

## CONCEPT OF PLANT DISEASES

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### I. Introduction

Plant disease is a condition of plant deterioration and damage caused by various abiotic and biotic factors. The disease triangle discussed in this module shows all the required conditions for a plant disease to occur. These abiotic factors include watering, temperature, and other examples while these biotic factors are mostly microorganisms.

For plant disease diagnosis, the identification of symptoms and signs helps determine the type of pathogen involved and the appropriate control measures to take. These said plant diseases can be classified according to different criteria. All of these will be discussed in detail below.

### II. Learning Objectives

At the end of the module, students are expected to:

1. List the required conditions for a plant disease to occur.
2. Describe the disease triangle.
3. Distinguish the different signs and symptoms of plant diseases.
4. Select an appropriate control measure to practice depending on the plant disease diagnosed.

### III. Pre-Test

Select the best answer that corresponds to your choice.

1. This tries to prevent the entry of the pathogen in coming into the area where it is currently unknown.
  - a. Eradication b. Protection c. Exclusion
2. This is intended to eliminate the pathogens that are already established in the area.
  - a. Eradication b. Protection c. Exclusion
3. The prevention of infection by putting a chemical barrier between the pathogen and the suscept.
  - a. Eradication b. Protection c. Exclusion
4. Modifying certain physiological and morphological features of the host in not to be easily infected.
  - a. eradication b. immunization c. exclusion
5. The ability of the plant to overcome the effects of the pathogen.
  - a. tolerance b. resistance c. escape
6. The ability of the suscept to undergo severe infection without a serious reduction of yield.
  - a. tolerance b. resistance c. escape
7. A susceptible plant does not become infected due to some circumstances.
  - a. tolerance b)resistance c)escape
8. The use predators and parasite to control disease.
  - a. chemical control b. biological c. physical
9. Protection of plant by mild virus strain against infection.
  - a. Bacteriophage b. cross protection c. interference
10. The use of pesticides is a ---control.
  - a. chemical b. biological c. physical

## V. Discussion

### **Concept of Plant disease**

“Any disturbance brought about a pathogen or an environmental factor which interferes with manufacture, translocation or utilization of food, mineral nutrients and water in such a way that the infected plant changes in appearance and yields less than a normal healthy plant of the same variety.” (Agrios, 1978)

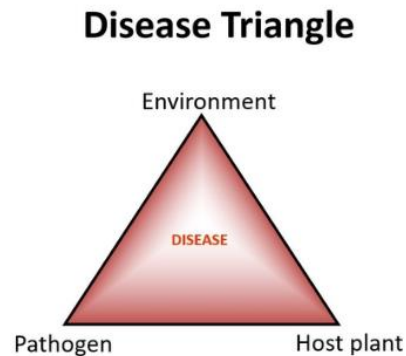
Disease is a common occurrence but a wholly satisfactory definition of the term has eluded plant pathologists for so long. Moreover, the present trend is towards a more expanded outlook on plant disease are given below.

1. A physiological malfunctioning caused by animate (Whetzel, 1972)
2. Any deviation from normal growth or structure of plants that is sufficiently pronounced and permanent to produce visible symptoms or to impair quality or economic value (Stakman and Harrar, 1975).
3. A malfunctioning process cause by continuous irritation (Horsfall and Dimond, 1975).
4. A dynamic interaction between an organisms and its environment which results in abnormal physiology an often morphological or neurological changes in the organisms (Merril).
5. Any disturbance brought about by a pathogen or an environmental factor which interferes with manufacture, translocation, or utilization of food, mineral nutrients and water in such a way that the affected plant of the same variety (Agrios, 1978).
6. It is a harmful alteration of the normal physiological and biochemical development of a plant (National Academy of Science, 1976).

The salient points in most definition of diseases are:

- a) The present of physiological disorders that are generally detrimental; and
- b) Morphological abnormalities result from the physiological malfunctioning.

## Plant Disease Triangle



If any one of the three factors is missing, the triangle is not complete, no disease will occur. Simply, plant disease will not occur if there is no viable pathogen, or no susceptible host plant, or the environmental conditions are not favorable. The severity of disease depends on the favorable level of each factor. How susceptible is the plant? How virulent is the pathogen? How conducive are the existing environmental conditions in supporting disease and pathogen spread?

