Greenhouse pests

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

Greenhouse pests

- Thrips
- Whiteflies
- Fungus gnats
- Shore flies
- Spider mites
- Leaf miners
- Aphids
- Mealybugs
- Bulb mites

Thrips

- Feathery wings
- Adults winged
- Nymphs wingless
- Rasping mouthparts
- Many are omnivores

Just like a deer, there's no singular here

W. Cranshaw

Western Flower Thrips

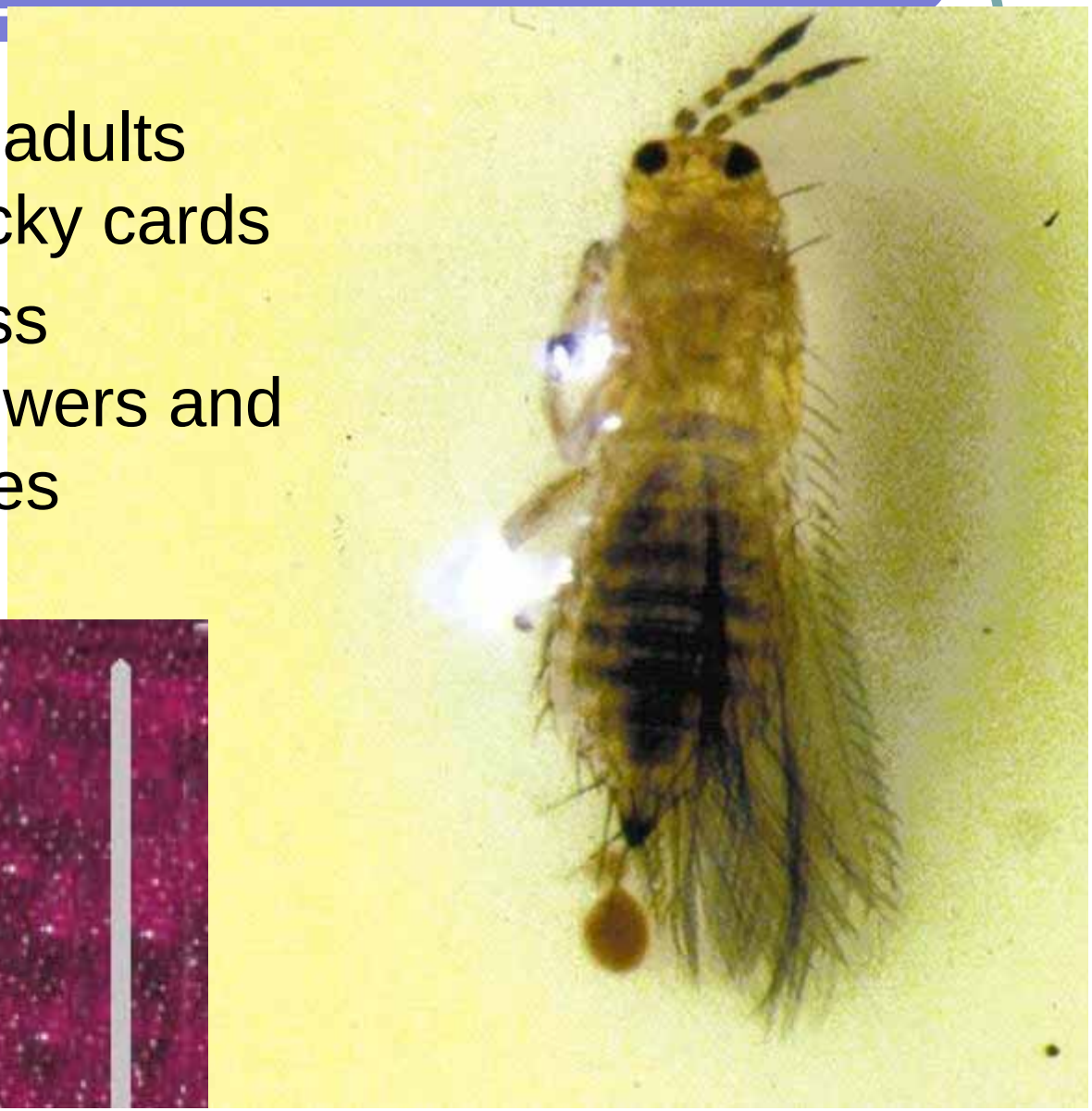
- Direct damage to flowers when adults and immatures feed
- Vectors impatiens necrotic spot virus
- Many host plants

