Title of project.

Integrated Management of Fungus Gnats in Production Greenhouses.

Project leader(s) and contact information.

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Background situation.

Fungus gnats are very serious pests in greenhouses, especially where propagation by cuttings takes place. We suspect that many disease problems in greenhouses are due to high fungus gnat populations. In 2003, several of the collaborators in the poinsettia nutrient monitoring project funded by the NYS IPM Program described fungus gnat populations that were not well managed, and they reported that root rot diseases subsequently developed causing serious losses.

The larvae of the insects feed on fresh plant tissue and vector disease pathogens, such as *Pythium, Fusarium, Verticillium* and *Thielaviopsis* spp. Managing fungus gnats is not easy, since larvae may arrive in the bagged soil mix, can overwinter in the greenhouse floor, and adults can fly in from other sections of the operation or outdoors. Pesticides such as insect growth regulators will not affect the adults; some of the traditional materials labeled for fungus gnats are on the FQPA list for evaluation of chronic low dose effects. We prefer not to recommend materials such as chlorpyrifos and diazinon.

The fungus gnat biological control products on the market include bacteria (Gnatrol, *Bacillus thuringiensis*), nematodes (ScanMask or Nemasys, *Steinernema feltiae*), and predacious mites (*Hypoaspis miles*). Although described in basic IPM resources such as the Guide for Greenhouse Florist Crops and Integrated Pest Management for Bedding Plants, relatively few experts recommend these products. However, they are widely used in organic greenhouses and appear to be cost-effective. In this project, we will examine several scouting methods for early detection of fungus gnat populations and test various biological control products for their ability to prevent outbreaks. If the test materials prove unsuccessful, intervention with a traditional insecticide may be necessary. There are several insect growth regulator products (including azadirachtin) that can be used without damaging the biocontrol organisms.

Expected outcomes of project.

Growers will experience fewer loses to fungus gnats while enhancing employee safety and, probably, reducing management costs.

Project activities.

Monitoring began in early February with the placement of yellow sticky cards and potato slices and adult and larval counts were made weekly thereafter until the end of May. Soil temperatures were also monitored in both pots and floor areas. When larvae were detected either nematodes (ScanMask) or *Bacillus thuringiensis* (Gnatrol) was applied, depending on soil temperature. When adults were first encountered releases of predacious mites (*Hypoaspis miles*) were made. Monitoring continued until the end of May.

Results and Farmer/business-level impacts.

Only one grower had complete records from previous seasons for comparison. The greenhouse sections used were connected to the main house but unheated until February. Soil temperatures in early February averaged approximately 35 degrees F compared to 50 degrees F in the areas in continuous production. For that grower fungus gnat levels in the non-treated control (section 2b) were nearly identical to 2004 (number of adults per card averaged 100.1% per week). No larvae were detected in the soil in any of the sections monitored.

In the first treated section (section 5) adult numbers were 270% (above 2004 prior to release of the predacious mites and a treatment with Gnatrol two weeks after release. Numbers the remainder of the season averaged 29% per week as compared to 2004 with March (pre release and treatment) at 11.5 per card per week. Numbers averaged 35 per card per week the three following weeks before dropping to 11 per card per week for three weeks. Following the missed application date the numbers climbed to 29.5 per card per week for the four remaining weeks in the study.

In the other treated section (section 7) the first three weeks following release (and a partial Gnatrol application two weeks later) the numbers averaged 34% of 2004 (20.7 per card per week) but rebounded to 169% the following two weeks (60.1 per card per week). A scheduled follow up Gnatrol application was not made. Despite this the numbers settled down to 51% the last five weeks (65.5 per card per week).

This grower discontinued poinsettia cutting production due to loses to fungus gnats but is interested in resuming if fungus gnats could be successfully managed. Though the numbers were markedly reduced they were much higher than for the other growers in the project, even at their lowest point. Better results would have likely been attained if the first Gnatrol application had been complete and the second application had been made.

Though incomplete 2004 records were available from the second grower, adult fungus gnat numbers for those dates that could be compared were approximately

halved in 2005 and the grower expressed the impression that he had fewer than in previous years.

In the first treated house (House 6) larvae were detected in the soil under the benches in mid February (soil temperatures averaged 52 degrees F.) and spot applications were made using nematodes. Adult gnats showed up two weeks later and predacious mites were released two weeks after that. The suggested Gnatrol treatment was not made however adult numbers remained low (< 2 per card) until mid-April and even then never climbed very high (avg. 5.8 per card per week throughout April and May).

In the second house (House 10) soil temperature were at or below 50 degrees F. until the heat was turned on in mid March. One larva was detected in the floor and 1 adult was captured prior to the heat coming on and plants being introduced. After plant introduction and prior to mite release and Gnatrol treatment adult numbers averaged 9.9 per card per week. Larvae were soon detected in hanging baskets and it was discovered that the grower had applied the Gnatrol to the flats only. A second application was made four weeks after the first but the hanging baskets were again missed and larvae continued to be detected in them. For the seven weeks following the initial release/treatment adult numbers averaged 11.4 per card per week.

The third grower had a history of gnat problems in one house (House 4) and better, but still incomplete, records. He had made great efforts in cleaning and sanitizing all his houses prior to the season.

In House 4, adults began showing up in mid March but in low numbers (< 1 per card per week as compared to a three year historical average of 4.3). No larvae were detected prior to the end of March when they began to appear in potted material (particularly 6” geraniums). Mites were released in mid March. A Gnatrol treatment was suggested at the end of March when larvae were detected however no application was made. In mid April adult numbers began to increase but remained relatively low (mid April to mid May the average was 6.3 per card per week). The historical count for this period was 13.4 in 2001 and 7.2 in 2002.

In House 10 adults first appeared in early March (< 1 per card) and larvae appeared two weeks later. Mites were released at that time and a Gnatrol treatment followed a week later. Despite this, adult numbers continued to climb, peaking three weeks after the Gnatrol application in mid April at 33 per card. They declined from there, averaging 16.3 per card per week for the remaining five weeks. The historical records were too incomplete to use for comparison but the grower felt there were too many gnats around.

Other participants (grower names excluded for privacy concerns)**.**

Elise Schillo-Lobdell, ke1@earthlink.net (315) 463-7525, Independent IPM scout. Contracted to conduct study at Barone's.

Dr. John Sanderson, Cornell University, advisor.

Outreach & media.

Growers were selected based on a history of fungus gnat concerns and contacted individually for their interest in participating. Results of the project will be shared at regional bedding plant schools in early 2006.

Producer evaluation.

All the growers experienced some decline in fungus gnat numbers. None of the growers followed the suggested treatment plan exactly; in particular applications of Gnatrol were often delayed or omitted altogether. Reasons given were: 1) Too busy with other, higher priority issues 2) Suspicion of side effects (one grower believed it made his plants chlorotic) 3) odor.

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