COMMON INSECT AND MITE PESTS OF GREENHOUSES (AND VEGETABLES)

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Pink Hibiscus mealybug

• The Hibiscus or Pink Mealybug, *Maconellicoccus hirsutus* (Green)
• Pest of many plants, trees, and shrubs. It infests hibiscus, citrus, coffee, sugar cane, plums, guava, mango, okra, sorrel, teak, mora, pigeon pea, peanut, grapevine, maize, asparagus, chrysanthemum, beans, cotton, soybean, cocoa, and many other plants.
Pink Hibiscus mealybug

- Tropical distribution: including Asia, the Middle East, Africa, Australia, and Oceania
- Florida 2002
- Not found in VA
- It is now a very serious pest in the Caribbean where it attacks many hosts of economic importance and disrupts Caribbean agricultural trade and commerce.
Chilli thrips

- *Scirtothrips dorsalis*
- Texas and Florida for now, no Virginia records

*Figure 1. Dorsal view of adult chilli thrips, *Scirtothrips dorsalis* Hood. Photograph by Lance Osborne, Entomology and Nematology Department, University of Florida.*
Chilli thrips

- Damage similar to other thrips on leaves and fruit

**Figure 12.** Deformed pepper fruit (no economic value) after damage from an infestation of the chilli thrips, *Scirtothrips dorsalis* Hood. Photograph by [Vivek Kumar](https://example.com), Entomology and Nematology Department, University of Florida.

**Figure 13.** Feeding scars on pepper plant leaves due to an infestation of the chilli thrips, *Scirtothrips dorsalis* Hood. Photograph by [Vivek Kumar](https://example.com), Entomology and Nematology Department, University of Florida.
Chemicals for GH new for 2014

- **Preferal** microbial Insecticide is a naturally-occurring fungus that infects both foliage and soil dwelling insects such as whiteflies, aphids, thrips, weevils, psyllids, leafminers, spider mites, mealybugs
- **Sultan** – all stages of mites (new chemistry)
- **Rycar** – whiteflies, aphids, chili thrips, mealybugs, and leafhoppers
- **Grandevo** - (Chromobacterium substugae) is a broad-spectrum bio-pesticide insecticide
- **Xxpire** - combines two new active ingredients: spinetoram and Isoclast™, works on both chewing and sucking insects.
- **Mainspring** - chewing and sucking pests such as leafminers, caterpillars and thrips. Insect stops feeding after ingestion
- **Fulcrum** (pyriproxyfen) whiteflies, fungus gnats and shoreflies
- **Kontos** – (spirotetramat) systemic insecticide, tetramic acid class of chemistry sucking insect and mite pests, including adelgids, aphids, leafhoppers, mealybugs, psyllids, spider mites, spittlebugs and whiteflies. Kontos is both xylem and phloem active, meaning that the systemic activity moves upward and downward in treated plants.
5-22  **Floral Crops:** Insects

