Biocontrol Demonstrations; An Introduction to Greenhouse Pests and Biocontrols

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IPM
Integrated Pest Management

Tools used to manage pests while reducing pesticide application.

Constantly being developed.

Pests

Insects + mites

Fungal + Bacterial Diseases

Viruses

Weeds

Rodents + Deer

Cultural

Mechanical

Last Resort: Chemical Sprays

What is Biocontrol?
Predator-Prey Relationship

"Good Guys"

- Biological control organisms
- Biocontrols
- Natural enemies
- Beneficials

Predators and Parasitoids

Pests

Insects + mites

Fungal + Bacterial Diseases

Viruses

Weeds

Rodents + Deer

Prey

Generalist vs. Specialist “Good Guys”

Biocontrols lag behind pests.

"Augmentative Biocontrol"
= buying and releasing biocontrol organisms

These are biocontrol producers:

Places like Griffin Greenhouse Supply are distributers.

Biocontrol Efficacy in Different Locations

- Greenhouse – release biocontrol organisms
- High Tunnel – release + provide habitat
- Outside – provide habitat

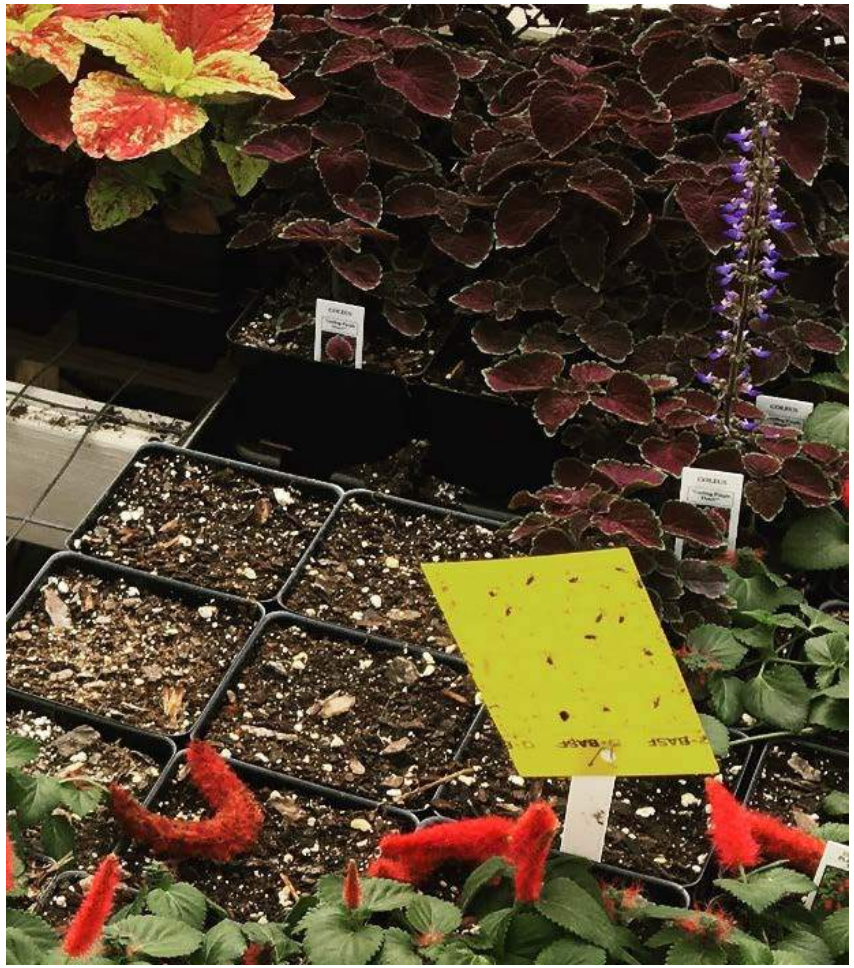
Plants are sold. They leave the greenhouse.

So how do you keep natural enemies in the greenhouse?

