

Pest Management of Hemp in Enclosed Production

Hemp Russet Mite

(Aculops cannibicola)

Fungus Gnats

(Bradysia spp.)

Damage and Diagnosis. Fungus gnats are small (1/8 inch), delicate, black flies with long legs and antennae. They are a common insect seen indoors, particularly in winter and spring, usually in close proximity to potted plants. The adults are sometimes considered a nuisance, although they are short-lived (less than a week), cannot bite, and do not feed. The larvae are worm-like and translucent, with a black head capsule, and develop in soil/growing media. They primarily feed on fungi and algae but may incidentally chew smaller plant roots. Direct root damage from fungus gnats is usually minimal, but injured roots can be invaded by fungi that cause root decay.

Biology Notes. Fungus gnat larvae are usually located in the top 2-3 inches of growing medium, depending on moisture level, where they feed on fungi, algae, and decaying plant matter. They will feed on plant roots and sometimes on leaves resting on the growing medium surface.

Larvae develop rapidly and are fully grown in 2 to 3 weeks. They then pupate in or on the growing medium surface. Adults emerge about a week later. Fungus gnat adults are weak fliers, typically flying in short, erratic patterns. In homes, they are commonly observed near the vicinity of and associated with the growing medium of houseplants; however, they may disperse short distances often accumulating around window frames.

During their seven to 10 day life span females may lay up to 200 eggs into the cracks and crevices of growing media. Moist growing media composed of peat moss are particularly attractive to adult females. At typical room temperatures (65 to 75°F) the life cycle (egg to adult) may be completed in 3 to 4 weeks.

Management of Fungus Gnats

Prevention and Quarantine. Fungus gnats are extremely common insects that are found in lawns, gardens, and the soil of indoor plants. They also may survive and reproduce in potting mixtures and some mixes may be infested at point of purchase.

Heating soil mixtures to 130°F for a half hour should kill all stages of fungus gnats - and many other soil organisms. Houseplants are common indoor sources of fungus gnats and *Cannabis* plantings should be isolated from these infestation sources.

Cultural Controls. Fungus gnat larvae thrive under conditions where soil is moist and decay fungi grow well. Moderating water use and frequency so that the soil surface periodically dries can reduce survival of eggs and small larvae and reduce attractiveness to egg laying females.

Growing media and fertilization will also affect fungus gnats. Peat moss-rich media and use of some organic fertilizers (e.g., fish emulsion) can favor fungus gnats. Problems will be less on media that do not readily decay (coconut coir) or in hydroponic culture.

Traps. Adults can be captured on sticky cards. Yellow and red are attractive colors and when placed strategically around the base of plants may mass-trap sufficient numbers of fungus adults to suppress their populations. Several suppliers sell yellow sticky cards. Sticky cards of canary yellow coated with Vaseline or some other sticky material can be easily homemade.

An effective means of detecting the presence of fungus gnat larvae is to insert 1/4 inch slices or wedges of potato into the growing medium. Larvae will migrate to the potato and start feeding within a few days. The potato slices should be turned-over to look for larvae present on the potato underside.

Biological Controls. Probably the most effective biological control for control of fungus gnats is the insect parasitic nematode *Steinernema feltiae*. Also called “insect predator nematodes” or “entomopathogenic nematodes” these are minute, nearly microscopic roundworms that are applied as a soil drench and kill susceptible insects. In the soil the nematodes seek out host insects, such as fungus gnat larvae, and enter through natural openings. Upon entry they release a bacterium that rapidly grows in the host insect, killing it within a couple of days. The nematodes feed and develop on the bacteria and degraded host tissues. When full grown they reproduce and can start new cycles of infection.

Insect parasitic nematodes are supplied on a moist substrate. When preparing for use they are mixed with water to produce a suspension of nematodes that can be applied as a soil drench. *Steinernema feltiae* is a living organism and is susceptible to extreme temperatures, drying and exposure to strong light. They can be stored in a refrigerator for a considerable period (months) before being prepared for use, but should never be frozen. It is suggested that they be applied to moist soil, when lighting is off or subdued, and promptly watered into the soil.

The **soil predator mite** *Stratiolaelaps scimitus* (formerly *Hypoaspis miles*) is a general feeder of insects, mites and other small arthropods that occur in soil. It can also sustain itself on algae and plant debris. Soil predator mites have to be mail ordered and come mixed with bran/peat for shaker application to the surface of potting media. They are light brown, under 1 mm in length, and are quite active.

They store poorly so plans should be made to apply soil predator mites shortly after receipt. Once introduced onto the potting mix they often will reproduce (life cycle is 2-3 weeks) and may provide some long term suppression of soil dwelling insects, such as fungus gnats.

Soil Drenches. Azadirachtin containing products can be used as a soil drench to control fungus gnat larvae. (Neem oils, labeled as clarified hydrophobic extracts of neem, *do not contain the active ingredient azadirachtin* and are not effective for fungus gnat control.) There are several azadirachtin-containing pesticides that are presently allowable for use in cannabis production in Colorado. Check the Colorado Department of Agriculture website for specific products that are allowed for use. <https://www.colorado.gov/pacific/agplants/pesticide-use-cannabis-production-information>)

(Note: The soil microbe *Bacillus thuringiensis* var. *israelensis* (e.g., Gnatrol, Mosquito Bits) is very commonly used as a soil drench to control fungus gnat larvae on most crops. However, under present rules *these products are not allowed to be used on cannabis grown in Colorado* due to a March 30 ruling by the CDA, since they are not labeled for tobacco.)

Sprays. Adults are short-lived eggs are laid shortly after they emerge from soil. As a result, foliar applications attempting to kill adults likely will have negligible impact unless repeated at very short intervals for weeks. There are several pyrethrins-containing pesticides that are presently allowable for use in cannabis production in Colorado. Check the Colorado Department of Agriculture website for specific products that are allowed for use.

<https://www.colorado.gov/pacific/agplants/pesticide-use-cannabis-production-information>)