BIOLOGICAL CLASSIFICATION
KINGDOM FUNGI

KINGDOM – FUNGI

Mycology	-	Study of fungi
Father of Mycology	-	P.A. Michele → book. Nova Plant arum Genera

CHARACTERS

(1) Fungi show a great diversity in morphology and habitat. Fungi are cosmopolitan. They prefer to grow in warm and humid places. Fungi are found mostly in humus rich soil. But in the presence of moisture, these can grow on leather, wood, pickle, bread and rotten fruits. Some fungi live parasitically in plants, animals and human body.

(2) Chloroplast is absent in fungi, so fungi are heterotrophs. The fungi constitute the unique kingdom of heterotrophic organism. Fungi obtain their own food from dead organic matter or living organisms.

General Characters:

(1) Fungi are eukaryotic, achlorophyllous, heterotrophic, non vascular, non flowering, gametophytic, haploid (n), multicellular organisms.

(2) **Habitat:** Fungi are cosmopolitan and occur in air, water, soil and on animals and plants.

- They prefer to grow in warm and humid places.

(3) **Nutrition in fungi:** The fungi constitute a unique kingdom of heterotrophic (saprophytic/absorptive nutrition) organisms. Type of heterotrophic nutrition in fungi

(i) **Saprophytes:** Most fungi are heterotrophic and absorb soluble organic matter from dead substrates and hence are called saprophytes.

e.g. You must have seen fungi on a moist bread and rotten fruits.

(ii) **Parasites:** Derive nutrition from living plants and animals.

e.g. White spots seen on mustard leaves are due to a parasitic fungus.

Many fungi cause diseases in plants and animals;

Wheat rust-causing Puccinia is an important example.

(iii) **Symbionts:** They can also live as symbionts – In association with algae as **lichens** and with roots of higher plants as **mycorrhiza**.

(iv) **Predacious:**

e.g. Arthrobotrys (Nematophagus Fungi)

(4) Thallus organization:

- The main body is thallus that is called **mycelium** which is composed of interwoven mass of thread like **hyphae**. Hyphae may be aseptate or septate.

Heterothallism and Homothallism :

Homothallic fungi :-

Those in which every thallus is sexually self fertile and can, therefore, reproduce sexually by itself without the aid of another thallus.

e.g. Chaetomium, Albugo candida

Heterothallic fungi :-

Those in which every thallus is sexually self-sterile and requires the aid of another compatible thallus of a different mating type for sexual reproduction.

e.g. Species of Mucor, Rhizopus, Puccinia & Maximum fungi

Note:

In most of fungi there are two distinct phases vegetative / assimilative phase (below soil, inconspicuous) and reproductive phase (Conspicuous and aerial).

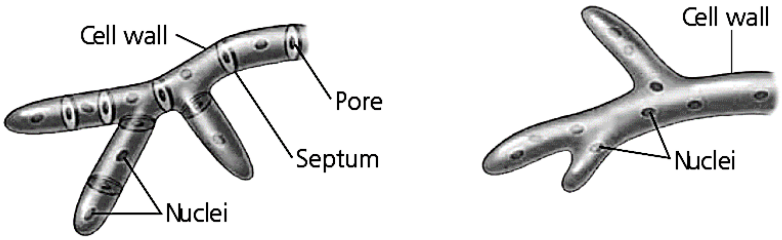
- **Mycelium is of following types.**

(a) **Aseptate mycelium:** Septa absent in hyphae so mycelium is coenocytic or multinucleated.

e.g. Phycomycetes - Albugo**,** Rhizopus.

(b) Septate mycelium: Septa present in hyphae so mycelium may be uninucleated (primary mycelium) or multinucleated (secondary mycelium) **e.g.** Class *Ascomycetes*, Basidiomycetes and Deuteromycetes.

Note – dolipore septa (collar like septa) are found in basidiomycetes only.



(a) Septate hypha **(b) Coenocytic hypha**

(5) Stored Food: Reserve food material is **glycogen and oil**.

(a) Cell wall: Cell wall is composed of **chitin or fungal cellulose** $(C_{22}H_{54}N_4O_{21})_n$ which is nitrogen containing homopolysaccharide of **NAG (N-acetyl glucosamine)**.

Note:

(i) Exceptionally in **oomycetes**, **cell wall** is composed of **cellulose**. **e.g.** Phytopthora.

(ii) Lomasomes are special outgrowths of cell membrane in between cell wall and cell membrane for the synthesis of cell wall.

REPRODUCTION

(1) Vegetative reproduction:-

(A) Fragmentation :- Some times the fungal filament (mycelium) breaks into small pieces due to any reason. Now these pieces form a new fungal filament and starts working like normal filament.

