Plant Pathology

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What is Plant Pathology?

The study of plant diseases!



What is a disease?

Any disturbance of a plant that interferes with normal growth and development, economic value or aesthetic quality and leads to development of symptoms; a continuous, progressive condition



Disease-causing Agents

- Living (**Biotic**):
 - -Fungi
 - -Virus
 - -Bacteria
 - -Nematodes
 - -Parasites

- Non-living (Abiotic):
 - -Nutrition
 - -Water
 - -Ethylene
 - -Pollution
 - -Temperature
 - -Wind
 - -Light
 - -Mechanical



Disease-causing Organisms





A Symptom Is...

• A **visual clue** indicating the plant is suffering from a disease or disorder









Symptoms

Secondary Symptom: result from pathogen activity somewhere else





A <u>Sign</u> Is...

• Evidence of the disease organism





Sign or Symptom?











ve Extension State University



Chlorosis vs. Necrosis







Disease-causing Organisms





Fungi

- Most **common** cause of plant disease
- Only 8% of known fungi cause plant disease
- Are NOT plants
- Mostly microscopic







Fungal Terms

- Hyphae: fine, threadlike filaments
- Mycelium: many hyphae



• Spore: reproductive unit



Entry to Plant

- Enter through:
 - Stomata
 - Wounds
 - Can force entrance





Identification

Spots with concentric rings

• Spores are unique to species









Common Symptoms

- Damping off
- Root or fruit rot
- Leaf blight
- Shoot dieback
- Leaf curl
- Witches' broom
- Mildew

- Mold
- Scab
- Wart
- Rust
- Smut



Damping Off





Root or Fruit Rots















_____ www.ext.vt.edu

Leaf Blight









Witches' Broom





Mildew









Mold





Scab









Rust







Smut





Fairy Ring!





Spread by:

- Wind
- Water
- Birds
- Insects and Mites
- Soil
- People



Control

- Remove dead/infected plant material
- Crop rotation
- Deep tillage
- Avoid wet foliage
- Sterilize equipment
- Fungicides



Disease-causing Organisms



Bacteria

- Simple single-celled organisms
- About 170 plant pathogens
- Mostly rod-shaped
- Microscopic





Entry to Plant

- Wounds or stomata
- Insect vectors





www.ext.vt.edu

www.plantmanagementnetwork.org/elements/view....

Identification



- Water-soaked, angular lesions
- Slimy texture
- Foul odor
- Bacterial streaming





Common Symptoms

- Leaf and fruit spot
- Blight
- Canker
- Wilt
- Leaf scorch
- Soft rots
- Gall



Leaf and Fruit Spot









Wilt




Leaf Scorch







Soft Rots





www.ctahr.hawaii.edu/Weisonsmistyt.edu

Gall





Spread By:

- Soil
- Water
- Seed
- Tools
- Infected plant material
- Cankers



Control

- Crop rotation
- Resistant cultivars
- Avoid working with wet foliage
- Antibiotics, bactericides, copper



Disease-causing Organisms



Virginia Tech • Virginia State University

Virus

- Very small packages of host-alien DNA or RNA
- Dead or Alive?? Lacks own metabolism!
- Very small use electron microscope
- Enter plant cell and tricks host into making more virus particles



Entry to Plant

- Must be introduced through mechanical injury
- Sucking insects can spread too



Identification

- By symptoms
- By use of a lab test





Symptoms

- Distorted growth
- Mottling
- Mosaic
- Ring spots
- Necrosis
- Stunting
- Wilting



Distorted Growth







Mottling





Mosaic







Ring Spots







Dwarfing







Color Break





Spread by

- Asexual propagation
- Seeds
- Pollen
- Insects and mites
- Nematodes
- Fungi
- Parasitic plants



Control

- Buy disease-free plants
- Remove infected plants/debris
- Resistant cultivars
- NO DIRECT CHEMICAL CONTROL!!



Disease-causing Organisms



Nematodes

- Microscopic worms
- 75% are not plant parasitic
- Foliar and soil





www.ext.vt.edu

http://www.ipm.iastate.edu/ipm/icm/files/images/nematodes_0.jpg

Nematodes

- All plant parasitic nematodes have a needle-like stylet
- Migratory vs. sedentary
- Cause direct damage and weakens plant





Entry to Plant

• Uses stylet to puncture plant cells



http://www.nature.com/hdy/journal/v96/n4/images/6800794f1.jpg



Identification

• Use microscope

• Nematode samples by Virginia Tech



Common Symptoms

- Stunted plants and root systems
- Poor/slow growth
- Death of plant
- Galls on root systems



Stunted Plants and Root Systems





Foliar Nematodes





Galls on Roots





Spread by

• Soil on shoes, tools, and transplants





Control

- High temperatures
- Crop rotation
- Dry weather
- Remove plant debris
- Tillage
- Resistant cultivars
- NO CHEMICALS FOR HOMEOWNERS!!





FIGURE 1-1 Schematic representation of the basic functions in a plant (left) and of the interference with these functions (right) caused by some common types of plant diseases.



Steps for Disease Diagnosis

- 1. Study symptoms and signs
- 2. Collect background info on history of and pattern of disease development
- 3. Consult reference books
- 4. Narrow down possibilities





Host



Spread of Diseases

Inoculum = part of pathogen that causes infection

- Fungal spores
- Fungal mycelium
- Bacterial cells
- Virus particles
- Nematode eggs





Inoculum

• Primary: Causes original infection

 Secondary: Additional infection during the growing season



Where can you find inoculum?

- Other infected plants
- Plant materials
- Plant debris
- Infested soil



Integrated Pest Management (IPM)

A broad-based approach that integrates cultural, biological, mechanical and chemical controls to manage a pest


IPM Toolbox





Cultural

- Plant resistance
- Disease-free plants or seed
- Sanitation
- Tillage/cultivation
- Crop rotation
- Temperature/Moisture management
- Manage soil
- Proper planting



Cultural (ctd.)

- Drainage control
- Repel or control vectors??
- Plant at proper planting depth
- Avoid injury



Mechanical

- Soil treatment with steam
- Soil solarization
- Hot-water seed treatment



Biological

 Organisms that inhibit, eat, or parasitize plant pathogens







Chemical

Most pesticides are protectants

 Preventative: must be applied prior to disease formation

Curative: can be applied after disease formation



Soil fumigation?





Questions?



