

GROWERTALKS

Pest Management

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Best Practices for Biocontrols, Part 5

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Previous articles in this series have described how to prepare for, receive and store a shipment of biocontrol agents (BCAs), how to release predatory mites, how to release parasitoid wasps, and how to use insect-killing nematodes. This article describes how to release some other commonly used BCAs, including the minute pirate bug *Orius insidiosus*, the aphid predatory midge *Aphidoletes aphidimyza*, and green lacewing larvae *Chrysopa spp.*

Minute Pirate Bug (*Orius insidiosus*)

Orius insidiosus (Figure 1) is an excellent BCA for many thrips species as an addition to the predatory mites *Amblysius cucumeris* and *Amblysius swirskii*. These predatory mites feed primarily on the first instar thrips larva, but *Orius* will also attack adult thrips, killing up to 80 Western flower thrips adults per day. *Orius* is primarily released for thrips control, but they'll also eat aphids, moth eggs and spider mites. Pollen is also a food source for *Orius*.

Often in ornamental crops, *Orius* isn't released because the crop cycles are really short or the crop isn't very suitable to get *Orius* established. An example of this is gerbera daisy as a cut flower or a potted plant. *Orius* lays their eggs in gerbera primarily in the flower stems, and in a cut flower operation, these flowers are being harvested constantly, removing the eggs, so *Orius* will have a difficult time to establish.

In potted gerbera, the flowers stay on the plant, but the crop cycle is so short that *Orius* will never complete two full life cycles on the plant. In many ornamental crops, pollen availability is also late in the crop cycle, not helping as an alternative food source for *Orius*.

As a solution for this challenge, growers have looked to ornamental peppers (the variety Purple Flash is recommended) as a banker plant to provide a needed pollen source and egg laying location. This will allow the *Orius* to establish in a growing operation with short-term crops. Starting with *Orius* introductions in early March onto flowering pesticide-free ornamental pepper plants will give time for the *Orius* populations to build up for when the pest pressure rises. Work with your supplier to determine how many banker plants to use. The releases can start earlier than March if daylength gets extended over 12 hours with artificial lighting to avoid short-day-induced diapause.

To enhance *Orius* establishment, *Ephestia* moth eggs can be released. Release rates of *Orius* on banker plants are approximately three to four *Orius* per plant for four to six weeks and it becomes easier to find them in the banker plants. In addition, adding 10 grams of *Ephestia* eggs per 100 banker plants per week for six to eight weeks will help to get a healthy *Orius* population established. When *Orius* is being observed on the sticky cards, it typically means that a healthy population is well on its way.

Ephestia Eggs

This is a species of moth that's commonly called Mediterranean flour moth (*Ephestia kuehniella*).

Researchers found that this moth's egg is a great food source for many beneficials. The eggs are collected at insectaries and kept frozen until they're fed to beneficials. Many of the commercial insectaries offer them for sale loose or glued onto cards. They work with Orius, Lacewings and other generalist predators.

Because Orius is an omnivore (it does drink from plants) growers must be mindful of the pesticides that they're using. Some systemic pesticides that may be compatible with predatory mites and some of the parasitoids aren't compatible with Orius because it feeds on the plants. Always review pesticide compatibility and spray records before introducing a beneficial.

Aphidoletes aphidimyza—A predatory midge for aphids

The larvae of Aphidoletes can be very effective aphid predators when used in the right situations. The adults aren't predatory (nectar feeders), but are good at finding aphid patches in a crop. There the mated females lay their orange-tinted oblong eggs (Figure 2) near their future prey. The orange larvae (maggots) that hatch are the predators and look like small orange caterpillars.

Within a patch of aphids, they'll kill more aphids than they can eat; they'll generally attack most aphid species in a greenhouse. They can be used together with parasitoid wasps for aphids, but aren't recommended for use with the predatory mite *Amblyseius swirskii*. This is because *A. swirskii* will feed on Aphidoletes eggs. Aphidoletes isn't likely to cycle in a greenhouse because conditions aren't good for pupation, so repeated releases are necessary. It's also very sensitive to pesticides with lesser-known pesticide compatibility compared with that of some of the more widely used BCAs.

