



FUNGUS GNATS:

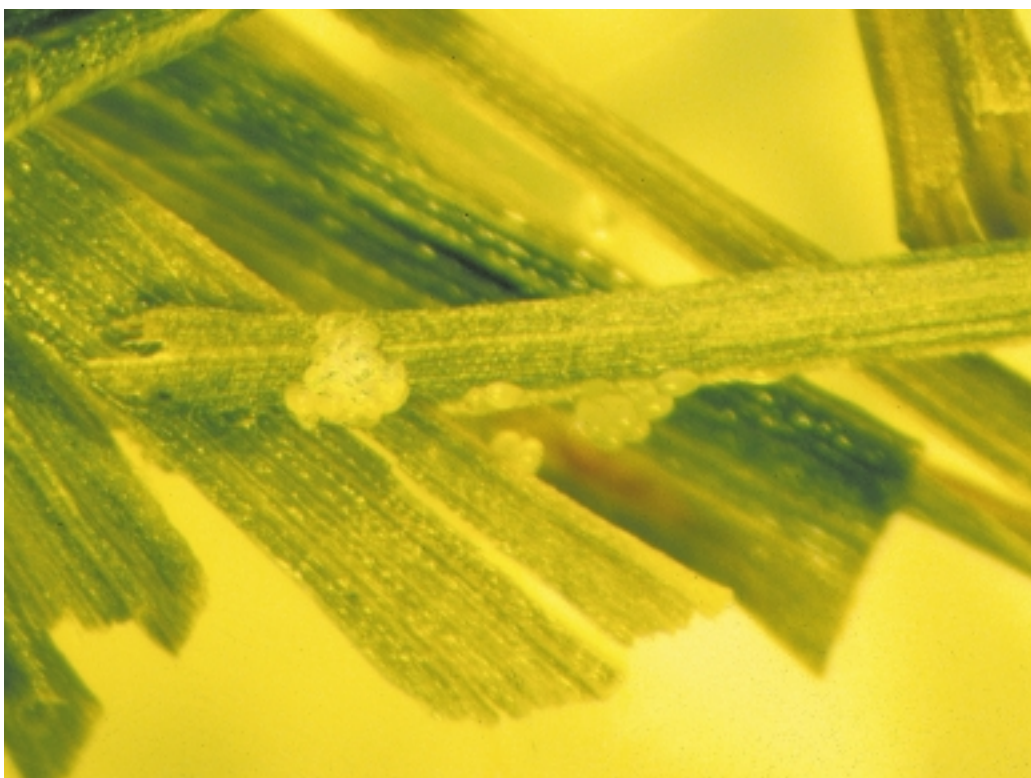
media and water control methods

Three professors put peat and coconut coir to the test for fungus gnat control.

By Marc van Iersel,
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Fungus gnats are common pests in greenhouses. Their larvae feed on the roots of many different crops, which can cause direct damage to the crop. The root damage caused by the larvae also makes it easier for fungal pathogens to enter into and infect plants. Finally, movement of adult fungus gnats among plants can spread foliar diseases throughout the crop.

Adult fungus gnats lay eggs on the potting medium, and the larvae feed slightly underneath the medium surface while they develop into adults. The larvae primarily feed on fungi, however, they can feed on plant roots as well, particularly when there is little or no fungus present in the potting medium. High moisture levels in the growing medium create favorable conditions for many fungi, and consequently, fungus gnats appear to cause more problems when the growing medium is kept moist. Because the larvae feed mainly in the upper part of the potting medium, letting the top portion of the medium dry out between waterings may reduce fungal growth and, therefore, fungus gnat populations. Much of the life cycle of fungus gnats occurs in the soil, and since this is where most of the plant damage occurs, it seems logical that proper management of the growing medium may help to reduce fungus gnat populations in the greenhouse.



