

Cornell Cooperative Extension

Capital Area Agriculture and Horticulture Program

Getting Started with Biocontrol in the Greenhouse

Greenhouse growers in New York's Capital Region are joining the ranks of farmers who use biological means to manage pest arthropods and pathogens (Figure 1). Pest resistance to pesticides and consumer demand are driving forces in the transition to biological control. "Natural enemy," "beneficial," and "biocontrol agent" are all terms that refer to organisms that are used to manage pests by feeding on or laying eggs in pest species. They are an effective integrated pest management (IPM) tool used as an alternative to pesticides. These predators and parasitoids are grown commercially, packaged, and shipped by insectaries all over the world.

Biocontrol programs work well to manage thrips, aphids, white flies, fungus gnats, and spider mites on ornamentals and vegetable transplants in greenhouse systems.

To achieve successful biocontrol, plan ahead. Starting in the middle of the season is not recommended. Biocontrol species have limited compatibility with pesticides. Talk with your plant supplier to understand the spray history of shipped plant material. This will reduce the risk of biocontrol death from pesticide residue.

For the best results, use one or more biocontrol species for each of the major pest species (thrips, aphids, and mites). If you are hesitant and only start with hanging basket sachets of *Aphidoletes*, you won't be able to apply the broad spectrum pesticides for twospotted spider mites later in the season without killing the aphid predators. While transitioning from conventional to biocontrol systems, it is likely that you will need to control a pest hot spot with a pesticide application. NYS IPM has created a [Greenhouse Scout app](#) with descriptions of biocontrol species, application instruction, and their chemical compatibility.

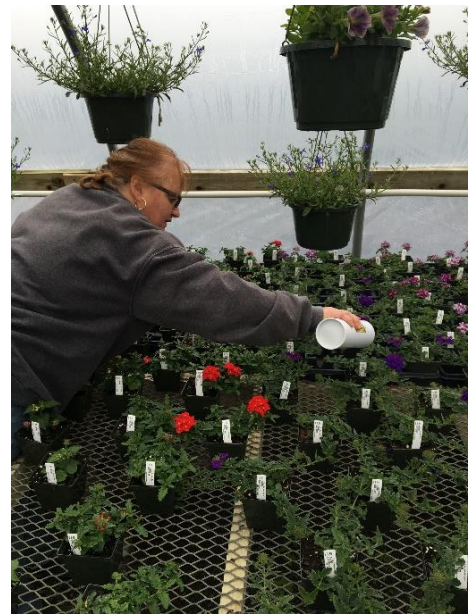


Figure 1. Washington County grower shaking predatory mites over spring crop on benches.

Differences from pesticides:

1. You do not need a pesticide applicator license to apply a product unless it has an EPA registration number and is a "restricted use" product.
2. There is no re-entry time or pre-harvest interval for biocontrols.
3. Biocontrols are live organisms and therefore repeated shipments are necessary throughout the growing season and proper storage is required.

Similarities to pesticides:

1. Growers need to **read application and rate instructions**. Just because two biocontrol products are packaged the same way doesn't mean they are the same species.
2. Research is conducted on organisms before release is permitted and commercial production begins.
3. Starting with a clean greenhouse and planning shipments ahead of time is critical to success.
4. Scouting with sticky cards is essential.

Biocontrol of Thrips

Different biocontrol species target stages of thrips in the soil and on foliage. Growers apply a predatory nematode (*Steinernema feltiae*) drench to the soil as planting begins and again two weeks later (Figure 2). To reduce the risk of disease spread, do not dunk trays into a bin of the nematode mix. Instead, apply nematodes as a sponch, drench, or through your irrigation system.



Figure 3. *A. cucumeris* in bran medium shaken out of a bottle onto potted plants on benches.

- Don't apply nematodes in the heat of the day.
- Nematodes are effective predators of fungus gnat larvae in the soil.
- When warmer temperatures approach and foliage is present (2-4 inches tall), the predatory mite, *Amblyseius cucumeris*, is an effective predator of thrips.
- Predatory mites are most commonly dispensed by shaking a bottle over plant foliage (Figure 3) or sticking sachets into pots and hanging baskets (Figure 5). This species of mite is known to feed on western flower thrips, chilli thrips, broad mite, and cyclamen mite (Table 1).