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Signal Word</th>
<th>Foliar Spray</th>
<th>Aerosol</th>
<th>Smoke Fog Vapor</th>
<th>Soil</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td><strong>Aphids</strong></td>
<td></td>
<td></td>
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<tr>
<td>Abamectin</td>
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<tr>
<td>Acephate</td>
<td>caution</td>
<td>75SP, 9T</td>
<td>3A</td>
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<td>Acetamiprid</td>
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<td>70WSP, 30SG</td>
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<td>Azadirachtin</td>
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<td>—</td>
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<td>All crops</td>
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<tr>
<td>Beauveria bassiana</td>
<td>caution</td>
<td>22WF, ES</td>
<td>—</td>
<td>—</td>
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<td>All crops</td>
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<tr>
<td>Bifenazate</td>
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<td>667F</td>
<td>A</td>
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<td>Greenhouse-grown ornamentals</td>
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<tr>
<td>Chlorpyrifos</td>
<td>caution</td>
<td>20ME</td>
<td>8A</td>
<td>—</td>
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<td>See label</td>
</tr>
<tr>
<td>Cyfluthrin</td>
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<td>20WP</td>
<td>—</td>
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<tr>
<td>Dinofuran</td>
<td>caution</td>
<td>20SG</td>
<td>—</td>
<td>20SG, 2G</td>
<td>—</td>
<td>Soil application as drench, granules</td>
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<tr>
<td>Endosulfan</td>
<td>danger</td>
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<td>—</td>
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<tr>
<td>Fenoxycarb</td>
<td>caution</td>
<td>25WP</td>
<td>0.6A</td>
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<td>All crops</td>
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<tr>
<td>Fenpropathrin</td>
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<td>2.4EC</td>
<td>1A</td>
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<tr>
<td>Flonicamid</td>
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<td>Fluvalinate</td>
<td>caution</td>
<td>2AF</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>All crops; see label for phytotoxicity</td>
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<tr>
<td>Imidacloprid</td>
<td>caution</td>
<td>II</td>
<td>—</td>
<td>—</td>
<td>1%G, 60WP</td>
<td>See label for rate range</td>
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<tr>
<td>Insecticidal soap</td>
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<td>—</td>
<td>—</td>
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<td>—</td>
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</tr>
<tr>
<td>Kinoprene</td>
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<td>II</td>
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<td>—</td>
<td>—</td>
<td>All crops</td>
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<tr>
<td>Lambda-cyhalothrin</td>
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<td>GC</td>
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<td>Methiocarb</td>
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<td>Permethrin</td>
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<td>All crops</td>
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<tr>
<td>Pyrethrin</td>
<td>caution</td>
<td>—</td>
<td>A</td>
<td>—</td>
<td>—</td>
<td>See label</td>
</tr>
<tr>
<td>Pyrethrin</td>
<td>caution</td>
<td>—</td>
<td>A</td>
<td>—</td>
<td>—</td>
<td>All crops</td>
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<tr>
<td>Pyrethrin</td>
<td>caution</td>
<td>—</td>
<td>A</td>
<td>—</td>
<td>—</td>
<td>See label</td>
</tr>
<tr>
<td>Resmethrin</td>
<td>caution</td>
<td>2EC</td>
<td>A</td>
<td>—</td>
<td>—</td>
<td>All crops</td>
</tr>
<tr>
<td>Spirotetramat</td>
<td>caution</td>
<td>240SC</td>
<td>—</td>
<td>240SC</td>
<td>—</td>
<td>Soil application as drench</td>
</tr>
<tr>
<td>Thiamectoxan</td>
<td>caution</td>
<td>25WG</td>
<td>—</td>
<td>25WG</td>
<td>—</td>
<td>See label</td>
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<tr>
<td>Tolfenpyrad</td>
<td>warning</td>
<td>EC</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>See label for phytotoxicity</td>
</tr>
<tr>
<td>Ultra-fine oil</td>
<td>caution</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>See label</td>
</tr>
</tbody>
</table>
## Organic Controls for Insect Pests of Floral Crops

Peter B. Schultz, Extension Entomologist, Hampon Roads AREC  
Eric R. Dew, Extension Entomologist, Virginia Tech

### Table 5.6 - Organic Chemicals, Predators, and Pathogens

<table>
<thead>
<tr>
<th>Product</th>
<th>Insects Controlled</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d-limonene</td>
<td>Imported fire ants</td>
<td>Provides quick kill.</td>
</tr>
<tr>
<td>Insecticidal soap</td>
<td>Works well on soft bodied insects, in particular aphids, mites, lacebugs, mealybugs</td>
<td>This product is sold under many trade names and is a fatty acid soap.</td>
</tr>
<tr>
<td>Spinosad</td>
<td>Many insect pests, including thrips, lepidopterous larvae, and leaf beetles</td>
<td>Entomist is for organic production.</td>
</tr>
<tr>
<td>Rotenone</td>
<td>Many insect pests including aphids, leafhoppers, mealybugs, weevils, Japanese beetles, flea beetles</td>
<td>Usually sold as a dust, but some formulations can be mixed in water.</td>
</tr>
<tr>
<td>Pyrethrin</td>
<td>Broad spectrum, works on a wide variety of insects</td>
<td>Usually sold mixed with other botanical insecticides.</td>
</tr>
<tr>
<td><strong>Predators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lady beetles</td>
<td>Feed on aphids and other soft bodied insects</td>
<td>Lady beetles may leave to find other prey.</td>
</tr>
<tr>
<td>Lacewings</td>
<td>Aphids, scales, mealybugs, other soft bodied insects</td>
<td>Immature Chrysoperla carnea are called aphid lions.</td>
</tr>
<tr>
<td>Predatory bugs</td>
<td>Thrips</td>
<td>Aphidolates aphidoliza for aphids.</td>
</tr>
<tr>
<td>Predatory mites</td>
<td>Whitefly, spider mites, thrips, fungus gnat larvae</td>
<td>Amblyseius swirskoi for whiteflies and thrips;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phytoseiulus persimilis for red and 2-spotted spider mites; Hypoaspis for fungus gnat larvae;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amblyseius californicus for 2-spotted spider mites and cinnamon mite;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amblyseius cucumeris for western flower thrips; Amblyseius andersoni for red and 2-spotted spider mites.</td>
</tr>
<tr>
<td>Parasitic wasps</td>
<td>Leafminers, whiteflies</td>
<td>Diacylius isaea for leafminers; Encarsia formosa and Entomoscelis eremicus for whiteflies.</td>
</tr>
<tr>
<td>Rove beetle</td>
<td>Fungus gnat larvae</td>
<td>Rove beetle for fungus gnat larvae.</td>
</tr>
<tr>
<td><strong>Pathogens</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brevicoryne</td>
<td>Leaf feeding caterpillars</td>
<td>Known as JR, is sold under many trade names.</td>
</tr>
<tr>
<td>Enthemopathogenic nematodes (Steinernema and Heterorhabditis)</td>
<td>Fungus gnats, shore flies, western flower thrips, root mealybugs, borers, root feeders</td>
<td>Rates are on product label, soil temperature should exceed 60 F. Apply late in the day, irrigate immediately.</td>
</tr>
<tr>
<td>Enthemopathogenic fungi</td>
<td>Whiteflies, thrips, aphids, mealybugs, fungus gnats, vine weevils, psyllids, plant bugs, beetles, leafhoppers</td>
<td>See label for proper material for target pest. Beavers is sold under several trade names. Follow label for mixing directions, application timing and intervals and if a foliar spray or drench. NoFly WP can be applied with a cold fogger.</td>
</tr>
</tbody>
</table>
Leafminer
Leafminer
Adult Leafminer
Leafminer Control in Greenhouses

