Part 1: Aphid Management in Winter Greens

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VVBGA Webinar Series: Aphid and Disease Management for Winter Greens in Tunnels with Ann Hazelrigg.

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Preventing The Aphid Apocalypse

About Aphids

(Hemiptera: Aphidoidea)

They Suck! Piercing sucking mouthparts to feed on plant sap

Cause distortion, stunting, sooty mold, viruses

Rapid population buildup

Visual & food quality issue

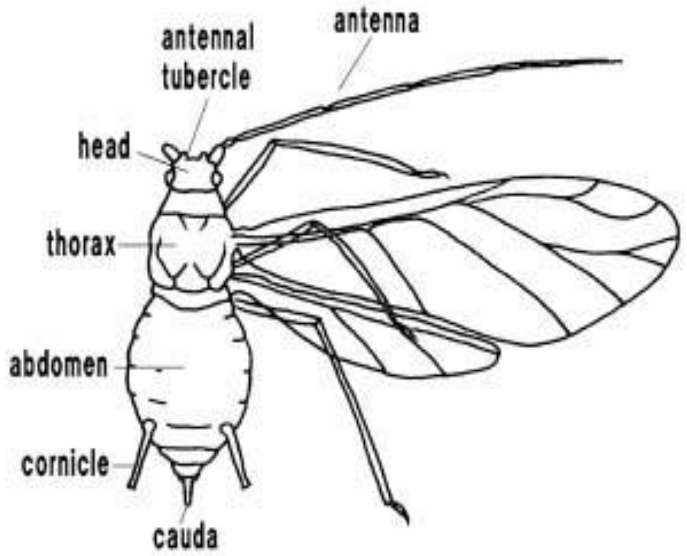
Labor intensive (washing produce)

Difficult to manage, few options for winter greens production

Management Success Tip #1

Know the biology of aphids

- What do their life stages look like?
- In what life stage do they cause damage?
- What does their damage look like?
- What time of year do they show up?
- What crops and varieties are usually affected?



Aphid ID

Non-winged & Winged 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!

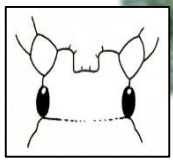
Typical Suspects

Myzus persicae (Green peach)

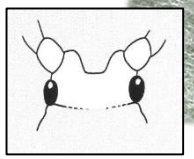
Green, pink, orange color, converging inward (W) tubercles, long cornicles with black tips

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

Aulacorthum solani (Foxglove)



Macrosiphum euphorbiae (Potato)



In fields in the west, the currant-lettuce aphid (or lettuce aphid) (*Nasonovia ribisnigri*) and the lettuce root aphid (*Pemphigus bursarius*) are common

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

N.r.

P.b.

You Know You Have Aphids When….

Distortion

Cast skins

Sooty mold & sticky honeydew (aphid poop)

Where Do Aphids Come From?

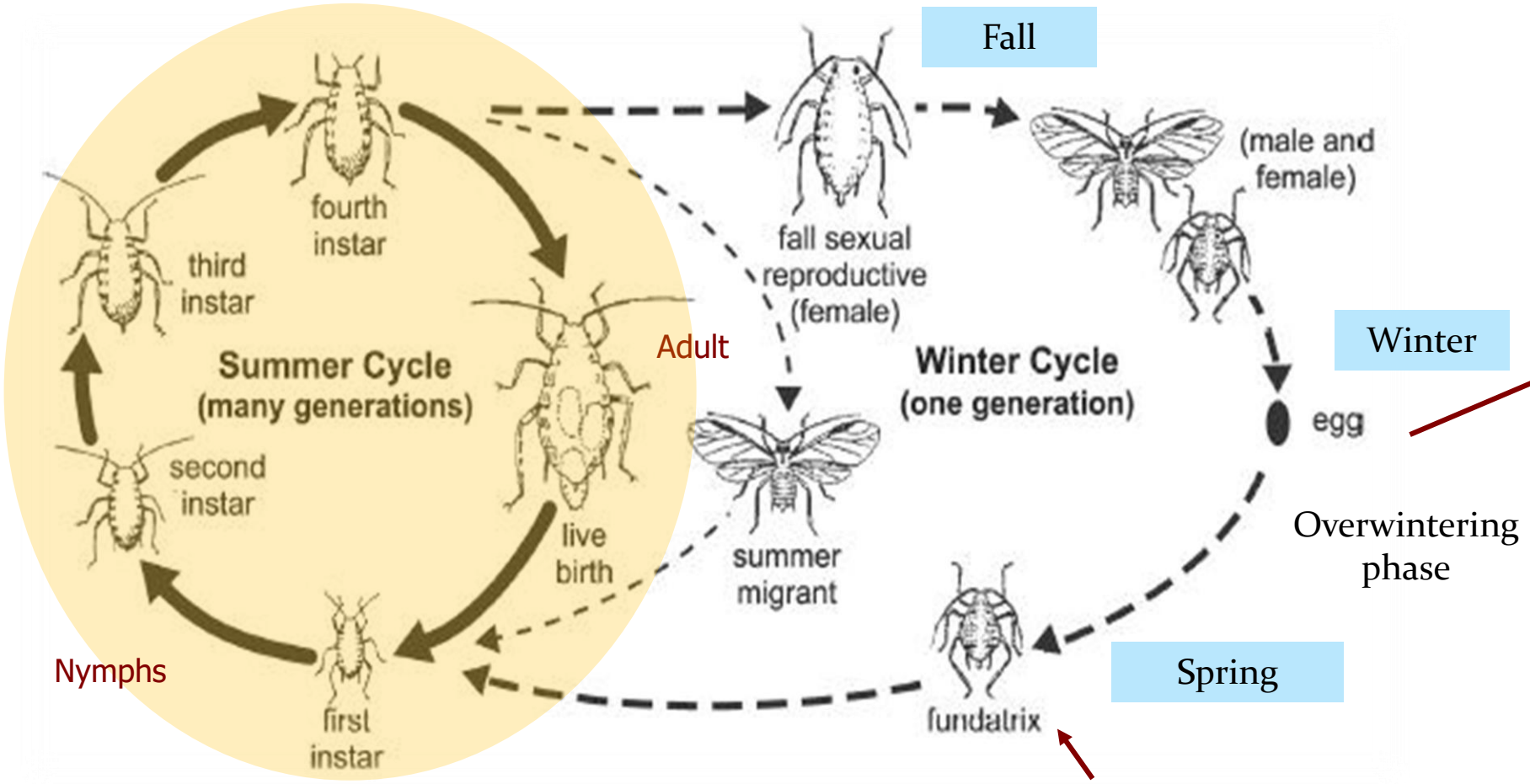
Hitchhiked in on plant material

Carry over from previous crops

Fly in from outside

Weeds (inside and out)