Figure 2. Package of *S. feltiae* predatory nematodes ready to be used in a sponch against thrips.

Biocontrol of Twospotted Spider Mite

Twospotted spider mite is often a secondary pest that becomes a problem when broad spectrum insecticide knocks out naturally occurring or released biocontrol organisms. Additionally, spider mites thrive in hot and dry conditions. A combination of two predatory mites, *Amblyseius californicus* and *Mesoseiulus longipes*, are an effective prophylactic spider mite management tool. If greenhouse temperatures are below 78°F, *Phytoseiulus persimilis* has been observed to be more effective. The key to managing twospotted spider mite outbreaks is to scout regularly so that you are aware that there is a problem brewing. The best spider mite management is cultural and biological, before they become a problem.

Biocontrol of Aphids



Figure 4. Container of *Aphidoletes*, a predatory midge, ready to be distributed.

Currently, the larvae of predatory midge, *Aphidoletes aphidimyza*, which feeds on green peach, melon, and potato aphids is the best biocontrol to begin your aphid management. There are several species of tiny parasitoid wasp that lay their eggs in different species of aphid. The parasitoid wasp, *Aphidius colemani*, lays her eggs in green peach and melon aphid. Establishing a parasitoid wasp colony using banker plants is an effective way to maintain a resident population of biocontrol agents for aphid management. This is a biocontrol system that is more advanced and not recommended for your first season of biocontrol. If *Aphidoletes* and/or parasitoid wasp species are not available from your supplier, minute pirate bugs (*Orius* sp.) and lady beetles (*Adalia* sp. or *Hippodamia* sp.) are also effective generalist predators of aphids.

Table 1. Commercially produced and accessible biocontrol species. Commonly referenced names are in bold.

Mode of Action	Biocontrol Agent	Target Pest(s)
Parasitism	<i>Aphidius colemani</i> (wasp)	Green peach and melon aphids
Predation	<i>Aphidoletes</i> <i>aphidimyza</i> (midge)	Foxglove, green peach, melon, and potato aphids
Parasitism	<i>Aphelinus abdominalis</i> (wasp)	Foxglove and potato aphids
Parasitism	<i>Aphidius ervi</i> (wasp)	Foxglove and potato aphids
Predation	<i>Adalia</i> sp., <i>Hippodamia</i> sp. (beetles) lady bugs	Foxglove, green peach, melon, and potato aphids
Predation	<i>Atheta coriaria</i> (beetle) rove beetles	Western flower thrips and fungus gnats
Predation	<i>Amblyseius cucumeris</i> (mite)	Western flower thrips and broad, chilli, cyclamen mites
Predation	<i>Amblydromalus limonicus</i> (mite)	Western flower thrips
Predation	<i>Amblyseius swirskii</i> (mite)	Western flower thrips, chilli thrips, and broad mite
Predation	<i>Steinernema feltiae</i> or <i>carpocapsae</i> (nematode)	Western flower thrips, fungus gnat, and shore fly
Predation	<i>Orius</i> <i>insidiosus</i> (true bug)	Western flower thrips, chilli thrips
Predation	<i>Amblyseius californicus</i> (mite)	Broad, cyclamen, and twospotted spider mites
Predation	<i>Feltiella</i> <i>acarisuga</i> (midge)	Twospotted spider mite
Predation	<i>Phytoseiulus persimilis</i> (mite)	Twospotted spider mite
Parasitism	<i>Leptomastix dactylopii</i> (wasp)	Citrus mealybug
Predation	<i>Cryptolaemus montrouzeri</i> (beetle) mealybug destroyer	Citrus and longtailed mealybugs
Predation	<i>Chrysoperla carnea</i> (lacewing)	Brown soft scale, citrus, longtailed mealybugs,



Figure 5. *A. cucumeris* in a stake sachet stick into the soil medium. Predatory mites are in the packet with bran mites to feed on in transit.

Additional Resources

NYS IPM's *Greenhouse Scout* app for:

Android: <https://itunes.apple.com/us/app/greenhouse-scout/id879950583?mt=8>

iPhone: <https://apps.apple.com/us/app/greenhouse-scout/id879950583>

Applied Bio-nomics [application rates](#) and [release instruction](#)

[UMass Grower Testimonial: Scheduling Biologicals](#)

[Educational Consumer Flier on Biocontrol](#)

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