## Definition and terminology in Plant Pathology

The common terms used in plant pathology are defined here to obtain a better understanding of the science.

- Pathogen - is any agent that causes a disease is generally referred to as living organisms such as fungus or bacterium that causes disease.
- Parasite - an organism which depend wholly or partly on other living organisms for its food. A parasite may be obligate or facultative.
  - Obligate parasite - is an organisms that is restricted to subsist on living organisms and attacks only living tissues.
  - Facultative parasite - is organisms, which has the faculty or ability to be a parasite although it is ordinarily a saprophyte.
- Saprophyte - is organism that lives on dead or inorganic matter. A facultative parasite has the ability to become a saprophyte but is ordinarily a parasite.
- Host – refers to a plant that is attacked by a parasite.
- Physiopathogen – those environmental factors that are able to cause plant diseases.
- Pathogenicity- the capacity of the pathogen to cause disease.

- Pathogenesis- is the chain of interrelated events of disease development.
- Suscept – a plant that is susceptible to a disease whether or not the pathogen is parasitic
- Virulence – refers to the quantitative amount of disease that can isolate of a given pathogen can cause in a given group of plants in terms of size of lesions or number of lesions
- Aggressiveness – measures the rate at which virulence is expressed by a given pathogenic isolate
- Disease resistance – inherent ability of an organism to overcome in any degree the effects of a pathogen
- Susceptibility – the inability to overcome the effects of a pathogen
- Tolerance – ability of plant to withstand the severe effects of the pathogen without experiencing a severe reduction in yield
- Masked symptoms – symptoms not expressed due to unfavorable condition
- Symptomless carrier – a host that do not show symptom irrespective of environment

## Symptoms of Plant Diseases

Symptoms are the expressions by the suscept or host of a pathologic condition by which a particular plant disease may be distinguished from other disease. In a broader sense, it includes any measurable host response to infection such as increased respiration and increased leaf temperature. Symptoms usually change as the disease progresses since disease is often a dynamic process. Symptoms may vary according to environment, the host variety, and the race of the pathogen.

Symptoms have been described as **primary** or **secondary**, **localized** or **systematic**, and **histological** or **morphological**. *Primary symptoms* are results of the causal agent's activities on the invaded tissues whereas *secondary symptoms* are the effects on the distant and uninvaded plant parts. *Localized symptoms* are characterized by distinct and very limited structural changes usually in the form of the lesions. *Systemic symptoms* on the other hand are more generalized pathological condition such as mottle, mosaic and wilting.

A *histological symptom* is essentially internal, and seen only upon the dissection of the diseased plant portion and examination under the microscope. It is expressed as an abnormality in cell content, structure or arrangement. Cell enlargement and vascular discoloration are histological symptoms. *Morphological*

*symptoms* are those malformations and other changes that visible to the naked eye.

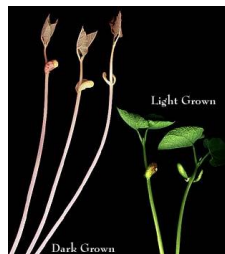
Symptoms are generally classified into:

1. The most common and noticeable symptoms of plant disease is a change in the natural coloring of the plant. Examples:
  - a. Chlorosis – failure of development of the green color of the leaf in the achlorophyllous organ.
  - b. Anthocynescene – changes in the anthocyanin content, a water-soluble pigment, gives the plant a purplish or reddish coloration.
  - c. Formation of melanin in diseased plants results in a dark brown or black discoloration of the affected tissues.
2. Necrotic symptoms involved the death or protoplast, cells or tissues. Examples are spot, blight, scorch, canker and die-back. Necrosis may be localize or generalize necrosis is confine to limited areas while in generalize necrosis, the death of host cells, the entire plant part become necrotic.
3. Hypoplastic symptoms appear when there is an inhibition or failure in the differentiation or development of some aspect of plant growth. Examples are stunning, mottle, mosaic, resetting and curling.
4. Hyperplastic symptoms are expressed with the occurrence of excessive multiplication, enlargement or overdevelopment may result from an increase in the size of the cells (hypertrophy) or an abnormal increase in the number of cells of hyperplasia.

The various symptoms were categories by Kenada (1974) into (a) Abnormal coloration, (b) Defoliation and fruit drop, (e) Abnormal growth increase of host, (f) stunting, and (g) Replacement of host tissue.

Specific symptoms and their description are given below.

