Greenhouse Integrated Crop and Pest Management

Wisconsin Fresh Fruit and Vegetable Growers Association
Spring Field Day

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Greenhouses are ideal for the build-up of pest populations.
Insects are difficult to manage:

- Multiple generations - up to 20 / year
- Lack of natural enemies to reduce populations
- Almost unlimited food
- Constant environmental conditions
- Some life stages are not susceptible to treatment
- Major insecticide and miticide resistance
Tolerance for pests or pest damage is low
IPM = Integrated Pest Management

IPM: is a decision-making process considers and utilizes ALL available pest management options or strategies to prevent economically-damaging pest outbreaks below an acceptable, pre-determined injury level or action threshold while reducing risks to human health and the environment.
What IPM is NOT!

- IPM does **NOT** preclude the use of pesticides!
- IPM is **NOT** merely a biological or “organic” pest control program
- IPM is a decision-making process, **NOT** a stringent or rigid management regime
Components of an IPM Program

- Monitoring and Sampling (inspect)
- Pest Identification (what pest)
- Decision-making (what action)
- Intervention (take action)
- Follow-up (re-inspect)
- Record-keeping (write it down, history)
- Education (learn)
Sampling or Scouting

Relative methods- tells the type and areas infested by certain pests

Examples- sticky cards, indicator plants

Absolute Methods- tells the number of a given pest per plant

Requires inspection of plants
Sampling or Scouting – Relative Measures

Sticky cards

Indicator plants
Sampling or Scouting

Absolute or Direct Sampling

- Visual inspections, use a hand lens
- blowing (exhaling) on flowers (thrips)
- sweeping or brushing a plant over a white piece of paper
Control Measures

**Cultural** - exclusion, inspection, sanitation, resistant cultivars, fallow

**Chemical** - the use of pesticides to suppress or eliminate pests; narrow or broad spectrum

**Biological** - the use of pathogens, or other arthropods for suppression of a targeted pest
Cultural Control

Exclusion - Screening

Inspection, Quarantine, and Sanitation
Cultural Control

- Weed control - inside and out
- Fallow
Chemical Control

Chemical controls are rather inexpensive, usually adding only 1-2¢ per plant.

Preventive approach

Curative approach
Chemical Control

- Worker Protection Standards
- Phytotoxicity
- Resistance Management
Biological Control

- General Considerations
- Problems

http://learningstore.uwex.edu/Problems-C83.aspx
Aphids

- Soft-bodied insects
- Wings present or absent
- Cornicles (tail pipes)
- Honeydew
  - Sooty mold
- May transmit viruses
- Reduces plant vigor, stunting, malformation

- Green Peach Aphid
- Cotton Aphid
- Potato Aphid
- Foxglove Aphid
- Melon Aphid
Honey Dew & Sooty Mold
Aphid Monitoring

- Check as many plants as possible
- Look at terminal buds and lower leaf surfaces
- Cast skins, honeydew, & sooty mold are indications of aphid infestation.
- Yellow sticky traps can monitor winged aphids
Aphid IPM

- **Sanitation**
  - Remove weeds inside and outside of greenhouse
- **Screen vents and windows**
- **Limit the use of quick-release fertilizer**
- **Beneficial Insects**
  - Green lacewings
  - Ladybeetles
  - Parasitic wasps

http://learningstore.uwex.edu/Problems-C83.aspx
Aphid Chemical Control

- Rotate chemicals every 2-3 applications to prevent insecticide resistance
- Organophosphate resistance common

Marathon (imidacloprid) – drench / drip best
Endeavor (pymetrozine) - slow kill - but stop feeding
Avid (abamectin) – aphid suppression

Thiodan (endosulfan)
Orthene (acephate)
Talstar (bifenthrin)

*Beauvaria bassiana (Botanigard)*
*Aza-Direct (azadiractin)*
Order Thysanoptera

- Thrips, complete metamorphosis
- 4 narrow, fringed wings
- Tube-like mouthparts
- Virus vectors (TSWV & INSV)
Thrips Damage

