


# Diseases of Trees

## - Arboriculture 101

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# Outline

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- Plant disease
  - Definition
  - Causal agents
  - Symptoms and signs
  - Disease diagnostics
- Disease development
  - Disease triangle
  - Host range
  - Infection
  - Dispersal
  - Overwinter

- Disease management
  - Host resistance
  - Exclusion
  - Eradication
  - Sanitation
  - Prevention
    - Fungicide application
    - Cultural practices
- Common tree diseases



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# What is a Plant Disease

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an **abnormal condition** that interferes normal **growth and development** of a plant and reduces its **yield and/or quality**





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### What are Causal Agents

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Plant Disease

Biotic/ Infectious

Abiotic/ Non-infectious

Organisms

Environments

Fungi  
Bacteria  
Nematodes  
Phytoplasmas  
Viruses & Viroids  
Parasitic Higher plants

Temperature  
Water  
Light  
Nutrient  
Soil pH  
Chemicals

Pathogen: a disease-producing organism or biotic agent

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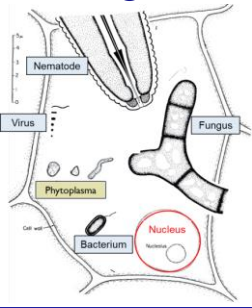
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### Pathogens – Relative Size

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### Fungus

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- A fungus digests food externally and absorbs nutrients directly through its cell walls.
- Heterotroph - obtain energy from other organisms
  - Saprophytes - Only obtain nutrients from dead or decaying organic matter
  - Parasites - obtain nutrients from living cells
  - Symbiosis - A mutually beneficial relationship with other organisms (plants, animals, or algae)

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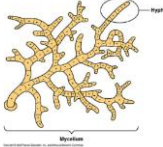
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### Fungi

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- **Hypha:** a single, **tubular filament** of a fungal thallus or mycelium; the **basic structural unit** of a fungus
  - Release enzymes and digest organic materials outside
  - Absorb sugars and amino acids through cell wall.
- **Mycelium:** **branched** hyphae



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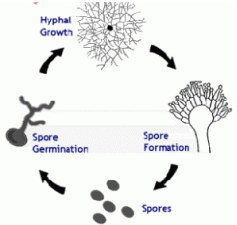
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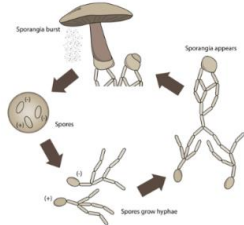
### Fungal Reproduction

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- Asexual: **fragmentation, budding, or producing spores**



- Sexual: two different **mating types**



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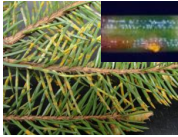
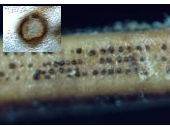
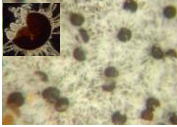



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### Fungal Reproduction

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Resting Structures

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- *Chlamydospore*
  - a **thick-walled** asexual resting **spore** formed from hyphal cells or conidial cells

- *Sclerotium*
  - a vegetative resting body, composed of a **compact mass of hyphae**

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Fungi - Mycorrhizae

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- A mutual **symbiotic** association between a **fungus** and a **plant**
- **Plants** provide fungi with **food**
- The **fungi** help the plants suck up **water** and provide **nutrients**
- Around **90% of plants** are in mutually-beneficial relationships with fungi.

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Fungi - Lichen

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- A **symbiotic** partnership of **fungi** and **algae**
  - The **algae** photosynthesize and provide **food** for the fungus;
  - The **fungus** provides a **place** for the algae

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Bacteria

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- A **single-celled** organism with a cell wall
- Parasitic
- reproduces by **division**
- One division/20 min
- From one cell to a million cells in 10 hours



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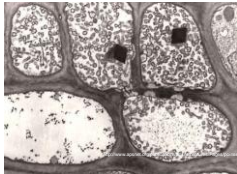
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Phytoplasma

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- A **phloem-limited** and **single-celled**
- **Lacking** the cell wall
- Transmitted through **leafhoppers**, plant propagation materials and seeds
- An **obligate parasite**
- Diseases
  - Ash yellows
  - Elm yellows



Electron microscopy of cross-section of gladiolus phloem tissue infected with phytoplasma. x6000.

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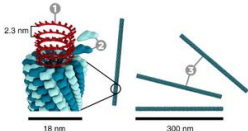
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Virus

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- **Nucleoprotein** (nucleic acid and protein)
- **No cell** structure
- **Obligate parasite**
- Survive **in living** host cells
- Transmitted by **insects**, **nematodes**, and **grafts**



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Nematode

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- Simple animal
- Microscopic worm
- Transmitted through soil, running water, rain-splash
- Root or foliar diseases



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Symptom

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- *Symptom*: an indication of disease by reaction of the host



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Symptom

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- *Chlorosis*: the failure of chlorophyll development



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Symptom

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- *Necrosis*: the death of cells or tissue





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Symptom

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- *Spot*: a symptom of disease characterized by a limited necrotic area, as on leaves, flowers, and stems





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Symptom

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- *Blotch*: a necrotic area of tissue irregular in form





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Symptom

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- *Scorch*: any symptom that resembles the result of **flame or fire** on the affected part, often seen at the **margin** of leaves



Leaf Scorch of Maple

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Symptom

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- *Blight*: a **sudden** and **extensive** spotting, discoloration, or destruction of leaves, flowers, stems, or entire plants



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Symptom

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- *Canker*: a plant disease characterized (in woody plants) by the **death of cambium** tissue



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Symptom

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- Dieback: the progressive death of shoots, beginning at the tips





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Symptom

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- Gall: an abnormal swelling or localized outgrowth produced by a plant





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Symptom

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- Rot: the softening, discoloration, and often decay of plant tissue





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Symptom

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- Wilt: the drooping of leaves from lack of water





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Symptom

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- Vascular discoloration: streaking or darkening of vascular tissues





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Sign

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- Sign: an indication of a disease from direct observation of a pathogen or its parts





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Sign

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Rhizosphaera needle cast of spruce



Stigmina needle cast of spruce

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Sign

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Needle rust of spruce



Gymnosporangium rust of pear

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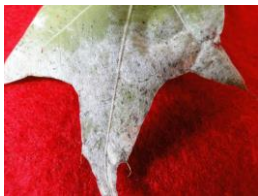
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Sign

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Powdery mildew of oak



Powdery mildew of magnolia

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Sign

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Plant Disease Diagnosis

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Correct diagnosis – Successful treatment



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Plant Disease Diagnosis

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- Proper plant identification
  - Common name and scientific name
  - Recognize healthy plant appearance (species and varieties)
  - A list of plant diseases associated with the plant



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Plant Disease Diagnosis

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- Check for symptoms and signs
  - Symptoms
    - Primary and secondary symptoms
    - Progression of disease symptoms
    - Variations in symptoms – more than one causal agents
  - Signs
    - only associated with certain diseases
    - Secondary organisms on diseased parts



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Plant Disease Diagnosis

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- Observe patterns
  - Distribution of symptoms
    - Uniform or local
  - Host specificity
    - Only certain species?
    - Similar symptoms on different species?





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Plant Disease Diagnosis

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- Ask questions
  - Watering
  - Weather conditions (temperature, hail)
  - Use of pesticides and chemicals







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