University of Wisconsin-Oshkosh
Environmental Studies 305

Invasive Plant Pathogens

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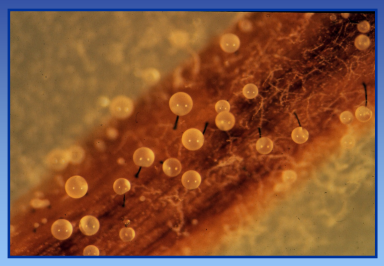
Invasive Plant Pathogens
Dutch Elm Disease

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

Invasive Plant Pathogens
Dutch Elm Disease

- 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)



Invasive Plant Pathogens
Dutch Elm Disease

- 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

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'

Invasive Plant Pathogens
Dutch Elm Disease

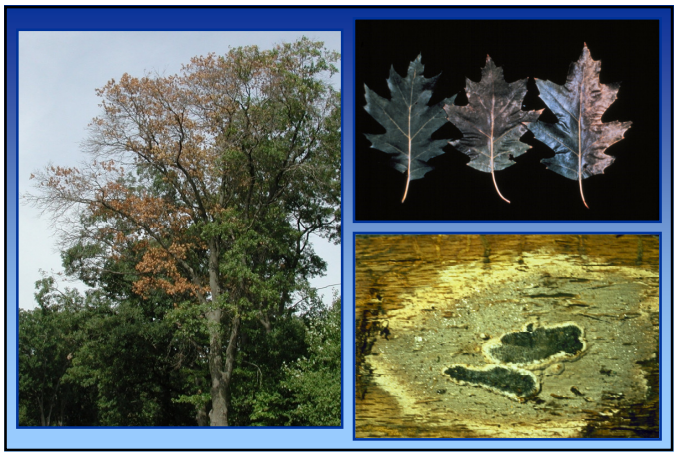
- Control
  - Disinfest pruning tools after routine pruning
    - 70% alcohol
    - 10% bleach
    - Commercial disinfectants
  - Use fungicides injections
    - Propiconazole, thiabendazole
    - Prophylactic or therapeutic
    - Every 12-24 months

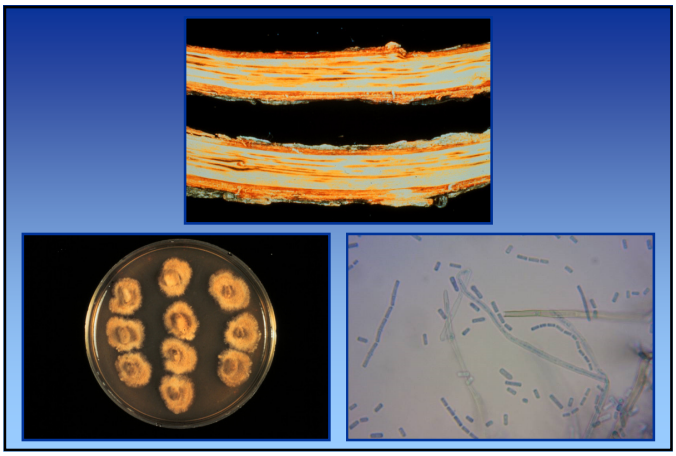
Invasive Plant Pathogens
Dutch Elm Disease

- Control
  - Treatments of dubious use
    - Tracing
    - *Verticillium dahliae*

Invasive Plant Pathogens
Oak Wilt

- 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)





Invasive Plant Pathogens
Oak Wilt

- Transmission
  - Insects
    - Oak bark beetles
      - *Pseudopityophthorus ninutissimus*
      - *Pseudopityophthorus pruinosus*
    - Sap beetles
      - *Carpophilus* spp.
      - *Colopterus* spp.
      - *Cryptarcha* spp.
      - *Epuraea* spp.
      - *Clischrochilus* spp.

Invasive Plant Pathogens
Oak Wilt

- 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

Invasive Plant Pathogens
Oak Wilt

- 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

Invasive Plant Pathogens
Oak Wilt

- 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

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
  - Disinfest pruning tools after routine pruning
    - 70% alcohol
    - 10% bleach
    - Commercial disinfectants

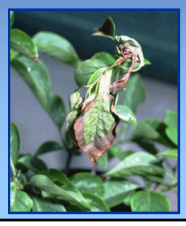
Invasive Plant Pathogens
Chestnut Blight

- Control
  - Learn to accept "shrubby" American chestnut trees
  - Watch for resistant varieties to come on the market
  - Hope for hypovirulence

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, arrow wood, *Viburnum* spp., and many others
  - Northern red oak, northern pin oak (by inoculation)
  - Host list continues to expand



Invasive Plant Pathogens
Ramorum Blight/Sudden Oak Death

- 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)

- 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!

Invasive Plant Pathogens
Ralstonia Wilt/Brown Rot

- Cause: *Ralstonia solanacearum*
  - Races (3)/biovars (2)
  - Phylotypes (II)/sequevars (1,2)
- Hosts
  - Potato
  - Geranium
  - Some additional solanaceous plants
  - Limited additional hosts



