Pests, Diseases and Weeds; Greenhouse Monitoring and Scouting

John Ray
Research Associate – Floriculture Program
Department of Horticulture & L.A.
Colorado State University
WHAT IS IT?

- Keeping your eyes (ears, nose?) open for existing or potential BIOTIC problems which can affect the marketability of your crop.
- An ESSENTIAL component of today’s best management practices for greenhouse (or field) production.
- The keystone of an Integrated Pest Management (IPM) program
Integrated Pest Management

• Components
  – Pest / Problem Prevention
  – Scouting / Monitoring
  – Action Thresholds
  – Control
Prevention

- Production Planning
- Sanitation
- Exclusion
- Environmental and Cultural management
Production Planning

- Plan for down-time to clean and prep for next crop
  - Address problems (drainage, weeds, drafts)
  - Don’t put it off!!!
- Do not stagger production in the same bay
Production Planning

• Choose resistant cultivars (?)
• Group plants with similar requirements
• Grow “trouble” plants in one area
• People / Product movement
  – no through traffic!
• Who will scout & monitor
Sanitation

• **Start Clean**
  - Dirt, stray plants, weeds (in and out), standing water
  - Floors/walls, benches, containers, growing media, hose/irrigation lines, injectors/stock tanks
Sanitation

• **Start Clean**
  – Clean plant material (spray history?)
  – Quarantine area
    • on down-wind end of multi-use house
    • Inspect ASAP
  – Limit traffic between production areas
    • clean to dirty, NOT dirty to clean!
Sanitation

• **Stay Clean**
  – “Air lock” type doors
    • *How many doors do you walk through from the outside to get to the growing area?*
  – **Air curtains**
Sanitation

• Stay Clean
  – Foot baths / Shoe covers
  – Hand disinfectant sprays / washes
  – Wand / Hose disinfectant dips
Exclusion

- Think like a bug (disease, weed)
  - Where do they come from?
  - Spontaneous generation?
Exclusion

- **Plug holes!!**
  - Obvious first – Insect exclusion screening
    - Ridge Vents
    - Pads
  - Not so obvious
    - Doors – install sweeps and “weather” stripping
- Really obscure
  - Cracks
    - Around perimeter of outside doors, fan boxes and sidewalls
Find & Seal
Cracks & Holes
Exclusion

- **Be aware of air movement!**
  - **With-in and Between bays**
  - **Fan staging and balancing**
    - What goes out one fan may be coming in the one right next to it
    - **Enough vent area to support exhaust airflow?**
  - **Positive pressure bays**
    - When you open the door, which way does the air blow?
Positive Pressure Setup
Environmental and Cultural

• **Abiotic stress can lead to pests**
  – Drought or physical damage -> aphids
  – High humidity -> mildews
  – *Overwatering* -> fungus gnats / soil diseases
  – *Overfertilization* -> foliar diseases

• **Yearly pest cycles**
  – *Spring whitefly*
  – *Summer thrips*
Scouting & Monitoring

• **Benefits**
  – Better quality material
  – Environmentally (and fiscally) responsible
  – Cheaper

• **Drawbacks??**
  – Takes time – but it’s a re-allocation, not an increase

• **Most growers do it informally / sub-consciously anyway**
Where to start?

- Formalize a plan and team
- Start simple / small
- Know your crops and pests
- Be regular
- Designate PMU’s
- Keep records
- Educate staff on what to look for
Team approach

- **Who is the “Scout”?**
  - General labor (transplant / water)
  - Grower
  - Pesticide applicator
  - External service

- **Must be an acknowledged responsibility**
- **Informal doesn’t work as well**
- **Meet formally at least weekly**
Pest Management Units

- A contiguous area that gets scouted, monitored and treated
  - A bench
  - A bay
  - A crop?

- Should be a physical location for consistency and ease of record keeping
General Supplies

- Hands-free, visor type, jewelers loupe
- 10X hand lens
- Sample bottles & waterproof pens
- 3-5 different color 18-24” long colored flags
  - Not yellow or green
- PDA with database / spreadsheet software
- Digital camera with macro setting (?)
- Apron with pockets
Scouting Kit
Pest Specific Supplies

- Yellow sticky cards and tall stakes (or string)
- Potato slices
- Pheromone traps
- ELISA virus test kits
  - Yeah, right, send it to Laura or Tamla
Scouting

- Visual inspection of plant material looking for “new” problems
- Slow “walk-through” of PMU
- Inspect plants with naked eye, loupe or lens
- Better training gives better results
- Pest problem dictates where you “scout”
  - Insects, foliar diseases—leaf surfaces
  - Root rots—unpot and survey roots
How do I scout?

• **No fixed number of plants**
  
  – More plants inspected = more time = more problems caught sooner
  
  – One plant in 100 (1000, 10000), randomly selected
  
  – Slow walk-through up and down each side of each bench
  
  – Stop every 5-10 ft and inspect
  
  – 3-10 minutes per 1000 ft²
How

• Every hundred plants or so, stop and “scout”
  – Visually survey upper leaf surface and terminals for insects / distortions
  – Tap open flowers onto white paper, count thrips
  – Pick up pot and gently drop it onto bench to see what flies off
  – Pick up pot, turn it over and visually survey lower leaf surfaces for larvae / adults
  – Un-pot and survey roots on soil surface for discoloration – look for sloughing
What to record

- **Average number of single life stage per leaf**
- **Number of lesions**
- **Numbers per card grid per side**
- **Be consistent week to week**
- **Enter everything into a spreadsheet**
Then what?

