

Fungus gnats

And how to defeat them

Page one - what are they?

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Organic Controls for Plant Pests

Please note: this guide is written from a UK perspective: information about pesticide licensing may not apply to other countries.

Photograph: Maja Dumat on [Flickr](#)

The most commonly-asked question among houseplant growers is 'how can I get rid of those tiny annoying flies'? Jane Perrone of The Plant Ledger has the answers.

What are they?

Fungus gnats are tiny black flies that fly around houseplants and lay their eggs into their pots: if untreated, populations can get huge! They are relatives of house flies, and are species from the genera *Orfelia* and *Bradysia*. They are also known as sciarid flies. They are slightly smaller (2-4mm long) and blacker than fruit flies, and waft around rather than flying steadily. They will not bite you and are not harmful to pets or children. .

The larvae are found in the soil and have clear bodies and black heads. They are just large enough to see with the naked eye. They eat fungus and rotting material, so will not do much damage to established plants, although they may weaken seedlings. Fungus gnats tend to fly near your face, as they are attracted to the carbon dioxide in your breath. They are also attracted to light.



Photograph: Judy Gallagher on [Flickr](#)

Gnat lifecycle

Adults live for about a week, and female flies lay dozens or hundreds of eggs every day, so populations can grow quickly. The life cycle will be fastest in warm conditions.

Day 1 Eggs laid by adult females.

Day 3-5 Eggs hatch into larvae.

Day 13-19 Larvae turn into pupa.

Day 23-25 Adults emerge

Where do they come from?

They usually arrive as larvae in the soil of newly introduced plants, or in bags of substrate, so are hard to spot. The adults can also fly in through open doors and windows. If you have a houseplant collection of any size, you will inevitably face a fungus gnat infestation at some point. Populations tend to peak in March and April, and again in September and October, although they can arrive at any time of year.

How to spot an infestation

Sticky traps like the ones in the picture above can be slotted around your plants to catch adults: ones for fungus gnats are usually coloured bright yellow. Laying a slice of potato on the soil surface will attract larvae, so you can check for numbers: replace with a new piece every few days. Neither 'trap' will fix the problem, but they'll give you an idea of how the severity of the infestation. Some traps come printed with a pattern of lines so you can count how many flies you have caught in a grid square over a week, to monitor whether the problem is getting better or worse. Flies waft up from pots when disturbed, and will congregate around foliage as they mate and lay eggs.

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Page two - homespun remedies



Seemingly everyone on the internet has a solution to fungus gnats, but do these homespun remedies work?

Adding cinnamon to the soil

Cinnamon has some antifungal properties, so it may kill off some of the fungus the larvae feed on, but it will not work well enough to make a significant dent in the population.

Watering with water infused with garlic/chilli/tea tree oil/other strong flavours

This tactic is not effective at treating fungus gnats.

Covering bare soil with rocks, sand, gravel or similar

This may appear as the perfect solution to fungus gnats: a layer of something inorganic on the soil surface that stops gnats laying their eggs. But fungus gnats are incredibly good at finding a way in: through the cracks between the mulch and the side of the pot, between the stones, or through the drainage holes in the bottom of the pot. If you water from the top, the mulch is disturbed and this can allow flies in to lay eggs. The layer needs to be very thick to have any chance of working, and even then it will rarely solve the problem.

Replacing all the potting mix around your plants

If you have one plant this is tedious: if you have dozens, it is out of the question. Plus it will not work: you will remove most if not all of the larvae, pupae and eggs, but if there is a single fly left in the house, they will quickly lay enough eggs to repopulate the fresh soil.

Watering from the bottom and allowing houseplant soil to dry out

Fungus gnat larvae do best in moist soil, but they will not be completely deterred by dry soil. I have cacti that haven't been watered for weeks that still have fungus gnats! Watering from the bottom may have a small beneficial effect, but again, it will not solve the problem.

Drenching with neem oil

Neem oil (an extract from the tree [*Azadirachta indica*](#)) is not licensed for pesticide use in the UK, so I cannot recommend it. Although neem oil comes from a natural source, that does not make it inherently 'safe'. There is some scientific evidence that bees and other beneficial wildlife may be damaged by exposure to neem oil, although this is not conclusive at present.