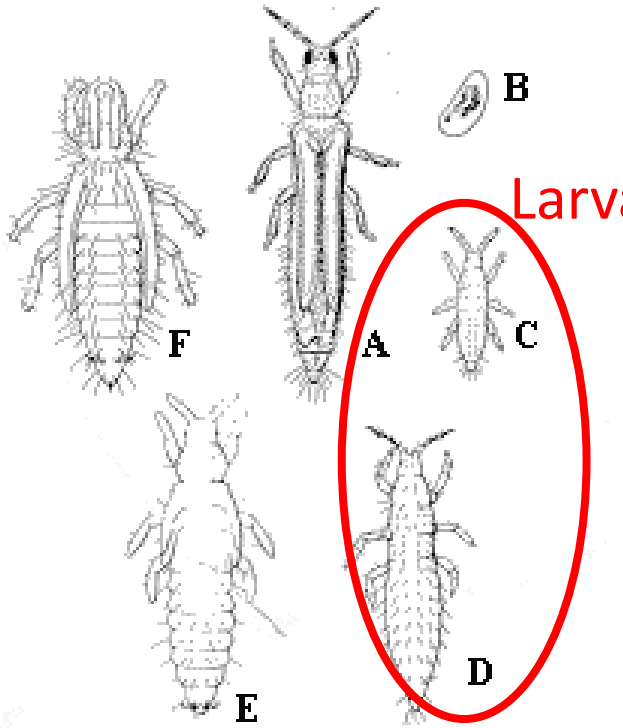
Biocontrols will stick around if they have food.

Have you seen ‘biocontrol’ advertised?

Have you seen evidence of biocontrol on plants?



Pest: Western Flower Thrips



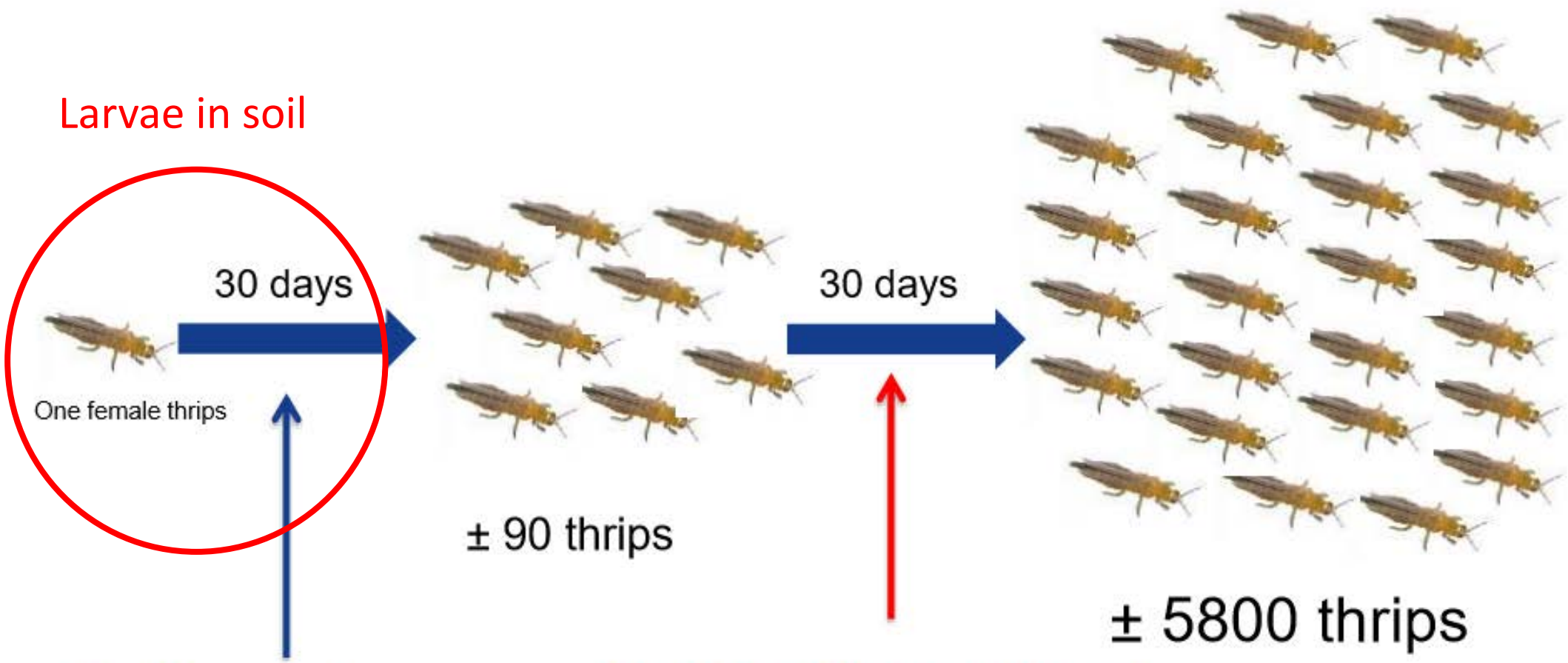
Western flower thrips. A, Adult. B, Egg. C-D, Larvae. E, Prepupa. F, Pupa.

