Strategies & Opportunities in Leek Moth Management

THE UNIVERSITY OF VERMONT
AGRICULTURE & LIFE SCIENCES

ALC AGROECOLOGY & LIVELIHOODS COLLABORATIVE

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“The story of leek moth is a story that we growers face on a seemingly increasing frequency: an invasive pest arrives about which we know little and have few strategies to control…”
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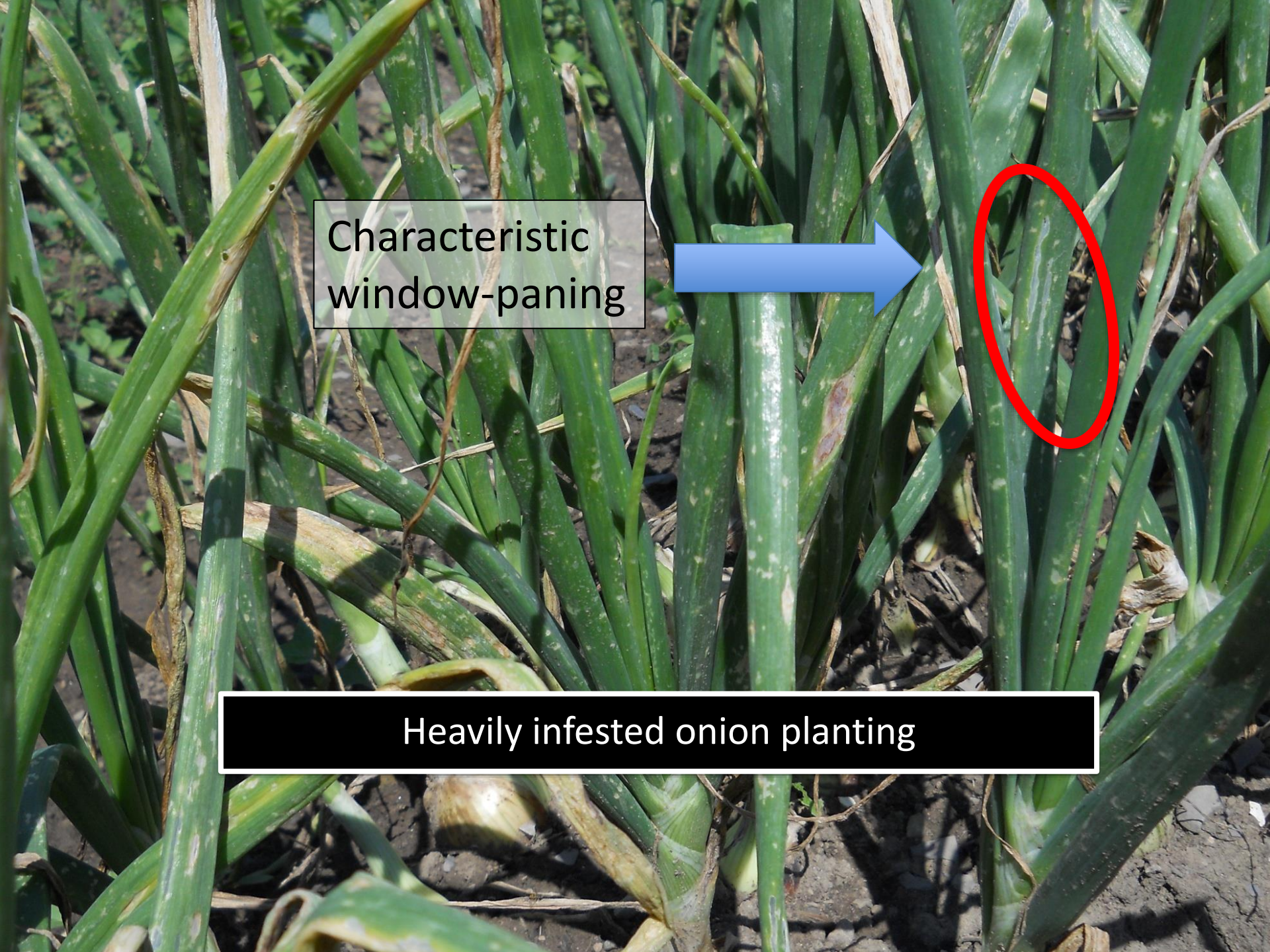
Leek Moth - *Acrolepiosis assectella*

