Department of biology

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((Mycology))

Stage (-3-)

LEC- ((5))

Classification of fungi

By

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Classification of fungi

The Kingdom Fungi is classified into three groups:

Pseudofungi

simple fungi

true fungi

Pseudofungi

The pseudofungi include a group of organisms that are similar to fungi and share with them many characteristics, but differ in others. Therefore, some scientists have called them Gymnomycota or Protozoa .

They differ from true fungi in not having a cell wall surrounding their cells. One of the common names for these fungi is slime molds

They are also called “naked fungi” because of the absence of a cell wall and because of their phagotrophic mode of nutrition—feeding by phagocytosis through engulfing bacterial, fungal, and organic particles—whereas true fungi have a filamentous form and feed by absorption.

They also differ in form, as they consist of a plasmodium, which is a naked, multinucleate, amoeboid structure that feeds by phagocytosis. There is also a pseudoplasmodium, which results from the aggregation of many small uninucleate amoeboid cells called myxoamoebae that come together to form one body.

Most of these fungi have limited economic importance, restricted to some genera that attack plants and cause damage to them, while some are used as food in South America.

This group of fungi is divided into four phyla as follows:

1. Phylum Plasmodiophoromycota
2. Phylum Dictyosteliomycota
3. Phylum Acrasiomycota
4. Phylum Myxomycota

1-Phylum Plasmodiophoromycota

These are endoparasitic slime molds

a group of fungi of a single evolutionary origin.

The plasmodium of these fungi is a naked, multinucleate, wall-less structure, but it is non-motile because it is confined within plant tissues, being endoparasitic.

Their zoospores are motile with two unequal flagella—one long and one short (heterokont flagella).

They are classified as follows:

Kingdom: Mycetae

Division or Phylum: Plasmodiophoromycota

Class: Plasmodiophoromycetes

Order: Plasmodiophorales

Family: Plasmodiophoraceae

This family includes 29 genera, all of which are endoparasitic. Some live in water and parasitize aquatic organisms such as algae and aquatic fungi, while others cause important plant diseases.

The most important genera are Plasmodiophora and Spongospora.

Plasmodiophora :The most notable species Plasmodiophora brassicae, which causes club root disease or Finger or toe disease in members of the family Brassicaceae especially cabbage

*The following is Classification

Kingdom: Mycetae

Division or Phylum: Plasmodiophoromycota

Class: Plasmodiophoromycetes

Order: Plasmodiophorales

Family: Plasmodiophoraceae

Genus:Plasmodiophora

Species: brassicae

club root disease

Life Cycle of Plasmodiophora brassicae

Asexual Life Cycle

1-Resting spores in the soil from previous crops germinate under moist conditions, producing motile zoospores with two unequal flagella.

2-The zoospores swim through irrigation water and infect young cabbage root hairs.

3-Inside the root hairs, they develop into a multinucleate plasmodium that fills the host cell.

4-The plasmodium forms asexual sporangia, releasing new secondary zoospores into the soil water.

5-These zoospores spread the infection to nearby roots, allowing the disease to propagate throughout the field.

