

## Insect & Disease Identification & Control

BILL ESKES  
GRIMES HORTICULTURE

## Total Crop Management

- INTEGRATED PEST MANAGEMENT



## The Importance of IPM

- Integrated Pest Management incorporates
  - Insect Prevention & Control
  - Disease Prevention & Control
- Sanitation
- Monitoring
- Identification
- Corrective Action
- Record Keeping

## Sanitation

### Weed Control



Hosts to numerous insects

- Weed Control
  - Control weeds around greenhouses and under benches
  - Weeds harbor for insects
  - Incorporate an insecticide with a product like Round-up to kill weeds & insects where applicable.

## Sanitation

- Use foot baths
- Avoid cleated shoes or boots that can transport soil easily.
- Clean tools regularly with a disinfectant.

## PRODUCTS TO CLEAN THE GREENHOUSE

- ZEROTOL – OXIDATE
- GREENSHIELD
- GREEN CLEAN
- PHYSAN 20

## Monitoring

### Tools you should never be without!

- Yellow Monitoring Cards or tape.
- A 10X to 15 X hand lens or loupe.
- A clip board for insect inspection & record taking.



## Monitoring & Record Keeping

- *Use yellow monitoring cards both inside and out!*
- *Place near hot spots, corners, doors, most susceptible crops.*
- *Log and monitor your results!*
- *Establish a threshold to trigger sprays*
- *Replace cards 24-48 hours after spraying*
- *Be consistent*
- *Hire outside source if possible.*
- *Use the experts!*

## Resistance Management and Rotation

- **FQPA**
- **New “Branded” Products**

## Resistance Management and Rotation

- Application of “like” chemicals.
- Multiple applications of the same product.

## Resistance Management and Rotation

**HOW DO WE *STOP* RESISTANCE? Know your Chemicals**

- Chemical Class Charts
- Mode of Action

## Resistance Management and Rotation

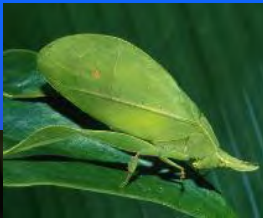
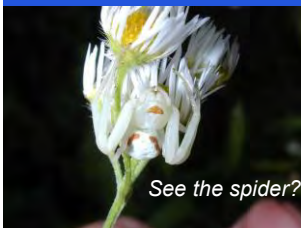
- ROTATION, ROTATION, ROTATION



*Camouflage Bug*

### Insect Identification

*They blend in...*



*...they hide!*

### Insect Identification

- Aphids
- Mites
- Fungus Gnat & Shore Flies
- Whiteflies
- Thrips
- Scale
- Mealybugs

## Aphid Life Cycle Homoptera-Aphididae

**Nymph to Adult:**  
7-10 days (73°-75°F)

*Over 1300 species in the U.S.!*

## Managing Aphids Biology & Life Cycle

→ **Asexual** - females give birth to identical clones

*Each daughter can begin reproducing in 4-10 days!*

## Aphids

- Soft-bodied
- Piercing-sucking mouth parts
- Color: varies but often green
- Length 0.06-0.14 inches
- Identifying characteristic-Siphunculi or cornicles on the abdomen

*Adult Female*

## Managing Aphids Biology & Life Cycle

→ **One adult produces 50-100 nymph clones**

*nymphs*  
*Adult Female*

## Aphid Life Cycle

**INSIDE A GREENHOUSE  
INSECT POPULATIONS  
CAN EXPLODE!**

**EXAMPLE**

**JAN. 1**  
**1,000**  
**APHIDS**

**7 GENERATIONS**

**FEB. 20**  
**43,317,485**  
**APHIDS**

## Managing Aphids Biology & Life Cycle

→ **Most adults are unwinged females and cannot fly**

## Managing Aphids

### Biology & Life Cycle

→ When colonies get overcrowded or host plant becomes undesirable, winged forms are produced



## Managing Aphids

### Biology & Life Cycle

- Winged adults can fly and will migrate in from outside
- Because of their life cycle, adults develop resistance to chemicals rapidly
- Populations tend to be the greatest during the spring on the new, tender growth where nitrogen levels are high, aiding reproduction

## Managing Aphids

### Keys to Management

- Early detection is essential
- An integrated program including inspection, trapping, and chemical applications is key to a successful control program.
- IGR use will predispose aphids to a more effective kill
- Rotate chemical classes & delivery technique every 2 weeks
- Systemic Insecticides are good, but they do not usually control aphids on or in flowers. More than one approach is necessary for control.