• Remove Infested Foliage
• Apply insecticides- e.g. Adept, Precision; Azadirachtin; Citation; Decathlon; Talstar, Attain
• Check insecticide label before using on vegetables
• Most common is tomato pinworm and it arrives on infested leaves, does not overwinter in VA
Two-spotted Spider Mite
Mite Damage
Two-spotted Spider Mite

- Monitor favorable weather (hot, low RH)
- Monitor life stages (mobile stages)
- Identifying “hot spots”
- Horticultural oils, Insecticidal soap
- Chemical controls- e.g. Avid, Hexygon, Kelthane, Akari, Floramite, Pylon.
- NOTE- Coverage is key
- Check insecticide label before using on vegetables
Biological Control for Spider Mites

Beneficial Insects:

*Phytoseilus persimilis* for two-spotted spider mites

- Dark-colored lady beetles known as the “spider mite destroyers” (*Stethorus* species) are specialized predators of spider mites.
- Minute pirate bugs, big-eyed bugs (*Geocoris* species)
- Predatory thrips can be important natural enemies.
Beneficial Mites

A great many mites in the family Phytoseiidae are predators of spider mites:

• *Galendromus occidentalis*
• *Phytoseiulus persilimis*
• *Mesoseiulus longipes*
• *Neoseiulus californicus*

Work well indoors, but variable results outside.
Insecticides that Increase Mite Problems

• carbaryl (Sevin) devastates most spider mite natural enemies.

• Malathion can aggravate some spider mite problems, despite being advertised frequently as effective for mite control.

• Soil applications of the systemic insecticide imidaclorpid (Merit, Marathon) have also contributed to some spider mite outbreaks.

Water management important for spider mites.
Fungus Gnats/Shore Flies

Fungus Gnats: larvae thrive on over watering, leads to root feeding, yellowing

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Shore Fly: larvae occur in algae mats under benches or in water system
Fungus Gnat Management

- Avoid over watering
- Use sterilized media
- Apply soil drenches for control of larvae
- Apply surface sprays to control emerging adults
- Yellow sticky cards for monitoring
Fungus Gnat Control

- Predatory nematodes: *Steinernema feltiae*
- Predatory mites: *Hypoaspis*
- Biological control: Gnatrol
- Insecticides: Gnatrol; Adept, Precision; Distance;
- Check insecticide label before using on vegetables
Life Cycle of a Fungus Gnat
Shore Fly

Associated with algae mats in cooling systems, not a plant pest but a nuisance pest. Note pale spots on wings.
Whiteflies

- Greenhouse Whitefly
- Silverleaf Whitefly
- Banded Wing Whitefly
- Citrus Whitefly and others
Whitefly Damage

- Feed on underside of leaves
- Yellow wilted leaves
- Stunted growth
- Plant may be killed
- Clouds of adults when leaf moved
- Honeydew
Whiteflies

Life cycle: Adult - egg (not shown) - nymph - pupa - Adult
Whitefly Pupa

Silverleaf whitefly on left and greenhouse whitefly on right.

Whitefly IPM

- Monitor weekly with yellow sticky cards
- Random leaf inspection
- Remove heavily infested leaves
- Consider parasites, e.g. *Encarsia formosa*
- Empty greenhouse between crops, cold will kill mealybugs
- Eliminate weeds
- Inspect incoming plants
Biological Controls for Whitefly

- **Encarsia formosa**
  - Develops within the whitefly nymphs body
  - Young whiteflies turn black and die in several days.
  - Temperatures must average (day plus night) 72 degrees F. 1 parasite/sq ft.