1. Etiolation – yellowing of normally green tissues caused by inadequate light.



2. Chlorosis – yellowing caused by some factor other than light, such as virus or mycoplasma.

Iron chlorosis



3. Mosaic – the presence usually on leaves of variegation pattern



4. Blight – an, extensive, usually sudden, death of most tissue, such as leaf blight.

Boxwood Blight – leaf spots



5. Shot hole – a perforated appearance of a leaf as the dead areas of local lesion drop out.



6. Canker – an often sunken necrotic area with cracked border that may appear in leaves, fruits, stems and branches.



7. Savoying is leaf puckering as a result of different growth rates in adjoining tissue. (E.g. Savoy cabbage and spinach).



Savoying of Cabbage

8. Mummification – an affected fruit is converted to a hard, dry, shriveled mummy.



Mummification in Atis



9. Stunting is when a plant is reduced in size and vigor as a result of unfavorable environmental conditions or a wide range of pathogens or abiotic agents.



Zinc deficiency in Apple

10. Leak – the host's juices exude or leak out from soft-rotted portions.



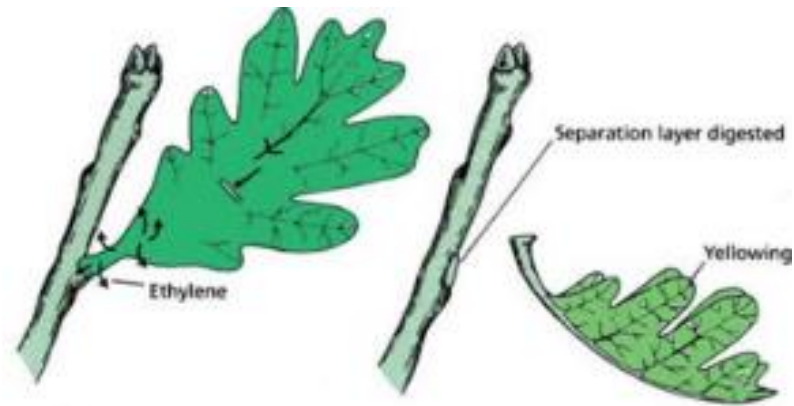
11. Die-back – a drying backward from the tip of twigs or branches.



12. Pitting- definite depressions or pits are found on the surface of fruits, tubers and other fleshy organs resulting in a pocked appearance.



13. Abscission – premature falling of leaves, fruits or flower due to the early laying the down of the abscission layer.



14. Phyllody – metamorphosis of sepals, petals, stamens or carpels into leaf-like structure.



15. Curling – abnormal bending or curling of leaves caused by overgrowth of one side of the leaf or localized growth in certain portions.



Almond Leaf Curl – *Taphrina* sp.

16. Scab – slightly raised, rough, ulcer like lesion due to the overgrowth of epidermal and cortical tissues accompanied with rupturing and suberization of cell walls.



17. Damping- off – rotting of seedlings prior to emergence or rotting of seedling stems at a area just above the soil.



18. Scarcody – abnormal swelling of the bark above wounds due to the accumulation of elaborated food materials.



Scarcody caused by girdling

19. Callus – an overgrowth of tissue formed in response to injury in an effort of the plant to heal the wound.



20. Fasciculation or Fasciation – clustering of roots, flowers, fruits, or twigs around a common focus.





21. Blast – term applied to the sudden death of young buds, inflorescence or young fruits.







22. Russeting – a superficial brownish roughening of the skin or fruits, tubers or other fleshy organs usually due to the suberization of epidermal or sub-epidermal tissues following injury to epidermis.



Here is a table of symptoms with possible causes included and also its sampling considerations with illustrations.

**TABLE 1. SYMPTOMS, POSSIBLE CAUSES, AND SAMPLING CONSIDERATIONS**

Symptom	Possible Causes, Sampling Considerations
 <p data-bbox="500 1425 573 1446">leaf spot</p>	Fungal, bacterial, or viral leaf spot pathogen, chemical phytotoxicity. Collect all stages of development. Note pesticide schedule.
 <p data-bbox="500 1528 581 1591">leaf tipburn or scorch</p>	Root or stem dysfunction, water stress, excess soluble salts, herbicide or other chemical injury. Fungal, bacterial or other pathogenic infection. Collect whole plant with roots and soil. Note pesticide and fertilizer schedule plus other components of cultural program.
 <p data-bbox="500 1686 581 1707">distortion</p>	Fungal, bacterial, viral or other pathogenic infection, herbicide or growth regulator injury, insect or mite damage, chemical phytotoxicity, mechanical damage. Collect representative sample of all symptoms. Note cultural program.
 <p data-bbox="500 1789 597 1810">vein enation</p>	Viral infection, growth regulator injury. Collect representative range of symptoms. If possible, keep tissue fresh or submit whole plant to permit observation and testing to take place over a period of time.