Adding diatomaceous earth to the potting mix or the soil surface

Diatomaceous earth (DE) is a occurring sedimentary rock processed to a white powder for various uses. Tests have shown it is not particularly effective at dealing with fungus gnats, either as a surface mulch or mixed into the soil. If you are handling DE, wear a mask as it should not be breathed in.

Adding hydrogen peroxide to soil

Hydrogen peroxide aka H₂O₂ is an unstable molecule that starts to break down the minute it hits organic matter (such as soil). It releases the extra oxygen atom to become water, hence the fizzing sound when applied to soil. However, by the time the H₂O₂ goes a small distance under the soil, it will probably have reacted and become water, so it may not kill all the larvae. There is also research suggesting that hydrogen peroxide is damaging to roots, but also conflicting research indicating it is beneficial. This remedy may be compelling as you can use something from your kitchen cupboard, but it is not particularly effective, and there are far better treatments available... read on for details!

Carnivorous plants

Carnivorous plants such as butterworts (*Pinguicula*) and sundews (*Drosera*) positioned among your houseplants can help to trap adult flies as a form of living sticky trap. Do your research, as they have different care needs to most other houseplants - for instance, they must be watered with rainwater.

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Part two - treatments (continued)

Do Bounce dryer sheets repel fungus gnats?

Strangely, there is evidence that they do! Experiments by entomologist Dr Raymond Choyd and colleagues at Michigan State University found fungus gnat adults were indeed repelled by the presence of Bounce dryer sheets (read more about it [here](#)). I am not sure I would want to have dryer sheets littering my plant pots, though, and it will not completely deter fungus gnats.

What are the solutions for fungus gnats that really work? Biological controls are the answer. Here's the lowdown on what they are and how to use them.

Biological controls

I have spoken to many entomologists and horticulturists who specialise in plant pests and they all agree that the best treatment for controlling fungus gnats in the long term is biological controls: a way of controlling pests using another creature that destroys the pest, but does not harm other soil fauna and is safe for you and your pets.

There are three main biological controls that work on fungus gnats, but only two of them are available in the UK.

- microscopic parasitic nematode worms called Steinernema feltiae (another species, Steinernema carpocapsae, are sometimes included) - often sold as 'sciarid fly control'
- a predatory mite called Stratiolaelaps scimitus - often sold as 'hypoaspis mites'
- BTI (Bacillus thuringiensis subspecies israelensis) is a naturally occurring bacterium which is used to control fungus gnats, mosquitoes and other diptera. BTI is not currently licensed for use in the UK.

It is vital that you source biological controls from a reliable source, as you need to buy the right species.

How do the Steinernema nematodes work?

The microscopic (0.5mm long) worms move through the soil via the water in it, and enter the bodies of the fungus gnat larvae, destroying them from within using bacteria they secrete which in turn releases toxins. They can kill multiple larvae in their lifetime and also work to kill larvae of thrips and leatherjackets. Apply when the soil temperature is between 10C and 30C. The nematodes will be sent to you in a packet and look like pale brown powder: use them as soon as possible, and well before the 'best before' date on the packet. Keep them in the fridge (ie in the dark at a temperature of 2-5C) until you can use them. They are added to water, then watered onto the houseplant soil (not the leaves) from the top, or sprayed onto the soil surface: make sure you dilute the solution to the ratio instructed by the seller, and apply to soil that is already slightly damp. Apply morning or evening when the sun is not out, or on an overcast day. It's vital that you keep the soil of treated plants moist for the two weeks after application, to make sure the nematodes can move through the soil to locate their prey. If you feel that keeping your plants this moist will not be possible owing to their preferred growing conditions, try the predatory mites instead (see below).

How does Stratiolaelaps scimitus work?

These tiny (less than 1mm) brown mites potter around the substrate (usually the top layer), feeding on fungus gnat larvae. They tend to perform better in drier soil than nematodes, and live for longer even if there is nothing to feed on. They also feed on other creatures in the soil, including root mealybugs, root aphids, springtails, thrips pupae and root mealybugs. They will also feed on spider mites overwintering in the soil. To apply, shake and turn the bottle gently to ensure the mites are evenly spread throughout their bedding, and sprinkle the contents on the top of your plant pots. A minimum temperature of 12C is required for the mites to work.

Thanks to Ladybird Plantcare for sponsoring this guide. You can buy their fungus gnat controls at ladybirdplantcare.co.uk/collections/sciarid-fly-controls