Source: NCSU

Larvae in soil

Thrips Damage

Development of thrips in 60 days (at 68°F)



Pest: Fungus gnats

Common in moist potting soil

Larvae feed on fungus in soil + root


Photo: Hill

Thrips and Fungus gnat predator #1: *Steinernema feltiae*

Predatory Nematodes

Photo: J. Sanderson

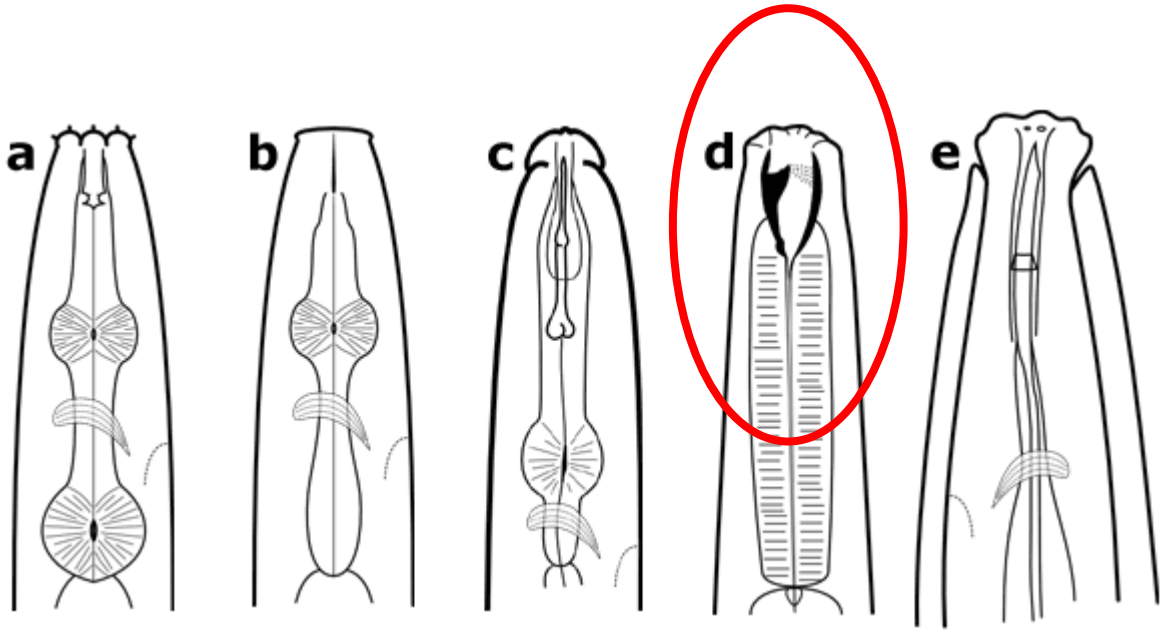


*Figure 2. Nematodes can be classified into **different feeding groups based on the structure of their mouthparts**. (a) bacterial feeder, (b) fungal feeder, (c) plant feeder, (d) predator, (e) omnivore. Figure credit: Ed Zaborski, University of Illinois.*

Predatory Nematode Application

Nematodes are sensitive to:

1. light
2. drying out
3. oxygen levels

Thrips predator #2: *Amblyseius cucumeris*

Predatory mite that feeds on thrips larvae (larvae only!)


