Whiteflies in the Landscape

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Whiteflies

- Approximately 75 species of whiteflies in Florida.
- Common pests of many ornamental plants
- Narrow and wide host range depending on the species
- Piercing-sucking mouthparts
- Excrete honeydew
- Capable of transmitting viruses
- Adults are small, moth-like, usually with white wings.

Photos: H. Glenn, UF/IFAS
Whitefly Life Cycle

Photo: H. Glenn, UF/IFAS
Variability in Whitefly Immature Stages
Damage from Whiteflies

• Direct damage
  – Caused by the piercing and sucking of sap from the foliage; leaf drop
  – Usually not sufficient to kill plants

• Indirect damage
  – Accumulation of honeydew and white, waxy flocculent material
  – Sooty mold growth on honeydew

• Virus transmission
  – Some whiteflies can transmit disease
  – Currently, no known viruses associated with the Rugose spiraling whitefly
Recent Whitefly Issues in the Landscape in South Florida

Ficus Whitefly

Rugose Spiraling Whitefly
Another Whitefly Also on Ficus

*Tetraleurodes fici*

Does not appear to cause the same type of damage

Photo: H. Glenn, UF/IFAS
Giant Whitefly
(*Aleurodicus dugesii*)

- Pest of hibiscus and several other hosts (ornamentals, citrus, banana, weeds)
- Found in Florida in 1996
- In California it has been reported on more than 43 hosts
- Approximately 3 times larger than most whiteflies
- Eggs laid in spiral pattern
- Florida released parasites for control
  - Established but no impact recorded
Keys Whitefly
(*Aleurodicus dispersus*)

- Attacks more than 100 species of plants (vegetable, ornamental and fruit plants)
- Reported in south Florida (been in Hawaii since 1978)
- Adult is small like a typical whitefly; produce large quantities of wax
- In Hawaii, released several natural enemies and *Encarsia haitiensis* were most effective
- Not really a problem now in Florida
Cardin’s Whitefly
*Metaleurodicus cardini*

- Been in Florida since 1917
- Recent outbreaks seen on *Duranta* species
- Similar appearance to the gumbo limbo spiraling whitefly
Dialeurodes schefflerae
Newly described whitefly species

• Consistently the most prevalent whitefly on dwarf schefflera grown in Florida
• Host-specific
• Also occurs in Hawaii and California
Ficus Whitefly

*Singhiella simplex* (Hemiptera: Aleyrodidae)

- Only feeds on ficus species
- Currently in several south and central Florida Counties
- Will likely spread to areas where ficus is grown
Ficus Whitefly Life Cycle

**Adult Whitefly** (2-4 days)

**Eggs** (10 days)

**1st instar – crawler** (4.2 days)

**2nd-3rd instars – nymphs**
- 2nd instar – 3.7 days;
- 3rd instar – 3.3 days

**4th instar – puparia** (5.8 days)

Constant temperature (80º F)
Ficus Whitefly - Damage

- Causes leaf yellowing
- Leaf drop (severe)
- Branch dieback (highly variable)
Natural Enemies Observed in the Landscape

- *Encarsia protransvena*
- *Amitus bennetti*
- *Harmonia axyridis*
- *Olla v-nigrum*
- *Exochomus childreni*
- *Chilocorus nigritis*
- *Curinus coeruleus*
Effect of Temperature on Length of Life Cycle

![Bar chart showing the mean number of days from egg to adult at different temperatures: 20°C, 27°C, and 30°C. The chart indicates that the mean number of days decreases as the temperature increases.]
First signs of defoliation (8/28)
Rugose Spiraling Whitefly
*Auleurodicus rugioperculatus*

- First found at USDA office in Miami on *Bursera simaruba* Spring 2009
- Known from Belize, Guatemala and Mexico
- Eggs are in a spiral pattern
- Adult is relatively large and docile
Plants Hosts

- Acalypha wilkesiana (Copperleaf)
- Annona sp. (Sugarapple)
- Araucaria heterophylla (Norfolk island pine)
- Bucida buceras (Black olive)
- Bursera simaruba (Gumbo limbo)
- Calophyllum species
- Catharanthus roseus (Madagascar periwinkle)
- Chrysobalanus icaco (Cocoplum)
- Chrysophyllum oliviforme (Satinleaf)
- Cocos nucifera (Coconut palm)
- Conocarpus erectus (Buttonwood)
- Cordyline fruticosa (Hawaiian ti)
- Dictyosperma album (Hurricane palm)
- Dypsis lutescens (Areca palm)
- Eugenia spp.
- Ficus aurea (Strangler fig)
- Ficus carica (Edible fig)
- Hyophorbe verschaffeltii (Spindle palm)
- Mangifera indica (Mango)
- Manilkara roxburghiana
- Myrica cerifera (Wax myrtle)
- Musa sp. (Banana)
- Parthenocissus quinquefolia (Virginia creeper)
- Persea americana (Avocado)
- Phoenix roebelenii (Pigmy palm)
- Quercus virginiana (Live oak)
- Sabal palmetto (Sabal palm)
- Schinus terebinthifolius (Brazilian pepper)
- Simarouba glauca
- Smilax auriculata
- Spondias sp.
- Spondias purpurea
- Strelitzia Nicolai (White bird of paradise)
- Strelitzia reginae (Bird of paradise)
- Tabebuia species
- Terminalia catappa (Tropical almond)
- Veitchia species
- Washingtonia palm
- Zeuxine strateumatica