	edema	Excess moisture, chemical phytotoxicity, fungal infection. Collect all representative stages. Note soil moisture, preceding weather conditions (prolonged cloudy, humid to wet weather?).
	vein clearing	Viral infection, growth regulator or herbicide injury. Collect all representative stages, note pesticide schedule on or near crop. Keep sample very fresh (essential for many viral diagnostic tests). Whole plant helpful.
	mosaic ringspot	Viral infection, reaction to cold or hot water on foliage, chemical phytotoxicity. Note watering methods, pesticide schedule. Collect very fresh sample or whole plants.
	mildew	Fungal infection. Collect symptomatic tissues.
	leaf blister	Fungal infection, insect or mite injury. Collect range of symptomatic tissues.
	scab	Fungal or bacterial infection, insect or other injury, chemical damage. Collect range of symptomatic tissues.
	defoliation	Root dysfunction, water stress, excess soluble salts, cold, heat, normal senescence, chemical or insect damage. Collect whole plants. Note recent cultural treatments.
	chlorosis	Macro- or micronutrient deficiency, low or excess light, growth regulator or herbicide injury, natural pigmentation/variegation, root dysfunction, soil pH problems. Collect representative samples of all symptoms, soil and roots.
	wilt	Fungal, bacterial, viral or other pathogenic wilt, root rot or canker pathogen. Water stress, excess soluble salts, high temperature, wind, cold, insect injury. Implies sudden onset. Collect whole plant with roots and soil.
	tip dieback	Slower or later expression of same factors as above, plus cold injury, insect damage.



blight

Localized or generalized branch or twig disorder caused by fungi, bacteria, insects, mechanical injury. Collect sample which includes transition zone from diseased to healthy tissue.



stunt

Fungal, bacterial, viral or other pathogenic infection, nutrient deficiency, water stress, nematode or insect injury, growth regulator damage. Collect whole symptomatic and asymptomatic plant. Note cultural program.



fasciation

Unknown. Usually considered a genetic abnormality, sometimes associated with insect injury. Collect symptomatic tissue of all stages, whole plants if possible. Note pesticide and growth regulator schedule.



proliferation  
witches' broom

Fungal, bacterial, viral, or MLO infection. Mite infestation. Micronutrient deficiency, herbicide or growth regulator phytotoxicity. Collect whole plants if possible. Note pesticide schedule.



girdle

Fungal disease, mechanical constriction, ground-line heat canker, insect injury. Collect symptomatic tissues of all stages of development.



canker diffuse  
and/or  
calloused

Fungal or bacterial infection, mechanical injury, heat or cold injury, sunburn, chemical injury. Collect symptomatic tissues, especially transition zones between healthy and symptomatic tissue. Check pattern of symptom expression.



Initiation  
of root  
primordia

Excess water, mechanical or chemical injury or pathogenic infection at ground line. Enough vigor to induce root primordia implies sudden onset of disorder to otherwise healthy plant. Collect whole plant or all representative plants parts.



pustule

Fungal infection (rust), excess moisture (exploded lenticels). Collect symptomatic tissue.



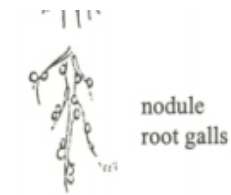
gall

Fungal or bacterial infection, mechanical injury, hormonal disruption, insect injury. Collect samples of all stages of gall development, including surrounding soil if below ground.



root rot

Fungal or bacterial infection, excess moisture, excess soluble salts, chemical injury. Collect whole plant with soil and roots.



Nodulating N-fixing bacteria, actinomycetes, bluegreen algae, root-knot nematode, insect injury, fungal bacterial or viral pathogenic infection. Collect symptomatic tissue.