- Rasping mouthparts puncture plant surfaces.
- Egg-laying also damages plants.
- Injury appears in streaks rather than spots ‘silvering’.
- Blossoms become brown and petals are distorted.
- Buds fail to open.
Thrips Damage – Virus Infection

- Tomato spotted wilt virus (TSWV)
- Impatiens necrotic spot virus (INSV)
Blue – Yellow Sticky Cards to Monitor Thrips
Thrips IPM

• **Sanitation**
  - Remove weeds that act as a thrips (virus) refuge.
  - Remove and destroy crop residues and affected plants after harvest.
  - Remove all soil debris from greenhouse.

• **Screen windows, vents, and fans.**

• **Pasteurize soil to kill immature thrips.**
Thrips Chemical Control

- Treat at 3-5 day intervals with very good coverage
- Rotate chemicals to prevent WFT resistance

- Conserve (spinosad)
- Radiant (spinetoram)
- Avid (abamectin)
- Pedestal (novaluron - IGR)
- Merit (imidacloprid)
- Flagship (thiamethoxam)
- Safari (dinitefuran)
- predacious mites (*Amblyseius cucumeris*)
- *Beauvaria bassiana* (Botanigard)
- M-pede (insecticidal soap)
- Azatin (azadiractin)
- Entrust (spinosad)
Order Diptera

- Flies, gnats, mosquitoes, midges
  - Fungus gnats
  - Shore flies

- Only 1 pair of wings – second pair are modified

- Adults have sponging mouthparts

- Larvae have chewing mouthparts and feed on roots, stems, fruit.
Fungus Gnats

- Distinguished by the long, many-segmented antennae.
- Weak flier
- Feed or decaying organic matter in potting mix, decaying plants
Fungus Gnat Damage
Fungus Gnat Monitoring

• Monitor with sticky traps placed horizontally at the crop canopy.

• Place potato wedges on growing medium surface to monitor larval populations.
  
  – Leave in place for 3-4 days then look for larvae feeding on cut surface.
Shore Flies

- Nuisance insect
- Short antenna
- Strong, fast flier
- 5 light spots on darker wings.
- Larvae have opaque bodies without distinct head capsules.
Shore Fly Damage & Habitat

• Shore fly damage is fly speck.

• Habitats with a lot of algae will promote shore fly outbreaks.

• Look under benches and other water pooling places.
Fungus Gnat & Shore Fly IPM

- Eliminate breeding areas
  - Drain wet areas.
  - Dispose of infested growing media.
  - Remove all plant debris.

- Avoid over watering plants

- Avoid over fertilizing plant which will promote algae growth.
Fungus Gnat & Shore Fly Chemical Control

- Citation (cyromazine - IGR)
- Adept (diflubenzuron – IGR)
- Distance (pyriproxyfen – IGR)
- Sanmite (pyridaben - miticide)

- Permethrin (synthetic pyrethroid)
- Orthene (acephate)
- Dursban (supplies available)

- Nematodes (Steinernema feltiae)
- Gnatrol (Bacillus thuringiensis israelensis)
- Predacious mites (Hypoaspis miles)
Insects Impact Cucurbit Production

Pollinators…

European honey bee

…and Devastators

Striped cucumber beetle
Insect Management in Potatoes

- Key Pests -

Colorado potato beetle

Green peach aphid

Potato leafhopper
Key Pests of Cole Crops

- Complex of 3 lepidopteran species
- All feed on marketed crop
- Need to identify species but can treat as a complex

Diamondback moth
Cabbage looper
Imported cabbage worm
Insect Pests in Onions

Onion Thrips Damage

Protected with insecticides

Not protected

Onion Thrips

Adult

Larva
Thank You, Questions, and Always…

Read and Follow Label Directions!

Pesticide Labels Change Frequently!