Greenhouse Pest Message, January 6, 2020
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Some Tips on Getting Started in Using Biological Control Agents

Ask your plant supplier what pesticides were applied to your incoming plant material to ensure that no long lasting pesticide residues will adversely impact the biological control agents that you are planning to release.

One week before opening a greenhouse, order beneficial nematodes, *Steinernema feltiae*, (Nemasys, Nemashield) for fungus gnat larvae; *Steinernema carpocapsae* (Millenium) for shore flies; *Stratiolaelaps scimitus* (formerly *Hypoaspis miles*) for fungus gnat larvae and thrips pupae; *Dalotia (Atheta) coriaria* for fungus gnats, shore flies, and thrips in the growing media; and *Neoseiulus (Amblyseius) cucumeris* for thrips larvae.

When your order arrives, open the package immediately to inspect their quality. Shipping is stressful and you are receiving fragile, starving creatures so **do not place them in the refrigerator**, which is too cool and dry (**except for beneficial nematodes**). Nematodes can be stored in a dedicated refrigerator with constant temperatures (38-42°F).

When your package arrives, check to see that the cold packs are still cold. Write the arrival dates on the outside of all materials. Keep the predatory mites and rove beetles at cool at room temperature and release the same day.

Nematodes are best applied either late in the afternoon or on a cloudy, overcast day. Remove the package of nematodes from refrigerator and allow the nematodes to warm up to room temperature before mixing with water. Beneficial nematodes can be applied with a Dosatron injector set at 1 to 100 ppm (to deliver 100 gallons final solution). Remove all the filters to prevent clogging. The hose nozzle should have large openings so the nematodes can move freely through this opening. Wet the plant leaves and media as much as possible during application. Some growers drench their greenhouse floors with the nematode solutions (depending upon the type).

Unrooted cuttings can be stuck into trays, and then watered in with the nematode solution. Pots that are filled with media and will be transplanted the next day or two can also be watered in with the nematode solutions. Two applications spaced 2 weeks apart usually provide 6 weeks of protection. Beneficial nematodes can also be applied with biological fungicides such as *Trichoderma* (RootShield or Rootshield Plus). Hydrogen dioxide (XeroTol

2.0) and fertilizer solutions are not compatible with the beneficial nematodes and need to be applied separately.

BASF Nemasys Beneficial Nematodes: Chemical Compatibility Guide https://betterplants.basf.us/content/dam/cxm/agriculture/better-plants/united-states/english/products/nemasys-beneficial-nematodes/nemasys-chemical-compatibility-guide.pdf

Stratiolaelaps scimitus (*Hypoaspis miles)* is applied during seeding or sticking of cuttings. These generalist predatory mites are very mobile and will colonize the **surface** of the growing media. (do not mix them into the growing media). They come in a tube of vermiculite-peat. Sprinkle across the treated area so they are evenly distributed. Re-reapply when transplanting or repotting. If you have dirt floors, it can be helpful to treat the greenhouse floors or the perimeter of the greenhouse.

Dalotia (Atheta) coriaria only needs to be applied once during seeding or sticking cuttings. These nocturnal rove beetles are easily established in greenhouses and are best released in the evening. All three stages of the rove beetles (egg, larva, and adults) are present in the vermiculite-peat carrier. Open the container to sprinkle them evenly across the area to be treated. Rove beetles are compatible with beneficial nematodes.

One supplier sells a breeding bucket system for the rove beetles, which consists of media, beetles, and a supplier food source. Exit holes in the bucket allow the beetles to exit into the greenhouse. These buckets are placed in shaded areas under the greenhouse benches. Growers can also make their own rearing systems. (On Farm Rearing of the soil predator Dalotia coriaria. MSU Organic Pest Management Laboratory. https://cerestrust.org/wp-content/uploads/MSU-Rearing-Dalotia-coriaria.pdf)

Neoseiulus (Amblyseius) cucumeris is available in mini-sachet packets on a stick or can be broadcast or placed in breeding piles. Because *N. cucumeris* only preys on the young thrips larvae, it is important to start releases **preventively,** at planting, before thrips are detected. *N. cucumeris* also eats pollen, or they may prey upon broad mites, as well as spider mites.

N. cucumeris is available as nymphs and adults mixed with a carrier or in slow release sachets. Slow release sachets consist of bran, whitish storage mites (that feed upon the bran), and *N. cucumeris* which prey upon the storage mites. Predatory mites should emerge from the sachets for 4 weeks or so unto the

crop. Place 1 mini-sachet per hanging basket or 1 to 4 mini-sachets per shuttle tray.

