# Pest Control in Greenhouses

1. What kind of needs does your site have?
    a. Research = low pest tolerance
    b. Public Spaces = low pesticide tolerance
    c. Collections/Educational = may want "example" pests
    d. Biotrons = may have tight containment, low pest tolerance
2. Determine pest thresholds, type of treatment that fits your needs
    a. Chemical?
    b. Biological?
    c. Cultural? (should be used to some degree in ALL situations!)
3. **COMMUNICATE** your needs to staff, others involved in your project

# Types of Pests

## Insects and Mites

1. Aphids
    a. Hemipteran; piercing/sucking phloem feeders
    b. All sorts of colors (green, black); different species on different hosts or groups of plants
    c. Produce honeydew
        i. Secondary pests may be attracted – fungi and ants
    d. Spread viruses
    e. Reproduce quickly, usually aesexually – live young
2. Whiteflies
    a. Hemipteran; piercing/sucking phloem feeders
    b. Can cause plant stunting, yellowing, leaf drop
    c. Adults fly, can spread viruses
    d. Immature stage looks very different, non-motile
3. Spider mites
    a. Mite, not insect. Young = 6 legs, adult = 8 legs
    b. Cause "stippling" damage (little white spots of dead cells), webbing
    c. Wide range of hosts (roses, corn, oxalis, carrots, etc.)
    d. Prefer hot, dry conditions
4. Thrips
    a. Thysanopteran; rasp cells open, suck up fluids
    b. Cause silvery patches of dead cells, with tiny black dots (frass)
    c. May move or eat pollen (some species)
    d. Can vector disease
    e. Hide in tight spaces, flowers, etc.

5. Shore Flies
    a. Do not feed on healthy plant tissue (both larvae and adult)
    b. Larvae = no black head capsule
    c. Nuisance pest (appearance, ingestion)
6. Fungus Gnat
    a. Adult = nonfeeding, larvae = feeds on plant roots, fungi, decaying organic matter
    b. Can create wounds and allow other pathogens to enter, can carry pathogens
    c. Larvae may tunnel into crowns or stems of plants
    d. Larvae = black head capsule
7. Mealybug
    a. Hemipteran; piercing/sucking phloem feeders
    b. White cottony-looking or waxy-looking masses, may have "tails"
    c. Can induce leaf drop, vector diseases. Unsightly
8. Scale
    a. Hemipteran; piercing/sucking phloem feeders
    b. Waxy shield-like coatings; difficult to get rid of, often pesticide resistant due to covering
    c. "soft" scales or "armored" scales (waxy coating or harder cover)
    d. Younger stages mobile, older usually not

## Diseases and Pathogens

9. Powdery Mildew
    a. Fungus; different species have different hosts & host ranges
    b. Can reduce yields, cause leaf distortion or loss
    c. Spreads by spores; needs humidity for spore germination
    d. Can be prevented and controlled, but not cured!
10. Alternaria (early blight)
    a. Fungi (*Alternaria solani*); common on potato, tomato
    b. "bullseye" appearance of brown spots on leaves
    c. Can result in leaf drop, stem damage, spots on fruit (tomato), yield reductions
    d. NOT the same as late blight (*Phytopthera infestans*, oomycete cause of potato famine)
11. Damping off pathogens
    a. Causes seedlings to not emerge, or collapse while young
    b. Pythium, Phytopthera – Oomycete/water molds
    c. Rhizoctonia, Fusarium – Fungi
    d. Avoid wet, heavy, compacted soil, planting too deep, etc.
12. Viruses
    a. Diverse, usually somewhat host specific
    b. Curling, discoloration, stunting, or other growth abnormalities
    c. Transmitted by insects, plant sap contact, nematodes, protozoa, or on/in seeds

Other Animals and Plants

13. Rodents
    a. Outdoor OR indoor
    b. Store seeds carefully, practice exclusion if possible
14. Weeds
    a. Diverse species – yesterday's crop can be tomorrow's weed…
    b. Grow in pots, on floors
    c. Compete with plants for resources
    d. Harbor pests and diseases

# Scouting and IPM

1. Timing
    a. Check all plants weekly, if not more
    b. Tell staff if you see something
2. Techniques
    a. Look at plants for signs, symptoms
        i. Stressed plants = more attractive to pests
        ii. Check high traffic areas, near doors
        iii. Check all life stages, species
    b. Tap test
        i. If ok to touch plants
    c. Stickycards
3. State of pest
    a. Alive? Causing damage?

# Control methods

1. Cultural
    a. Sanitation – remove dead/dying plants, debris, infested plants
    b. Exclusion – don't let them in!
        i. Don't bring plants from other sites
        ii. Be aware of hitchikers
        iii. Visit infested areas last
        iv. Screening, air flow, blowers
        v. Close doors
    c. Create unfavorable environments
    d. Movement issues, contamination

        i. Common spaces and tools
        ii. Traffic flow
2. Chemical - Pesticides
    a. Different classes target different organisms, different systems within an insect/mite/fungus
    b. Canola oil to RUP's
    c. Rotation, rotation, rotation!
    d. Must follow labels ("label is law")
    e. Safety, documentation and training may be issues
    f. Look out for phytotoxicity – test treatment on a few plants
    g. Range in effectiveness, cost, application methods and timing
3. Biological – use of another organism to kill/limit pest
    a. May be nematodes, insects, fungi, mites, or bacteria
    b. May be a predator, parasite, competitor, etc.
    c. Can be difficult to strike a balance
    d. Possible to achieve ongoing control with little input
    e. Usually good for public spaces (fewer chemicals)

# Things YOU can do!

1. Keep your plants as healthy as possible = less attractive & vulnerable to pests
2. Look at your plants often, report concerns early
3. Avoid weeds
4. Remove dead/dying/done with material promptly
5. Don't bring in outside plants, "pet" plants
6. Keep hitchikers in mind – visit contaminated spaces last
7. Minimize standing water, algae, puddles
8. If possible, keep conditions unfavorable for pests
    a. (space plants out for good air flow, cooler temps for longer insect life cycles -> less generations & slower population growth)
9. **COMMUNICATE about your project with greenhouse staff – what do you need, and what are you doing? How can we help?**

Questions on this presentation or regarding pest control issues?
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