۞Kingdom Fungi۞

Fungi: Eukaryotic organisms, structure **thallus**, spread in different places in wet soil and dry in the fresh and salt water in the air and attacked many of them plant, animal and human also used some of them as a food and is one of the micro-organism-free chlorophyll so fungi are heterotrophy.

Fungi thallus have two phases:

- Somatic phase (vegetative phase): (unicellular, filamentous).
- Reproductive unites (gametes, spores, conidia).

Mycology: the science who study specializes structure and the classification and methods of reproduction of different types of fungi and their economic importance**.**

Common characteristics between fungi and other living organisms

Organisms	Similarity	differences
Fungi and Plant	1- Contain cell wall. 2- Inability to move. 3- Nutrition absorbency	1- Fungi don't contain pigment chlorophyll. 2- Fungi don't contain complex vascular system 3- Store carbohydrate as **glycogen** in fungi and as **starch** in plant
Fungi and Bacteria	Both contain a cell membrane and cell wall.	1-bacteria prokaryotic while fungi Eukaryotic. 2- bacteria can be autotrophs as well as heterotrophs while fungi are heterotrophs.
Fungi and Animal	1. both eukaryotic and heterotrophic organisms.	Animals have only plasma membrane while fungi have cell wall in addition to the plasma.

	2. Store carbohydrate as **glycogen**	
Fungi and Algae	1- Both algae and fungi form thallus . 2- Algae and fungi tend to growth in moist or wet environments.	1- algae are autotrophy containing chlorophylls while fungi are heterotrophy . 2- Algae are incapable of living in the dark while Fungi are capable of living in the dark.

Morphology of Fungi

Fungi bodies consists either of unicellular (yeasts) or filament minutes microscopic size know **hyphae** (singular hypha) may be divided into cells or undivided, The hypha extends by tip growth, and multiplies by branching, creating a fine network called a **mycelium.**

Hypha are colorless but, in some fungi, take several different colors and this is due to the nature of the nutrients stored or to presence some of the different dyes. Each Hypha consists of an outer wall thinning and an internal cavity is full material protoplasm, and in some fungi to a number of fungal cells separated by cross walls called **septa**, And the cross walls between the cells have a small hole central that allows connection protoplasm between the cell and other. Hypha in some Fungi are undivided or no septa called **coenocytic**.

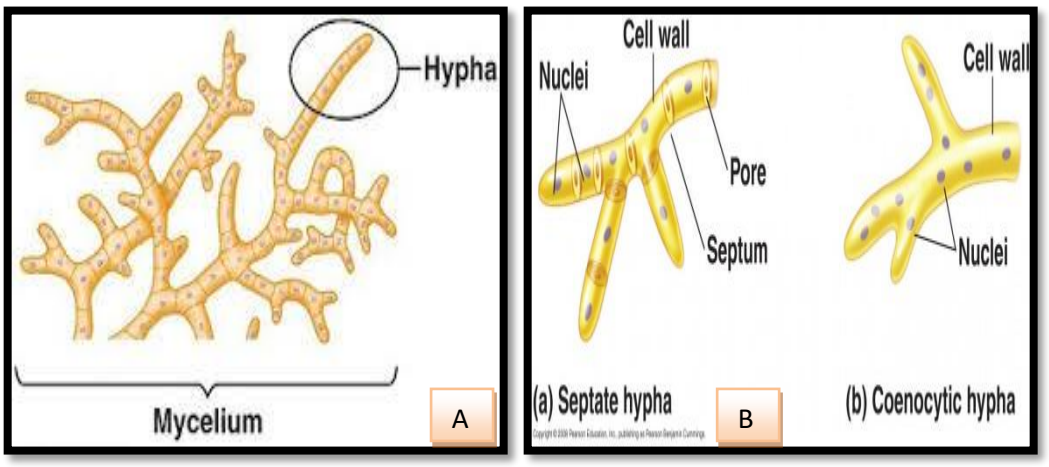


Figure (1) (A) Mycelium (B) Coenocytic

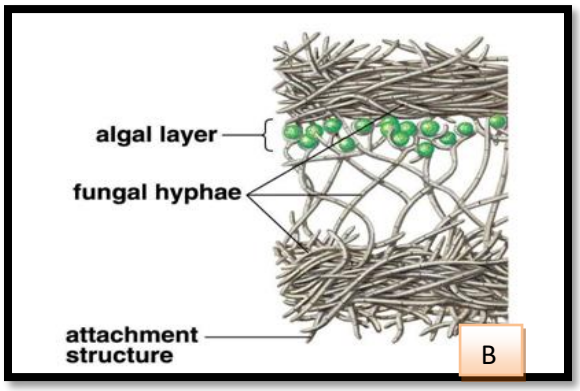
Fungi Nutrition

The nutrition in fungi is **absorptive**, use Enzyme to break down a large complex molecule in to small organic compounds, then absorbed it.

