

**FACULTY OF AGRICULTURE SCIENCES AND  
ALLIED INDUSTRIES**

**Course Material**

**Course Name: Fundamentals of Plant Pathology**

**Course Code: PPA-121**

**B.Sc. Agriculture**

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**Course Instructor**

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**LECTURE 4**  
**GENERAL CHARACTERISTICS OF FUNGI AND FUNGAL-LIKE**  
**ORGANISMS CAUSING PLANT DISEASES**

**FUNGI**

**Fungi** are eukaryotic, spore bearing achlorophyllous organisms with absorptive nutrition that generally reproduce both sexually and asexually and whose somatic structures known as hyphae are surrounded by cell wall containing chitin and glucans (but no cellulose) as the skeletal components.

**Oomycetes**

- A group of fungal like organisms, the Oomycota generally referred to as (Oomycetes), until about 1990 were called considered as lower fungi.
- Majority have cell wall composed of glucans and small amount of cellulose, but not chitin.
- Now regarded as members of the kingdom Chromista (also known as Straminopila) rather than Fungi; but continued to be discussed with fungi because of their many other similarities to them, especially the way they caused disease in plants.

**Habitat**

- Most of the more than 100,000 known fungus species are strictly saprophytic and they live on dead organic matter.
- About 50 species cause diseases in humans
- About 50 species caused diseases in animals.
- More than 10,000 species of fungi can cause diseases in plants.
- All plants are affected by some kinds of fungi and each of the parasitic fungus can

attack one or many kinds of plants.

- Some fungi like those causing rusts, smuts, powdery mildews and downy mildews can grow and multiply on their host plants during their entire life, and therefore called as obligate parasites or biotrophs.
- Fungi like *Venturia inaequalis*, the apple scab fungus, pass a part of their life on the host as parasites and a part on the dead tissues of the same host on the ground as saprophytes in order to complete their life cycle in nature, and therefore are called hemibiotrophs.
- **Facultative saprophytes** generally grow parasitically on the hosts but continue to live, grow and multiply on the dead tissues of the host and may further move out of the host debris into the soil or other decaying plant material to grow and multiply strictly as saprophytes, e.g., *Phytophthora infestans*.
- **Facultative parasites** live perfectly well in the soil or elsewhere as saprophytes but can parasitize or cause disease in the plants when they get opportunity under favourable conditions to do so, e.g., *Alternaria alternata*.

### Morphology

- **Mycelium:** A filamentous vegetative body.
- **Hypha (pl. hyphae):** Individual branch of mycelium which are generally uniform in thickness, usually about 2-10  $\mu\text{m}$  in diameter. The hyphae may be septate or aseptate.
- **Coenocytic hyphae-** The aseptate or non-septate hyphae having the nuclei scattered in the cytoplasm.
- **Septate hyphae-** The hyphae have septa having perforations through which cytoplasmic strands, containing nuclei can migrate from one cell to the other.
- A characteristic dolipore septum is formed in certain basidiomycetes.
- Diameter of hyphae may be as narrow as 0.5  $\mu\text{m}$  and as wide as 100  $\mu\text{m}$ .
- The vegetative thallus may consist of only one cell or may even be naked, amoeboid, multinucleate plasmodial mass without cell wall or a system of strands of varying diameter called rhizomycelium.
- In some fungi, hyphae form aggregates and develop various kinds of structures.

These may be:

- **Rhizomorphs:** thicker root like aggregates.
- **Sclerotium:** a hard roundish or amorphous structure and has a hard rind surrounding a soft interior i.e. medulla.
- **Stroma:** some fungi also develop mat like structures which contain the fruiting bodies.
- Rhizomorphs and sclerotia help the fungus to survive from one cropping season to the other and also function in initiating the disease as a primary inoculum.
- **Pseudoparenchyma:** Sometimes the hyphae aggregate to form tissue like structure called plectenchyma. In cross section, it appears like parenchymatous cells of the higher plants. This is called pseudoparenchyma and consists of rounded fungal cells.
- **Prosenchyma:** Less compact structures consisting of hyphae made of elongated cells. These are found mostly in the stroma or fruiting bodies of Ascomycota or Basidiomycota.

## FUNGAL CELL STRUCTURE

A typical fungal cell consists of protoplasm which is surrounded by a cell membrane, and cell wall being its outer most covering. The protoplasm typically contains nucleus, mitochondria, ribosomes, golgi bodies and endoplasmic reticulum among others.

### Cell wall

- Made up of chitin and  $\beta$ -glucans in the members belonging to the kingdom Fungi.
- Chitin is a polymer of N-acetylglucosamine units which is also found in the exoskeleton of insects.
- Made up of cellulose in kingdom Straminopila (including Oomycota).
- Cellulose is a polymer of  $\beta$  D-glucose units and is also found in the cell wall of plants and algae.

### Nucleus

- The nuclei of fungi are extremely small and lie near the limit of resolution power

of light microscope.

- Electron microscopic studies have revealed that the nuclear membrane does not disappear but constricts in the centre like a dumb-bell during nuclear division. This type of division is known karyochoresis, term given by Moore in 1964.
- In meiosis, however, the nuclear membrane disappears.