Left: Fungus gnat eggs; Right: Fungus gnat larvae. (All photos courtesy of Ron Oetting)



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Greenhouse managers have a choice of many different types of growing media, and the optimal choice depends on the type of crop being grown. Growing media is available in many different textures, ranging from finely textured (normally containing vermiculite), which is commonly used for seedlings, to more coarsely textured media (normally with bark) used for potted plants. In addition to the texture of the medium, the components of various media differ, and there are more choices available now than ever before. Because of problems associated with the supply of peat, as well as environmental concerns related to its harvesting, the industry has been looking for alternatives to peat. Coconut coir, a by-product of the coconut industry, has rapidly gained popularity as a component of soilless media. Its chemical and physical characteristics are fairly similar to those of peat, and it has been promoted as a replacement for peat in growing media. Also, coconut coir often has been marketed as a growing medium component that can inhibit the development of fungus gnats. However, there appears to be little research-based information to confirm this claim. We conducted several studies comparing how coconut coir and peat affect the development of fungus gnat populations.

DOES COIR INHIBIT FUNGUS GNAT DEVELOPMENT?

In a laboratory study, we determined how peat and coir affect the development and survival of fungus gnats. Peat, sterilized peat and peat with added yeast (as a food source for the fungus gnats) were compared with coconut coir, sterilized coir and coir with added yeast. Individual Styrofoam cups were filled with this media, and 20 fungus gnat eggs were added to each cup. The number of fungus gnat adults emerging from the different media was recorded after two weeks. The counts were continued for an additional two weeks, at which point almost all the adults had emerged.

Very few adult fungus gnats emerged from either peat or coir when a food source was not provided, independent of whether the peat or coir had been sterilized (See Figure 1, page 20). When yeast was added, about 12 (60 percent) of the 20 eggs in each cup developed into adults. The number of adult fungus gnats that had emerged was similar for both peat and coir. The developmental time from egg to adult was also similar for peat and coir (approximately 18 days in the presence of yeast). We conclude from this

study that fungus gnats develop equally well in peat and coir and that they need a food source to complete their development from egg to adult, regardless of the potting media. This contradicts the widely held belief that coconut coir inhibits fungus gnat development.

COMPOSITION, TEXTURE AND WATER MANAGEMENT

In a greenhouse study, we looked at how different growing media (different textures and made with either coir or peat) affected the development of fungus gnats. Chrysanthemums were grown in 6-inch pots filled with one of several potting media. Three different media (Redi-Earth, MetroMix 366 and MetroMix 510) were used. Redi-Earth is a fine-textured medium used for germination and is a mixture of peat and vermiculite. MetroMix 366 has an intermediate texture, made with peat, vermiculite, pine bark and a little bit of bark ash. It is used for both bedding plants and potted plants. MetroMix 510 is a coarse-textured growing medium. It is made with the same components as MetroMix 366 but contains less vermiculite and more bark and bark ash. Although these potting media normally are made with peat, the Scotts Company custom-made these three media for our study with coir instead of peat.

In addition to potting medium composition and texture, we also looked at the effect of water management on fungus gnat development. To do this, five different levels of soil moisture were tested. Chrysanthemums were watered only when the water in the growing medium decreased to 90, 71, 52, 34 or 15 percent of the total amount the pots could hold. At 90-percent soil moisture, the growing medium is almost saturated with water, while 15 percent refers to a very dry growing medium.

At the start of the experiment, approximately 50 fungus gnat eggs were applied to each pot, and 20-30 days later, the number of both larvae and adult fungus gnats were recorded. We also looked at how the plants grew in the different media and how almost saturated to very dry conditions affected plant growth.

The results of the greenhouse experiment were not straightforward. Depending on the texture of the growing medium, coir either reduced or increased the number of fungus gnat larvae (See Figure 2, page 20). In the fine-textured media (Redi-Earth), coir resulted in more than three times as



Left: Adult fungus gnat; Right: Fungus gnat feeding damage followed by infection with *Thielaviopsis on vinca*.

pests & diseases

Figure 1. The effect of peat and coir on the development of fungus gnats. Coir did not inhibit the development of the fungus gnats when peat and coir (either sterilized or not, and with or without yeast as a food source for the larvae) were compared. Fungus gnats develop readily, as long as there is a food source present.