Crown rot affects oldest tissues. Bud rot affects youngest tissue. Fungal, bacterial infection. Excess soluble salts. Collect entire plant with roots and soil.



Fungal infection, mechanical injury, heat or cold damage, chemical injury. Collect representative samples of all stages.



Fungal infection. Collect representative samples of all stages.

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## Signs of Plant Disease

Signs of plant disease refer to the structures of the pathogen that are found associated with the infected plant. Some of these structures may not always be present in disease plant because their formation depends on environmental conditions. Most of these signs are best seen and distinguished under a microscope. Signs are as important as symptoms in plant disease diagnosis. They may either be in the form of vegetable or reproductive structures.

Example of signs are fungal mycelia, spores and fruiting bodies, bacterial ooze, sclerotial bodies, nematodes at various growth stages and plant parts of phanerograms (parasitic flowering plants) vegetative structures of the pathogen develop for feeding or for storage purposes. Reproductive organs are structures which the pathogen develops primarily for reproduction. These may be in the form of fruiting, bodies and germs consisting of spores, eggs, etc. fruiting bodies are structures in which spores of most reproductive units of the pathogen.



## **Plant Disease Diagnosis**

Diagnosis is the identification of specific plant disease through their characteristic symptoms and signs including other factors that may relate to the disease process. Diagnosis is the first step in the study of disease in plants. Correct plant disease diagnosis is necessary for recommending the appropriate control measures, and in plant disease surveys.

Diagnosis based on symptoms alone is not a very reliable means of identifying a particular malady since some diseases exhibit that same symptoms although their pathogens may be very different. The presents of signs of the disease increases the reliability of diagnosis but it should be born in mind that it is quite too common to find secondary invaders or saprophytic microorganisms in the invaded stages of infection. The structure of these innocuous organisms may be mistaken for the primary pathogen.

Studies and work that require actual proof of pathogenicity require the application of Koch's rules of proof. This is known as Koch's postulate. This postulate state that: (1) the suspected pathogen must always be present in the plant when the disease occurs, (2) the organism which is believed to cause the disease must be isolated and grown in pure culture, (3) the pure culture of the organism must produce the symptoms and signs of the disease when inoculated into a healthy plant, (4) the suspected causal organism must be reinsulated in pure culture from the inoculated plant and must be identical to the original organism.

For those organisms that cannot be grown in pure culture like those obligate parasites such as viruses and nematodes, there is a need of modifying the Koch's rules of proof. These holds true when working with physiopathogen.

## **Classification of Plant Disease**

A rational grouping of the thousands of plant disease is helpful in the identification and subsequent control of particular disease. Several criteria for classification had been devised.

1. Classification according to the affected organ.
  - a. e.g. root diseases, foliage diseases, fruit diseases, stem diseases
2. Classification according to the physiological process affected.
  - a. e.g. plant growth, absorption of nutrients and water, translocation, secondary metabolism, normal plant functions, water transport, storage organs, and reproduction.

3. Classification according to symptom
  - a. e.g. leaf spots, rusts, anthracnose, mosaics, wilts, fruit rots
4. Classification according to the type of plant affected
  - a. e.g. vegetable diseases, diseases of forest trees, diseases of field crops, diseases of ornamentals
5. Classification according to the type of pathogen that causes the disease.
 

These may be grouped into infectious disease, if caused by pathogen; and non-infectious disease, if caused by physiopathogen.

  - a. Furthermore, infectious disease may be classified as
    - i. Fungal diseases
    - ii. Bacterial diseases
    - iii. Viral diseases
    - iv. Diseases caused by mycoplasma
    - v. Diseases caused by Viroids
    - vi. Diseases caused by protozoa
    - vii. Diseases caused by phanerogams; and
    - viii. Diseases caused by nematodes
  - b. On the other hand, non-infectious diseases are grouped into the casual abiotic agent such as:
    - i. Extremely high or excessively low temperatures
    - ii. Unfavorable oxygen relation
    - iii. Unfavorable moisture conditions
    - iv. Nutrient deficiencies
    - v. Minerals toxicities
    - vi. Air pollution; and
    - vii. Toxicity of pesticide

This last method of classification of etiological or casual agent of a particular disease that gives one is preferred by many workers because it allows them to understand how the disease develops and spreads, and of the control measures that are most to the affected against the malady.