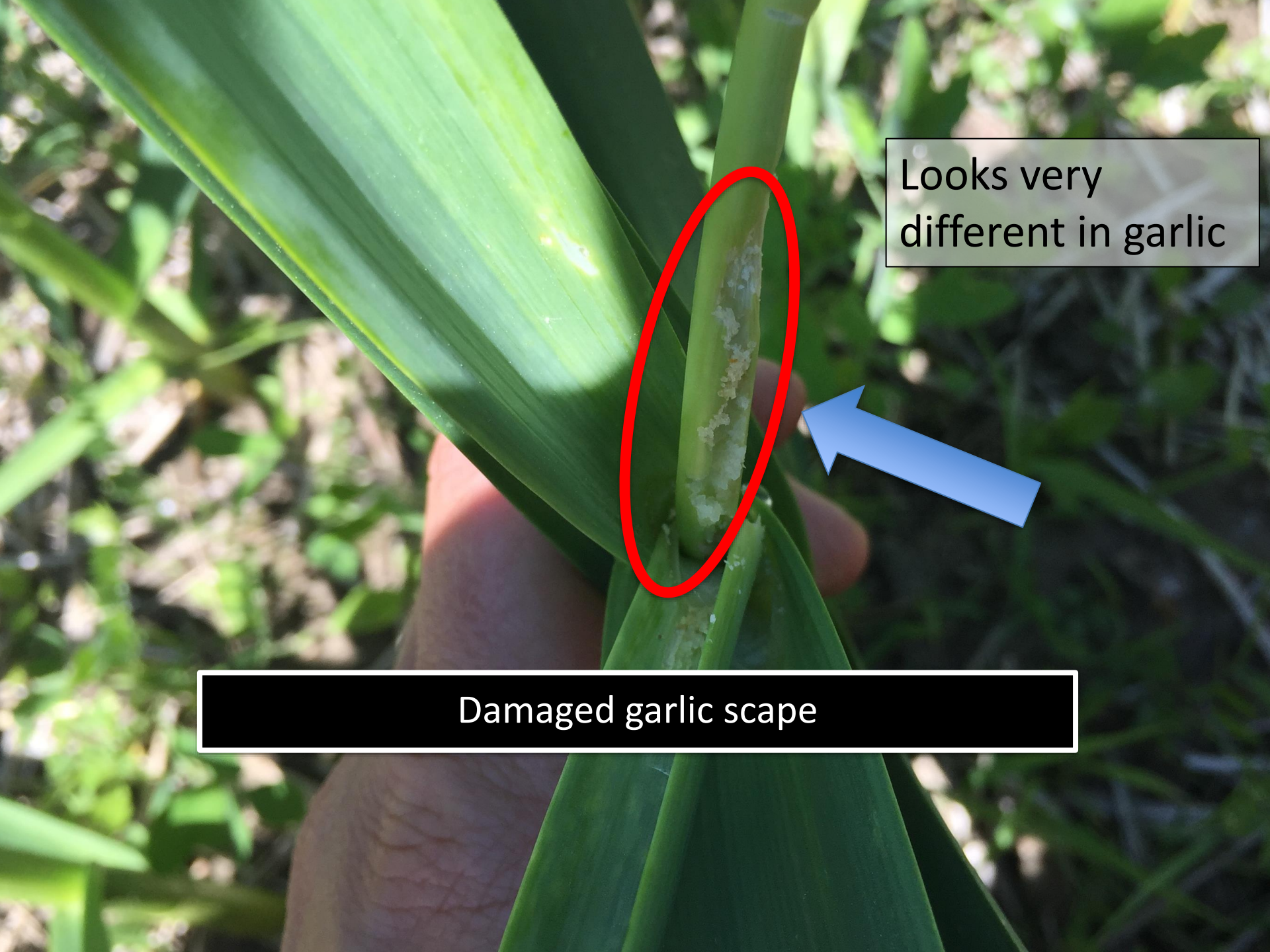
Recent invasive in USA (2009)

Pest of all allium crops

Pseudo-leaf miner

Multi-voltine (3-4 flights/year)


