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BASICS PEST MANAGEMENT OF INSECTS AND MITES IN HIGH TUNNELS

Integrated Pest Management for High Tunnels

- Cultural
 - Prevention
 - Sanitation
 - Exclusion
- Plant resistance
- Beneficials
 - Predators
 - specialists vs. generalists
 - Parasitoids
- Grafting
- Sprays



Tunnel production is neither field nor greenhouse.


No rain

- Favors thrips and mites

Passive ventilation

- Some field pests will enter the structure

Thrips



- Tiny
- Wide range of hosts
 - Cukes, Tomatoes, Eggplant, Peppers...
- Transmit Virus
- Look for yellow flecking, black dots.
- Most often found on the underside of leaves and inside flowers.

Two Spotted Spider Mites

- Not insects, they are arachnids.
- Prefer dry, hot conditions.
- Over-winter inside high tunnels
- Many hosts.




Aphids

- Several species which are not easy to ID
- Many hosts
- Prolific reproducers



Other arthropod pests

- Tomato fruit worm (European corn borer)
- Tomato horn worm
- Cutworms
- Whiteflies
- 'Other' mites (russet, broad)
- Cucumber beetle
- Ants

Cultural Control

- Sanitation
- Physical Exclusion
- Pruning
- Temperature
- Moisture



Sanitation

- Weeds harbor:
 - Mites
 - Thrips
 - Aphids
- Excess water promotes:
 - Shore flies
 - Fungus Gnats



Exclusion



Mulch to prevent mite problems.



Insect Screening



Pruning

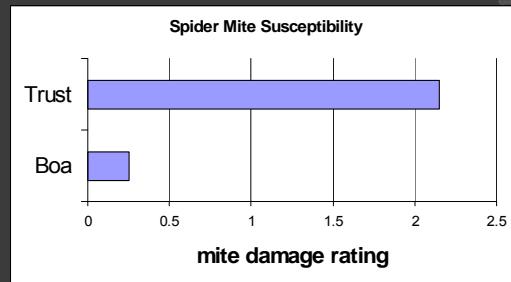


Plant Resistance

- Insect resistance:
 - Some varieties are less attractive.
 - Some varieties are more tolerant.
- Cucurbits
 - Striped cucumber beetle are less attracted to plants with low levels of cucurbitacin (non-bitter types).



Tomato Varieties: Trust vs Boa Two Spotted Spider Mites



Biological Control



- Beneficial Insects
 - Predators
 - Specialists vs. generalists
 - Parasitoids
- Well-researched in *greenhouse* settings
- Require time to work.
- Must be used preventatively.

Why Biological Control?

- Enclosed environment is the best for retaining introduced beneficials.
- Pesticides don't fit well in enclosed settings:
 - Degradation has not been well researched
 - Short harvest intervals
 - Some field materials are prohibited from greenhouse use

Why use Biologicals?

- They work when you rest.
 - Less labor than repeated application of oils, soaps, etc.
- They don't 'burn' plants.
- No Re-entry Interval
- No Pre-Harvest Interval.
- They work!



Environmental Management

- The most aggressive beneficial insects need specific temperature and relative humidities.
- High tunnels have wide swings in temp and RH.
- This requires selecting less sensitive beneficials, repeat releases, creating habitat (banker plants).

Aphids

- ID of aphid species is essential as different beneficials control different aphid species.
- *Aphidius colemani* (a parasitoid) controls peach aphids.
- *Aphelinus abdominalis* controls potato aphids.
- *Aphidius ervi* controls pea aphids.



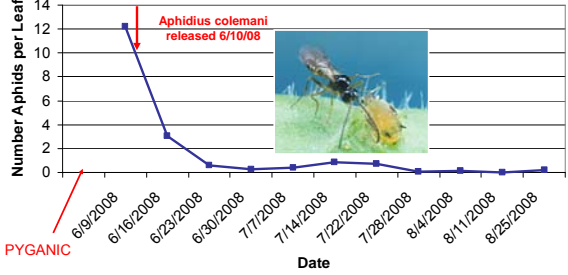
A. Colemani

- It is a parasitoid
 - Lays eggs inside aphids
 - These become 'mummies'
- Progress is visible



On Farm Trials


Trumansburg, NY: Biological Control of Aphids on High Tunnel Eggplant



Thrips control in high tunnel cukes



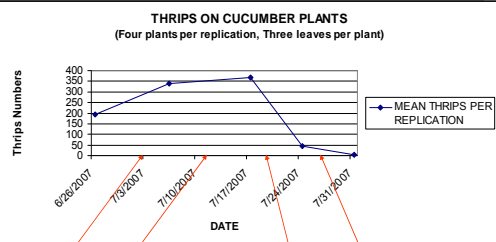
Amblyseius cucumeris



- I like this one!
- It is a generalist predator.
- Can survive on pollen if prey become unavailable.
- Cost effective.

