



# **Unit G: Pest Management**

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## **Lesson 2: Managing Crop Diseases**

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# Terms

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

# What is a plant disease & what conditions are necessary for it to develop?

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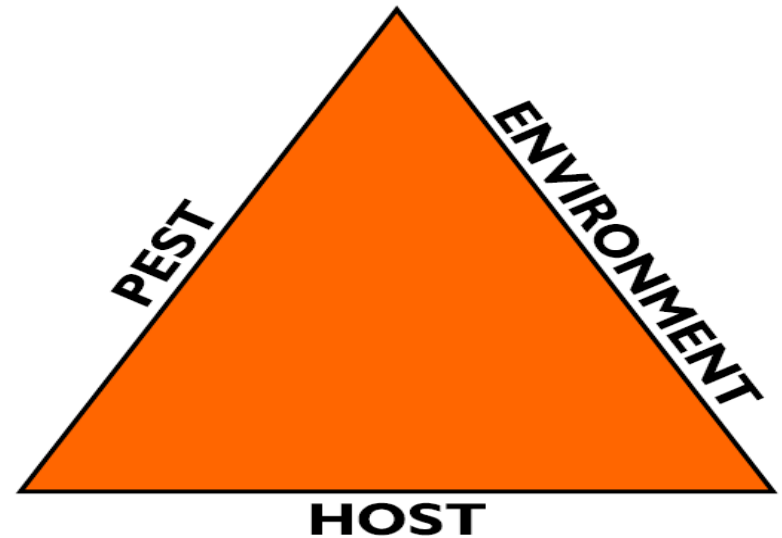
- ✦ A **plant disease** is a harmful alteration of the normal physiological and biochemical growth of the plant, or as a condition in which a plant differs from a normal (healthy) plant in appearance, structure, or function.
- ✦ **Plant pathology** is the study of plant diseases.



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

**Pest problems develop when three conditions are present:**

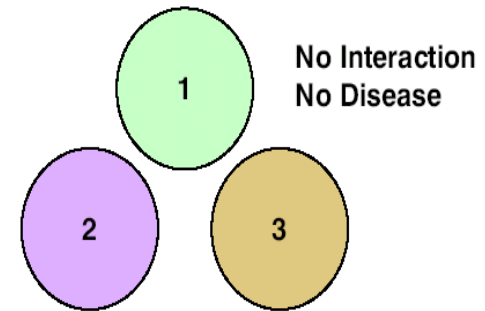
- **pest (insect, weed, disease, etc.)**
- **host (susceptible plant)**
- **favorable environment**



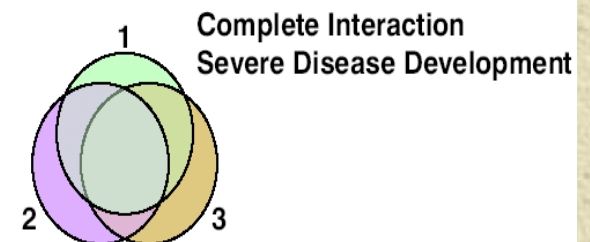
# INTERACTION IN A DISEASE COMPLEX

✦ Four conditions necessary for a plant disease to develop are: a susceptible host plant, a disease-producing agent, a favorable environment, and a time for the disease to develop.

✦ If any one of these conditions is not met, a disease will probably not occur.



- 1 Causal organism
- 2 Susceptible host
- 3 Favorable environment





# How are plant diseases classified?

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Plant diseases can be divided into two broad categories

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

✦ **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, such as weather, air pollutants, and nutrient deficiencies.

✦ They cannot be transmitted from plant to plant but they occur very quickly in a wide variety of plants.

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

✦ A **pathogen** is a living, disease-producing agent that can be transmitted from plant to plant.

✦ They may invade the entire plant (**systemic infection**) or only affect certain plant parts (**localized infection**).



