Catharine Mannion
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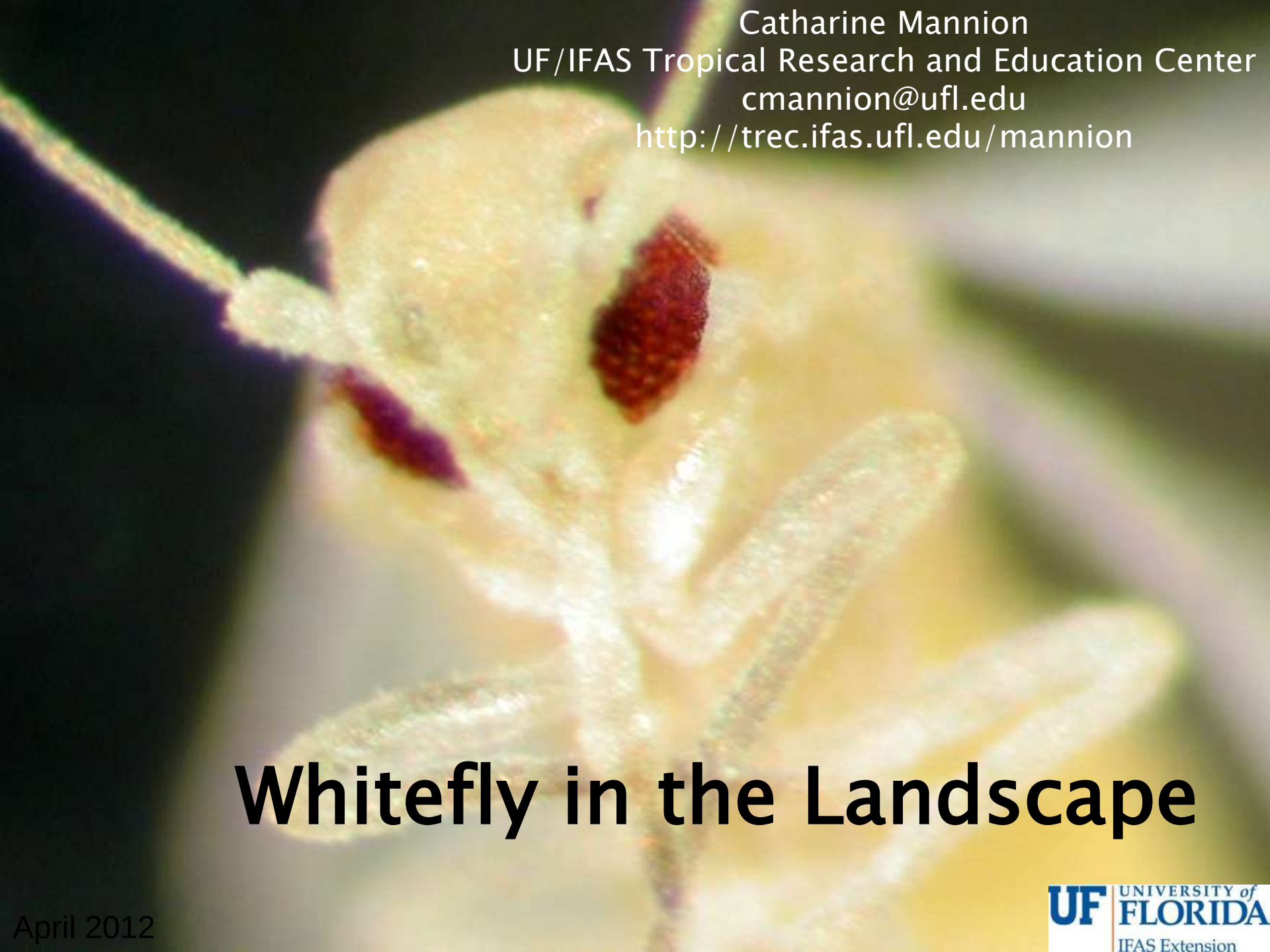


Whitefly in the Landscape

April 2012

UF UNIVERSITY of FLORIDA
IFAS Extension

Whiteflies

- Approximately 75 species in Florida
- Common pests of many ornamental plants
- Narrow and wide host range depending on the species

Photos: H. Glenn, UF/IFAS

Adult Whiteflies

- “Moth-like” with white wings.
- Piercing-sucking mouthparts
- Excrete honeydew
- Some capable of transmitting viruses

Photo: H. Glenn, UF/IFAS

Whitefly Nymphs

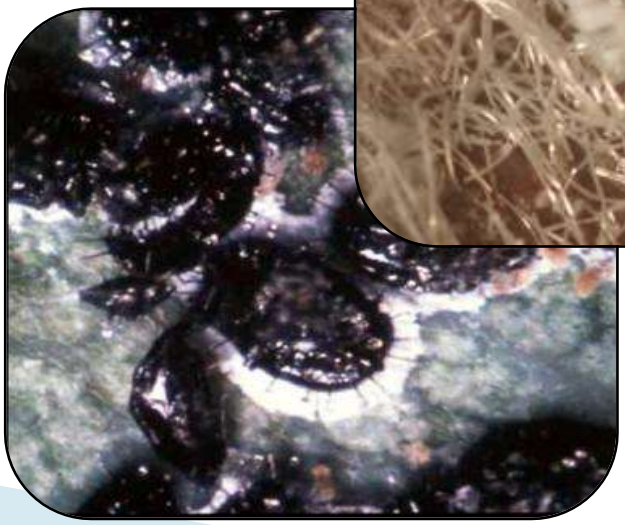
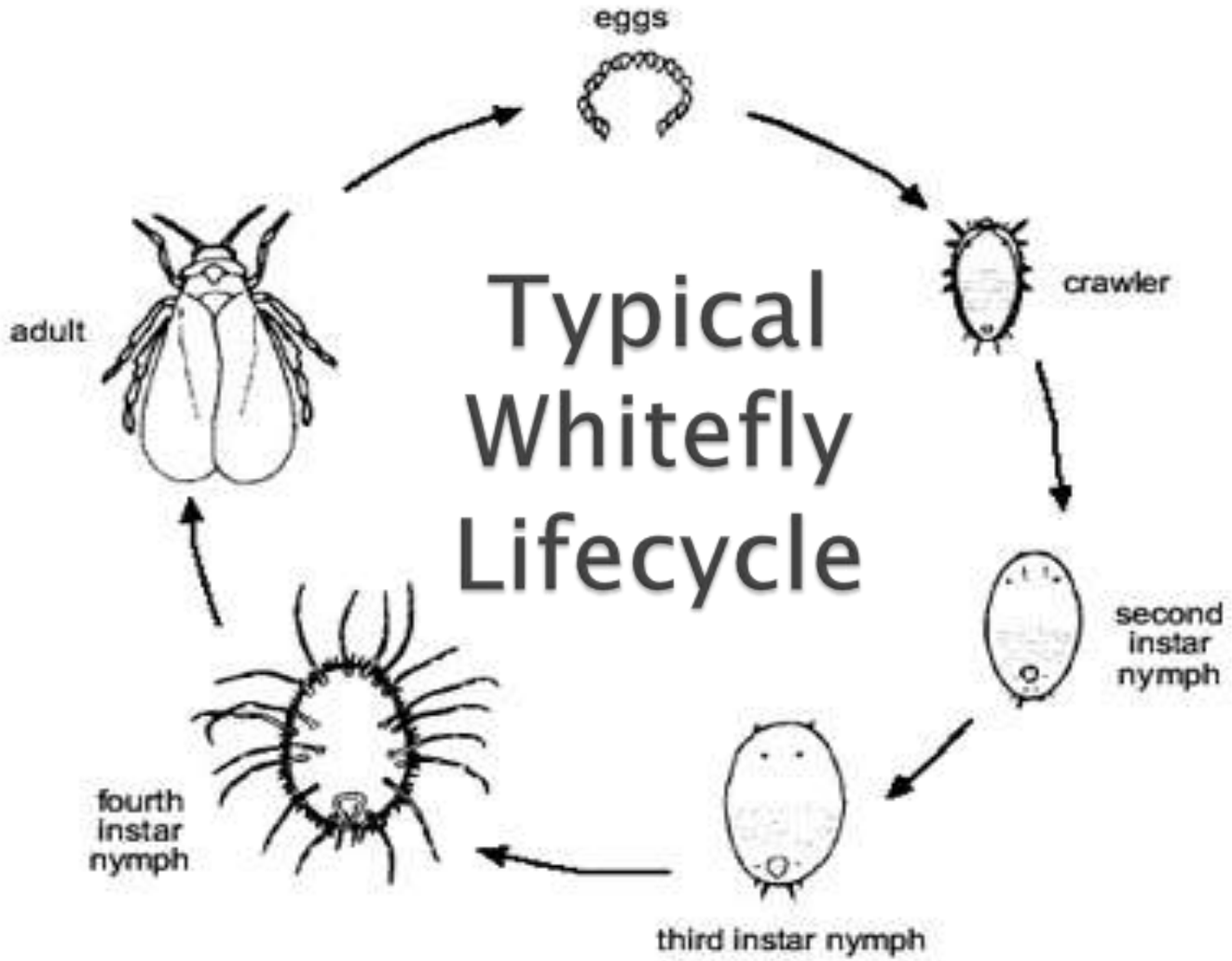


Photo: H. Glenn, UF/IFAS

Typical Whitefly Lifecycle



Courtesy University of California: Statewide IPM Program, Agriculture and Natural Resources

Recent Whiteflies

Rugose Spiraling Whitefly

Bondar's Nesting Whitefly

Ficus Whitefly

Photo: H. Glenn, UF/IFAS

Other Whiteflies

- Keys whitefly (*Aleurodicus dispersus*)
- Cardin's whitefly (*Metalurodicus cardini*)
- Giant whitefly (*Aleurodicus dugesii*)

Photo: H. Glenn, UF/IFAS

Bondar's Nesting Whitefly

Paraleyrodes bondari

2011

- First detected in Dec 2011, Lee County
- New US continental record
- Three other species known in Florida
- Not known as economic pest

Photo: H. Glenn, UF/IFAS

Bondar's Nesting Whitefly

Paraleyrodes bondari

2011

- Currently in:
  - Miami-Dade, Broward, Palm Beach, Lee and Collier Counties
- Hosts
  - Ficus (Banyan, weeping fig, Indian laurel)
  - Avocado, canary laurel, guava, lemon, orange, sapote, surinam cherry, sweetsop, Chinese hibiscus, tilo (stinkwood),
  - Palms (Coconut, *Chamaedorea)*

Photo: H. Glenn, UF/IFAS

Bondar's Nesting Whitefly

Nymphs

Photo: H. Glenn, UF/IFAS

Whitefly “nest”

