Avoiding Aphid Outbreaks on High Tunnel Tomatoes

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New England Vegetable
& Fruit Conference
December 18 , 2024

Entomology Research Laboratory

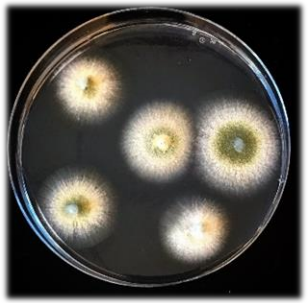
Specialize in integrated pest management (IPM)

Conservation biological control (habitats to attract & sustain beneficial insects in agroecosystems)

Hemlock woolly adelgid & other invasive pests.

Saffron Production & Pests

Ticks



Primary emphasis on biological control (parasites, predators and pathogens)

Greenhouse & high tunnel pests (thrips, whiteflies, aphids, spider mites)

High Tunnels Provide Protection for Plants & Pests!


Mite Madness


Aphid Apocalypse

About Aphids

(Hemiptera: Aphidoidea)

- They Suck! Piercing sucking mouthparts feed on plant sap.
- Cause distortion, stunting, sooty mold, viruses.
- Rapid population buildup (give live birth).
- Visual & food quality issue.
- Labor intensive (washing produce).
- Difficult to manage.

Shipher Wu, Nat. Taiwan Univ.

Purdue Univ.

