

Fungus Gnat Biology and Control

J.P. Sanderson

FUNGUS GNATS:

Identification:

Adult fungus gnats (*Bradysia* spp.) are small (approx. 1/8 inch long), blackish-grey, gnat-like flies with long gangly legs, many-segmented antennae which are longer than their heads, and have a single pair of greyish transparent wings with a Y-shaped vein near each wing tip. [Fig.1]



They are weak flyers and may be found running/flying near soil level.

Fungus gnat larvae are the damaging stage of this insect. They are usually concentrated in the top 1-2 inches of the growing media, but can be found throughout the pot. The larvae are translucent, legless, and worm-like, with a distinctive black head capsule, and are about 1/4 inch long just prior to pupation. [Fig.2] Larvae might be seen crawling near the surface of the growing medium if the population is very high.



Damage:

The first few weeks of a crop are most critical for fungus gnat control. Larvae prefer to feed on fungi rather than healthy plant tissue. Although fungus gnat larvae can eat plant material, they need fungi in their diet for optimal survival, development, and reproduction.

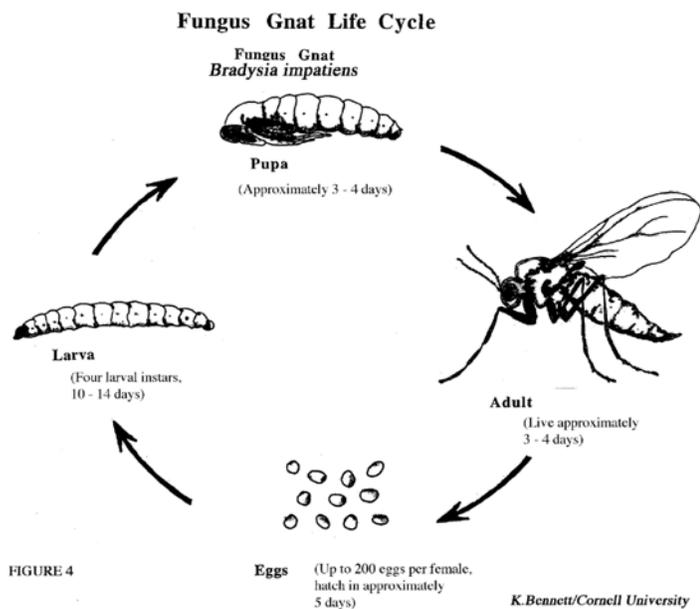
Chewing by larvae can cause direct root damage, and provide an entry into the roots for fungal pathogens.

Seedlings and young plants without fully developed root systems are particularly susceptible to their damage. [Fig.3]



Unrooted cuttings are also particularly vulnerable, with larval feeding interfering with callus formation and thus root initiation. Adult fungus gnats do not cause direct damage to plants, but are considered a nuisance pest to consumers. In addition, adults and larvae have been implicated in the transmission of plant fungal diseases, including *Thielaviopsis*, *Pythium*, *Verticillium*, and *Fusarium*. Larvae may transmit fungal plant diseases via their excretion. Adults may transmit these diseases via excretion or by carrying spores of disease organisms on their bodies. Disease transmission by fungus gnats has been documented in lab studies, but it is not yet clear whether fungus gnats play an important role in disease transmission under commercial conditions.

Biology: Mated adult females deposit up to 200 eggs singly or in clusters in crevices or cracks on the surface of the growing media. Adult females prefer to lay eggs where fungus is growing. The offspring of a given female will either be all males or all females. At 70° -75° F, these whitish-yellow eggs hatch in 3-6 days. The four larval instars then feed for about 2 weeks and usually pupate near the soil surface within a thread chamber. After 3-7 days in the pupal stage, adults emerge and live for up to 8 days. They can develop from egg to adult in 3-4 weeks. This life cycle is dependent on temperature and as temperatures decrease, the length of their developmental time increases. [Fig.4]



Optimal temperature for development seems to be 70-75° F. They do not appear to thrive at high temperatures. Overlapping life stages are often present at the same time, though the bulk of the population may exist in only a few life stages.

Monitoring: For monitoring adults, yellow sticky traps placed horizontally at soil level are most effective. However, fungus gnats can be monitored along with most other flying greenhouse pests by positioning yellow sticky traps vertically just above the crop canopy. Count them weekly and record the numbers to see if the infestation is increasing or decreasing. Because fungus gnats are often particularly damaging to young plants, monitor for adults several weeks before a crop is started, and continue to monitor as the infestation is cleaned up before the new crop is started. To monitor whether larval control is being achieved, use raw potato slices (at least 1 inch thick) or wedges, placed cut-side down on the surface of the growing medium. Check the slices weekly, replace them weekly, and record numbers of larvae found on the potato slices and on the soil surface beneath the slices.

Cultural control: No growing mixes are immune to fungus gnat infestation, but fungus gnat numbers can vary among growing mixes. Adults are strongly attracted to microbial activity in soil/media. For fungus gnat management, avoid immature composts (<1yr old), including composted pine bark mix. Mixes with any compost are usually more attractive to fungus gnats than pure sphagnum peat. Good sanitation is vital. Clean up spilled growing media, clean up algae, and fix plumbing leaks. Weed control inside and outside the greenhouse is important. Avoid over-watering and sloppy irrigation. Keep compost piles well away from production areas. Cycle plants through the greenhouse as quickly as possible. Some growers have greatly reduced fungus gnat and shore fly adult levels by stretching strips of sticky yellow plastic 6" wide ribbon throughout the greenhouse near the soil level along the sides of benches or beneath benches, in areas of adult activity.

Insecticides: Many insecticides used for fungus gnat control are insect growth regulators and only affect larval stages, not adults. May need both an adulticide and a larvicide for well-established populations

Biological control: Releases of natural enemies should be done when populations are low, at start of crop.

Nematodes: *Steinernema feltiae* is the most effective nematode species for fungus gnat larvae. Make first application at planting, or soon after, then 2-3 weekly applications. Irrigate the day before application. Apply as a drench. Nematodes are not usually good at reducing a serious infestation, one reason why they should be applied near the start of the crop.

Bacteria: Gnatrol is applied as soil drench. The active ingredient is a bacterium that must be ingested by fungus gnat larvae. The bacterial toxin that kills the fungus gnat larva is only effective for 48 hours after application; so repeat treatments with higher label rates at 3 to 5 day intervals for heavy infestations.

Predators: Releases of the predaceous mite, *Hypoaspis miles*, may give excellent control. Release soon after planting. A single release has provided 6-8 weeks of control in some cases. The predators are capable of establishing and spreading throughout a greenhouse if the environment is favorable. They live in the top layer of soil and feed on any small arthropods they encounter (including thrips). Check each shipment for viability: shake up the bottle, then shake a small amount of sawdust carrier onto a sheet of paper and look for rapidly-moving light-brown mites, using a handlens.

Note: The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by Cooperative Extension is implied. Cornell Cooperative Extension and its employees assume no liability for the effectiveness or results of any product. Check the product label, which is the final word with respect to product usage. It is a violation of Federal law to use a product in a manner inconsistent with its label.