Photo: H. Glenn, UF/IFAS

Natural Enemies

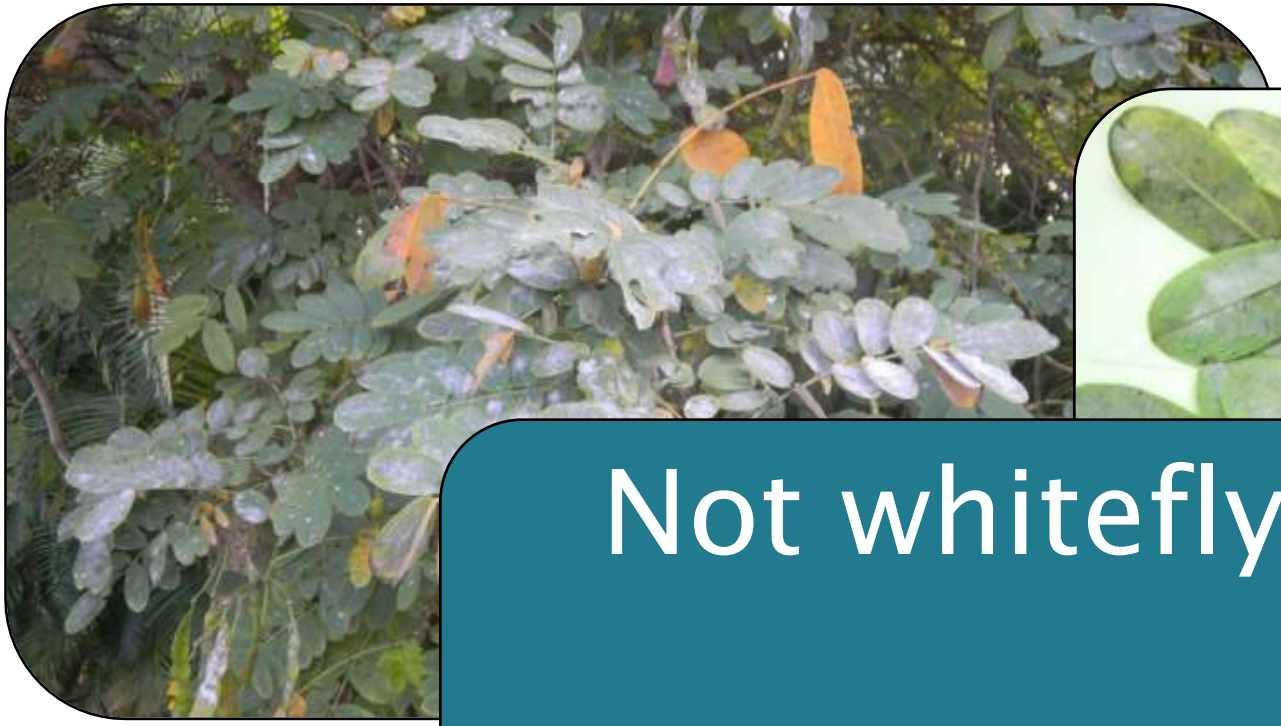
- Beetle predator, *Nephaspis oculatus*

- Wasp parasitoid, *Encarsia variegata*

Photo: H. Glenn, UF/IFAS

Bondar's Nesting Whitefly

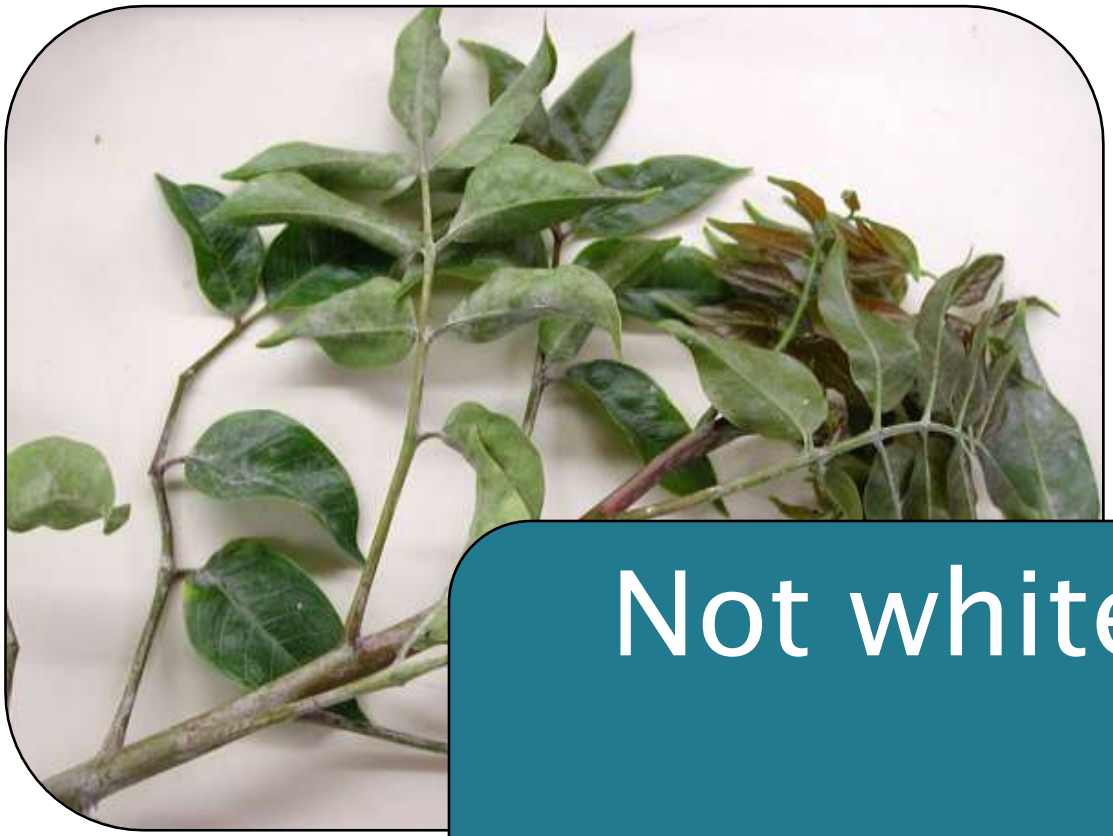
- White wax
- Honeydew
- Sooty mold



Not whitefly

Powdery Mildew

Photo: H. Glenn, UF/IFAS



Not whitefly

Powdery Mildew

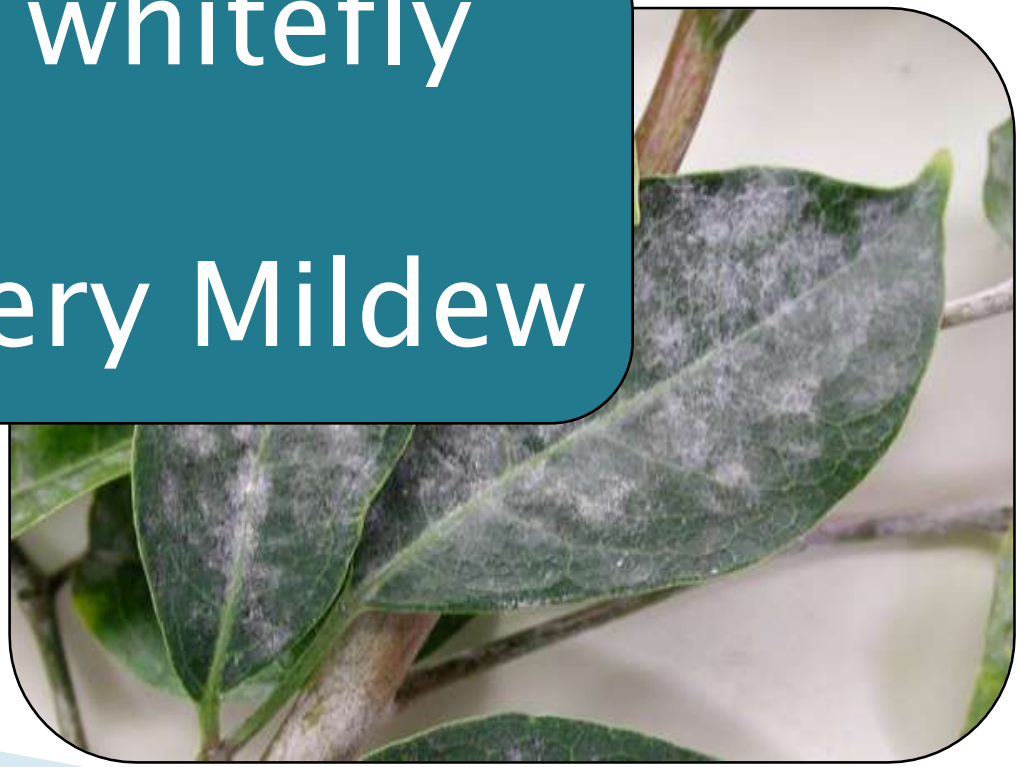


Photo: H. Glenn, UF/IFAS

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

Photo: H. Glenn, UF/IFAS

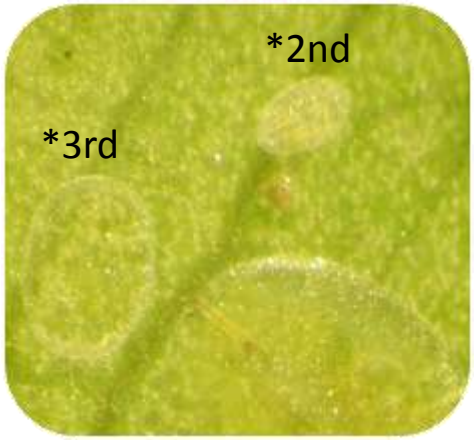
Ficus Whitefly Life Cycle

Constant temperature (80º F)

Adult Whitefly
(2-4 days)

Eggs
(10 days)

4th instar – puparia
(5.8 days)



2nd–3rd instars – nymphs
2nd instar – 3.7 days; 3rd instar – 3. 3 days

1st instar – crawler
(4.2 days)

Photo: H. Glenn, UF/IFAS

Photo: H. Glenn, UF/IFAS

Ficus Whitefly – Damage

- Causes leaf yellowing
- Leaf drop (severe)
- Branch dieback (highly variable)

Photo: H. Glenn, UF/IFAS

Photo: H. Glenn, and C. Mannion, UF/IFAS

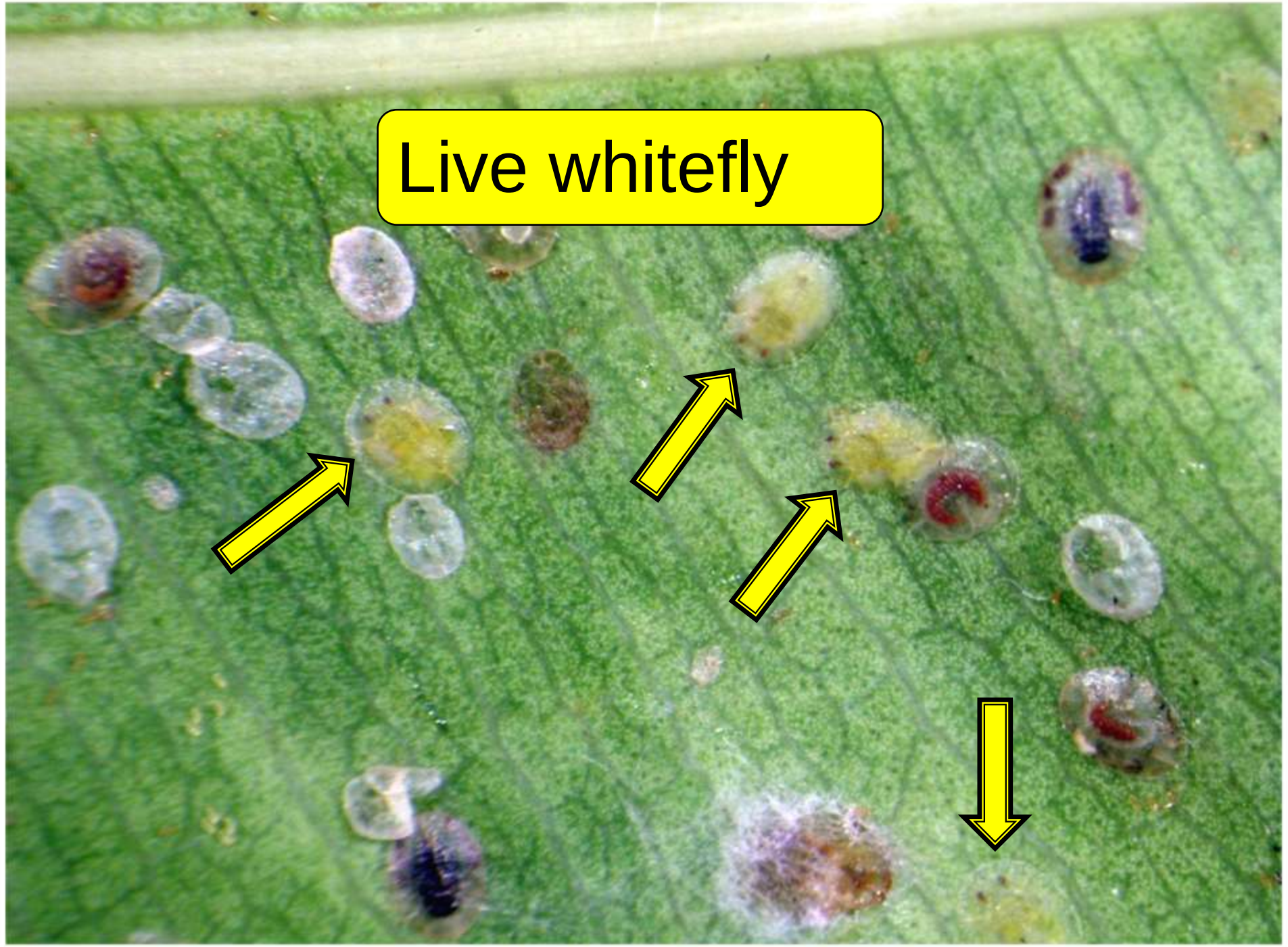
Natural Enemies Observed in the Landscape

