Biocontrol Demonstrations;
An Introduction to Greenhouse Pests and Biocontrols

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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
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- Weeds
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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 distributors.
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


Larvae in soil

Thrips Damage

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

Larvae in soil

30 days

One female thrips

± 90 thrips

Start here = Success

Too late = Disappointment

30 days

± 5800 thrips

Ronald Valentin
Pest: Fungus gnats

Common in moist potting soil

Larvae feed on fungus in soil + root
Thrips and Fungus gnat predator #1: *Steinernema feltiae*

Predatory Nematodes

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!)

*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
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)

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

Environment
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*

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)

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**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

<table>
<thead>
<tr>
<th>Pest</th>
<th>Banker plant</th>
<th>Food source</th>
<th>Natural enemy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphids</td>
<td>Oat, wheat</td>
<td><em>Rhopalosiphon padi</em></td>
<td><em>Aphidius colemani</em></td>
</tr>
<tr>
<td>Thrips</td>
<td>Castor bean</td>
<td>Pollen</td>
<td><em>Iphesius degenerans</em></td>
</tr>
<tr>
<td>Whitefly</td>
<td>Mullen</td>
<td>Plant sap</td>
<td><em>Dicyphus hesperus</em></td>
</tr>
<tr>
<td>Thrips</td>
<td>Ornamental peppers</td>
<td>Pollen</td>
<td><em>Orius insidiosus</em></td>
</tr>
</tbody>
</table>
Whitefly
(egg-adult in 18-28 days)
Biocontrol for Whitefly

Encarsia (parasitoid wasp)

Delphastus (predatory beetle)

Photo: Biobest

White Fly

Photo: Sanderson Lab
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/](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