

## Advanced Master Gardener Training

### Diseases of Herbaceous Ornamentals

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### Diseases of Herbaceous Ornamentals Damping-Off/Seedling Blights

- **Causes**
  - Pythium spp.
  - Rhizoctonia solani
  - Fusarium spp.
- **Hosts:** Any herbaceous ornamental
- **Favorable environment**
  - Cool soil temperatures
  - Wet soils



### Diseases of Herbaceous Ornamentals Damping-Off/Seedling Blights

- **Control**
  - Use a pasteurized soil mixture
  - Use decontaminated pots, working surfaces and tools
    - 10% bleach
    - 70% alcohol
    - Commercial disinfectants

### Diseases of Herbaceous Ornamentals Damping-Off/Seedling Blights

- **Control**
  - Moderate soil moisture
    - Use a soil with adequate drainage
    - DO NOT over-water
  - Germinate seeds at higher temperatures

### Diseases of Herbaceous Ornamentals Damping-Off/Seedling Blights

- **Control**
  - Use fungicides to protect seedlings
    - Captan
    - Streptomyces lydicus
    - Trichoderma spp., Gliocladium spp., Pseudomonas spp., Bacillus spp.
    - Apply as a seed treatment or drench

## Diseases of Herbaceous Ornamentals Powdery Mildews

- **Cause**

- *Erysiphe* spp.
- *Uncinula* spp.
- *Phyllactinia* spp.
- *Blumeria* spp.
- *Oidium* spp.
- *Microsphaera* spp.
- *Sphaerotheca* spp.
- *Podosphaera* spp.
- *Brasiliomyces* spp.
- *Ovulariopsis* spp.

- **Hosts: Virtually anything**

- **Favorable environment: High humidity**



## Diseases of Herbaceous Ornamentals Powdery Mildews

- **Control**

- Remove diseased plant material and debris
  - Burn (where allowed)
  - Deep bury
  - Hot compost
- Reduce humidity
  - Plant less densely
  - Thin existing stands
- Use resistant cultivars/varieties

## Diseases of Herbaceous Ornamentals Powdery Mildews

- **Control**

- Use fungicides to prevent infections
  - Dithiocarbamates, myclobutanil, propiconazole, tebuconazole, thiophanate-methyl
  - Sulfur, neem oil, other plant-based oils
  - Baking soda (1.5 Tbsp/gal) and light weight horticultural oil (3 Tbsp/gal)
  - Alternate active ingredients (FRAC Codes)
  - Apply when humidity >60-70%
  - Apply at 7-14 day intervals

## Diseases of Herbaceous Ornamentals Impatiens Downy Mildew

- **Cause: *Plasmopara obducens***

- **Hosts**

- Standard garden impatiens (*I. walleriana*)
- Balsam impatiens (*I. balsamina*)
- Jewelweed (*I. pallida*, *I. capensis*)
- New Guinea impatiens (*I. hawkeri*) (resistant/tolerant)



### Diseases of Herbaceous Ornamentals *Impatiens Downy Mildew*

- **Control**
  - DO NOT grow impatiens in the same location every year
  - Grow tolerant/resistant/immune plants
  - Start with clean transplants and seed
  - Keep materials from different sources physically separated
  - DO NOT overcrowd plants
  - DO NOT overhead water

### Diseases of Herbaceous Ornamentals *Impatiens Downy Mildew*

- **Control**
  - Watch carefully for the disease
  - Bag and discard affected plants
    - Symptomatic plants
    - Asymptomatic surrounding plants
  - Disinfect contaminated materials
    - 70% alcohol
    - Commercial disinfectants
    - 10% bleach

### Diseases of Herbaceous Ornamentals *Impatiens Downy Mildew*

- **Control**
  - Use fungicides to prevent infections
    - Mancozeb
    - Apply at 7 day intervals

### Diseases of Herbaceous Ornamentals *Daylily Leaf Streak*

- Cause: *Aureobasidium microstictum*
- Host: *Daylily*



## Diseases of Herbaceous Ornamentals Daylily Leaf Streak

- **Control**
  - Promote rapid drying of leaves
    - Divide large clumps
    - Plant less densely
  - DO NOT overhead water
  - Remove diseased leaves and plant debris
    - Burn (where allowed)
    - Deep bury
    - Hot compost