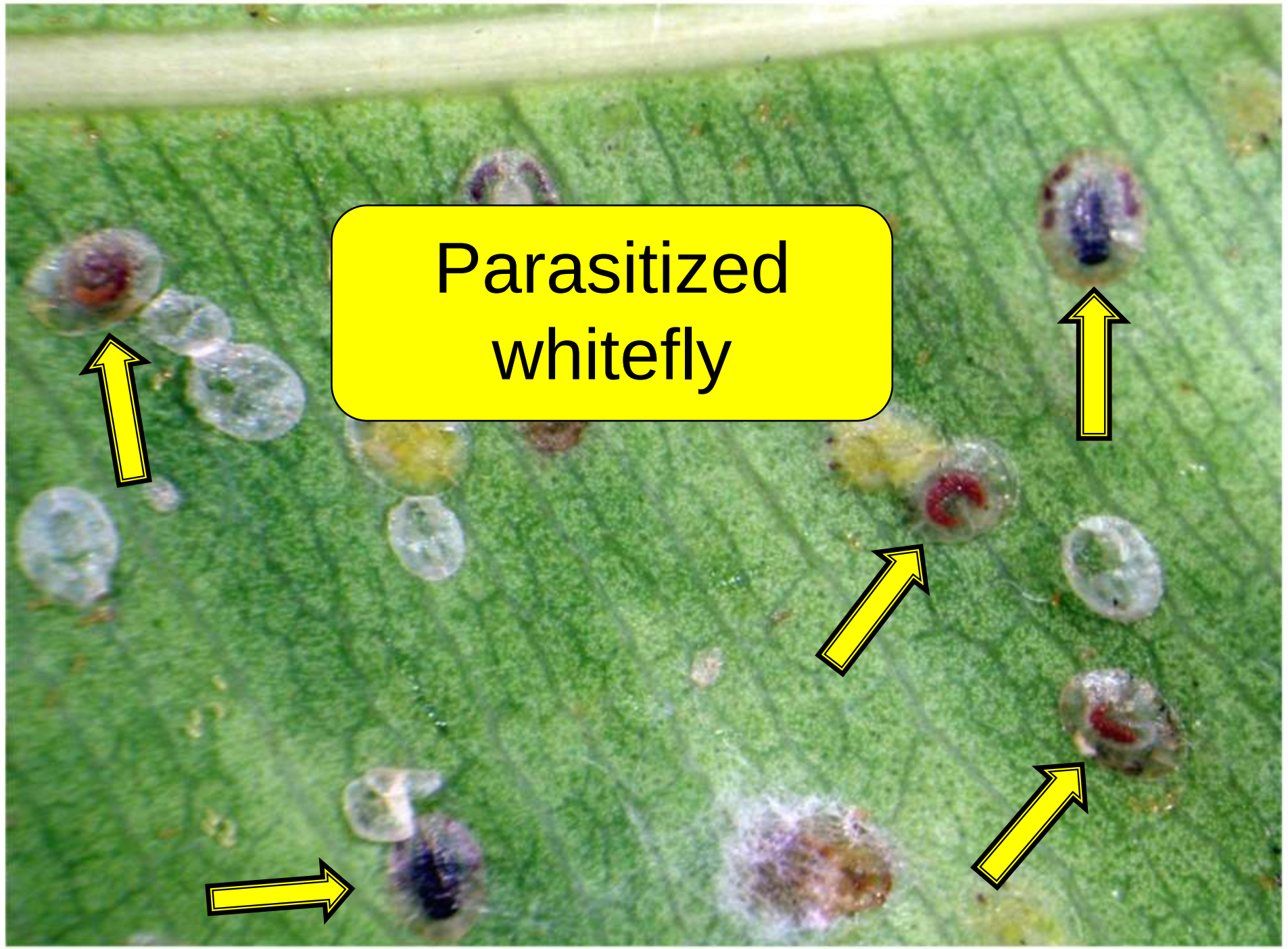
- *Harmonia axyridis*
- *Olla v-nigrum*
- *Exochomus childreni*
- *Chilocorus nigritis*
- *Curinus coeruleus*

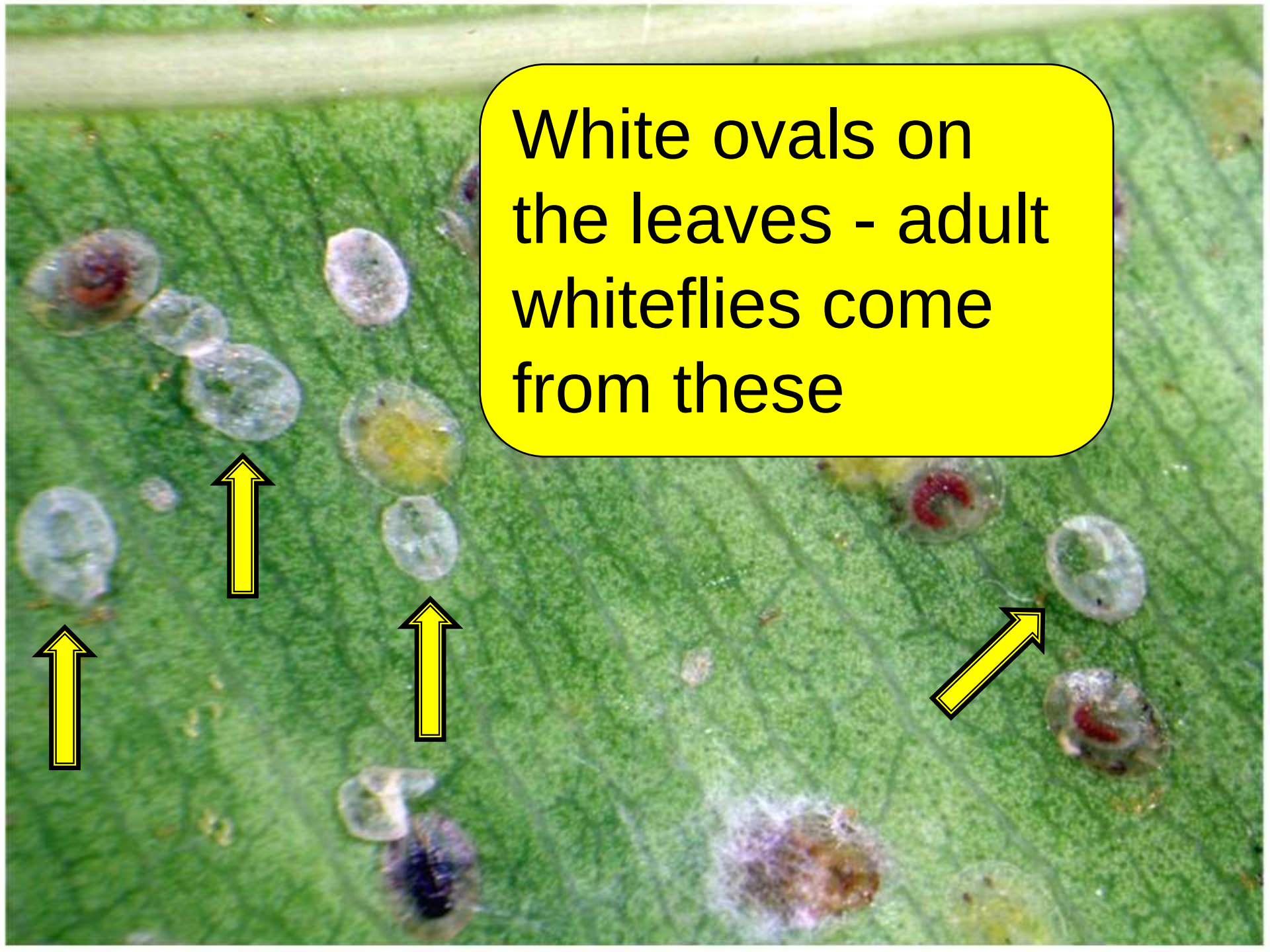
- *Encarsia protransvena*

- *Amitus bennetti*

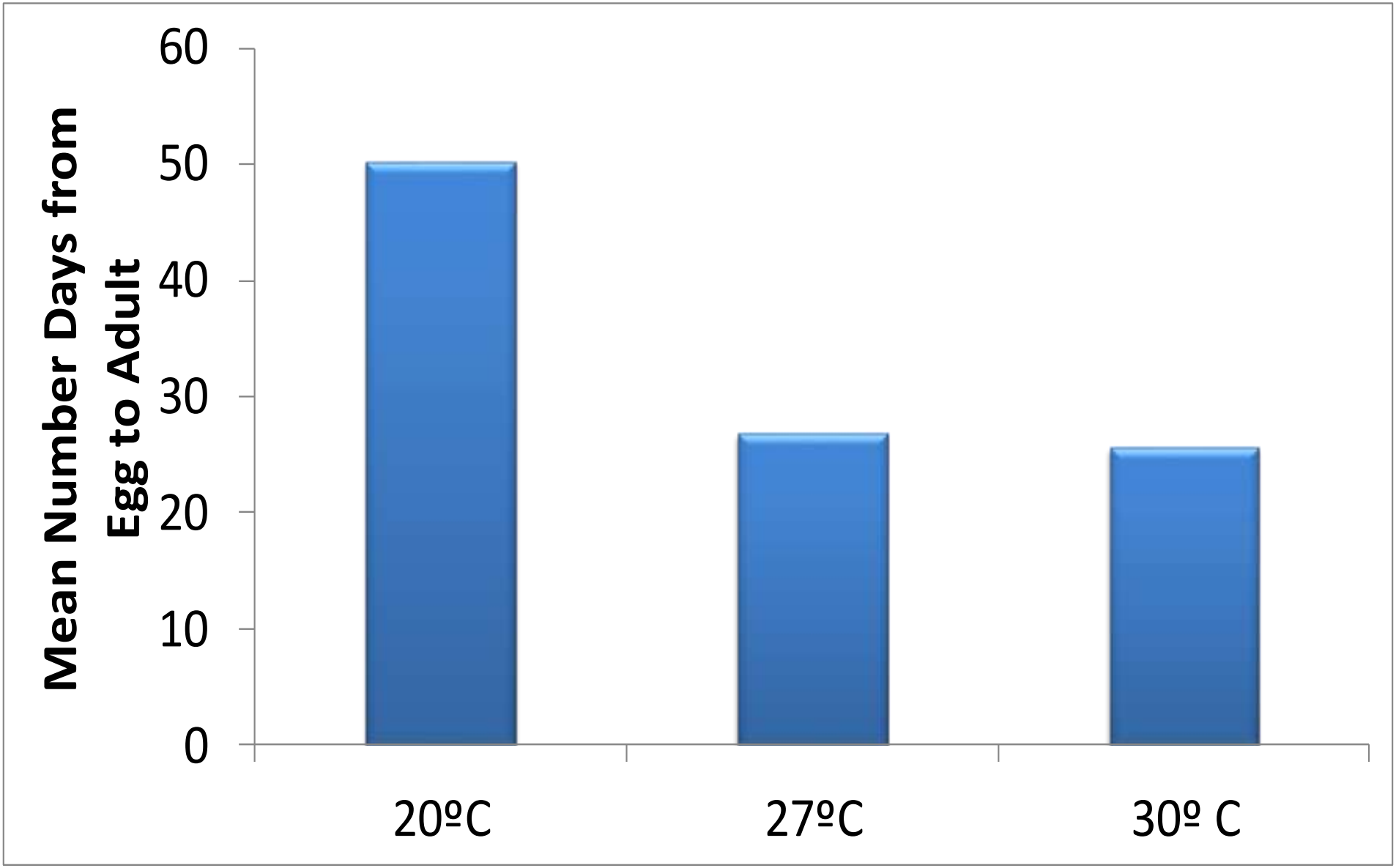
Photo: H. Glenn, UF/IFAS


Live whitefly

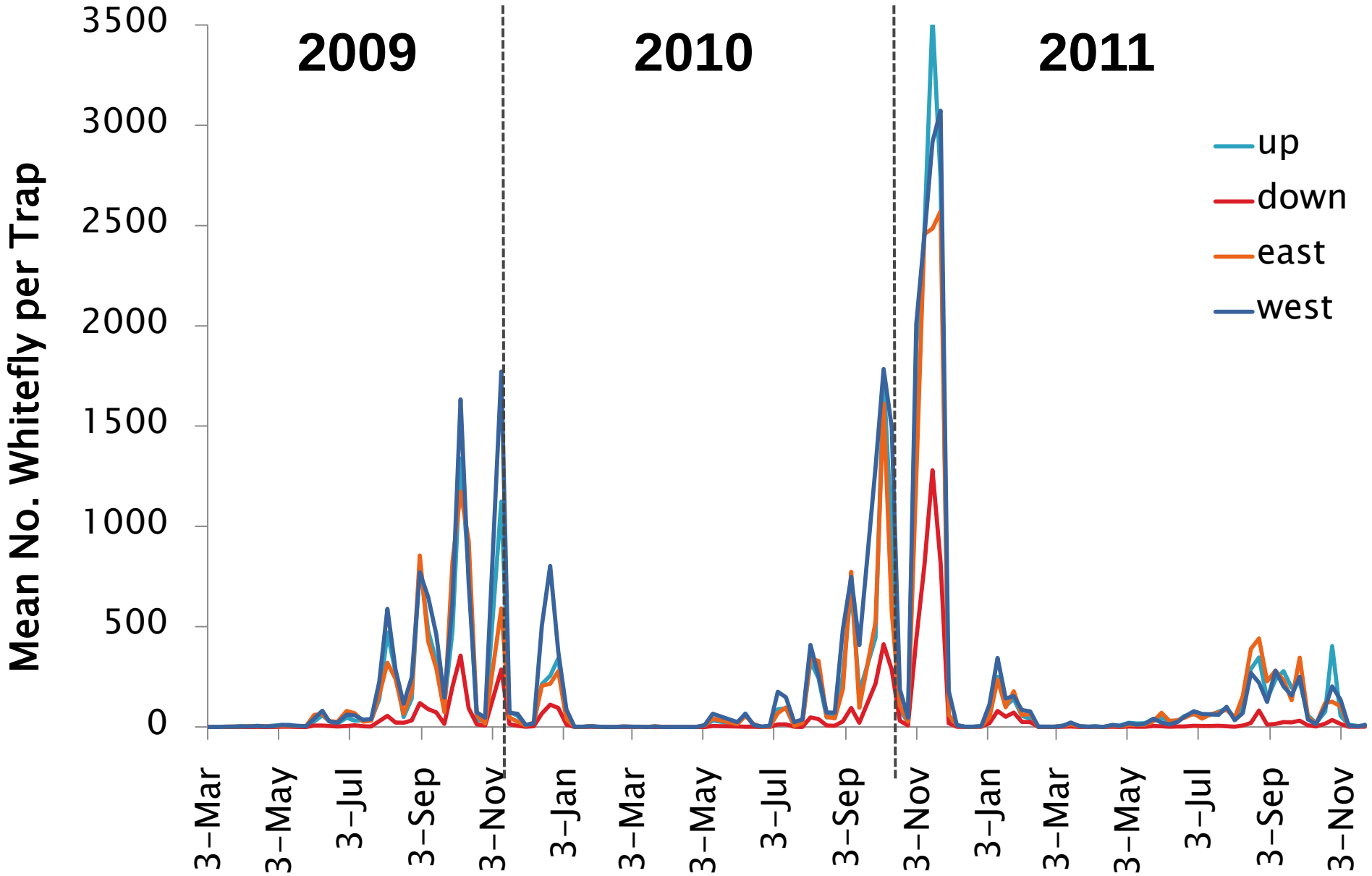

Parasitized whitefly


White ovals on the leaves - adult whiteflies come from these

Effect of Temperature on Length of Life Cycle



Ficus Whitefly – Trapping Adults



Continued Ficus Decline

- Breakdown of pesticides – ???
  - Are there whiteflies
  - Resistance ?
  - Viruses/bacteria/toxins
  - Other factors
    - Low use rates
    - Drought

