**Plant Pathology**

 It is derived from two Greek words i.e. Pathos= Disease or Suffering and Logos = to study

“It is the study of plant diseases caused by plant pathogens”

**Pathogen**

 Any organism or micro-organism which lives, feeds and multiplies on host and also cause diseases.

**Parasite**

 Any organism or insect which lives feeds and multiplies on host and may cause disease.

**Disease**

Any deviation from normal functioning is called disease. OR

“It is a continuous process due to some biotic or non-biotic factors which cause abnormality in the physiology, morphology and genetics of plant or its part that reduces quality or quantity or both above economic levels”.

 Disease may be caused by

1. Biotic agents such as plant pathogenic fungi, bacteria and nematodes.
2. Abiotic agents such as temperature, Relative humidity, Rain fall, Fog, Imbalance of nutrients and pH etc.
3. Mesobiotic agents such as viruses

**What are microorganisms?**

 A microorganism or microbe is a [microscopic](https://en.wikipedia.org/wiki/Microscopic_scale) [organism](https://en.wikipedia.org/wiki/Organism), which may be [single-celled](https://en.wikipedia.org/wiki/Unicellular_organism)or [multicellular](https://en.wikipedia.org/wiki/Multicellular_organism). Microorganisms are very diverse and include all [bacteria](https://en.wikipedia.org/wiki/Bacteria), [archaea](https://en.wikipedia.org/wiki/Archaea) and most [protozoa](https://en.wikipedia.org/wiki/Protozoa). This group also contains some [fungi](https://en.wikipedia.org/wiki/Fungus), [algae](https://en.wikipedia.org/wiki/Algae). Many [macroscopic](https://en.wikipedia.org/wiki/Macroscopic_scale) animals and [plants](https://en.wikipedia.org/wiki/Plant) have microscopic [juvenile stages](https://en.wikipedia.org/wiki/Juvenile_%28organism%29). Some microbiologists classify [viruses](https://en.wikipedia.org/wiki/Virus) and [viroids](https://en.wikipedia.org/wiki/Viroid) as microorganisms.

**Importance of Micro-Organisms**

**VIRUSES**

**Harmful aspects**

* Cotton leaf curl disease is caused by CLCuV
* Tobacco mosaic disease is caused by TMV
* Sugarcane mosaic disease is caused by ScMV

**Beneficial aspects**

* Used to kill insects as bio control agents
* Used in genetic engineering
* Some viruses are the sources of enzymes such as RNA polymerases
* Viruses are the most efficient means of gene delivery
* Color breaking agent in ornamental plants

**BACTERIA**

**Harmful aspects**

* *Xanthomonas axonopodis* causes citrus canker disease in citrus
* *Erwinia amylovora* causes fire blight of pear, peach and apple
* Soft rot of vegetables caused by *Erwinia carotovora* in tomato and Brinjal etc.
* Most can cause food spoilage
* Some bacteria can cause process failure by clogging process systems
* Cause foul smelling gas
* Different species of *Streptococcus, Micro­coccus* and *Lactobacillus* cause spoilage of milk and different milk products

**Beneficial aspects**

* Used as a vector in genetic engineering
* Used for fermentation process (milk to yogurt)
* The lactic acid bac­teria are used in the preparation of butter, cheese
* *Acetobacter aceti*, the acetic acid bacteria are used in the conversion of alcohol to acetic acid
* Important for symbiosis process e.g. *Rhizobium*
* Used for antibiotic preparation e.g. *Streptomyces*
* Used in transgenic cotton (BT. Cotton)
* Disintegrate dead biological materials ( compost)
* These Can produce useful gas( methane)
* Can help in digestion
* Used in the ret­ting of jute, hemp and flax fibres e.g. *Clostridium tetani, C. botulinum*

**Nematodes**

**Harmful aspects**

* Economic losses due to diseases
* Causes citrus decline in citrus
* Wheat ear cockle and root-knot disease is caused by nematodes

**Beneficial aspects**

* Used to control insects by biological method
* Improve soil fertility

**FUNGI**

**Harmful aspects**

* Economic losses due to plant diseases e.g. early and late blight of potato.
* Leather, paper, timber and textile industry has been destroyed by species of *Polyporus* and *Armillaria, Mucor, Trichoderma*
* Food industry specially pickles and pasteurized foods are destroyed
* Different types of food are destroyed by different fungi like *Mucor, Aspergillus, Penicillium, Rhizopus* etc.
* Poisonous mushrooms which called as death caps e.g. *Amanita phalloides* produce toxins like α-amanitin causes lesions of stomach cells
* Well-known hallucinogenic drug, is extracted from the sclerotia of *Claviceps purpurea.*

**Beneficial aspects**

* Bakery products are formed by fermentation e.g. yeast
* Some fungi are edible such as mushrooms e.g. oyster mushrooms, Button mushrooms
* *Ganoderma lucidum* and *Agaricus subrufescens* enjoy usage as therapeutics in traditional Chinese medicine.
* The shiitake mushroom is a source of a clinical drug called Lentinan.
* Fungi are also used to produce industrial chemicals, including citric, malic and lactic acids.
* Fungi are easy to handle for research purposes
* Some antibiotics like penicillin is formed from fungus called *penicillium*
* Some beneficial fungi are helpful to fertile the soil
* Some fungi are used as insecticides i.e. biological control e.g. *coelomyces* is used
* to kill mosquitoes