N. cucumeris can be applied by gently sprinkling (broadcasting) the loose mites over the unrooted and rooted plant trays. They can also be placed in a small breeder pile (about a teaspoon) of loose mites in the middle of each plug tray. Inspect a small sample under the microscope to be sure the predatory *N. cucumeris* are active. Sometimes, growers confuse the larger white bran mites, which are used as a food source, for the beneficial *N. cucumeris*. If you are using the mini-sachets, the new formulation of packets on sticks works well for plug trays. *Neoseiulus* should be reapplied when transplanting or repotting.

When using the mini sachets, place them in the plant canopy, where they will stay more **shaded** so there is more relative humidity. If the mini-sachets are placed in bright sunlight, high temperatures and low relative humidity in the sachets adversely affects the reproduction and egg hatch of the predatory mites. (Eggs will shrivel and die at low relative humidity). If mini-sachets are placed within the plant canopy, the temperature peaks less, with higher relative humidity needed for the reproduction of these predatory mites.

As each new shipment of plant material arrives, follow this same procedure. Keep the packing slips and write down where and when you release the biological control agents or have a separate record keeping system for this procedure.

There is a section on using biological controls on the newly revised and updated UConn Greenhouse IPM website:
https://ipm.cahnr.uconn.edu/greenhouse-publications/

Grower Talks Magazine published a series of excellent articles on best practices for biocontrol in 2021:

Sanderson, J. S. Wainwright-Evans, and R. Valentin. Best Practices for Biocontrols, Part 1. Grower Talks. 84 (10):40-42. February 2021. https://www.growertalks.com/Article/?articleid=25071

Sanderson, J. S. Wainwright-Evans, and R. Valentin. 2021. Release the Beasts., Part 2. Grower Talks. 84 (11): 64-66. March 2021. https://www.growertalks.com/Article/?srch=1&articleID=25126&highlight=sanderson

Sanderson, J., S. Wainwright Evans, and R. Valentin. 2021. Best Practices for Biocontrols, Part 3. GrowerTalks. 84 (12) 60-64. April 2021.

https://www.growertalks.com/Article/?srch=1&articleID=25175&highlight=sanderson

Sanderson, J., S. Wainwright-Evans, and R. Valentin. 2021. Best Practices for Biocontrols, Part 4. GrowerTalks. 85 (1):62-66. May 2021. https://www.growertalks.com/Article/?srch=1&articleID=25217&highlight=sanderson

Sanderson, J., S. Wainwright-Evans, and R. Valentin. 2021. Best Practices for Biocontrols, Part 5. GrowerTalks. June 2021. issue: https://www.growertalks.com/Article/?articleid=25255

Smith, T., and L. Taranot. 2015. Scheduling Biologicals. UMass Extension Factsheet. 2 pp.

Talk to several suppliers before the growing season begins. Ask them if they provide technical support and consulting services to help you set up your biological control program before selling you beneficial insects or mites. Inquire whether they carry the beneficial you are interested in ordering. Check to see that the supplier will ship the natural enemies in an insulated polystyrene container with directions on how to handle the natural enemy upon receipt. Check with the supplier on their delivery schedule and shipping costs.

Here is a partial listing of some of the suppliers and or distributors of natural enemies used by New England growers.

1. **Applied Bionomics**, Victoria, BC, Canada
Web: http://www.appliedbio-nomics.com/ Email: mailto:brianabl@telus.net Telephone: 250-656-2123

2. **Beneficial Insectary**, Redding, CA
Web: http://www.insectary.com or www.greenmethods.com
Email: info@insectary.com
Telephone: 1-800-477-3715

3. **Biobee USA**
Web: www.biobee.us
Email: info@biobee.us
Telephone: 410-572-4159

4. **BioBest Biological Systems**
Web: www.biobestgroup.com or info@biobest.ca

Email: info@biobest-usa.com
Telephone: 519-322-2178 or
toll-free: 855-2BIOBEST (855-224-6237)

5. **IPM Laboratories, Inc.**, Locke, NY
Web: www.ipmlabs.com
Email: ipminfo@ipmlabs.com
Telephone: 315–497–2063

6. Koppert Biological Systems
Web: www.koppert.com
Email: info@koppertonline.com
Telephone: 1-800-928-8827

7. Bioline Agrosciences, Inc., Oxnard, CA
Web: http://www.biolineagrosciences.com/
Email: info@biolineagrosciences.com
Telephone: 805–986–8265

8. **Plant Products USA**
39035 Webb Drive
Westland, MI 48185
Cell: 860-319-7686
Tel: 248-661-4378 Fax: 416-840-2873
jeff.mayer@plantproducts.com
www.plantproducts.com
Jeff Mayer
Technical Sales Representative

For additional suppliers of natural enemies, see the Association of Natural Biocontrol Producers (ANBP). *No discrimination is intended for any companies not listed.*

Upon receipt of natural enemies, check the quality of the shipment. Assess the number of shipment days and how cold or warm the ice packs are and whether there is any condensation. Look for movement of the natural enemies that are not in a resting stage.

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