Continued Ficus Decline

- Cumulative stress
  - Poor planting, age, drought, whiteflies and other insects, disease
- Importance of nutrition
  - Fertilization
    - (ex: 2 lb N per 1000 sq ft)
  - Micronutrients
  - Disease management

Continued Ficus Decline

- Samples with leaf yellowing, defoliation and dieback
  - Isolated a fungus from all of them
    - *Phomopsis* and *Diaporthe*
  - Common endophytes
  - Previously shown to cause dieback of Ficus spp.
  - Likely causing dieback due to stress

Rugose Spiraling Whitefly

Aleurodicus rugioperculatus

- First found in Miami on *Bursera simaruba* Spring 2009
- Adult is relatively large and docile

Photo: H. Glenn, UF/IFAS

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

White, waxy substance

Photo: H. Glenn, UF/IFAS

Honeydew and sooty mold

Photos: K. Gabel, Monroe County Extension and H. Glenn, UF/IFAS

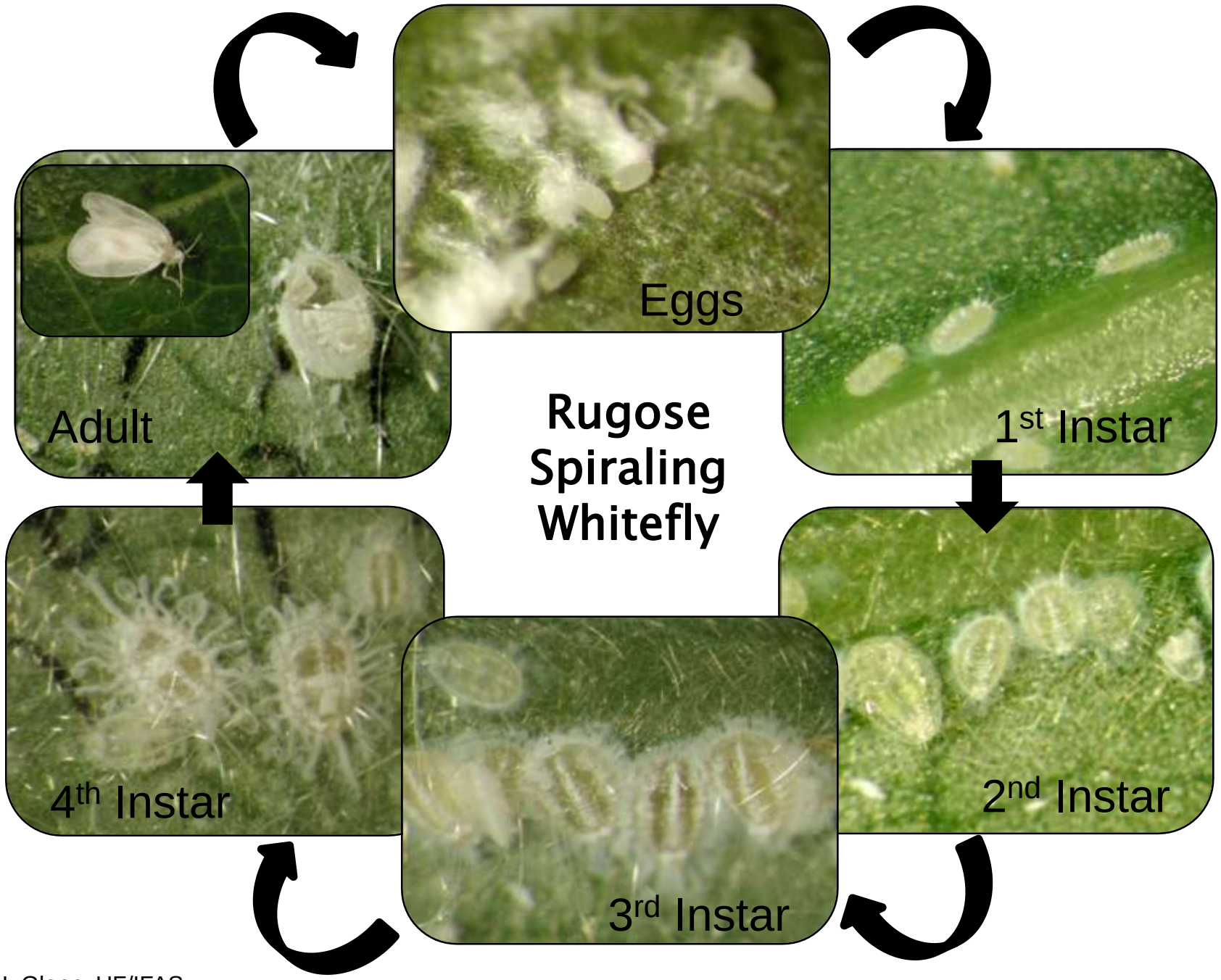


Photo: H. Glenn, UF/IFAS

Rugose Spiraling Whitefly Spiraling Eggs

Photo: H. Glenn, UF/IFAS

Parasites and Predators

Photo: H. Glenn, UF/IFAS

Nephaspis oculata

- Coccinellid predator
- Feeds on many whitefly species
- Well established in Florida for > 25 years
- Been introduced to other places for control of spiraling whitefly
- Currently found feeding on Rugose spiraling and Bondar's nesting whiteflies

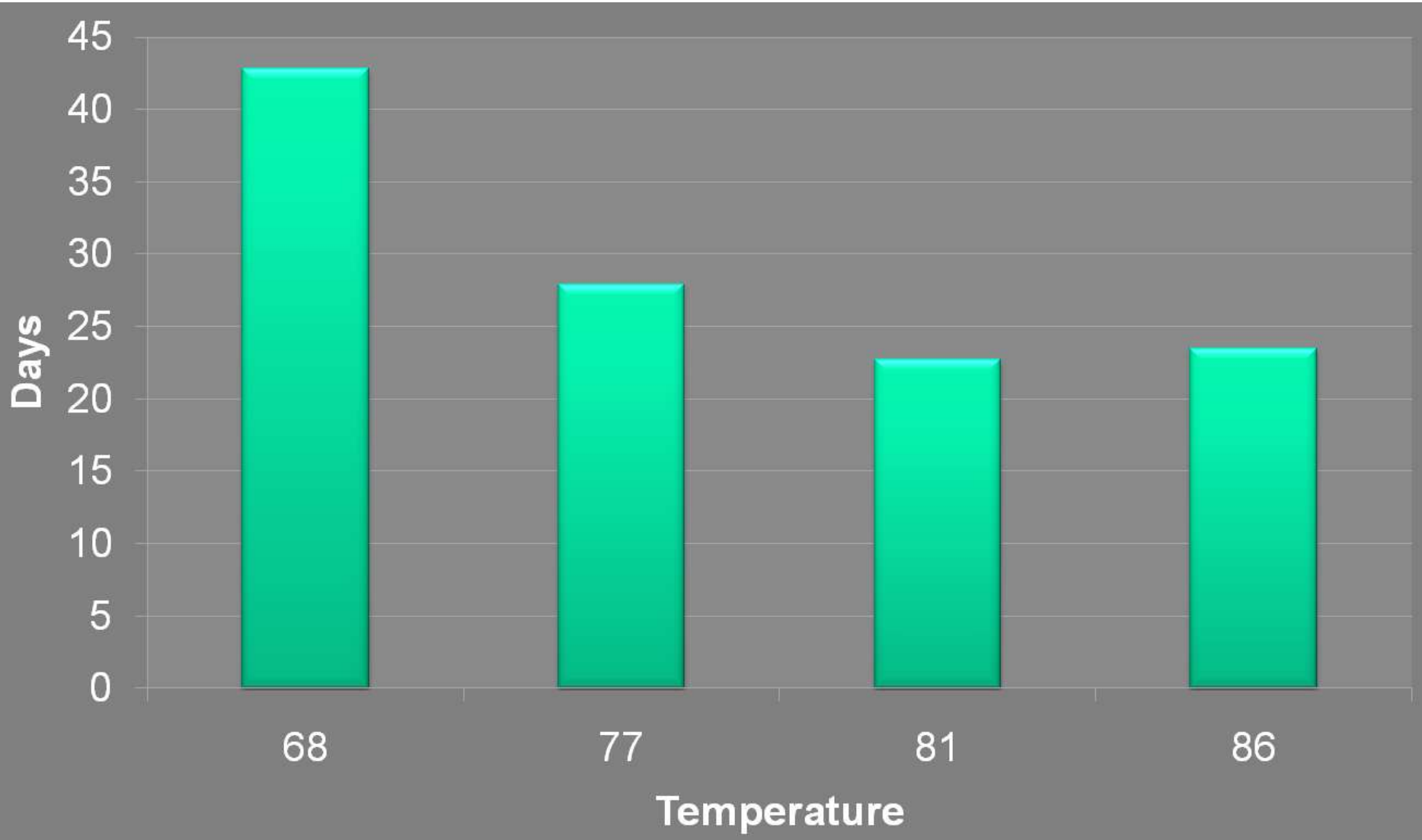
Photo: H. Glenn, UF/IFAS

Delphastus species

- Another common predator
- Feeds on many whiteflies
- Commercially available
- NOT commonly seen feeding on Rugose spiraling whitefly indicating it may not be a suitable natural enemy

Photos: BugGuid.net

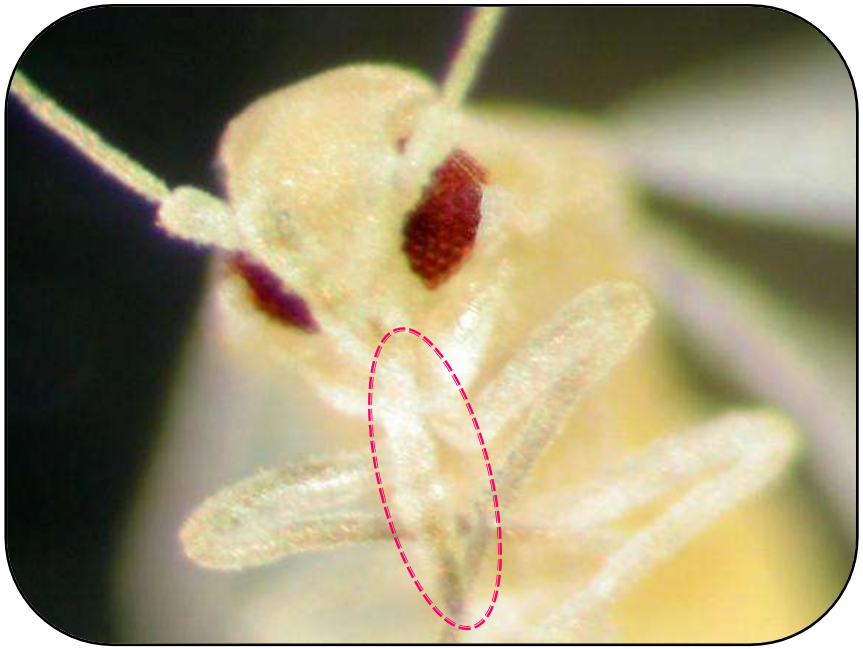
Effect of Temperature on the Life Cycle of the Rugose Spiraling Whitefly



Whitefly Management

Managing Insects with Piercing/Sucking Mouthparts

- Can be difficult to control
- Often have short life cycles
- Often not initially noticed



- Waxy secretions/coverings that provide protection
- Production of honey dew

Photo: C. Mannion, UF/IFAS

Biological Control

- Important and necessary component for long-term control
- Potential natural enemies
  - For each whitefly there are beetle predators and wasp parasitoids currently feeding on the whitefly
  - Potential of predators/parasitoids for closely related whiteflies

MUST MATCH THE CORRECT NATURAL ENEMY WITH THE APPROPRIATE PEST

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
  - 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 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

Insecticide Selection
Foliar Application
Professional Use (Landscape and Nursery)

Abamectin (Avid)
Acetamiprid (TriStar)
Azadirachtin (Azatin XL)
Bifenthrin (Talstar)
Buprofezin, (Talus)
Clothianidin (Arena)
Endosulfan (Endosulfan; Thiodan)
Flonicamid (Aria)
Horticultural oil
Imidacloprid (Merit, Marathon, Discus, Allectus)
Pymentrozine (Endeavor)
Pyriproxyfen (Distance)
Spiromesifen (Judo)

Beauveria bassiana (BotaniGard)

Neonicotinoids Insecticides

Use of these insecticides has grown considerably since the forerunner of the group (imidacloprid) was first introduced in the early 1990's

- Acetamiprid
- Clothianidin
- Dinotefuran
- Imidacloprid
- Thiamethoxam
- Nitempyram
- Thiacloprid

Systemic Insecticides (Neonicotinoids)

Active Ingredient	Trade Names Professional Use	Trade Names Over-the-Counter
Acetamiprid	TriStar** (no soil application)	Ortho Max Flower, Fruit and Vegetable Insect Killer; Ortho Rose Pride Insect Killer
Clothianadin	Arena, Aloft	
Dinotefuran	Safari**, Zylam	Green Light Tree & Shrub Insect Control with Safari
Imidacloprid	Merit, Marathon, Coretect, Discus, Allectus, Bandit, several generic labels	Bayer Advanced Rose and Flower Insect Killer; Bayer Advanced Tree & Shrub Protect & Feed; Bonide Systematic Insect Control; Ferti-Lome Tree and Shrub Systematic Insect Drench; Ortho Max Tree & Shrub Insect Control
Thiamethoxam	Flagship, Meridian	*;*labeled also for trunk treatment (basal trunk spray)

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

Whitefly Management

- Systemic insecticide – soil and trunk methods

Drench

Granular

Injection

Trunk spray

Photos: H. Glenn, UF/IFAS and J. Chamberlin, Valent, Inc.