Source: UCR


Source: Omafra

A. cucumeris will also feed on some spider mites and pollen.

Cucumeris Application

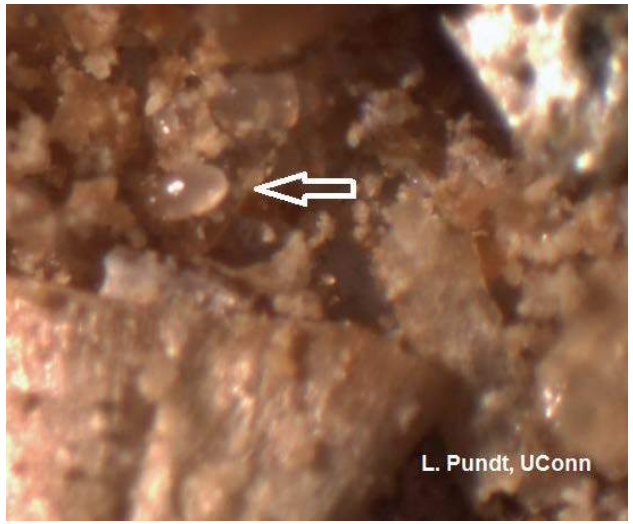
Sashets on stakes: “slow release”

Bottle shaken onto plants: weekly application

What's inside?

Predatory mite "cucumeris"

Bran mite prey



Fungus eaten by bran mite

Sensitive ecosystem in a bag!

Balance for success:

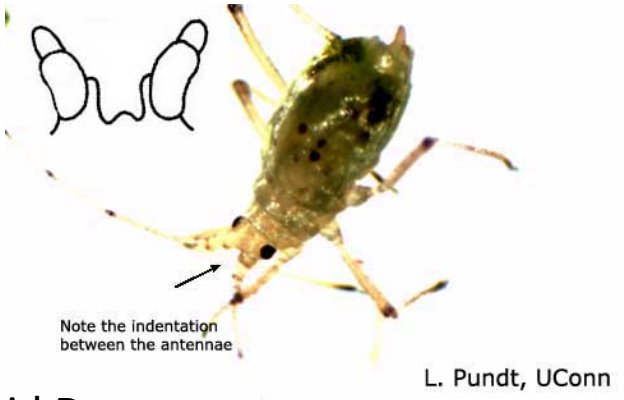
1. keep sashets wet
2. limit disease on plants
3. limit fungus gnat population

Thrips and Fungus gnats

EARLY application to attack thrips and fungus gnat larvae in SOIL

Pest: Aphids
What species do you have?

Most common in greenhouses:
-Green peach aphid
-Fox glove aphid



Foxglove Aphid Damage

Parasitoid Wasps

Photos: Wild and Chattington

Banker Plants

= permanent insect colonies

Many systems:

-Green peach aphids on pepper

-Cherry oat aphid on oats

-Cereal aphids on barley

Grower orders aphid mummies from an insectary

Sprinkled onto banker plants

Banker plants are distributed throughout the greenhouse.

Parasitoids feed on green peach and/or fox glove aphids on cash crop.

They have a constant habitat in banker plants.

Predator: Minute Pirate Bugs (Orius spp.)
Another Banker Plant System

Feeds on thrips, aphids, leafhopper etc.

Ornamental pepper → pollen → constant thrips → MPB predators

Another Banker Plant System

Take home message:

