

17. Biological Control of Fungus Gnat Larvae (HortReport, December 2000)

Fungus gnats, a common greenhouse pest, are known for infesting cuttings and other young plant materials, potted and long-term crops such as greenhouse vegetables.

Fungus gnats have an egg stage, four larval stages, a pupal stage, and finally the winged adult. One adult can lay up to 200 eggs. Eggs are deposited in the top inch of soil or planting medium. Fungus gnat larvae (black head capsule and transparent body) generally eat rotting plant material, and algae and fungi; however they will also eat root hairs, stem, and leaf tissue. Young seedlings and plugs are particularly prone to attack. The most common symptoms that appear are the wilting and slowing of growth of the infested plants. Indirect damage can occur to plants when larvae feeding on roots create entrance sites for soil born pathogens such as *pythium*, *phytophthora* and *thielaviopsis*. The adult fungus gnat is also capable of spreading disease spores. Begin monitoring in greenhouse with yellow sticky cards before seedlings are started to determine if fungus gnats or other pests are present. This practice allows a grower to catch a pest problem in its earliest stages and maybe solve the problem before it gets started. Continue to monitor after vegetable seedlings emerge and during the crop cycle. Sanitation is critical for controlling this pest. Eliminate wet spots and algae growth since they promote fungus gnat development.

The larval stage of the fungus gnat can be controlled biologically with the use of the insect parasitic nematode, *Steinernema feltiae* and the predatory soil mite, *Hypoaspis miles*. These biocontrols should be used as preventive measures with low pest populations.

Steinernema actively searches for fungus gnat larvae and upon finding it, enters the body through natural openings. Once inside, the nematode releases bacteria that will eventually cause the death of the larva. *Steinernema feltiae* can be applied through an irrigation system, knapsack or motorized sprayer (remove screens) or with a watering can.

Hypoaspis is a predatory mite that inhabits the top layer of the soil and feeds on harmful soil dwelling insects such as fungus gnat larvae, thrips pupae and collembolans. *Hypoaspis* can be used in combination with insect parasitic nematodes and usually one application is sufficient. This predatory mite is supplied in sprinkler tubes mixed with peat and vermiculite.

On page 21, specific information is given relating to the mode of action and application of these natural enemies.



Figure 7. Fungus gnat larvae, notice black head capsule.



Figure 8. Larval feeding damage on vinca plugs.



Figure 9. Adult fungus gnat on yellow sticky card. Notice "Y" vein on wing tip.

18. Biological Control of Fungus Gnat Larvae with *Steinernema feltiae* (HortReport, January 2001)

Monitor and treat for fungus gnats when transplants for the spring crop are started. An effective biological control for treating the larval stage of this pest is using the insect-parasitic nematodes, also called entomopathogenic (lethal parasites of insects) nematodes. Insect parasitic nematodes have been used successfully in many of the green industries such as greenhouses, nursery, mushroom and turf. Nematode products are exempt from re-entry intervals and worker protection standards. The nematode used in fungus gnat control products is *Steinernema feltiae*.

Life Cycle

Nematodes are simple roundworms that are shipped to the grower in the infective juvenile stage. When applied to the soil, the infective juvenile seeks out and penetrates the fungus gnat larva entering the body via natural openings or areas of thin cuticle. Once inside the body, the nematodes release bacteria from their intestines, which results in infection of the insect larva and death within 24-48 hours. The nematodes feed on broken down tissue in the insect cadaver and develop into adults. A new generation of nematodes is produced within two weeks. Thousands of new infective juveniles emerge from the insect cadaver in search of fresh hosts. Infected fungus gnat larvae appear brownish-yellow rather than the healthy white color.

Application

Steinernema nematodes are delivered to the grower as either a clay formulation or liquid suspension. Follow label directions for application. Once in suspension, apply nematodes to the compost/soil surface as a drench.

- Apply routine preventive treatments to prevent crop damage.
- Treat as soon as possible after sowing seed or inserting cuttings.
- For slow growing crops, reapply nematodes at six – week intervals.
- If fungus gnat populations are already established it may take 2-3 weeks before you see a reduction in adult fungus gnats.