Characteristic window-paning
Heavily infested onion planting


Looks very different in garlic
Damaged garlic scape

Life Cycle

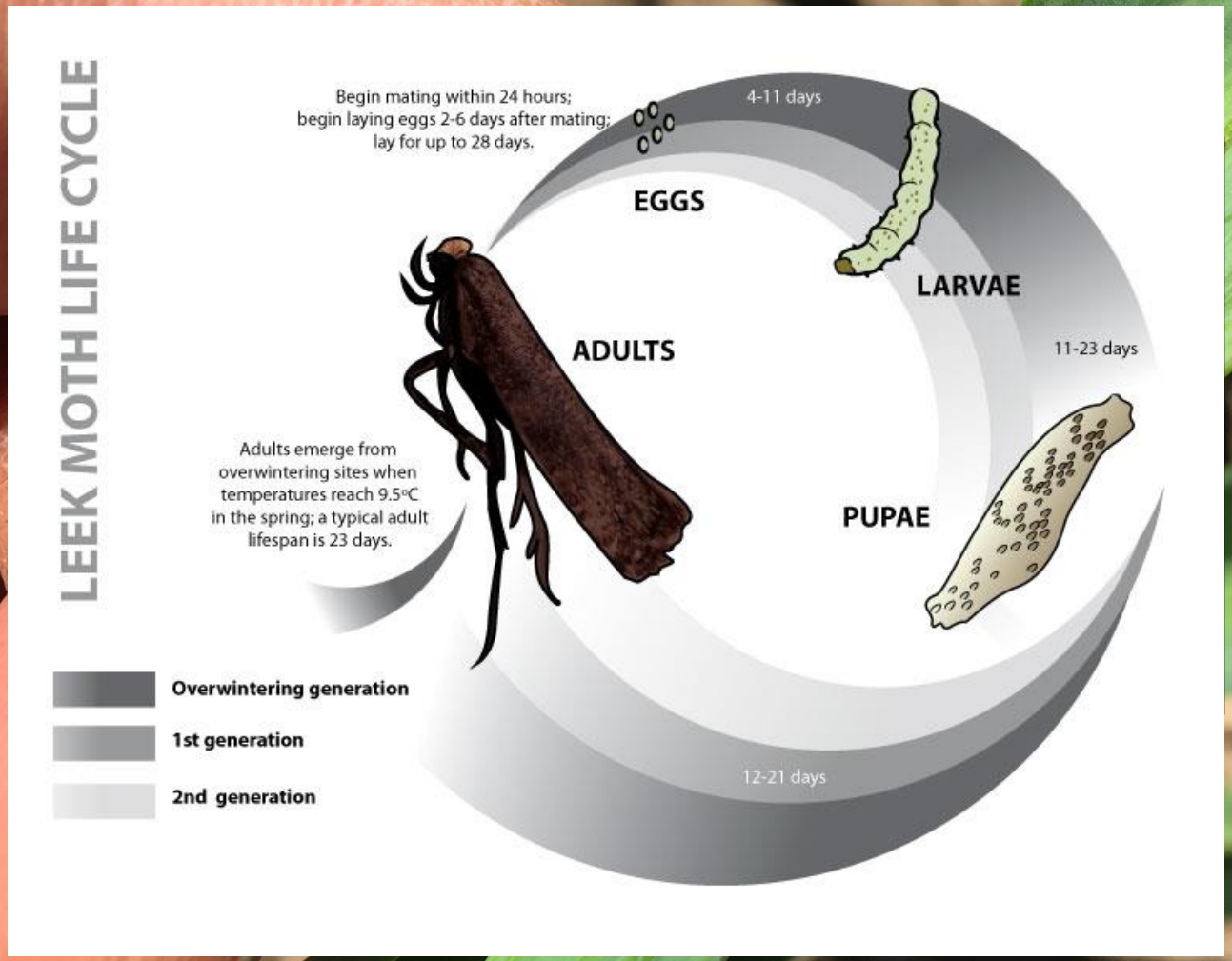
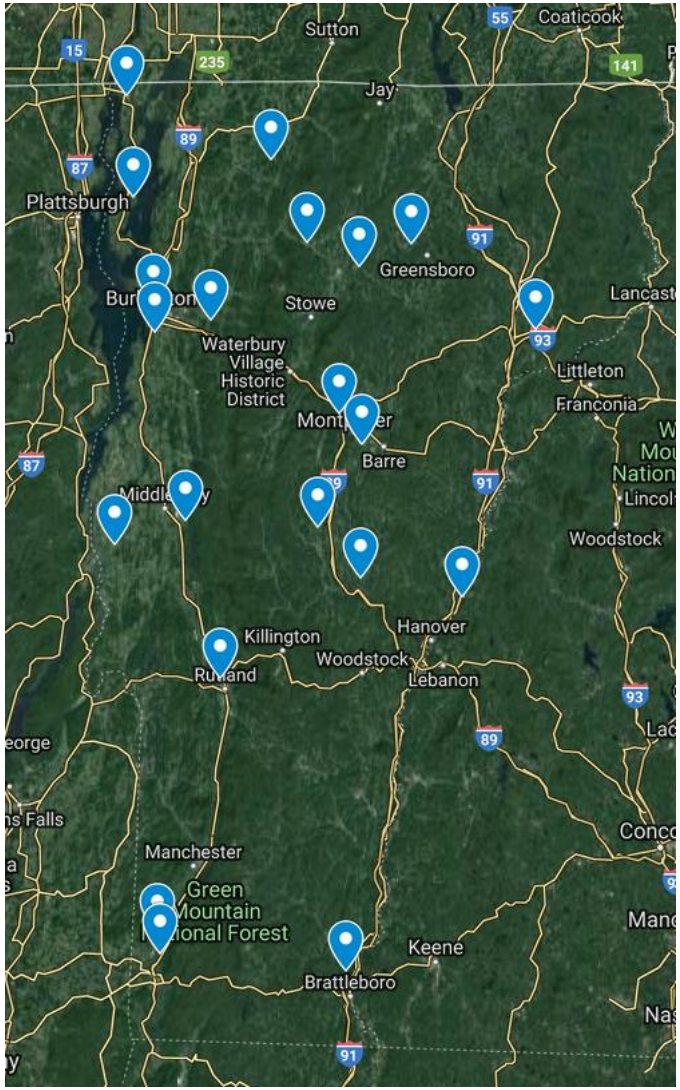
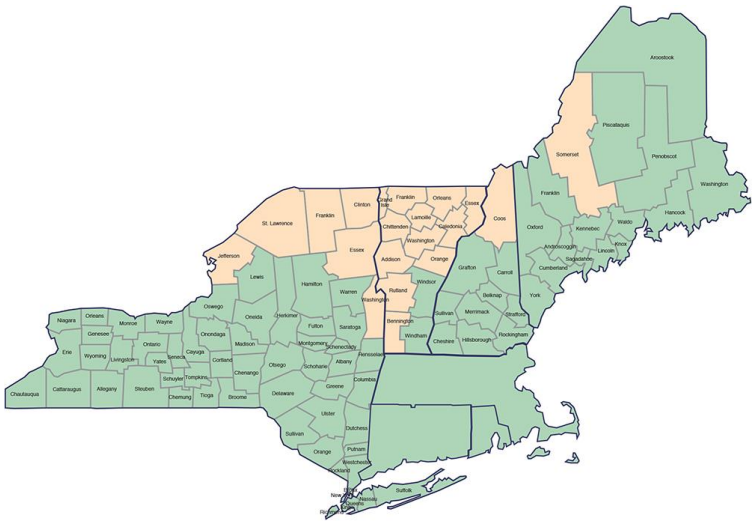


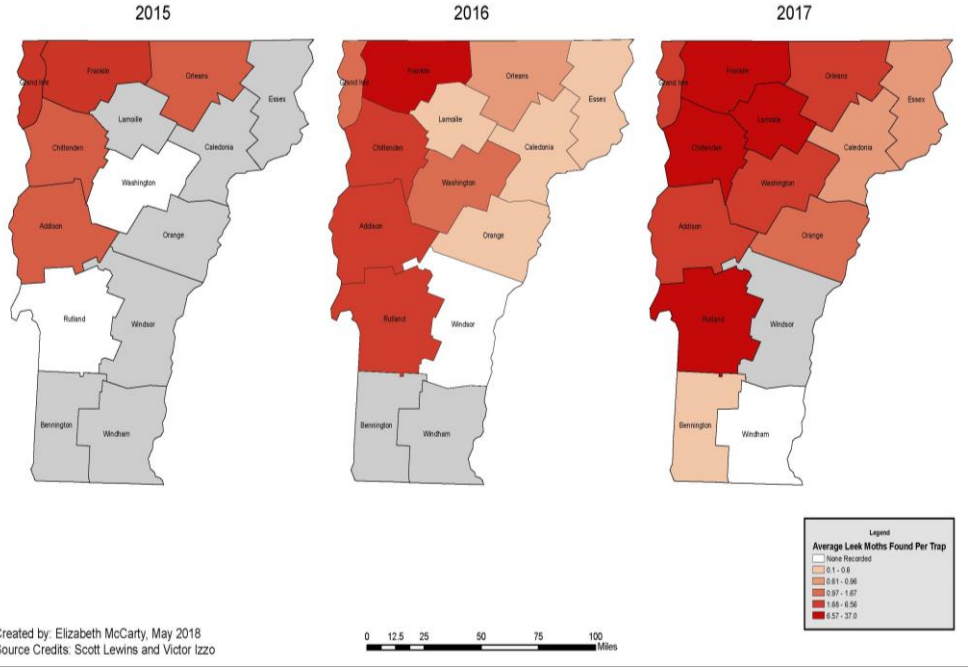
Figure 10. Leek moth larva.
Source: Andrea Brauner, Agriculture and Agri-Food Canada