Live Aphids & Cast Skins

Jack Kelly Clark, UC IPM

Scot Nelson

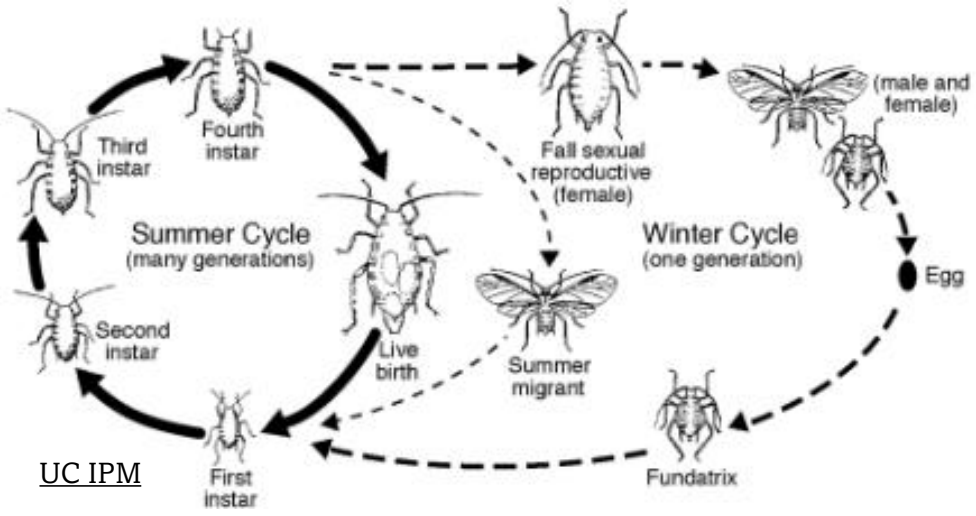
Distortion

Honeydew

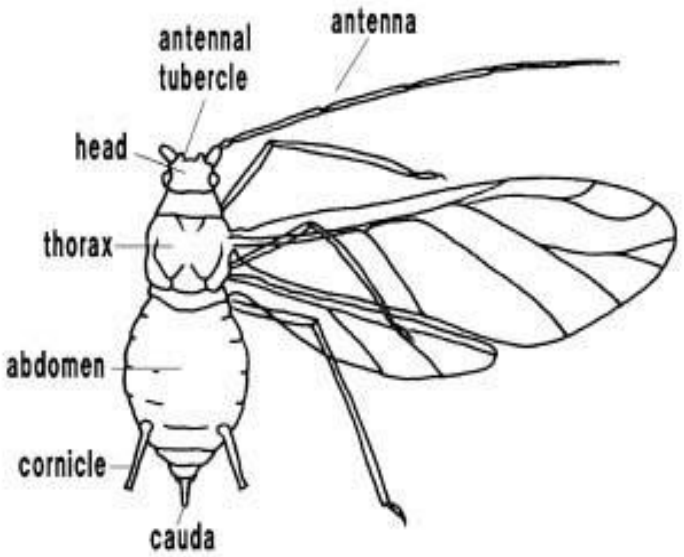
Sooty Mold & More Cast Skins

Know Aphid Biology

- What do their life stages look like?
- In what life stage do they cause damage?
- What does their damage look like & where on the plant does it occur?
- What time of year do they show up?
- What crops and varieties are usually affected?



UC IPM



Aphid ID

Non-winged (aptera) & Winged (alata) Forms

ID based on several features:

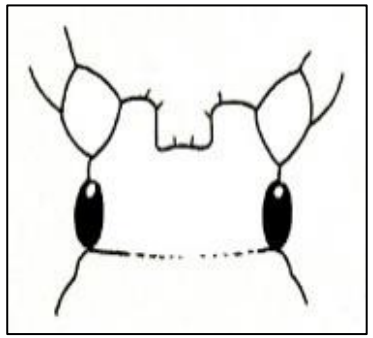
- Antennal tubercles (head shape)
- Cornicles (stovepipes) length & texture
- Host plant
- Not so much by color

Please send as many mature adults as possible for ID!

The Usual Aphid Suspects

Aulacorthum solani (Foxglove)

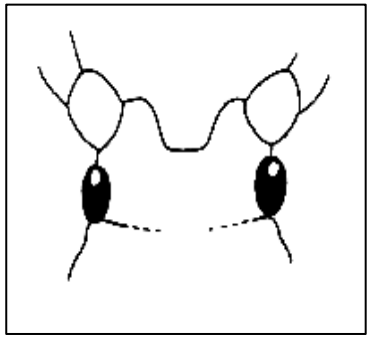
Pale green, yellow & shiny color, parallel-slightly divergent tubercles, dark spots at cornicle bases



tomato, eggplant, greens, peppers

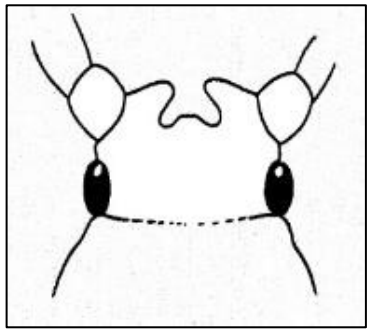
Macrosiphum euphorbiae (Potato)

Pink, green color, parallel-slightly divergent tubercles, slender, pear shaped body, very long cornicles



Tomato (and many more)

Myzus persicae (Green peach)



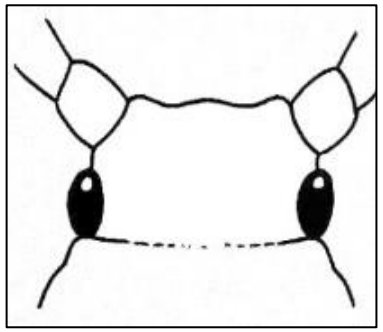
Green, pink, orange color, converging inward (W) tubercles, long cornicles with black tips

eggplant, pepper, greens

Online Aphid ID Tool: AphID

Aphis gossypii (Melon)

Green, yellow color, undeveloped, flat tubercles, short, dark cornicles



cucumber

Where Do Aphids Come From?

Hitchhiked in on plant material

Carry over from previous crops

Fly in from outside

Weeds (inside and out)

Integrated Pest Management "IPM"

- IPM is a decision-making process.
- Threshold setting (when to intervene?).
- Economics (cost of control vs. cost of damage).
- Uses best management practices (cultural/biocontrol/biorational pesticides)
- Broad-spectrum pesticide chemistries as last resort.

