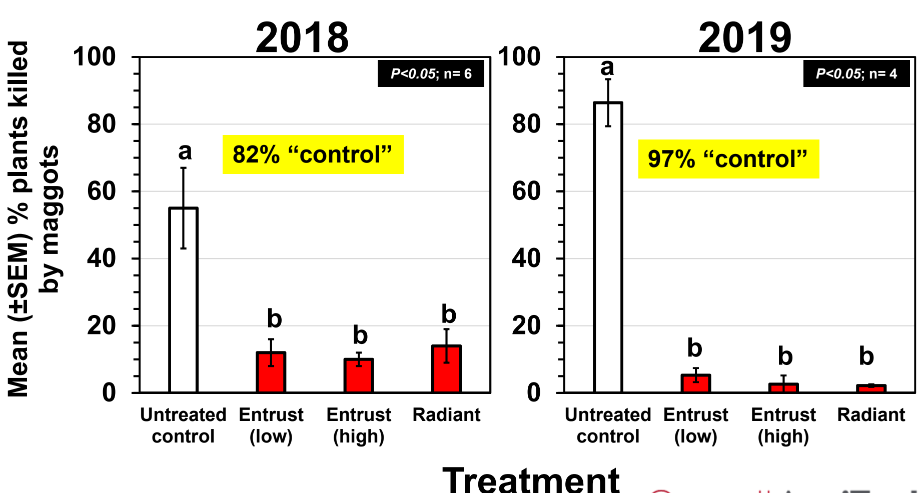

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Onion maggot control summary

- Lorsban not needed with FarMore FI500
- Lorsban added to Trigard improved control
- "New" FarMore FI500 with Trigard should not need Lorsban
- Mitigate resistance by annually rotating Trigard and Regard
- Entrust SC may be a future option for protecting onion transplants

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Topics

Onion maggot

- Current insecticide options
- Insecticide resistance management guidelines

Allium leafminer

- Distribution and life history
- Current insecticide options

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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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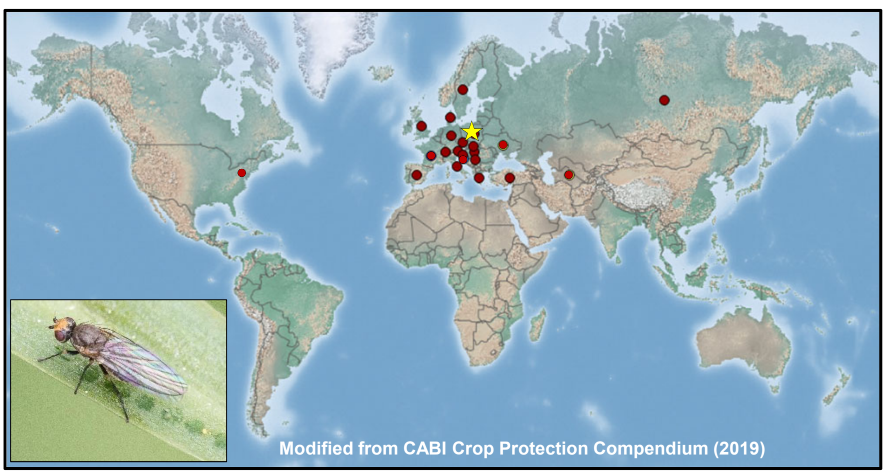
World distribution of Allium leafminer



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

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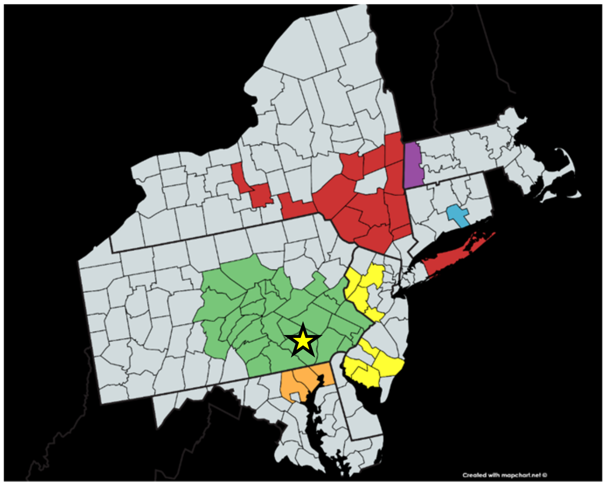
North American distribution of Allium leafminer



