

## Horticulture 334

### Diseases of Greenhouse Crops

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### Diseases of Greenhouse Crops Damping-Off/Seedling Blights

- **Pathogens**
  - *Pythium* spp.
  - *Rhizoctonia solani*
  - *Fusarium* spp.
- **Hosts:** Seedlings of virtually anything
- **Environmental trigger:** Cool, wet soils



### Diseases of Greenhouse Crops Damping-Off/Seedling Blights

- **Control**
  - Use a pasteurized soil mixture
  - Use decontaminated pots, working surfaces and tools
  - Moderate soil moisture
    - Use a soil with adequate drainage
    - DO NOT overwater

### Diseases of Greenhouse Crops Damping-Off/Seedling Blights

- **Control**
  - Germinate seeds at higher temperatures
  - Use fungicides/biological control products to protect seedlings
    - Etridiazole, metalaxyl, mfenoxam, captan
    - *Trichoderma* spp., *Gliocladium* spp.,  
*Streptomyces* spp., *Pseudomonas* spp.,  
*Bacillus* spp.
    - Applied as a seed treatment or soil treatment

### Diseases of Greenhouse Crops Root/Crown Rots

- **Pathogens**
  - *Pythium* spp.
  - *Phytophthora* spp.
  - *Rhizoctonia solani*
  - *Fusarium* spp.
  - *Cylindrocarpon* spp.
  - *Thielaviopsis* spp.
- **Hosts:** Anything and everything
- **Environmental trigger:** Cool, wet soils



### Diseases of Greenhouse Crops Root/Crown Rots

- **Control**
  - Use a soil-less potting mix
  - Pretest soils/mulches/composts for the presence of root rot fungi
  - Moderate soil moisture
    - Use a soil/potting mix with adequate drainage
    - Improve drainage in poorly drained soils/potting mixes
    - DO NOT overwater

### Diseases of Greenhouse Crops Root/Crown Rots

- **Control**
  - Decontaminate infested tools, pots, work areas
  - Decontaminate recycled water
    - Filtration
    - Irradiation
    - Chemical treatment

### Diseases of Greenhouse Crops Root/Crown Rots

- **Control**
  - Use fungicides to prevent infections
    - Etridiazole, metalaxyl, mefenoxam, fosetyl-AI
    - PCNB, thiophanate-methyl, fludioxonil
    - Spray applications or soil drenches
    - Alternate active ingredients (FRAC Codes)
  - Use biopesticides to prevent infections
    - *Trichoderma* spp., *Gliocladium* spp.
    - Incorporated into potting mixes

### Diseases of Greenhouse Crops Powdery Mildews

- **Causes**
  - *Erysiphe* spp.
  - *Uncinula* spp.
  - *Phyllactinia* spp.
  - *Blumeria* spp.
  - *Oidium* spp.
  - *Microsphaera* spp.
  - *Sphaerotheca* spp.
  - *Podosphaera* spp.
  - *Brasiliomyces* spp.
  - *Ovulariopsis* spp.
- **Hosts: Virtually everything**
- **Environmental trigger: High humidity**



### Diseases of Greenhouse Crops Powdery Mildews

- **Control**
  - Remove diseased plant material and debris
  - Reduce humidity
    - Space plants farther apart
    - Increase air flow
  - Grow resistant cultivars/varieties

### Diseases of Greenhouse Crops Powdery Mildews

- **Control**
  - Use fungicides to prevent infections
    - Dinocap, dithiocarbamates, myclobutanil, triadimefon, triforine, sulfur or thiophanate-methyl
    - Baking soda (1.5 Tbsp/gal) and light-weight horticultural oil (3 Tbsp/gal)
    - Apply when humidity >60-70%
    - Alternate active ingredients (FRAC Codes)
    - 7-14 day application interval

### Diseases of Greenhouse Crops Impatiens Downy Mildew

- **Causes**
  - Plasmopara obducens
  - Bremiella sphaerosperma
- **Hosts**
  - Standard garden impatiens (I. walleriana)
  - Balsam impatiens (I. balsamina)
  - Jewelweed (I. pallida, I. capensis)
  - New Guinea impatiens (I. hawkeri) (resistant/tolerant)

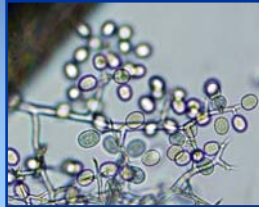
## Diseases of Greenhouse Crops *Impatiens Downy Mildew*

- **Environment trigger**
  - Cool conditions (59 - 73°F)
  - Long leaf wetness periods (> 6 hrs)
  - High humidity