Prevention is Paramount

Remove debris from previous cropping cycle

Soil steaming

Prune/thin regularly

Scout /Monitor (inspect incoming plant material, random crop plants, sticky cards) & record findings

Exclude with Screen/Row Cover

Identify pests (insects & diseases) properly

Fallow

Train all personnel what pests like

Test Soil (Nutrients, pH, EC)

Select pest-resistant varieties

Manage Weeds Inside (weed mats) and Outside (weed free zone, wider the better)

Cover crop

Provide proper ventilation/air flow

Spot Spray or Rogue Infested Plants

Avoid rotating crops into already infested tunnels

Consider plant-mediated IPM systems (trap crops/habitat plantings)

Biocontrol use (early/preventatively in cropping cycle)


Timing is Everything
Weeds
Aphid infested greens
New transplants

Scouting Benefits

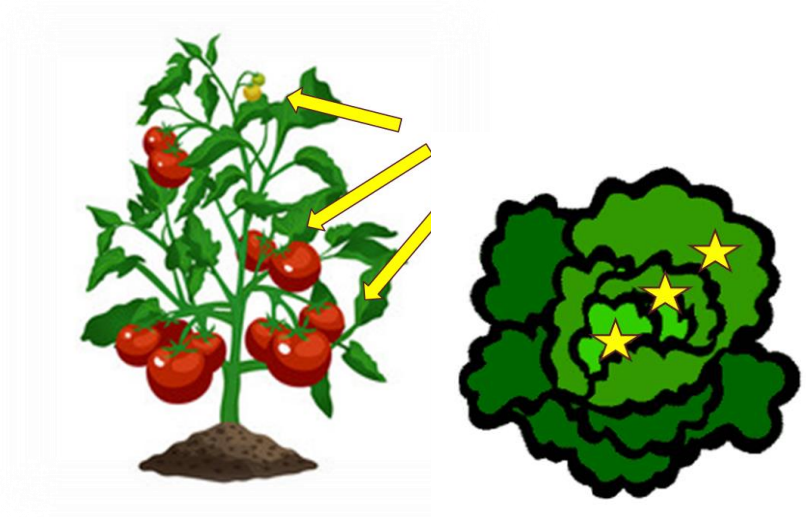
- Find & tackle problem before it explodes.
- Determines how many plants are infested & at what magnitude?
- Helps establish personal action thresholds.
- Identifies varieties prone to infestation.
- Predicts timing of annual infestations.
- Identifies growing methods in need of improvement/change.
- Determines pesticide & biocontrol agent release rates.
- Evaluates efficacy of biocontrols or pesticides/management success.

Some Scouting Strategies

Regular intervals (weekly if time allows – every 2 weeks)

Use hand lens/magnifier (at least 10x)

Sticky Cards (only captures flying insects)



Plant Inspections

- Tap plant/foliage over laminated/ protected paper to dislodge pests
- Know where & how to look: leaf undersides, growth tips, tap blossoms to dislodge arthropods
- Check different locations within plants (outer, inner, middle, lower, upper).

Make a super cool scouting kit!

Write info down

Flag infested areas

Write It Down

Essential information includes:

- How many plants are infested ‘what % of the crop?’
- What is the infestation level per plant? (a number estimate per plant is ideal, i.e., < 5, > 50, etc.).