Flower Distortion by WFT on Chrysanthemum

Impatiens Necrotic Spot Virus

Western Flower Thrips

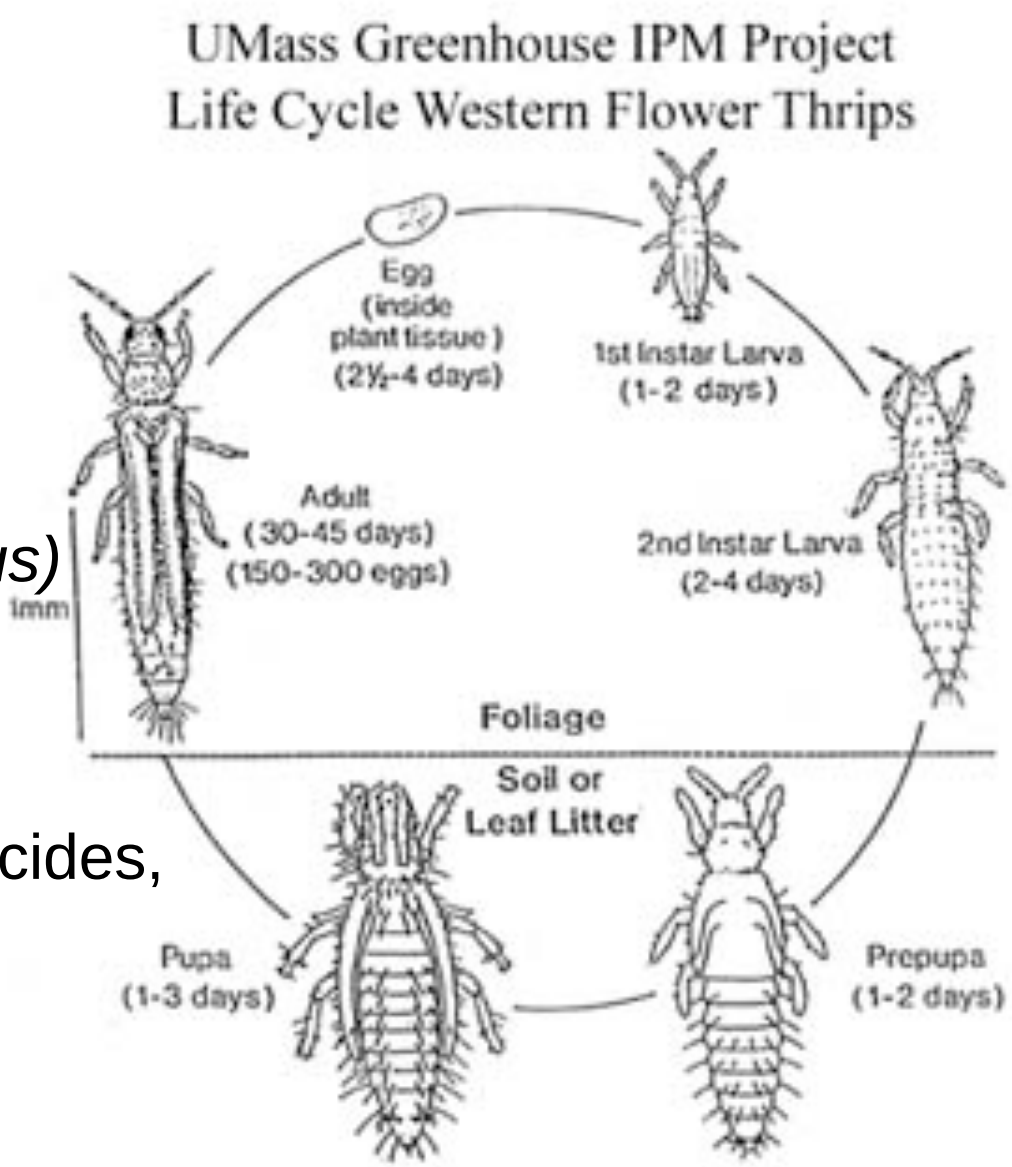
- Monitor winged adults using yellow sticky cards
- Look for wingless immatures in flowers and other tight spaces