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

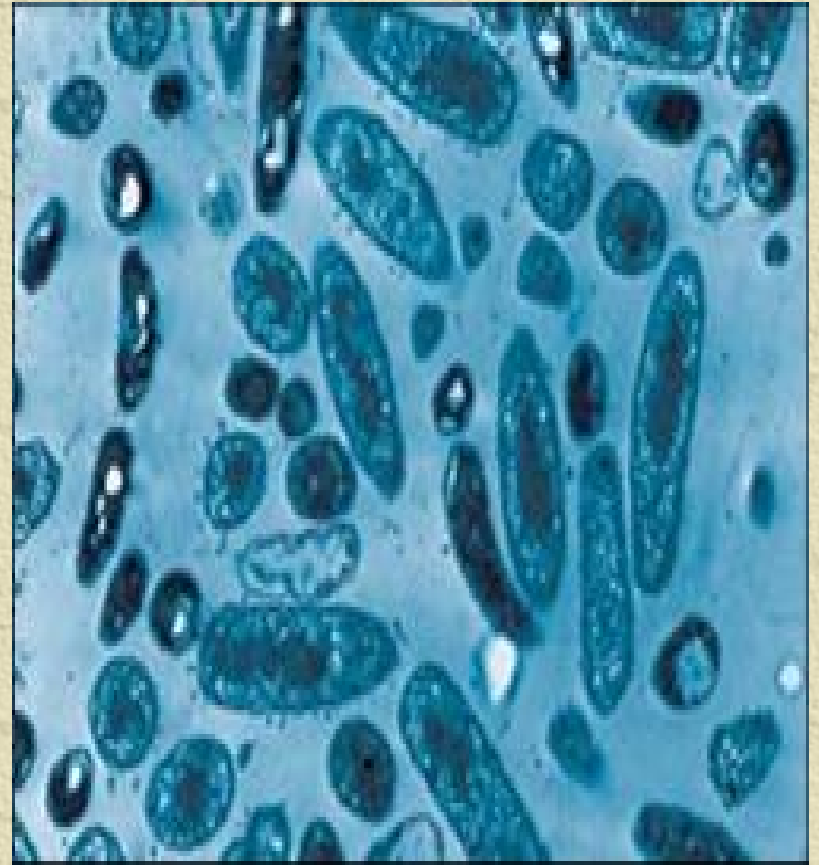
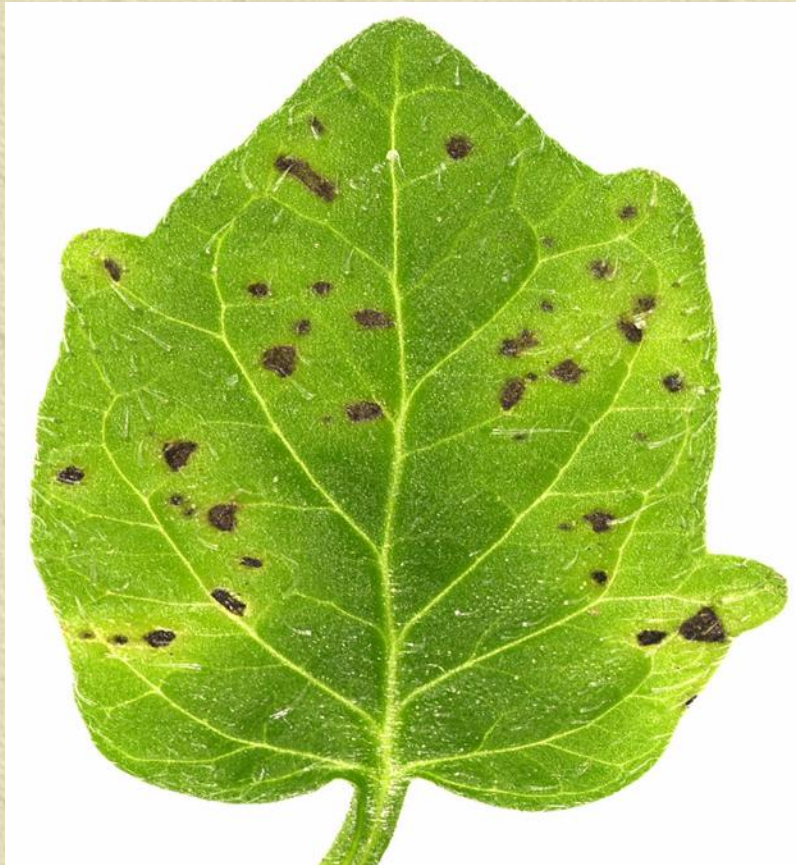
✦ One bacterium can produce up to 70 billion offspring in hours.