Methods of Application for Neonicotinoids

- There are numerous options on how to apply the neonicotinoids;
- Take advantage of the different methods
- Take advantage of the different formulations
- Fit the method of application for the site
- The site and method needs to be on the label

What are the Variables Associated with Successful Applications?

Type of Plant

Growing Environment
(container, field, greenhouse, landscape, etc)

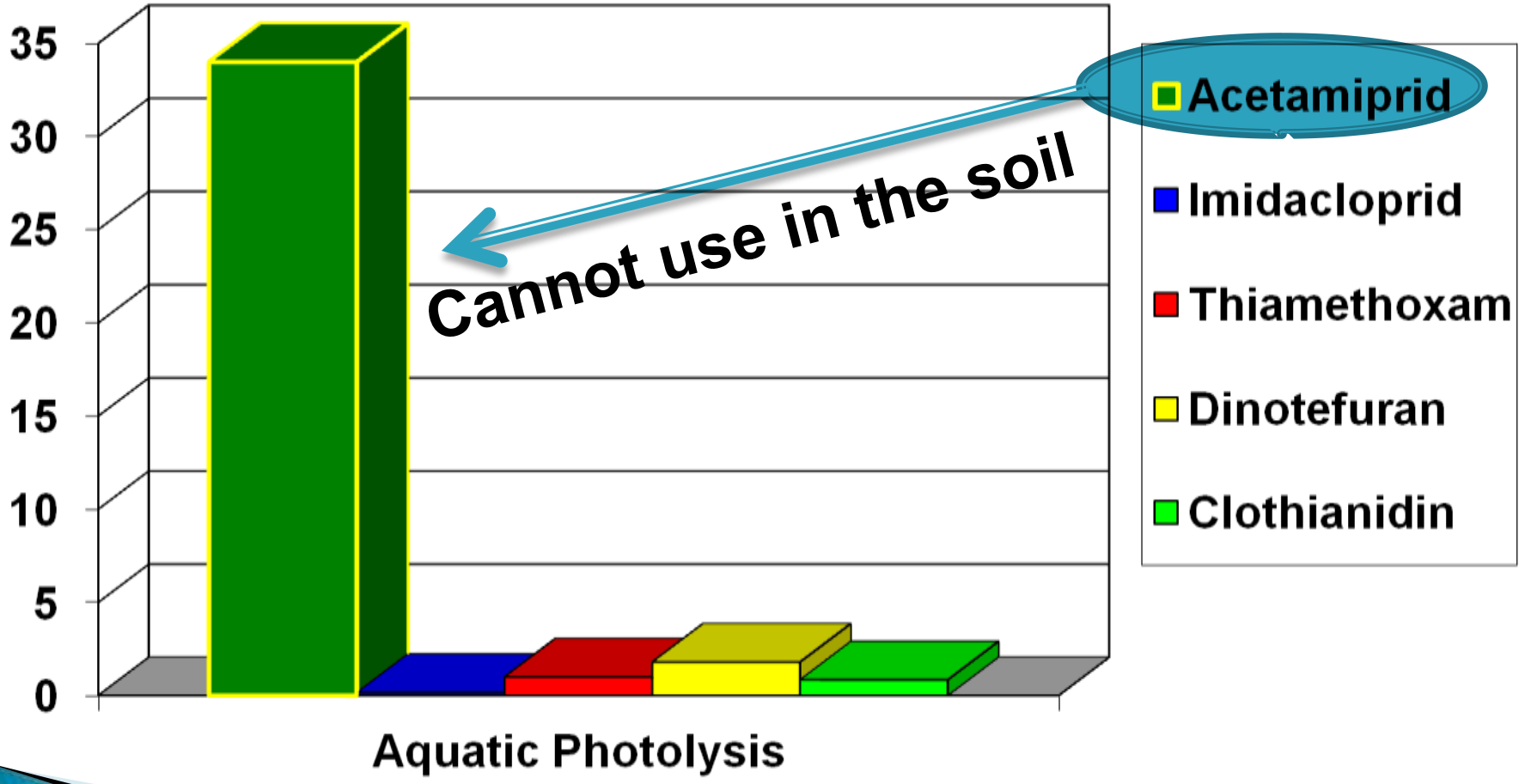
How fast will it work?

How long will it last?

Application Method
(foliar, drench broadcast, injection, etc)

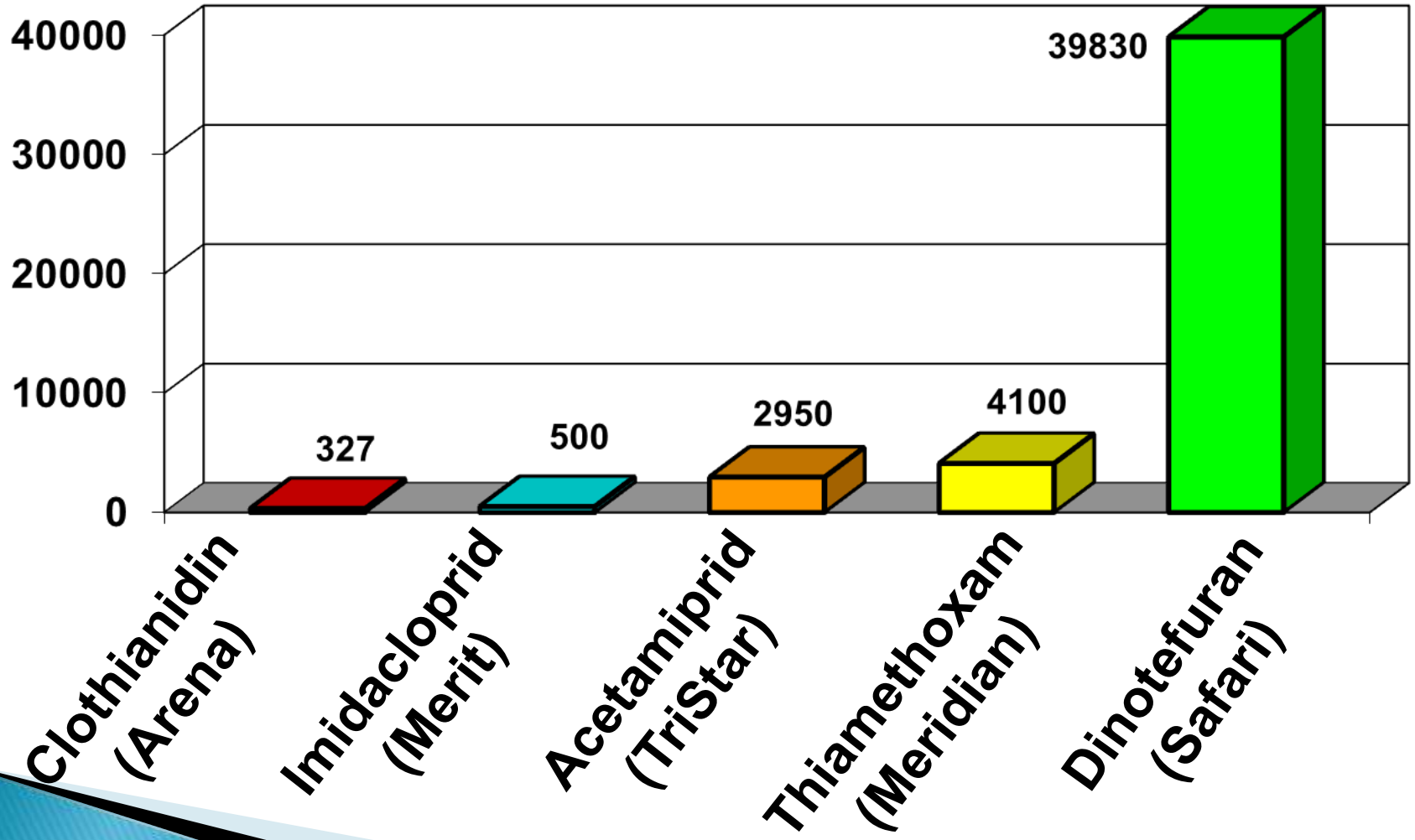
Ecological Considerations
(runoff, leaching, non-targets)

UV Stability of Neonicotinoids



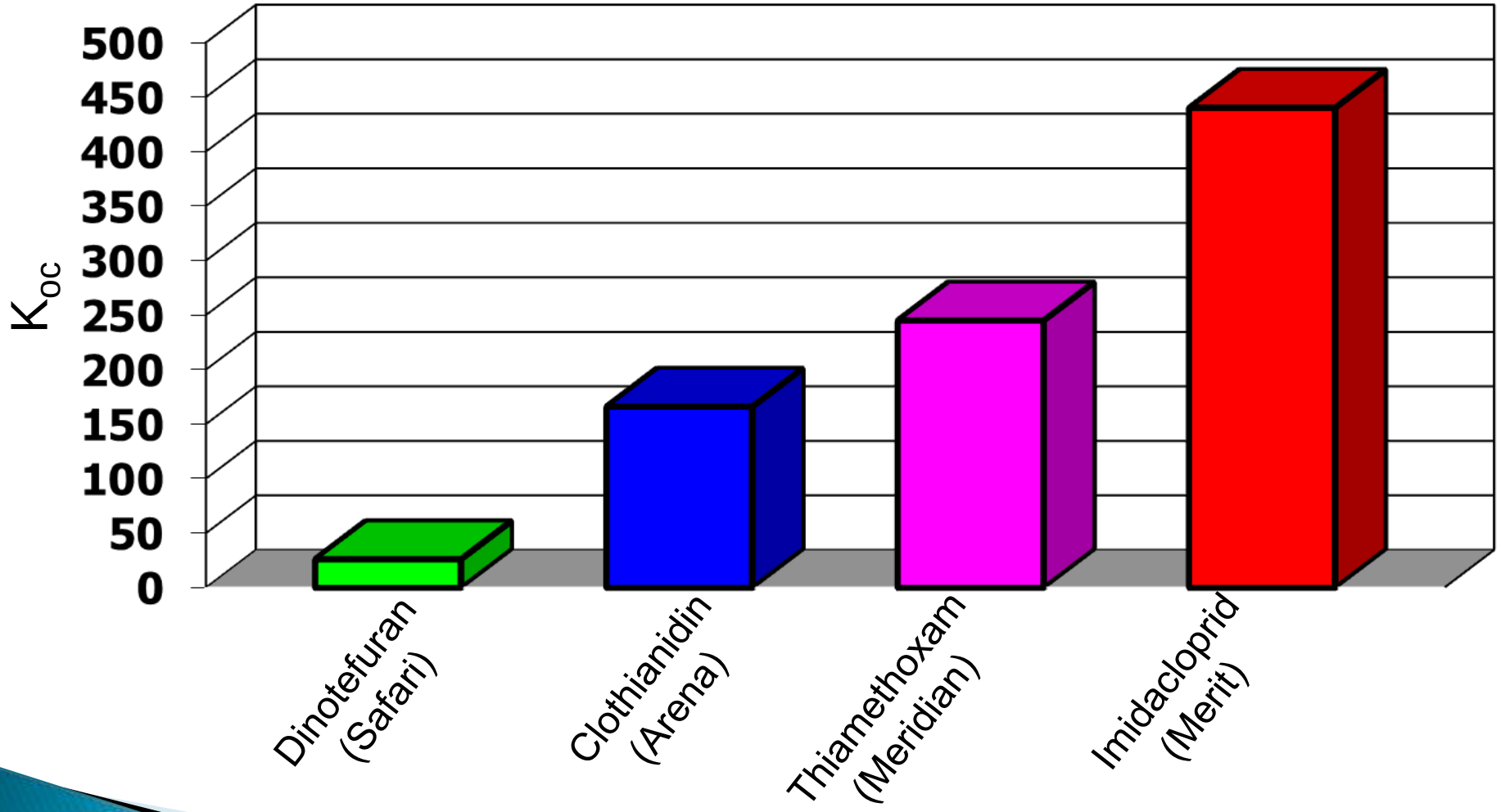
Slide Credit: Presentation by C. Sclar, Longwood Gardens

