Module 12:
Plant Disease – Viruses, Bacteria and Fungi! Oh My!

LSU AgCenter Home Gardening Certificate Course

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Plant Disease Triangle

Susceptible Host

Virulent Pathogen

Conducive Environment

DISEASE
Plant Pathogenic Organisms

Virulent Pathogen: Fungi, fungal-like organisms, bacteria, phytoplasmas, viruses, viroids, nematodes and parasitic higher plants are all plant pathogens.
Viruses

• Very first virus ever described was TMV (1898 Martinus Beijerinck)
• Only visible with an electron microscope
• Obligate parasites
• ca. 4000 identified, 1000 plant viruses
• Inner core of Nucleic Acid (RNA or DNA)
• Outer sheath or coat of protein (Capsid)
• Require a wound to infect
• Some are pollen or seed transmitted
Viruses

• Most field transmission is by vectors
• Insects in the order Hemiptera, such as aphids, planthoppers, leafhoppers, whiteflies, psyllids and mealy bugs— that have piercing sucking mouthparts —are the most common and economically important vectors of plant viruses.
• Also vectored by mites, beetles, grasshoppers and nematodes
• Viruses takeover a plant cells biochemical machinery
Viruses

Typical leaf symptoms of viral diseases include

- mosaic patterns, blistering
- chlorotic or necrotic lesions
- yellowing, stripes or streaks
- vein clearing,
- vein banding
- leaf rolling and curling
Flower symptoms include:
• deformation
• changes in the color of the flowers including dramatic color mosaics called color breaking
Fruit and vegetable symptoms may include:
- mosaic patterns
- stunting, discoloration or malformation
- chlorotic ringspots

Viruses

- Cucumber Mosaic
- Zucchini Yellow Mosaic
- Tomato Spotted Wilt
- Watermelon Mosaic
- Papaya Ringspot
Stems symptoms include:
• stem pitting and grooving or
• tumors
• growth proliferation (witch’s broom)

Viruses

Exocortis
Tomato Spotted Wilt
Witch’s Broom
Tomato Yellow Leaf Curl
Viruses

Control (Identify):
• Certified virus-free seed and plants
• Vector control
• Reservoir elimination (weed control)
• Genetic resistance
Bacteria

- Bacteria are microscopic, single-celled organisms
- No organized nucleus
- Plant pathogenic bacterial species number in the hundreds (versus thousands for fungi)
- Identified by differences in
  - colony characteristics
  - biochemical properties
  - DNA
Bacteria

• Infection must occur through natural openings
  • Lenticels
  • Hydathodes
  • Stomata
• Wounds in the plant (e.g. insect feeding)
• Bacteria can be spread from plant to plant via soil, insects, splashing water, infected seeds, or tools
Bacteria

- Phytoplasmas are microscopic, bacteria-like organisms that lack cell walls
- Obligate parasite of plants
- Phloem limited
Bacteria

Symptoms:
• Leaf spots, blights, cankers, and wilts,
• fruit, stem, and crown rots and galls
• Many leaf spots are angular or linear with straight edges
• Spots expand easily between but not across leaf veins
• With some bacterial leaf spots, a yellow halo surrounds the lesion.
• Bacterial rots often lead to a slimy texture and a foul odor
• Often difficult to distinguish from fungal diseases
Bacteria

- Bacterial Speck
- Black Rot
- Bacterial Leaf Blight
- Bacterial Canker
- Bacterial Wilt
- Soft Rot
- Crown Gall
- Ring Rot
- Citrus Canker
- Bacterial Spot
- Bacterial Wilt
- Citrus Canker
Bacteria

Control (Identify):

- Genetic – Resistant varieties
- Certified Bacteria-free seed and plants
- Sanitation – Disinfest tools
- Crop Rotation
- Copper-containing pesticides
- Antibiotics
- Grafting
Fungi

- Fungi and Fungi-Like Organisms (FLOs) cause more plant disease than any other group of plant pathogens
- These organisms cannot make their own food
- They lack chlorophyll
- They have filamentous growth
- Most, but not all, reproduce by spores
- Fungi and FLOs overwinter in soil or on plant debris
Fungi

• Over 19,000 fungi are known to cause diseases in crop plants worldwide
• They may remain dormant on living and dead plant tissues until conditions are right for growth
• Fungi spread through soil and plant tissue by hyphal growth
• Some spread through moist environments by swimming zoospores
Fungi

• Fungi can infect through natural openings and wounds
• Fungi can infect directly through the cuticle
• Fungal spores can germinate and directly infect if surface water is present for ca. 2 hours
• Fungal spores are readily dispersed by wind, water, soil, insects, and other invertebrates
Fungi

Fungal plant diseases include:

- Anthracnose
- Leaf spot
- Rust
- Wilt
Fungi

- Blight
- Fruit Rots
- Scab
- Gall

Phytophthora Blight
Citrus Scab
Sour Rot
Potato Scab

Black Knot
Late Blight
Early Blight
Fungi

- Canker
- Damping-off
- Root rot
- Stem rot
- Mildew
- Dieback

![Cucumber Downy Mildew](image1)

![Stem Rot](image2)

![Cysopora Canker](image3)

![Damping Off](image4)

![Cucumber Powdery Mildew](image5)

![Fusarium Root Rot](image6)
Fungi
Control (Identify):
• Disease free seeds and plants
• Resistant Varieties
• Sanitation – Disinfect tools and equipment
• Remove plant debris
• Remove and discard diseased plants
• Irrigate the roots not the leaves
• Crop Rotation
• Soil Solarization
• Good Drainage
• Fungicides
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