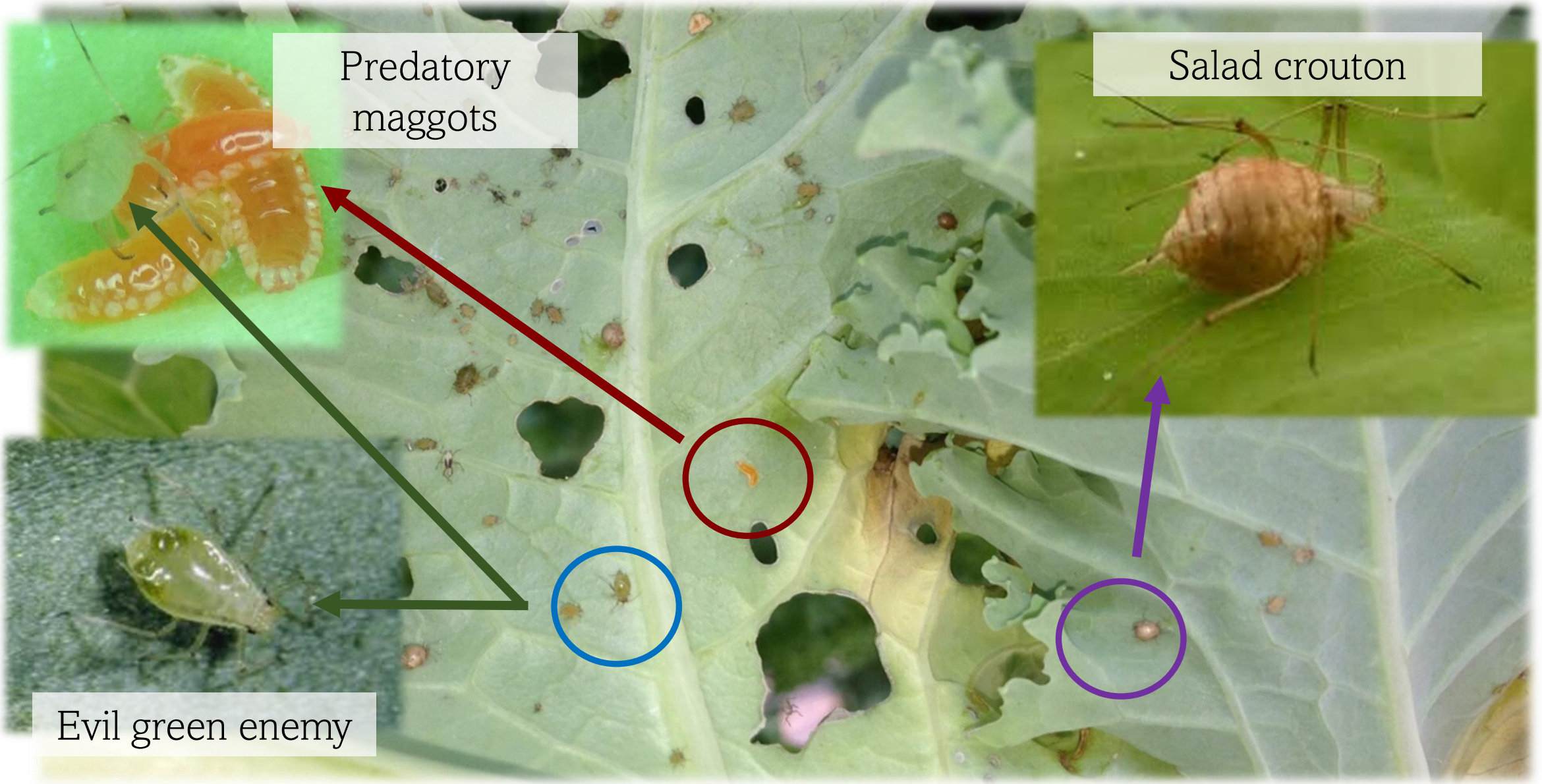
Why is this information important?

- Biocontrol release rates depend on this information.
- Often, biocontrol fails because release rate was too low for the pest population or applied for wrong square footage.
- Useful for anticipating what issues may occur and when in future years.
- Over time allows for preventative biocontrol releases.

Get To Know Your Friends

- What are their life cycles?
- What do their life stages look like?
- Where do the life stages live (soil vs foliage)?
- What do they attack? (specialists vs. generalists).
- What pest life stages do they attack?
- In what life stage do they attack?
- What time of year/environmental conditions do they occur & do best?
- Is successful management occurring? (ratio of friends & foes)

Who's Who Here?