And, the list continues to grow
Rugose Spiraling Whitefly
Spiraling Eggs
Rugose Spiraling Whitefly
Eggs

Adult

1st Instar

Rugose

Spiraling

Whitefly

4th Instar

3rd Instar

2nd Instar

"
Natural Enemies

Parasitoid: *Encarsia guadalupae*

Beetle predator: *Nepasphis oculata*

Lacewing Predator:
Effect of Temperature on the Life Cycle of the Rugose Spiraling Whitefly
Population of Rugose Spiraling Whitefly
Whitefly Management
Managing Insects with Piercing/Sucking Mouthparts

- Can be difficult to control
- Often have short life cycles
- Often not noticed until populations are high
- Many have waxy secretions/coverings that provide protection
- Production of honey dew (for some insects)
Management of Whitefly in the Landscape

• Cultural control
  – Alternative plant choices (difficult for rugose spiraling whitefly)

• Washing plants off with water
  – Small infestations or small plants
  – Must remove the immature stages and eggs.
Management of Whitefly in the Landscape

• Soaps and oils
  – Horticultural oil; insecticidal soap; dish soap (don’t use soaps with degreasers i.e. Dawn)
  – Strictly contact so thorough coverage is required
  – Several applications are required 7-10 days
  – Phytotoxicity under high temperatures
Management of Whitefly in the Landscape

• Insecticides
  – Sometimes important in the early management of a pest
  – Appropriate choices of insecticide, formulation, methods of application and frequency of application
  – Effects on natural enemies
Management of Whitefly in the Landscape

• Insecticides
  – Misuse or overuse can cause problems such as insect resistance, secondary pest problems, environmental contamination, and detrimental effects on non-target organisms
  – Follow label instructions - The site and method of application must be on the label (i.e. landscape, nursery, etc.)
Management of Whitefly in the Landscape

• Apply a systemic (neonicotinoid) insecticide to the soil or trunk
  – Soil application (drench, granular, pellets)
  – Trunk application (basal spray, injection)
  – Longer term control
# Neonicotinoid Insecticides

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Trade Names Professional Use</th>
<th>Trade Names Over-the-Counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetamiprid</td>
<td>TriStar (no soil application)</td>
<td></td>
</tr>
<tr>
<td>Clothianadin</td>
<td>Arena, Aloft*</td>
<td></td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Safari</td>
<td>Green Light Tree &amp; Shrub Insect Control with Safari</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>Merit, Marathon, Coretect, Discus*, Allectus*, several generic labels</td>
<td>Bayer Advanced Lawn Complete Insect Killer; Bayer Advanced Tree &amp; Shrub Insect Control ; Ortho Max</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>Flagship, Meridian</td>
<td></td>
</tr>
</tbody>
</table>

* Contains a Neonicotinoid and a pyrethroid
UV Stability of Neonicotinoids

Aquatic Photolysis

- Acetamiprid
- Imidacloprid
- Thiamethoxam
- Dinotefuran
- Clothianidin

Cannot use in the soil
Relative Water Solubility of Neonicotinoids

- Clothianidin: 327
- Imidacloprid: 500
- Acetamiprid: 2950
- Thiamethoxam: 4100
- Dinotefuran: 39830

Slide information courtesy C. Sclar. Longwood Gardens
Soil and Foliar Application of Insecticides

![Graph showing the mean number of live nymphs per leaf over days after application, comparing control and hort oil-foliar treatments.](image-url)
Soil and Foliar Application of Insecticides

Mean No. Live Nymphs per Leaf

Days After Application

- Control
- Hort Oil-foliar
- Merit-foliar
- TriStar-foliar
- Aria-foliar
Soil and Foliar Application of Insecticides

![Graph showing the mean number of nymphs per leaf over days after application for different insecticide treatments. The x-axis represents days after application, ranging from 0 to 126, and the y-axis represents the mean number of nymphs per leaf. The graph includes lines for various treatments such as Control, Hort Oil-foliar, Merit-foliar, TriStar-foliar, Aria-foliar, Merit .6ml, Merit 1.2 ml, Merit 2.4 ml, CoreTect-low, and CoreTect-high. The peaks and trends vary among the treatments, illustrating the effectiveness of different applications over time.]
Management Options

