PLANT PROTECTION IN THE GREENHOUSE
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Plants need to be protected against Animals….Insects….and Disease causing organisms.

ANIMALS: usually kept away by physical barrier – wall, fence, netting, greenhouse structure. Mice are probably the only animals that may pose a problem in the greenhouse.

INSECT PESTS:
Perfect ‘controlled’ environment for your plants = perfect environment for insects. CEA can help exclude certain insects from the greenhouse with insect screening.
Large commercial operations (especially tomatoes, peppers) use bees for flower pollination.
Therefore, traditional insecticides are not normally used. This is a ‘plus’ for marketing = “pesticide free”. If no insecticides are used, the grower needs other control measures.
Insects can cause significant damage to plants –
Physical damage to the roots or stem (disrupts water/nutrient transport; plant collapse).
Physical damage to the leaves (disrupts photosynthetic output).
Physical damage to the ‘saleable’ portions (fruit, leaves, flowers, etc.).
Transmission of toxins into the plant.
Transmission of bacteria, fungi or viruses that then cause disease.

Insects that typically cause damage in a greenhouse setting, include:
Aphids: 6 legs, “roundish” body, several colors (white, tan, black).
Damage: suck plant sap/reducing growth; “honeydew” drops on lower leaves and fruit; promotes sooty mold which reduces PS; toxic substances and viruses can be injected.
Control/Natural Enemies: Gall midge (Aphidoletes aphidimyza), Parasitic wasp (Aphidius matricariae), Verticillium lecanii, Lady Bird Beetle (Hippodamia convergens) and Lacewing (Chrysoperla carnea).

Red Spider Mites (Tetranychus urticae and T.cinnabarinus): 8 legs, ovoid, many colors.
Damage: suck plant sap; destroy chlorophyll (yellow patches); produce webbing.
Control/Natural Enemies: Dusting sulfur (do not dust beneficials or bees!), predatory mite (Phytoseiulus persimilis).

Russet Mites (Eriophyid–Aculops lycopersici): microscopic, 4 legs, body = head + mouth.
Damage: on tomato, russet color on stem; collapse of leaf tissue; scarring of fruit.
Control/Natural Enemies: Dusting sulfur (do not dust beneficials or bees!), Cinnamite®.

Thrips (Thrips tabaci, T.fuscipennis, Frankliniella occidentalis): 6 legs, long narrow tan.
Damage: Larvae suck out cell contents, cell dies turns silvery; black spots = excrement; damage to fruit and flowers; transmission of Tomato Spotted Wilt Virus.
Control/Natural Enemies: Predatory mites (Amblyseius barkeri and A cucumeris), predatory bugs (genus Orius), Verticillium Lecanii.

White Fly: (Trialeurodes vaporariorum and Bemisia tabaci): 6 legs, like a small white housefly
Damage: suck plant sap; “honeydew” drops on lower leaves and fruit; promotes sooty mold; transmit viruses.

Control/Natural Enemies: Parasitic wasps (*Encarsia Formosa* and *Eretmocerus eremicus*) and *Verticillium lecanii*.

**Butterflies and Moths (Order Lepidoptera):** 6 legs, variable size, 2 pairs of wings.
Damage: feed on leaves; bore through stems/flowers/fruit; excrement contaminates the crop.
Control/Natural Enemies: “BT”, *Bacillus thuringiensis* var. *kurstaki*.

**Shore flies and fungus gnats:** look like miniature houseflies or mosquitoes, respectively.
Damage: no significant direct harm, but can transmit pathogenic fungi and viruses.
Control/Natural Enemies: *Bacillus Thuringiensis* (Gnatrol®), soap solution, others.

**DISEASE CAUSING ORGANISMS:** Include fungi, bacteria and viruses.

**Botrytis or gray mold** (*Botrytis cinerea*): on above-ground parts; develops in cool, humid, overcast conditions, and/or with too close plant spacing, and/or poor ventilation.
Damage: includes stem girdling and plant death and damage to leaves and fruit.
Control: adequate ventilation around stems, fungicides (or salts) applied to wounds.

**Pythium and Phytophthora species:** produce zoospores that swim in the solution; attack roots.
Damage: produces wilt and complete plant collapse
Control: sanitation, soaps or surfactants (5-20 ppm) in the nutrient solution

**Powdery mildews:** non-zoosporic; some species are particularly bad on peppers, while others attack cucumbers, lettuce and tomatoes.
Damage: yellow or white powdery patches on leaves reducing photosynthesis.
Control: use resistant varieties and dusting sulfur. Certain “biofungicides” are being tested.

**Tomato Mosaic Virus** – Can be carried on the hands of smokers. Use TMV resistant varieties.
**Tomato Spotted Wilt Virus** – Transmitted by thrips. Control thrips. Use TSWV resistant var.
**Geminiviruses** – Transmitted by white flies. Therefore, control the white fly population.

**BIOLOGICAL CONTROL:** Use one organism (beneficial) to control another (pest)
This is a “knowledge intensive” technique. Pest identification is critical to choosing the proper beneficial. Introduce the beneficial BEFORE the pest population is large.
Beneficials can be attracted to the crop, periodically introduced, or “mass” introduced.

**INTEGRATED PEST MANAGEMENT (IPM):** The prevention and control of pests and diseases using all existing crop protection techniques and strategies
Cleanliness is paramount (seeds, transplants, greenhouse (in/out), hands, tools, irrigation water).
Optimize plant health, avoid plant damage, use resistant/tolerant varieties. Use insect net, floor covering, sticky traps, trap plants, biological control and lastly, pesticides.

Questions?
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Paper # E-125933-03-01. Supported by CEAC, the Controlled Environment Agricultural Center, College of Agriculture and Life Sciences, The University of Arizona. (Plant Protection PatR.doc)