Aphid Natural Enemies

Lacewings

Brown (Micromus variegatus)

Green (Chrysoperla rufilabris)

Predatory larvae (green); as adults & larvae (brown)

Predatory fly

Predatory as orange maggot/larva

Predatory Mite

NEW for use in US in some NE states!!!!

Anystis baccarum aka The Crazee Mite

Parasitic Wasps (specialists)

Aphidius colemani (green peach)
Aphidius ervi (potato & foxglove)

Aphidoletes aphidimyza
(many aphids)

*enters diapause in winter

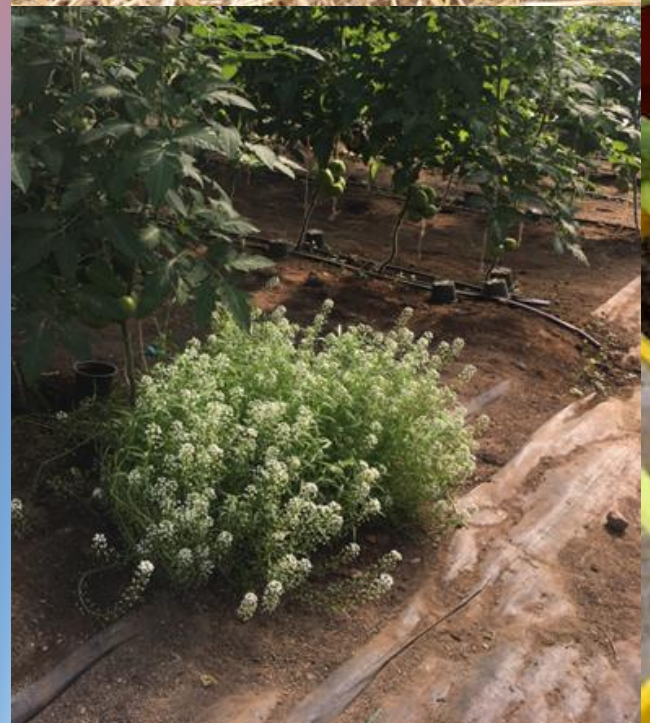
Lady Beetles

Hippodamia convergens

Mummies

Larvae-pupae develop within aphid 'mummy'

Aphelinus abdominalis
(potato & foxglove)



Plant-Mediated IPM Systems

Habitat Plantings

Plant combinations that provide food & shelter to attract & sustain a complex of naturally occurring &/or purchased nat. enemies (i.e., alyssum)

Banker Plants

Plants that provide nutrition (usually a non-pest host insect or pollen) for an ongoing supply of purchased nat. enemies (i.e., oats/barley grass system for *A. colemani*; fava bean system for aphids for *A. ervi*)

Awesome Alyssum

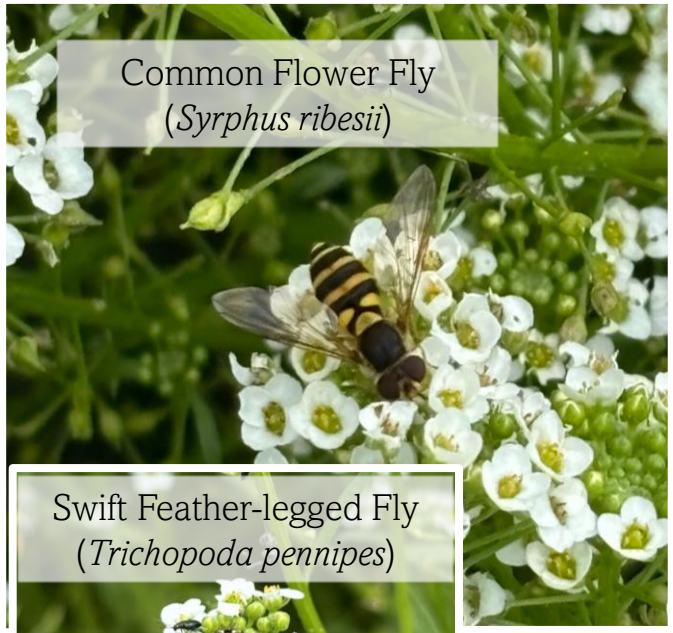
Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