Aphids Are Complicated



The MOTHER Aphid
start of the parthenogenic reproduction
(You really don't want this one to come into your high tunnel)

Management Success Tip #2

Prevention & Sanitation Are Essential

Scout & Monitor

Train all personnel what an aphid looks like

Avoid rotating crops into already infested(?) tunnels

Inspect incoming plant material

Fallow

Screen (double-edge sword)

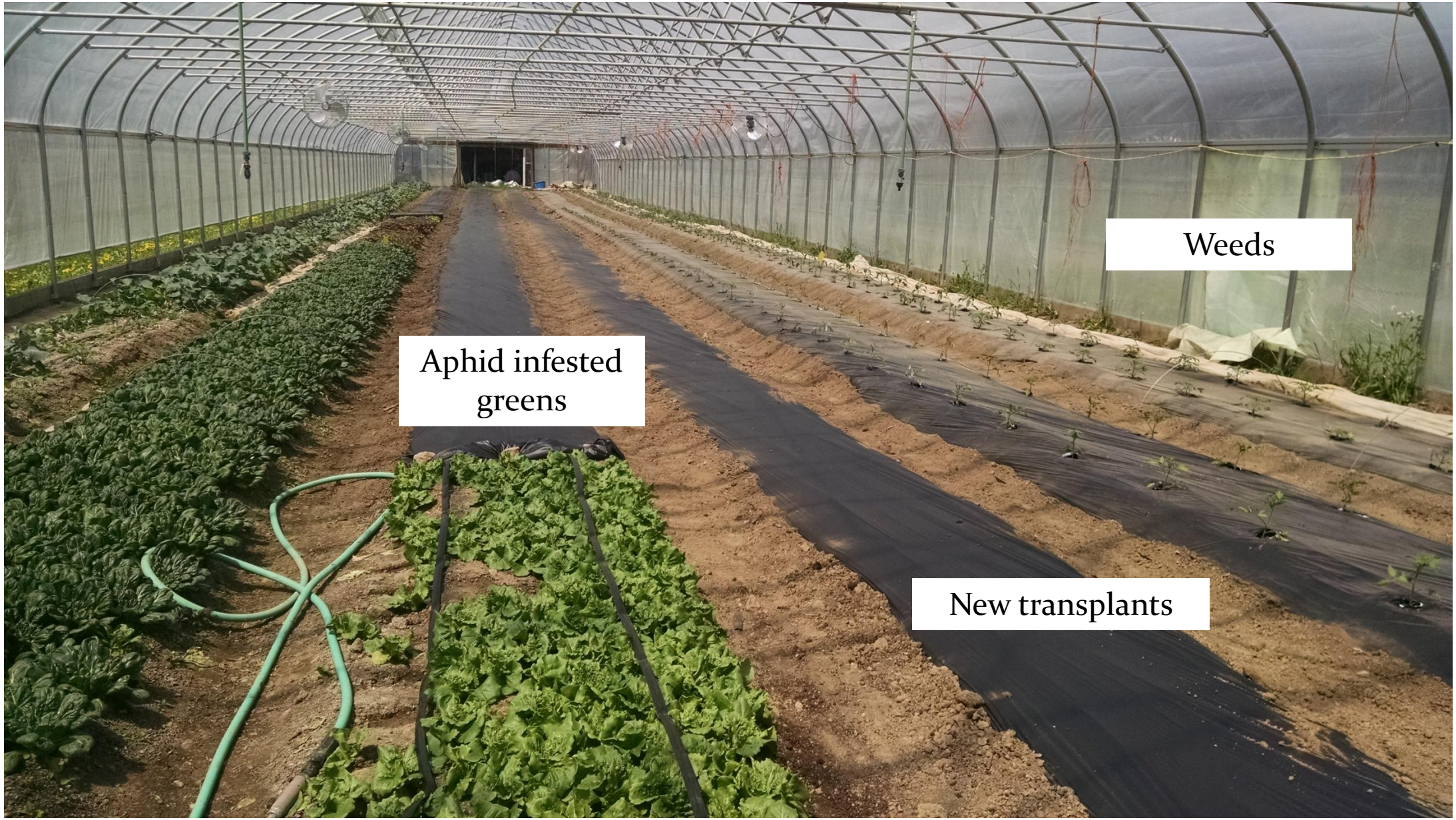
Manage Weeds Inside (weed mats) and Outside (weed free zone, wider the better)

Remove debris from previous cropping cycle

Spot Spray or Rogue Infested Plants

Consider Biocontrol (early in cropping cycle)

A Not So Smooth Transition



Scouting Benefits

Find the problem before it gets out of hand

Establish action thresholds

Identify varieties prone to infestation

Predict infestation timing

Identify growing methods in need of improvement/change

Evaluate efficacy of biocontrols or pesticides

Determine rates of biocontrols to use

Evaluate long-term success of management

Scouting Strategies

Inspect plants regularly (especially any incoming materials)

Focus early in the fall season (weekly – every 2 weeks), then spring

Inspect systematically - 10 plants per 100ft of row (2 per 20ft interval) or a 10x10in square per interval.

Visually plant into 3 stratums (outer, middle, and center) and randomly select 3 leaves/stratum to visually inspect.

Flag areas where problems are found

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).