- ☆ 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

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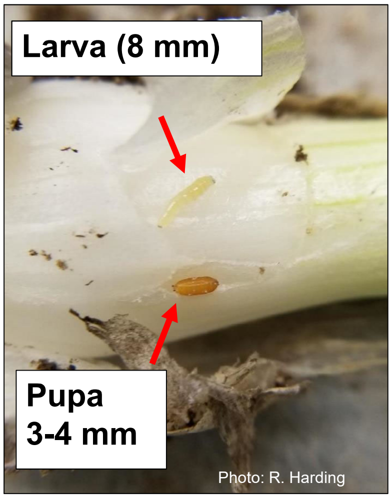
Damage by Allium leafminer



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

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Allium leafminer has caused severe crop losses on small farms

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Damage by Allium leafminer

Bulb onion

- Economic loss from ALM damage has not occurred in conventional bulb onion fields
- ALM infested onion bulbs are rare

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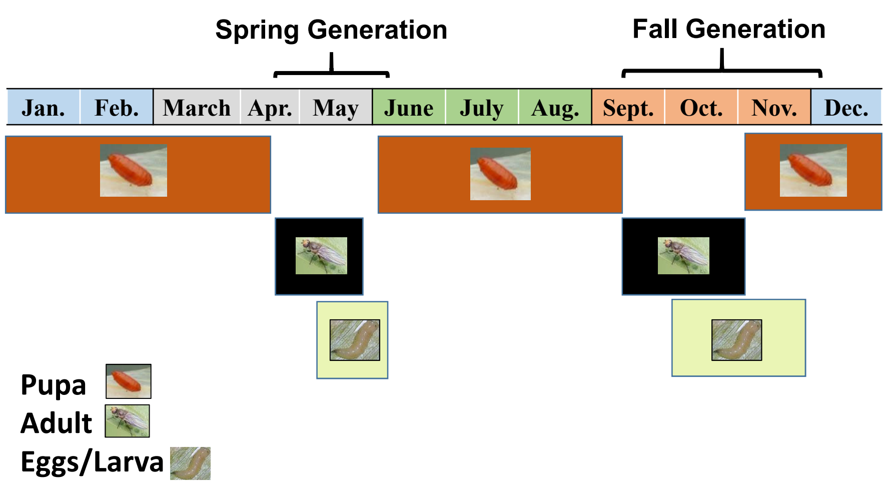
Life Cycle of Allium leafminer in Northeastern US



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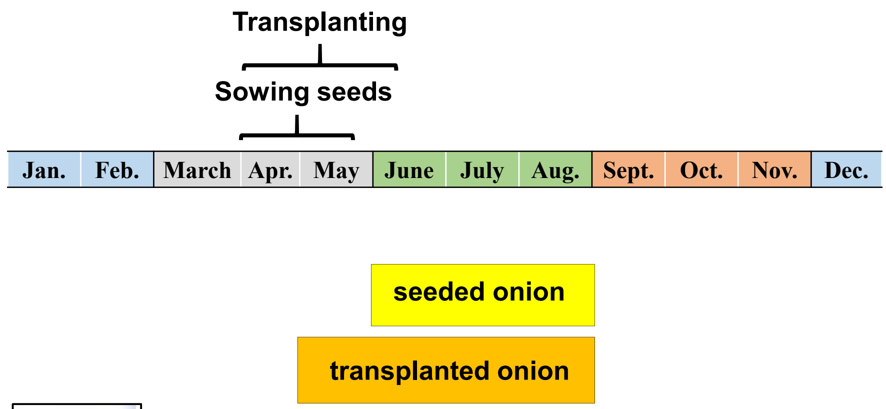
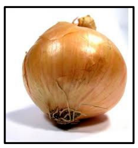
Bulb onion foliage availability for ovipositing Allium leafminer in Northeastern US