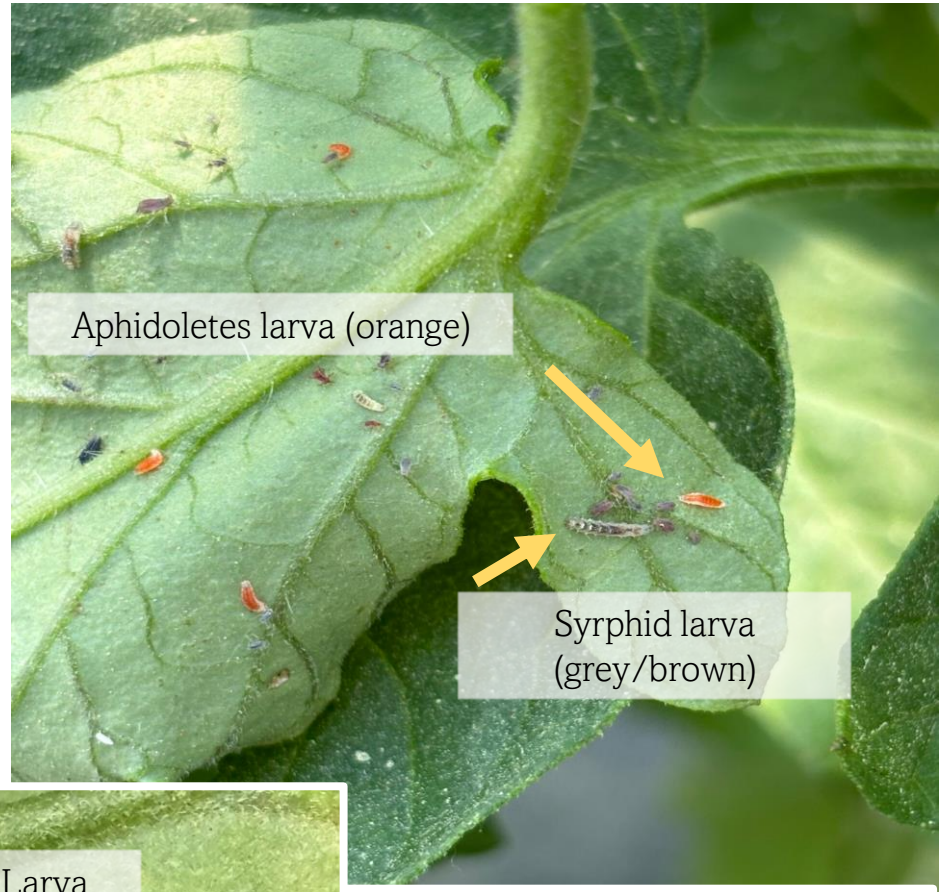
Walker Farm
Dummerston, Vermont

Honey Field Farm
Norwich Vermont

Jericho Settlers Farm, Inc.

The Wild Side of Biocontrol





Biocontrol Success Takes Time & Effort

- Plan ahead! Create an individualized biocontrol release schedule with supplier/crop advisor.
- Monitor nat. enemy quality upon arrival.
- Continue scouting (don't assume they are doing their jobs).
- Modify/revisit plan as needed.