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.
- Useful for anticipating what issues may occur and when in future years.
- Over time allows for preventative biocontrol releases.

Comments About Sticky Card Use

Capture only winged insects

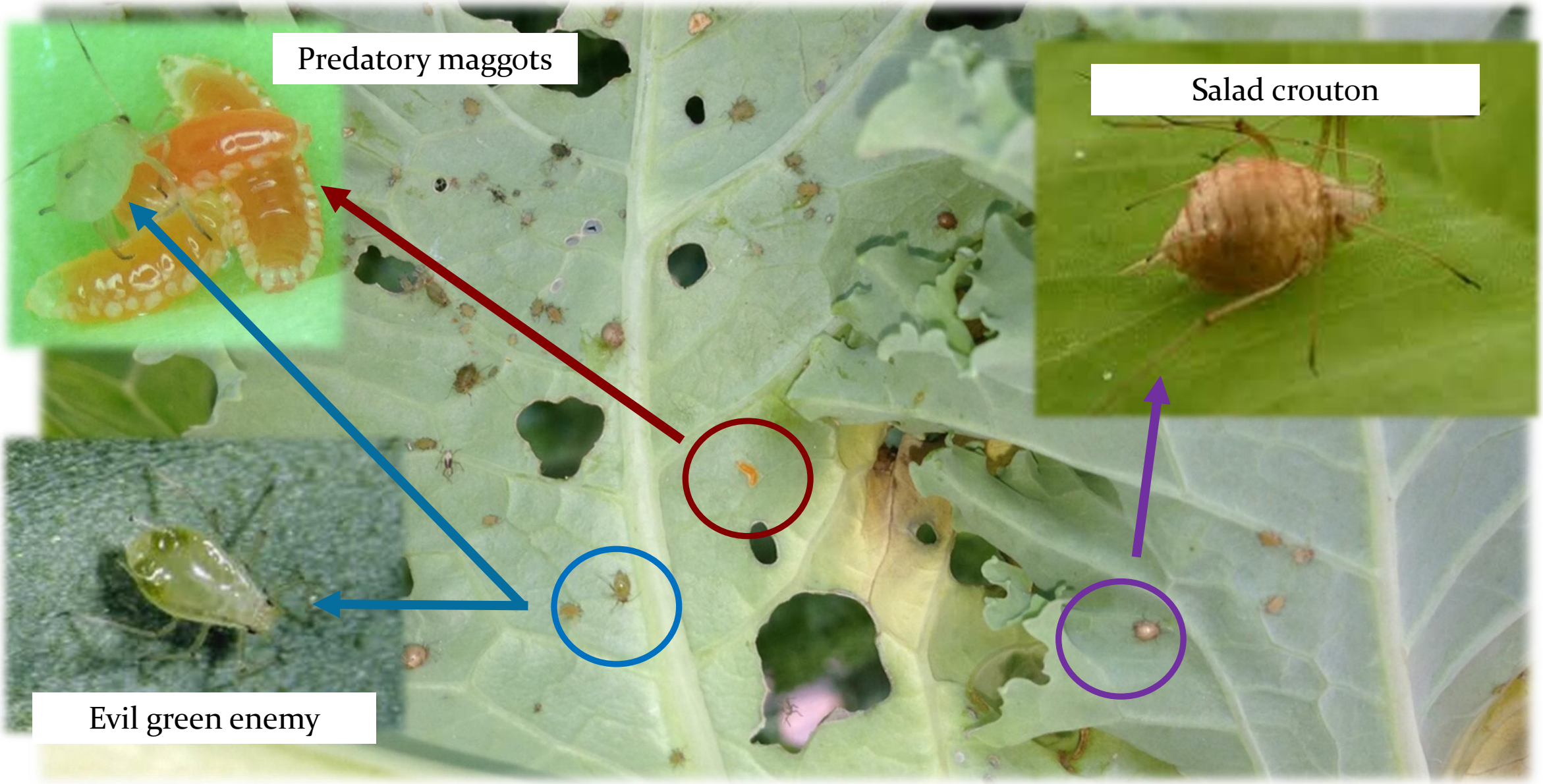
Do not rely on as sole monitoring tactic

Management Success Tip #3

Know Your Friends

- What do their life stages look like?
- What stages do natural enemies attack?
- What are the life cycles of the natural enemies?
- What time of year do they perform the best?

Who's Who Here?



Aphid Natural Enemies

Predatory Green Lacewings

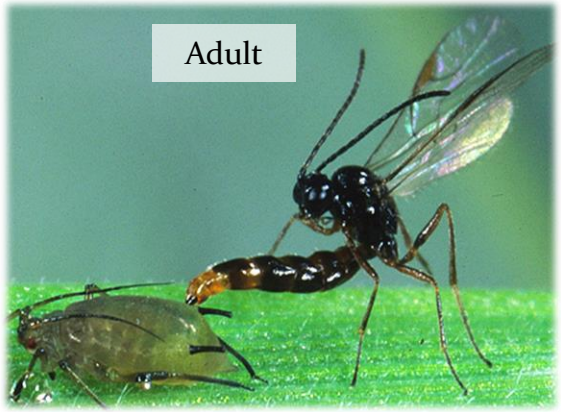
Chrysoperla rufilabris

Predatory fly

Predatory as orange maggot/larva

Parasitic Wasps (specialists)

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



Aphidoletes aphidimyza
(many aphids)

Lady Beetles

Mummies

Larvae-pupae develop within aphid 'mummy'

Aphelinus abdominalis
(potato & foxglove)

Parasitic Wasps

Aphidius colemani

Adults lay eggs inside aphids

Larvae-pupae develop inside, turning aphid into 'mummies', killing them

Adults feed on honeydew

Works best at 50 to 76 F

Tolerates cool temperatures

September about latest release

Not affected by day length

Need to ID aphids (only parasitizes green peach)

Can be introduced under row cover

Adult

Developing larva-pupa (within mummy)

Lady Beetles

Predatory beetles (adults & larvae eat aphids)