WFT
Life cycle

Above ground mobile stages can be killed by pesticides and predaceous mites (*Amblysieus, Neoseiulus)*

Below ground stage can't be killed by pesticides, but may be killed by predaceous mites (*Hypoaspis spp*)



WFT Control

- Screen vents
- Eliminate reservoir plants (weeds, old plants etc.)
- Monitor with sticky traps-Tends not to be a problem in winter months
- If applying contact pesticide, do so at 5 day intervals to kill adults emerging from pupae
- http://www.entm.purdue.edu/entomology/ext/targets/e-series/EseriesPDF/E-110.htm

Thrips Pesticide Considerations

Pesticide Resistance

Rotate classes of pesticides @ 3 weeks

Thigmotaxis

Thrips are omnivores. They hide in buds, coverage is difficult.

Floral protection

Systemics like imidacloprid do not translocate to flowers. More mobile products are likely in future.

Compatible with BC

Spinosad won't kill mite predators, is a lamellar systemic

Biological Control for WFT

Mites

http://www.umass.edu/umext/floriculture/fact_sheets/pest_management/thripsbio.html

- *Amblysieus cucumeris* and *degenerans* (Foliar predators)
- *Hypoaspis miles* and *aculeifer* (soil dwelling pupal predators)

Plant bugs

- *Orius* spp.

Fungal disease

- *Beauvaria bassiana*

http://www.entomology.umn.edu/cues/inter/Biologic.html

Greenhouse thrips

- Adults are black. Yellow nymphs produce black fecal drops.
- Not a disease vector

Other Greenhouse Thrips

- Gladiolus thrips
  - A problem for gladiolus growers
- Tobacco thrips
  - Migrate into ghouse late in season, can be confused with gladiolus thrips

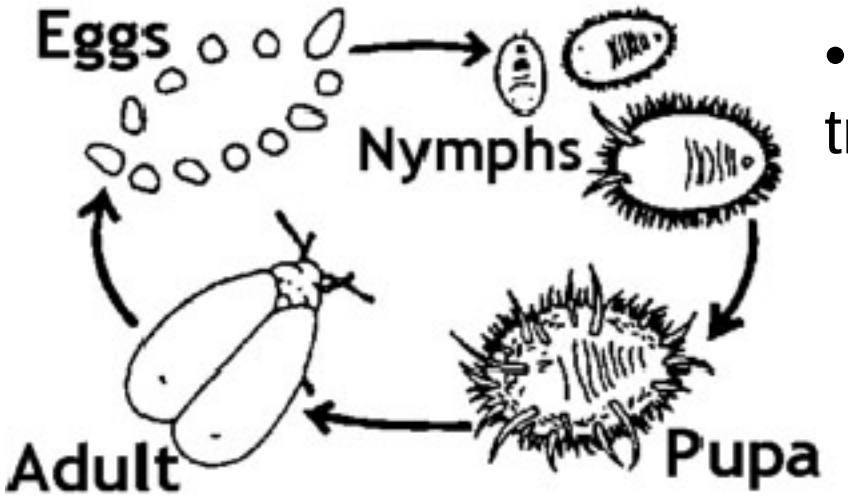
See key for other thrips

http://www.entomology.umn.edu/cues/inter/inmine/Thrips.pdf

Whiteflies

- Produce honeydew and cause sooty mold problem
- Flying white adults can be unsightly
- Problem on Poinsettias and may other crops
- Can vector diseases in some instances

Whitefly Life Cycle



(Courtesy University of GA)

- Adult is the mobile phase
- Eggs,nymphs and pupae transported on plants.