✦ Bacteria cannot move by themselves and depend on splashing rain, wind, animals, insects, implements, seed, and other means to get to host plants.

✦ Bacteria usually enter through wounds in the plant and cause local or systemic infections.



# Bacteria

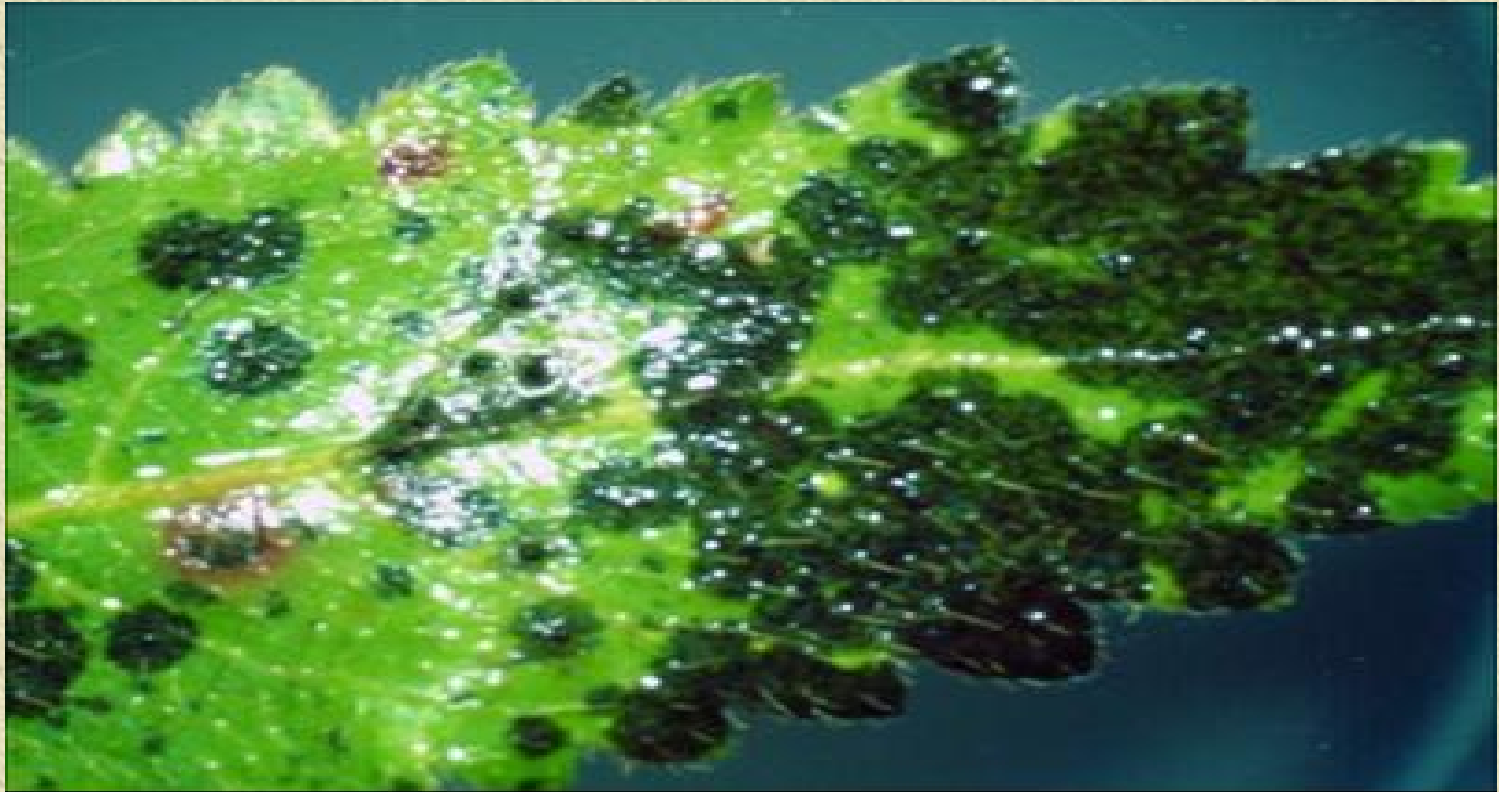



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- ✦ Fungi are the most common causes of infectious plant diseases.
  - ✦ **Fungi** are small, many-celled plants that lack chlorophyll.
  - ✦ Most reproduce by spores. Fungi enter the plant and destroy or disrupt parts of it, making it unsuitable for human use.

