FUNGUS GNATS AND SHORE FLIES

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Proper identification of fungus gnats, *Bradysia impatiens* or *B. coprophilia* and shore flies, *Scatella stagnalis* is necessary since their habits, damage and control differ. Fungus gnat adults are small (< 1/8" long), fragile, gray to black flies that have relatively long delicate-looking legs. They are best identified by a distinctive "Y" shaped vein on each wing and bead-like antennae that are longer than the head. Fungus gnat adults, although easily agitated to fly, are poor fliers which tend to stay on soil surfaces.

In comparison, shore fly adults are more robust (> 1/8" long), heavier looking, dark-colored flies with shorter legs. They lack the "Y" wing vein of fungus gnats and have bristle-like antennae that are shorter than the head. Although not easily induced to fly, they are strong fliers when forced to do so.

Neither shore fly nor fungus gnat adults cause any direct damage to plants. However, shore flies may leave noticeable "fly specks" (feces) on leaf surfaces when their populations are high. Plants spotted by these "fly specks" are less marketable. Fungus gnat adults do not deposit "fly specks" on the foliage, but when abundant, fungus gnat adults cause nuisance complaints particularly in retail operations or where plant materials are being sold through supermarkets. In these situations there is a great deal of pressure to control nuisance populations of fungus gnats.

Fungus gnat larvae are worm-like, translucent to opaque white in color and have a distinctive, shiny black head capsule. Shore fly larvae are maggot-like and have no noticeable head or head capsule. Shore fly larvae breed primarily in algae on pots, benches, floors, walls and sub-irrigation mats. They are difficult to control. Fortunately, shore fly larvae cause no direct damage to plant material. Elimination or reducing algae abundance will prevent large populations from developing and thus avoid the "fly speck" problem previously mentioned. Fungus gnat larvae normally develop in fungi-infested soils and on decaying plant material. However, unlike shore flies, once the larvae become established in the potting media they can directly damage plants as they feed on small roots and root hairs.

Recently, many growers have noticed an increase in fungus gnat populations. Several factors may be involved including: less than adequate control approaches, greater use of soilless media, poor greenhouse sanitation, the use of more water in the greenhouse, and weather conditions that have tended to keep greenhouses more humid and damp than usual. Let's examine each of these possibilities to better understand the influence they have on fungus gnat development. In doing so, approaches that might be used

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to reduce fungus gnat populations should become apparent.

1. **Weather.** It is no accident that this insect is commonly called the fungus gnat as it thrives on decaying organic matter. Cloudy, cool days will slow evaporation and increase condensation. Thus, potting medium and soil beneath benches will remain wet for longer periods. The prolonged wet conditions encourage fungal growth, possibly in the form of root rots. The increased presence of fungi results in an increase in fungus gnat populations.

Although we often wish otherwise, we cannot control weather, but we can influence how fast things dry out. In addition, weather can be used as a barometer of how much attention and time you'll need to spend on fungus gnat control.

2. **Sanitation.** Proper greenhouse sanitation is often mentioned as the cornerstone of disease prevention. It is also important for reducing fungus gnats. Growers who allow weeds to remain beneath benches are asking for problems. The weeds help to trap moisture, and contribute decaying organic material in the form of roots, stems, and leaves that serve as food for the fungus gnat larvae. In addition, plant parts from your crop can drop, be thrown, or swept under the bench. For many growers, fungus gnats get started in just such an under-bench environment before they attack the main crop.

Several approaches can be used to make the under-bench environment inhospitable for fungus gnats. Keeping the area free of weeds and plant debris will reduce the amount of food available. This can be done by hand weeding and clean-up, or by the use of a proper herbicide. However, two techniques have been used by some growers to eliminate unwanted weeds and prevent fungus gnat development.

The first approach uses hydrated lime at the rate of 1.5 lbs./gal. of water to create a slurry which is then distributed under the bench. Application of hydrated lime is messy and it can take up to 2 days for the material to dry. A one month residual can be expected at this rate. The second approach uses copper sulfate at 1 lb./gal. of water. The mix is then sprayed on all under-bench soil. A 3 month residual is claimed at this rate. I suspect that copper sulfate will also reduce algae problems and thus help to control shore flies.