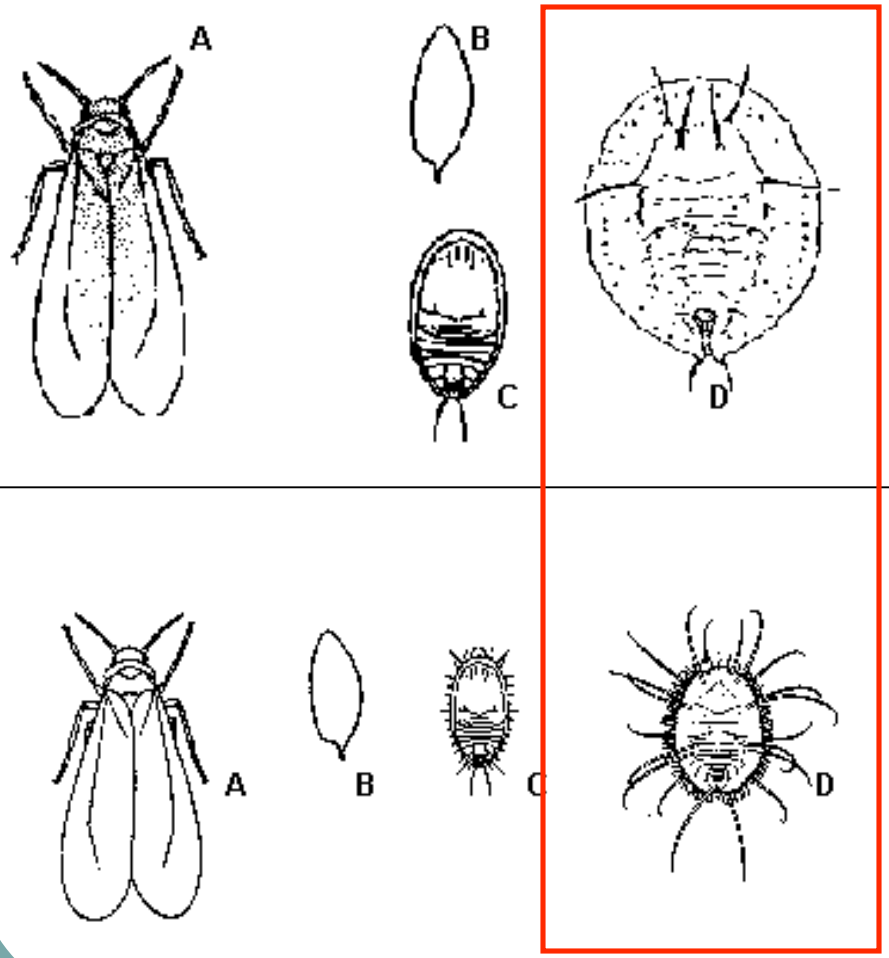
Greenhouse Whitefly

Adult Greenhouse Whitefly

Adult Silver Leaf Whitefly

Silver Leaf Whitefly Nymphs

Silverleaf vs GHS Whitefly



silverleaf

greenhouse

Bandedwinged Whiteflies

Similar to greenhouse whitefly, but adult has banded wings

Whitefly management

- Inspection of new plant material
- Sanitation
- Monitor plants and yellow sticky cards

Biological Controls:

- Encarsia formosa (Inoculative)
- Eretmocera eremicus (Inundative)

http://www.umass.edu/umext/floriculture/pest_management/biological_control.html

Poinsettia -Whitefly Innundative release (after Van Driesche 2002)