## Managing Aphids

### Chemical Control

#### Adults/Larvae

Aerosols, Marathon, Orthene, Pyreth-It,  
Avid, Decathalon, Mavrik,

#### Insect Growth Regulator's

Enstar, Azatin, Distance

What can  
damage these  
junipers in  
July?






*Two Spotted Spider Mite*

## Two-Spotted Spider Mites

- Mites are arachnids not insects!
- *Tetranychus urticae*-the most prevalent & damaging to flower and foliage crops.
- Approx. length-0.02 inches
- Color: range from light yellow to black
- Identifying characteristic-two dark spots on either side of the abdomen.



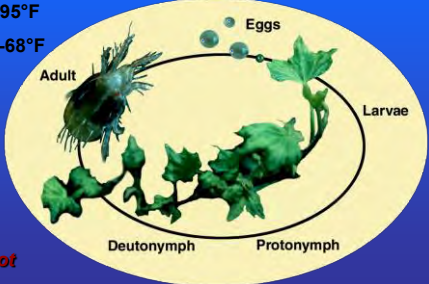
## Spider Mites



- Other common mites are Lewis spider mites found primarily on poinsettia crops and carmine spider mites commonly found on carnations.
- Control is similar with all types of spider mites.
- Diapausing/hiberation is common in late fall or winter and they often become red in color during this time frame.

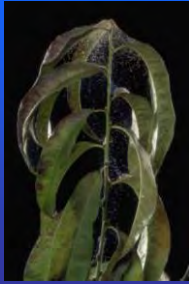
## Spider Mite Life Cycle

**Egg to Adult:**  
 8 days @ 77-95°F  
 28 days @ 50-68°F



*Two spot*

## Spider Mites



- Like most arachnids, spider mites are web weavers.
- Heavily infested plants are covered with a web
- All spider mites spin webs on host plants, which is used for protection.
- Heavily webbed plants should be disposed.

## Managing Spider Mites

### Monitoring Tips

- **Even though they have piercing-sucking mouthparts, damage is similar but more severe than thrips.**



## Managing Spider Mites

### Monitoring Tips

*When feeding, twospotted mites remove the sap, forming a necrotic spot at each site. 18-22 cells per minute are destroyed!*



## Managing Spider Mites

### Monitoring Tips

- **To identify spider mites:**
  - Tap leaves of plant vigorously over white paper
  - Have a hand lens or loupe ready to use.



## Managing Spider Mites

### Keys to Management

- **Twospotted mite infestations are worse in the summer/fall - they multiply rapidly in hot/dry temperatures**
- **Southern red mites are at their peak under mild, humid conditions found in winter**
- **Stressed plants are more susceptible**



## Managing Spider Mites

### Keys to Management

- **Because of their size, ability to hide in webs, and short life cycle, Mites develop resistance to insecticides rapidly -**  
*Rotation of chemicals is imperative!*

## Managing Spider Mites

### Chemical Control

#### **Adults/Larvae**

*Aerosols, Talstar, Floramite, Judo, Akari, Avid, SanMite, Pylon*

#### **Eggs**

*Hexygon, Ovation, Tetrasan*

## What is this?

- The most common question we receive is:
  - Fungus Gnat or Shore Fly?



## What is this?



Fungus Gnat



Shore Fly

## Fungus Gnats



- Length- 0.25 inches
- Color-dark gray
- Primary Characteristic of the adult-Long antennae
- Adults do not feed upon the plant.
- Larvae are the destructive form!
- Most larvae live in the top 1 inch of soil or growing media.

## Shore Fly



- Length- 0.25 inches
- Color-Black with red eyes and white spots on wings
- Do not have Long antennae!!!
- Adults are found on algae covered surfaces of pots, flats or irrigation matting.

