Study unit 7

Thanks for your involvement in making this group an interactive one. If you are yet to participate, Please do.

As it has been mentioned in my welcome address that all the tutorials will be based on what the Lecturer has designed. Even though, I tried (and will try in subsequent ones) to simplify the module for the purpose of your understanding, I would like to say that IT IS NOT EXHAUSTIVE IN ITSELF. Hence, onus lies on you to study and study to ensure maximum achievement. To this effect, only highlight excerpt are presented here. This also will cut across all tutorials that I would be pasting on myunisa.

Fungi are heterotrophs; they cannot manufacture their own food as plants do. Fungi absorb nutrients from the environment outside of its body. Most fungi secrete **hydrolytic enzymes** into their surroundings. These enzymes breaks down complex molecules to smaller organic compounds that is absorbable into the body of the fungi. Others penetrate the cell wall of their host with the help of the enzymes they produce and absorb nutrient directly from the cells.

Role of fungi

The use of their enzymes therefore gives fungi the role as a decomposer, parasite and mutualists (symbionts) in ecology.

I. Fungi as a decomposer

Decomposers break down non-living organic substances like dead trees animals and wastes and absorb nutrients from them.

II. Parasitic

They absorb nutrient directly from the cell of living organism (the host). Some of the parasitic are pathogenic i.e. they cause diseases in the host

III. Mutualist or symbionts

Fungi absorb nutrients from the hosts but reciprocate the host with beneficial actions. For example, fungi living inside the termite; they help in breaking down and digestion of woods.

FUNGI BODY STRUCTURE

Fungal structure is mainly as (1) multicellular filaments or (2) single cells.

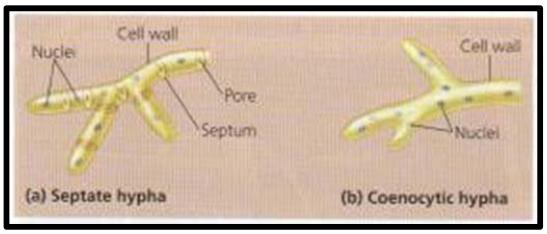
Multicellular fungi

Fungi extend its multicellular filaments into its environment so as to absorb nutrient. The fungi body forms a network of tiny filament called hyphae. The hyphae are made up of tubular cell wall made of chitin surrounding the plasma membrane and cytoplasm. Chitin is also found in the exoskeleton of insects. The hyphae forms an interwoven mass called mycelium (plural: mycelia) that infiltrates the

material on which the fungi feed. The fungi mycelium grows rapidly because the nutrient in fungi passes through the cytoplasm to the tip of the extending hyphae.

The hyphae are divide by the cell wall called the **septa** (singular: septum) in most fungi. Organelles of the cell may flow from one cell to the other cell through the pores on the septa. Fungi with septa are called **septate** hyphae while fungi that lack septa (the dividing wall in hyphae) are called the **coenocytic or aseptate** fungi. The cytoplasmic is not divided and they consist of numerous nuclei.

The repeated nucleus division without the occurrence of cytokinesis leads to coenocytic condition in fungi.



Two types of hyphae

REPRODUCTION IN FUNGI

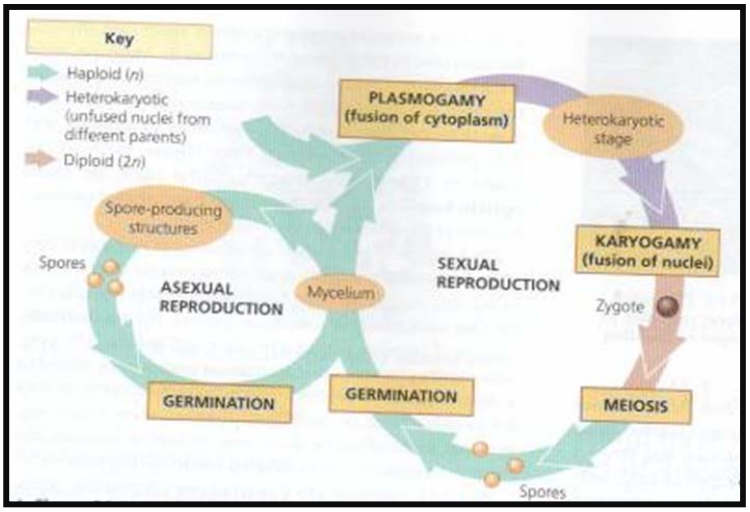
I. Sexual reproduction

The sexual reproduction in fungi starts when hyphae forms two mycelia and release sexual signal molecules called **phrenomones**. If the mycelia are of different mating, phrenomones from each partner bind to the **receptor** of the other. The hyphae moves towards the phrenomones and when they meet at the receptor, they fuse. The hyphae from the same mycelium do not fuse. The process called "compactibility test" which is responsible for the choice of fusion. The union of cytoplasm of two parent mycelia is called **Plasmogamy**

