ARIZONA COOPERATIVE EXTENSION
THE UNIVERSITY OF ARIZONA
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Fungus Gnat Integrated Pest Management

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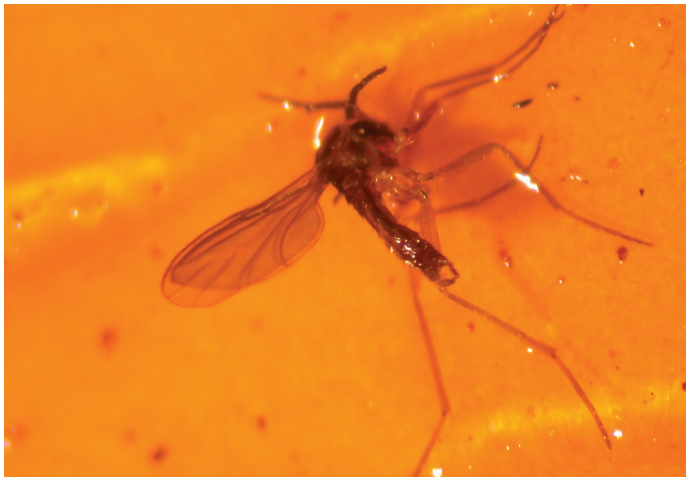
Fungus gnats are small flies in the order Diptera and families Mycetophilidae and Sciaridae. The larvae of many species live in moist soil, fungi or decaying vegetation. Some can be found in the soil of potted or outdoor plants. Adults are a nuisance when they emerge and fly around within the home environment; larvae are rarely seen but some species can damage plant seedlings by feeding on the roots (Dreistadt, 2001).

Fungus gnats can best be controlled through Integrated Pest Management or IPM. This is a science-based approach to managing pests using a mixture of safe, sustainable and effective strategies against pests, which could consist of insects, weeds, diseases, birds and rodents. IPM uses an assortment of approaches to manage pests with non–chemical means. When pesticides are required they are chosen to target problem pests and to reduce impacts on beneficial organisms, people and the environment. This form of pest management focuses on developing management strategies not just controlling one type of pest.