Statewide Leek Moth Monitoring (2015-2018)

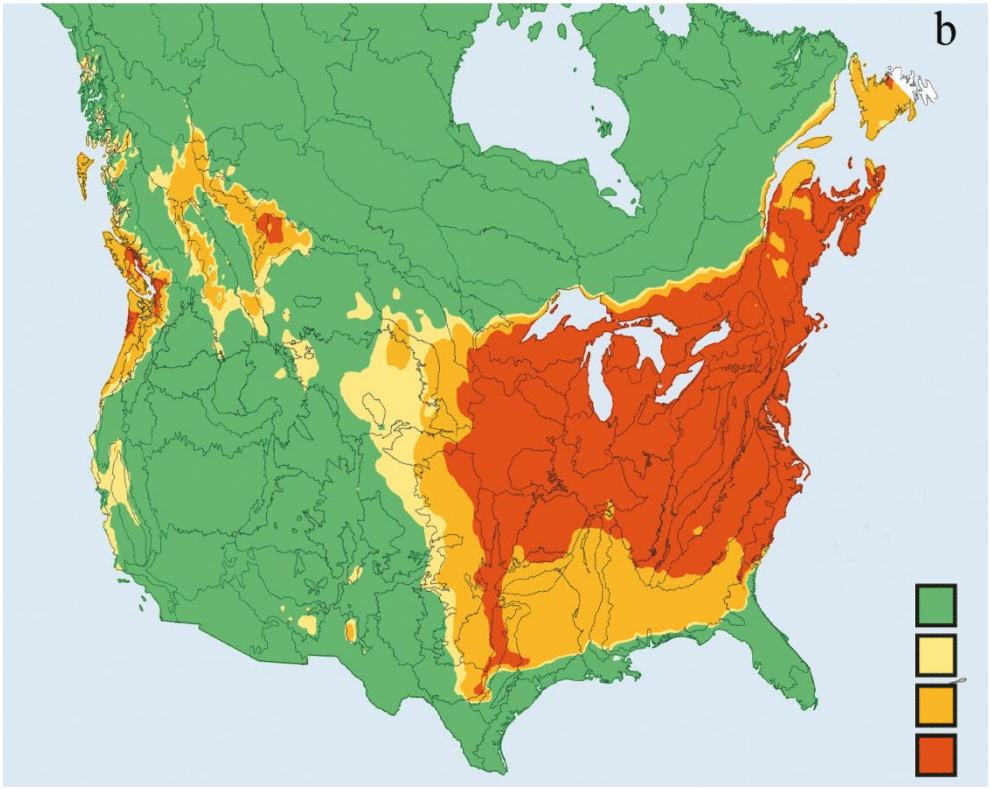


Current Distribution





Potential Distribution



Mason et al. 2011

Current Management: Cultural Controls

- Pheromone-baited monitoring traps
- Floating row cover or insect netting
  - can be easily removed during the day for weeding
  - can be paired with plastic mulch
  - may not work as you scale up

Photo: Andrea Brauner

Current Management: Chemical Controls

Olmstead & Shelton 2012

Insecticide	Label rate/h[a]	Rate g (AI)/ha	2 DAT % mortality (±SE)[bc]	4 DAT % mortality (±SE)[bc]	8 DAT % mortality (±SE)[bc]
Lambda-cyhalothrin (Warrior II)	0.140 L	35.0	96.3 ± 3.7 aA	81.0 ± 9.9 aB	66.7 ± 5.4 bC
spinetoram (Radiant SC)	0.730 L	182.1	92.6 ± 4.9 aA	95.2 ±4.8 aA	91.7 ± 5.4 aA
methomyl (Lannate LV)	3.505 L	874.3	81.5± 8.1 abA	85.7 ± 6.7 aA	83.4 ± 8.9 abA
chlorantraniliprole (Coragen)	0.365 L	127.5	77.8 ± 7.8 abA	90.5 ± 6.1 aA	91.7 ± 5.4 aA
spinosad (Entrust)	0.140 Kg	168.1	66.7 ± 7.8 bA	71.4 ± 15.3 aA	70.9 ± 9.8 abA
Bt aizawai (Agree WG)	2.243 Kg	1120.8	14.8 ± 8.1 cA	9.5 ± 6.2 bA	16.7 ±6.3 cA
azadirachtin (Neemix 4.5)	0.511 L	127.5	11.1 ± 5.6 cA	14.3 ±6.7 bA	12.5 ± 8.8cA
Bt kurstaki (DiPel DF)	1.121 Kg	605.3	11.1 ± 5.6 cA	14.3 ± 9.9 bA	12.5 ± 6.1cA
untreated check	—	—	14.8 ± 8.1 cA	19.1 ± 9.9 bA	16.7 ± 12.6cA