Relative Water Solubility of Neonicotinoids



Slide information courtesy C. Sclar. Longwood Gardens

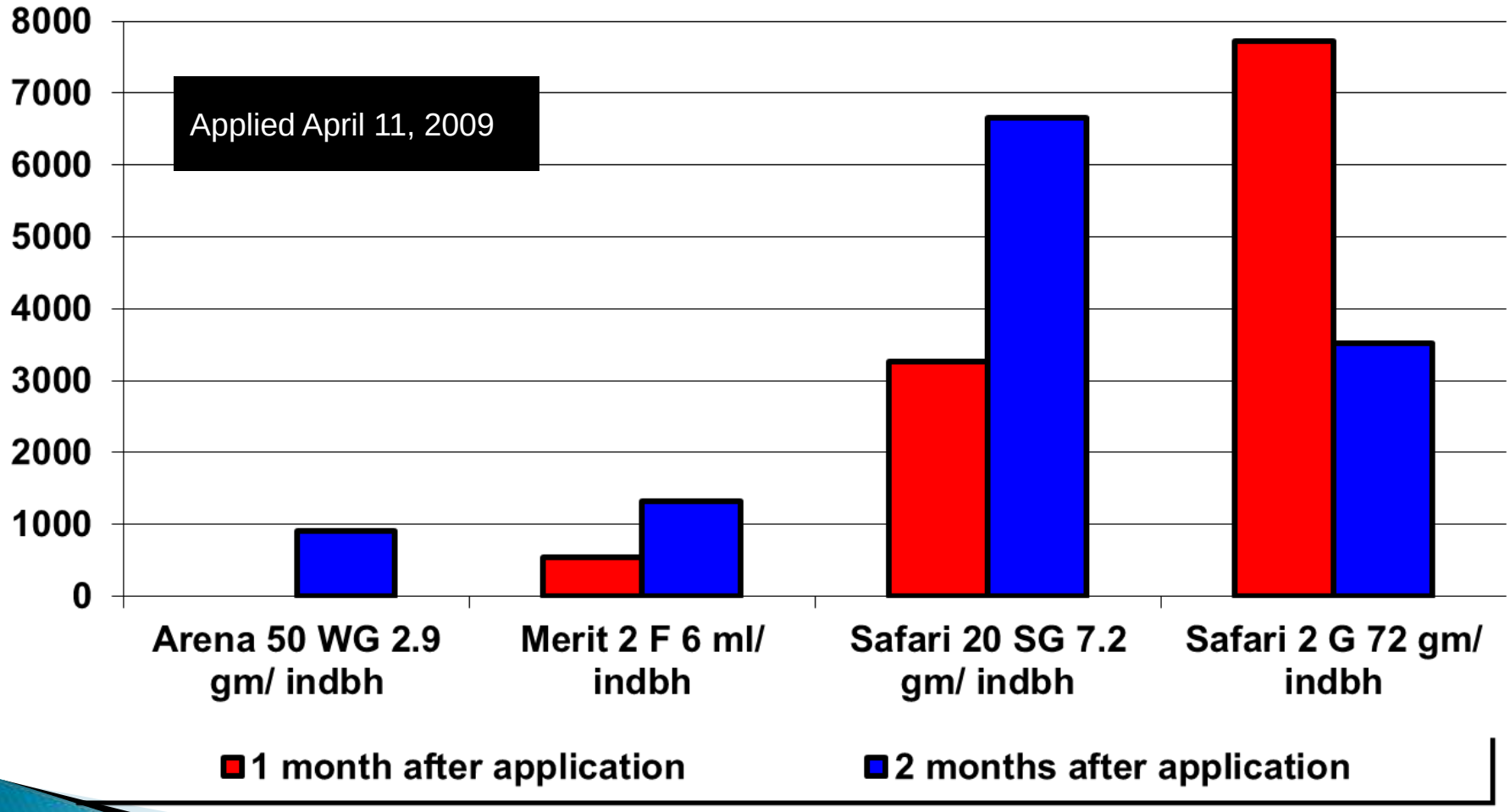
Soil Binding Potential (K_{oc})



Source: Shetlar, Turfgrass Trends, July 2007

Neonicotinoid Uptake

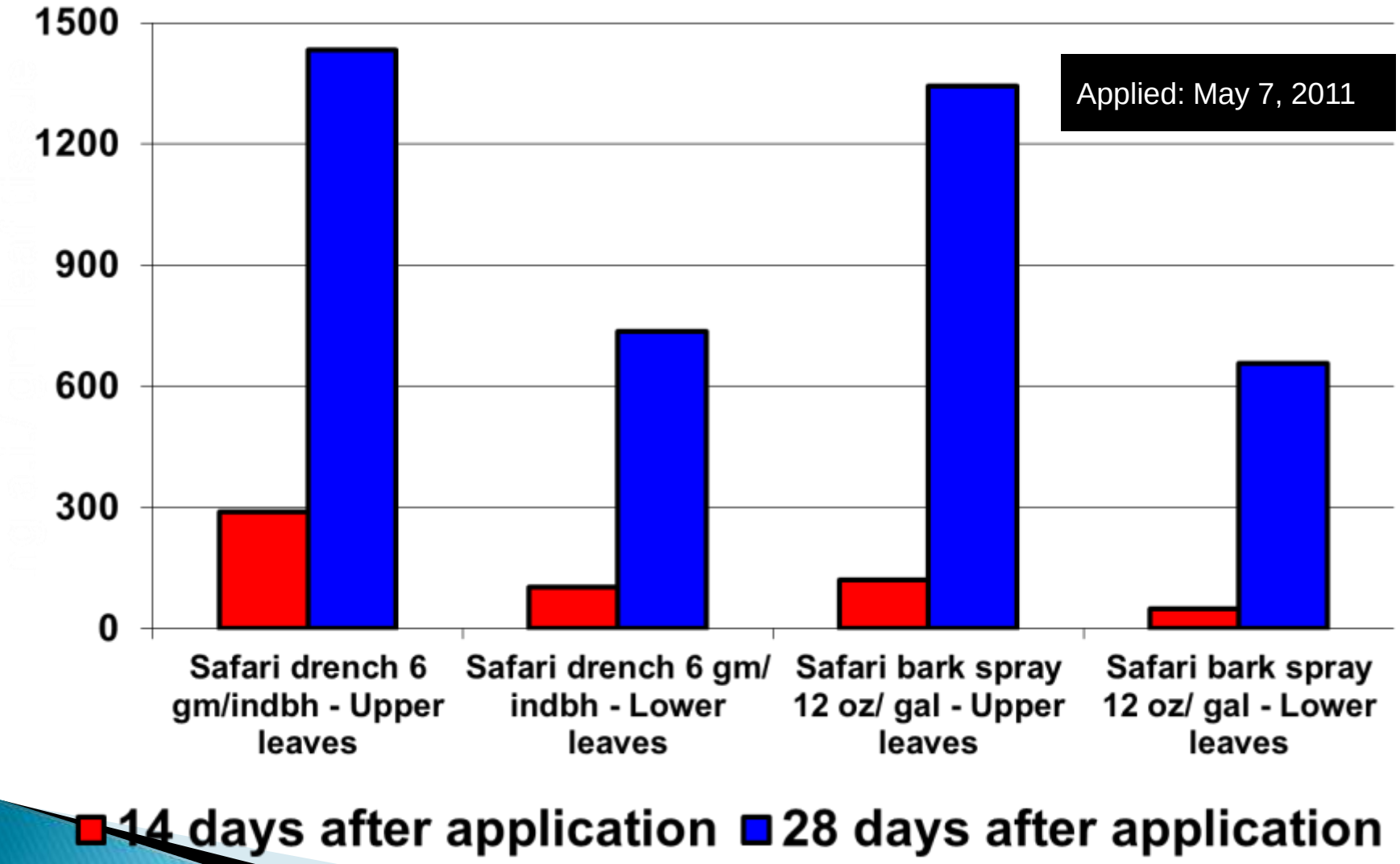
Royal Palm (25-30 ft) - Soil Application



Dr. A. D. Ali (Davey Tree), Walter Albeldano (Valent USA Corp).

Safari Uptake into Foliage

Mexican Fan Palm (13” dbh)



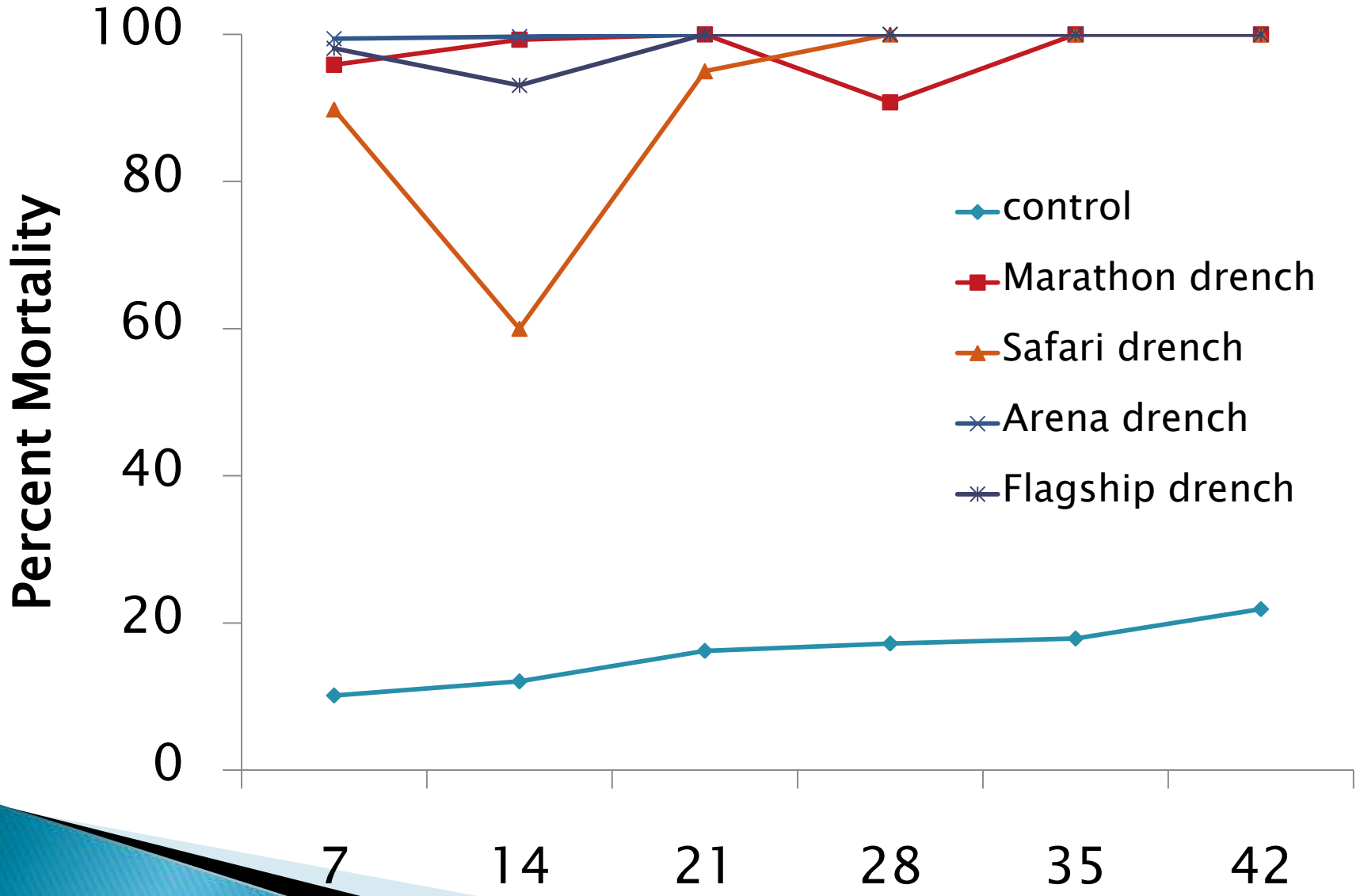
Buzz Uber (Crop Inspection Service), Walter Albeldano (Valent USA Corp).