## Diseases of Herbaceous Ornamentals Daylily Leaf Streak

- **Control**
  - Use varieties that are less susceptible
    - 'Betty Bennet', 'Edna Spalding', 'Ella Pettigrew', 'Globe Trotter', 'Nancy Hicks', 'Pink Superior', 'Ron Rousseau', 'Sudie', 'Tropical Tones', 'Upper Room', 'Winsome Lady'
  - Use fungicides to prevent infections
    - Chlorothalonil, mancozeb, thiophanate-methyl
    - Alternate active ingredients (FRAC Codes)
    - Apply at 7-14 day intervals

## Diseases of Herbaceous Ornamentals Hollyhock Rust

- **Pathogen:** *Puccinia malvacearum*
- **Hosts**
  - Hollyhock
  - Other plants in the mallow family
- **Favorable environment**
  - Wet weather
  - Cool to moderate temperatures



## Diseases of Herbaceous Ornamentals Hollyhock Rust

- **Control**
  - Buy rust-free hollyhock plants
  - Grow rust resistant hollyhock varieties
  - Remove weedy mallow species
  - Promote rapid drying of leaves
    - Plant less densely
    - Thin existing plant stands
  - DO NOT overhead watering
  - DO NOT overwater

## Diseases of Herbaceous Ornamentals Hollyhock Rust

- **Control**
  - Remove diseased leaves and plant debris
    - Burn (where allowed)
    - Deep bury
    - Landfill

## Diseases of Herbaceous Ornamentals Hollyhock Rust

- **Control**
  - Use fungicides to prevent infections
    - Chlorothalonil, mancozeb, myclobutanil, tebuconazole, triticonazole
  - Alternate active ingredients (FRAC Codes)
  - Apply during periods of high moisture (particularly early in the growing season)
  - Apply at 7-14 day intervals

## Diseases of Herbaceous Ornamentals Botrytis Blight/Gray Mold

- **Pathogen:** Botrytis cinerea
- **Hosts**
  - Virtually any herbaceous plant
  - Flowering plants
    - Geranium
    - Peony
    - Dahlia
- **Favorable environment:** Wet weather



## Diseases of Herbaceous Ornamentals Botrytis Blight/Gray Mold

- **Control**
  - Remove infested plant debris/infect plant parts
    - Burn (where allowed)
    - Deep bury
    - Hot compost
  - Remove senescing plant parts
  - Promote rapid drying
    - Plant less densely
    - Thin existing plant stands

## Diseases of Herbaceous Ornamentals Botrytis Blight/Gray Mold

- **Control**
  - DO NOT overhead water
  - DO NOT overwater
  - Use fungicides to prevent infections
    - Chlorothalonil, copper-containing fungicides, fludioxonil, mancozeb, thiophanate-methyl
  - Alternate active ingredients (FRAC Codes)
  - Apply during periods of high moisture
  - Apply at 7-14 day intervals

## Diseases of Herbaceous Ornamentals Xanthomonas Leaf Diseases

- **Causes:** Xanthomonas spp.
- **Hosts**
  - Geranium
  - Poinsettia
  - Anthurium
  - Begonia
  - Ivy
  - Others
- **Favorable environment:** Wet weather



## Diseases of Herbaceous Ornamentals *Xanthomonas* Leaf Diseases

- **Control**
  - Inspect plants before purchase for symptoms
  - Promote rapid drying of leaves
    - Plant less densely
    - Thin dense stands
  - DO NOT overhead water
  - DO NOT handle plants when wet
  - Be cautious carrying over plants from year to year

## Diseases of Herbaceous Ornamentals *Xanthomonas* Leaf Diseases

- **Control**
  - Remove diseased leaves and plant debris
    - Burn (where allowed)
    - Deep bury
    - Hot compost
  - Disinfect contaminated materials
    - 70% alcohol
    - Commercial disinfectants
    - 10% bleach