- Eretmocerus eremicus – released weekly for 15 weeks .
- Insect growth regulator (Fenoxycarb) applied at week 7 and 8 to slow whitefly population growth
- Cost of $.25/plant – competitive with imidacloprid (plus follow up sprays)

Encarsia formosa

Greenhouse Whitefly (black = parasitized)

Chemical Control of Whiteflies

- Whitefly Control in Greenhouses and Interior Plantscapes: University of Georgia
  http://www.ces.uga.edu/pubcd/b1077-w.html
- Imidacloprid gives long lasting control but must use other materials to prevent resistance
- Many pesticide options exist

Type Q Whiteflies Resistant to neonicotinoids

See website for resistance management and lists of products that work

http://www.irac-online.org/documents/moa_whiteflyposter.pdf

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
- Soil mites, *Hypoaspis miles*, 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 Israelensis (Gnatrol) also kills larvae

Foliar applications kill adults

- Pyrethroid and other insecticides control adults.
- For more information See E-111
- http://www.entm.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/entomology/ext/targets/e-series/EseriesPDF/E-111.htm

Two Spotted Spider Mite

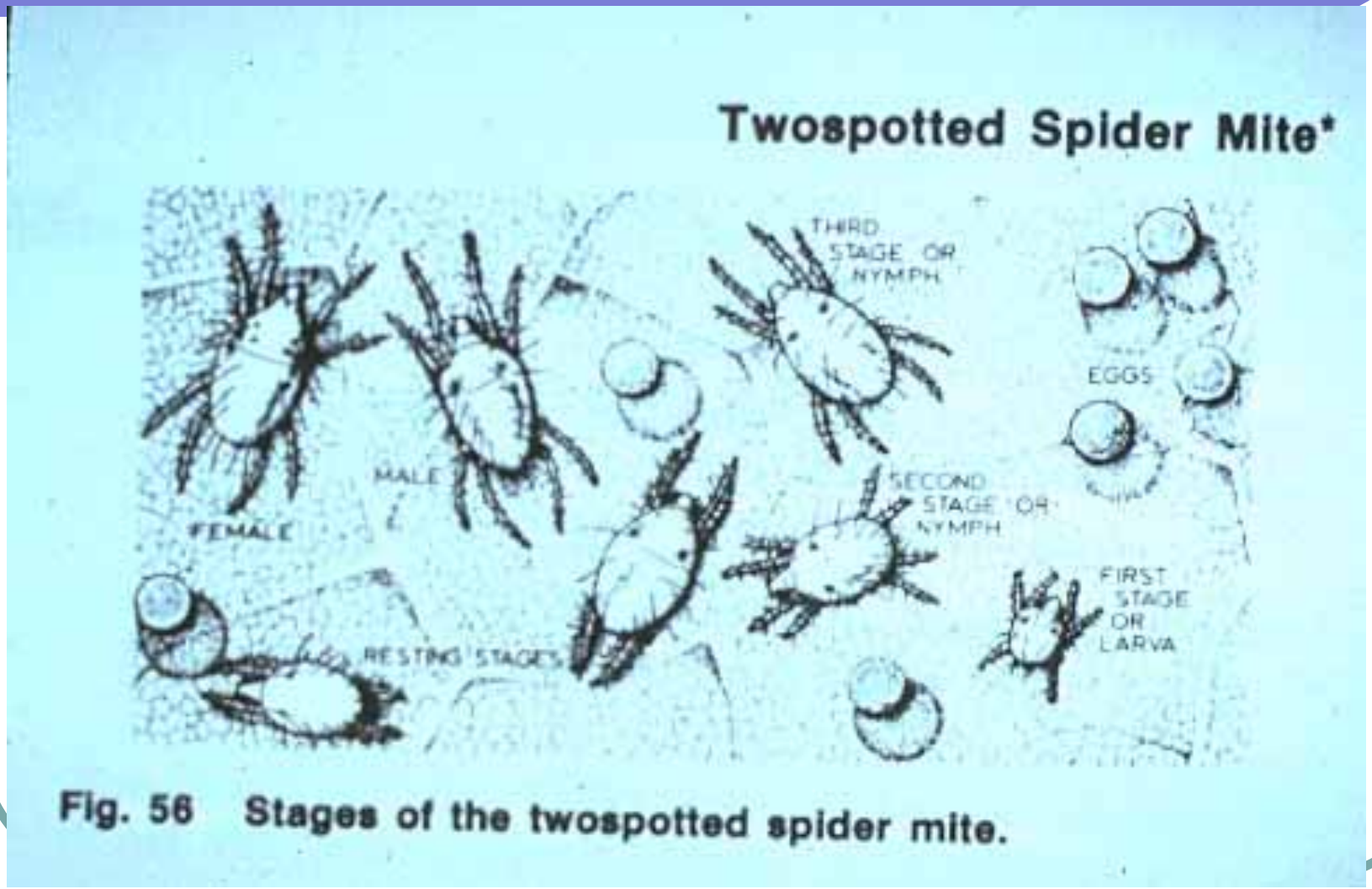