## Diseases of Greenhouse Crops *Impatiens Downy Mildew*

- **Control**
  - Grow immune/resistant/tolerant species
  - Start with clean seed and transplants
  - Move (i.e., rotate) impatiens production
  - Keep materials from different sources physically separated
  - DO NOT overcrowd plants
  - DO NOT overhead water



## Diseases of Greenhouse Crops *Impatiens Downy Mildew*

- **Control**
  - Scout frequently
  - Bag and discard affected plants
    - Symptomatic plants
    - Asymptomatic surrounding plants
  - Disinfest contaminated areas
    - Commercial disinfectants
    - 10% bleach
    - 70% alcohol

## Diseases of Greenhouse Crops *Impatiens Downy Mildew*

- **Control**
  - Use fungicides to prevent infections
    - mefenoxam, fluopicolide, potassium phosphite, mancozeb, pyraclostrobin + boscalid, fluoxastobin, cyazofamid, dimethomorph, fenamidone, azoxystrobin
    - Alternate active ingredients (FRAC Codes)
    - Apply at 7 day application intervals

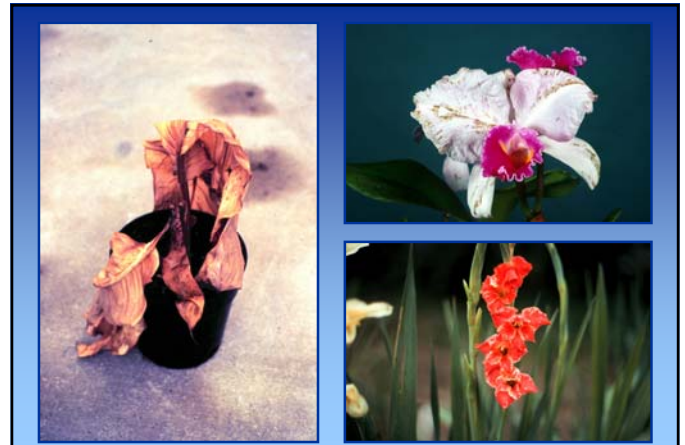


## Diseases of Greenhouse Crops Viral Diseases

- **Pathogens**
  - Many with more discovered all the time
  - Wide-range
    - Impatiens necrotic spot virus (INSV)
    - Tomato spotted wilt virus (TSWV)
    - Tobacco mosaic virus (TMV)
    - Cucumber mosaic virus (CMV)
    - Tobacco rattle virus (TRV)

## Diseases of Greenhouse Crops Viral Diseases

- **Pathogens**
  - Narrow-range
    - Cymbidium mosaic virus (CyMV)
    - Odontoglossum ringspot virus (ORSV)
    - Hosta virus X (HVX)
- **Environmental trigger: None**
- **Transmission: Insect, mechanical, seed**



## Diseases of Greenhouse Crops Viral Diseases

- **Control**
  - Buy plants from a reputable source
  - Inspect plants prior to purchase for disease
  - Test plants prior to purchase (Agdia, Inc. – [www.agdia.com](http://www.agdia.com))
  - DO NOT smoke around plants
  - Control insect vectors
  - Isolate infected plants/remove plant debris

## Diseases of Greenhouse Crops Viral Diseases

- **Control**
  - Remove weed hosts
  - Disinfest contaminated materials
    - 1% Sodium dodecyl sulfate (sodium lauryl sulfate) + 1% Alconox® (2½ Tbsp + 2¼ Tbsp/gal)
    - 20% low fat dry milk (Carnation®) + 0.1% polysorbate 20 (9½ cups + ¼ tsp/gal)
    - Trisodium phosphate (14 dry oz/gal)
    - Alcohol dip followed by flaming

### Diseases of Greenhouse Crops Viral Diseases

- **Control**
  - Wash hands, particularly if you smoke
  - Decontaminate recycled water
  - NO Chemical control

### Diseases of Greenhouse Crops Xanthomonas Leaf Diseases

- **Cause: *Xanthomonas campestris***
  - *pv. poinsetticola*
  - *pv. hederiae*
  - *pv. begoniae*
  - *pv. dieffenbachiae*
  - *pv. pelargonii*
- **Hosts: Varied depending on pathovar**
- **Environmental Trigger: High moisture**



### Diseases of Greenhouse Crops Xanthomonas Leaf Diseases

- **Control**
  - Start with clean propagation materials
  - Follow strict sanitation procedures when working with plant materials
  - Remove symptomatic plants
  - Remove contaminated plant debris
  - Disinfest greenhouses after production