## Plant Disease Management

- Avoidance
  - Choosing a planting location where the pathogen is not present.
  - Choosing a planting site not conducive to disease.
  - Crop Rotation
- Exclusion
  - Legal restrictions and quarantines.
  - Propagation of disease free cuttings.
  - Production of disease free seed in areas not favorable for disease.
- Eradication
  - Removal of pathogens from infested soil and tools.
  - Removal of pathogens from infected seed or plant parts.
  - Removal of infected plants



Steaming soil to eradicate root knot nematode

- Protection
  - Cultural Control
  - Biological Control
  - Chemical Control
  - Genetic Resistance

V. Activity

<b>Name:</b>	<b>SCORE:</b>
<b>Course, Year and Section:</b>	
<b>Instructor:</b>	
<b>Date of Submission:</b>	

**Laboratory Exercise No. 2**

**CLASSIFICATION OF SIGNS AND SYMPTOMS**

**I. INTRODUCTION**

Phytopathology comes from the Greek words, “*phyto*”, “*pathos*” and “*logos*” which means “plant”, “suffering” and “to study”. Studying the cause and origin of a plant disease is very important to determine the threshold level of the crop production damage thus to secure and maintain the quantity and quality of the fresh commodities until it reaches the end users.

Classification of plant disease is very vital prior to application of preventive measures. It is classified according to the: affected plant organ which is generally related to the affected physiological process of the plant, symptoms, type of the affected plant and with the type of pathogen that causes the diseases mostly microorganisms. Determining the precise sign and symptoms in plants leads to proper plant care.

Symptoms of plant diseases refer to the physical or external and internal reactions or alterations of a plant as a result of the disease. It is any visible response by the susceptible host which is affected by the infection which includes increase transpiration rate, early senescence of some plant parts and even death of the tissue.

On the other hand, sign refers to the pathogen, its parts, structures or products seen on the host plant. Mostly, some of these structures are not always present in the affected or diseased plants because the formation of the pathogenic structure or product depends on the external factor like the environmental condition. So, most of these are best seen and distinguished under an appropriate microscope.

## II. OBJECTIVES

To identify, classify and distinguish different plant diseases based on their sign and symptoms and familiarize the most common plant diseases in the Philippines.

## III. MATERIALS

Obtain different diseased plant samples

### 1. Diseases caused by fungi and fungal-like *Oomycetes*

#### 1.1. CEREAL/GRAINS

Rice blast	<i>Bipolaris</i> leaf spot of corn
Sheath blight of rice	Downy mildew of corn
Corn rust	

#### 1.2. VEGETABLES

Leaf mold of tomato	Downy mildew of squash
Powdery mildew of cabbage	

#### 1.3. LEGUMES/ROOT CROPS

Peanut rust	String bean leaf spot
<i>Fusarium</i> wilt of mungbean	Taro leaf blight

#### 1.4. FRUIT BEARING TREES

<i>Sigatoka</i> of banana	Anthrachnose of mango
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### 2. Diseases caused by bacteria

Bacterial wilt of solanaceous crops

Bacterial blight of rice

Citrus canker

Soft rot of vegetables

Anthurium blight

### **C. Diseases caused by nematode**

Root knot of solanaceous crops

### **D. Diseases caused by virus**

Bean mosaic

Rice *tungro*

Tobacco mosaic

Papaya ringspot

Abaca/Banana bunchy top

## **IV. METHODOLOGY**

Draw, sketch and label the specimens collected and obtained. For:

### **1. Fungi**

- a. Describe the symptoms (like color, shape and part of the plant affected) and microscopic signs.
- b. Observe fungal pathogen by placing scraped portion of the diseased plants in a microscope slide. Examine the mounts in the microscope and look for fungal structures like mycelia, conidiophores and conidia.
- c. With a use of cellophane, place it over the sporulating lesions allowing the spores to adhere to the cellophane strips. Observe the strips placed in a glass slide under a microscope.

### **2. Bacteria**

- a. Describe the symptoms (like color, shape and part of the affected plant) and microscopic signs.
- b. Cut tissues into convenient sizes with a flamed scalpel to expose the inner affected portion.
- c. Incubate the tissue in a moist chamber for 12 – 24 hours, depending on the disease, to induce the formation of bacterial ooze. Bacterial ooze may appear in dirty-white or sometimes yellowish droplets on the affected part.