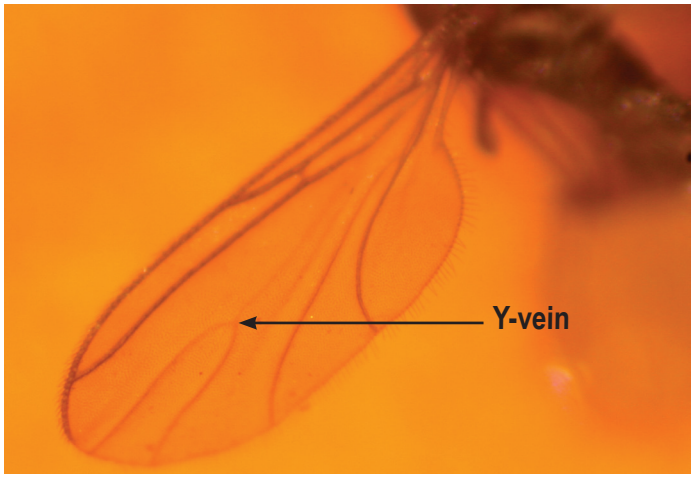
DAWN GOUGE

Fungus gnat adult



STACEY BEALMEAR

Fungus gnat adult male on sticky trap



STACEY BEALMEAR

Y-vein in fungus gnat wing

Identification

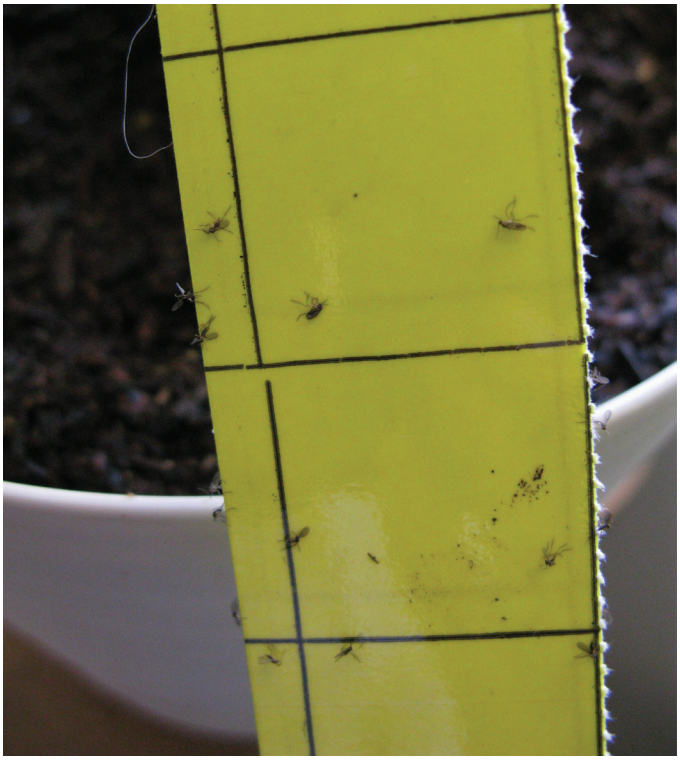
Adults are small (2.5-3.2mm) grey or black insects that resemble mosquitoes with long slim legs and thread like antennae. They have one pair of wings that are clear or light grey with a diagnostic Y-shaped vein in the wing. The larvae are 5.5mm long maggots with black shiny heads and, legless white to clear body (Price et al., 1993).

Life Cycle

The fungus gnat goes through complete metamorphosis that includes egg, larva, pupa and adult stages. A life-cycle can be completed in three to four weeks. Females lay between 50-300 eggs which will hatch in 4-7 days at room temperature (70-75 °F). At a temperature of 72 degrees, larvae feed for two weeks (Puntd, 2006). Pupation happens in the soil and takes 5-6 days before adults emerge. Adults live for about a week, mate, and start the process over again. Many generations can be present at the same time throughout the year (Lyon, 2009).

Feeding

Adults, while annoying, feed on water and plant nectar and pose no harm to humans. Larvae feed in the soil on decaying plant matter, fungi and plant roots. This feeding can stunt plant growth, kill seedlings and reduce overall plant growth. Both adults and larvae have the ability to spread plant pathogens which can in turn lead to plant death.



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Fungus gnats on sticky trap

Management

MONITORING

Inspect plants and soil for adults during watering or place yellow sticky traps in pots. Gently tap or shake the plant and adults will fly off making them easier to find. Check sticky traps every 2-3 days. Potato slices can be used to monitor for larvae. Peel and slice a raw potato into 1-inch pieces and place at a 3/8-inch deep in potting soil. Larvae will move to the potato to feed and can be easily counted. Check the potato a couple of times a week by picking up the slice and examining it for larvae.

CULTURAL CONTROL

Eliminating excess moisture is the most important control method. Fungus gnats do best in moist soil, so key management strategies are to avoid overwatering plants and make sure they are well drained. The top surface of soil should be allowed to dry before watering again. This helps to kill larvae and eliminate the next generation. Watering from the bottom of the pot can be helpful but make sure not to allow water to puddle for long periods of time as this can lead to root rot. Minimize organic matter especially on the top surface of the plant to reduce breeding sites. Diatomaceous Earth placed on or in the soil does not control fungus gnat adults or larvae (Cloud, 2005 and Cloud et al., 2007).

PHYSICAL CONTROL

It is important to keep gnats away from plants to prevent infestation. Keeping doors and windows closed or screened is an easy way to accomplish this. Not introducing infested plants into an uninfected home or greenhouse is another important way to avoid infestation. When purchasing soil make sure it is gnat free and store it in dry, closed containers. Yellow sticky traps can also act as a physical control method by trapping adults, preventing them from producing eggs, limiting future populations.