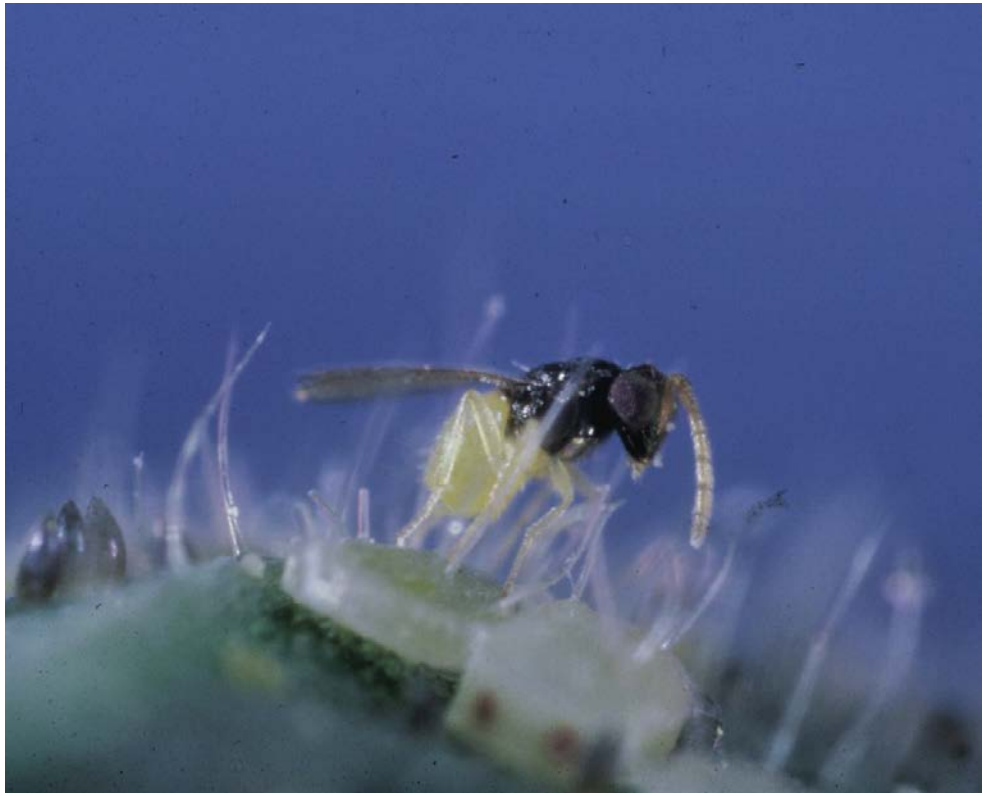
Banker plants are a way to keep biocontrol in the greenhouse.

Pest: Caterpillars

Another type of parasitoid:

Trichogramma brassicae is an egg parasitoid.

Lays eggs in caterpillar eggs.



Eggs that have been parasitized by a Trichogramma wasp!

Two-spotted spider mites (TSSM)

<u>Management</u>

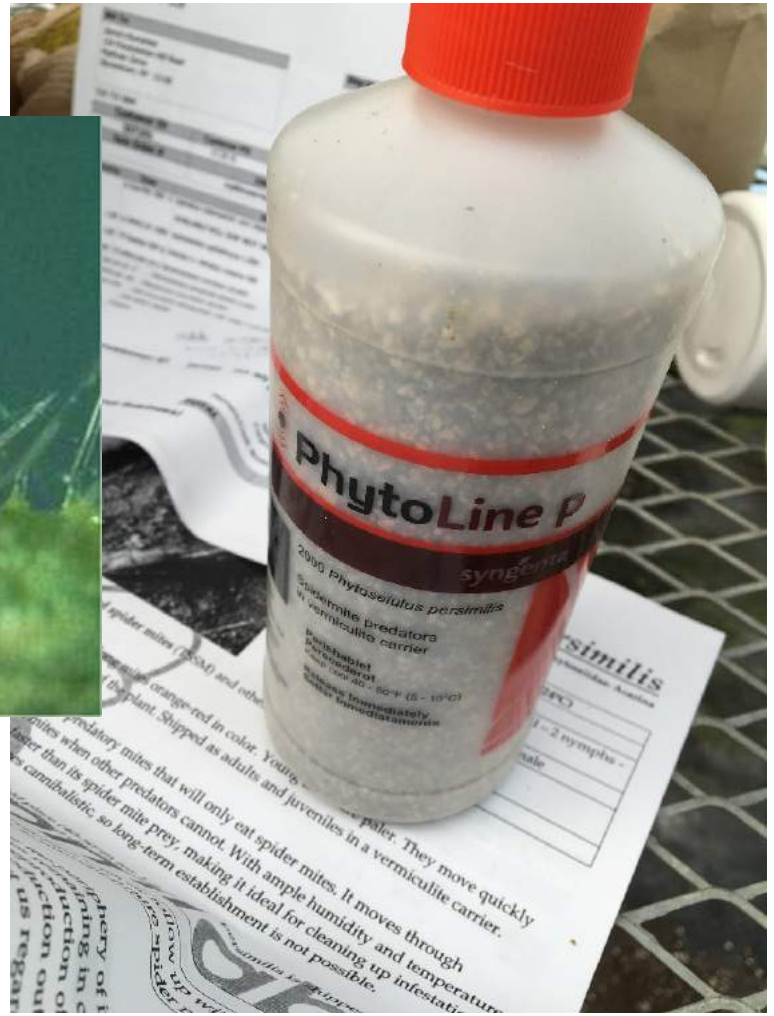
If you spray broad spectrum products for PLH, you will have a secondary outbreak of TSSM.