## Diseases of Herbaceous Ornamentals *Xanthomonas* Leaf Diseases

- **Control**
  - DO NOT use bactericides for control

## Diseases of Herbaceous Ornamentals *Ralstonia* Wilt

- **Cause:** *Ralstonia solanacearum*
  - Races (host range-based classification)
  - Biovars (sugar usage-based classification)
- **Hosts**
  - Geranium
  - Other herbaceous ornamentals
  - Vegetables
    - Potato
    - Tomato

## Diseases of Herbaceous Ornamentals *Ralstonia* Wilt

- **Favorable environment**
  - Warm temperatures
  - Wet weather



### Diseases of Herbaceous Ornamentals *Ralstonia Wilt*

- **Control**
  - Inspect plants before purchase for symptoms
  - Keep plants from different sources separated
  - Disinfect contaminated materials
    - 70% alcohol
    - Commercial disinfectants
    - 10% bleach
  - Routinely wash hands with soap and water when working with plants

### Diseases of Herbaceous Ornamentals *Ralstonia Wilt*

- **Control**
  - If you suspect that you have this disease, contact the PDDC!

### Diseases of Herbaceous Ornamentals *Aster Yellows*

- **Pathogen:** *Aster yellows phytoplasma*
- **Hosts**
  - Many plants in the Asteraceae (aster family)
  - Many other plants in many other plant families
- **Favorable environment:** None
- **Vector:** *Aster leafhopper*



### Diseases of Herbaceous Ornamentals *Aster Yellows*

- **Control**
  - Remove diseased plant material and debris
    - Hot compost
    - Bury
    - Burn (where allowed)
  - Control leafhopper vector (?)

## Diseases of Herbaceous Ornamentals Tobacco Mosaic

- **Cause:** Tobacco mosaic virus (TMV)
- **Hosts**
  - Many herbaceous ornamentals
  - Many vegetables
- **Favorable environment:** None
- **Transmission: Mechanical**
  - Touch
  - Tools



## Diseases of Herbaceous Ornamentals Tobacco Mosaic

- **Control**
  - Buy plants from reputable sources
    - Inspect plants for symptoms of TMV
    - Test plants for TMV
  - DO NOT smoke around plants
  - Wash hands routinely with soap and water
  - Keep weeds under control
  - Landfill diseased plants and plant debris

## Diseases of Herbaceous Ornamentals Tobacco Mosaic

- **Control**
  - Disinfest contaminated materials
    - 1% Sodium dodecyl sulfate (sodium lauryl sulfate) + 1% Alconox® (2½ Tbsp + 2¾ 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
  - DO NOT use chemical controls on plants

## Diseases of Herbaceous Ornamentals Cucumber Mosaic

- **Cause:** Cucumber mosaic virus (CMV)
- **Hosts**
  - Many herbaceous ornamentals
  - Many vegetables
- **Favorable environment:** None
- **Transmission**
  - Insects (aphids)
  - Mechanical





## Diseases of Herbaceous Ornamentals Cucumber Mosaic

- **Control**
  - Buy plants from reputable sources
    - Inspect plants for symptoms of CMV
    - Test plants for CMV
  - Keep weeds under control
  - Remove diseased plants and plant debris
    - Burn (where allowed)
    - Deep bury
    - Hot compost

## Diseases of Herbaceous Ornamentals Cucumber Mosaic

- **Control**
  - Disinfect 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
  - DO NOT use chemical controls on plants
  - DO NOT use insecticides for aphid control

## Diseases of Herbaceous Ornamentals Tospovirus Diseases

- **Diseases**
  - Tomato spotted wilt
  - Impatiens necrotic spot
- **Causes**
  - Tomato spotted wilt virus (TSWV)
  - Impatiens necrotic spot virus (INSV)

## Diseases of Herbaceous Ornamentals Tospovirus Diseases

- **Hosts**
  - Many herbaceous ornamentals
  - Many vegetables
- **Favorable environment: None**
- **Transmission**
  - Insects (thrips)
  - Mechanical