**3. Nematode**

- a. Wash the roots of the specimen with running water.
- b. Examine the roots for any presence of galls or knots.
- c. Place several galls on the glass slide and look for masses of eggs.
- d. Flatten the galls and cover it with cover slip in another slide and look for the male and female nematode.

**4. Virus**

- a. Examine infected plant parts and observe for any physiological malformations or changes.
- b. Compare obtained specimens with healthy plant samples.

**V. OUTPUT**

**1. SYMPTOMS CAUSED BY FUNGI**

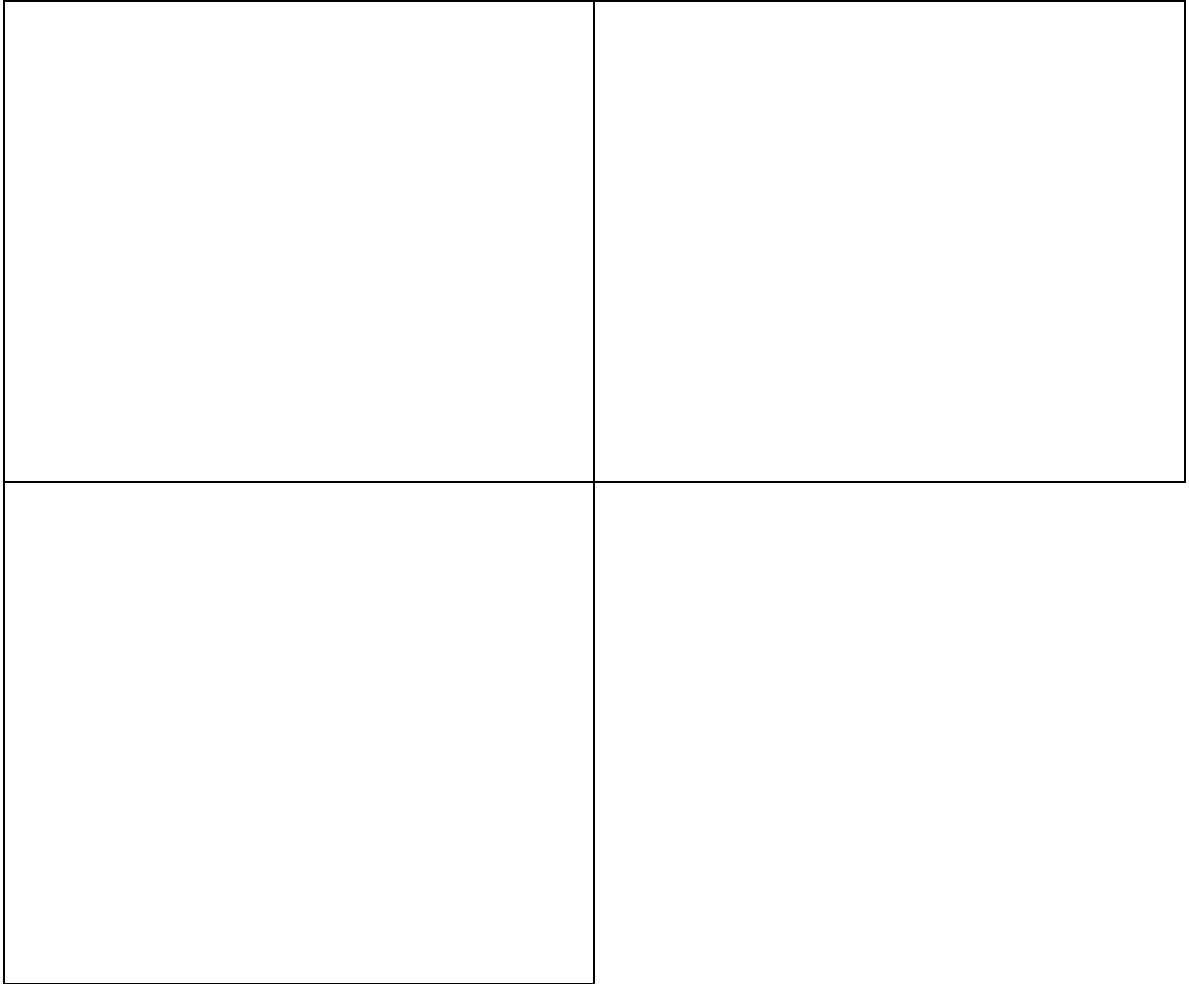





Note: Label each drawing. Add some colors to make your work lively.