Type of fungi Nutrition

Nutrition in fungi divided into three divisions:

- **Saprophytism Nutrition:** Living on the remains organisms (plants and animals) live on dead cells**.**
  1-Obligate Saprophytism: Living only on dead cells **ex:** *Penicillium sp*., bread mold .
  2-Facultative Saprophytism: Usually living parasitic but if not find the host lived saprophytic ex: Smut fungi.
- **Parasitism Nutrition:** Living on or inside tissues of organisms causing diseases.
  1-Obligate parasitism: Lived only on living cells ex: Rust fungi, Downy mildew.
  2-Facultative parasitism: Usually living saprophytic, if not find proper material (dead cells) they lived parasitic ex: *Fusarium sp*.
- **Symbiosis Nutrition:** also called commensal**,** fungus live beneficial relationship with another organism, such as:
  Lichens: benefit relationship between fungus and algae.
  Mycorrhiza: benefit relationship between fungus and plant root.



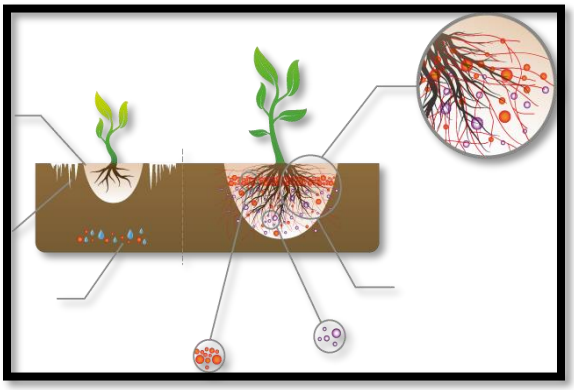


Figure (2) (A) Lichens (B) Mycorrhiza

Reproduction in Fungi

At the time of reproduction fungi when all somatic phase converted into reproductive structure. Such a condition is known as **Holocarpic** but if only part of the somatic phase converted into reproductive structure, it is called **Eucarpic**.

Types of Reproduction in fungi:

a- Asexual reproduction (anamorph): Also known somatic or vegetative reproduction, occurs in all kinds of fungus with the provide proper conditions. This reproduction is achieved in several ways:

1- Fragmentation: forming arthrospore.
2- Simple diffusion like yeast.
3- Budding: forming blastospores.
4- Chlamydospores.
5- Spores (ex: zoospores, aplanospores).

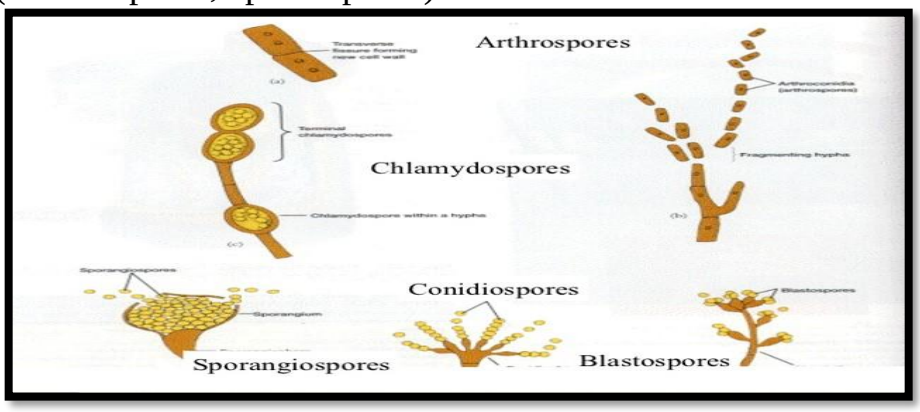


Figure (3) Asexual Reproduction ways

- If the spores inside fruit bodies known or **sporangia** (singular sporangium) called **sporangiospores,** carried on **sporangiophore**.
- If the spores produced at the tips or sides the hypha, they called **conidia** carried on **conidiophore**.

