

## GENERAL CHARACTERS OF FUNGI

### Fungi:

Fungi are eukaryotic, spore bearing, achlorophyllous, heterotrophic organisms that generally reproduce sexually and asexually and whose filamentous, branched somatic structures are typically surrounded by cell walls containing chitin or cellulose or both with many organic molecules and exhibiting absorptive nutrition.

### General characters

1. All are eukaryotic - Possess membrane-bound nuclei (containing chromosomes) and a range of membrane-bound cytoplasmic organelles (e.g. mitochondria, vacuoles, endoplasmic reticulum).
2. Most are filamentous - Composed of individual microscopic filaments called hyphae, which exhibit apical growth and which branch to form a network of hyphae called a mycelium.
3. Some are unicellular - e.g. yeasts.
4. Protoplasm of a hypha or cell is surrounded by a rigid wall - Composed primarily of chitin and glucans, although the walls of some species contain cellulose.
5. Many reproduce both sexually and asexually - Both sexual and asexual reproduction often result in the production of spores.
6. Their nuclei are typically haploid and hyphal compartments are often multinucleate - Although the oomycota and some yeast possess diploid nuclei.
7. All are achlorophyllous - They lack chlorophyll pigments and are incapable of photosynthesis.
8. All are chemoheterotrophic (chemo-organotrophic) - They utilise pre-existing organic sources of carbon in their environment and the energy from chemical reactions to synthesize the organic compounds they require for growth and energy.
9. Possess characteristic range of storage compounds - e.g. trehalose, glycogen, sugar alcohols and lipids.
10. May be free-living or may form intimate relationships with other organisms i.e. may be freelifing, parasitic or mutualistic (symbiotic).

### SOMATIC STRUCTURES:

#### Thallus/ Soma

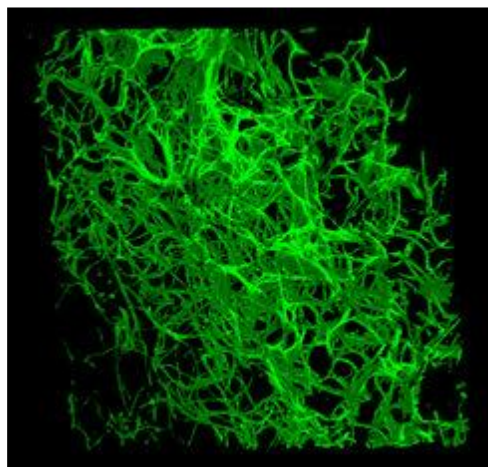
Commonly called as vegetative body or fungal body. A thallus( pl. thalli) is a simple, entire body of the fungus devoid of chlorophyll with no differentiation into stem, roots and leaves lacking vascular system.

**Hypha (hypha=web) ( pl. hyphae) :**

Hypha is a thin, transparent, tubular filament filled with protoplasm.It is the unit of a filamentous thallus and grows by apical elongation.

**Mycelium( pl. mycelia):**

A net work of hyphae ( aggregation of hyphae) constituting the filamentous thallus of a fungus.It may be colourless i.e., hyaline or coloured due to presence of pigments in cell wall.The mycelium may be ectophytic or endophytic.



**TYPES OF FUNGAL THALLI:**

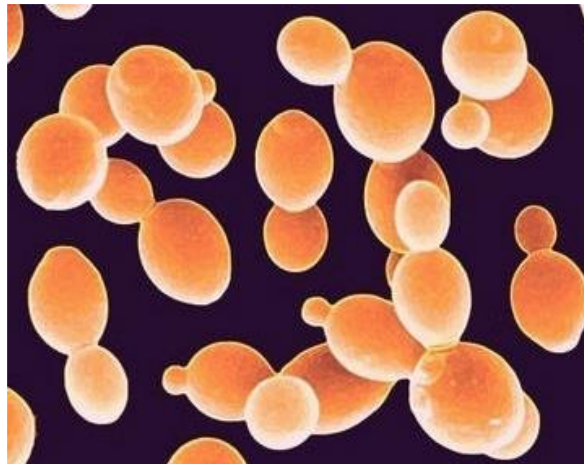
1.Plasmodium (plasma = moulded body): It is a naked,multinucleate mass of protoplasm moving and feeding in amoeboid fashion .

Eg. *Plasmodiophora brassicae*.

***Plasmodiophora brassicae* in host cell**



**2.Unicellular thallus:** consisting of a single cell. Eg.Chytrids, Synchronium



**3.Multi cellular or filamentous thallus:** Majority of fungi i.e., a true fungi are filamentous, consisting of a number of branched, thread like filaments called hyphae.Eg.Many fungi,Alternaria.

**Fungi based on reproductive structures:**

**Holocarpic (holos=whole+karpos=fruit):** If the thallus is entirely converted into one or more reproductive structures, such thallus is called holocarpic thallus

. Eg.Synchronium

**Eucarpic(Eu=good+karpos=fruit):**If the thallus is differentiated into a vegetative part which absorbs nutrients and a reproductive part which forms reproductive structures, such thallus is called eucarpic thallus.

Eg.Pythium

**Ectophytic fungus:**

If the fungal thallus is present on the surface of the host plant, it is called ectophytic

.Eg. Oidium .

**Endophytic fungus:**

If the fungus penetrates into the host cell / present inside the host, it is called endophytic.

Eg. Puccinia. Endophytic fungus may be intercellular (hypha grows in between the cells), or intra cellular ( hypha penetrates into host cell).

Eg.Ustilago, or vascular (xylem vessels) Eg. *Fusarium oxysporum*

Inter cellular hyphae produce special organs called haustoria which penetrate the host cell and absorb food. These are absent in intracellular hyphae.