(B) Budding :-

eg. : Saccharomyces (Yeast)

(C) Fission :-

eg. : Schizosaccharomyces (Yeast)

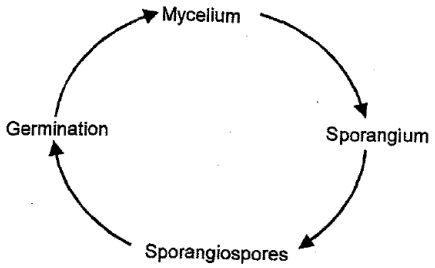
Note : Reproduction through bud formation and fission takes place only in nonmycelial form.

Asexual reproduction –

Asexual reproduction takes place by the formation of different types of spores. These spores are formed by mitotic division.

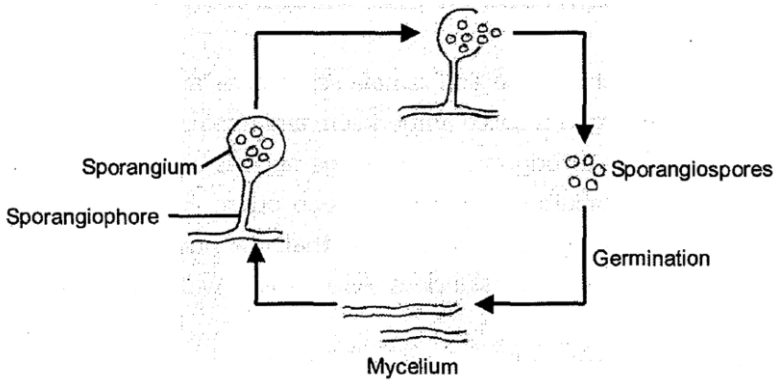
Spores are the following types :

Sporangiospores: They are formed in sporangium. Sporangium is formed at the tip of fungal filament. Those fungal filaments on which sporangia are formed is called as sporangiophore. Numerous spores (sporangiospores) are present in the sporangium, that comes out by rupturing of sporangium and germinate to form fungal filaments. The formation of sporangiospores takes place endogenously.

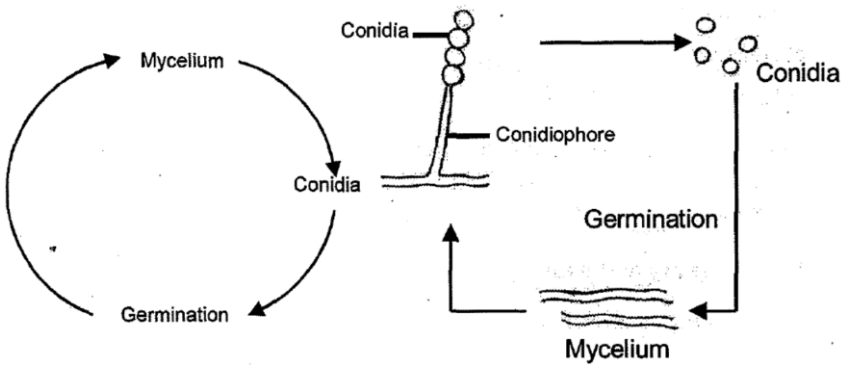


Sporangiospores are of Two types

- **Zoospore :-** When the sporangiospores formed in sporangium are flagellated and motile, then they are called as zoospores. In this condition the sporangium is called as zoosporangium.
- **Aplanospore :-** When sporangiospores are non flagellated and non motile then they are called aplanospores.



- **Conidia :-** The formation of conidia takes place exogenously. These conidia are formed at the tip of conidiophores



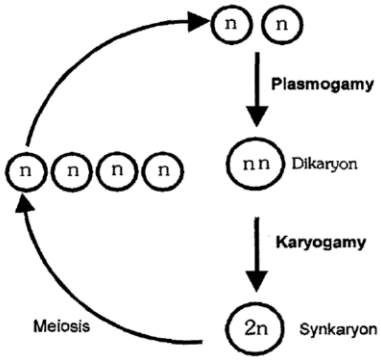
Sexual reproduction in fungi completes in three steps

(A) Plasmogamy :- This is the first stage of sexual reproduction. In this stage two motile or non-motile sex cells fuse with each other but their nuclei do not fuse, due to which a single cell has two nucle. This binucleate or dikaryotic stage is called dikaryon.
In phycomycetes the fusion of two haploid cells immediately result in diploid cell (2n). However in other fungi (ascomycetes and basidiomycetes), an intervening (prolonged gap) dikaryotic stage (n + n, i.e. to nuclei per cell) occurs (long gap between plasmogam and karyogamy) such a condition is called a dikaryon and the phase is dikaryophase.

