

# **Unit D: Controlling Pests and Diseases in the Orchard**

## **Lesson 5: Identify and Control Diseases in the Orchard**

# Terms

- Abiotic disease
- Bacteria
- Biotic diseases
- Cultural disease control
- Disease avoidance
- Disease resistance
- Disease tolerance
- Fungi
- Infectious diseases
- Localized infection
- Noninfectious disease
- Pathogen
- Plant disease
- Plant pathology
- Systemic infection
- Viruses

I. A plant disease is a harmful alteration of the normal physiological and biochemical growth of the plant, or as a condition in which a plant differs from a normal (healthy) plant in appearance, structure, or function.

A. Plant pathology is the study of plant diseases.

1. Plant diseases differ from nonparasitic injury in the length of time during which they affect the plant.
  - a. A disease usually consists of a series of harmful processes that occurs over a fairly long period of time.
  - b. Injuries are disorders that occur over a short period of time.

2. Four conditions necessary for a plant disease to develop are:
  - a. A susceptible host plant, a disease-producing agent, a favorable environment, and a time for the disease to develop.
  - b. If any one of these conditions is not met, a disease will probably not occur.

II. Plant diseases can be divided into two broad categories.

A. Plant diseases are classified as either noninfectious or infectious, depending on their cause.

# **1. *Noninfectious disease* or *abiotic***

***disease*** is not caused by a pathogen, but rather by elements in a plant's environment that are damaging to it.

- a. They cannot be transmitted from plant to plant.
- b. They occur very quickly in a wide variety of plants and do not continue to damage the plant throughout the season.
- c. They are caused by unfavorable growing conditions, such as extremes in weather, air pollutants, nutrient deficiencies or excesses, and toxic chemicals.

**2. Infectious diseases or biotic diseases** are caused by a living organism or pathogen.

- a. A **pathogen** is a living, disease-producing agent.
- b. The pathogen can multiply and be transmitted from plant to plant.
- c. They may invade the entire plant (**systemic infection**) or only affect certain plant parts (**localized infection**).
- d. Pathogen groups include bacteria, fungi, viruses, and parasitic seed plants.



**3. *Bacteria*** are microscopic one-celled organisms that reproduce by simple division.

- a. Assuming cell division every 20 minutes, one bacterium can produce up to 70 billion offspring in hours.
- b. Bacteria cannot move by themselves and depend on splashing rain, wind, animals, insects, farm implements, seed, and other means to get to host plants.
- c. Bacteria usually enter through wounds in the plant and cause local or systemic infections.

- d. Symptoms of bacterial infection are wilting, soft rots, leaf blights, and spots.
- e. Mycoplasmas and spiroplasmas are bacterial forms that lack cell walls.
  - i. They are transmitted by leafhoppers or plant propagation, and are often the causal agents of the yellows and witch's broom type of diseases, formerly thought to be caused by viruses.



4. Fungi are the most common causes of infectious plant diseases.
  - a. ***Fungi*** are small, many-celled plants that lack chlorophyll.
  - b. Most reproduce by spores.
  - c. Fungi enter the plant and destroy or disrupt parts of it, making it unsuitable for human use.
  - d. The organisms are spread by rain, wind, insects, seeds, farm implements, and runoff water or runoff soil.
  - e. Symptoms of fungal diseases included wilting, yellowing, blotching, spotting of leaves, and rotting of roots, stalks, stems, or fruit.