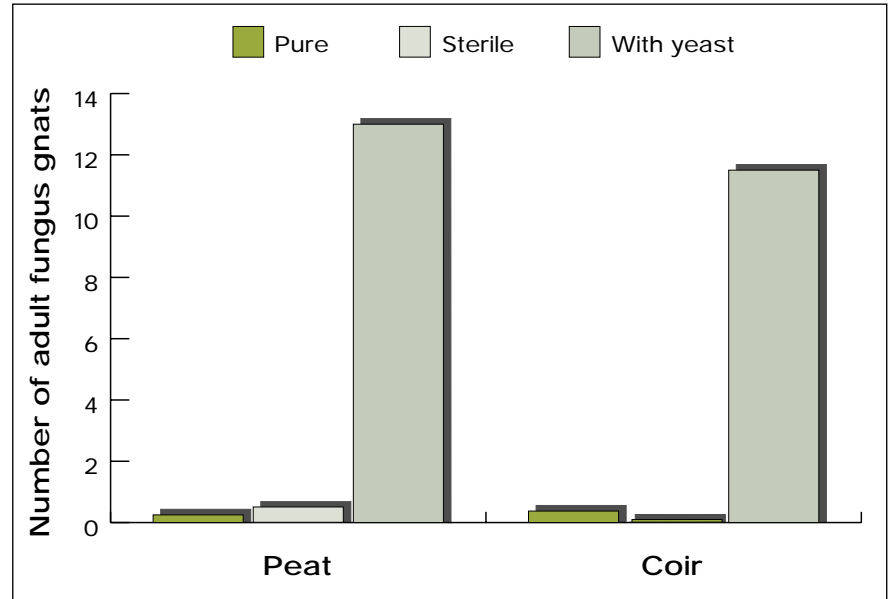


Figure 2. The effect of peat and coir on the development of fungus gnats in media with different textures (fine, medium and coarse). Coir did not always reduce the number of fungus gnats. In the fine medium, coir resulted in substantially more larvae than peat, while coir reduced the number of larvae in medium- and coarse-textured media.