Growers who have used both approaches feel that copper sulfate is easier to work with and less irritating to those handling the material than is hydrated lime. Overall, the ease of application and longer residual action appear to make copper sulfate less expensive than hydrated lime even though copper sulfate is more expensive on a per pound basis. While growers using these approaches claim they are effective, I have been unable to uncover any hard research data to verify (or refute) these claims.

Insecticides can also be used under the bench to control fungus gnat larvae. Diazinon has been effective for this purpose.

3. **Soilless Media.** Dr. Lindquist, Ohio State University has been looking at the relationship between growing media, insecticides, and fungus gnats. His findings suggest that certain media, especially those containing composted bark, or having a peat base, may produce more fungus gnats than other media types. He also found that the effectiveness of some insecticides was better in some media than in others. Thus, the switch to greater use of artificial growing media is probably contributing to the increased incidence of fungus gnats. This does not mean that growers should be returning to soil-based mixes. Rather, they should consider fungus gnats as an insect that will probably require greater attention whenever soilless mixes are used.

4. **Control.** For many reasons growers tend to react to fungus gnat problems only after the adult stage becomes apparent. Unfortunately, this places the grower in a catch-up game that is difficult and expensive to win. The probable relationship of beneath-the-bench fungus gnat populations to crop problems, the fact that fungus gnats thrive under the same conditions that favor soil fungi, and that the insect has a free-flying, non-feeding adult stage and a larval form found in the soil, sets the stage for a program that integrates several different approaches.

Foremost of these is elimination of beneath-bench fungus gnat populations. A grower who deals only with crop-related populations and ignores the fungus gnats "down under" is inviting an intensive, long-term control effort. Therefore, beneath-the-bench control of fungus gnat larvae using a conventional insecticide or perhaps either copper sulfate or hydrated lime is necessary for a good control program.

Even with good beneath-bench control, a grower will occasionally find that in-crop control will be needed. Diazinon, Temik, oxamyl, and bendicarb (Turcam, Dycarb) have shown reasonably good results in controlling fungus gnat larvae. However, only oxamyl is registered for this use. The materials need to be applied to the soil surface and lightly watered in. In addition to the larval stage, the adult fungus gnat may also need to be controlled, particularly if the population has gotten out of hand. Resmethrin in aerosol form has given good results for the purpose of adult control. Recent reports from Ohio mention the possibility of resistance of the adults to resmethrin. However, I've had no reports of problems in Minnesota.

Finally, since fungus gnat larvae do best when fungi are present in the soil, control of soil fungi and in particular root rots using the appropriate fungicide will help reduce fungus gnat problems.

FORT COLLINS GREENHOUSE CLIMATOLOGICAL SUMMARY FOR FIVE WEEKS, BEGINNING AUGUST 31, 1986 (SEE BULLETIN 426 FOR DETAILS)

	Week beginning:									
	8/31/86		9/7/86		9/14/86		9/21/86		9/28/86	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Average outside temperature (°F)	67	58	64	54	66	56	61	54	53	46
Maximum outside temperature (°F)	84	73	81	74	82	71	71	64	68	62
Minimum outside temperature (°F)	45	45	44	43	50	42	45	35	35	32
Degree-days of heating	—	25	4	39	—	32	14	39	42	66
Average hours in the period	12	12	11	13	11	12	11	13	9	14
Accumulated total solar radiation (MJ/sq.m.)	109	—	89	—	95	—	95	—	76	—
Average relative humidity (%)	53	70	53	70	61	77	53	68	67	81
Maximum relative humidity (%)	100	99	100	100	100	100	100	100	100	100
Minimum relative humidity (%)	22	34	19	26	16	27	17	25	33	29
Average absolute vapor pressure (mb)	12	12	11	10	13	12	10	10	9	9
Average wind speed (mph)	2	1	2	2	1	1	4	1	3	1
Maximum wind speed (mph)	14	14	19	25	14	18	28	34	16	15
Average CO_2 concentration (Pascal)	18	—	19	—	20	—	23	—	25	—
Maximum CO_2 concentration (Pascal)	24	—	28	—	26	—	29	—	42	—
Accumulated gas consumption (cu.ft./sq.ft.)	4	8	7	15	3	11	6	17	15	32

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