Requires lots food to stick around

Generalist predators (also eats thrips, mites & pollen)

Does well year-round

Works well under row cover

Generalized Bio Release Timeline for Aphids

Lady Beetles

Aphidius wasps

Aphidoletes flies

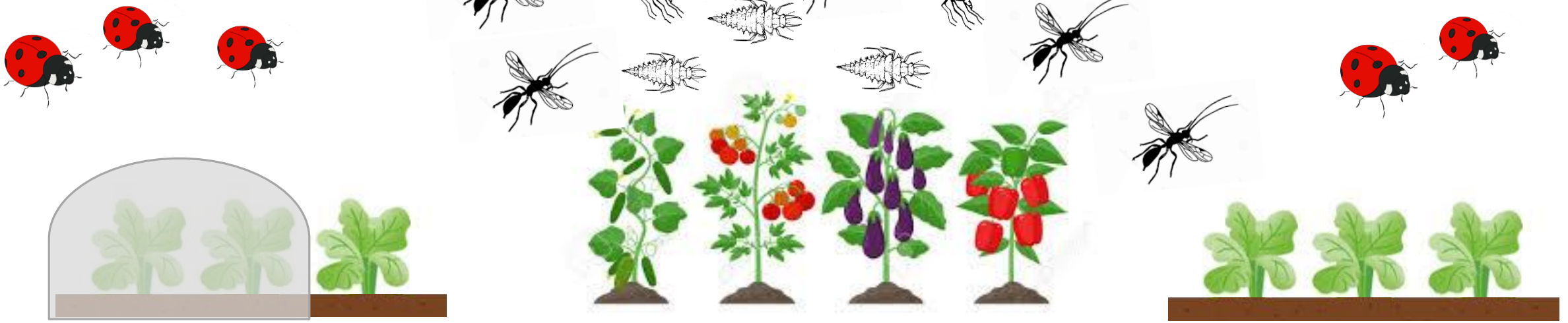
Lacewing larvae

Aphidius wasps

Lady Beetles

Be on lookout for outbreaks

Intensive scouting



Winter

Spring

Summer

Fall

For Biocontrol Success …

Timing Is Everything

Success takes time and effort

Plan ahead – schedule releases with biocontrol supplier (this is where writing scouting info down becomes handy)

Monitor nat. enemy quality upon arrival

Continue scouting (don't assume they are doing their jobs)

Contact Extension for id or management suggestions

Grower Guide: Quality Assurance of Biocontrol Products

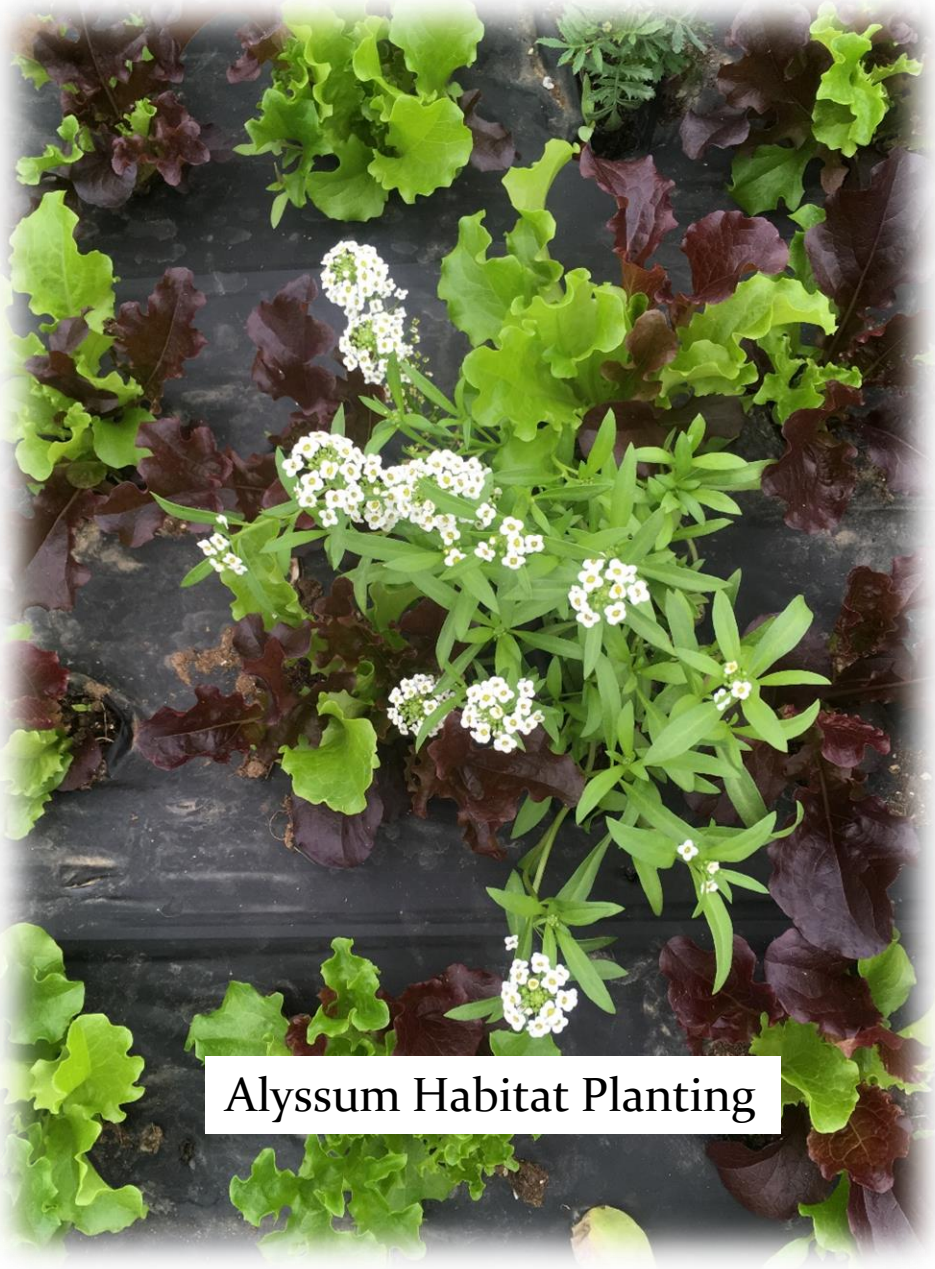
https://www.vinelandresearch.com/wp-content/uploads/2020/02/Grower-Guide.pdf