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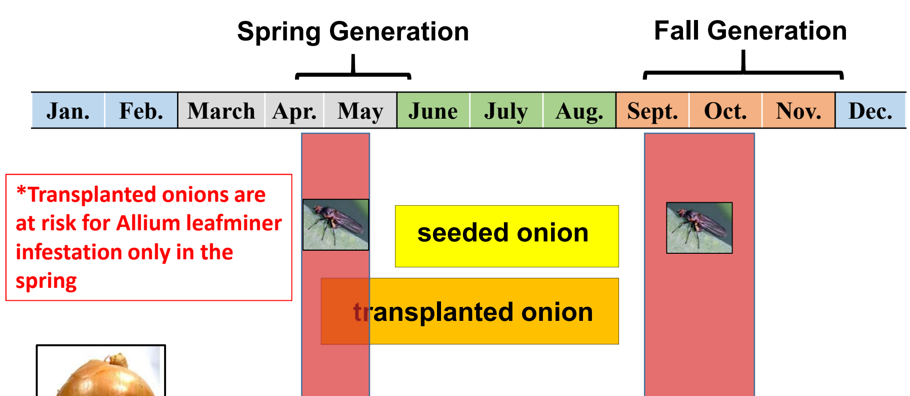

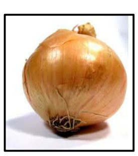

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Insecticides for Allium leafminer control in Europe

- 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

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

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What insecticides and delivery strategies best control ALM?

- Identify effective insecticides (conventional and OMRI-Listed)
- Evaluate foliar applications and at-plant transplant treatments

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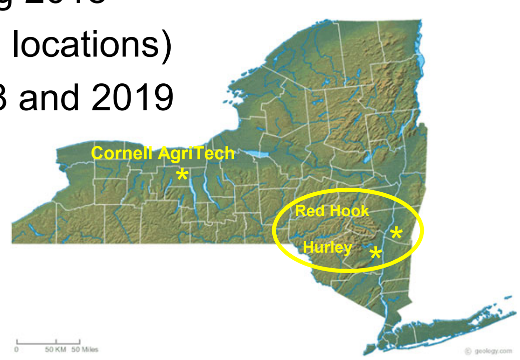
Locations

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	OMRI LISTED	IRAC Group	# of trials
abamectin	Agri-Mek SC	no	6	3
acetamiprid	Assail 30SG	no	4A	3
azadirachtin*	Aza-Direct	yes	unknown	4
azadirachtin + pyrethrin*	Azera	yes	unknown + 3A	1
cyantraniliprole	Exirel	no	28	4
cyromazine	Trigard	no	17	3
dinotefuran	Scorpion 35SL	no	4A	4
imidacloprid	Admire Pro	no	4A	3
kaolin clay*	Surround WP	yes	unknown	1
lambda-cyhalothrin	Warrior II w/zeon tech.	no	3A	3
methomyl	Lannate LV	no	1A	2
pyrethrin*	PyGanic Specialty	yes	3A	4
spinetoram	Radiant SC	no	5	4
spinosad*	Entrust SC	yes	5	3
spirotetramat	Movento	no	23	1

[1]Conventional products co-applied with LI-700; OMRI products co-applied with either Nu-Film or M-Pede

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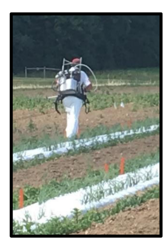
Foliar application strategy

- 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**



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RESUTS: Foliar application strategy for Allium leafminer control

Active ingredient	Product	OMRI LISTED	% trials significantly reduced damage	Mean % control
dinotefuran	Scorpion 35SL	no	100 (n=4)	89
cyantraniliprole	Exirel	no	75 (n=4)	84
spinetoram	Radiant SC	no	75 (n=4)	78
methomyl	Lannate LV	no	50 (n=2)	85
lambda-cyhalothrin	Warrior II w/zeon tech.	no	33 (n=3)	79
acetamiprid	Assail 30SG	no	33 (n=3)	78
cyromazine	Trigard	no	33 (n=3)	68
spinosad*	Entrust SC	yes	25 (n=4)	70
abamectin	Agri-Mek SC	no	0 (n=3)	69
imidacloprid	Admire Pro	no	0 (n=3)	59
kaolin clay*	Surround WP	yes	0 (n=1)	44
spirotetramat	Movento	no	0 (n=1)	35
azadirachtin + pyrethrin*	Azera	yes	0 (n=1)	22
azadirachtin*	Aza-Direct	yes	0 (n=4)	10
pyrethrin*	PyGanic Specialty	yes	0 (n=4)	0

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

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imidacloprid	Admire Pro	no	0 (n=3)	59
kaolin clay*	Surround WP	yes	0 (n=1)	44
spirotetramat	Movento	no	0 (n=1)	35
azadirachtin + pyrethrin*	Azera	yes	0 (n=1)	22
azadirachtin*	Aza-Direct	yes	0 (n=4)	10
pyrethrin*	PyGanic Specialty	yes	0 (n=4)	0