Aphidoletes is shipped as pupae mixed into sawdust or vermiculite. They may be packaged in trays, bottles or blister packs. They can be distributed into the crop in release boxes hung inside the canopy in the shade. Don't place them in full sun or the carrier might dry out, which impacts successful emergence. If using blister packs, keep them at room temperature in the shade until the first adults are seen.

Place within the canopy in the shade and out of direct sunlight. Be sure to open the flap in the back of the pack, but not so much that water would enter the blister. If using trays, keep them above-ground in the shade, protected from watering, until adults are seen to emerge, then open the tray to release the midges into the canopy. The adults are active during dawn and dusk. They're weak flyers, so avoid moderate to strong wind currents during times that they might be flying.

Only mated females lay eggs, so some growers take these steps to ensure that females are mated: Prepare a container (e.g., a bucket with a lid) with some screened holes on the sides for ventilation. Place a slightly moistened tray of pupae in the carrier in the bottom of the container. Suspend cotton threads or window screening (imitating spider webs) across the inside lid to give females something to hang from. Close the bucket, keep it shaded and wait for a couple days for adults to emerge and mate. Place buckets into the greenhouse in the shade, open the bucket in the evening and let the adults disperse.

Green lacewings (*Chrysopa* [*Chrysoperla*] *carnea* or *C. rufilabris*)

The larvae of the green lacewing are voracious predators, attacking a wide variety of pests. They're so voracious that they'll also eat each other! They'll attack aphids, spider mites, mealybugs, thrips, whiteflies and small caterpillars, but are most useful against aphids and for mealybug suppression.

They have long, thin, soft bodies with hollow sickle-shaped jaws that they use to suck their prey (Figure 3). The lime-

green adults with large, lacy wings and golden eyes aren't predators, but eat pollen, nectar and honeydew, and lay their eggs on leaves near pests. The flightless larvae don't disperse from plant to plant, but can be very effective with localized releases onto plants in aphid hotspots. Sometimes they can be used curatively for isolated and moderate aphid infestations. They usually don't cycle in a greenhouse.

Lacewings can be purchased as eggs, larvae or adults:

- **Eggs:** The pale green oval eggs may be sold glued to cards or in bottles mixed with a carrier such as vermiculite, bran, or buckwheat or rice hulls. Egg cards can be hung in the shade of the canopy in aphid hotspots. Eggs in bottles can be sprinkled over the hotspot foliage. Some growers will lightly mist the foliage with water before sprinkling to help the product stick to the foliage rather than fall through the canopy. Because of the duration of the egg stage before the larval predators emerge, eggs should be released preventatively. Ants will eat the eggs, so ant management is important.
- **Larvae:** Larvae are sold in bottles mixed into a carrier or Hexcel (cardboard) rearing frames. Product should be sprinkled onto foliage in hotspots soon after receipt to prevent the larvae from eating each other inside the bottle. Larvae in product that falls through the canopy to the floor won't find their way back to the plant and will be wasted. Larvae will eat pests for two to three weeks until they end their larval stage, but they kill the most pests during their last nymphal stage.
- **Adults:** Some suppliers sell lacewings as adults, but these aren't commonly used in greenhouse production.

Each of these beneficials are excellent BCAs, but they can be a little trickier to use than some of the more common ones. Understanding their biology, how to release them and pesticide compatibility will help growers be more successful with their use. **GT**

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*Figure 1. The minute pirate bug, *Orius insidiosus*, is commonly used against Western flower thrips larvae and adults, but it will also eat aphids, spider mites and moth eggs. Photo: Suzanne Wainwright-Evans.*

*Figure 2. The eggs of *Aphidoletes aphidimyza* are laid in patches of aphids where the larvae that hatch will begin to attack the aphids. Finding these tiny, orange-tinted eggs in a patch of aphids is a good sign that *Aphidoletes* is working for you. Photo: John Sanderson.*

Figure 3. A green lacewing larva, sometimes called an "aphid lion," using its hollow sickle-shaped jaws to suck fluids out of an aphid. Photo: Suzanne Wainwright-Evans.