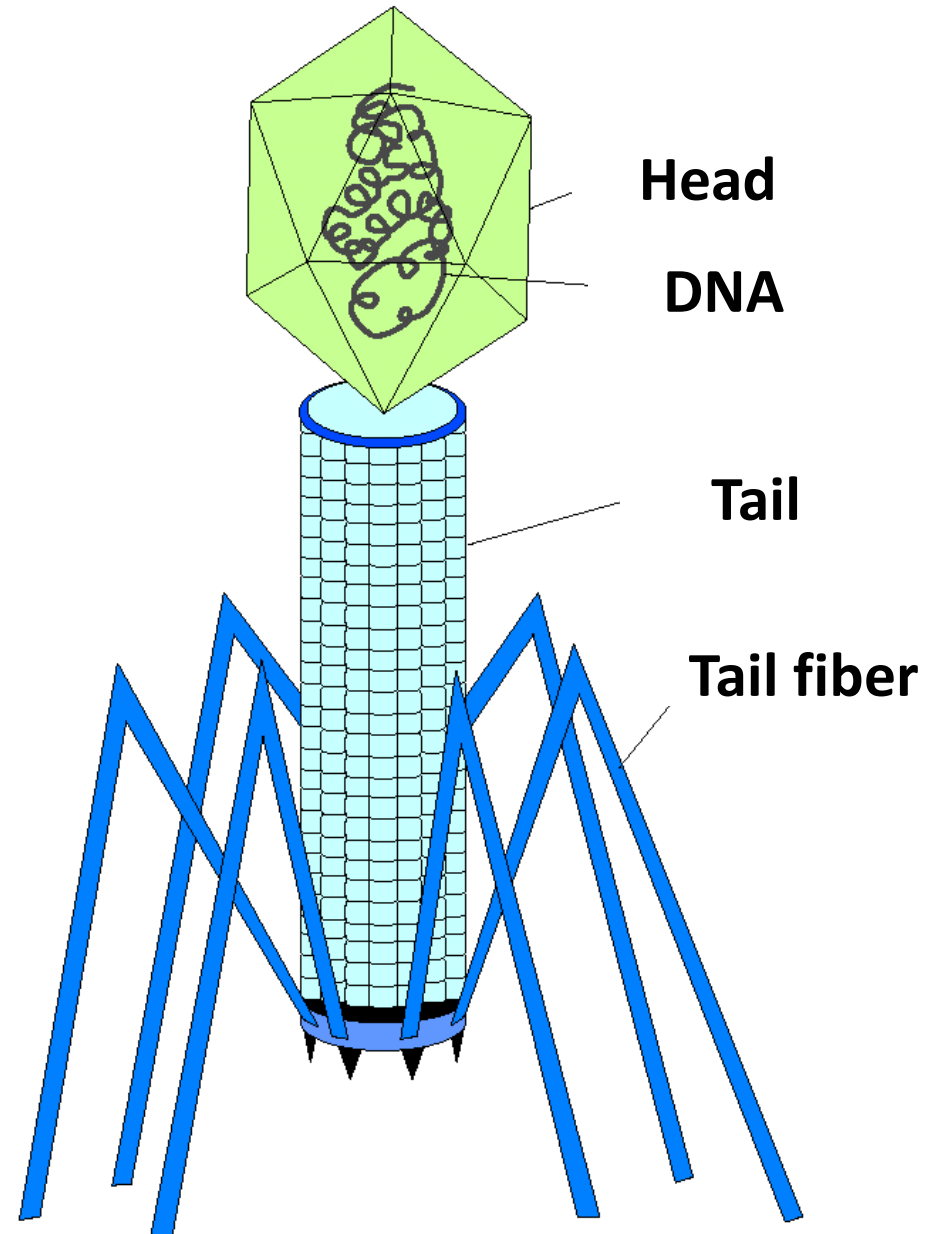




**5. *Viruses*** are tiny pathogens that can be seen only with special microscopes.

- a. Viruses usually enter plants and cause systemic infections.
- b. Viruses cannot move on their own, and are commonly spread by insects and seed.
- c. Symptoms of viral diseases include discoloration, stunted or unusual growth, and poor development of normal plant parts.

# Example of a Virus



III. Plants react to pathogens by producing symptoms, indications of disease that affect the external or internal appearance of the plant.

A. As an orchard is checked for insects, the severity of diseases can also be noted.



1. Examine roots, stalks, and leaves, and collect samples for positive identification.
  - a. Some pathogens cause localized infections; others may infect the entire plant.
  - b. It is important to inspect the entire plant when diagnosing a plant disease problem.
2. Orchards are sampled depending upon the disease type.
  - a. Different fruit varieties are affected by different diseases and all will have a different economic threshold.