Sexual Life Cycle

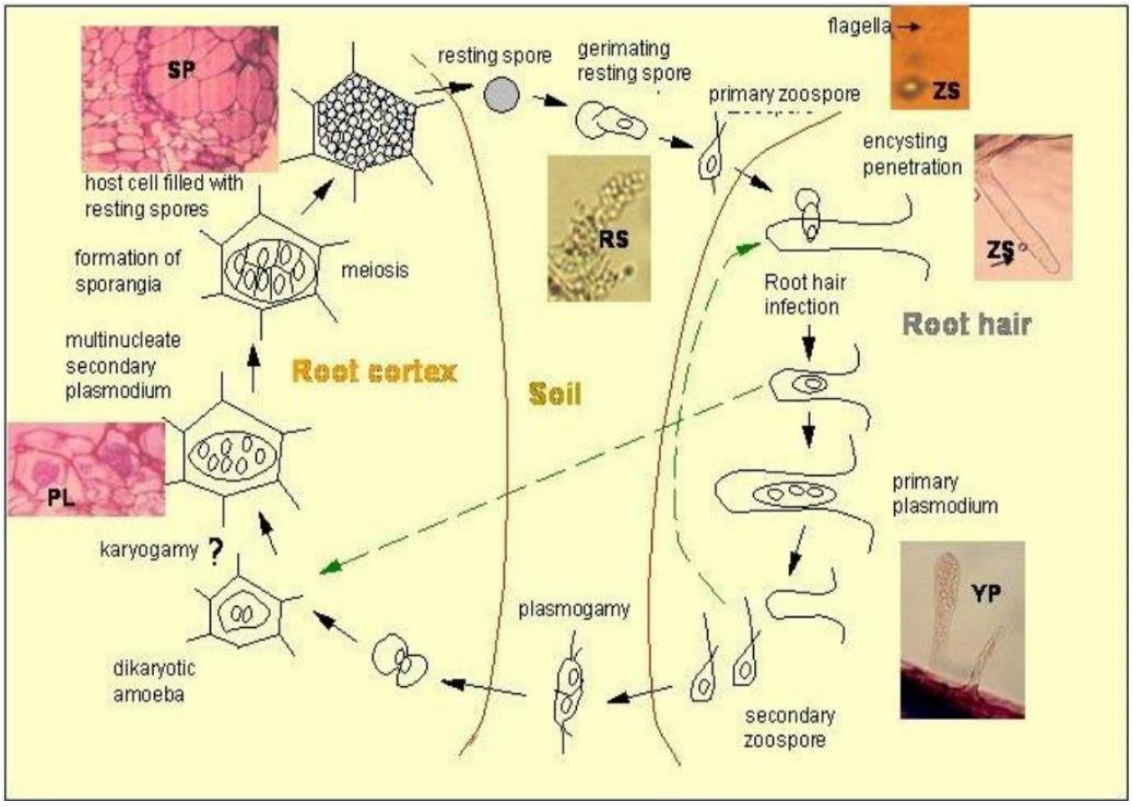
1-At the end of the growing season, some sporangia produce motile gametes instead of zoospores.

2-Two gametes fuse to form a diploid zygote (binucleate amoeboid cell).

3-The zygote penetrates the root cortex and undergoes nuclear fusion (karyogamy).

4-The resulting young plasmodium multiplies, causing abnormal swelling and deformation of roots (club-shaped galls).

5-The mature plasmodium differentiates into many resting sporangia, each containing resting spores that remain dormant until the next season.



Spongospora subterranea

The second fungus, particularly the species Spongospora subterranea, has a life cycle similar to the previously mentioned fungus (Plasmodiophora brassicae), with the main difference being the host. This fungus infects potato tubers, causing the disease known as powdery scab. The resting sporangia appear on the tubers as black or brown lesions. From the resting spores formed during the previous growing season, the life cycle begins again under suitable environmental conditions.

2-Phylum Dictyosteliomycota

Cellular slime molds are composed of small, uninucleate amoeboid cells that aggregate into a pseudoplasmodium. They lack a cell wall and are phagotrophic. Free-living with limited ecological or economic importance, they are valuable in fungal evolution studies. Aggregation occurs via pheromone-controlled streaming, and the pseudoplasmodium moves like a snail, leaving a slimy trail.

Classification:

Kingdom: Mycetae

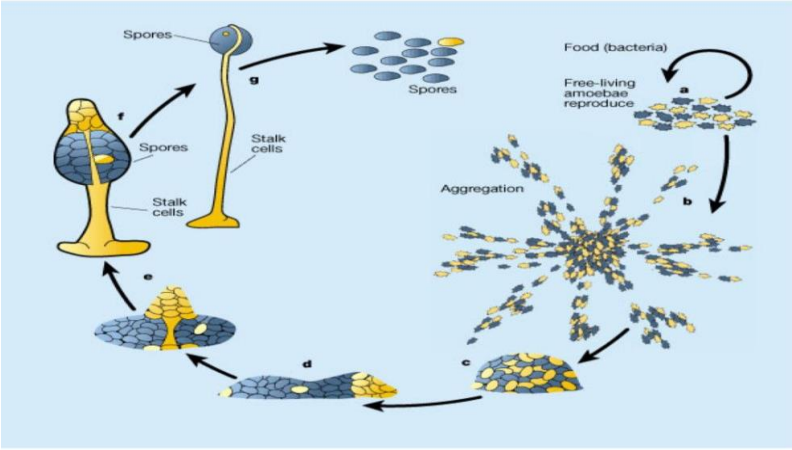
Division (or Phylum): Dictyosteliomycota