2. SYMPTOMS CAUSED BY BACTERIA

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Note: Label each drawing. Add some colors to make your work lively.

### 3. SYMPTOMS CAUSED BY NEMATODE



4. SYMPTOMS CAUSED BY VIRUS


**VI. ASSESSMENT CRITERIA**

**QUESTION:**

What is the difference between signs, symptoms and syndrome?

**ANSWER:**

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**QUESTION:**

What is the difference between downy mildew and powdery mildew?

**ANSWER:**

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**QUESTION:**

What are the three elements for the development of plant disease?

**ANSWER:**

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**QUESTION:**

How do plants obtain viral diseases?

**ANSWER:**

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**QUESTION:**

Is it possible to identify plant disease without the availability of laboratory apparatus in the field?

**ANSWER:**

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Define the following signs and symptoms:

1. Abscission =
2. Acervulus =
3. Apothecium =
4. Ascus =
5. Basidium =
6. Blast =
7. Bleeding =
8. Blight =
9. Blotch =
10. Callus =
11. Canker =
12. Chlorosis =
13. Cleistothecium =
14. Conidiophore =
15. Conk =
16. Curling =

17. Damping off =
18. Die-back =
19. Etiolation =
20. Fasciculation or Fasciation =
21. Felt =
22. Flecks =
23. Gumming or gummosis =
24. Haustorium =
25. Leak =
26. Mildew =
27. Mold =
28. Mosaic =
29. Mottling =
30. Mummification =
31. Mushroom =
32. Mycelium =
33. Odor =

34. Ooze =

35. Pathogen cell =

36. Plasmodium =

37. Perithecium =

38. Phyllody =

39. Pitting =

40. Pseudothecium =

41. Pycnidium =

42. Rhizomorph =

43. Rosetting =

44. Rotting =

45. Rusetting =

46. Sarcody =

47. Savoying =

48. Scab =

49. Sclerotium =

50. Shot -hole=

51. Sorus =

52. Sporangium =

53. Spore =

54. Sporodochium =

55. Spot =

56. Streak or stipe =

57. Stroma =

58. Vein clearing =

59. Virescence or greening =

60. Wilting =

**VII. REFERENCES**

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## Post Test

### I. Find out which word is related to the given word.

1. Pathogen
  - a. environment b. parasite c. suscept
2. suscept
  - a. plant b. pathogen c. environment
3. sign
  - a. mycelium b. blight c. yellowing
4. symptom
  - a. nematode b. spore c. rot
5. host
  - a. diseased b. pathogenic c. parasitic
6. obligate parasite
  - a. virus b. bacteria c. saprophytic
7. facultative saprophyte
  - a. parasitic b. saprophytic c. pathogenic
8. facultative parasite
  - a. parasitic b. saprophyte c. systemic
9. injury
  - a. lightning b. bacteria c. temperature
10. disease
  - a. pathogenic b. parasitic c. infectious

### II. How are your symptoms and signs?

1. An extensive necrotic area.
  - a. blight b. spot c. yellowing d. canker
2. Sharply defined variegated color pattern
  - a. mottle b. mosaic c. yellowing d. chlorosis
3. Thread-like vegetative fungal structure
  - a. fiber b. mycoplasma c. mycelium
4. Hard, dry, shriveled fruit
  - a. hard rot b. soft rot c. mummification
5. Why whitish secretions containing bacterial cells
  - a. foul b. drops c. ooze
6. Cause by lack of water
  - a. drying b. shriveling c. wilting d. blasting
7. Sunken dead areas with cracked borders.
  - a. canker b. ring spot c. spot d. leaf streak

## VI. Summary

- Plant diseases only occur when 3 conditions are met. These conditions comprise the disease triangle and are the susceptible host, virulent pathogen, and favorable environment.
- To diagnose a plant disease, you need to observe the signs and symptoms. Signs are the direct or physical presence of any part of the pathogen or its reproductive organ in the infected plant. Symptoms are the expressions by the susceptible host of a pathologic condition by which a particular plant disease may be distinguished from other disease.
- Plant diseases can be classified according to affected organ, affected physiological process, symptoms, affected type of plant, and type of pathogen that caused it.
- Plant disease control can be performed by avoidance, exclusion, eradication, and protection.

## VII. References

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