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

Injury	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:

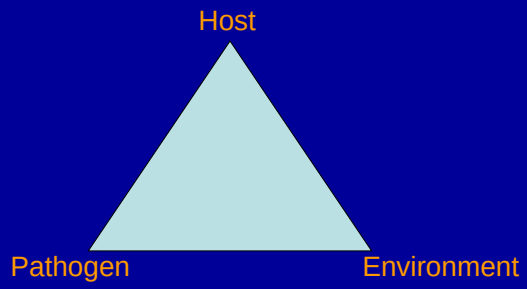
a. the pathogenic agent(s) must be present

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

- **Weaked 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, SO_2)
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!!

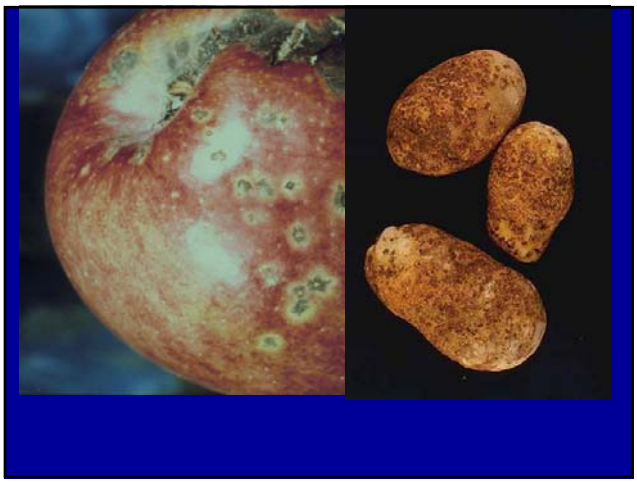
Name of Disease: Apple scab
Causal Agent: *Venturia inequalis*
Host: apple
Tissues affected: leaves and fruit
Primary symptom: scab-type lesion
Secondary symptoms: Defoliation, fruit deformation and drop

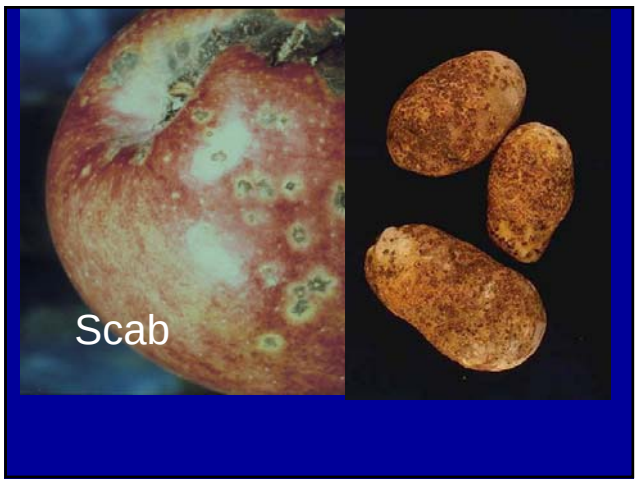
APS Database 'Common Names of Plant Diseases' (http://www.apsnet.org/online/common/top.asp).

Leaf spot

Blight


Cankers




Scab


Fruit rot


Mosaic


Wilt

Signs

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


Sign: Fruiting body of a Fungus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Sign: Bacterial strands
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