Basic plant pathology training

Pathogenic agents

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What can make plants sick?

- Genetic abnormalities
- Air pollutants
- Other chemicals
- Soil acidity/alkalinity
- Nutrient imbalance
- Low oxygen
- Drought
- Heat or frost
- Mechanical impact
- Non-living, abiotic
- Living, biotic
Plant Pathogens (Biotic agent)

Mostly microscopic

Fungi, bacteria, viruses, nematodes, parasitic plants, phytoplasma, spiroplasmas

Fungi

- Fungi are filamentous organisms that are for the most part microscopic, but some produce large structures such as toadstools or mushrooms.
- Approximately 100,000 fungal species have been described and most of them are beneficial or benign.
- There are only about 8,000 fungal species that cause plant diseases
Disease caused by FUNGAL AGENTS

• Most of the common diseases occurring on landscapes are caused by fungi.

• 85% of plant diseases caused by fungi.

Characteristics of FUNGI

• Radial growth as tubular filaments (hyphae)
Fungal hyphae characteristics for identification

Reproduction & Survival

- Spores
- Rhizomorph
- Sclerotia
Types of plant pathogenic fungi

- Zygomycota (terrestrial fungi)
  - Bread molds
- Ascomycota (sac fungi)
  - Black spot of roses
- Deuteromycota (Imperfect fungi)
  - Botrytis & Alternaria (early blight tomato)
- Basidiomycota (club fungi)
  - Rust & shelf-fungi
Some example of “fungal” plant pathogens

- Root rots by water molds (oomycete) – NOT fungi
  - Aseptate mycelium, a swimming phase
  - Phytophthora, Pythium (*Root rots*)

Example: Fungi- Botrytis
Diagnosis of fungal diseases

• Presence of visible fungal structures
  – May be observed unaided or with magnification.
• Can usually be cultured on artificial media for identification
  – Exceptions: obligate parasite such as rust and mildew fungi.
Review questions

Fungal pathogens are the causal agents for over 80% of all known plant diseases.

1. TRUE
2. FALSE

Review question

*Alternaria* is a genus of fungus that can infect many different plants. We call *Alternaria* a fungus with

1. a narrow host range
2. an effective attitude
3. a wide host range
4. none of the above
Bacterial Diseases

- Bacteria are simple single celled organisms that are microscopic. Approximately 9,000 bacterial species have been described and about 80 species are plant pathogens.

- Most of these bacteria are enveloped in a protective layer of **viscous gummy material** and most also have **flagella** that are distributed in various patterns over the cell wall.

Bacterial Reproduction

- Bacteria multiply and divide asexually by **binary fission** which means reproduction by splitting into two equal halves.

- Bacteria can go through this process very rapidly and under favorable conditions may divide every 20 minutes.
  - At this doubling rate of reproduction one bacterium could produce one million bacteria in the time span of about ten hours.
Diagnosis of bacterial disease

- Leaf lesions sometimes limited by veins (angular)
- Ooze or streaming from cut tissue
- Can be cultured on media
  - Use of selective media for identification of pathogen.

Bacteria

- Blights
Viral diseases

- Made up of genetic material and protein coat
- Replicate by hijacking plant DNA
- Require wound to enter plant cell
- Require living host
- Usually transmitted by a vector
Virus diseases: What to look for..

- Eliminate other potential causes, such as bacterial, fungal diseases or insect damage

- Indirect evidence: presence of vectors (e.g. Insect known to transmit the virus)

- Testing using laboratory methods (serological or genetic testing)

Viral symptoms
Viral symptoms

Plant Parasitic Nematodes

- Characteristic of nematodes
  - Very small animals (round worms)
  - Typically in the soil
  - Usually attack roots, sometimes foliage
  - Reproduces with eggs
Plant parasitic

Sting nematode
Various shape and sizes of nematodes

Diagnosis of nematode diseases

- Know the symptoms found on the host plant
- Look for the presence of the nematodes
Plant Parasitic Nematodes

- Root knot
Parasitic plants

- Characteristic of parasitic plants
  - Obtain all or some of their needed nutrient from other plants.
  - Many have little or no chlorophyll.
  - Cause relatively few problems when compared to other disease problems.

Diagnosis of Parasitic Plant

- Know symptoms (typically stunting & unhealthiness)
- Presence of the pathogen on the host.
Parasitic plants: Mistletoe