Fig. 56 Stages of the twospotted spider mite.

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

Miticides

Selective, Easy on Beneficials, Long residual

- Akari, Floramite, Ovation, Hexygon, Tetrasan,Vendex

Short residual

- Oil, Soap

Rescue Treatments, Not Selective

- Talstar, Scimitar, Battle, Avid, Sanmite
  - *Pylon (greenhouse only) – not effective against Lewis mites*

Lewis Mite

Lewis mite

- On poinsettia
- Smaller than TSSM
- Lack 2 spots
- Floramite, Avid, Akari OK
- Pylon not effective

Spider mite biological control

Many natural enemies

- Predatory mites
  - Neoseiulus persimilis (heavy populations)
  - Neosilius californicus (low populations)
- Predatory midges (fly to containers)
- Minute pirate bugs
- Lacewings

Predatory midge *Feltiella acarisuga*

http://creatures.ifas.ufl.edu/beneficial/F_acarisuga_larva.htm

Predatory Mite

Green Lacewing Adult

Green Lacewing Larva

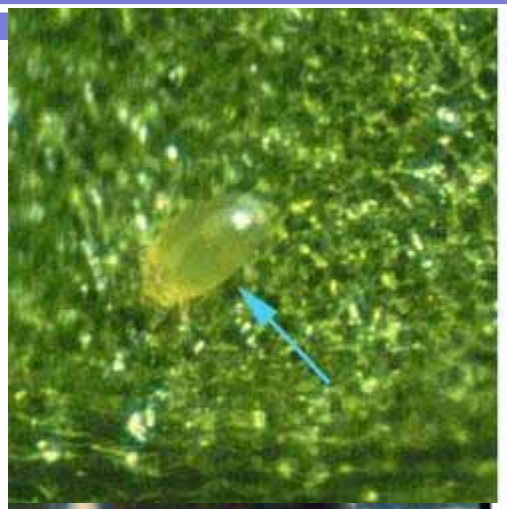
Spider mite control

- 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

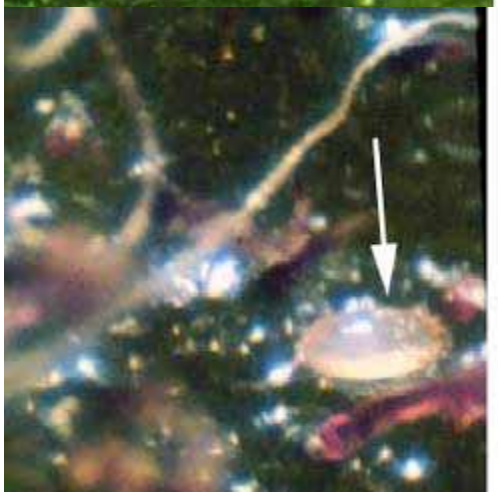
http://www.entm.purdue.edu/entomology/ext/targets/e-series/EseriesPDF/E-42.htm

Cyclamen and Broad Mites

Broad mite damage to begonia. Note the bark-like texture of the injured stem and the stunted leaves.