Spinosad (Entrust) only organic insecticide shown to be effective

2017/18 Onion Varietal Trial

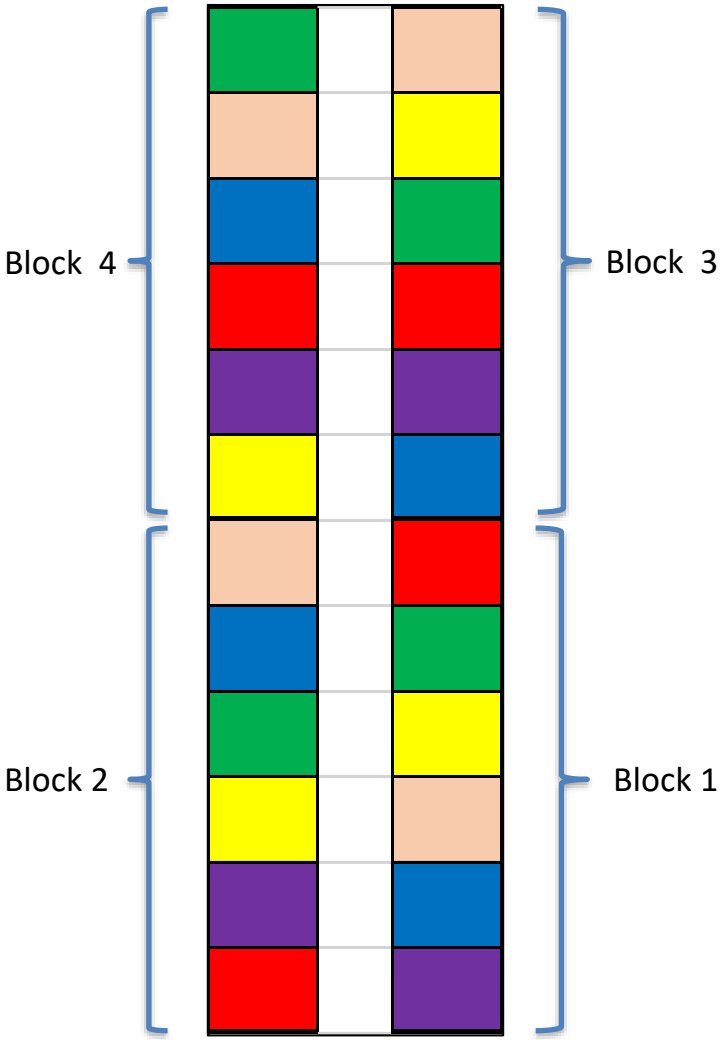
How do yellow and red onion varietals differ in tolerance and/or resistance to leek moth pest pressure?

Table 1. Onion cultivars evaluated in field trials (2017-2019)

Onion Cultivar	Variety (Red or Yellow)	Time to Maturity (Days)	Experiment Year
Bridger	Yellow	90	2017
Cortland	Yellow	105	2017
Patterson	Yellow	104	2017
Pontiac	Yellow	108	2017
Sedona	Yellow	108	2017, 2019
Yankee	Yellow	108	2017
Cabernet	Red	100	2018
Monastrell	Red	106	2018
Red Baron	Red	115	2018
Red Carpet	Red	115	2018
Redwing	Red	118	2018, 2019
Rossi di Milano	Red	110	2018

Randomized Complete Block Design

Red (2018)	Yellow (2017)
Rossa di Milano	Bridger
Cabernet	Cortland
Monastrell	Patterson
Red Carpet	Pontiac
Red Baron	Sedona
Redwing	Yankee

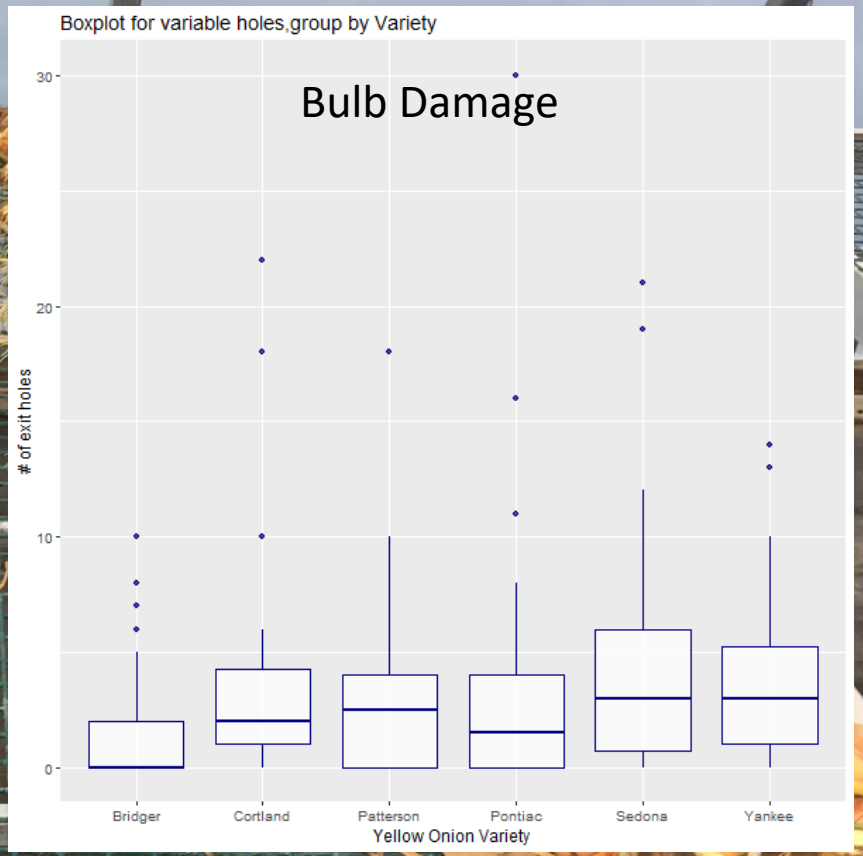


90 Onions/Plot

Results: Leaf and Bulb Damage (Incidence)

Leaf Damage

- Yellow onions displayed **>70% leaf damage** across all later maturing varieties.
- Red onions exhibited less **than 10% incidence** of above ground damage and virtually no bulb damage.



