Invasive Plant Pathogens

Dutch Elm Disease

- **Causes**
  - *Ophiostoma ulmi*, *Ophiostoma novo-ulmi* (*Ceratocystis ulmi*)
  - *Pesotum ulmi* (*Graphium ulmi*)
  - *Sporothrix* stage
  - Yeast stage

- **Hosts**
  - Highly susceptible elms
    - American, Belgian, English, red, rock, September, European white, winged
  - Elms of intermediate susceptibility
    - Cedar, European field (smooth-leaf), wych (Scots)

- **Favorable environment**
  - Cool, wet weather (for infection)
  - Hot, dry weather (for symptom expression)

- **Transmission**
  - Elm bark beetles
    - *Scolytus multistriatus* (European)
    - *Hylurgopinus rufipes* (Native)
  - Root grafts
    - Major method of movement in clumps of elms
    - *Ophiostoma ulmi* can reach the roots during the first season of infection
**Invasive Plant Pathogens**

**Dutch Elm Disease**

- **Control**
  - Remove diseased elms
  - Disrupt root grafts
    - Mechanically (vibratory plow or trenching machine)
    - Chemically (soil fumigant)
    - Physical barriers
  - Be careful using elm wood
    - Remove bark
    - Cover wood

- **Mechanically**
- **Chemically**
- **Physical barriers**

- **Remove bark**
- **Cover wood**

**Invasive Plant Pathogens**

**Dutch Elm Disease**

- **Control**
  - Plant resistant elms
    - Crosses between American and other elms
  - True American elms
    - ‘American Liberty’
    - ‘Independence’
    - ‘Princeton’
    - ‘Valley Forge’
    - ‘New Harmony’

- **Crosses between American and other elms**
- **True American elms**
  - ‘American Liberty’
  - ‘Independence’
  - ‘Princeton’
  - ‘Valley Forge’
  - ‘New Harmony’

- **Disinfest pruning tools after routine pruning**
  - 70% alcohol
  - 10% bleach
  - Commercial disinfectants
  - Use fungicides injections
    - Propiconazole, thiabendazole
    - Prophylactic or therapeutic
    - Every 12-24 months

**Invasive Plant Pathogens**

**Dutch Elm Disease**

- **Cause**
  - *Ceratocystis fagacearum* (*Chalara quercina*)
- **Hosts**
  - About 20 species of oak (both “red” and “white”)
  - Chinese chestnut
- **Favorable environment**
  - Cool, wet weather (for infection)
  - Hot, dry weather (for symptom expression)
Transmission – Insects
• Oak bark beetles
  – *Pseudopityophthorus ninutissimus*
  – *Pseudopityophthorus pruinatus*
• Sap beetles
  – *Carpophilus* spp.
  – *Colopterus* spp.
  – *Cryptarcha* spp.
  – *Epuraea* spp.
  – *Clischochilus* spp.

Transmission – Root grafts
• Major method of movement in oak forests
• Often form between trees in the same subgenus
  – Black/red oak group
  – White oak group
• Movement of up to 20-25 ft/year

Control
– DO NOT prune or wound oaks from bud break to 2-3 weeks past full leaf development
– Disrupt root grafts
  • Mechanically (vibratory plow or trenching machine)
  • Chemically (soil fumigant)
  • Physical barriers
– Remove diseased (and healthy) trees

Control
– Be careful using oak wood
  • Remove bark
  • Cover wood
– Use fungicide injections
  • Propiconazole
  • Prophylactic or therapeutic
– Every 12-24 months
**Invasive Plant Pathogens**  
**Chestnut Blight**

- **Cause**
  - *Cryphonectria parasitica* (*Endothia parasitica*)
- **Hosts**
  - American chestnut
  - Other chestnut species (NOT horsechestnut)
  - Some oak species
- **Favorable environment**
  - Cool, wet weather

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**Invasive Plant Pathogens**  
**Chestnut Blight**

- **Control**
  - Grow American chestnut individually and isolated from all other chestnuts
  - Reduce wounding (mechanical and insect)
  - Prune out infected branches and trunks
  - Disinfect pruning tools after routine pruning
    - 70% alcohol
    - 10% bleach
    - Commercial disinfectants

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**Invasive Plant Pathogens**  
**Ramorum Blight/Sudden Oak Death**

- **Cause**: *Phytophthora ramorum*
- **Hosts**
  - Coast live oak, California black oak, Shreve oak, tanoak, big leaf maple, rhododendron, huckleberry, California bay laurel, madrone, manzanita, huckleberry, California honeysuckle, toyon, California buckeye, California coffeeberry, arrowwood, *Viburnum* spp., and many others
  - Northern red oak, northern pin oak (by inoculation)
  - Host list continues to expand
Control
– Buy woody ornamentals from a reputable source
– Inspect plants prior to purchase for symptoms of sudden oak death
– Keep new plants isolated from established plants

Invasive Plant Pathogens
Ramorum Blight/Sudden Oak Death

Invasive Plant Pathogens
Ramorum Blight (Sudden Oak Death)

Invasive Plant Pathogens
Ralstonia Wilt/Brown Rot

Invasive Plant Pathogens
Ralstonia Wilt/Brown Rot

Control
– Remove and destroy infected plants (with the help of WIDATCP and USDA APHIS)
– Contact the PDDC if you believe you have found this disease!

Cause: Ralstonia solanacearum
– Races (3)/biovars (2)
– Phylotypes (II)/sequevars (1,2)

Hosts
– Potato
– Geranium
– Some additional solanaceous plants
– Limited additional hosts

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
– Test suspect plants with dipstick tests
**Invasive Plant Pathogens**

**Ralstonia Wilt/Brown Rot**

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

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**Soybean Rust**

- **Causes**
  - Phakopsora pachyrhizi
  - Phakopsora meibomiae

- **Hosts**
  - Soybean
  - Other economically important legumes
  - Legume weeds (e.g., kudzu)

- **Favorable Environment:** Warm, wet weather

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**Soybean Cyst Nematode**

- **Cause:** Heterodera glycines
- **Host:** Soybean
- **Favorable Environment:** None
Invasive Plant Pathogens

**Soybean Cyst Nematode**

- **Control**
  - Prevent soil movement
  - Decontaminate equipment
  - Rotate to a non-host
  - Plant resistant/tolerant varieties

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**Invasive Plant Pathogens**

**Tar Spot**

- **Causes**
  - *Rhytisma americanum*
  - *Rhytisma acerinum*

- **Hosts:** Maples

- **Favorable Environment:** Cool, wet weather

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**Tar Spot**

- **Cause:** *Sawadaea tulasnei*

- **Host:** Norway maple

- **Environmental trigger:** High humidity

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**Invasive Plant Pathogens**

**Sawadaea Powdery Mildew**

- **Control**
  - **DO NOT panic**
  - Remove diseased leaves
    - Burn
    - Bury
    - Hot compost
  - Use fungicides to prevent infections
    - Copper-containing fungicides
    - At bud break, 1/2 and full leaf expansion
Invasive Plant Pathogens
Sawadaea Powdery Mildew

• Control:
  – DO NOT panic
  – Remove diseased leaf debris
  – Reduce humidity
    • Plant trees less densely
    • Thin branches
  – Produce and use trees other than Norway maple

• 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 with different FRAC codes
    • Apply every 7-14 days

Invasive Plant Pathogens
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@plantpath.wisc.edu
http://pddc.wisc.edu
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