Management Success Tip #4

Try Habitat or Banker Plants

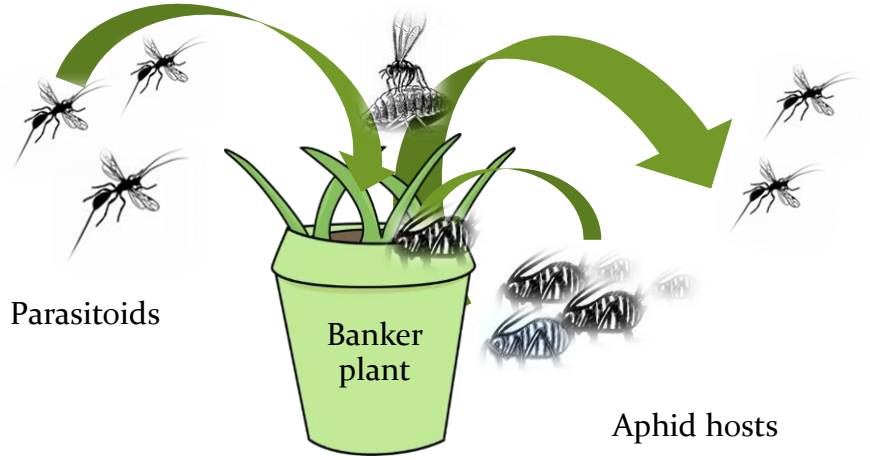
Habitat Plantings
Plant combinations that provide food & shelter to attract & sustain a complex of naturally occurring &/or purchased nat. enemies (alyssum for winter greens)

Banker Plants
Plants that provide nutrition (usually a non-pest host insect or pollen) for an ongoing supply of purchased nat. enemies



Alyssum Habitat Planting

Aphid Banker Plant System



Winter wheat/rye/barley infested with host-specific bird cherry oat aphids, *Rhopalosiphum padi*

A. colemani are released onto the system

Wasps reproduce within the system

Wasps disperse into crop to search for green peach aphid

Potential greatest in tunnels with heat

Can be labor intensive

Pesticides

Table 21: Biorational and Selective Insecticides and Miticides - New England Vegetable Management Guide: https://nevegetable.org/table-21-biorational-and-selective-insecticides-and-miticides

Insect Control - New England Vegetable Management Guide: https://nevegetable.org/crops/insect-control-6

Compatibility: Pesticides and natural enemies of pests: Cornell Biocontrol Bytes https://blogs.cornell.edu/biocontrolbytes/2020/05/12/compatibility-pesticides-and-natural-enemies-of-pests/