Each mating hypha contributes haploid nuclei (*n*). In most fungi, the haploid nuclei contributed by each hyphae does not fuse directly, they coexist at some part of the mycelium. This mycelium therefore said to be **heterokaryon** (meaning: different nuclei coexisting). The mycelium is **Dikaryotic** mycelium when the fused mycelia contribute nuclei and nucleus from each parent pair themselves into a cell (meaning: two nuclei)

2nd stage

The **karyogamy** occurs in the next stage of the life cycle. Here, the haploid nuclei fuse to form diploid (*2n*) cells, at this stage zygote is formed, then, Meiosis occurs. Meiosis restores the haploid (*n*) condition of the nuclei leading to spore formation.



General life cycle of fungi

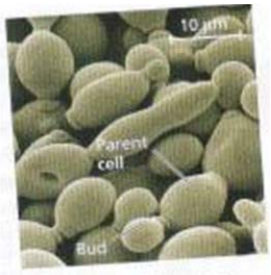
II. Asexual reproduction

Spore production in mold

Asexual reproduction occurs in fungi when the filamentous fungi produces haploid (n) spores by the process called mitosis. These species (filamentous fungi) may be called **mold** if their mycelia is visible. Mold grows fast and produces spore quickly enabling the rapid reproduction of fungi. They are also capable of sexual reproduction when they find members of their specie with a different mating type.

Asexual production as a single celled in yeast

This occurs by ordinary cell division or pinching of small "bud cell" off the parent cell. This occurs in all other fungi that is lacking sexual reproduction as Deuteromycetes (meaning second-fungi)



Yeast undergoing budding

ZYGOMYCETES

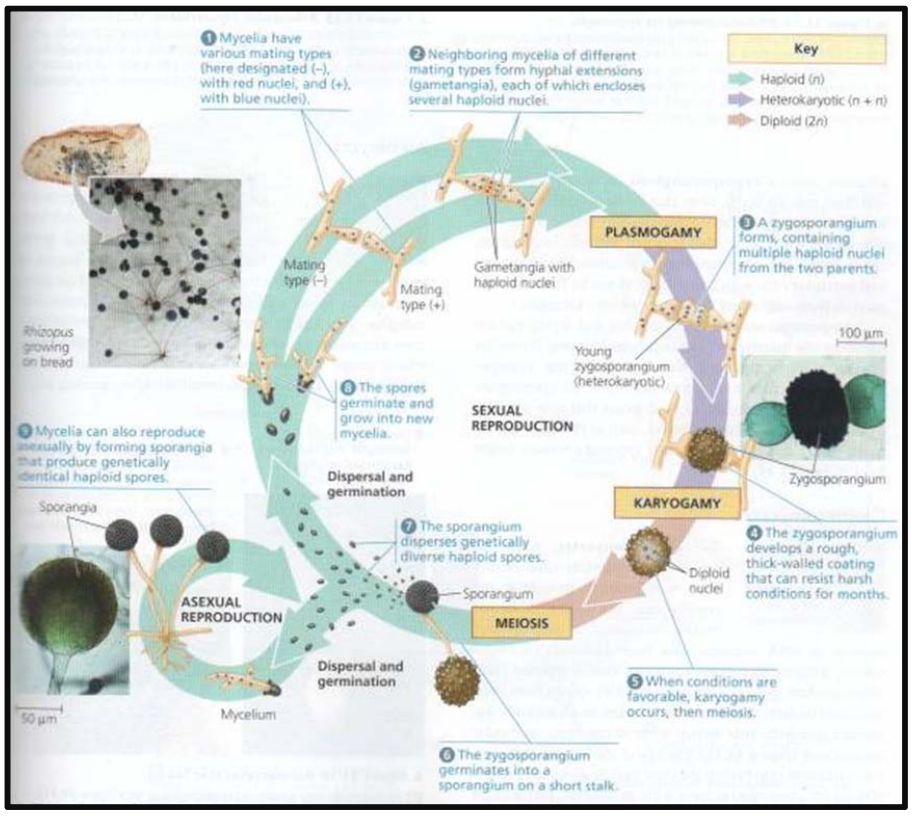
Example of this is the **mold**. They grow rapidly into foods and fruits. They may therefore be decomposer on non-living organic substance, or may be parasite or symbionts on living organisms. The hypha is usually **coenocytic** but may be **septate** where reproductive cells are formed.