Class: Dictyosteliomycetes

Order: Dictyosteliales

Family: Dictyosteliaceae

Genera: Dictyostelium sp., Acytostelium sp.



life cycle of Dictyostelium sp

3-Phylum - Acrasiomycota

Free-living organisms forming a pseudoplasmodium composed of small amoeboid cells. Here, the cells are cylindrical, sometimes resembling a snail (cellular slime mold). The posterior is broad, considered a single false foot, and contains a contractile vacuole. The group was previously studied with the Dictyosteliomycota but later separated due to differences such as the presence of flagellated spores, false feet, amoeboid cell shape, non-motile pseudoplasmodium, aggregation in small clusters rather than streaming, and distinct cell division patterns. Classification is based on mitochondrial morphology.

Kingdom: Mycetae

Division/Phylum: Acrasiomycota

Class: Acrasiomycetes

Order: Acrasiales

Family: Acrasidaceae

Genus: Acrasis sp.

4-Phylum: Myxomycota (True Plasmodial Slime Molds)

True plasmodial slime molds possess a genuine multinucleate plasmodium, which is naked, amoeboid, and lacks a cell wall. They feed by phagocytosis, consuming bacteria, small particles, and fungal spores. These organisms inhabit moist, temperate, and warm environments, living on decaying organic matter in soil, rotting wood, and fallen leaves. Their significance is mainly taxonomic, contributing to the classification of fungi, and they are also important in scientific research. They represent the ideal model of slime molds.

Notable studies on slime molds, especially regarding the sporophore, were conducted by Martin in 1960. In the life cycle:

The plasmodium represents the vegetative phase.

The sporophore represents the spore-bearing structure.

These two stages are sequential and rarely present simultaneously in the same organism.

Types of Plasmodium:

1-Protoplasmodium: Microscopic, unbranched, homogeneous cytoplasm; single spore structure; Echinosteliales.

2-Aphanoplasmodium: Initially microscopic, grows into a branched, transparent network; Stemonitis sp.

3-Phaneroplasmodium: Large, yellow, plate-like, branched with visible cytoplasmic streaming; Physarum sp.

Special Structures:

1-Hypothallus: A somewhat solid area originating from or forming on the plasmodium, giving rise to the sporophore.

2-Stalk: The structure supporting the sporangium.

3-Peridium: A thin membrane surrounding the sporangium.

4-Lime: Calcium deposits found in some sporangia.

5-Columella: Fibrous structures supporting sporangia.

6-Capillitium: Thread-like or spherical/elliptical structures aiding spore dispersal; may be colorful or transparent.

7-Spores: Develop within the plasmodium; resemble the sporangium except in shape.

8-Plasmodiocarp: Sporangium-like structure in which spores form.

9-Cushion: Large, cushion-like structure.

10-Aethalium: Aggregated group of sporangia.

11-Pseudoaethalium: Pseudo aethalium; multiple sporangia clustered together.

Classification of Myxomycetes

According to Martine (1983), Myxomycetes are classified into one class, which is further divided into three subclasses as follows:

1-Subclass Ceratiomyxomycetidae

Order: Ceratiomyxales

family Ceratiomyxaceae

Ceratiomyxa sp

Characteristics: This is the only order with external spores, meaning that the sporophore extends outward and bears the spores externally.

Important genera: Ceratiomyxa .

2-Subclass Stemonitomycetidae

Order: Stemonitales

Subclass Myxogastromycetidae

Includes the following orders: Trichiales, Liceales, Physarales, and Echinosteliales.