Pesticide Safety Education Program (UVM): https://www.uvm.edu/extension/psep

Fungal-Based Biopesticides

Mycotrol ESO & BioCeres WP

Strains of the insect killing fungus *Beauveria bassiana*

Contact is necessary

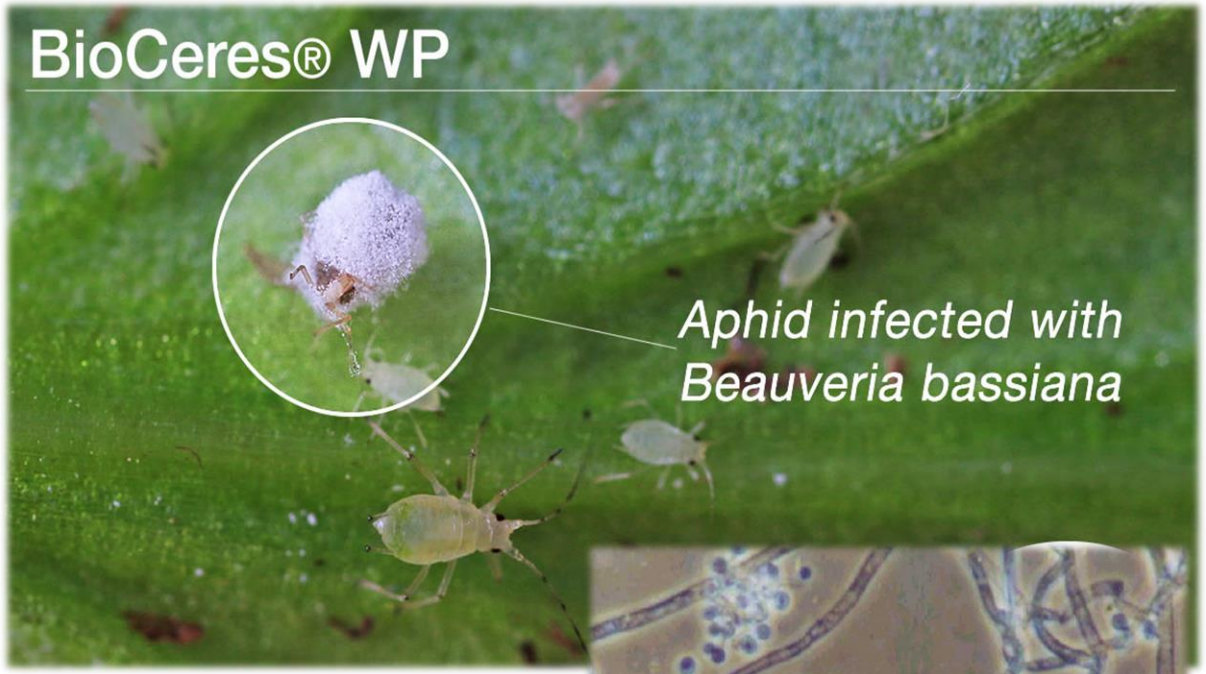
Multiple applications usually required

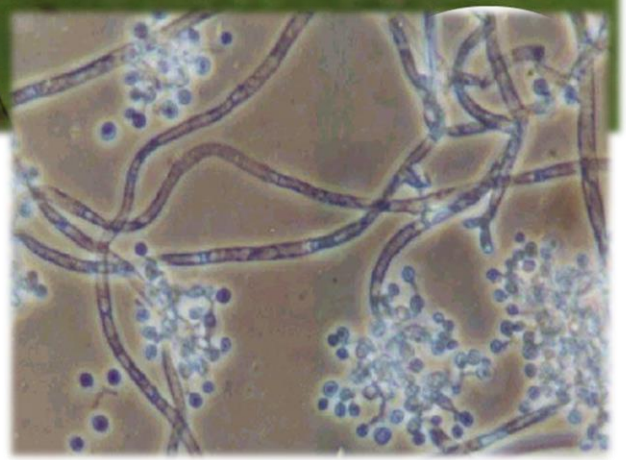
Dense canopies challenging

Needs high humidity & temperature

Potential for use in early fall

READ LABEL – BioCeres not for use on brassicas

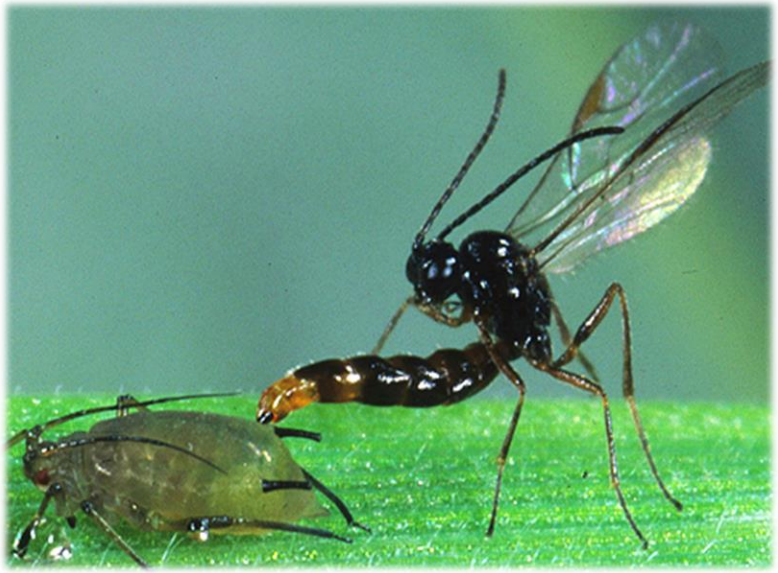




Spores

BioWorks: https://www.bioworksinc.com/mycotrol-eso/
BioSafe Systems: https://biosafesystems.com/product/bioceres-wp/

Parasitic Wasps | National Geographic



Aphids vs Parasitic Wasps

https://www.youtube.com/watch?v=Bc69LLLEQRk

Additional Resources

Aphid Management in Winter Tunnel Greens (Cornell): https://rvpadmin.cce.cornell.edu/uploads/doc_197.pdf

Applied Bio-nomics Ltd. Technical Manual: https://www.appliedbio-nomics.com/technical-manual/

Biocontrol Supplier Partial Listing (UVM): https://www.uvm.edu/~entlab/Greenhouse%20IPM/Links.html#Bio

Critical Questions to Help You Manage Persistent Pest Problems (UVM): https://www.uvm.edu/~entlab/High%20Tunnel%20IPM/Factsheets/Critical%20Questions%20to%20Manage%20Persistant%20Pest%20Problems%20Aug%202019.pdf

Guidelines & Tips for Scouting High Tunnel Crops (UVM): https://www.uvm.edu/~entlab/High%20Tunnel%20IPM/Factsheets/Scouting%20Guidelines%20High%20Tunnel%20Pests%20Natural%20Enemies%20Aug%202019%20UVM.pdf

High Tunnel Pest Management (UVM): https://www.uvm.edu/~entlab/High%20Tunnel%20IPM/HighTunnelIPM.html

Managing Aphids in High Tunnels and Greenhouses (Univ. of Kentucky): https://kentuckypestnews.wordpress.com/2017/05/23/managing-aphids-in-high-tunnels-and-greenhouses/

New England Vegetable Management Guide: https://nevegetable.org/

Sustainable Pest Management in Greenhouses and High Tunnels (Cornell): https://www.sare.org/Learning-Center/Fact-Sheets/Sustainable-Pest-Management-in-Greenhouses-and-High-Tunnels

Thank You!

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UNIVERSITY OF VERMONT EXTENSION

USDA

United States Department of Agriculture
National Institute of Food and Agriculture

2020 Vermont Vegetable and Berry Grower Webinar Series
http://www.uvm.edu/vtvegandberry/Webinars2020.html

3rd High Tunnel Conference to be held December 1, 8 & 15 -- Details coming soon!

Please me anytime for site visits and to discuss pest management options.