- **Eretmocerous californicus**
  - Also develops inside the body and whiteflies die
  - Also kill many whiteflies in the process of “blood feeding”. Wounds to feed and may not lay egg
  - *E. californicus* is also much more effective against the silverleaf whitefly.
Whitefly Parasites

*Encarsia formosa* on left and *Eretmocerous californicus* on right.

Whitefly IPM

- Insect Growth Regulators (Enstar, Distance, Endeavor) for nymphs
- Insecticidal soap for adults
- Marathon as soil treatment
- Orthene plus a pyrethroid e.g. Tame, Decathlon, Talstar
- Check insecticide label before using on vegetables
- Rotate insecticides to combat resistance
- Coverage is important
Aphids

Small, soft bodied insects
Green Peach Aphid- most important species

note “tail pipes”
Aphid Life Stages

Aphids: a, wingless; b, newborn nymph; c and d, winged; e, nymph
Aphid Damage

- stunting, curling
- stipples, spots
- honeydew, sooty mold
- cast skins, wax
Aphid IPM

- Monitor for distorted foliage
- Monitor for honeydew, sooty mold
- Monitor or release natural enemies (ladybeetles, lacewings, predatory midges)
- Apply insecticidal soaps, botanicals
- Apply synthetic insecticides, e.g. Marathon, Decathlon, Avid, Endeavor
- Check insecticide label before using on vegetables
APHID BIOCONTROL

Other than lady beetles and lacewings…

*Aphidoletes aphidimyza* -- Aphid predator

*Aphidus matricariae* -- Aphid parasite
Thrips

- small, yellow, slender, > 1/8”
- Damage: white spots, stunting,
- bud/flower death, puckering
- Disease Trans.: Tom. Spot. Wilt Virus (TSWV)
Thrips
Thrips Life Cycle

WESTERN FLOWER THRIPS LIFE CYCLE
Flower Thrips
Damage to Peony
Thrips Damage
Thrips IPM

- Monitor with blue sticky cards
- Remove damaged/diseased plants
- Discard “zoo plants”
- Maintain clean stock plants
- Exclusion with screened vents
- Apply insecticides if needed, e.g. Conserve, abamectin (Avid), Mesurol, Thiodan
- Check insecticide label before using on vegetables
THRIPS BIOLOGICAL CONTROL

*Amblyseius* ALSO CALLED *Neoscelius* for BIO-CONTROL ON PLANTS

*Hypoapsis* FOR THRIPS IN SOIL
Scale Insects

• **Soft Scales:**
  • Hemispherical Scale
  • Brown Soft Scale

• **Armored Scales:**
  • Florida Red Scale
  • Cactus Scale
  • Boisduval Scale
Hemispherical Scale
Brown Soft Scale Bio-Control

*Scutellista cyanea* Motschulsky is a common parasite and *Metaphyous luteolus* Timberlake controls brown soft scale in California.

Hemispherical Scale Bio-Control

The most important parasite of hemispherical scale in the United States is *Metaphycus helvolus*. 
Florida Red Scale
Cactus Scale
SCALE CONTROL

- Physical removal
- Isolate plants
- Horticultural oils, Insecticidal soap
- Insecticides, e.g. Closure, Decathlon, Distance, DuraGuard, Orthene
- Scales not pests of vegetables
Mealybugs
Mealybugs
Mealybug Control

- Discard heavily infested plants
- Beneficial insects somewhat effective
- Alcohol and water swabs
- Horticultural oils, Insecticidal soap
- Insecticides- e.g. Imidacloprid (Marathon), azadirachtin (Azatin), DuraGuard, Orthene, Talstar
- Mealybugs rarely pests of vegetables, might check transplants from infested greenhouses
Bio-Control for Mealybugs

*Cryptolaemus montouzieri* (beetle, predator) and *Lepomastix dactylopii* (wasp, parasitoid)

Lepomastix is much better at seeking out new, light infestations of citrus mealybugs but they really like light and long days.
Pest Management Options

- Identify the pest
- Determine the potential for injury
- Consider management options
- Use the best option for your operation
- Keep good records for future years
Monitoring

- Frequent plant inspection
- Yellow sticky cards-whiteflies, aphids, fungus gnats, leafhoppers
- Blue sticky cards-thrips
Cultural Control

- Inspect new deliveries upon arrival
- Keep new plants separate for a week
- Use suppliers that provide quality plants
- Keep pests out of greenhouse—e.g. screening, double entry doors, etc.
Record-keeping

- Note host or plant type
- Location in the greenhouse
- Abundance
- Strategy used

<table>
<thead>
<tr>
<th>Plant</th>
<th>Green # or location</th>
<th># plants infested</th>
<th>Chemical, Effective?</th>
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The End
Cuban Laurel Thrips, *Gynaikothrips ficorum*

- One site in Williamsburg area
- Greenhouse
- *Ficus retusa* is most common host, other *Ficus* may have some resistance
- Purple spots and leaf curl