



Characteristic "Y" vein of fungus gnat wings.

Controlling Fungus Gnats

Fungus gnats have been hard to control, and insecticide resources are dwindling. A University of Illinois study is now underway that may give you the keys to control this pest.

By Raymond A. Cloyd and Edmond R. Zaborski

Greenhouse floricultural crops are susceptible to several arthropod pests that affect crop marketability and cause economic loss. Among these pests, fungus gnats are especially problematic during propagation when plant roots are just developing. Fungus gnats are flies with a life cycle consisting of: an egg, four larval stages, a pupal stage and an adult stage. Each generation, from egg to adult, can be completed in 21-40 days, depending on temperature.

Adult fungus gnats are delicate, winged, 1/10-inch long insects, with long legs and antennae, and have a characteristic "Y" vein on each wing. Fungus gnats may be seen running or flying over the surface of moist growing medium. They frequently rest quietly on the surface of the growing medium or on the undersides of foliage; however, they may be found flying some distance from these locations as well.

Adults live for approximately 7-10 days. They are attracted to media that support the growth of fungi, such as peat and composted tree bark, where females deposit 100-200 eggs into the cracks and crevices on the surface of the growing medium. Eggs, about 1/20 of an inch long, hatch into clear legless larvae that later become an opaque white and reach a length of approximately 1/4-inch long. A shiny black head capsule differentiates these larvae from other fly larvae that might be found in growing media.

Larvae are generally located within the top two inches of the growing medium. However, they can also be found in the bottom of containers near the drainage holes and on the inside edge of containers. In the absence of fungal hyphae as a food source, they are attracted to and feed on the newly developing roots of cuttings.

LARVAL DAMAGE

Fungus gnat larvae cause direct plant injury by feeding on plant roots, thereby reducing their ability to take up water and nutrients. Larval feeding also causes indirect damage by creating wounds that allow entry of soil-borne plant pathogens.

In addition, larvae will bore into poinsettia cuttings at the region where roots emerge from the base of cuttings and migrate up the stem. This causes wilting and subsequent death. High populations of fungus gnats result in economic

loss by causing plant mortality or by stunting plant growth and reducing marketability.

FUNGUS GNAT CONTROLS

Conventional insecticides are most commonly used to manage fungus gnat populations in greenhouse production systems. Annual insecticide costs vary between individual greenhouse operations. For example, costs can range from \$40-\$190 per 1,000 sq. ft. per year in some Illinois greenhouses.

Changes in federal regulations, such as the Food Quality Protection Act, are reducing the



Left: Fungus gnat eggs on surface of growing medium. Right: A natural fungus gnat enemy — *Stienernema feltiae*. (Photos courtesy of Raymond A. Cloyd.)

availability of conventional insecticides. As a result, greenhouse managers are seeking alternative strategies to manage fungus gnats.

Biological control — or the use of natural enemies — is another method for managing fungus gnat populations in greenhouses. Two commercially available natural enemies, the entomopathogenic nematode, *Steinernema feltiae* (Nemasys, Entoneem, Scanmask), and the soil-inhabiting predatory mite, *Hypoaspis miles*, have potential. As yet, greenhouse managers have not widely adopted these natural enemies because of uncertainties about their efficacy, lack of experience with using them and limited technical information about proper use.

UNIVERSITY OF ILLINOIS STUDIES SOLUTIONS

The University of Illinois and the Illinois Natural History Survey have initiated a research program to better understand the

biology, behavior and interactions of fungus gnats and their natural enemies under different greenhouse production conditions. To be effective, it is essential that populations of natural enemies coincide spatially and temporally with those of fungus gnat larvae. Consequently, we are investigating how choice of growing media and watering regime interact to influence the within-pot distributions and survival of fungus gnat larvae and their natural enemies.

We will also assess different rates and times of introducing natural enemies for their influence on fungus gnat larval populations and plant condition. These experiments will include a comparison of the efficacy and economics of employing natural enemies vs. insecticide treatment for fungus gnat control.

In our research, we are placing an emphasis on accurately estimating the influence of different treatments on populations of fungus gnat larvae. To do this, we have developed a method for producing and manipulating large numbers of uniformly aged larvae in laboratory cultures for use in our experiments. A much bigger challenge, however, is to reliably recover larvae from the growing media so that we can estimate larval populations and their responses to treatments. To address this problem, we have adopted, and are now improving, a procedure for recovering larvae from growing media that uses wet sieving and flotation.

With the ability to reliably manipulate and measure larval populations, we will be able to address questions that were previously difficult to answer. This research will help provide an acceptable alternative for managing fungus gnat populations in greenhouses, conservatories and interior plantscapes. GPN

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Raymond A. Cloyd is assistant professor, extension specialist in ornamental entomology/integrated pest management at the University of Illinois, Urbana, Ill. Edmond R. Zaborski is assistant professional scientist, soil invertebrate ecology at the Illinois Natural History Survey Center for Economic Entomology.