- ✦ The organisms are spread by rain, wind, insects, seeds, farm implements, and runoff water or runoff soil.
- ✦ Symptoms of fungal diseases included wilting, yellowing, blotching, spotting of leaves, and rotting of roots, stalks, stems, or fruit.



# *Fungi*



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- ✦ **Nematodes** are microscopic roundworms that live in the soil and feed in the root system of plants.
  - ✦ Nematodes are obligate parasites in that they can survive only on or in living plants.
  - ✦ They reproduce by eggs and are spread by anything that moves nematode-infected plant parts or nematode-infested soil.

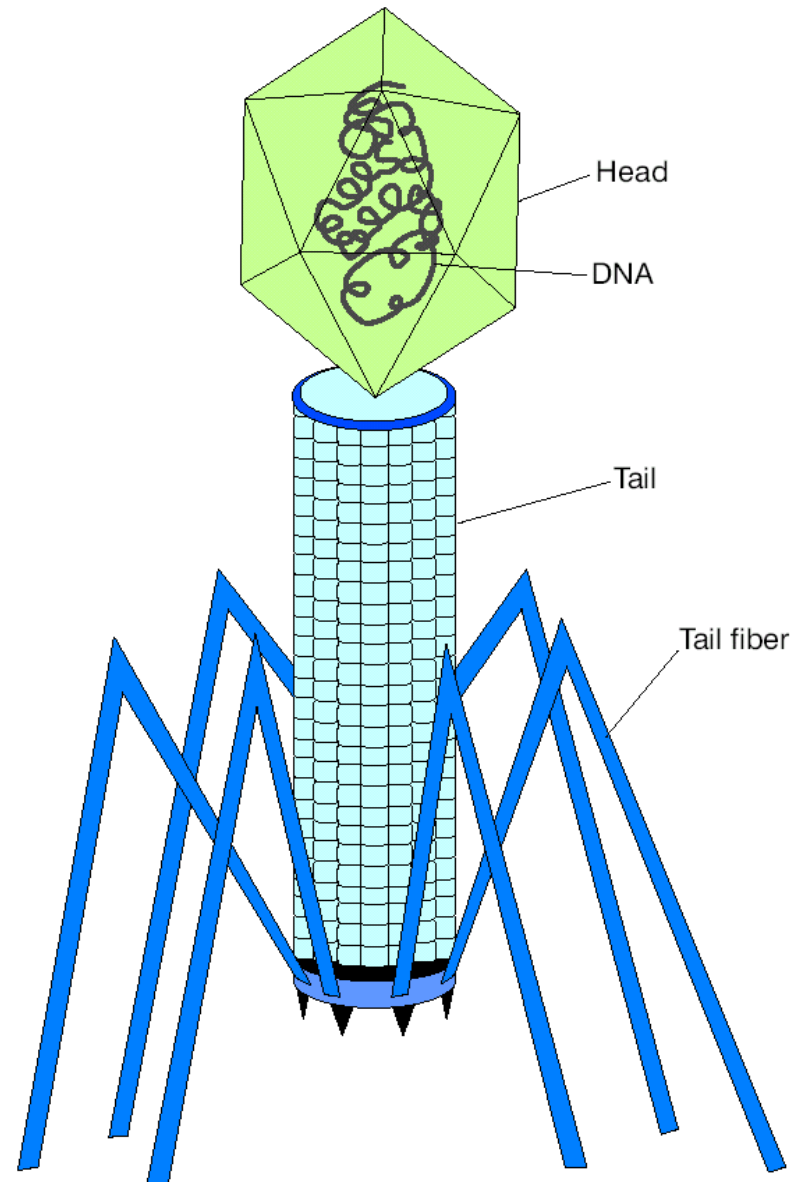


# *Nematodes*

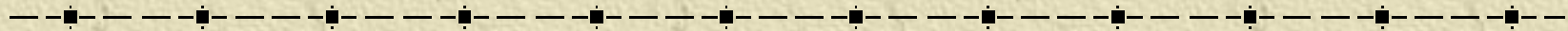


## EXAMPLE OF A VIRUS

- ✦ **Viruses** are tiny pathogens that can be seen only with special microscopes.
- ✦ Viruses usually enter plants and cause systemic infections. Viruses cannot move on their own, and are commonly spread by insects and seed.







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✧ **BACTERIA**

- ✧ **wilt (bacterial)**      **corn, alfalfa, tomato, potato**
- ✧ **gall crown**            **gall in trees and many crops**
- ✧ **Infection**              **angular leaf spot of cotton**

✧ **FUNGI**

- ✧ **Anthracnose**            **cotton, cucumber, cantaloupe, watermelon**
- ✧ **downy mildew**          **grain crops, grape, onion, spinach, lettuce, cucumber**
- ✧ **powdery mildew**        **grain, cucumber**
- ✧ **wilt**                      **cotton, tomato, sweet potato, watermelon**


✧ **VIRUSES**

- ✧ **Mosaic**                  **tomato, potato, sugarcane stuntcorn**
- ✧ **Streak**                  **sugarcane**



# How are plant diseases scouted, identified, and diagnosed?

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




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✦ As a field is spot-checked for insects, the severity of diseases can also be noted.

✦ 1. Examine roots, stalks, and leaves, and collect samples for positive identification. It is important to inspect the entire plant when diagnosing a plant disease problem.

✦ 2. Fields are normally spot-checked in five different areas in 20-foot sections or within a 1 by 10 foot area for forage & small grains.






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✦ Determine the severity of the disease and the percentage of plants displaying disease symptoms.

✦ 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.



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✦ 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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✦ 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.

✦ Some pathogens infect only certain parts of the plant.

✦ Diseases that affect the entire plant are called systemic infections.

✦ Once inside the plant, the pathogen moves throughout & causes wilting, yellowing, and stunted growth.

✦ Systemic diseases often kill the plant.