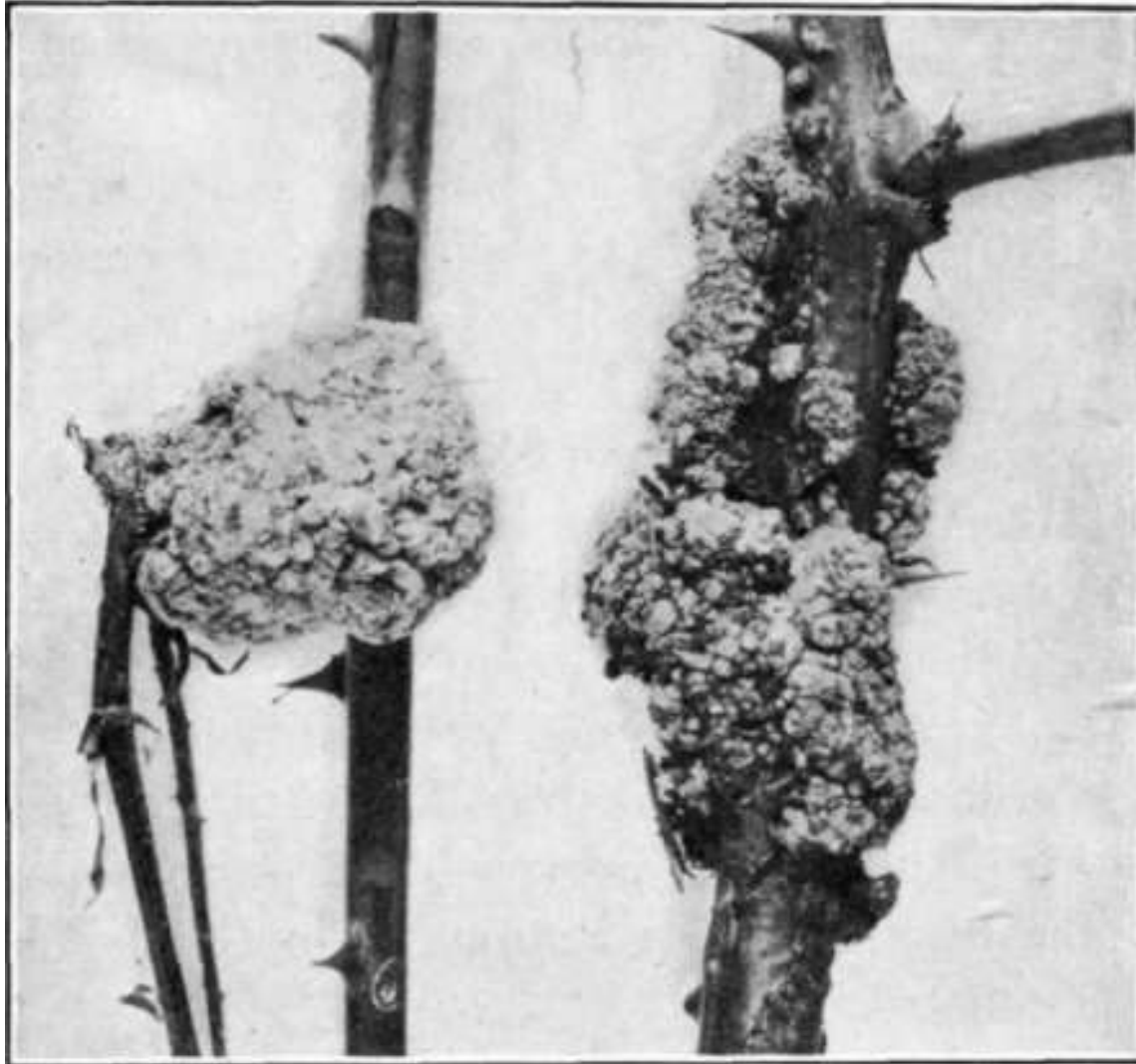
B. Determine the severity of the disease and the percentage of plants displaying disease symptoms. Symptoms are used to help identify the pathogen and may ultimately help determine the exact cause of the disease.

