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((Mycological Taxonomy))

Stage (-3-)

LEC- ((2))

Zygomycetes

By

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Class: Zygomycetes | Division: Zygomycota (Conjugated Fungi)

General Overview and Habitat

- This division includes more than 80 genera and approximately 750 species.
- Most species are saprophytic fungi, living on organic matter at various stages of decomposition in soil, water, or on other organic substrates. The most well-known are the bread molds.
- A few species are obligate parasites on insects (Entomophilous fungi) or plants, and some can cause minor diseases in humans.
- Some species are facultative parasites on plants, while others parasitize other fungi.

Key Characteristics

1. **Lack of Flagellated Spores:** Zygomycetes do not produce motile spores.
2. **Mycelium Structure:** The mycelium is coenocytic (non-septate), fast-growing, and may develop septa with age. In some species, swellings occur in the hyphae, forming thick-walled resistant spores called **chlamydo spores**.
3. **Asexual Reproduction:**
 - Non-motile spores (aplanospores) are produced inside sporangia.
 - The entire sporangium may act as a single conidium.
4. **Sexual Reproduction:**
 - Occurs through the conjugation of two similar non-motile gametangia (isogametes).
 - This results in the formation of a **zygospore**, a thick-walled, resistant spore capable of surviving adverse environmental conditions.

Major Orders

This class is divided into three main orders:

1. **Order: Mucorales (Black Molds)**
 - Widely distributed; includes approximately 60 genera and 400 species.
 - Mostly saprophytic, rarely parasitic on insects, plants, or other fungi. Some species can cause neurological diseases in humans.
 - Mycelium: coenocytic; septa appear with age. Chlamydo spores are present in some species, such as *Mucor racemosus*.
 - Many species can decompose carbohydrates and produce organic acids (citric, lactic, succinic, formic) and alcohol.



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- Some species are opportunistic pathogens on fruits during storage, e.g., *Rhizopus stolonifer*. Some, like *Absidia corymbifera*, can infect humans.

Important Genera: *Rhizopus*, *Mucor*, *Sporodina*, *Phycomyces*, *Absidia*

Genus Rhizopus

- A widely distributed genus with about 35 species; notable species include *R. stolonifer* (Black Bread Mold).
- Habitat: bread, fruits, and vegetables; spores are always present in the air.
- Mycelium: coenocytic, with horizontal hyphae called **stolons**; root-like structures called **rhizoids** anchor the fungus and absorb nutrients.
- Sporangioophores emerge opposite rhizoids, producing sporangia containing non-motile spores (aplanospores).
- Mature sporangia produce a central structure called **columella**.
- Asexual reproduction: spores are dispersed by air, water, or insects and germinate to form new mycelium.
- Chlamydospores: thick-walled, resistant spores containing nutrients for survival under harsh conditions.

Sexual Reproduction

- Occurs under unfavorable environmental conditions.
- Fusion of two similar gametangia produces a **zygospore**, which enters dormancy and germinates under suitable conditions.
- Zygospores develop into sporangioophores, completing the life cycle.
- Life cycle: predominantly **haploid (1N)**, with the only diploid stage being the zygospore.

Economic Importance of Rhizopus:

- Causes spoilage of stored vegetables.
- Industrial production of lactic acid.
- Used to manufacture cortisone.

Genus Mucor

- Known as Black Mold; widely distributed, with about 60 species.
- Habitat: bread, jams, fermented foods, old preserved foods, leather, paper, and occasionally on living organic matter.
- Mycelium: coenocytic, branched; septa may appear in older hyphae.
- Sporangioophores: structure varies by species (single, multi-axial, or branched).
- Life cycle similar to *Rhizopus*.

Economic Importance:



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- Some species spoil stored fruits and vegetables.
- *Mucor pusillus* can infect internal human organs.
- *Mucor javanicus* is used industrially for alcohol production.

Parasitism Among Mucorales:

- Parasitism can occur between different fungal species. For example, *Mucor simplex* parasitizes *Absidia glauca*, possibly as a hybridization between different strains.

2. Order: Entomophthorales

- Less widespread than Mucorales.
- Mostly obligate parasites on insects and some lower plants like mosses or lichens.
- Hyphae form limited septa; germ tubes quickly develop transverse septa to form zygotes, similar to Mucorales.
- Contains approximately 25 genera and 100 species, mostly infecting insects; about 40 species parasitize insects.

Example: *Entomophthora muscae* causes a “cholera-like” disease in houseflies.

- Infection begins when spores adhere to the fly and germinate. Hyphae grow, segment into unicellular portions, and produce sporangiophores.
- Conidia are forcibly ejected 2–3 cm, forming a white halo around the dead fly. Spores adhere to other surfaces or flies, completing the asexual cycle.



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