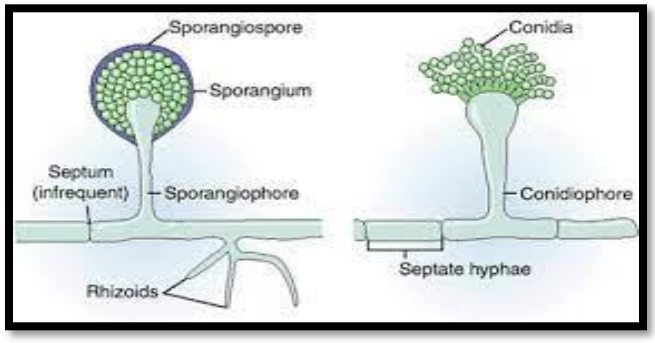


Figure (4) Sporangiospores and Conidia

b- Sexual Reproduction (telemorph): Must pass through three stages:

1- Plasmogamy (cell fusion).
2- Karyogamy (nuclear fusion).
3- Meiosis (reduction division).

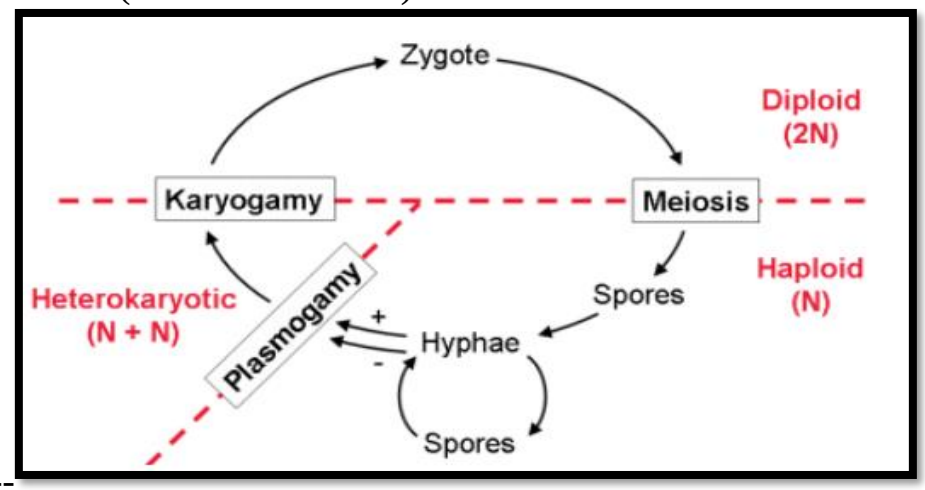


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Figure (5) Sexual Reproduction in fungi

❖ **Reproductive organs** called **gametangia** contain a sexual cells called **gametes**, This reproduction is achieved in several ways:

1- Planogamtic copulation.
2- Gamitangial copulation.
3- Gamitangial contact.
4- Spermatization
5- Somatogamy

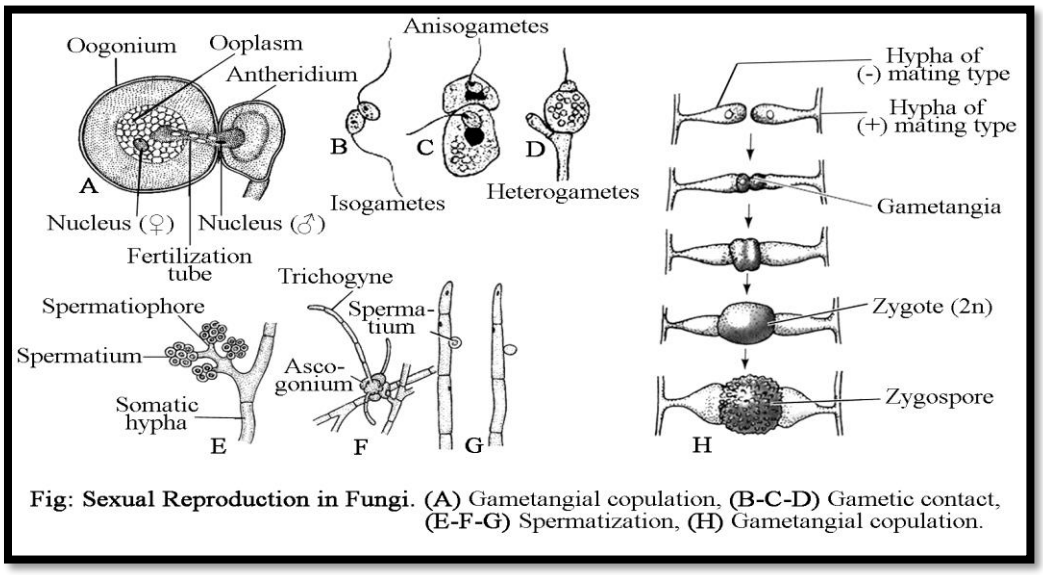

Figure (6) gametangia types in fungi