Length of Control

- Important to monitor for active pest populations to determine time of re-treatment
- Neonicotinoids (applied as soil or trunk treatments)
  - Generally provide long-term control (6 – 12 months)
  - Consider a.i., use rate, formulations, environmental conditions

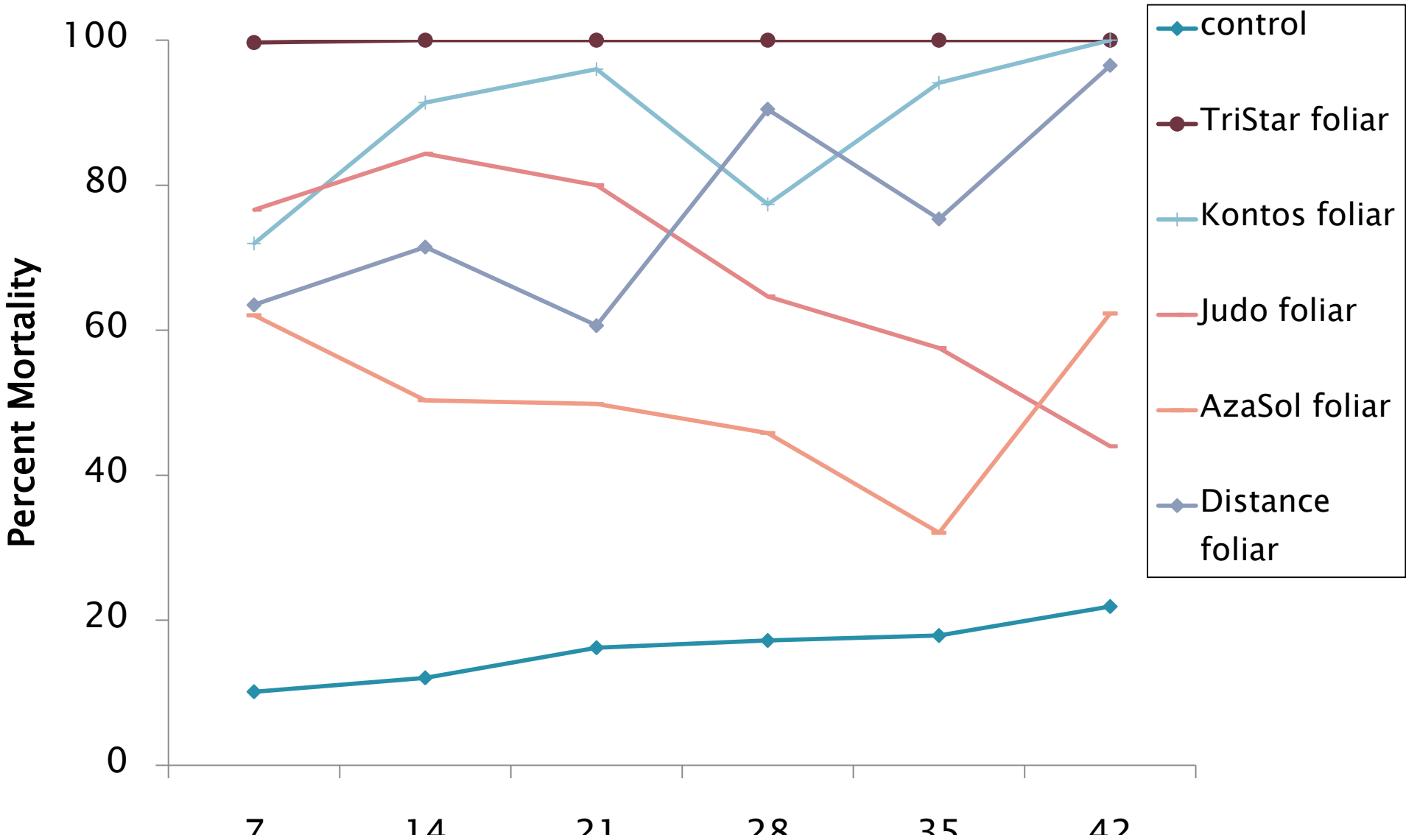
Drench Application with Neonicotinoids

(Spiraling whitefly on Gumbo Limbo)

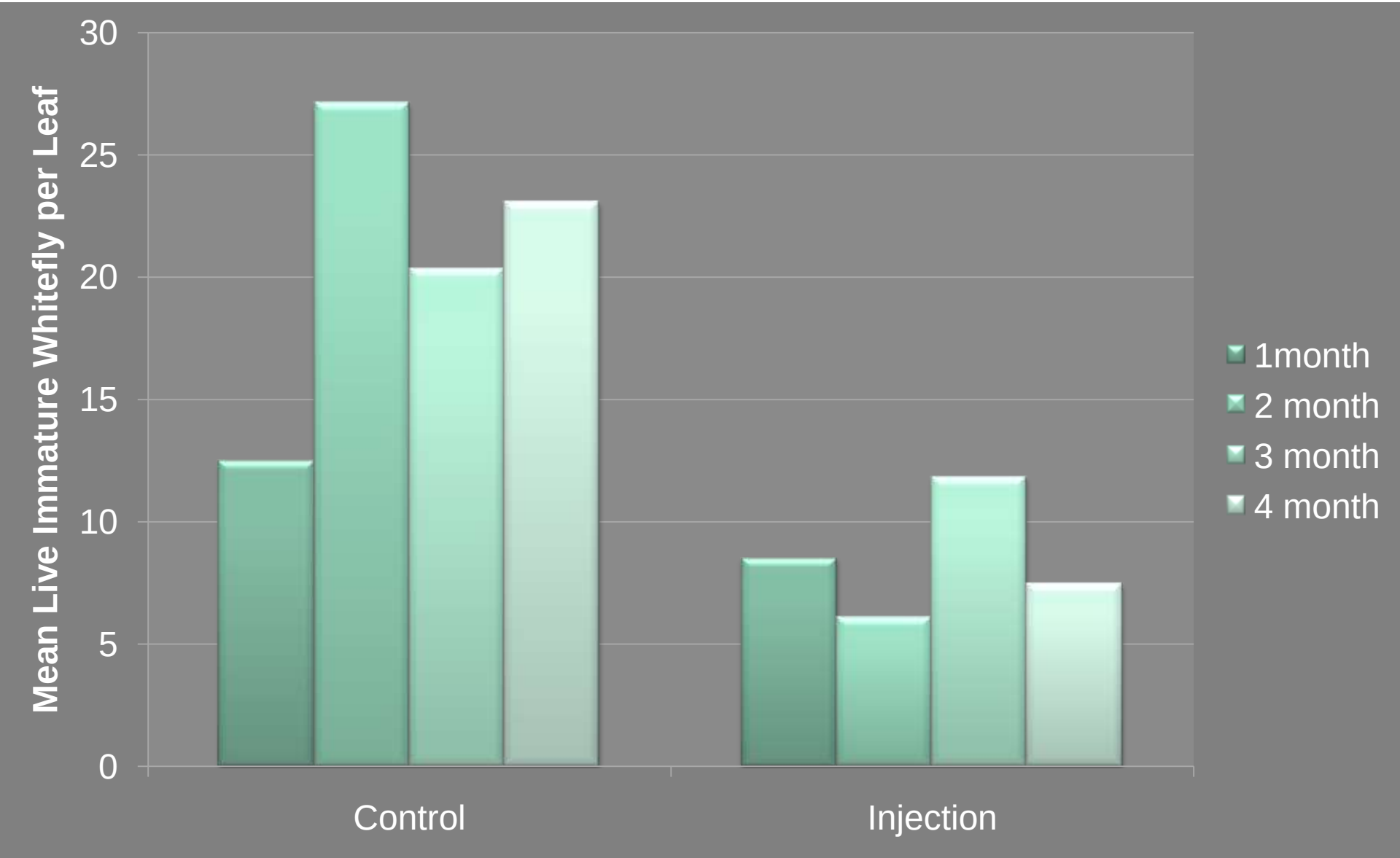


Foliar Insecticide Application

(Spiraling whitefly on Gumbo Limbo)

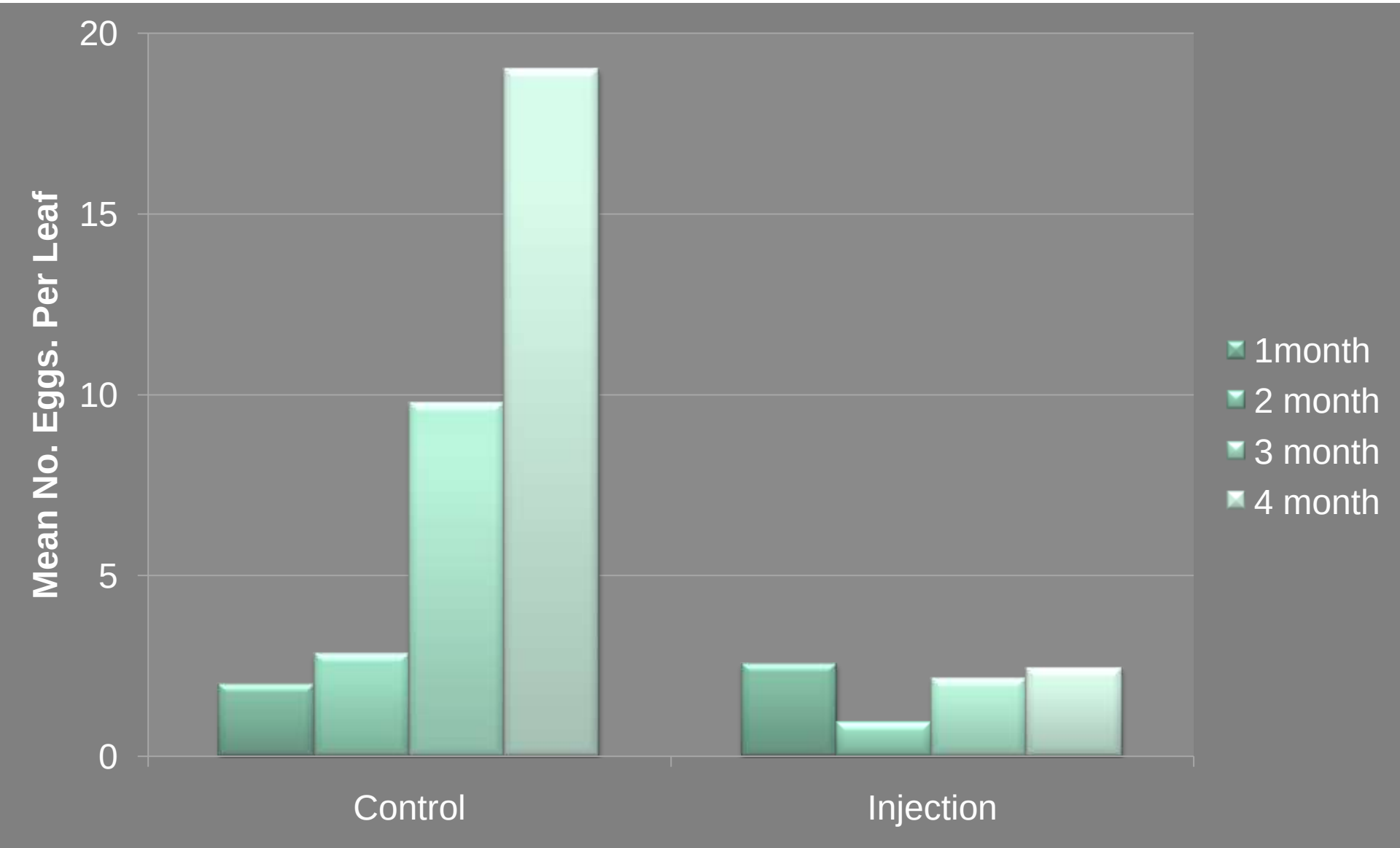


Tree Injection with Imidacloprid
(Spiraling whitefly on Gumbo Limbo)

