

Asexual Reproduction Methods

Asexual cycle is usually **repeated several times during the season**, whereas the sexual stage of many fungi is produced only **once a year**. The asexual methods of reproduction commonly found in fungi may be summarized as follows: -

1. Sporulation

Sporulation is the most common method of asexual reproduction in fungi, where specialized structures produce spores that can develop into new individuals.

2. Budding

Budding is a form of asexual reproduction primarily seen in yeasts. In this process, a new organism develops as an outgrowth or bud on the parent cell. The nucleus of the parent cell divides, and one daughter nucleus migrates into the bud while the other remains in the parent cell.

3. Fragmentation

Fragmentation involves breaking apart mycelial structures into smaller pieces, each capable of growing into a new individual. This method is common in filamentous fungi.

4. Fission

Fission is primarily observed in **unicellular fungi** (like certain yeasts), where a single cell divides into two daughter cells through nuclear division and subsequent cytoplasmic division.

5. Sclerotia and Rhizomorphs

- **Sclerotia:** These are compact masses of hardened mycelium that can survive adverse environmental conditions and germinate to form new fungal colonies when conditions improve.
- **Rhizomorphs:** These are structures that resemble roots and facilitate nutrient absorption and colonization of new substrates.

Sexual Reproduction Methods

Fungi reproduce sexually through several methods, which can be classified into different stages:

1. **Plasmogamy:** This is the first stage, where the cytoplasm of two compatible haploid cells fuses, but the nuclei remain separate.
2. **Karyogamy:** In this stage, the two haploid nuclei from the fused cells finally fuse, forming a diploid zygote nucleus.
3. **Meiosis:** The diploid zygote undergoes meiosis, producing haploid nuclei that can develop into **sexual spores**.

Methods of Sexual Reproduction

1. **Gametangial Contact:** Two gametangia of opposite sex come into contact, and the male gametangium transfers its nucleus into the female gametangium through a **pore** or **fertilization tube**.
2. **Gametangial Copulation:** The entire contents of two gametangia fuse to form a common cell called a **zygote** or **zygospore**.
3. **Spermatization:** Some fungi produce minute, spore-like, single-celled structures called **spermatia** (non-motile gametes). These are transferred by agents like water, wind, or insects to receptive hyphae or the trichogyne of an **ascogonium**.
4. **Somatogamy:** In fungi where gamete formation is **absent**, anastomoses (fusion) occur between hyphae, and their somatic cells fuse to produce dikaryotic cells.
5. **Planogametic Copulation:** This is the simplest type of sexual reproduction, where a motile male gamete fuses with a large, non-motile female gamete (egg or ovum).
6. Examples of Sexual Spores: **Ascospores, Basidiospores, Oospores, and Zygo spores.**

Sexual compatibility: Those in which every thallus is sexually **self-fertile** and, can therefore, reproduce sexually by itself without the aid of another thallus, these types of fungi we called (**Homothallic fungi**). Those in which every thallus is sexually **self-sterile**, and requires the aid of another compatible thallus or a different mating type for sexual reproduction, these types of fungi called (**Heterothallic fungi**).