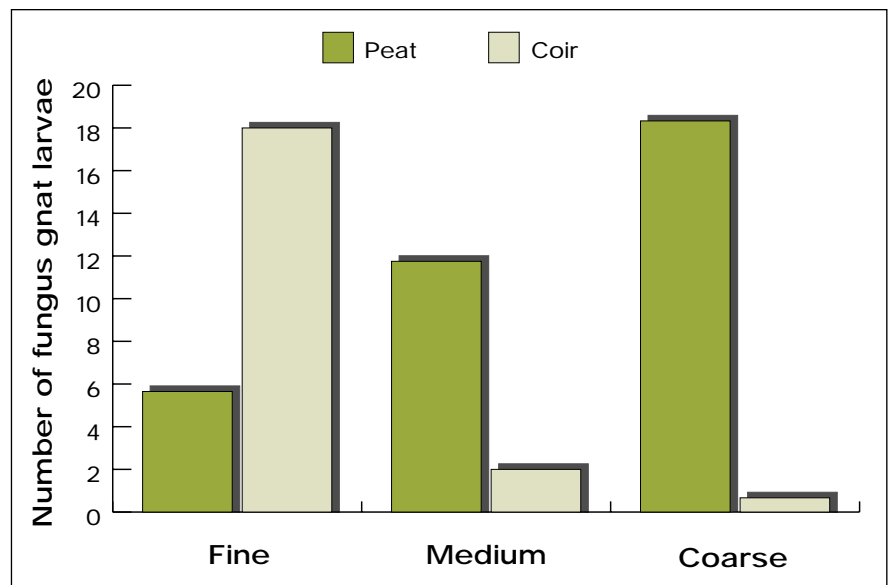
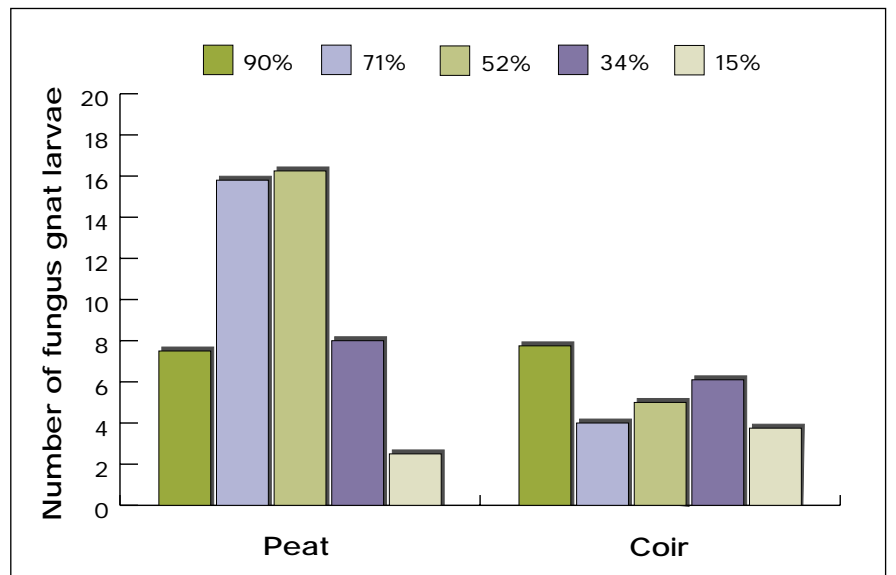


Figure 3. The effect of soil moisture on the number of fungus gnat larvae in the growing medium. The percentages refer to the moisture content of the growing medium at which the plants were watered again (higher values are moister media). Moisture had no effect on the number of larvae in coir-based media, but in peat-based media, 71 and 52 percent moisture resulted in the most larvae.




many larvae as peat. On the other hand, in medium- (MetroMix 366) and coarse- (MetroMix 510) textured media, peat resulted in substantially more larvae than coir.

The amount of soil moisture affected the number of larvae in peat-based media, but not in coir-based media (See Figure 3, left). Very wet or dry conditions resulted in fewer fungus gnat larvae than intermediate moisture levels (71 and 52 percent) in peat-based media. However, when the level of moisture is high in the potting medium, there are other problems associated with the greenhouse crop, such as lack of oxygen in the root zone. Also at very low (15 percent) moisture levels, plants may wilt, and growth is inhibited. A 34-percent moisture level in the growing medium appears to be a good target value to minimize fungus gnat problems and to maintain good plant growth. Our results show that chrysanthemums, and presumably most other greenhouse plants, can grow well with a 34-percent moisture content. Therefore, letting the growing medium dry out between waterings can help maintain good plant growth and reduce fungus gnat development, especially in peat-based media.

DESIRABLE MEDIUM AND SOIL MOISTURE

The choice of the growing medium to use is complicated by the fact that coir reduced fungus gnat populations in some cases but increased it in others and vice versa for peat. Our results suggest that peat may be the better choice in the fine-textured media, while coir may be the better choice in more coarse media, such as those used for bedding plants and potted plants. Coir certainly is not a cure-all for fungus gnat problems. However, letting the growing medium dry out between watering may help, but won't eliminate, fungus gnats. Insecticide applications may be necessary when larger populations of fungus gnats occur.

You may have to experiment in your own greenhouse to determine which growing media minimizes problems with fungus gnats. If you are currently using a medium in which fungus gnats are a problem,

replace the peat with coconut coir (or vice versa) and allow the top 1-2 inches of the potting soil to dry between waterings. 

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