Subsequent Research Questions:

1. Are red onions less susceptible?
2. Are leaf tubes housing LM larvae that are causing storage damage in bulbs?

Bridger incurred significantly less bulb damage (mean = 30%) as compared to other storage onions

2019 Red vs. Onion Varietal Trials

Sedona

Significantly higher incidence of leaf damage in yellow onions

Redwing

All damaged onions exhibited higher mass

Anova Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Damage	1	0.2746	0.2746	4.3979	0.0378 *
Onion_Variety	1	8.2086	8.2086	131.4798	<.001***
Residuals	137	8.5533	0.0624	NA	NA

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

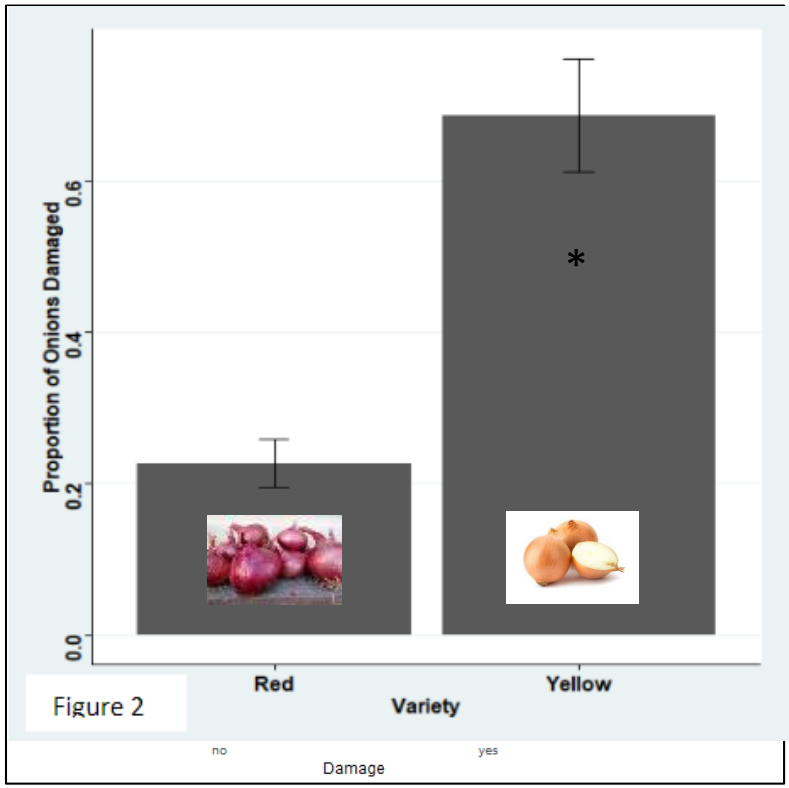


Figure 2

Leaf Damage

Post Harvest Handling in Onions

Onion Topping

Treatments (performed at two farms)

Onions were topped at:

- 1’’
- 6’’
- 10’’
- No cutting

Data Collected

Yield:

- Bulb fresh weight (post curing)

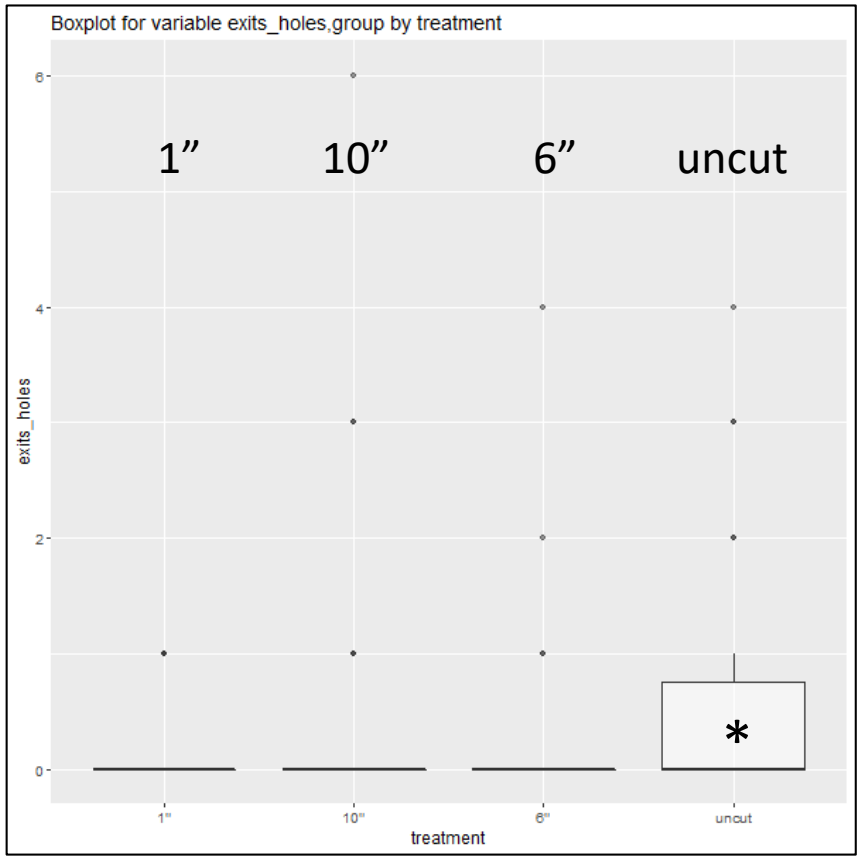
LM damage:

- # of exit holes in bulb (pre and post storage)

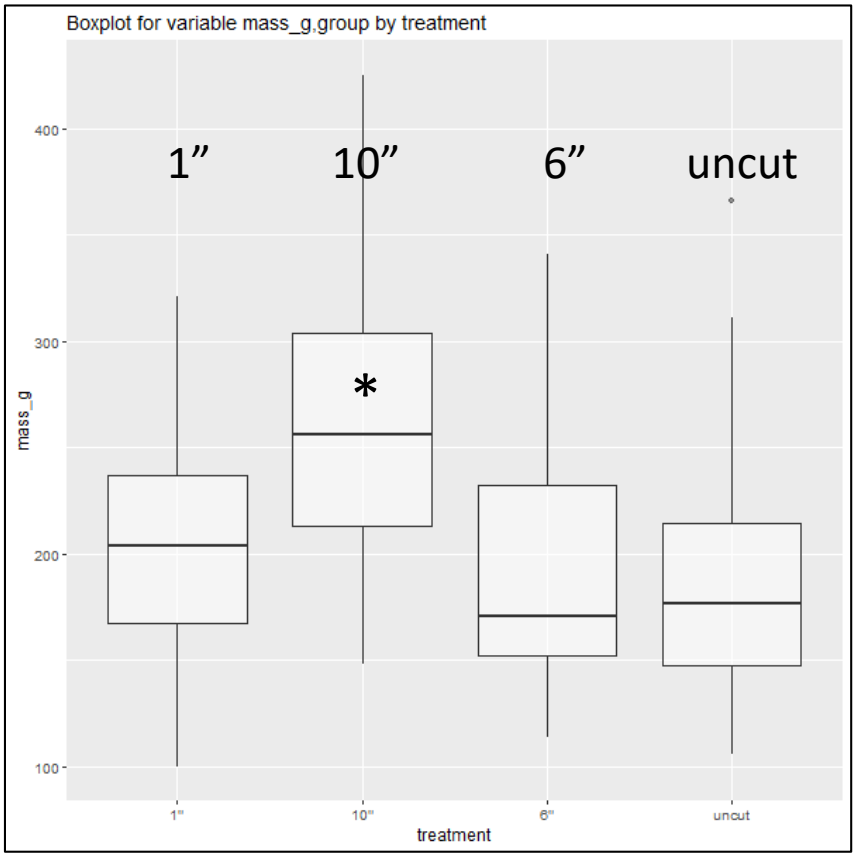
Storage quality:

- # of affected onion layers per bulb (e.g. rot)

Post Harvest Handling in Onions (pre-storage)



Bulb Damage (# exit holes)



Bulb Yield (g)

Post Harvest Handling in Onions (post-storage)

After storage data collection

Unaffected onions

Affected Onions

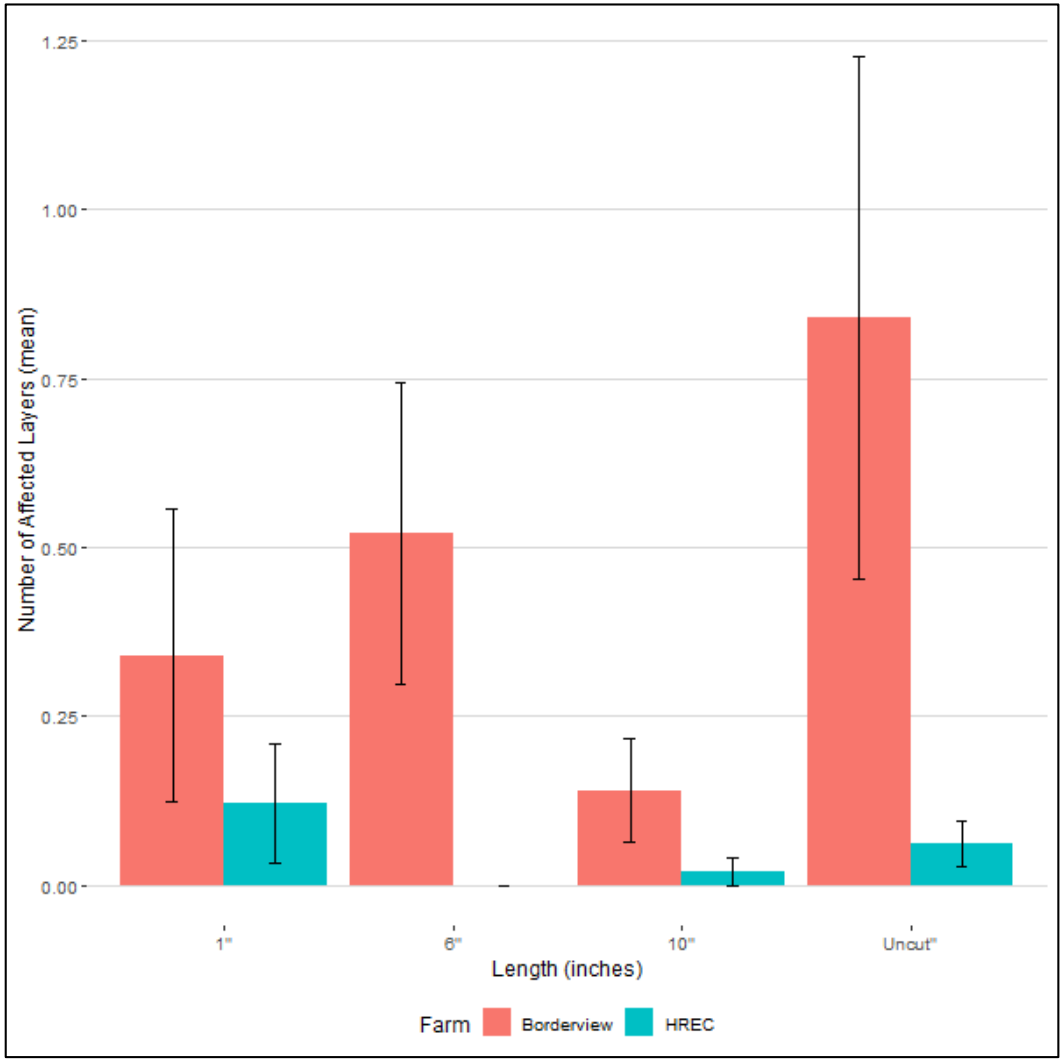
Rotted layers

Post Harvest Handling in Onions (post-storage)