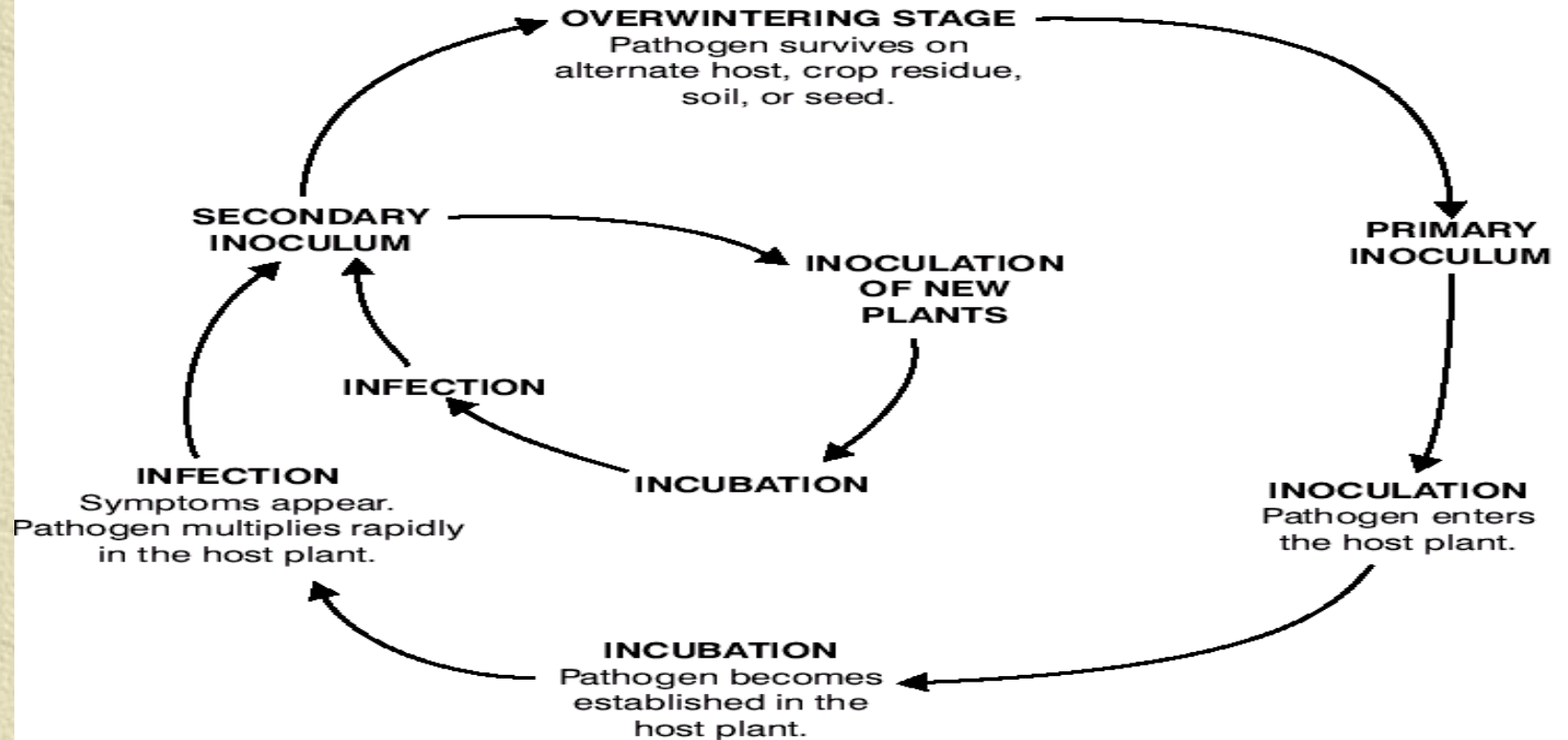
# Steps to follow for diagnosing diseases.

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- ✦ 1. Scout the field and note problem areas.
  - ✦ 2. Examine the plants and note the plant parts affected, symptoms of disease, & signs of pathogens.
  - ✦ 3. Observe the field and note the infestation pattern, field conditions, field history, & weather conditions for the past 10 to 14 days.
  - ✦ 4. Consult references to assist you in disease identification or consult your county extension adviser.



# STAGES OF DISEASE DEVELOPMENT

There are three pathogenic stages in the development of a disease that may occur only once or many times in the seasonal cycle of the disease. These stages are illustrated below.



The methods used to control crop diseases are many but can be grouped into three main categories

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- ✦ 1. **Disease avoidance** is when crop plants may have morphological structures such as sunken stomata or a thick cuticle that discourages penetration of inoculums.
- ✦ 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**.



The methods used to control crop diseases are many but can be grouped into three main categories

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✦ 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.




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✦ 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.



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- ✦ 1. Crop rotations change the crop host and also reduce the level of the primary inoculum.
  - ✦ 2. A change in planting date, either earlier or later, often helps a crop escape or withstand disease infection.
  - ✦ 3. Tillage and cultivation reduce the source of primary inoculum of some diseases by burying crop residues.
  - ✦ 4. Weed control of all kinds often eliminates the alternate disease host but always reduces the competition of weeds for light, water, and nutrients.

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- ✦ 5. Chemical disease control may be effective but it is not always feasible on field crops. Chemical control must be applied before inoculation and remain on the plant or be reapplied as long as there is a threat of inoculation. Once a pathogen has entered the plant, chemical control is difficult, if not impossible. Chemical control of plant diseases is strictly preventative. There are no treatments to reduce the symptoms once a plant has the disease.



# What strategies are used in disease management?

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- ✦ Successful management of field crop 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.

# Review/ Summary

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- ✦ 1. How do you identify the conditions necessary for a plant disease to develop?
- ✦ 2. What are some classification of plant diseases?
- ✦ 3. How do you control plant diseases?
- ✦ 4. What strategies are used in disease management?