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Biological Control in Propagation

Moriah LaChapell
Biological Control Agents
mlachapellschalock@wilburellis.com

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What is Biological Control?

Biological control involves the release or application of natural enemies including parasitoids (parasitic wasps), predators and pathogens (entomopathogenic fungi and nematodes) to regulate an existing pest population.
– Dr. Raymond A. Cloyd

Minute Pirate Bug, *Orius insidiosus*

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What are the benefits of Biological Control?

- Combat difficult to control pests
- Resistance management tool
- Reduce labor
- Produce sellable crops
- Marketing “bee friendly” plants

Aphidius colemani (APHIPAR) Koppert

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How to approach Biological Control

There is no cookie cutter approach to successfully implementing biological control. Every growing location comes with a different set of challenges.

- Type of Pest(s)
- Pest Pressure
- Tolerance level for damage

> Pest pressure is the inevitable, ubiquitous factor in evolution which makes for an apparently pointless multiplicity of species in all areas in which it has time to operate. – Gillett (1962)

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Beneficial Insect Performance Factors

- Communicate pest type and production specifications
- Check the vitality of the beneficial insect and contact the supplier right away if there is low survivorship or poor searching behavior
- The safest approach is to release beneficial insects preventatively
- Discuss insecticide history and spray programs

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Limit Exposure to Non-Compatible Pesticides

- Direct versus Indirect Exposure
- Direct exposure of an insecticide to a beneficial insect is a lethal dose that results in immediate death.
- Indirect exposure of an insecticide to a beneficial insect is a sublethal dose which can reduce fecundity, foraging behavior or progeny survival;
  Example: Organophosphate versus Imidacloprid

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Selecting Compatible Products

- Select a product with shorter persistence or residue; Example: Botanigard for Thrip and Aphid suppression
- Spot treatments based on scouting data can maintain existing beneficial insect populations
- Work with propagators to secure liners that are produced with biological control or compatible pesticides

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The Benefit of Working with a Supplier Who Uses Biocontrol

Iwasaki Nursery is a large commercial nursery that maintains an extensive biological control program. A melon aphid infestation was controlled by the predatory wasp *Aphelinus abdominalis.* The predator was not released and most likely came in on purchased plants.

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Melon Aphid *Aphis gossypii* Encyclopædia Britannica, Inc

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Evaluating Beneficial Insect Suppliers

Photo courtesy of Philips Lighting

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Supplier Poinsettia Trial at Iwasaki Nursery

Ongoing trial on biological control at Iwasaki Nursery to evaluate supplier beneficial insects and the control of *Bemisia tabaci*.

- 6 different ranges, 3 suppliers.
- BioBest's *Eretmocerus* mix appears to be most effective, but Bioline's *Eretmocerus* mix is more affordable.
- Pest pressure has been low so far.
- Iris Whitefly and Banded Whitefly are occurring, which might not be controlled by *Eretmocerus*. Applied Bionomic's *Encarsia* are an important addition.

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Difficult to Control Pests

- Western Flower Thrips (*Frankliniella occidentalis*)
- *Q*-Biotype Whitefly (*Bemisia tabaci)*
- Foxglove Aphid (*Aulacorthum solani)*
- Asian Citrus Psyllid (*Diaphorina citri*)
- Broad Mites (*Polyphagotarsonemus latus*)

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Bemisia tabaci Amada44 via Wikimedia Commons

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Q-Type Bemisia tabaci Control

- *Eretmocerus eremicus* is a tiny parasitic wasp (~1 mm in length) that is indigenous to the southern desert areas of California and Arizona and is an important parasitoid of whiteflies.
- *Delphastus catalinae* is a small ladybird beetle which preys on all species and stages of whitefly

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Delphastus catalinae DELPHIBUG Koppert

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Thrips Management

1. Introduce the predatory mite *Stratiolaelaps* to the soil
2. Drench soil with Nemasys (*Steinernema feltiae)*
3. Release the predatory mite *A. cucumeris* and *A. swirskii*

Photo by Ron Goldman

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Foxglove Aphid

- *Aphidius ervi* is originally a European species, but it has been widely introduced into North America and South America and other regions in recent years as part of biological control programs for aphids on a variety of crops. Once a female finds an individual aphid or aphid colony, she will palpate the aphids with her antennae. If the aphid she is examining is of the correct size and has not already been parasitised, she rapidly curls her abdomen under her body and stabs the aphid with her ovipositor.

