

# RHIZOPUS

## Characteristic Features of Zygomycota

This is a sub-division with characteristic thick walled resting spores called zygospores. Around 765 species belonging to 145 genera have been reported to belong to this group. They are commonly known as moulds or molds.

1. **Habit and Habitat** → Most of the species are saprophytic growing on dead organic matter, dung (coprophilous) or even soil. Some form mycorrhizal associations and a few are weak parasites of plants and animals.
2. **Thallus Structure** → It is well developed, profusely branched and aseptate mycelium. It becomes septate in older hyphae but can also be septate in some species. The cell wall is made up of chitin-chitosan. Special rhizoidal hyphae arise in some species.
3. **Asexual Reproduction** → It takes place through the production of numerous non-motile sporangiospores in special sac like sporangia. It also takes place through chlamydospore development.

4 Sexual Reproduction → Most of the species of Zygomycota are heterothallic but a few are homothallic. The special sexual branches called as Zygothecae develop, progame tangia as their side branches. The progametangia produce several sexual units called gametangia. The reproduction is isogamous or rarely anisogamous gametangial copulation. The two gametangia of opposite strains fuse and form a prozygospore, which enlarges, secretes a thick multilayered wall to become Zygosporangium, which produces a single diploid zygospore inside them.

5. The zygospores germinate after undergoing a meiotic division. The strain segregation takes place at this stage. The germ tube produces a germ sporangium which contains spores of + or - or both strain.

### RHIZOPUS

The genus Rhizopus is represented by some 35 species, which are cosmopolitan in distribution. Most of the species are saprophytic and are found growing on dung, humus and

## Systematic Position

- Kingdom - Myceteae
- Division - Amastigomycota
- Sub-Div - Zygomycotina
- Class - Zygomycetes
- Order - Mucorales
- Family - Mucoraceae
- Genus - ~~Rhizopus~~ Rhizopus

other organic products of plant and animal origin such as bread, decaying foods, jams, pickles etc. R. stolonifer is the most common species of the genus found growing on the stale bread and thus commonly known as bread mould. Some of the species are weak facultative parasites and cause plant and animal diseases. Example.

R. artocarp - Fruit drop of Jack fruit

R. arrhizus - Fruit rot of Apples

R. stolonifer - Leaf disease of strawberries  
- Soft rot of sweet potatoes

R. arrhizus, R. equines, R. microsporus  
- Mucormycosis in Animals and man.

R. stolonifer is commercially used for the production of various organic acids such as Fumaric acid, lactic acid etc. It is also used in some steps in cortisone synthesis. Rhizopus along with Mucor is used for the saccharification of grains in alcoholic fermentation.

**Thallus Structure** → The thallus is made up of slender, profusely branched hyaline, aseptate ~~like~~ cotton like mycelium. It grows inside the substratum during the vegetative phase. As it enters the reproductive phase, the mycelium comes out on the surface of the substratum and differentiates into 3 types of hyphae.

1. **Stolons** → Stolons are less branched, stout, aerial hyphae growing on the surface of the substratum. These hyphae grow horizontally in all the directions. After growing for some distance on the substratum, these hyphae touch the substratum and enter into it to form a node like structure. Many such hyphae arise from this node like structure and grow in all the directions. They again form nodes and

They again form nodes and in this way growth continues. The rhizoids like structures from the lower side arise and the sporangiophores arise from the upper side of the nodes.

2. Rhizoids → These are branched and slender clusters of brown coloured hyphae, which arise from the lower surface of the node. These perform two functions, besides anchorage of the fungus, they absorb water and nutrients from the substratum.

3. Sporangiophores → These are vertically growing asexual and unbranched hyphae which arise in tufts from the upper surface of the node. These are reproductive hyphae and bear terminal sporangia. The sporangia are black in colour and are produced in large numbers, giving the substratum a blackish appearance. Due to this reason Rhizopus is also known as Black-Mold.

The hyphae are enclosed by a rigid cell made up of chitin-chitosan. The wall is microfibrillar and the microfibrils run parallel to the surface of hyphae. The wall is followed by a

thin plasma membrane, which regulates the movements of the substances into and out of the hyphae. The cytoplasm is dense in the growing regions but becomes granular in the other parts. The vacuoles appear in the old hyphae. All the usual cellular ~~comp~~ components like nuclei, mitochondria, endoplasmic reticulum and ribosomes are present. Besides these oil droplets and glycogen bodies are also present. The septa are absent in the actively growing hyphae, but these are developed to seal off the damaged hyphae and the reproductive bodies.