## Fungus Gnats

- Fungus gnat larvae are translucent with shiny black heads.
- They feed on fungi or decaying organic matter, but will attack healthy roots and stems of plants



## Shore Fly

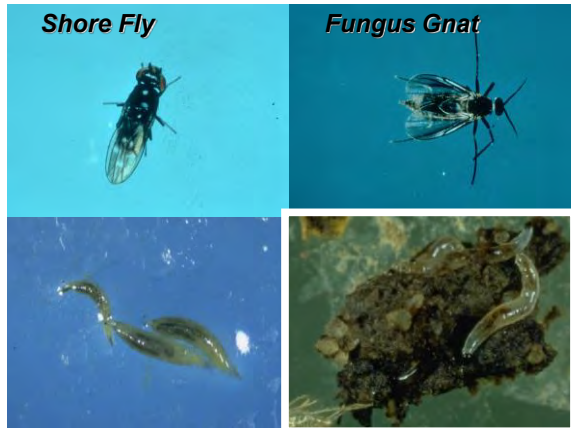
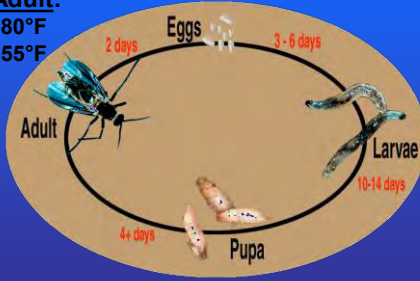
- Shore Fly larvae are translucent with two breathing tubes at the rear. They do not have dark heads.
- They feed on algae but rarely injure plants. The adults can leave unsightly specks on leaves.





# Fungus Gnat Life Cycle

**Egg to Adult:**  
12 days- 80°F  
27 days- 55°F



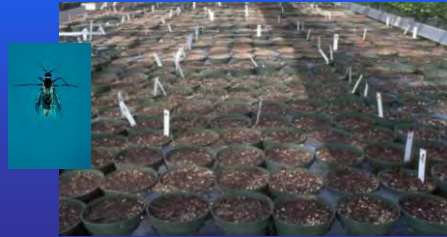
# Fungus Gnats & Shore Flies

→ Both insects spread plant pathogens



# Fungus Gnats

→ Fungus gnats are attracted to organic soil components



# Shore Fly

→ Shore fly larvae feed on algae under benches or in pots



# Managing Shore Flies

Keys to Management

For shore flies control -

→ eliminate algae



## Managing Fungus Gnats & Shore Flies

- Utilize a soil applied preventative insecticide for larvae control



## Managing Fungus Gnats & Shore Flies

- Larvae are easily controlled



## Managing Fungus Gnats & Shore Flies

- Begin soil media applications immediately after potting



## Managing Fungus Gnats & Shore Flies

- For liners, seeded trays or unrooted cuttings, wait 7 days, then apply Gnatrol

Repeat monthly.



## Managing Fungus Gnats & Shore Flies

- Use an IGR early season
- Treat under benches between crops
- Drench the top 1-2 inches of the soil
- Control adults with a fogging insecticide or Total Release applications such as Tame/Orthene, DuraPlex, Preclude or Attain.
- Eliminate algae with a Bromine or Quaternary Ammonium solution like GreenShield or Hydrogen Dioxide like Zerotel.

## Managing Fungus Gnats & SF *Chemical Control*

### **Adults/Larvae**

*Aerosols, Marathon, Orthene, Safari,*

### **IGR's**

*Enstar, Azatin, Distance*

What insect is this?



## Managing Thrips

Biology & Life Cycle

→ Size, mobility and life cycle make control challenging



*Flower Thrips*

## Thrips Life Cycle

### Egg to Adult

10 days @ 86°F

15 days @ 76°F

57 days @ 54°F



Females lay 25-50 eggs

## Thrips



- Small, narrow bodied insect
- Length-1.0 to 1.5 mm
- Adults have long fringed wings but are not good flyers.
- Color-light yellow color to translucent.
- Eggs are laid within leaf or flower tissue and larvae mature in either the same tissue or burrow into the soil to undergo pupation.