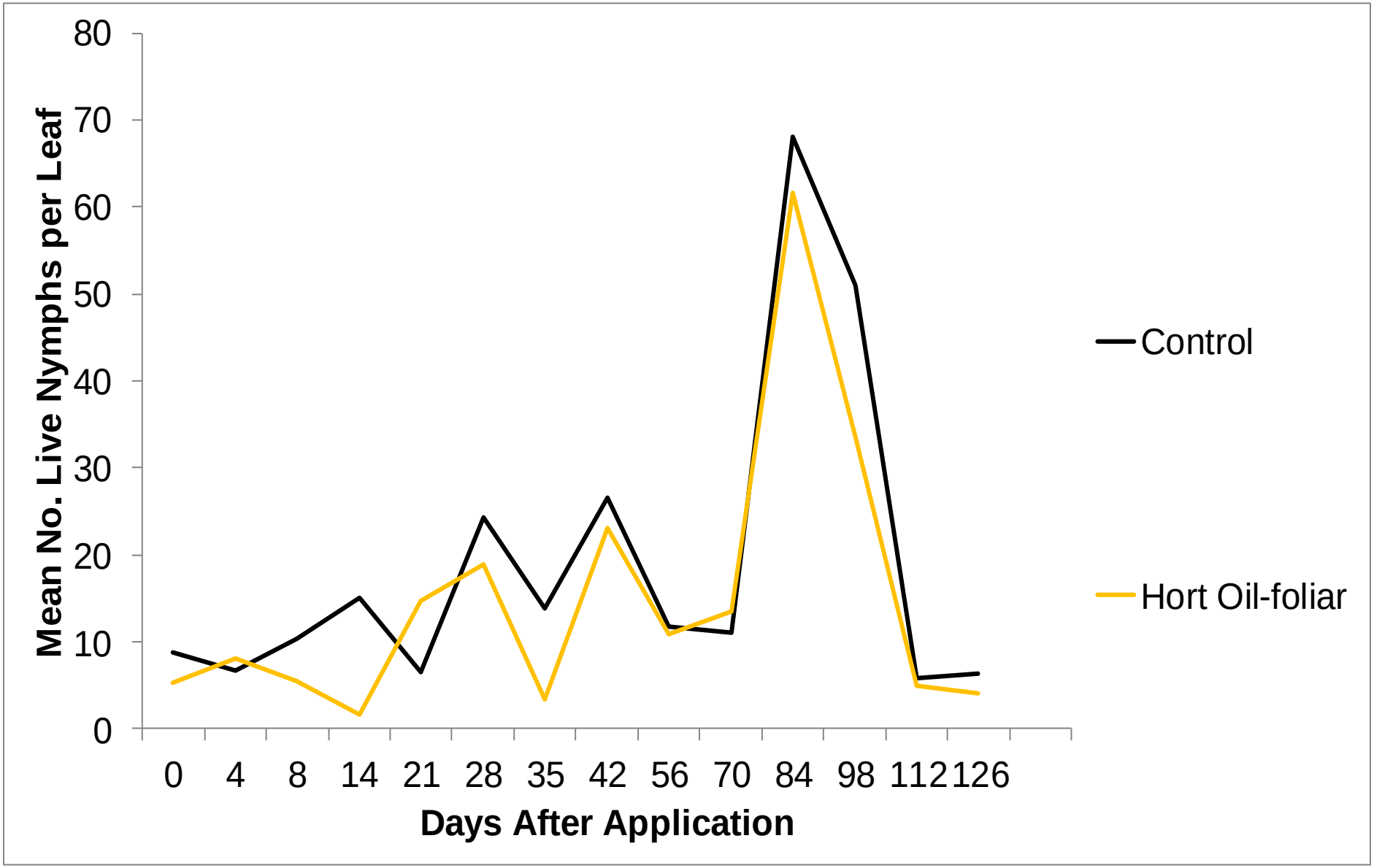


Tree Injection with Imidacloprid

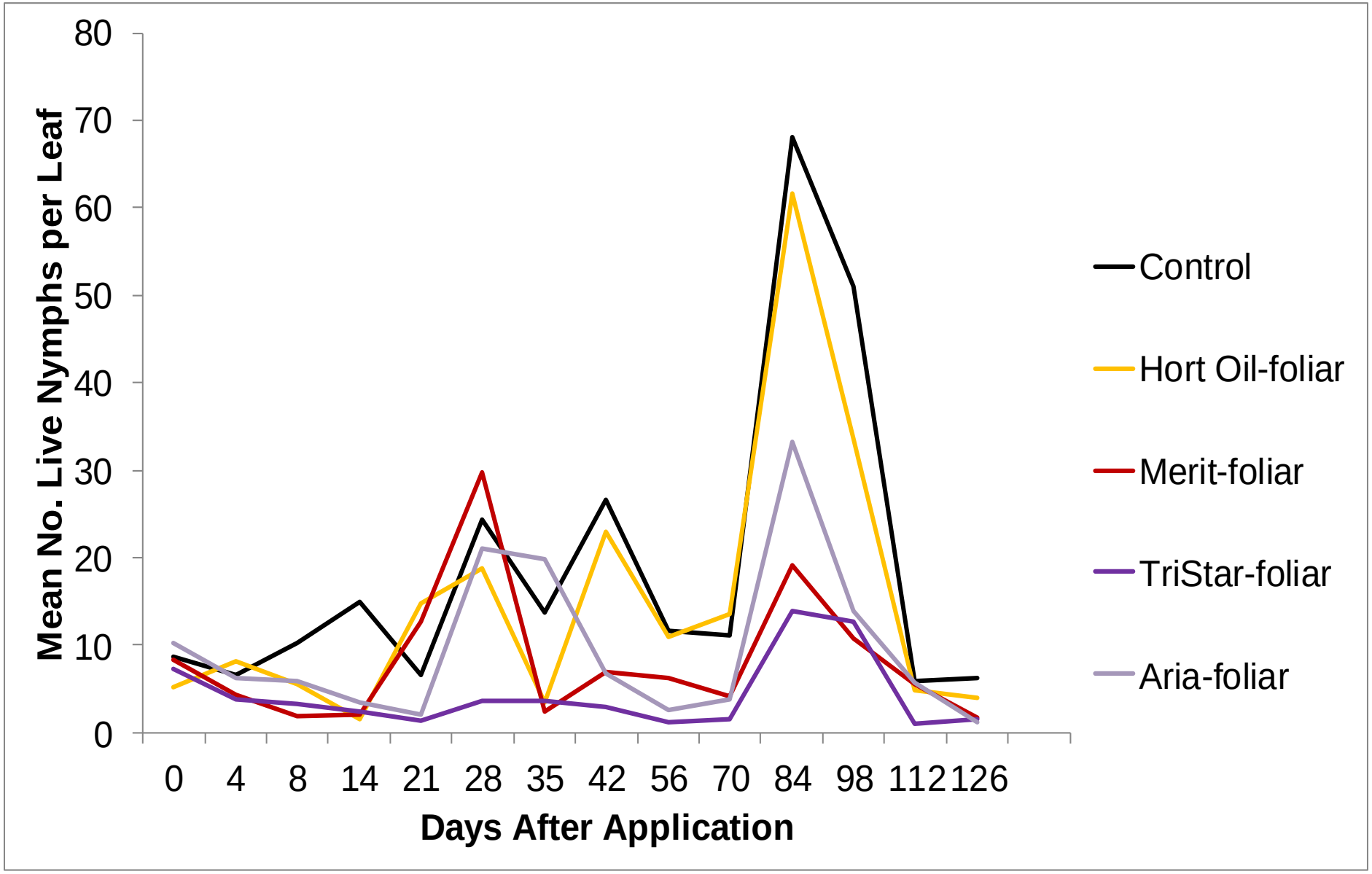
(Spiraling whitefly on Gumbo Limbo)



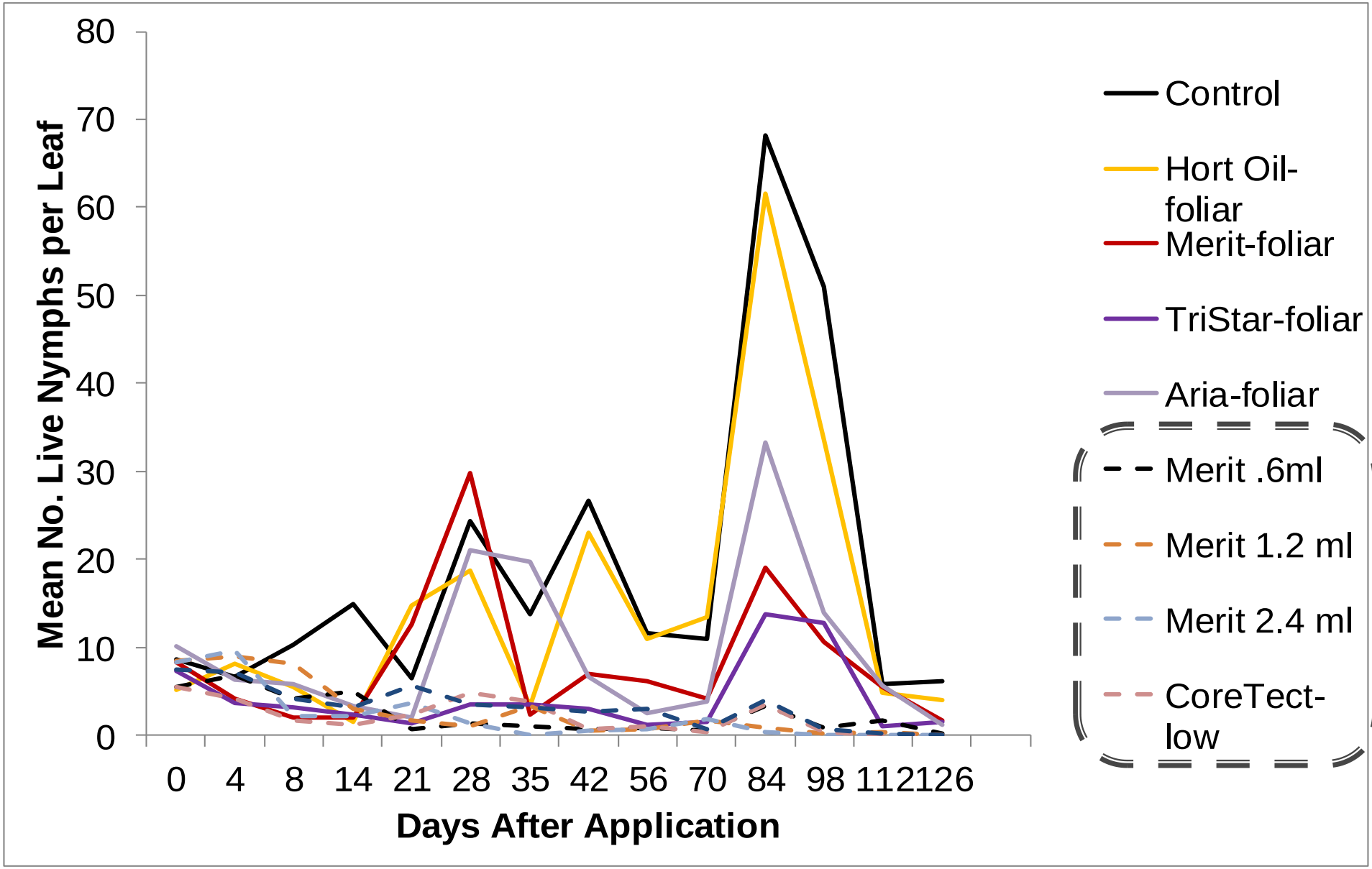
Soil and Foliar Application of Insecticides – Ficus Whitefly



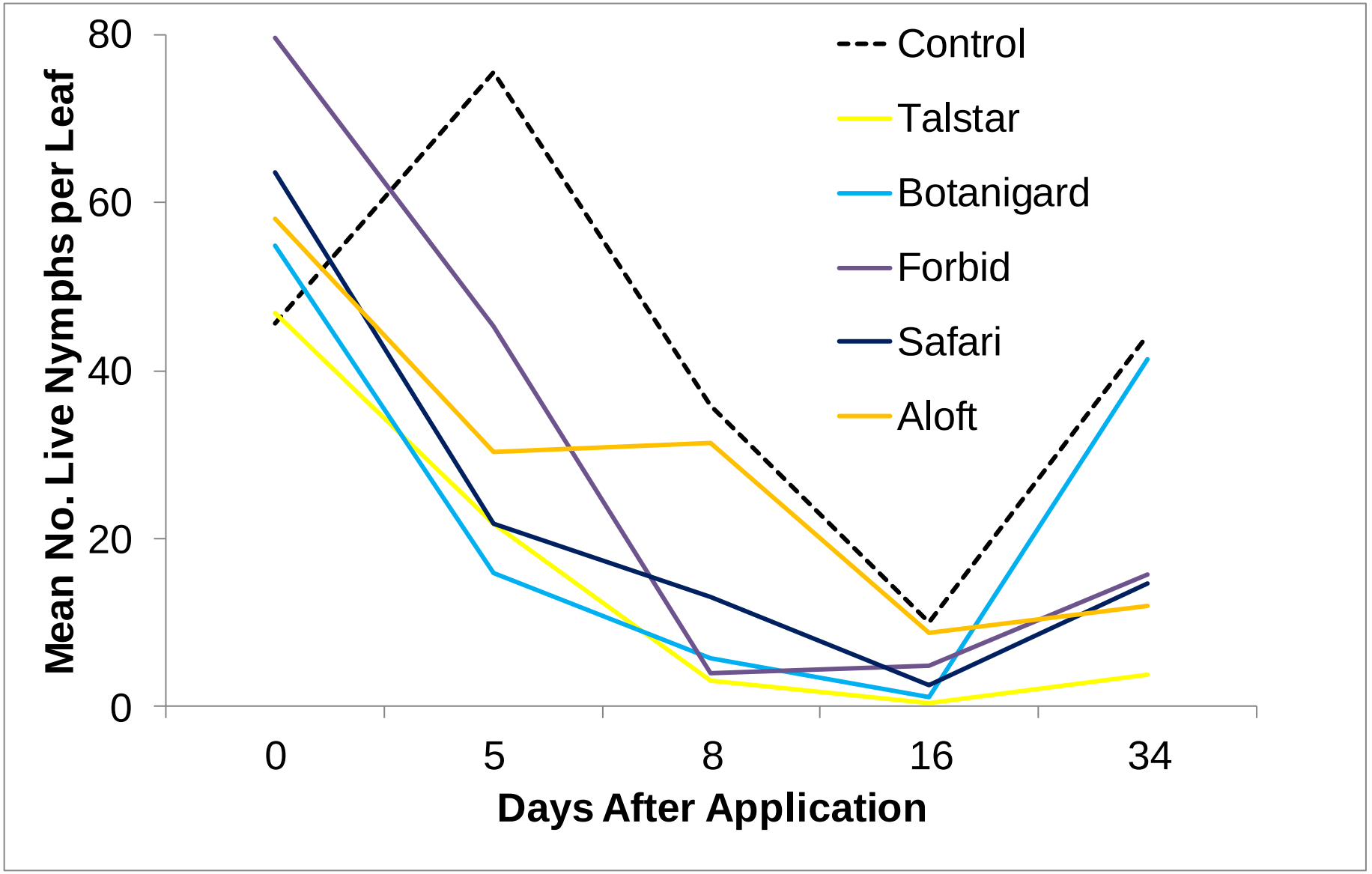
Soil and Foliar Application of Insecticides – Ficus Whitefly



Soil and Foliar Application of Insecticides – Ficus Whitefly



Foliar Application of Insecticides



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 and Bondar's nesting whitefly
  - Nuisance versus pest
  - 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

- 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

Web Resources

- http://www.pbcgov.com/coextension/horticulture/whitefly/

- http://trec.ifas.ufl.edu/mannion
- http://mrec.ifas.ufl.edu/lso/IAWG/
- http://edis.ifas.ufl.edu/
- http://creatures.ifas.ufl.edu/

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