SPRING-SUMMMER 2024

Tunnel No: 1							
Tunnel Size: 30x96ft (2,880 sqft); unheated	4/29	5/6	5/13	5/20	5/27	6/3	6/10
Crops: Tomato (60%), Pepper (20%) Cucumber (20%)	18	19	20	21	22	23	24
Aphids							
Aphelinus abdominalis wasp parasitoid (for foxglove/potato)							
Aphidius ervi wasp parasitoid (for foxglove/potato)			1			1	
Aphidius colemani wasp parasitoid (for green peach/melon)			1			1	
Aphidoletes aphidimyza predatory fly (all aphid species)		1	1	1		1	
Lacewing larvae							
Thrips							
Neoseiulus cucumeris predatory mite (loose)							
Neoseiulus cucumeris predatory mite (sachets)		1				1	
Orius insidiosus predatory bug		1	1			1	
Dalotia coriaria predatory beetle (soil-dwelling)							
Stratiolaelaps scimitus predatory mite (soil-dwelling)	1						
Steinernema feltiae nemarodes (soil-dweling)							
Spider/Broad Mites							
Neoseiulus fallacis predatory mite (loose)							
Neoseiulus californicus predatory mite (sachet)		1				1	
Phytoseiulus persimilis predatory mite							
Feltiella acarisuga predatory fly							
Whiteflies							
Amblyseius swirski predatory mite (loose)							
Amblyseius swirski predatory mite (sachets)							
Delphastus catalinae (predatory beetle)							
Encarsia formosa wasp parasitoid (hanging tags)			1			1	

Order as needed

Timing is Everything (Take 2)

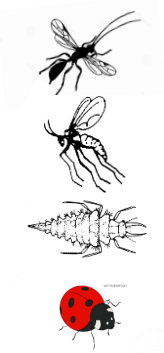
Generalized Bio Release Timeline for Aphids (Year-Round Production)

Aphidius wasps

Aphidoletes flies

Lacewing larvae

Ladybeetles

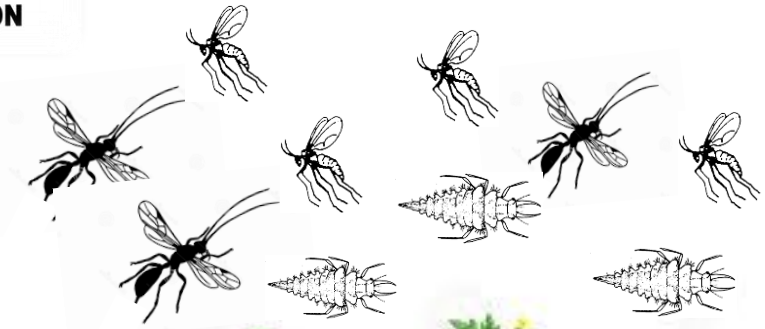


Be on lookout for outbreaks

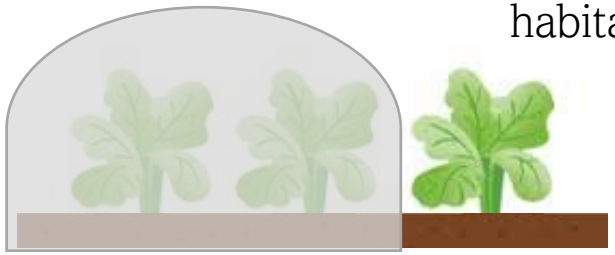
Intensive scouting

Intensive scouting

Be on lookout for infestations



alyssum habitat plants



Winter

Spring

Summer

Fall

New England Vegetable Management Guide is a comprehensive guide to current production and pest management techniques for commercial vegetable crops.

https://nevegetable.org/

THE UNIVERSITY OF VERMONT EXTENSION
PESTICIDE SAFETY EDUCATION PROGRAM

Read the Label!