1-Order Liceales

Characteristics: Comprises calcareous-free fungi. The shapes of the sporophores are variable, and no capillitium is present. The most common form is a primary plasmodium.

Important genera: Licea, Lycogala, Dictydium.

Family: Liceaceae. Spores are often light-colored and sometimes microscopic.

2-Order Trichiales

Characteristics: Spores are light-colored, ranging from yellow to red or orange. Capillitium is dense. Members are abundant in nature. Plasmodium may be microscopic or macroscopic.

Important genera: Metatrichia, Trichia, Hemitrichia, Arcyria.

Families: Two families encompassing four genera and 27 species.

3-Order Echinosteliales

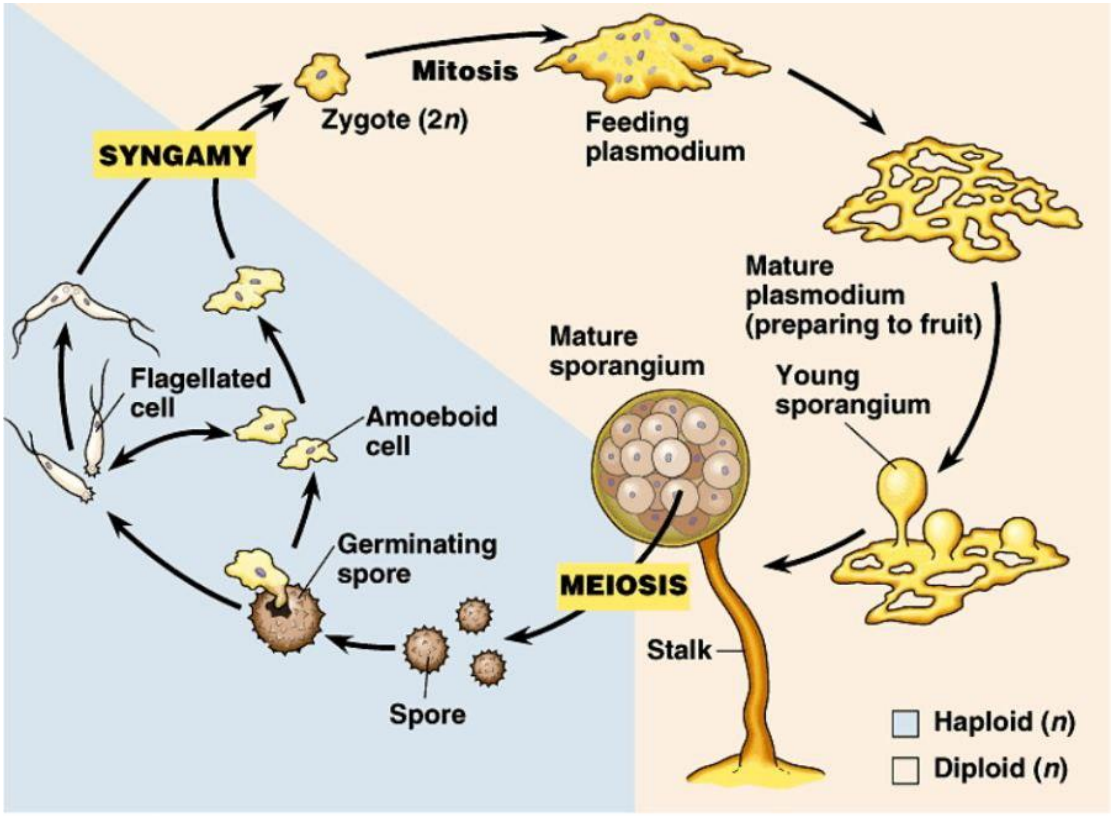
Characteristics: A small order.

Important genera: Echinostelium, Clastoderma.

4-Order Physarales

Characteristics: This order produces a flexible plasmodium. Spores are purplish, and calcium deposits are found on the structures.

Important genera: Physarum.



Life Cycle of Myxomycota