

## 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.

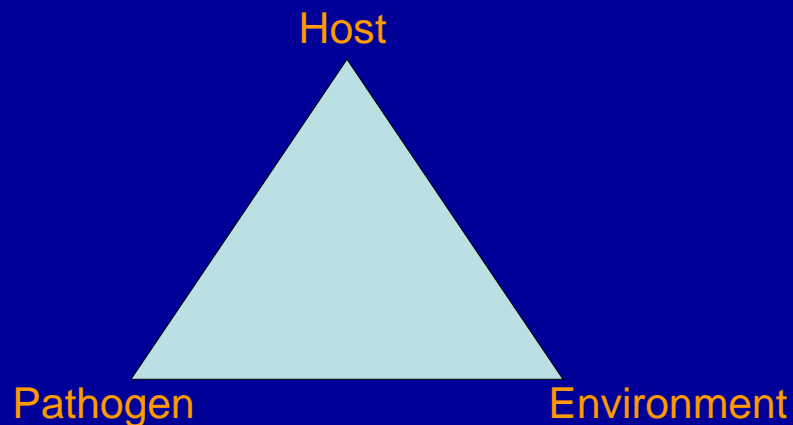
(back to overhead #1)

**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



$$\text{Disease} = f(\text{host} \times \text{pathogen} \times \text{environment})$$

**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, SO<sub>2</sub>)
- 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: Spores in 'pustules'







Sign: Fruiting body of a Fungus