<u>Environment</u>

Hot & Dry Seasons = More spider mites

-water your plants

Predatory mites: *N. californicus* and *P. persimilis*



Pest: Mealy Bug
What species do you have?

Biggest problem when a grower overwinters perennials in a greenhouse

Biocontrols for Mealybugs

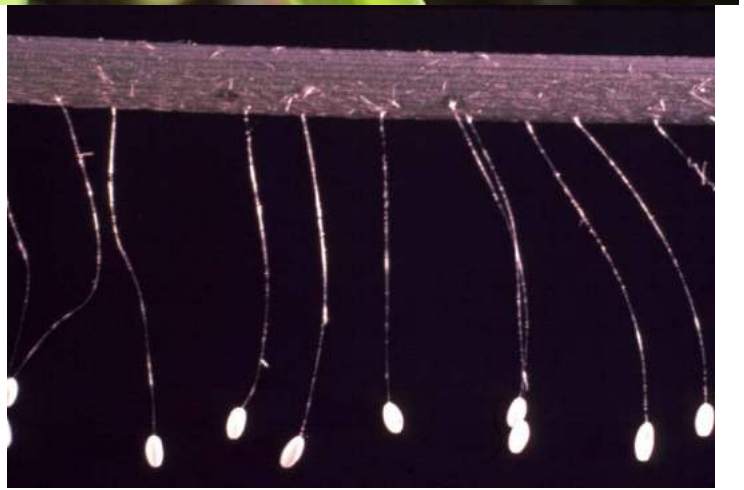
Expensive predatory beetle colony:

Cryptoaemus montrouzieri

Photo: Cynthia Keiser

Mealy bug destroyer

Green Lacewing

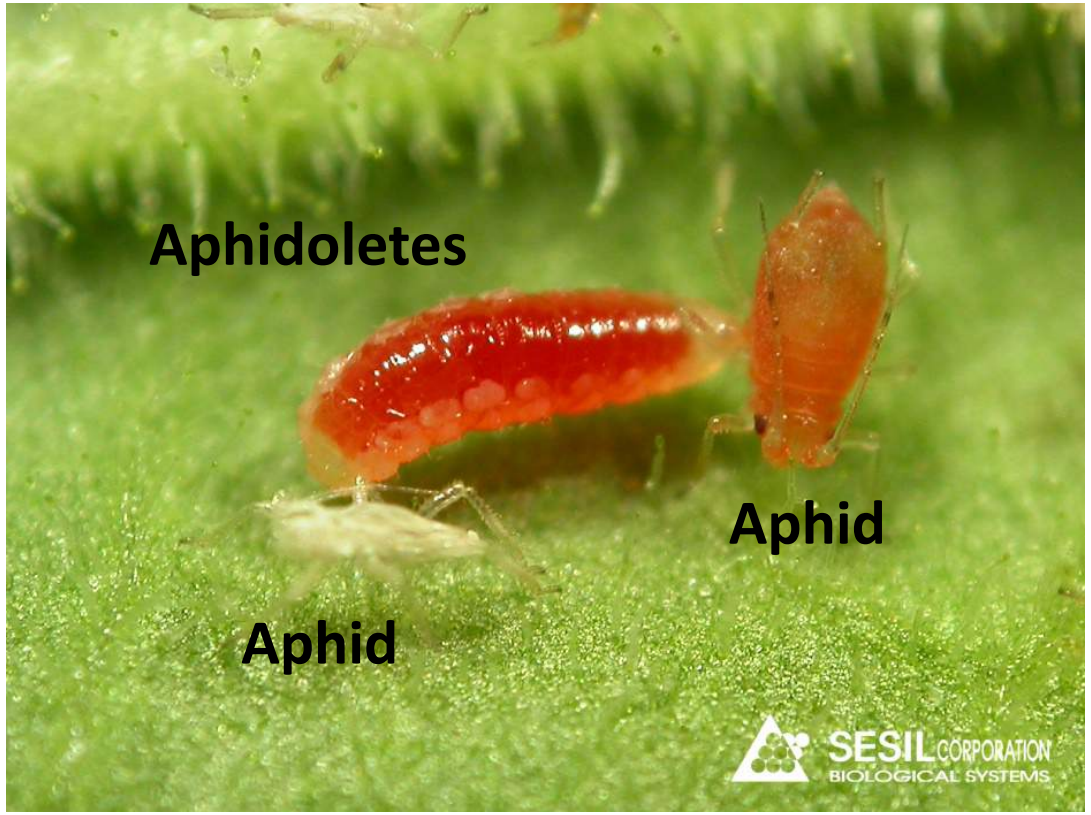


Other Mealy Bug Management Tools:

- Don’t overwinter plants in the greenhouse
- **Power Washing**: water at 1800 PSI at a distance of 6 inches from leaves
- **Neem Oil + Power Wash** works in some cases
- Mealy bugs can hide out on *container rims*
- Some growers use **Cedar mulch** on problem plants (repellant)

Caution with Neem Oil when pollinators are present.
Horticultural Oils are not as reliable but will kill overwintering eggs and smother immature and adults.
Need Pesticide Applicators License when applying any product with restricted use.

Aphid Predator: Aphidoletes larvae



Aphidoletes are sensitive to day length.
LED lights can improve their impact!

Aphid Predator: Aphidoletes larvae

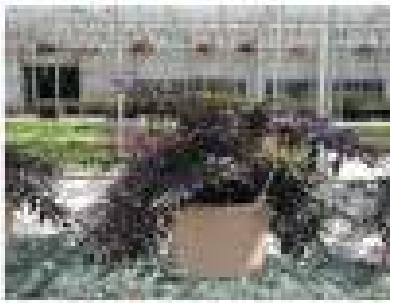
MSU Banker Plant Table

Banker plants

Examples in commercial greenhouse production

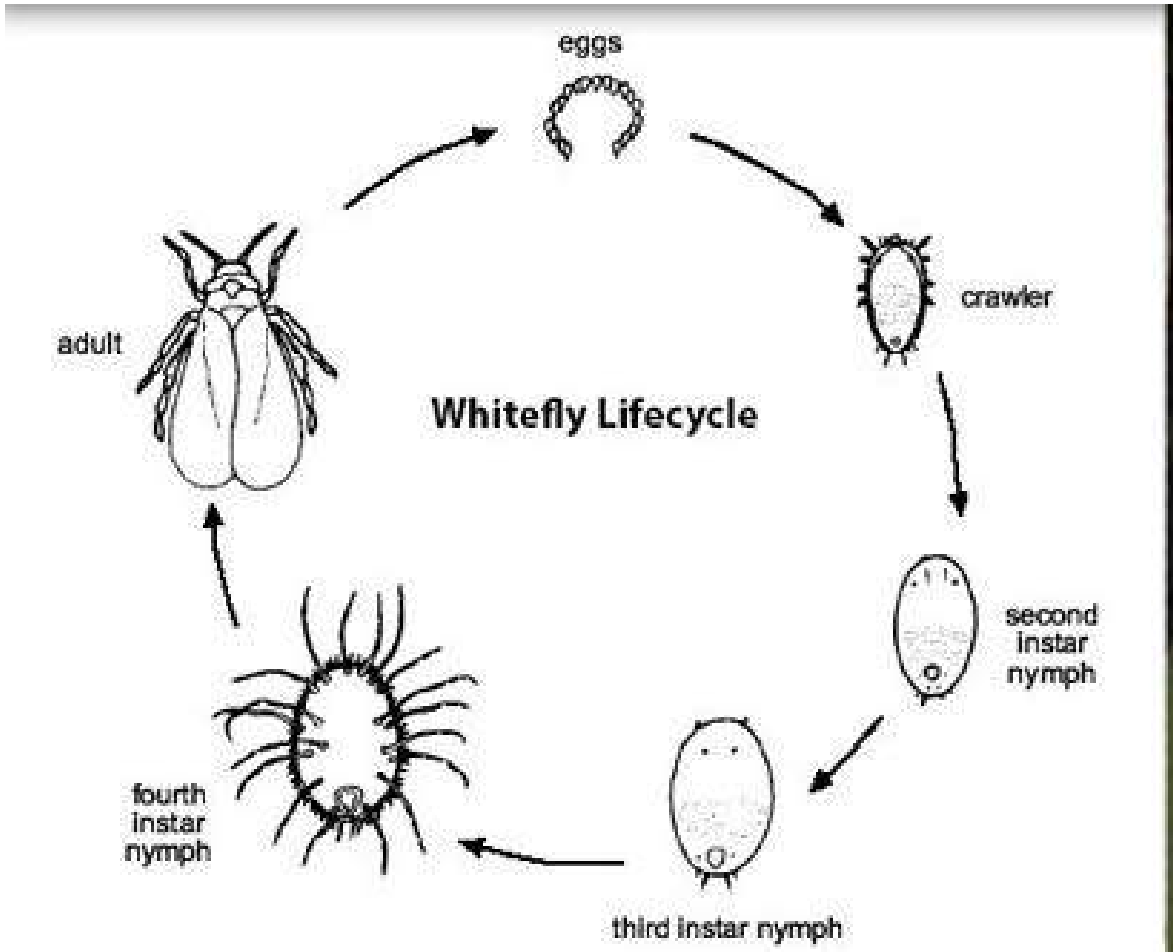
Pest	Banker plant	Food source	Natural enemy
Aphids	Oat, wheat	*Rhopalosiphon padi*	*Aphidius colemani*
Thrips	Castor bean	Pollen	*Iphesius degenerans*
Whitefly	Mullen	Plant sap	*Dicyphus hesperus*
Thrips	Ornamental peppers	Pollen	*Orius insidiosus*