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Bacillus thuringiensis used to kill gnat larvae

DAWN GOUGE

Parasitic nematodes

DAWN GOUGE

Fungus gnat larvae infested with parasitic nematodes

BIOLOGICAL CONTROL

Biological control agents can be very effective in the management of fungus gnats. There are two commercially available: *Steinernema* nematodes and *Hypoaspis* mites. *Steinernema* nematodes have a simple life cycle starting with juvenile nematodes seeking a host insect. The nematode enters the fungus gnat's body through the mouth, anus or spiracles (holes through which an insect breathes). Once in the body, symbiotic bacteria are released from the nematode, which in turn kills the host insect. The dead insect and bacteria are food for the nematode until it reaches the adult stage where it reproduces and starts the process again in the soil. Completion of the life cycle occurs in a few days. This nematode is not dangerous to humans or pets. *Hypoaspis* are small (0.8mm) tan mites that feed voraciously on gnat eggs and larvae. The life cycle of the mites is 13 days from egg to death. Reproduction will occur in the potting soil, keeping them around to feed for many generations. Reapplication can be made in 2-4 weeks, if needed, and complete control can be expected in 2-4 applications. Like *Steinernema* these mites, dwell in the soil, and are not harmful to humans or pets.

CHEMICAL CONTROL

Commercially available Bt products are very effective for reducing larval populations. *Bacillus thuringiensis* (Bt) subspecies *israelensis* (Bt/H-14) can be applied as a soil drench and will slowly kill larvae in the soil (Waldvogel, 2004). Bt is a naturally occurring bacterial organism derived from soil. It is applied as an organically approved pesticide that produces proteins toxic to the insect. The proteins arrest the digestive system so the insect ceases eating and starves to death. There are several different strains of Bt that are effective against a number of insects, including adults and larvae of some beetles, flies, and moths. However, only the *israelensis* subspecies is effective against fungus gnats. Reapplication can be made every other week, if needed, and complete control can be expected in 2-4 applications. While other types of insecticide treatments can be used for control, Bt is most commonly recommended by Cooperative Extension because of its organic nature. Always follow pesticide labels.

References:

Cloud, R. A. 2005. Fungus Gnats and Diatomaceous Earth. **http://www.gpnmag.com/Fungus-Gnats-and-Diatomaceous-Earth-article6124**

Cloud, R. A., A. Dickinson and K. E. Kemp. 2007. Effects of Diatomaceous Earth and *Trichoderma harzianum* T-22 (Rifai Strain KRL-AG2) on the Fungus Gnat *Bradysia* sp. nr. *coprophila* (Diptera: Sciaridae). J. of Econ. Entom. 100(4) 1353-1359.

Dreistadt, S. H. 2001. Fungus Gnats, Shore Flies, Moth Flies, and March Flies. **http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7448.html**

Lyon, W. F. 2009. Fungus Gnats. **http://ohioline.osu.edu/hyg-fact/2000/2114.html**

Price, J. F., L. S. Osborne, C. A. Nagle and E. McCord Jr. 1993. Management of Fungus Gnats in Ornamentals. **http://edis.ifas.ufl.edu/ig125**

Puntd, L. 2006. Fungus Gnats are Serious Pests. **http://www.hort.uconn.edu/ipm/greenhs/htms/fngnatser.htm**

Waldvogel, M. 2004. Fungus Gnats Indoors. **http://www.ces.ncsu.edu/depts/ent/notes/Urban/fungusgnat.htm**

Resources for Ordering Biological Control Agents & Sticky Traps

The Green Spot Ltd.
93 Priest Rd.
Nottingham, NH
03290-6204 USA
Phone: 603.942.8925
Fax: 603.942.8932
http://greenmethods.com/site/

ARBICO Organics
P.O. Box 8910
Tucson, AZ, 85738-0910
Phone: 1-800-827-2847
Fax: 520-825-2038
http://www.arbico-organics.com/

Ordering *Bacillus thuringiensis* (Bt/H-14)
Gardens Alive
5100 Schenley Place
Lawrenceburg, Indiana 47025
Phone: (513) 354-1482
Fax: 513-354-1484
http://www.gardensalive.com/product.asp?pn=3440

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This information has been reviewed by university faculty.
cals.arizona.edu/insects/az1531.pdf

Other titles from Arizona Cooperative Extension can be found at:
cals.arizona.edu/pubs