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Winter Greens Disease

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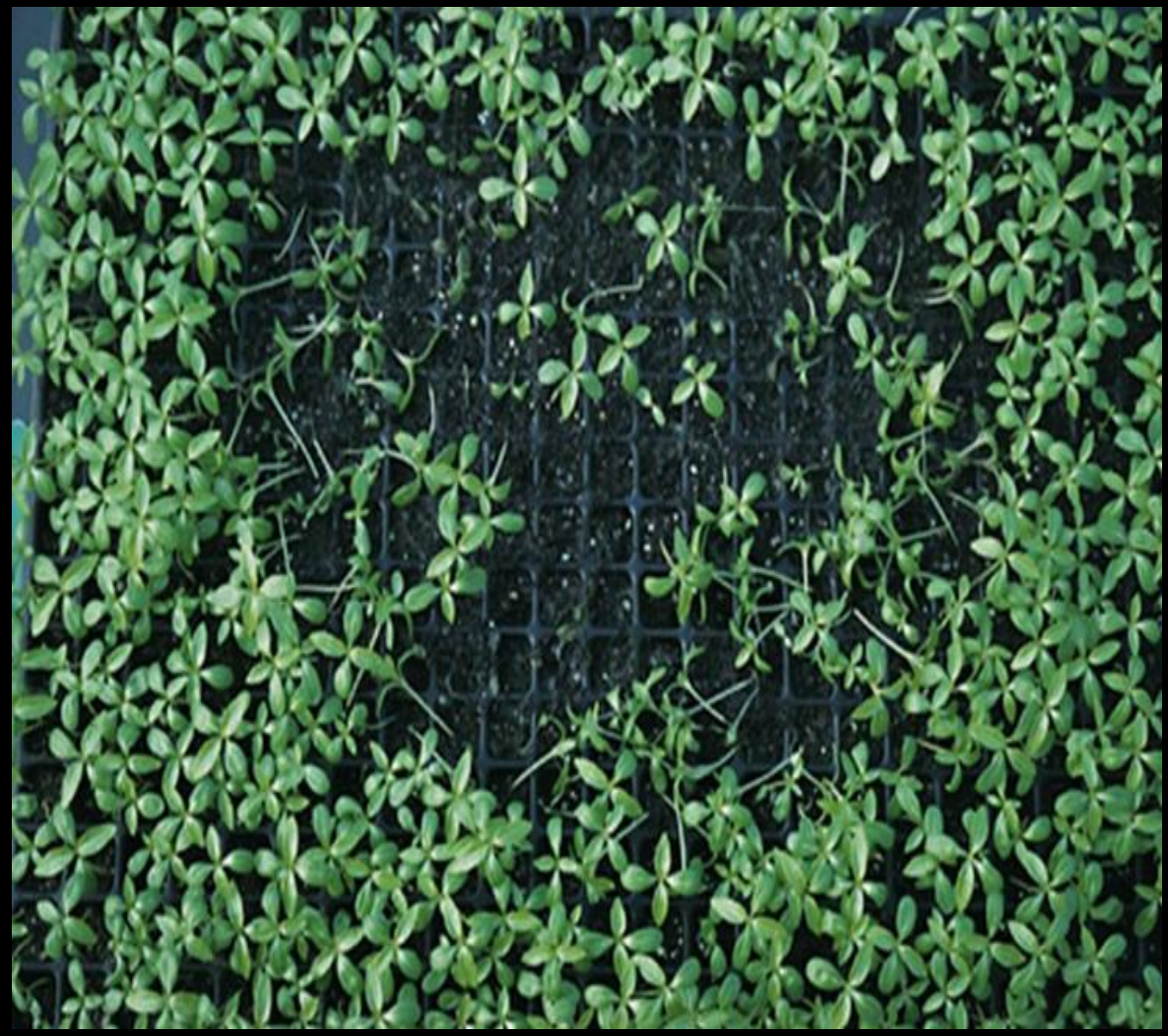
Soilborne Diseases-damping off



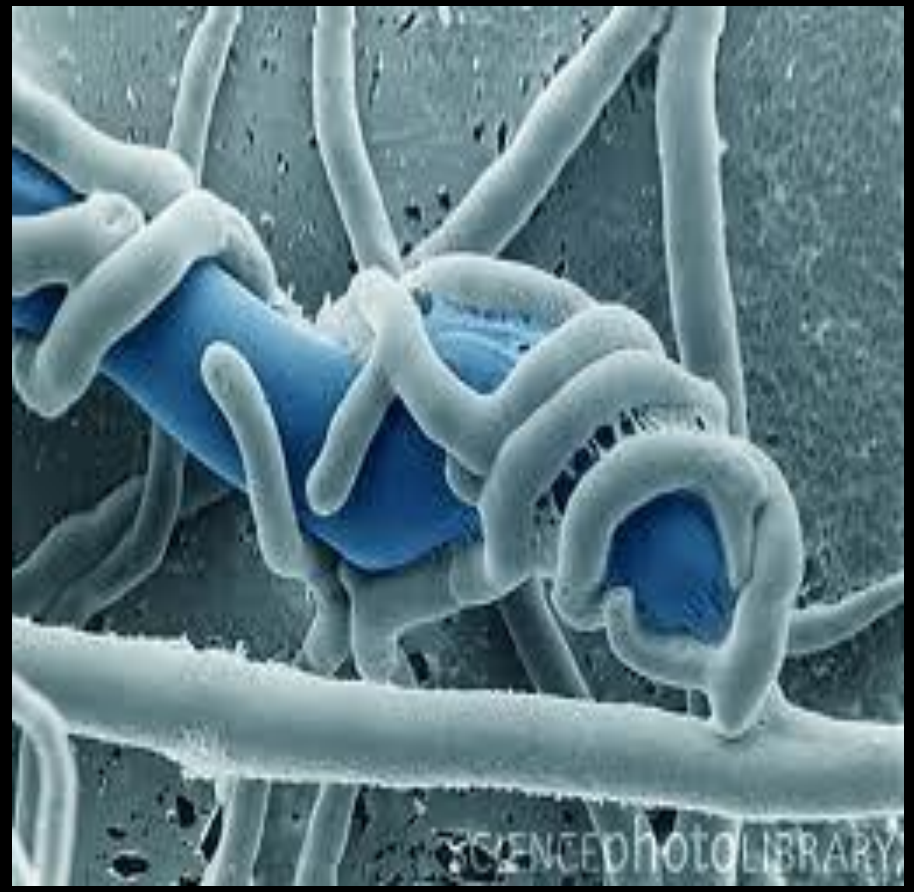
Damping OFF

- 4-5 different soil borne fungi- IN ALL SOILS
- All these fungi like cool wet soils

Management/Avoidance

- Anything to promote rapid germination
- Start with clean flats
- Use of heat mats if seeding in flats
- Avoid over watering especially when cool/cloudy

Soil amendments



- Choice of soil mix-high organic matter will have high water-holding capacity

- Use of Rootshield-Trichoderma fungus competes with the bad guys for sites on roots