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Two Spotted Spider Mite (TSSM) (*Tetranychus urticae* Koch)

1. Predatory mites will eat pest mite eggs and adults
2. They kill by inserting mouth parts in eggs or adults and sucking out the contents
3. *P. persimilis* is blind and relies on odor to locate prey
4. Predatory mite species thrive in different temperatures and relative humidity

All Predatory Mites Are Not Created Equal

1. Type I Predatory Mites are specialist (specialized) predatory mites because they only feed and survive on spider mites in the family Tetranychidae (also referred to as Tetranychid), which includes the two spotted spider mite, *Tetranychus urticae*.
    a) EX *Phytoseiulus persimilis*
2. Type II Predatory Mites are selective predatory mites with a broad host range. These predators will eat various prey and pollen. Less likely to cannibalize in adverse conditions.
    b) EX *Neoseiulus californicus, N. fallacis,* and *N. (Amblyseius) cucumeris*
3. Type III Predatory mites are generalist predators that feed on eriophyid and broad mites. They will also feed on pollen, honeydew and plant exudates. They are more likely to cannibalize in adverse conditions (see Donner Party).
    c) EX *Amblyseius swirskii*

http://www.greenhousegrower.com/production/insect-control/all-predatory-mites-are-not-created-equal/

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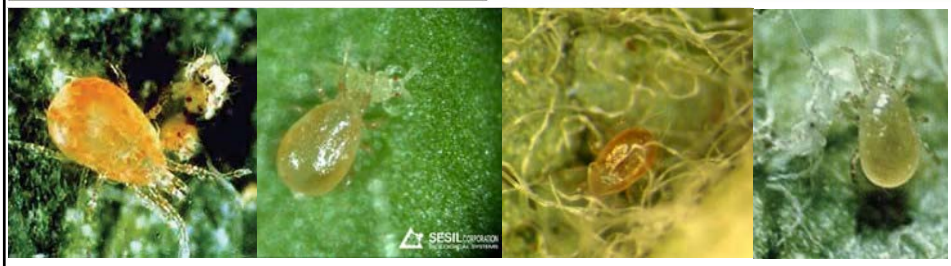
Common Predatory Mites

Beneficial Insect	Target Pest
Amblyseius cucumeris ("cucs")	Type II Selective Predator
Galendromus occidentalis ("occi's")	Type II Selective Predator
Amblyseius fallacis (fallacis)	Type II Selective Predator
Amblyseius andersoni (andersoni)	Type III Generalist Predator
Neoseiulus californicus (californicus)	Type II Selective Predator (shares Type III traits)



Galendromus occidentalis *Amblyseius cucumeris* *Amblyseius andersoni* *Neoseiulus californicus*

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Insects. 2016 Dec; 7(4): 48.
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PMCID: PMC5198196

How to Start with a Clean Crop: Biopesticide Dips Reduce Populations of *Bemisia tabaci* (Hemiptera: Aleyrodidae) on Greenhouse Poinsettia Propagative Cuttings

Rosemarije Buitenhuis,[1,*] Michael Brownbridge,[1] Angela Brommit,[1] Taro Saito,[1] and Graeme Murphy[2]
Eric W. Riddick, Academic Editor

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Abstract Go to:

(1) Global movement of propagative plant material is a major pathway for introduction of *Bemisia tabaci* (Hemiptera: Aleyrodidae) into poinsettia greenhouses. Starting a poinsettia crop with high pest numbers disrupts otherwise successful biological control programs and widespread resistance of *B. tabaci* against pesticides is limiting growers' options to control this pest; (2) This study investigated the use of several biopesticides (mineral oil, insecticidal soap, *Beauveria bassiana*, *Isaria fumosorosea*, *Steinernema feltiae*) and combinations of these products as immersion treatments (cutting dips) to control *B. tabaci* on poinsettia cuttings. In addition, phytotoxicity risks of these treatments on poinsettia cuttings, and effects of treatment residues on mortality of commercial whitefly parasitoids (*Eretmocerus eremicus* and *Encarsia formosa*) were determined; (3) Mineral oil (0.1% v/v) and insecticidal soap (0.5%) + *B. bassiana* (1.25 g/L) were the most effective treatments; only 31% and 29%, respectively, of the treated *B. tabaci* survived on infested poinsettia cuttings and *B. tabaci* populations were lowest in these treatments after eight weeks. Phytotoxicity risks of these treatments were

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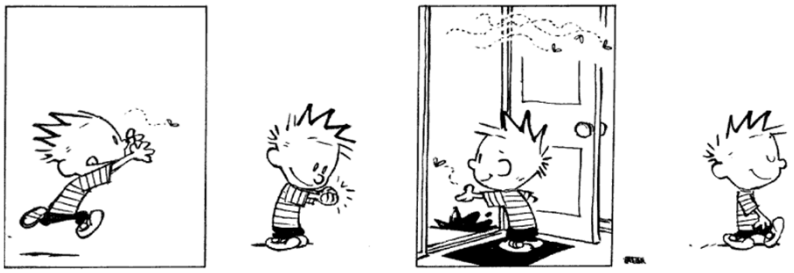
Thank You!



mlachapellschalock@wilburellis.com

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