Biological control in high tunnel cukes

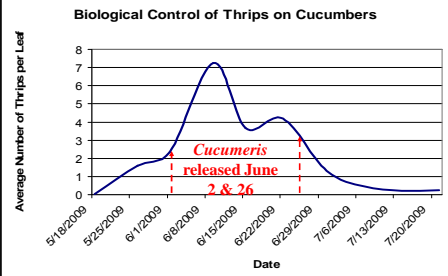
THRIPS ON CUCUMBER PLANTS
(Four plants per replication, Three leaves per plant)



Released 500 Orius
Released 10,000 cucumeris
Released 10,000 cucumeris
Released 10,000 cucumeris

Gaining efficiency

Biological Control of Thrips on Cucumbers



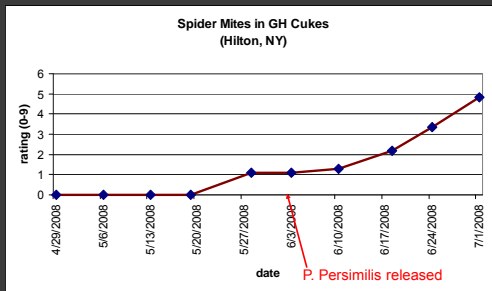
Spider Mite Control



- *Phytoseiulus persimilis*
 - aggressive predator
 - needs RH over 75% and temperature of 68F
 - only eats Spider Mites
- *Amblyseius californicus*
 - Also a predator, but not as aggressive
 - eats mites, thrips and pollen
 - needs RH over 75% and temperature of 68F



We don't win every time.



Do Beneficials Pay?



- At one site our total bill for biological control was \$479.
- This could be somewhere between 5-10% of our gross for 3000 sq ft.

Beneficial Insect Lessons

- Scout often.
- Order beneficials prior to, or immediately after finding a pest outbreak.
- Know your suppliers delivery schedules and deadlines.
- Effects will not be immediate, continue scouting.
- Plan ahead for pest intensive crops (Vine Crops, Berries and Eggplant)

Conclusions

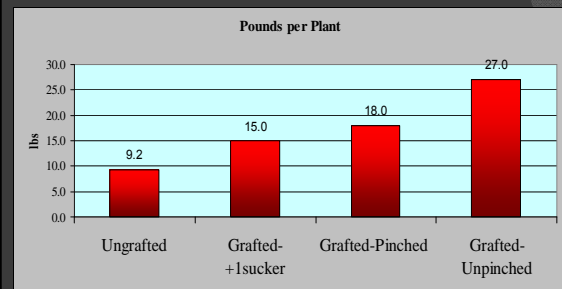
- Biocontrol works well in greenhouses
 - Release early in production cycle
 - Pest ID is essential
 - Know the supplier's deadlines!
- High tunnels are not greenhouses
 - Swings in temperature and relative humidity
 - Generalist predators
 - Repeat releases

Grafting

- We graft a desirable fruiting variety onto a vigorous rootstock.
- Generally used to confer:
 - Vigor
 - Disease resistance
- May also be a tool for insect/mite management.
- Grafting is allowable for Certified Organic.



Average Pounds of Tomatoes per Plant, Grafts vs. Un-Grafted



Insecticides

- Regulations vary from state to state.
- Check with your local extension on what is allowed.
- Consider applicator and worker safety before spraying in tunnels.



Organic Insect Sprays

- Oils
- Bts
- Entrust (Spinosid)
- Surround
- Garlic and other repellants...



Organic Sprays

- Coverage essential
 - Oils kill via suffocation
 - Mites and Thrips are usually on the under side of the leaf.
- Bts and Entrust are best for worm control.
 - Entrust has good action against thrips
- Overhead application is required for some tunnel crops.

Winter greens...



- Off-season markets creates unique pest scenarios.
- Aphids can ruin fall and winter greens crops.
- Beneficials inactive in during this time period.
- Come back on November 8 for details!

High Tunnel IPM

- Cultural control
- Resistant plants
- Beneficial Insects
- Grafting
- Sprays