## Thrips



- Damage occurs when Thrips insert their mandible into flower tissue and remove plant fluids with a needle like stylet.
- Larvae will damage flowers and leaves from within them, so damage is not seen until they open.
- Thrips also transmit viruses to plants like INSV (impatiens necrotic spot virus).

## Managing Thrips

### Biology & Life Cycle

- Thrips feed on foliage and flowers
- Rasping-sucking mouthparts
- Damage is bleached, silvered or deformed leaves; also necrotic spots and blotches



## Managing Thrips

### Keys to Management

- Monitoring is extremely important!
- Use an IGR throughout the year for larvae control
- For high thrips pressure: mid-week spray + IGR applications
- Treat soil surfaces with Azatin and a synthetic Pyrethroids such as Decathalon to control pupae and adults
- Non-chemical controls: exclusion screens around vents and cooling pads, inspection of incoming plants, and rogue & discard heavily infested plants

## Managing Thrips

### Chemical Control

#### Adults/Larvae

*Conserve, Avid, Marathon, TR Aerosols, Mesuro!, Safari, TriStar*

#### IGR's

*Pedestal, Enstar, Azatin*



## Whitefly Life Cycle

### Egg to Adult:

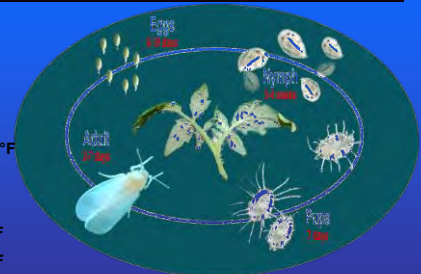
*Greenhouse Whitefly*

21-26 days @ 81°F

*Sweet Potato Whitefly*

16 days @ 86°F

31 days @ 68°F



*Over 1100 species worldwide; 100 in the U.S!*

## Whiteflies



- Newly emerged adults are pale green to yellow in color. Mature adults are soon covered with a powdery white wax.
- Have piercing-sucking mouth parts.
- All stages can be found on the underside of leaves.
- Three most prominent white flies are:
  - Greenhouse Whitefly
  - Silver Leaf Whitefly
  - Banded Wing Whitefly

## Managing Whiteflies

### Biology & Life Cycle

- Females can live up to 2 months and can lay up to 500 eggs in her lifetime.
- Females produce eggs within a few days of emergence.
- Produce honeydew which is a substrate for black sooty fungus.



## Managing Whiteflies

### Biology & Life Cycle

- **Some whiteflies are present year round; largest numbers in late summer / early fall**
- **Over 700 species of hosts plants, varying with species of whitefly**

## Managing Whiteflies

### Biology & Life Cycle

→ Whiteflies typically arrive on incoming plants - inspect carefully



*Do you inspect ALL material before placing it in the greenhouse or landscape?*

## Managing Whiteflies

### Keys to Management

- Monitor populations weekly.
- If populations increase, spray at 3 to 4 day intervals

## Managing Whiteflies

### Keys to Management

→ Spray coverage must reach the undersides of leaves



## Managing Whiteflies Chemical Control

### Adults/Larvae

Marathon, Talstar, BotaniGuard, Aerosols, Avid  
Endeavor, Sanmite, Flagship, Safari, TriStar

### IGR's

Distance (Pyriproxifen), Precision/Preclude,  
Azatin

**Remember-Insect adapt and evolve very quickly!**



What's This?



## Scale Life Cycle

Egg to Adult :

### SOFT SCALE

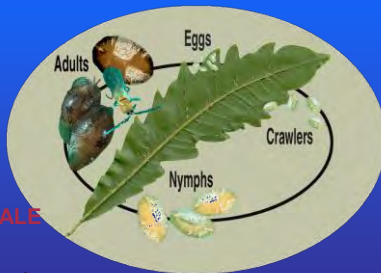
Avg. 60 days  
but varies widely  
with species &  
temperature

85 species in U.S.

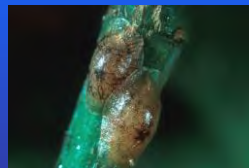
### ARMORED SCALE

Avg. 6-7 months  
but varies widely  
with species & temperature

350 species in U.S.



