Structure & Life Cycle of *Rhizopus, Yeast, Peziza*
Rhizopus
Occurrence & Habitat

- Mostly saprophytes
- Grow in soil, dung and on variety of plants and animal matter e.g. stale bread, decaying fruits, jams, cheese etc.
- The most common species is *Rhizopus stolonifer*.
- Since it grows on stale bread, therefore, commonly known as Bread Mould.
Substrates of *Rhizopus*
Vegetative Structure

- Plant body consists of white cotton like mycelium (branched filamentous hyphae)
- Hyphae are aseptate and multinucleate (coenocytic)
- Septa appear in older hyphae or at time of reproduction
- The young mycelium is colorless but due to formation of reproductive bodies, it appears black.
- Sporangia and spores are black and entire surface of substrate appears black
- Hence also known as Black Mould
Vegetative Structure

- At maturity, mycelium inside substratum produces hyphal branches which come out and spread upon substratum.
- This aerial mycelium gets differentiated into 3 types of hyphae
  - Stolons: grow horizontal over substratum for some distance and then bend down in substratum.
  - Rhizoids (hold fast): Arise from lower side of each node and penetrate into substratum. These are repeatedly branched.
  - Sporangiophores: Erect, unbranched reproductive hyphal branches arise in cluster from node.
3 types of hyphae
Asexual Reproduction

Development of sporangium

- Develops at the tip of sporangiophores.
- The protoplasmic content flows into sub-apical region.
- Terminal part of sporangiophore becomes knob like vesicle.
- Swollen portion of sporangiophore represents young and developing sporangium.
- The protoplasmic contents of developing sporangium differentiate into 2 zones:
  - Outer dense cytoplasm rich in nuclei and reserve food
  - Central vacuolated cytoplasm with less nuclei.
Asexual Reproduction

Development of sporangium

- Numerous small vacuoles appear in between 2 zones.
- These vacuoles flatten and fuse followed by formation of cell wall.
- This forms peripheral dense sporangiophorous zone and dome shaped central columella.
- Peripheral sporangiophorous zone undergoes protoplasmic cleavage to produce multinucleate non-motile sporangiophore.
16.5 Spore formation in fungus
Sexual Reproduction

It is isogamous type

- Gametes are non-motile, non-flagellated aplanogametes.

- Mode of sexual fusion is gametangial copulation (Conjugation) type.

- Fusion occurs b/n 2 gametangia produced on same plant (homothallic species).

- In majority, species are heterothallic (2 gametangia produced on different plants.)
Sexual Reproduction

- The male and female sex organs (gametangia) are labelled as plus (+) or minus (-) strains.

- One mycelium of (+) strain come closer to anither of (-) strain.

- It stimulates formation of special hyphae called zygophores

- 2 zygophores produce progametangia.

- The 2 progametangia fuse and form gametangium which form aplanogametes (coenogamete).
Sexual Reproduction
Sexual Reproduction

- At the time of sexual fusion, 2 aplanogametes fuse resulting in formation of zygosporangium.
- Zygosporangium encloses zygospore.
Sexual Reproduction

Zygospore

Suspensor

Young Zygospore
Sexual Reproduction
Germination of zygospore
Life cycle of *Rhizopus*

Black bread mold *Rhizopus stolonifer* (1)
Life Cycle of Rhizopus
Yeast
Important Features

- Non-mycelial Ascomycetes, do not produce fruiting bodies (or ascocarps).
- Reproduce by budding, fission or both.
- Ascospores are produced in a naked ascus.
Occurrence & Habitat

- Ubiquitous & found everywhere on sugary substratum.
- Mostly saprophytic, may be parasitic.
- Grow on nectar of flowers, surface of fruits, fruit juices etc.
- The most common species is *Saccharomyces cerevisiae*. It reproduces by budding, therefore, known as budding yeast.
- *Saccharomyces octosporus* reproduces by fission, therefore, known as fission yeast.
Vegetative Structure

- Unicellular, occur in chains, forms false colonies (Pseudomycelium).
- Individual cell is colorless but colonies may appear red, green yellow etc.
- Each cell possess 2-layered cell wall, granular cytoplasm (outer ectoplasm and central endoplasm).
Asexual Reproduction

**Budding**
- During favorable conditions, when food is abundant.
- A small bud like outgrowth initiates at one end of the parent cell.
- Bud enlarges & divides by formation of constriction.
- One daughter nucleus goes to bud and bud behave like parent cell.
- When a bud produce another bud over it, it forms pseudomycelium.
Budding

- Cell Wall
- Nucleus
- Cytoplasm

**Age**

1. Cell division by budding
   - M
   - D
   - Growth

2. M
   - D
   - M
   - Growth

3. M
   - D
   - M
   - M
   - D

**Yeast Budding**

Buds
Asexual Reproduction

Fission

- Parent cell elongates.
- Nucleus divides into two daughter nuclei.
- It is followed by cytokinesis by transverse septum.
- Septum develops centripetally resulting in formation of two daughter cells.
Sexual Reproduction

- Occurs when food is scanty.
- Sex organs are not formed.
- Sexual fission occurs between 2 vegetative cells which behave as gametes.
- Fusing gametes are haploid and may be isogamous or anisogamous.
- Such type of reproduction is called Gametic copulation.
Life cycles

Haplobiontic life cycle
- Diploid phase is very short; Haploid phase is very long.

Diplobiontic life cycle
- Diploid phase is long; Haploid phase is very short.

Haplo-Diplobiontic life cycle
- Both haploid and diploid phases are of long duration; Haploid phase is very short.
Life cycles

HAPLOPHASE → PAIRING → DIPLOPHASE → HAPLOPHASE

GERMINATION → SPORULATION → GERMINATION
Peziza
Occurrence & Habitat

- All are obligate saprophytes.
- Grow on dead decaying organic matter.
- The genus produces characteristic cup-shaped *Apothecia* above substratum.
Vegetative Structure

- The mycelium grows below substratum as branched and filamentous hyphae.
- Hyphae are septate and septa are perforated.
- Each cell is uninucleate.
- The plant body produces cup-shaped fruiting bodies called **Apothecia** above substratum.
Asexual Reproduction

- Not very common.
- Some species form conidia.
- Some species are known to produce thick walled chlamydospores.
Sexual Reproduction

- Sex organs are not formed.
- Sexual fusion occurs by method of Somatogamy (fusion b/n 2 vegetative cells).
- Two vegetative cells undergo plasmogamy.
- It results in formation of Dikaryotic cells or Dikaryons.
- The dikaryon produces tubular growths called Ascogenous hyphae.
- The pair of nuclei migrate into ascogenous hyphae which becomes multicellular due to formation of septa.
Sexual Reproduction

- The terminal cell of ascogenous hyphae forms **hook** or **crozier**.
- The crozier forms a 3-celled structure in which penultimate cell is dikaryotic.
- It starts functioning as **Ascus mother cell**.
- The two nuclei in ascus mother cell fuse and then divides by meiosis followed by mitosis.
- It forms 8 linearly arranged oblique **Ascospores**.
- Numerous small sterile branches called **paraphyses** develop b/n asci.
- The whole spherical mass now differentiates into cup-shaped ascocarp called **Apothecium**.
Thank you!