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

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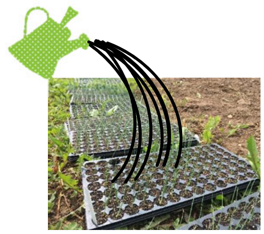
Transplant application strategies

- **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



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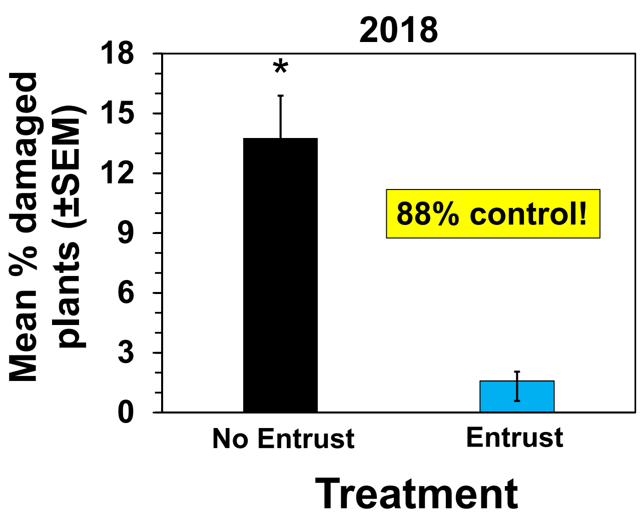
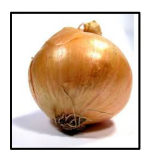
RESULTS: Transplant application strategy (bare-root dip) for Allium leafminer control in bulb onions





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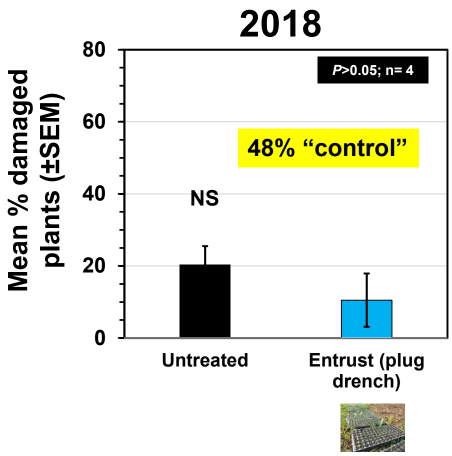
RESULTS: <u>Transplant strategies (plug plant)</u> for Allium leafminer control in scallions



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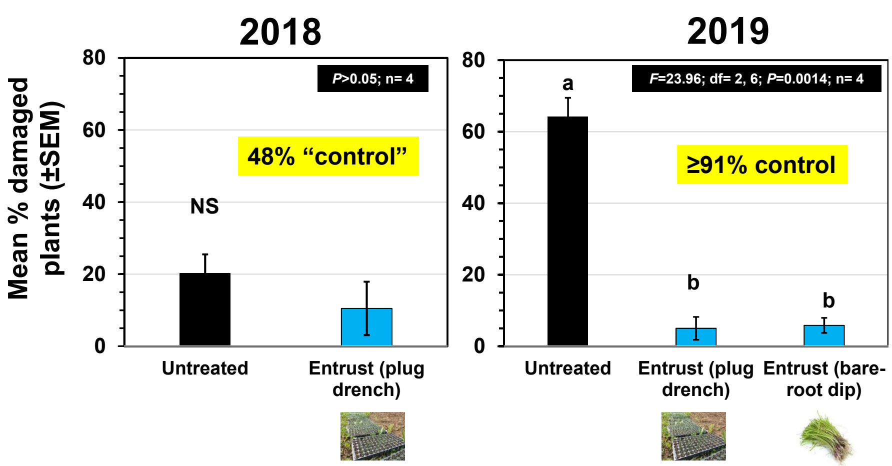
RESULTS: <u>Transplant strategies (plug plant & bare-root)</u> for Allium leafminer control in scallions



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Allium leafminer control summary

- Transplanted onions at greater risk than direct-seeded
- Most consistently effective foliar-applied insecticides
  - cyantraniliprole (Exirel)
  - dinotefuran (Scorpion 35SL)
  - spinetoram (Radiant SC)
  - spinosad (Entrust) (best OMRI-Listed product evaluated)
- *Note*: all are labeled for leafminers on bulb vegetables; Scorpion is not labelled in NY
- 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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