- Record your results for EVERY plant inspected
- Summarize results for each PMU
- If problem is found, flag the plant with the color of the day and record flag color on scout form
- Make a graph to help visualize what’s happening
Thrips population in wheat greenhouse

Date

- 4/9
- 4/14
- 4/19
- 4/24
- 4/29
- 5/4
- 5/9
- 5/14
- 5/19

New thrips / sq. inch

0.00
1.00
2.00
3.00
4.00
Monitoring

• Checking existing problems for increase or control efficacy
  – Is your spray really working?
  – Only the bug knows
Sticky Cards

- One sticky card for each PMU or 1000 ft², whichever is greater
  - Every card has PMU, Date and side number.
- Use yellow for general trapping, blue for thrips only
- Use “gridded” cards, count only center of cards
- Orient cards vertically with face north and south
- Place cards near entrance points or “most likely” places (most insects blow in)
Sticky Card

Count these squares
Mass Trapping
Monitoring Station
Monitoring Station
Things to look for

- **Thrips**
  - Feeding injury ‘scrapes’, larvae in flower buds
- **Aphids**
  - Cast-off skins, distorted leaves, honeydew
- **Whiteflies**
  - Telltale “fliers”
  - Eggs, larvae, adults on undersides of leaves
Thrips
Aphids
GHWF Characteristics

- “Hairs” around body margin of nymph
- Wing position of adult
Things to look for

- **Mites**
  - yellow speckling on inside leaves
  - Adults with red ‘eye-spots’ on under side of leaf
  - Webbing (too late)

- **Fungus Gnats**
  - Fliers (distinct) and walkers (distinct)
  - Larvae on underside of potato slice
  - Injury on leaves very near soil surface
Things to look for

- **Mildews**
  - Distorted leaves
  - *White mycelium on young leaves*

- **Scabs / Rusts**
  - ‘*Dusty*’ sporulation on leaves
Weeds

• Get rid of them, both Inside AND Outside the greenhouse
  – Sources of viruses
  – Reservoir of bugs and diseases
  – Usually go unnoticed because people ‘get used to them’

• DON’T – enough said
Diseases

- Fungal
- Bacterial
- Viral

- Foliar
- Soil
Foliar Fungi

• **Symptoms**
  - Spots ranging in size from pinpoints to quarters
  - Some can also cause stem cankers
  - May have ‘gray, powdery’ mold on leaf surface
Foliar Bacteria

- **Symptoms**
  - Small brown spots often with yellow halos (*Xanthomonas*)
  - Brown spots 1/8 inch or more across with tan centers; can encompass an entire leaf (*Pseudomonas*)
  - Infected area may have a greasy, water-soaked appearance (*Pseudomonas*)
Damping Off / Root Fungi

• Symptoms
  – Stem rots near the soil surface; seedling falls over
  – Seed decays in the soil before or after germination
  – Root rots after plant is germinated and growing
    (stunting first, then plant dies)
Geranium with *Pythium* root rot

*Rhizoctonia* damping-off of vinca
Rhizoc stem canker
**Thielaviopsis Root Rot**

218 *Thielaviopsis* root rot: Root tips are quite black, darker than a typical *Pythium* infection.

219 *Thielaviopsis* root rot: Roots blacken.
Cortical Sloughing
Geranium Root Rot
Rhizoctonia Root Rot
Pythium Root Rot

Above ground symptoms of black root rot on pansies.
Viruses

- Symptoms
  - Brown or black spots on leaves
  - Yellow, black or necrotic rings or oakleaf patterns on leaves, stems or flowers
  - Wilting or stunting
  - Tip dieback
  - Chlorotic mottle or mosaic on foliage
Damage Action Thresholds

- **Do you need to treat the problem?**
  - Knee-jerk is YES – SPRAY, SPRAY SPRAY!
  - But, in reality, you may be OK with out it
    - e.g. low levels of thrips on plants destined for the landscape market

- **How do you know?**

- **Develop thresholds**
Economic Threshold
Economic Threshold

- Different for each pest, crop & time
  - White fly threshold different for poinsettias
    - (near 0)
  - Compared to tomatoes
    - (10-20 per plant)
  - When is “harvest”?
Control Options

• Another Lecture Entirely
Sources of Info

Integrated Pest Management for Floriculture and Nurseries

Publ. #3402  $45.00 + SH

http\www.anrcatalog.ucdavis.edu
WHO TO CALL

Laura Pottorff
Regional Greenhouse Specialist
Colorado State University
Adams County Cooperative Extension
303.637.8111
LPottorff@co.adams.co.us

John Ray
jar18@lamar.colostate.edu
Sorry Laura

John A. Ray
Colorado State University
Research Associate
W.D. Holley Floriculture Research Program
Department of Horticulture & L. A.
111 Shepardson Bldg
Fort Collins CO 80523-1173
970.491.4615 (Office)
970.491.7745 (FAX)
jar18@lamar.colostate.edu
Thanks!

• Dr. Steve Newman
• Dr. Laura Pottorff
• Dr. Tamla Blunt
  – And so many other people whom I’ve lifted (borrowed, stolen) material from!