Endophytic intra cellular mycelium absorb food directly from protoplasm with out any specialized structures. In ectophytic mycelium, haustoria are produced in epidermal cells.

**Septation in Fungi :(septum=hedge/partition) ( pl.septa)**

Some fungal hyphae are provided with partitions or cross walls which divide the fungus into a number of compartments /cells. These cross walls are called septa.

**Aseptate hypha/coenocytic hypha: ( Koinos=common,kytos=hollow vessel)**

A hypha with out septa is called aseptate /non-septate/ coenocytic hypha wherein the nuclei are embedded in cytoplasm.Eg. lower fungi like Oomycetes and Zygomycetes.



**Septate hypha:**

A hypha with septa or cross walls is called septate hypha.

Eg.common in higher fungi like Ascomycotina, Basidiomycotina and Deuteromycotina



## General types of septa:

### 1. Based on formation:

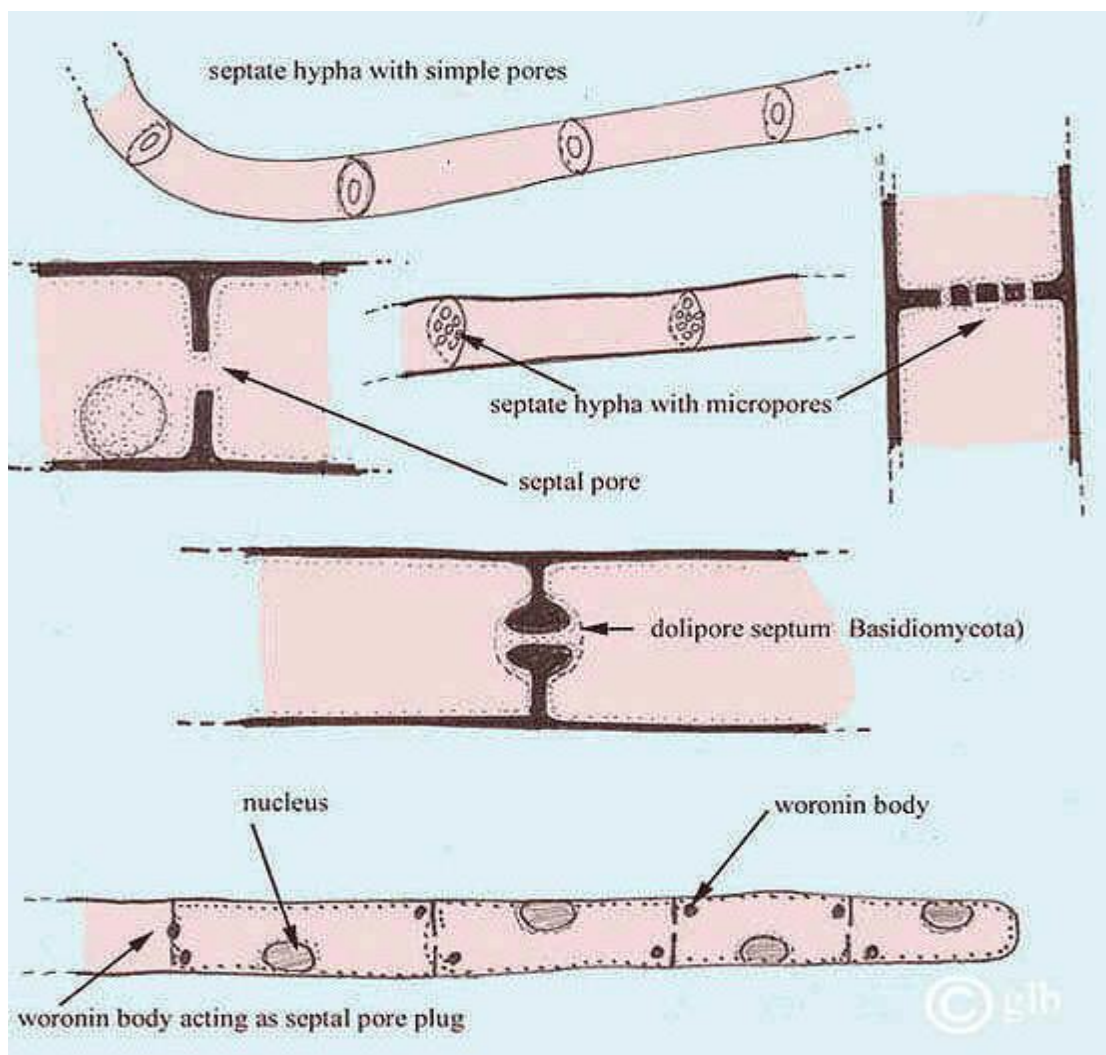
**a) Primary septa:** These are formed in direct association with nuclear division (mitotic or meiotic) and are laid down between daughter nuclei separating the nuclei /cells. Eg. Higher fungi like Ascomycotina and Basidiomycotina.

**b) Adventitious septa:** These are formed independent of nuclear division and these are produced to delimit the reproductive structures. Eg. lower fungi like Oomycetes and Zygomycetes in which septa are produced below gametangia (sex organs) which separate them from rest of the cells.

### 2. Based on construction:

**a) Simple septa:** It is most common which is a plate like, with or without perforation.

**b) Complex septa:** A septum with a central pore surrounded by a barrel shaped swelling of the septal wall and covered on both sides by a perforated membrane termed the septal pore cap or parenthosome. Eg. Dolipore septum in Basidiomycotina.



### **3. Based on perforation:**

**a) Complete septa:** A Septum is a solid plate without any pore or perforations. Eg. Adventitious septa in lower fungi.

**b) Incomplete septa:** A septum with a central pore