Classification of fungi

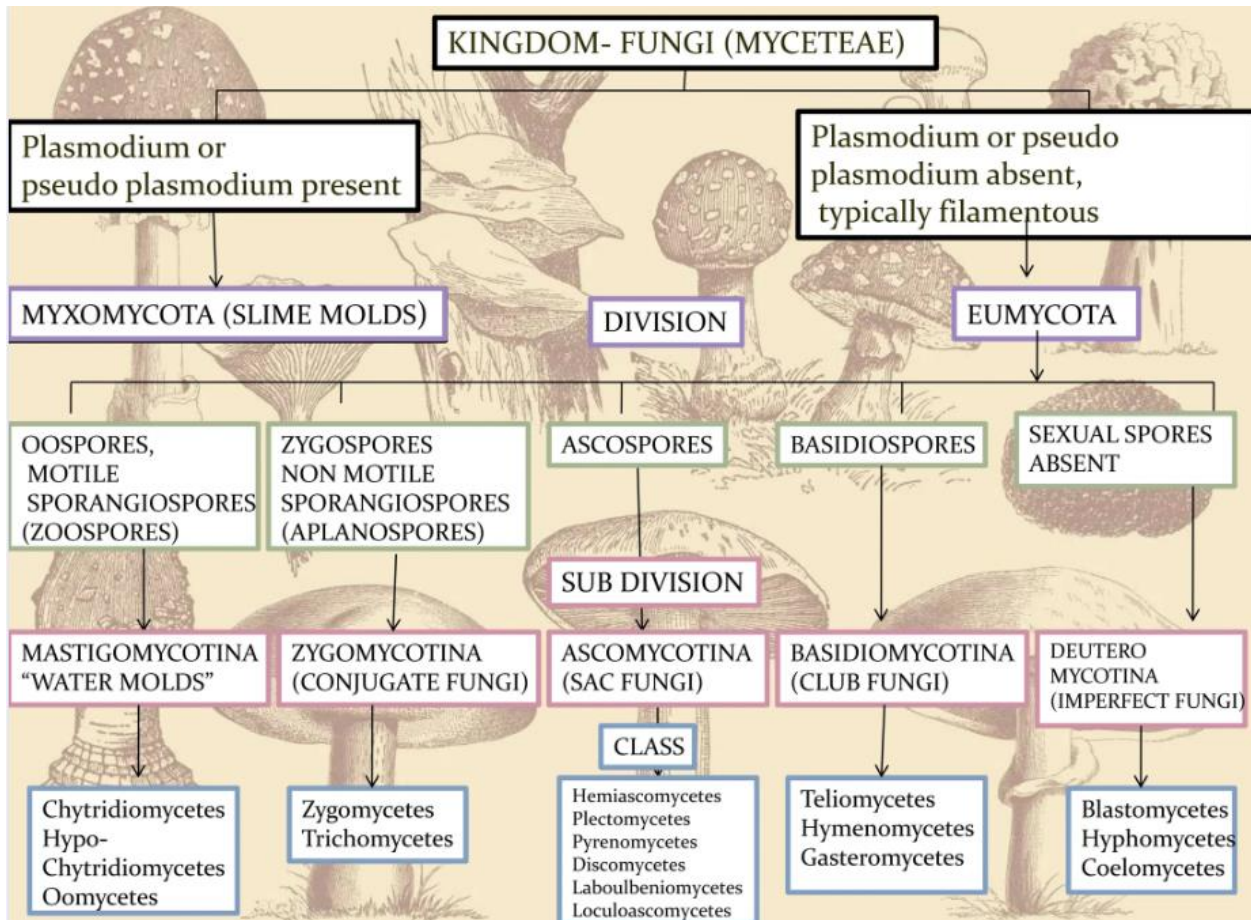
Classification Criteria

Fungi are classified based on several criteria, including:

- **Morphology:** Characteristics such as the appearance of the colony, hyphal organization (septate vs. coenocytic), and reproductive structures.
- **Reproductive Methods:** The type of reproduction (sexual vs. asexual) and the structures involved (e.g., asci, basidia, zygospores).
- **Cell Wall Composition:** Fungal cell walls are primarily composed of chitin, distinguishing them from plants, which have cellulose in their cell walls.
- **Nutritional Mode:** Fungi can be classified based on their nutritional strategies:
 1. **Saprophytic:** Decomposing dead organic matter (e.g., *Aspergillus*).
 2. **Parasitic:** Living on and deriving nutrients from living hosts (e.g., *Puccinia*, a plant pathogen).
 3. **Symbiotic:** Engaging in mutually beneficial relationships (e.g., mycorrhizal fungi).

The classification system in fungi started with kingdom and end with species as follows:

- Kingdom: Mycetae -Fungi
- Division: Mycota
- Subdivision: Mycotina
- Class: Mycetes
- Subclass: Mycetidae
- Order : ales
- Family: aceae
- Genus and Species: -There is no special ends



Division Myxomycota (SLIME MOLDS) is divided into 4 classes

ACRASIOMYCETES
 EX. *Dictyostelium*
 Brain-eating amoeba
Acrasidae

HYDROMYXOMYCETES
 Ex net slime molds

MYXOMYCETES
 Ex. Dog vomit slime mold
physarum leucophaeum

PLASMIDIOPHOROMYCETES
Plasmodiophora brassicae, which causes clubroot of cabbage and related plants, and *Spongospora subterranea*, which causes powdery scab of potatoes.

Division 1: Myxomycota

General characteristics:

1. **No cell wall**
2. Swarm cells contain two unequal anterior whiplash **flagella**.

This division consists of **two** classes:

Class 1: Myxomycetes (Free living plasmodium)

Class 2: Plasmodiophoromycetes (Endoparasite plasmodium).

Division 2: Eumycota

This division consists of **five** subdivisions:

Subdivision 1: Mastigomycotina:1

1. Swarm cells contain (posterior or anterior or both) whiplash flagellum.
2. No mycelium (in most individuals) or Mycelium is presence but **coenocytic**.

Subdivision 2: Zygomycotina:

1. Fungi with aseptate mycelium.
2. Asexual reproduction by **aplanospores**.
3. Sexual reproduction, gametangial contact, resulting in the formation of **zygospores**.

Subdivision 3: Ascomycotina:

1. Fungi with septate mycelium.
2. Producing ascospores in sac-like cells (asci), usually eight **ascospores**.

Subdivision 4: Basidiomycotina:

1. Fungi with septate mycelium and forming clamp connections.
2. Basidium bearing usually four **basidiospores**.

Subdivision 5: Deutromycotina:

1. Fungi with septate mycelium.
2. Usually producing **conidia**.
3. Sexual reproduction **unknown**.

Fungal infections

- Human diseases caused by pathogenic fungi known as (**Mycoses**).

Conditions conducive to fungal infections

Although fungi are ubiquitous in the environment, they generally colonize tissues and cause infection only when the body's normal defenses or the normal flora are disrupted.

1. Disruption of the body's physical, chemical, or physiologic barriers
2. Immunosuppression, particularly loss of CD4 T_H1 responses
3. Disruption of normal bacterial flora

** Many fungi cause opportunistic infections of immunosuppressed individuals with hereditary or acquired T cell deficiencies.*

Types of fungal infections (mycoses)

Fungal infections and the agents causing them are commonly classified based on the site of disease or the immune status of the host.

1. **Superficial mycoses** involve the keratinized outermost layers of skin, hair, and nails.
2. **Cutaneous mycoses** involve the keratin-containing epidermis and deeper layers of the hair, skin, and nails.
3. **Subcutaneous mycoses** involve the dermis, subcutaneous tissues, muscles, and fascia.
4. **Systemic mycoses** often originate in the lungs but disseminate to other organs (especially in immunocompromised individuals).
5. **Opportunistic mycoses** generally occur only in patients with compromised immune systems (e.g., cancer patients receiving immunosuppressive therapy and human immunodeficiency virus [HIV]-infected individuals).