Relatively low amount of affected onions across both sites. (max = 9/50)

Significant difference in storage quality between farms

Susceptibility to onion rot seemed to be higher in uncut onions

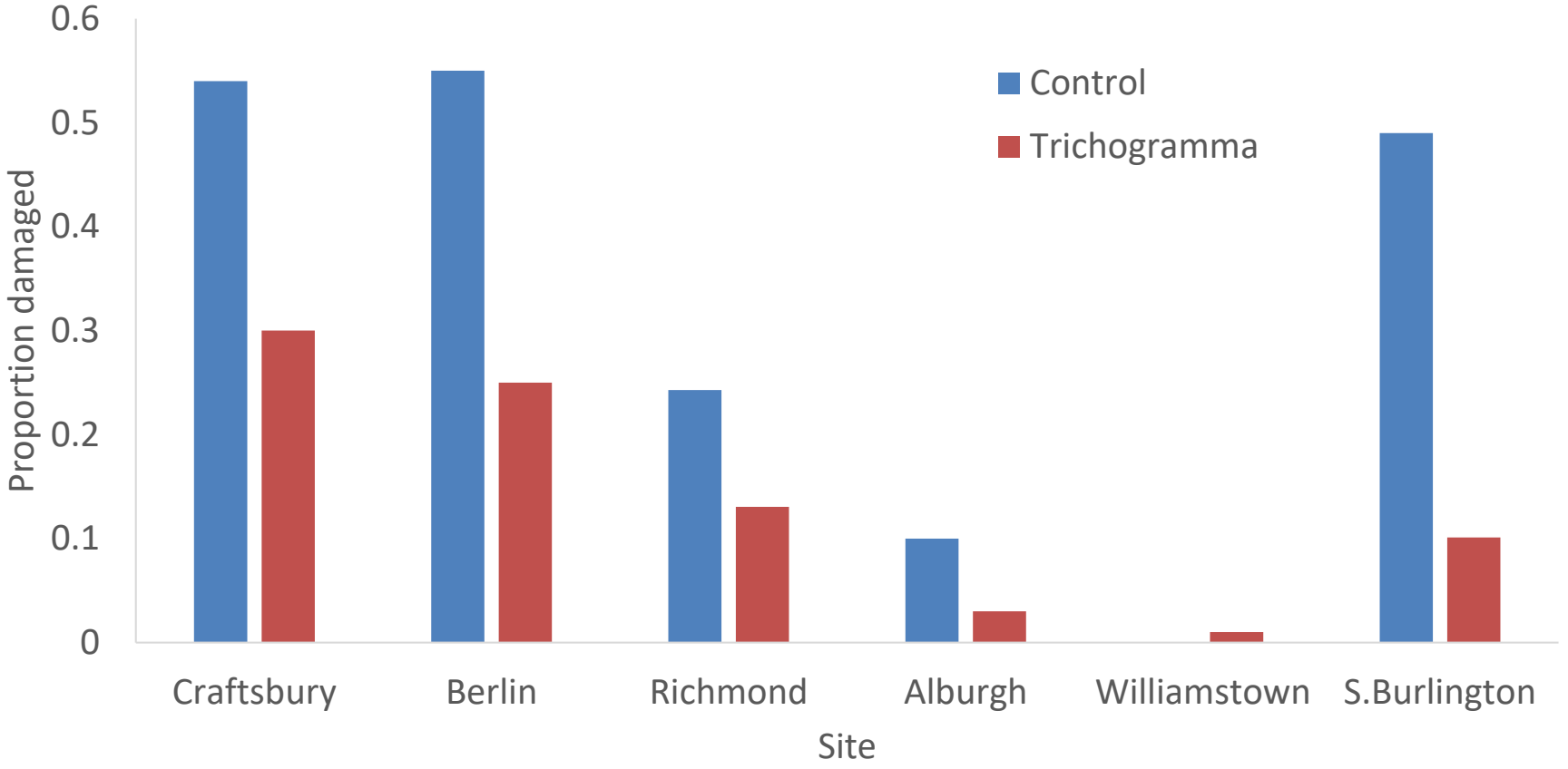


New Avenues: Biocontrol (Trichogramma brassicae)

Experimental Protocol

- Six farms
- Release and no-release plots
- >200m apart
- Released weekly from second flight to harvest
- Sentinels to confirm parasitism

Trichogramma results



Significant reduction (>50%) in LM damaged leaves when Trichogramma released

Some concluding thoughts…

- Flight data are useful in all alliums
- Some yields may not be impacted by moderate LM infestations, but quality is still a problem (shallots, leeks, storage onions, garlic scapes)
- Biological control seems to be a good option in all alliums
- Post harvest handling may be a key cultural control for onions
  - Timing removal of onion with flight data
  - Clipping of onions prior to curing
  - Curing in closed areas

Thank you!

Funding for the work reported here was provided by the USDA Sustainable Agriculture Research and Education Program, Research and Education Grant LNE19-379