Female broad mite at extreme magnification.



Extreme closeup of a cyclamen mite female.

- Microscopic mites will cause russeting, and leaf distortion.
- Young growing tips are often affected

Photo Courtesy of J. Baker NC State

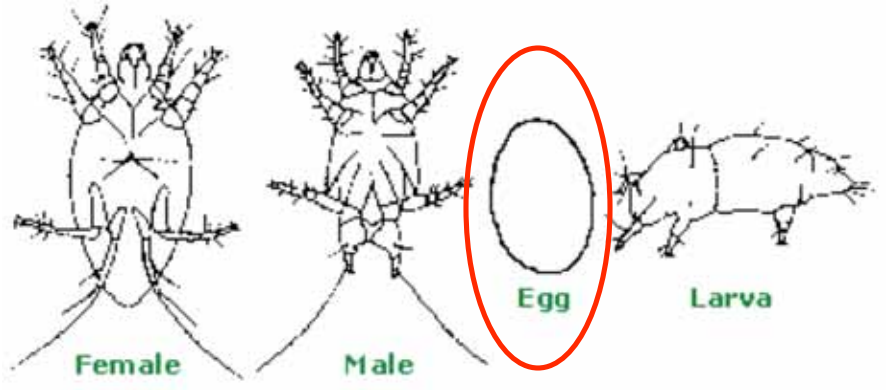
Cyclamen vs Broad Mites

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

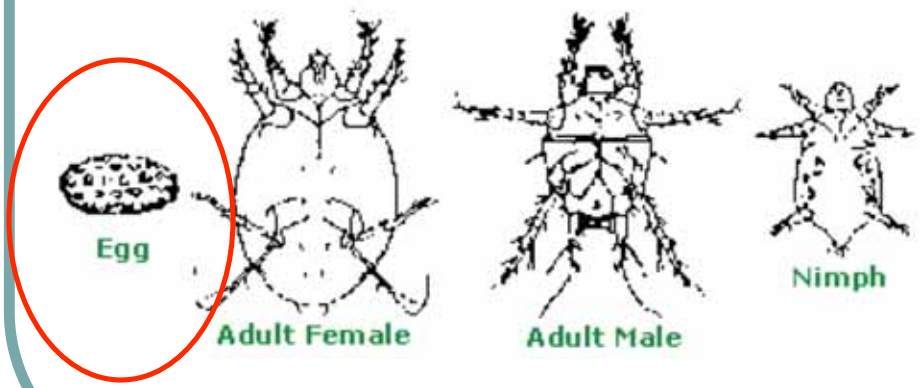
Eggs are smooth

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

Cyclamen vs. Broad Mites



Cyclamen mite
Smooth eggs



Broad mite
Bumpy eggs

Illustrations Courtesy of J. Baker NC State

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 -Abamectin (Avid), Milbemectin (Ultiflora),chlorfenapyr (Pylon), Dicofol (Kelthane)

For broad mites only -pyridaben (Sanmite),

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/blbmite.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

Mealybugs

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 conserver beneficials.

