

**COURSE DESCRIPTION: PLANT PATHOLOGY**  
**COURSE CODE: BOT 425**  
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Pathogen is what causes diseases on plants.

Wilting is caused by a fungus

Plant pathology is defined as the study of plant disease.

A plant can be said to be diseased when there is a harmful deviation from the normal functioning of the physiological process

A disease can easily be known when there is continuity. A plant may be damaged but not diseased.

A disorder may be caused by non-parasitic agents such as adverse soil condition.

A pathogen is any agent which causes damage it is generally used for living organism some capable of attacking plants e.g. fungi and bacteria.

A parasite is an organism or virus living in or on a living organism, deriving requirements needed for its growth but the host does not derive anything in return. A parasite is also a pathogen if it causes disease.

A pathogen which obtains nourishment from the living cell of the host is said to be a BIOTROPH

The one killing the host cells and living on the dead remains is known as the NECROTROPH

The one living 1<sup>st</sup> as a biotroph then later becomes a necrotroph is known as HEMIBIOTROPH

Most but not all pathogens are also parasite in that they derive the materials they need for growth from a living plant.

An obligate pathogen (Biotroph) cannot be grown in the absence of the host or can be said to be restricted to the living tissue.

Facultative pathogens are those which can be grown in artificial culture and are able to colonize both living and dead tissues.

Saprophytes (saprobes) derive the materials needed by them from dead organic matter.

A disease is a condition of abnormal structure and or function in a plant resulting from the plant interaction with a causal agent and characterised by certain symptoms and signs.

A symptom is a visible or otherwise, detectable expression of abnormal physiological, development, or behavior in a plant resulting from disease. Symptoms often involve changes in form, colors, odor, texture and structure.

**SIGNS:** Any observable part or remnant of the causal agent (pathogen) on / around the host. Common signs include vegetative or reproductive structure of the pathogens ( mycelium or spores)

### **Different symptoms found in the plant**

Death or disintegrating of the cell tissues and or organs, discoloration of the pathogen (yellow, purple etc) wilting, abnormal growth and development e.g. tumor formation, lack of seed formation or the curling of leaves.

**Wilting:** This is a form of drying caused by the interference of the normal supply and movement of water into pathogen.

**Rot:** Disintegration of tissues which can be accompanied by release of cell fluid such that there is an exuding from the partially disintegrated tissue.

**Soft rot:** The rotted part is soft and moist.

**Dry rot:** Rotted part relatively dry and firm

**Mummification:** Shriveling and wrinkling in fruits

**Damping off:** Like wilting but in emerging or very young seedling.

**Defoliation:** This is the shedding of the whole organ. The flower or bud of fruits can be shed i.e bud drop or flower drop.

Necrosis generally means death of plant tissue.

### **THE CAUSES OF DISEASES**

Plant growth can be limited by some numbers of factors, such as non-parasitic inanimate or non transmissible causes and those due to parasitic, animate and transmissible agents. Certain diseases caused by viruses or macro plasma – like organisms closely resemble non-parasitic diseases in their symptoms.

### **DISEASES DUE TO NON-PARASITIC AGENTS/CAUSES**

It is non-transmissible. Immediately the causal factor is removed, it gets back to performing well. Although the damages that can be done may cause a set back in the growth rates, the damage can also predispose plants to attack by pathogen.

The non-transmissible factors include:-

1. Adverse climatic conditions such as low temperature, adverse soil condition
2. Mechanical and Chemical injury.
3. Adverse soil condition could be by mineral deficiency or in excess of it.

4. Disturbances due to genetic origin such as chlorosis, cutting, dwarfing,, variegation.
5. Other factors such as drought can bring about wilting and eventually death of the plant

Disease could also be caused by combination of these factors.

## **DISEASES DUE TO PARASITIC AGENTS**

The 2 major groups of organisms which feed saprophytically and obtain nourishment by secreting extracellular enzyme into the medium in which they are feeding are the fungi and bacteria.

These organisms were thought not to be able to cause diseases in living organisms due to some physical and chemical barrier, but due to their wide range of carbohydrate splitting enzymes, they are mostly important in plants. The viruses are becoming more rampant while bacteria due to their ability to breakdown protein are more important in animals. It can be said that the main causes of diseases in plants in the order of importance are:

Fungi, Viruses, Mycoplasma like organisms, bacteria and parasitic flowering plants.

## **CONCEPT OF PLANT DISEASES**

Usually a disease causes a progressive and continuous disturbance of cellular activities that eventually become manifest as symptom.

In the case of the fungal infection, the fungus keeps growing until it reaches the reproductive phase and starts to reproduce. The time that passes between the infected spot is known as the latency period.

The latency period is followed by the infection period during which the fungus produces a certain number of spores per day. The spores produced are dispersed and can start a new infection at other parts of the plant where a new cycle of the fungus begins again..

An infection may remain latent as an in apparent chronic infection that gives no sign of its presence (symptomless infection). In the case of many symptoms-less virus infection, the virus may vigorously multiply in the host. Such hosts are carriers of the virus.

Tolerance is the ability of a host to endure infection by a particular pathogen. The term tolerance is used when there is an apparent non-restricted and extensive colonization by a parasitic organism or virus.

**Infection :** invasion of the tissue by bacteria viruses, fungi and other internal parasites.

**Infestation:** Invasion of the body by organisms such as ticks or mites, which remain on the surface and do not enter the tissues.

**Resistance:** Absence of symptoms because infection and colonization have been restricted in their activity by the host defensive response implies resistance not tolerance.

The establishment of a parasitic relationship is known as infection i.e. the entry of a pathogen successfully into a susceptible pathogen, a host that is exempt to infection is said to be immune. Following infection is colonization i.e. the advance of pathogen within the tissue of the host. If specie is strictly confined to the tissue of the host in nature, they can sometimes be referred to as ecologically obligate pathogens. If infection is confined to just one part of the host, it is said to be a local infection.

If the pathogen spreads through the plant from a single point of infection so as to infect all or most part of the host, although often seeming to have little adverse effect on the tissue through which it grows or is transported, it is said to be a systemic infection

Virulence has been used to denote qualitative rather than quantitative differences in pathogenicity while aggressiveness is used to describe the capacity of a parasite to invade or grow in its host plant and to reproduce on or in it more rapidly than others (highly aggressive). Aggressiveness can also be used to measure pathogenicity.

## **THE HOST – PARASITE (PATHOGEN) RELATIONSHIP**

The spreading of a disease depends on 2 factors.

1. Time
2. Environment

The time determines the cause of the disease as the pathogen population increases with the passage of time. Environmental factors such as climatic, soil conditions and cultivation methods have a great influence on the activity and development of the parasite and on the expression of the disease symptom.

The host – parasite relationship involves one living organism, the host that harbors another living organism or virus ( the parasite). The latter being dependent on that host for its existence. It is obvious that the effect of such intimate co-existence depends not only on the hereditary properties of each of the partners but also on the environmental conditions which have great influence. The way an organism manifests itself (the phenotype) is the result of the interaction between its genotype and the environment.

The growth of the parasite in a host usually results in an increase that is detrimental to plants. However, there is a protective mechanism which may either prevent the parasite from establishing itself in the host or strangulate the developing parasite. Such a pathogen is therefore said to develop some resistance to the parasite. The ability of the host to show resistance to the pathogen makes infection an exception rather than a rule. The resistance can either be in-built or induced (defence).

## **RESISTANCE BY PROTECTION**

**Such protection may be:**

1. Structural
2. Chemical
3. Absence of nutrients.