Foliar Insecticide Application

• Whitefly should be present
• Foliar insecticides may provide quick control, most will not provide long-term control.
• Some foliar insecticides (i.e. pyrethroids) may disrupt the natural enemies and should be used very selectively.
• It is **not** recommended to use the same insecticide on both the foliage and in the soil
<table>
<thead>
<tr>
<th>Insecticide Selection</th>
<th>Foliar Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Use (Landscape and Nursery)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abamectin</td>
<td>Avid</td>
</tr>
<tr>
<td>Acetamiprid</td>
<td>TriStar</td>
</tr>
<tr>
<td>Azadirachtin</td>
<td>Azatin XL</td>
</tr>
<tr>
<td>Bifenthrin</td>
<td>Talstar</td>
</tr>
<tr>
<td>Buprofezin,</td>
<td>Talus</td>
</tr>
<tr>
<td>Clothianidin</td>
<td>Arena</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>Endosulfan; Thiodan</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>Endosulfan; Thiodan</td>
</tr>
<tr>
<td>Flonicamid</td>
<td>Aria</td>
</tr>
<tr>
<td>Horticultural oil</td>
<td></td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>Merit, Marathon, Discus, Allectus</td>
</tr>
<tr>
<td>Pymentrozine</td>
<td>Endeavor</td>
</tr>
<tr>
<td>Pyriproxyfen</td>
<td>Distance</td>
</tr>
<tr>
<td>Spiromesifen</td>
<td>Judo</td>
</tr>
<tr>
<td>Beauveria bassiana</td>
<td>BotaniGard</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Trade Name(s)</th>
<th>Active Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower, Fruit &amp; Vegetable Insect Killer (Ortho)</td>
<td>Acetamiprid</td>
</tr>
<tr>
<td>Bug-B-Gon Max Lawn &amp; Garden Insect Killer (Ortho)</td>
<td>Bifenthrin</td>
</tr>
<tr>
<td>Rose &amp; Flower Insect Killer (Bayer Advanced); Lawn &amp; Garden Insect Killer (Schultz)</td>
<td>Cyfluthrin</td>
</tr>
<tr>
<td>Triazicide Once &amp; Done Insect Killer (Spectracide)</td>
<td>Lambda-cyhalothrin</td>
</tr>
<tr>
<td>Indoor/Outdoor Broad Use Insecticide (Hi-Yield)</td>
<td>Permethrin</td>
</tr>
<tr>
<td>Yard &amp; Garden Insect Killer (Bonide); Rose &amp; Flower Insect Spray (Spectracide)</td>
<td>Pyrethrin</td>
</tr>
</tbody>
</table>
Mortality of Rugose Spiraling Whitefly

Days After Treatment

Percent Mortality

control
Marathon drench
Safari drench
Arena drench
Flagship drench
TriStar foliar
Kontos foliar
Judo foliar
AzaSol foliar
Distance foliar
Complications in Management

• Drought conditions have affected the activity of the systemic insecticides – particularly imidacloprid
• Need to follow recommended methods of application
• Use rates – sometimes below recommended rates
Complications in Management

- Rugose spiraling whitefly
  - Less “washing” effect of rain
  - Large host range
  - Excessive wax production – can impede contact between insecticide and insect
Specific Management Tips

Ficus Whitefly

• Scout – immature stages; do not rely on the presence of adults

• Foliar insecticides – only when live whitefly are present

• Soil or trunk insecticides – can be preventative; provide long term control
Specific Management Tips

Rugose Spiraling Whitefly

• Scout – spiraling eggs on undersides of leaves; easy to see
Specific Management Tips

Rugose Spiraling Whitefly

• Foliar insecticides – contact may be difficult due to heavy wax production

• Soil or trunk insecticides – use for heavily infested trees; can use for nearby plants or if eggs are present
Specific Management Tips
Rugose Spiraling Whitefly

• Whatever control method you use, there will be impact on natural enemies
• Insecticide use
  – Use appropriate insecticides and methods of application

• DO EVERYTHING POSSIBLE TO CONSERVE NATURAL ENEMIES
  – Necessary for long term control
**Remember** - the below symptoms do not stop or go away immediately even if you are controlling the pest

- Leaf drop
- Sooty mold
- White, waxy flock

Do not apply additional insecticide unless you are sure it is necessary
Test Your Whitefly Expertise
Pest, Predator, Parasite ???

Predator
Parasite
Parasitized
Predators
Pest, Predator, Parasite ???

Pest
(pupal skins)

Parasite

Parasite

Parasite
Pest, Predator, Parasite ???

Parasite

Predator

Predator

Pest

Lacewing

Beetle

Live whitefly
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