PEST

Whitefly
(egg- adult in 18-28 days)



Biocontrol for Whitefly

Encarsia (parasioid wasp)

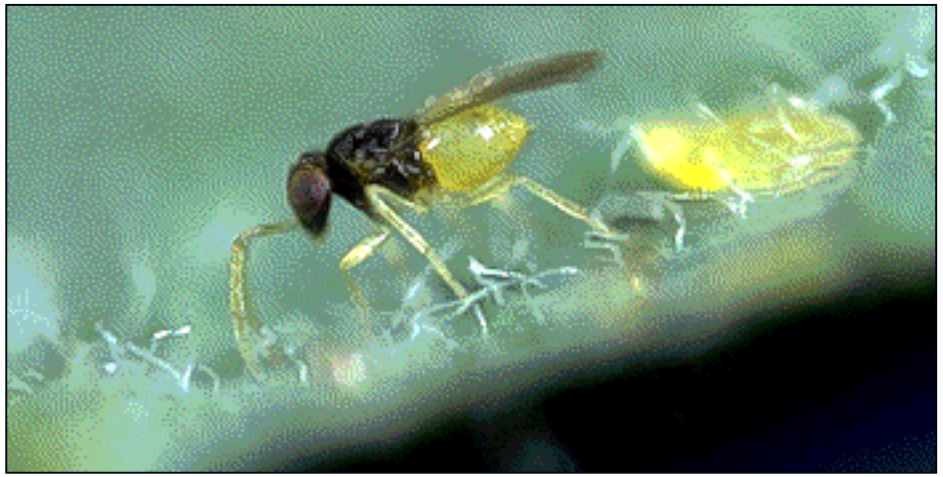


Photo: Sanderson Lab

Delphastus (predatory beetle)

Photo: Biobest

White Fly

Release of ***Encarsia*** on pointsettia for **Whitefly Management**

Challenges for Growers

- Start early, plan ahead
- Cost
- They have a system that works (pesticides)
- Not enough consumer pressure
- No interest in “organic flowers”
- Special care for certain products
- Biocontrols are alive!
- Aesthetic business

Reasons Why Growers Jump into Biocontrol

- Consumer demand in some areas
- Pests are resistant to pesticides

Thank you! Looking for more?

- *Lily's Capital Region Horticulture Factsheets: http://blogs.cornell.edu/capitalareaagandhortprogram/capital-horticulture/*
- *Betsy Lamb, Cornell University NYS IPM*
  - *Pocket IPM: Greenhouse Scout App (https://nysipm.cornell.edu/agriculture/ornamental-crops/greenhouse-resources/pocket-ipm-greenhouse-scout-mobile-app)*
- *Tina Smith, UMass Extension*
- *Leanne Pundt, UConn Extension*