(B) Karyogamy :- In this stage the nuclei present in the cell fuse with each other, to form a diploid nucleus which is known as synkaryon.

(C) Meiosis :- In this stage, meiosis takes place in the diploid nucleus due to which again haploid nuclei or haploid cells are formed.

Note: Sexual reproduction is by the formation of zygospore /oospore, ascospores and basidiospores.



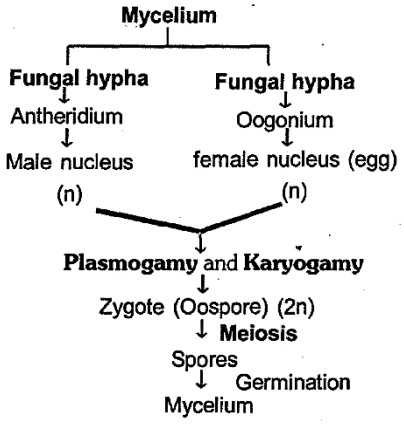
METHODS OF SEXUAL REPRODUCTION

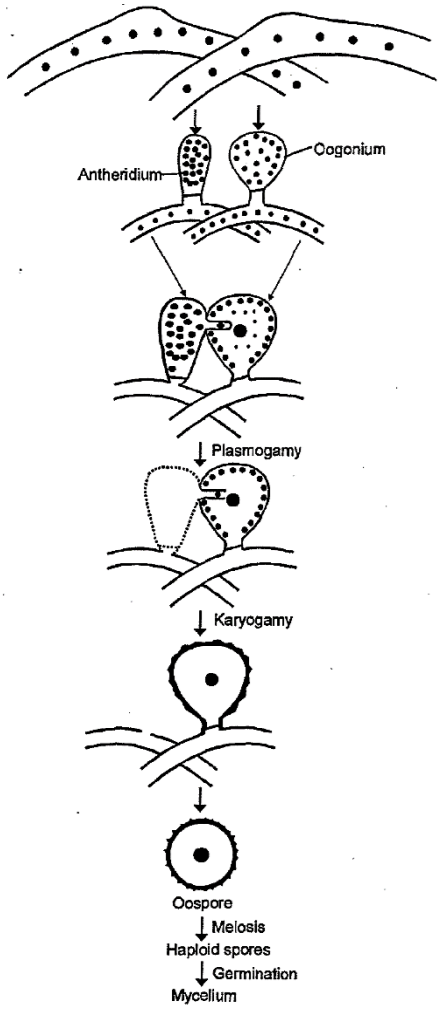
(1) Gametangial Contact:-

(a) In this process, first of all male and female sex organs are formed on two different hypha of same mycelium. Male sex organ is called antheridium and female sex organ is called oogonium.

(b) In mature antheridium & oogonium one - one nucleus behave like a male and female gamete. Now antheridium and oogonium come close to each other. After that a fertilizing tube comes out from antheridium and enters the oogonium. After that, the nucleus of antheridium goes to the oogonium through this tube and fuse with its nucleus. As a result of which a diploid zygote is formed, which is called oospores.

(c) Now meiotic division takes place in the nucleus of oospores, as a result of which haploid spores are formed. Now each spore germinates and gives rise to a new mycelium.

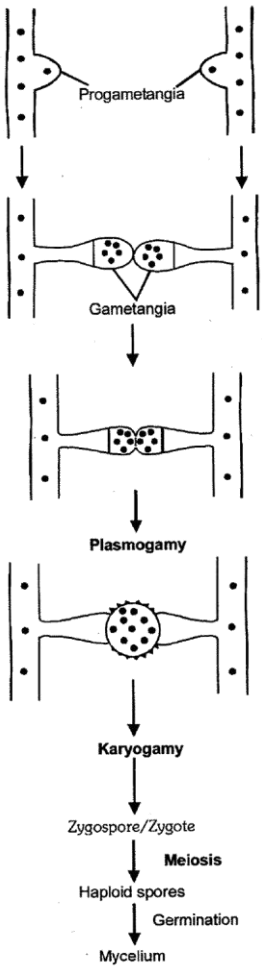




(2) Gametangial copulation :-

(a) In this process, gametangia are formed on two different mycelium.
First of all the a part of hypha become swollen and form progametangia. Both the gametangia have many nuclei. Now these gametangia fuses with each other. Due to which a zygote is formed which is known as zygospore.

(b) Now meiotic division takes place in zygospore, as a result of which haploid spores are formed. Now each spore germinates and gives rise to a mycelium.



(3) Somatogamy :- In it, no sex organs are formed. In this process two mycelium comes close to each other and their cells get fused