

Review of lecture 1:

Significance of Plant Disease

- 10% of all food production is lost to disease (30% to all pests)
- The introduction of exotic plant pathogens has caused great losses: e.g., American chestnut
- Many additional exotic threats: sudden oak death, soybean rust
- Each year, suppression of plant disease costs billions of dollars worldwide
- Plant pathogens restrict trade
- Pathogens continually evolve:
 - break resistance in host crops
 - develop insensitivity to chemicals

Lecture 2: Disease Concept

- **Plant Pathology involves understanding biology at multiple levels of scale:**
molecular, cellular, tissue, organismal, population, and community
- **And, Plant Pathology integrates many areas of study:**
plant science, molecular biology, genetics, biochemistry, microbiology, soil science, meteorology, statistics, economics
- The '**Disease Concept**' is the link that unifies the discipline

Functions of a healthy plant

Healthy plants carry out several physiological functions to the best of their genetic potential:

- a. grow cells and develop tissues**
- b. uptake water and minerals from soil**
- c. translocate of water and minerals**
- d. capture energy & synthesize sugars**
- e. translocate, utilize and store sugars**
- f. metabolize synthesized compounds**
- g. reproduce**

(Overhead #1)

Injury

vs

Disease

insect feeding

rot

frost

gall

herbicide damage

wilt

lightning

stunt

Disease defined

Disease is the injurious alteration of one or more physiological processes in a living system (in our case, a plant) caused by the continuous irritation of a primary causal factor or factors.

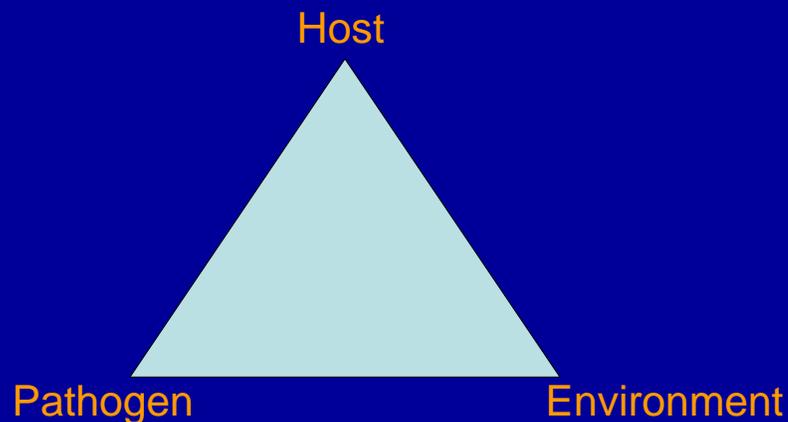
(back to overhead #1)

Three ingredients are necessary for disease to occur:

- a. the pathogenic agent(s) must be present
- b. the host must be susceptible to the agent(s)
- c. the environment is conducive to the interaction of pathogen and host

This is commonly expressed as:

The Disease Triangle



Disease = f (host X pathogen X environment)

**Disease is a condition of the host,
and
we need vocabulary to describe it**

**Terms that describe a diseased condition
are called 'symptoms'**

**If a pathogen can be seen in association
with a symptom, the observed
pathogen structure is called a 'sign'**

Examples of symptoms

- **Weakened or killed tissues:**
Necrosis, chlorosis, rot (soft, dry, firm)
Lesion, canker, mosaic
- **Abnormal in cell growth:**
Gall, tumor, curl, scab, knot
- **Whole plant appearance:**
damping-off, blight, stunted, dwarfing,
rosetting, yellows, wilt

Homework: Look up these words in the APSnet glossary
– write the definition in your notebook

Examples of signs

- Fungal
spore, fruiting body, mycelium, sclerotium, pustule
- Bacterial
streaming, cells
- Nematodes
cysts, juveniles

Causal Agents of plant diseases

Biotic:

- 1) fungi (and fungus-like organisms)
- 2) bacteria
- 3) viruses
- 4) nematodes
- 5-7) phytoplasmas, viroids, higher plants

Abiotic:

- 1) air pollutants (e.g., ozone, SO₂)
- 2) chemical imbalances or toxins

(Overhead # 2)

Homework: Read handout #2 carefully – use a glossary or dictionary to look up words you don't understand

Disease symptoms

- Symptoms are the plant's response to disease
- Symptoms reflect the physiological function of the plant that is disrupted or impaired

- Diseases can be categorized according to their symptoms

Examples: root rots, leaf spots, abnormal growth, vascular wilts, fruit rots

Diseases have names!!

Name of Disease: Apple scab

Causal Agent: *Venturia inequalis*

Host: apple

Tissues affected: leaves and fruit

Primary symptom: scab-type lesion

Secondary symptoms: Defoliation, fruit deformation and drop

[APS Database 'Common Names of Plant Diseases'](http://www.apsnet.org/publications/commonnames/Pages/default.aspx)

(<http://www.apsnet.org/publications/commonnames/Pages/default.aspx>)



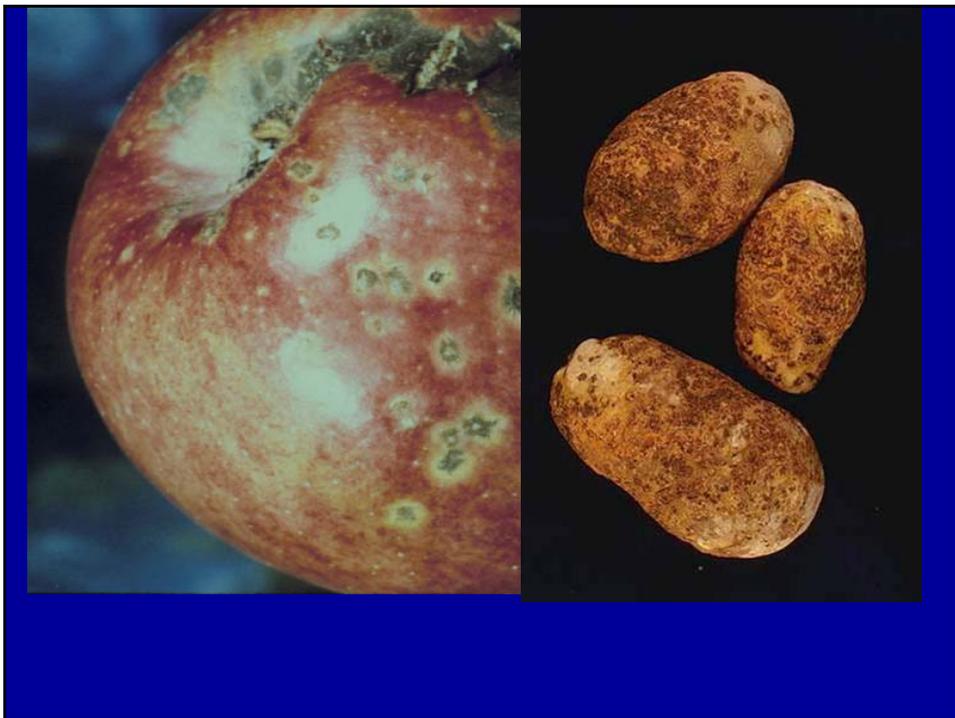
Leaf spot



Blight



Cankers











Signs

- Signs are the physical evidence of a pathogen's structure





Sign: Fruiting body of a Fungus