### Diseases of Greenhouse Crops Ralstonia Wilt

- **Cause: *Ralstonia solanacearum***
  - races
  - biovars
- **Hosts**
  - Geranium
  - Many other herbaceous plants
  - Potato
- **Environmental trigger: Warm weather**



### Diseases of Greenhouse Crops **Ralstonia Wilt**

- **Control**
  - Start with clean propagation materials
  - Follow strict sanitation procedures when working with plant materials
    - Keep plants from different sources separated
    - Disinfect pruning tools
    - Disinfect hands when working with plants

### Diseases of Greenhouse Crops **Ralstonia Wilt**

- **Control**
  - If you suspect you have the disease, contact the PDDC/WI DATCP
    - Confirm the disease
    - Remove symptomatic plants
    - Remove co-mingled plants
    - Remove contaminated plant debris
    - Disinfect greenhouses after production

### Diseases of Greenhouse Crops **Foliar Nematodes**

- **Cause:** Aphelenchoides spp.
- **Hosts**
  - Wide host range
  - Houseplants: African violets, ferns, begonia, chrysanthemum
  - Landscape plants: Hosta, coral bells
- **Environmental trigger:** Rain



### Diseases of Greenhouse Crops **Foliar Nematodes**

- **Control**
  - Start with clean propagation materials
  - Follow strict sanitation procedures when working with plant materials
  - Remove symptomatic plants
  - Remove contaminated plant debris
  - Avoid overhead irrigation
  - Hot water treatments (10 minutes at 125°F)

### Diseases of Greenhouse Crops Root Knot Nematodes

- Cause: Meloidogyne spp.
- Hosts
  - Many ornamentals
  - Tomato
- Environmental trigger: None



### Diseases of Greenhouse Crops Root Knot Nematodes

- Control
  - Start with clean materials
  - Grow resistant varieties (N)
  - Use soil-less growing media or pasteurized soil
  - Discard infected plants

### Diseases of Greenhouse Crops Cyst Nematodes

- Cause: Cactodera spp.  
(Cactus cyst nematode)
- Hosts
  - Cacti
  - Other succulents
- Environmental trigger: None



### Diseases of Greenhouse Crops Cyst Nematodes

- Control
  - Start with clean materials
  - Use soil-less growing media or pasteurized soil
  - Discard infected plants



### Diseases of Greenhouse Crops Disease Control

- **Resistance**
- **Exclusion**
- **Protection**
- **Eradication**
- **Avoidance**
- **Therapy**

### Diseases of Greenhouse Crops Disease Control

- **Resistance**
  - Use resistant varieties
  - Use tolerant varieties

### Diseases of Greenhouse Crops Disease Control

- **Exclusion**
  - Buy seed from a reputable source
  - Buy healthy transplants
  - Control insect pests
  - Use non-contaminated water
  - Disinfest, disinfest, disinfest

### Diseases of Greenhouse Crops Disease Control

- **Protection**
  - Use chemical control products
    - Synthetic compounds
    - “Organic” compounds (sulfur, copper, bicarbonate)
  - Use biological control products
    - Bacteria (*Pseudomonas*, *Bacillus*, *Streptomyces*)
    - Fungi (*Trichoderma*, *Gliosporium*, *Coniothyrium*)
    - Plant Extracts (Neem oil)

### Diseases of Greenhouse Crops Disease Control

- **Protection**
  - Use registered/labeled materials only
  - Use products safely
  - Get training

### Diseases of Greenhouse Crops Disease Control

- **Eradication**
  - Properly dispose of old plant debris
  - Remove diseased plants promptly
  - Control weeds
  - Adequately clean pots, tools, etc.
  - Pasteurize soil prior to use
  - Decontaminate recycled water

### *Diseases of Greenhouse Crops Disease Control*

- **Avoidance**
  - *Moderate soil moisture*
  - *DO NOT overhead water if possible*
  - *Adjust plant spacing to reduce humidity*
  - *Have balanced nutrition*
  - *Prevent water/heat stress*
  - *Remove senescent plant parts promptly*

### *Diseases of Greenhouse Crops Disease Control*

- **Therapy**
  - *Hot water treatments*
    - *Whole plants*
    - *Seeds*  
*“Hot-Water Seed Treatment for Disease Management”*  
*(<https://pddc.wisc.edu/fact-sheet-listing-all/>)*
  - *Chemical treatments*

### *Diseases of Greenhouse Crops Where to Go for Help*

*Plant Disease Diagnostics Clinic  
Department of Plant Pathology  
University of Wisconsin-Madison  
1630 Linden Drive  
Madison, WI 53706-1598  
(608) 262-2863  
[pddc@wisc.edu](mailto:pddc@wisc.edu)  
<http://pddc.wisc.edu>  
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