1. Some common symptoms of plant pathogens are wilting, yellowing, leaf spots, blights, dropping leaves, and necrosis or death of plant tissue.
2. The pathogen itself may also produce signs. Signs of plant pathogens are structures or parts of the pathogen itself, the host plant does not produce them. Examples of signs may include fruiting or spore-producing structures, a mat of fungal tissue, over-wintering structures, and bacterial exudates.

C. To identify plant diseases correctly, you must carefully observe the symptoms of the disease and the signs of the pathogen itself. The symptoms are usually of three types.

1. Over-development of tissues: galls and swellings.
2. Underdevelopment of tissues: stunting, lack of chlorophyll, or incomplete development of organs.
3. Death of tissues: leaf or flower blights, leaf spots, root rots, cankers, wilting.

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- D. Examine all parts of the injured or diseased plant. Root problems may produce wilting, stunting, dieback, or nutrient deficiencies. Determine whether the problem is localized or systemic.
1. Some pathogens infect only certain parts of the plant. These diseases cause localized infections and include many leaf blights, leaf spots, stem cankers, galls, and root rot.



2. Diseases that affect the entire plant are called systemic infections.
  - a. Once inside the plant, the pathogen moves throughout and causes wilting, yellowing, and stunted growth.
    - i. Systemic diseases often kill the plant.
  - b. When diagnosing diseases the entire plant must be examined.
  - c. Notice where diseases occur in the orchard and how they have developed.

- E. Steps to follow for diagnosing diseases.
1. Scout the orchard and note problem areas.
  2. Examine the plants and note the plant parts affected, symptoms of disease, and signs of pathogens.
  3. Observe the orchard and note the infestation pattern, field conditions, field history, and weather conditions for the past 10 to 14 days.
  4. Consult references to assist you in disease identification or consult the Extension Specialist.

- IV. The cost of the treatment and life cycle of the pathogen must be considered when selecting a control measure.
- A. The methods used to control crop diseases are many but can be grouped into three main categories. Genetic control, or host plant resistance, is the most common and important method of disease control. Three general classes of disease resistance have been designated.

1. ***Disease avoidance*** is when crop plants may have morphological structures such as sunken stomata or a thick cuticle that discourages penetration of inoculum.
2. With ***disease tolerance*** an infection may occur, but the crop host is able to withstand the invasion, continue to grow, and produce satisfactory yields. There is no evidence of incubation and/or infection even though inoculation has occurred with true ***disease resistance***.
3. ***Cultural disease control*** involves any change or manipulation of field operations that alters either the life cycle of the pathogen or the host, so that inoculation or infection does not occur.

B. Optimum plant density, timely cultivation and fertilization, and proper water management are all practices that promote vigorous crop growth. Healthy plants are less disposed to disease while stressed plants are more likely to suffer disease infection and damage.

1. Choose fruit and nut varieties that are proven disease resistant.
2. Weed control of all kinds often eliminates the alternate disease host but always reduces the competition of weeds for light, water, and nutrients.
3. Chemical disease control may be effective but it is not always feasible in orchards.
  - a. Chemical control must be applied before inoculation and remain on the plant or be reapplied as long as there is a threat of inoculation.
  - b. Once a pathogen has entered the plant, chemical control is difficult, if not impossible.
  - c. Chemical control of plant diseases is strictly preventative.
  - d. There are no treatments to reduce the symptoms once a plant has the disease.

V. Successful management of orchard diseases is based on a thorough understanding of factors influencing disease development and expression. Strategies should include measures to reduce losses in the current crop as well as considerations for future plantings.

- A. The interaction of four factors influences the development of all plant diseases. Plant disease management is directed toward disrupting one or more of these factors.
1. The presence of a susceptible host crop.
  2. A pathogen, disease-causing agent, capable of colonizing the host.
  3. An environment that favors the pathogen and not the host.
  4. Adequate time for economic damage and loss to occur.
- B. Measures used to manage plant diseases are crop rotation, genetic resistance, fungicides, and cultural or agronomic practices.



# Review/Summary

1. What is a plant disease and what are the conditions necessary for a plant disease to develop?
2. How are plant diseases classified?
3. What is the proper scouting, identification, and diagnosis process of plant diseases.
4. What are some ways to control plant diseases?
5. What are some strategies used in disease management?