a) Asexual phase

The sporangia develop at the tip of the hyphae. Inside each sporangium are hundreds of spores which develop and are dispersed through the air. The spores that land on food grow into new mycelia. In a situation where the environmental condition is unfavorable for example where food is lacking; they reproduce sexually

b) Sexual reproduction

The parents in sexual union are mycelia with different mating types and different chemical markers, but they may look identical. The fusion of the parent cytoplasmic material forms **Zygosporangium**, a multinucleate structure which develops a thick rough wall. The 2nd stage of the sexual reproduction which is **Karyogamy and meiosis** occurs inside the Zygosporangium. The multinucleated haploid mass (the Zygosporangium) at this stage forms multinucleated diploid structure. This is called the Zygote (*2n*) stage in life cycle. Zygosporangium are metabolically inactive when conditions are unfavorable, but when the condition is favorable, the nuclei undergo meiosis, it then germinates to a sporangium and the sporangium release genetically diverse haploid spores that may colonize new substrates.



The life cycle of the zygomycete (black bread mold)

BASIDIOMYCETES

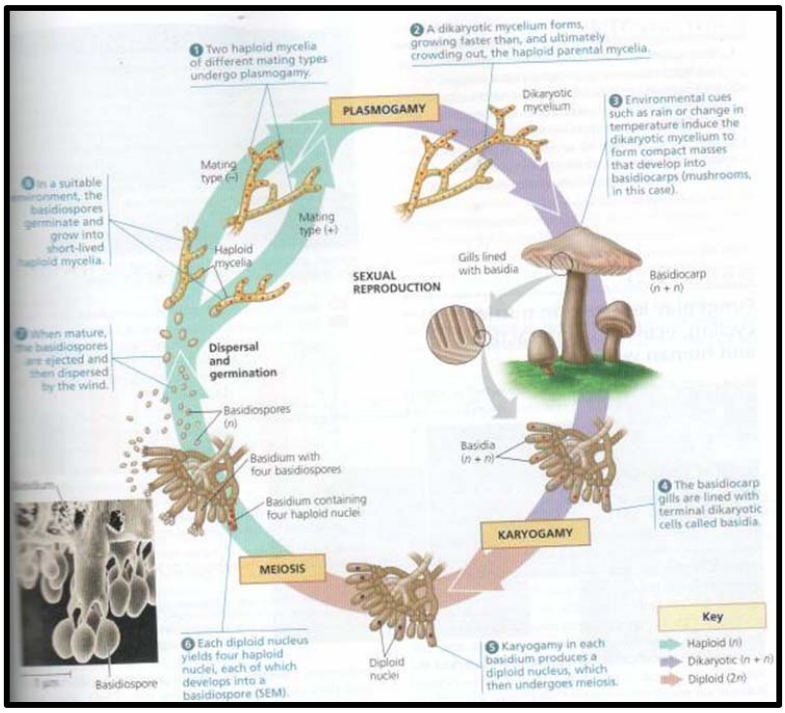
Mushrooms, puff balls are example of this phylum. They are important wood decomposer. They are good at decomposing the complex polymer lignin. Fungi reproduce sexually by producing fruiting bodies called basidiocarps.

Life cycle

Two haploid of different mating types undergo **plasmogamy** to form a **dikaryotic** mycelium which grows very fast. The dikaryotic mycelium in a favorable condition develops into compass masses that develop into **basidiocarps** (which is the common mushroom). The underneath the basidiocarp gills lined the **basidia**(the terminal part of the dikaryoytic cell) . The 2nd stage **karyogamy** occurs in each basidium to produce a diploid nucleus (*2n*) and it then undergo **meiosis**. Each diploid nucleus in the basidium produces four haploid nuclei. Each of the haploid nucleus basidiospore. The matured basidiospores are ejected and dispersed.

Some things to Note in sexual reproduction

- Karyogamy produces diploid nucleus (2n)
- It is usually followed by meiosis
- Meiosis generates haploid nucleus (*n*)



The life cycle of mushroom forming basidiomycete

Ecological Importance of Fungi

- **Decomposer:** fungi are good decomposer. They decompose organic materials **including** the cellulose and lignin of plant cell wall.
- They help in the recycling of carbon, nitrogen and other elements
- **Mutualist:** some fungi serves as a defense and protection against pathogens