## Diseases of Herbaceous Ornamentals Tospovirus Diseases

- **Control**
  - Buy plants from reputable sources
    - Inspect plants for symptoms of TSWV/INSV
    - Test plants for TSWV/INSV
  - Keep weeds under control
  - Remove diseased plants and plant debris
    - Burn (where allowed)
    - Deep bury
    - Hot compost

## Diseases of Herbaceous Ornamentals Cucumber Mosaic

- **Control**
  - Use insecticides to control thrips
  - Disinfest contaminated materials
    - 1% Sodium dodecyl sulfate (sodium lauryl sulfate) + 1% Alconox® (2½ Tbsp + 2¾ Tbsp/gal)
    - 20% low fat dry milk (Carnation®) + 0.1% polysorbate 20 (9% cups + ¼ tsp/gal)
    - Trisodium phosphate (14 dry oz/gal)
    - Alcohol dip followed by flaming
  - **DO NOT** use chemical controls on plants

## Diseases of Herbaceous Ornamentals Hosta Virus X

- **Cause:** Hosta virus X (HVX)
- **Host:** *Hosta*
  - ‘Gold Edger’, ‘Gold Standard’, ‘Golden Tiara’, ‘Striptease’, ‘Sum and Substance’
- **Favorable environment:** None

## Diseases of Herbaceous Ornamentals Hosta Virus X

- **Transmission: Mechanical**
  - Tools
    - Shovels
    - Knives
    - String edgers
    - Lawnmowers
  - Touch



## Diseases of Herbaceous Ornamentals Hosta Virus X

- **Control**
  - Buy hostas from reputable sources
    - Inspect hostas for symptoms of HVX
    - Test hostas for HVX
  - Keep new and established hostas separated
  - Remove diseased plants and plant debris
    - Burn (where allowed)
    - Deep bury
    - Hot compost

## Diseases of Herbaceous Ornamentals Hosta Virus X

- **Control**
  - Disinfest contaminated materials
    - 1% Sodium dodecyl sulfate (sodium lauryl sulfate) + 1% Alconox® (2½ Tbsp + 2¾ Tbsp/gal)
    - 20% low fat dry milk (Carnation®) + 0.1% polysorbate 20 (9% cups + ¼ tsp/gal)
    - Trisodium phosphate (14 dry oz/gal)
    - Alcohol dip followed by flaming
  - **DO NOT** use chemical controls on plants

## Diseases of Herbaceous Ornamentals Tobacco Rattle

- **Cause: Tobacco Rattle Virus**
- **Hosts**
  - **Ornamentals**
    - Astilbe, bleeding heart, columbine, coral bells, daffodils, epimedium, gladiolus, hyacinth, marigold, peony, tulip, vinca
  - **Vegetables**
    - Beans, beet, pepper, potato, spinach
- **Favorable environment: None**

## Diseases of Herbaceous Ornamentals Tobacco Rattle

- **Transmission**
  - **Stubby-root nematodes**
    - *Trichodorus* spp.
    - *Paratrichodorus* spp.
  - **Mechanical**
  - **Grafting**
  - **Seed**



## Diseases of Herbaceous Ornamentals Tobacco Rattle

- **Control**
  - **DO NOT buy symptomatic plants**
  - **Grow non-susceptible plants**
    - Annual phlox, carnation, devil's trumpet (downy thorn-apple), sweet William, zinnia, zombie cucumber
  - **Remove and destroy infected plants**
    - Burn (where allowed)
    - Deep bury
    - Hot compost

## Diseases of Herbaceous Ornamentals Tobacco Rattle

- **Control**
  - **Disinfect contaminated materials**
    - 1% Sodium dodecyl sulfate (sodium lauryl sulfate) + 1% Alconox® (2½ Tbsp + 2¾ Tbsp/gal)
    - 20% low fat dry milk (Carnation®) + 0.1% polysorbate 20 (9½ cups + ¾ tsp/gal)
    - Trisodium phosphate (14 dry oz/gal)
    - Alcohol dip followed by flaming
  - **DO NOT attempt to control stubby-root nematodes**

## Diseases of Herbaceous Ornamentals Tobacco Rattle

- **Control**
  - **DO NOT use chemical controls on plants**
  - **DO NOT attempt to control stubby-root nematodes**