Some Common Soft and Armored scales

- Soft scales
  - brown soft scale
  - hemispherical scale
  - tessellated scale
- Armored scales
  - Boisduval scale
  - Fern scale

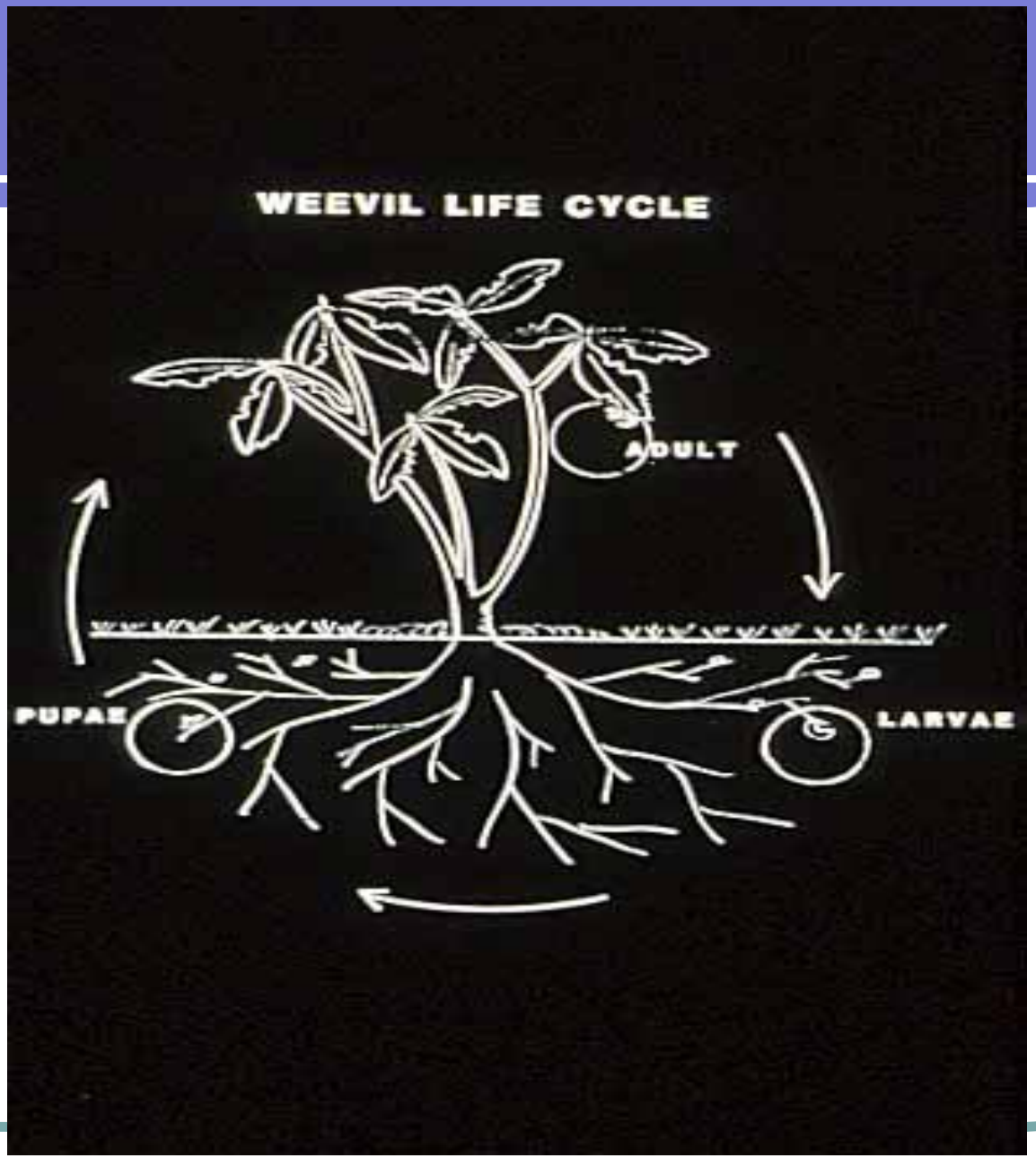
Brown Soft Scales and Crawlers

Fern Scale

Biological Control is critical for scale management – Many NE's available

Adult Black Vine Weevil

Weevil Life Cycle



Black Vine Weevil Damage


PAY FOR
ONE, TAKE
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SPORTSWEAR
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BUY ONE
GET
ONGSLEEVE T-S
BROIDERED