Spinach leafspots-Cladosporium

Spinach leafspots-Cladosporium/Stemphylium

Cladosporium- small discreet spots

Stemphylium-larger more diffuse spots

Cladosporium

- Prefers cool and moist 59° - 68°F and RH> 80%.
- Can grow 41° - 86°F.
- Can live in dead spinach tissue for up to 8 years

Management:

- Temperature and moisture management key- no row covers on wet plants
- Bleach or hot water treat seed, rotate, spacing
- Remove infected tissue
- Bacillus mycoides isolate J (LifeGard WGOG): 1.0 to 4.5 oz/100 gal water/A; PHI 0d, REI 4h, Group P6.
- Resistant cultivars-'Winter Bloomsdale' more resistant than 'Ozarka' or 'Fall Green'

Spinach Downy Mildew

Yellow on upper leaf surface

Diagnostic purple/brown spores on undersides-Wet paper towel

Spinach downy mildew

- Common fall disease-pathogen likes cool, cloudy, wet conditions. Can spread rapidly in a field or tunnel-epidemic! (spore to infection to spore in 6-7 days)
- Increase in high tunnel spinach-pathogen needs a green bridge
- Many races-17 currently
- About 1/year
- Breeders are busy!

- Reduce humidity and leaf wetness
- Use of resistant varieties will minimize the incidence of the disease.
- There are several races of the pathogen with Race 14 recently surfacing in New England high tunnels. Select resistance to Races 1-15 if possible. Once infected, there is little that can be done.
- Rotate out of spinach for at least two years.
- Fungicides applied preventatively are best-several conventional.
- Organic products include copper, Actinovate, Double Nickel, LifeGard, Regalia, Oxidate, Trilogy, and Zonix. Copper is considered most effective but based on few evaluations of organic products. Check REI and PHI when selecting conventional or organic fungicides to make sure fits production schedule.

Resistant Cultivars

corvair f1 (DM 1-11, 13, 15, 16) Smooth Leaf · Tunnel or field · Spring/fall or overwinter crop · Suitable for mechanical harvest · Upright habit

shelby f1 (DM 1-13, 15, 16) Smooth Leaf · Tunnel or field · Spring/fall crop · Strong emergence

- Several races of the pathogen 1-15 we are finding lot of Race 14 in NE now DM 12, 14 and “novel”

Sent samples to U of Arkansas for race testing-14 or a new one??

Kookaburra

(F1) Spinach Seed

Product ID: 3

Fast-growing, semi-savoy for early spring and fall.

Upright variety making it easy to harvest for both baby and full-size leaves. Attractive dark green, oval leaves. Great flavor. High resistance to downy mildew races 1-13, 15. Avg. 30,800 seeds/lb. Packet: 1,000 seeds.

EDEMA

Under winter and spring conditions Glandular Trichomes-normal!

Lettuce downy mildew

- White powdery spores on upper leaf surface
- Cool cloudy conditions-late fall field and high tunnel
- Usually a problem approaching maturity
- Infection can occur in as little as 3 hours when leaves are wet
- Attacks older leaves first
- Resistant cultivars-very adaptable pathogen many races
- Seed treatment

Powdery mildews

- Likes high humidity
- Windblown spores can overwinter
- Attacks a lot of greens but each is host specific
- **Warmer, drier conditions high humidity-rain inhibits**
- Spores on both surfaces
- Attacks as plants reach maturity

Powdery mildew- Kale, other brassicas

- Usually late in the season-warm hi RH
- Good organic options-sulfur
- Destroy crops when done

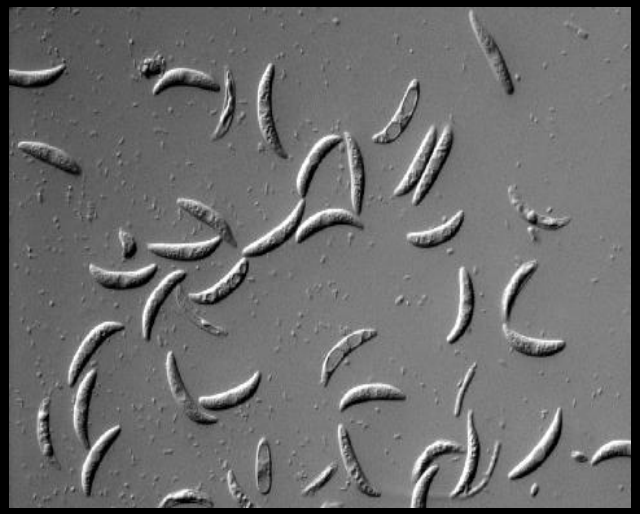
Powdery Mildew-Kale

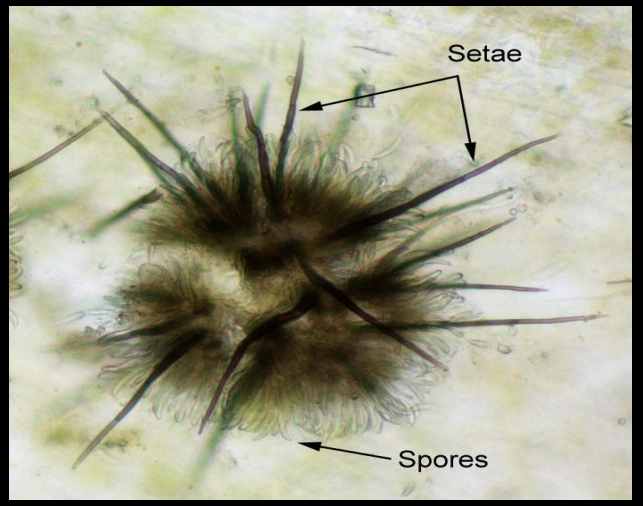
White Russian and Red Ursa affected; not Winterbor.

Image cf. Teresa Rusinek, Cornell

Frothy squash due to yeast or bacteria following injury by squash or cucumber beetle from Great Lakes Veg Group

Plant Diagnostic Clinics





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