Nutrition → Rhizopus is heterotrophic in its mode of nutrition. It derives its nutrition from the dead organic matter by growing as ~~sp~~ saprophyte on it. The nourishment is absorbed by the hyphae growing inside substratum and by the rhizoids directly.

### Questions

- Q1. Give an illustrated account of the thallus structure in Rhizopus.
- Q2. Describe the structure of mycelium in Rhizopus and its mode of nutrition.

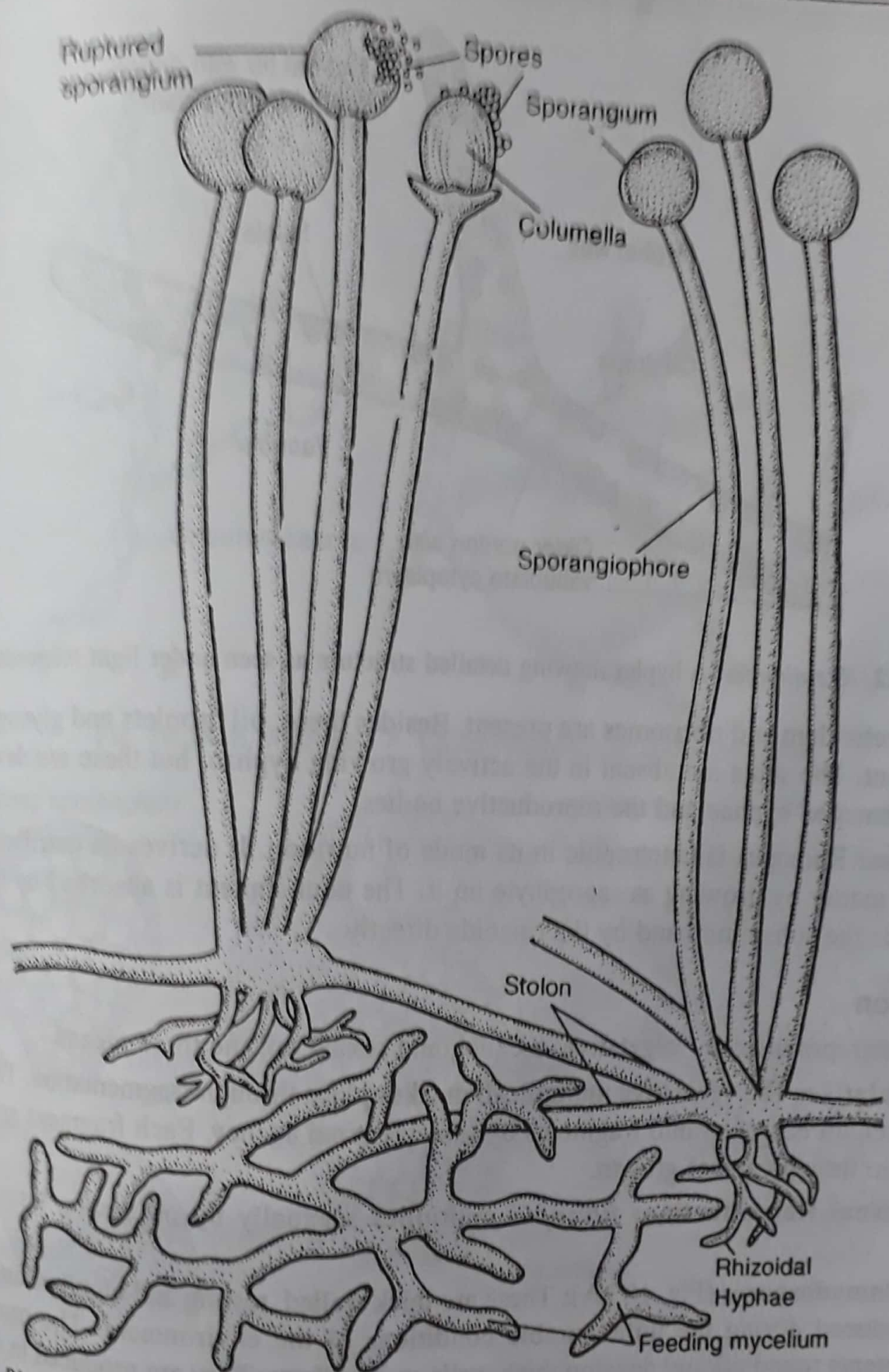


Fig. 10.1. *Rhizopus stolonifer* showing connection of internal mycelium with the aerial mycelium which is differentiated into stolons, rhizoidal hyphae and sporangiophores.

3. Sporangium