## Scale



- Scales have piercing-sucking mouth parts.
- Soft scales are larger than armored scale and can reach lengths up to 0.16 inches.
- Color and sizes vary.
- Soft scale produces honeydew. Armored scale does not.

## Scale



- Scales produce a waxy coating over their bodies that may or may not become hard depending on the type.
- Scales produce eggs that stay under the protective coating.
- Crawlers move to new plant growth to feed.
- Females lose their legs and remain sessile for the rest of their lives.

## Managing Scale Biology & Life Cycle

- **Scales are divided into 3 groups:**
  - **Soft Scales**
  - **Armored or Hard Scales**
  - **Mealybugs**

## Managing Scale Keys to Management

- **Primarily found on foliage plants**
- **The most important way scale is dispersed is by movement of infested plants by man!**
- **Inspect plants thoroughly before moving and/or planting**

## Managing Scale Chemical Control

### Adults/Crawlers

*Decathlon, Mavrik, Talstar, Aerosols, Decathlon*

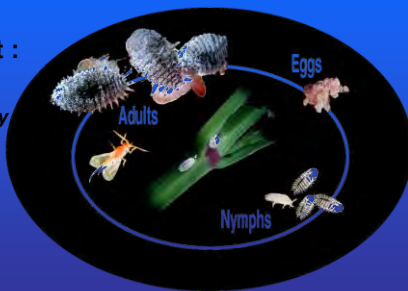
### IGR's

*Distance (Pyriproxifen), Precision/Preclude (soft scale only)*

## Mealybugs Life Cycle

### Egg to Adult :

*Avg. 60 days but varies widely with species & temperature*



## Mealybugs

- Male Mealybugs resemble a typical winged insect.
- Female are soft bodied but produce
  - a white waxy powder that covers the body
  - White projections that make it appear ruffled
  - Usually have a long like tails



## Mealybugs

- White “cotton-like” balls near the insect are egg sacs.
- Primarily found near nodes of plants.
- Produce honeydew
- Retain their legs and are mobile throughout their lifetime.



**Mealybugs  
are found  
just about  
anywhere!**

## Managing Mealybug

### *Chemical Control*

#### **Adults/Crawlers**

*Safari, Talstar, Aerosols, Decathlon,  
Marathon, Soaps, Orthene*

*Program Approach: 1% Ultra Fine Oil . First  
two sprays at 3 days followed by 2 sprays at 7  
days.*

#### **IGR's**

*Distance, Enstar, Preclude*

## Disease Identification Fungal, Bacterial, and Viral

- Botrytis Blights
  - Rust
- Powdery Mildew
- Others

## Botrytis-Gray Mold

- The most common disease of ornamental crops.
- Spores can be dispersed through air currents or water or by insects such as bees and aphids.
- Blights on any part of the plant like leaf spots or root rot are associated with Botrytis.



## Gray Mold Transfer

- Transferred from flower to leaf





## Leaf Spot-Botrytis



## Rust



- Orange or brown spores appear on the underside of lower leaves first.
- Primarily found in areas where morning dew is prevalent.
- Rust usually affects the leaves and will cause the leaf to die and drop.
- Fungicides should be used as a protective or preventative measure.

## Powdery Mildew



- Fungal threads create a white powdery appearance on the upper leaf surface.
- Severe infection can result in leaf curling, distorted flowers or fruits to death of tissue.

## Alternaria



## Black Spot on Rose



## Virus

- Virus on Sunflower



## Mosaic Virus on Rose



## Target Spot Lesion-Rhizoctonia



## Xanthomonas



## Xanthomonas



## Leaf Spot



## Disease Management

### *Fungicides & Bactericides*

Kocide, Heritage, Medallion, Daconil, Cleary 3336, Chipco 26019, Banrot, Banner

- Preventative applications of fungicides are imperative.
- Follow the labels!
- Rotate between MOAs.
- Reduce humidity and keep foliage as dry as possible.
- Good sanitation programs are also essential in prevention diseases.

Thank  
You!



Questions?