Invasive Plant Pathogens
Ralstonia Wilt/Brown Rot

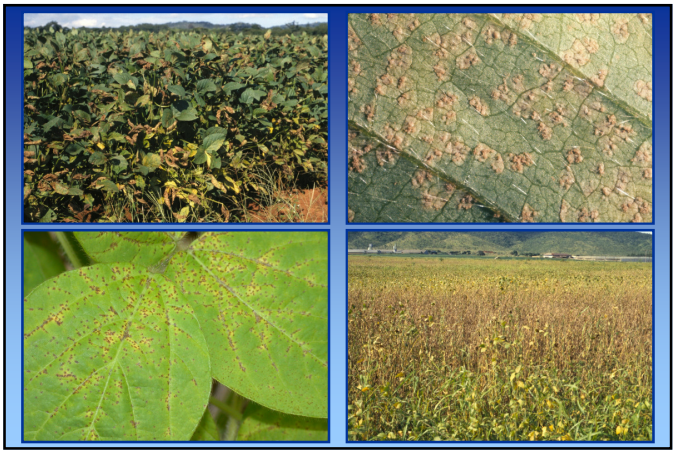
- Control
  - Start with clean propagation materials
  - Follow strict sanitation procedures when working with plant materials
    - Keep plants from different sources separated
    - Disinfect pruning tools
    - Disinfect hands when working with plants
  - Test suspect plants with dipstick tests

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
    - Disinfest greenhouses after production

Invasive Plant Pathogens
Soybean Rust

- Causes
  - Phakopsora pachyrhizi
  - Phakopsora meibomiae
- Hosts
  - Soybean
  - Other economically important legumes
  - Legume weeds (e.g., kudzu)
- Favorable Environment: Warm, wet weather



Invasive Plant Pathogens
Soybean Rust

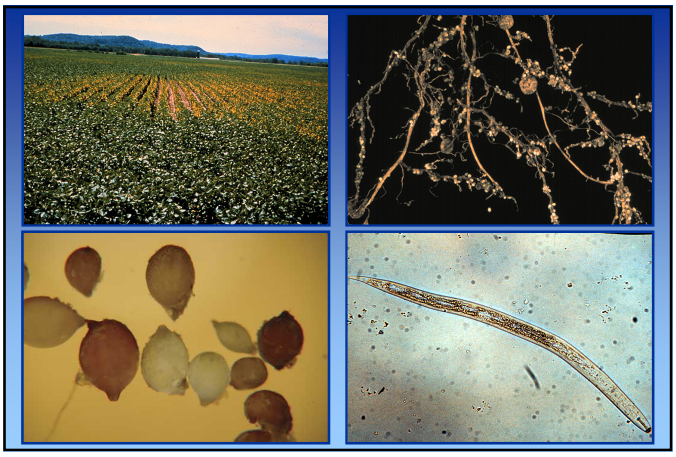
- Control
  - Use fungicides to prevent infections
    - Azoxystrobin, chlorothalonil, flutriafol, fluxapyroxad, metconazole, propiconazole, prothioconazole, pyraclostrobin, tebuconazole, tetraconazole, thiophanate-methyl, trifloxystrobin
    - Bacillus spp./strains, Reynoutria sachalinensis
    - Alternate active ingredients with different FRAC codes

Invasive Plant Pathogens
Soybean Rust

- Control
  - Use fungicides to prevent infections
    - Begin applications based on scouting information (http://sbr.ipmpipe.org/cgi-bin/sbr/public.cgi)
    - Apply every 7-14 days

Invasive Plant Pathogens
Soybean Cyst Nematode

- Cause: Heterodera glycines
- Host: Soybean
- Favorable Environment: None

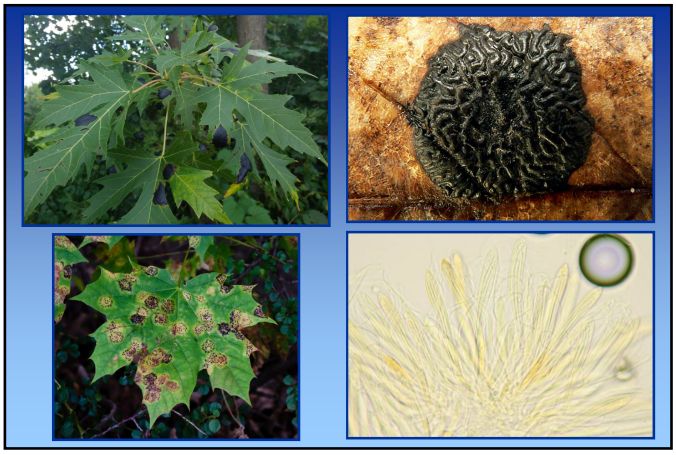


Invasive Plant Pathogens
Soybean Cyst Nematode

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

Invasive Plant Pathogens
Tar Spot

- Causes
  - *Rhytisma americanum*
  - *Rhytisma acerinum*
- Hosts: Maples
- Favorable Environment: Cool, wet weather



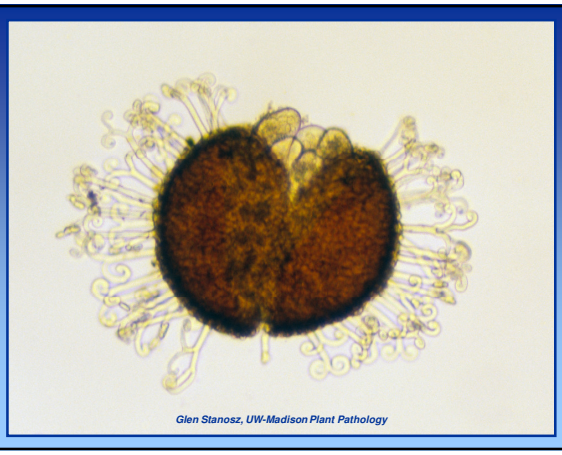
Invasive Plant Pathogens
Tar Spot

- 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

- Cause: *Sawadaea tulasnei*
- Host: Norway maple
- Environmental trigger: High humidity





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

Invasive Plant Pathogens
Sawadaea Powdery Mildew

- 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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