## Diseases of Herbaceous Ornamentals Foliar Nematode

- **Cause:** *Aphelenchoides* spp.
- **Hosts**
  - Many types of herbaceous plants
  - Landscape plants
    - Hosta, begonia, coral bells, miterwort
  - Houseplants
    - African violets, ferns, chrysanthemum
- **Favorable environment:** Wet weather



## Diseases of Herbaceous Ornamentals Foliar Nematode

- **Control**
  - Inspect plants prior to purchase for symptoms
  - Avoid overhead irrigation
  - Remove symptomatic plants and infested plant debris
    - Burn (where allowed)
    - Deep bury (landfill)
    - Hot compost

## Diseases of Herbaceous Ornamentals Foliar Nematode

- **Control**
  - Disinfest contaminated materials
    - 70% alcohol
    - Commercial disinfectants
    - 10% bleach
  - Hot water treatments (10 minutes at 125°F)
  - DO NOT use nematicides

## Diseases of Herbaceous Ornamentals Southern Blight

- **Pathogen:** *Sclerotium rolfsii*
- **Hosts**
  - Many herbaceous annuals and perennials
    - Hosta
    - Bedding plants
  - Some woody ornamentals
- **Favorable environment**
  - Warm soil temperatures
  - Wet soils



## Diseases of Herbaceous Ornamentals Southern Blight

- **Control**
  - DO NOT buy infected/infested plants
  - Avoid cocoa mulch (?)
  - Remove infected plants, mulch and soil
    - Double bag
    - Landfill
  - Disinfect contaminated materials
    - 70% alcohol
    - Commercial disinfectants
    - 10% bleach

## Diseases of Herbaceous Ornamentals Southern Blight

- **Control**
  - Amend soil with organic matter (?)
  - Use fungicides for control
    - Contract with a professional pesticide applicator
    - Azoxystrobin, flutolanil, flutolanil + thiophanate-methyl, PCNB, tebuconazole, triadimefon
    - Alternate active ingredients (FRAC codes)
    - Apply 14 – 28 day intervals
  - Pray for a really, really, REALLY cold winter

## Diseases of Herbaceous Ornamentals Root/Crown Rots

- **Pathogens**
  - Pythium spp.      – Phytophthora spp.
  - Rhizoctonia solani      – Fusarium spp.
  - Cylindrocarpon spp.      – Thielaviopsis spp.
- **Hosts: Any herbaceous plant**
- **Favorable environment**
  - Cool soil temperatures
  - Wet soils



## Diseases of Herbaceous Ornamentals Root/Crown Rots

- **Control**
  - Moderate soil moisture
    - Grow ornamentals in well-drained sites
    - Use a potting soil with adequate drainage
    - Improve drainage in poorly drained yard soils
      - Add organic matter to improve drainage
      - Use raised beds
  - DO NOT overwater
  - DO NOT overmulch

## Diseases of Herbaceous Ornamentals Root/Crown Rots

- **Control**
  - Pretest soils/mulches/composts
  - Use a soil-less potting mix or pasteurized potting mixes for containerized plants
  - DO NOT move contaminated soil or plants
  - Disinfect contaminated materials
    - 70% alcohol
    - Commercial disinfectants
    - 10% bleach

## ***Diseases of Herbaceous Ornamentals Root/Crown Rots***

- ***Control***
  - ***Use fungicides to prevent infections***
    - ***Contract with a professional pesticide applicator***
    - ***Etridiazole, metalaxyl, mefenoxam, fosetyl-AI, PCNB, thiophanate-methyl, fludioxonil***
    - ***Alternate active ingredients (FRAC codes)***
    - ***Use granular formulations if possible***
    - ***Use during periods of wet weather***

## ***Diseases of Herbaceous Ornamentals Root/Crown Rots***

- ***Control***
  - ***Use biopesticides to prevent infections***
    - ***Trichoderma, Gliocladium***
    - ***Use for potted plants***
    - ***Exercise caution when combining with chemical fungicides***

## ***Diseases of Herbaceous Ornamentals 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  
<http://pddc.wisc.edu>***

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