For optimum performance consider these factors:

- Soil temperature must be 55-90° F.
- Use nozzle screens of at least 50 mesh or coarser during application.
- Do not store for extended periods.
- Irrigate compost before and after application (nematodes require moisture for movement).
- Keep compost moist for the first two weeks after application.
- Do not apply within 7 days of a nematocide application.

Suppliers of Nematodes

IPM Labs, Locke, NY, Phone: 315-497-2063, email: ipmlabs@baldcom.net
International Technology, Bio Best Products, CO, Phone: 303-661-9546
Griffin Greenhouse and Nursery Supply, (Nemasys®), Phone: 1-800-732-3509
(Many biological control suppliers sell nematodes)

Useful websites

<http://www2.oardc.ohio-state.edu/nematodes/>
<http://www.biologicco.com/>
<http://www.biobest.be>
<http://www.bugsandbees.com>
<http://www.koppert.nl>
<http://www.nysaes.cornell.edu/ent/biocontrol/websites.html>



Figure 10. Infective juvenile stage of the entomopathogenic nematode, *Steinernema feltiae*.

19. Biological Control of Fungus Gnat Larvae with *Hypoaspis miles* (HortReport, February 2001)

Monitor and treat for fungus gnats when transplants for the spring crop are started. There are effective biological controls for treating the larval stage of this pest that include the insect-parasitic nematode, *Steinernema feltiae* (discussed on page 21) and the predatory soil mite, *Hypoaspis miles*. *Hypoaspis miles* has already shown good potential as a control for fungus gnat larvae, however it has also been found to feed on other soil insects such as springtails, thrips pupae and shore fly larvae. *Hypoaspis miles* can be introduced without any problem in combination with insect parasitic nematodes. Remember, the key for controlling fungus gnats is to eliminate wet spots and algae growth since they promote fungus gnat development.

Life Cycle

This predatory mite inhabits the top layer (1-1.5 inches) of the soil. *Hypoaspis miles* is a brown colored predatory mite, growing to 1 mm in length. Females lay their eggs in the soil. At 75° F, *H. miles* takes 10-13 days from egg to adult, passing through 3 immature stages. *H. miles* prefers moist potting compost and can live for up to 7 weeks in the absence of food. Soil must be moist, but not wet. This predatory mite will not go into hibernation in cold temperatures. The minimum temperature for good activity is 60° F. *H. miles* can be observed in and on the soil and at the base of plant stems.

Application

Hypoaspis miles is delivered to the grower in sprinkler tubes with all stages of the predatory mites in a vermiculite/peat carrier. Always follow instructions that are supplied with the product. If instructions are not packed with the product, contact your supplier and request this information.

- Apply routine preventive treatments to prevent crop damage.
- Treat as soon as possible after sowing seed or inserting cuttings.
- Contact your biocontrol supplier for rates of introduction.
- Press the openings of the sprinkler tube and sprinkle the material on compost or on

the rockwool cube.

- The predatory mites start searching for their prey immediately after introduction.

Hypoaspis miles products

For optimum performance consider these factors:

- Several pesticides have a negative effect on *Hypoaspis miles*. When controlling diseases and other pests consult your supplier for a list of side-effects of pesticides on beneficial organisms.
- The predatory mites should be introduced as soon as possible after delivery.

Suppliers of *Hypoaspis miles*

Many biological control suppliers sell *Hypoaspis miles*

IPM Labs, Locke, NY, Phone: 315-497-2063,
email: ipmlabs@baldcom.net

International Technology, Bio Best Products, CO,
Phone: 303-661-9546

Syngenta Bioline, Oxnard, CA, Phone: 805-986-8265, Fax: 805-986-8267, email:

info@syngentabioline.com

Useful websites

<http://www.biobest.be>

<http://www.bugsandbees.com>

<http://www.koppert.nl>

<http://www.nysaes.cornell.edu/ent/biocontrol/websites.html>



Figure 11. *Hypoaspis miles* delivered to the grower in sprinkler tubes with a vermiculite/peat carrier.