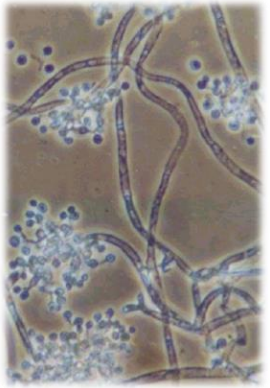
Biorational Pesticides

- Botanicals: Plant-derived materials (i.e, pyrethrin, azadirachtin, neem oil)
- Microbials: Formulated from living microorganisms or their byproducts like bacteria (i.e., *Burkholderia* spp., *Chromobacterium subtsugae*) & fungi (i.e., *Beauveria bassiana*)
- Synthetics & Minerals: Insect growth regulators (i.e., pyriproxyfen), insecticidal soaps/fatty acids of potassium salt, feeding disruptors (i.e., pymetrozine, flonicamid)

Heat-killed Burkholderia spp. (bacteria)

Suppression only

Entomopathogenic (insect-killing) fungi (*Beauveria bassiana*)



Spores

USDA National Organic Program

Conventional Chemistries

- Contact insecticides: bifenthrin, permethrin (do not use on varieties with fruit < 1in diam), esfenvalerate, malthion)
- Systemics: imidacloprid (mature plants only), dinotefuran (transplants,; do not apply to varieties with fruit < 2" such like cherry or grape tomatoes) [neonics]
- Long PHIs (several days)

Things to Consider Using Pesticides

- Only apply as necessary late or early in day.
- Spot treat localized pest outbreaks, not whole tunnel.
- Never exceed application rate/season limit.
- Check compatibility with biological controls/pollinators.
- Keep spray records.
- Follow-up scouting.
- Rotate chemistries/modes of action for resistance management.
- Be sure approved for use in your state.

Read the Label!

Build A Strong Support Network

- Consult Univ. Extension Specialists or private consultants for IPM plan development.
- Use pest diagnostic services offered through Univ. Ext.
- Keep up to date. Join local associations & email lists.
- Obtain pesticide trainings/licensing.

THE UNIVERSITY OF VERMONT EXTENSION
PESTICIDE SAFETY EDUCATION PROGRAM

Plant Diagnostic Clinic

NEW ENGLAND VEGETABLE & BERRY GROWER'S ASSOC.

Entomology Research Laboratory

VERMONT VEGETABLE & BERRY GROWERS ASSOC.

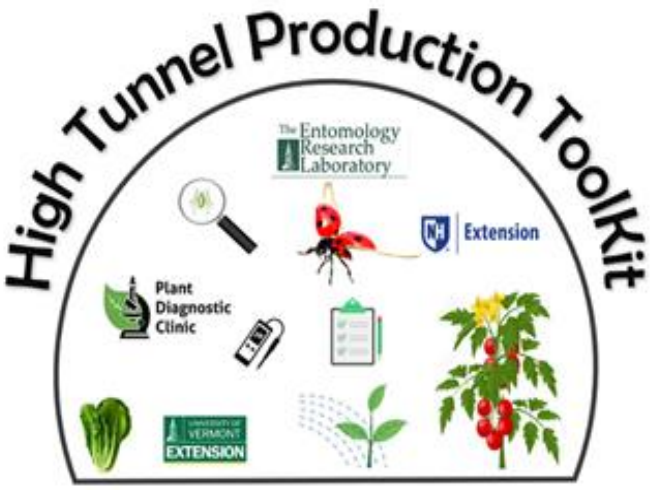
THE UNIVERSITY OF VERMONT EXTENSION
AGRICULTURAL & ENVIRONMENTAL TESTING LAB

Pest Management is Challenging But Not Impossible

Regional High Tunnel Survey!

University of New Hampshire

University of Vermont



https://www.uvm.edu/~htunnel/

Email Me to join the "Tunnel Vision Listserv" Newsletters

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This work is supported by the National Institute of Food & Agriculture, US Dept. of Agriculture, Crop Protection & Pest Management Competitive Grants Program (No. 2021-70006-35509/project accession no. 1027204), the Northeast Sustainable Agriculture Research and Education program under subaward number LNE22-445 and the USDA NRCS, VT Conservation Innovation Grant No. NR231644XXXG003. Any opinions, findings, conclusions, recommendations, use of tradenames and corporations expressed herein are those of the authors and do not necessarily reflect the view or an endorsement by the US Dept. of Agriculture. Images may be subject to copyright. For educational purposes only. Not for reproduction without permission from the authors.

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