Greenhouse Pest Management

Greenhouse pests
- Thrips
- Whiteflies
- Fungus gnats
- Shore flies
- Mites
- Bulb mites
- Aphids
- Mealybugs
- Leaf miners (rare in IN)

Fungus gnat - damage by larvae
- Larvae (maggots) feed on fungus in soil and nip at roots, and tunnel in stem.
- High populations of maggots can injure plants and spread soil borne pathogens like Pythium
- Thrive in moist soil
- Monitor larvae by placing a potato slice on the soil and changing weekly
**Fungus gnat adults**

- Adults are have long antenna.
- High populations of adults can be a nuisance, and may spread Botrytis among flowers.
- Adults are attracted to yellow sticky cards placed 2" above plant canopy.

**Fungus Gnat Cultural Control**

- Keep soil covered in potting area. Adults lay eggs in moist media.
- Keep greenhouse weed-free to prevent moist conditions suitable to fungal growth.
- Moderate watering to keep plants dry.

**Fungus Gnat Biological Control**

- Nematodes (*Steinernema feltiae*) attack larvae.
- *Bacillus thuringiensis israeliensis* (Gnatrol)
Fungus Gnat - Chemical Control

Pot drenches kill larvae
- Adept and Distance are insect growth regulators that provide good control of larvae
- *Bacillus thuringiensis var Israeliensis* (Gnatrol) also kills larvae
Foliar applications kill adults
- Pyrethroid and other insecticides control adults.
- For more information See E-111
  - [http://www.entp.purdue.edu/entomology/ext/targets/e-series/EseriesPDF/E-111.htm](http://www.entp.purdue.edu/entomology/ext/targets/e-series/EseriesPDF/E-111.htm)

Shore flies

- Adults are nuisance pests
- Antenna are short and bristled-like a house fly
- Wings have spots
- Larvae feed on algae in upper inch of soil

Shore flies – Cultural Control

- Clean up standing water that can be a source of algae.
- Use an algicide to clean up algal buildup.
- Keep greenhouse weed-free to prevent moist conditions suitable to algal growth.
- Moderate watering to keep plants dry
**Shore flies – Biological Control**

- *Hypoaspis miles* kill larvae
- Native parasitoid (*Hexacola sp.*)

Controls for FG that DO NOT control SF
- *Bacillus thuringiensis israeliensis* (Gnatrol)
- Nematodes (*Steinernema feltiae*)

**Shore fly– Chemical Control**

- Adept and Distance are insect growth regulators that provide good control of larvae.
- Pyrethoid and other insecticides control adults.
- For more information See E-111
  - [http://www.entm.purdue.edu/entmorg/ent/targets/e-series/EseriesPDF/E-111.htm](http://www.entm.purdue.edu/entmorg/ent/targets/e-series/EseriesPDF/E-111.htm)

**Two Spotted Spider Mite**

![Two Spotted Spider Mite](image)
Spider Mite Monitoring

Turn over leaves to look for:
• Stippling of leaves
• Presence of webs and eggs.

Tap foliage over white paper to look for
• Mites crawling on paper

Spider mite biological control

Many natural enemies
• Predatory mites
  • Neoseiulus persimilis (heavy populations)
  • Neosilus californicus (low populations)
• Predatory midges (fly to containers)
• Minute pirate bugs
• Lacewings

Spider mite control

• Use miticides compatible with natural enemies
  bifenazate (Floramite), clofentazine (Ovation) or hexythiazox (Hexygon)
• Use insect growth regulators and spinosad to control other pests to avoid killing predators
• Rotate classes of insecticide to prevent resistance
• See E-42 for details
  http://www.entm.purdue.edu/entomology/ext/targets/e-series/e-seriesPDF/E-42.htm
Microscopic mites will cause russetting, and leaf distortion. Young growing tips are often affected.

Cyclamen vs Broad Mites

Cyclamen mites favored by cool temperatures (60 F and high humidity)
Eggs are smooth

Broad mites favored by warm temperatures (70-80 F). Eggs are dimpled.

Cyclamen and Broad Mite control

Arrive into greenhouses on tubers and in buds of plant material
- Heat treat infested plant material at 111 F for 15 minutes
- Miticides-pyridaben (Sanmite), chlorfenapyr (Pylon), abamectin (Avid)
Bulb Mite

Bulb mite Damage and Control

- Are problematic on Easter Lilies and other bulbs
- Spread Pythium and other diseases

Not much is labeled for control.

Dipping bulbs for 30 minutes in hot water, or with Kelthane, Avid, or Hexygon have been effective. Hypoaspis miles, a predator mite shows some promise.

For details see:
http://floriculture.osu.edu/archive/dec00/bblmite.html

Black Bean Aphid
Aphids

- Cause honeydew/sooty mold problem
- Potential disease vectors
- Monitor for winged adults in yellow sticky cards.
- Inspect plants for wingless adults and immatures
- Screening vents is critical
- Many natural enemies
- Systemic insecticides also effective

Green Peach Aphid

Parasitized Aphids
Green Lacewing

Predator

Mealybugs

Identification
http://mrec.ifas.ufl.edu/lso/Mealybugs.htm

Common Mealybugs in Indiana
Citrus mealybug
Longtail mealybug

Monitor by inspecting plants
Mealybug biological control

- Cryptolaemus montreuzieri – a beetle predator that lays eggs in ovisacs of several species (Does not control Longtail mealybugs)
- Parasitoids are available but tend to be more specific (Leptomastix spp.)

Citrus Mealybug

Long-tailed Mealybug
Mealybug Destroyer

Mealybug Parasite- Leptomastix dactylopii

Mealybug chemical control

- Waxy coating and ability to hide in crevices makes mealybugs difficult to control with insecticides.
- Ovisacs laid on pots or under benches can complicate control.
- Systemic insecticides can be helpful
- Spot applications to conserve beneficials.
Some Common Soft and Armored scales

Soft scales
  brown soft scale
  hemispherical scale

Armored scales
  Boisduval scale
  Fern scale

Brown Soft Scales and Crawlers

Fern Scale
Biological Control is critical for scale management – Many NE’s available

Adult Black Vine Weevil

Weevil Life Cycle
Black Vine Weevil Damage

Leaf miners

Leaf miner control

- Two common leaf miners
  - serpentine leaf miner *Liromyza brassicae*
  - pea leaf miner *Liriomyza huidobrensis*
- Resistance to pesticides can be a problem.
- Use a systemic pesticide to kill young mines in leaves.
- Parasitoids are available
- See link from University of California for details
  - [http://www.ipm.ucdavis.edu/PMG/r280300911.htm](http://www.ipm.ucdavis.edu/PMG/r280300911.htm)