Controlling Fungus Gnats

By Raymond A. Cloyd

QUESTION: I AM CONTEMPLATING THE USE OF BIOLOGICAL CONTROL AGAINST FUNGUS GNATS. CAN YOU PLEASE PROVIDE INFORMATION ON THE COMMERCIALLY AVAILABLE BIOLOGICAL CONTROL AGENTS?

ANSWER: Fungus gnats (*Bradysia* spp.) are major insect pests of greenhouse-grown horticultural crops and are one of the few insect pests in which the damaging stage, the larva in this case, is located within the growing medium. Fungus gnats are especially problematic under excessively moist conditions during propagation when plant cuttings, plugs or seedlings are initiating root systems. Biological control agents or natural enemies such as a predatory mite and beetle, and entomopathogenic nematode have been and are extensively used to suppress fungus gnat larval populations in greenhouses throughout the United States and worldwide. The biological control agents commercially available from most suppliers/distributors include the predatory mite, *Stratiolaelaps scimitus* (formerly *Hypoaspis miles*); the rove beetle, *Dalotia* (formerly *Atheta*) *coriaria*; and the entomopathogenic nematode, *Steinernema feltiae*. The soil-dwelling predatory mite, *S. scimitus* is used to suppress fungus gnat larval populations; however, eggs and pupae are typically not attacked. It has been reported that *S. scimitus* may also attack thrips pupae. The mites are 1⁄50 inches (0.5 mm) long and light-brown in color, and they tend to reside in the top ½ (1.2 cm) inch of the growing medium. Females lay eggs in the growing medium that hatch into nymphs after one to two days. Nymphs develop into adults in five to six days. The life cycle takes approximately seven to 11 days to complete. Both nymphs and adults feed on certain life stages of insect pests that reside in the growing medium. *Stratiolaelaps scimitus* is well adapted to moist conditions but will not survive in growing medium that is excessively moist. Optimum development and reproduction of *S. scimitus* occurs at growing medium temperatures between 59 and 86° F.

Both the larvae and adults of the rove beetle, *D. coriaria* attack fungus gnats (eggs, larvae and pupae). They may also feed on certain life stages of both shore flies (eggs, larvae and pupae) and thrips (pupae). Adults are about 1⁄8 inches (3.0 mm) in length, and dark-brown to black in color. The larvae are yellow-brown in color. Both life stages are active and fast moving. They may be observed on the surface of the growing medium; however, they tend to reside in the growing medium. The life cycle, egg to adult, takes 11 to 22 days to complete depending on temperature. Rove beetle adults are mobile and are capable of flying long distances within a greenhouse from the original release site although they tend to spend most of their lifespan in the growing medium. In our research at Kansas State University (Manhattan, Kansas) we have found rove beetle adults to be highly effective predators of fungus gnat larvae.

Top: Stratiolaelaps scimitus *is a soil-dwelling predatory mite used to suppress fungus gnat larval populations.* ***Bottom:*** *The entomopathogenic nematode,* Steinernema feltiae*, attacks fungus gnat larvae by entering through natural openings and releasing a bacterium that consumes the internal contents of the larvae.*

The entomopathogenic nematode, *S. feltiae* is a microscopic roundworm that attacks fungus gnat larvae by entering through natural openings such as the anus, mouth or spiracles (breathing pores) and then releasing a bacterium that consumes the internal contents of the larvae. Infected fungus gnat larvae are typically killed within 24 to 48 hours. The nematodes must be applied prior to larval populations building-up to damaging levels. The ability of nematodes to suppress fungus gnat larval populations is influenced by a number of factors including application rate, timing of application, host plant and nematode strain used. Furthermore, the infectivity of the nematodes against fungus gnat larvae may differ depending on the growing medium type and moisture content. It is recommended to irrigate the growing medium before and after applying the nematodes to ensure their survival. In addition, fungus gnat larval stages may exhibit differences in susceptibility to nematodes based on the strain and even larval instars present. Temperature is also a major factor that may impact suppression of fungus gnat larval populations by *S. feltiae* as the nematode requires growing medium temperatures between 46 and 86° F for infection, and 50 and 77° F for reproduction. It is important to note that before applying nematodes be sure to remove any filters that are 50 mesh or finer and maintain pump pressure below 300 psi, and also keep the nematode solution agitated in order to prevent the nematodes from settling to the bottom of the solution.

A potential issue associated with the use of biological control agents for suppression of fungus gnat larval populations is compatibility between or among the different biological control agents. Although there is limited information affiliated with assessing intraguild predation (this is when natural enemies attack other natural enemies that share the same pest host) it appears that *S. feltiae* may be used with *D. coriaria* whereas *D. coriaria* larvae may be fed upon by *S. scimitus*. It is important to remember that all of the biological control agents mentioned above must be released before fungus gnat larval populations reach high numbers and are already causing damage to plants. Therefore, establishing a reliable scouting program by using yellow sticky cards to monitor for adults and potato wedges to detect the presence of larvae will ensure the success of biological control programs used against fungus gnats. g

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