MUCOR & RHIZOPUS

(Pin mold) (Common bread mold)

or

Black mold of bread

SYSTEMATIC POSITION :

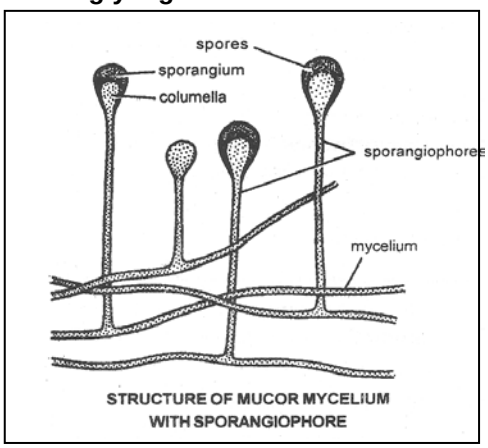
Kingdom Plantae
Division Chlorphyta
Class phycomycetes
Sub. Class zygomyceetes
Order mucorales
Family mucoraceae
Genus **Mucor/Rhizopus**

HABIT AND HABITAT

- Rhizopus and Mucor and **saprophytic** fungi and in laboratory can be obtained on **moist bread.**
- Rhizopus and Mucor and also called as **braed mold.**

STRUCTURE OF MYCELIUM

- It is branched **coenocytic, aseptate** and vacuolated.
- The hyphal wall is made up of **chitin.** Besides, glucosamine, galactose, protein, lipid, **Mg** and **Ca** are also present in the cell wall.
- In cytoplasm, storage food in present in the form of **oil droplets** and **glycogen bodies.**



STRUCTURE OF MUCOR MYCELIUM WITH SPORANGIOPHORE

REPRODUCTION

(i) Vegetative reproduction
(ii) Asexual reproduction
(iii) Sexual reproduction

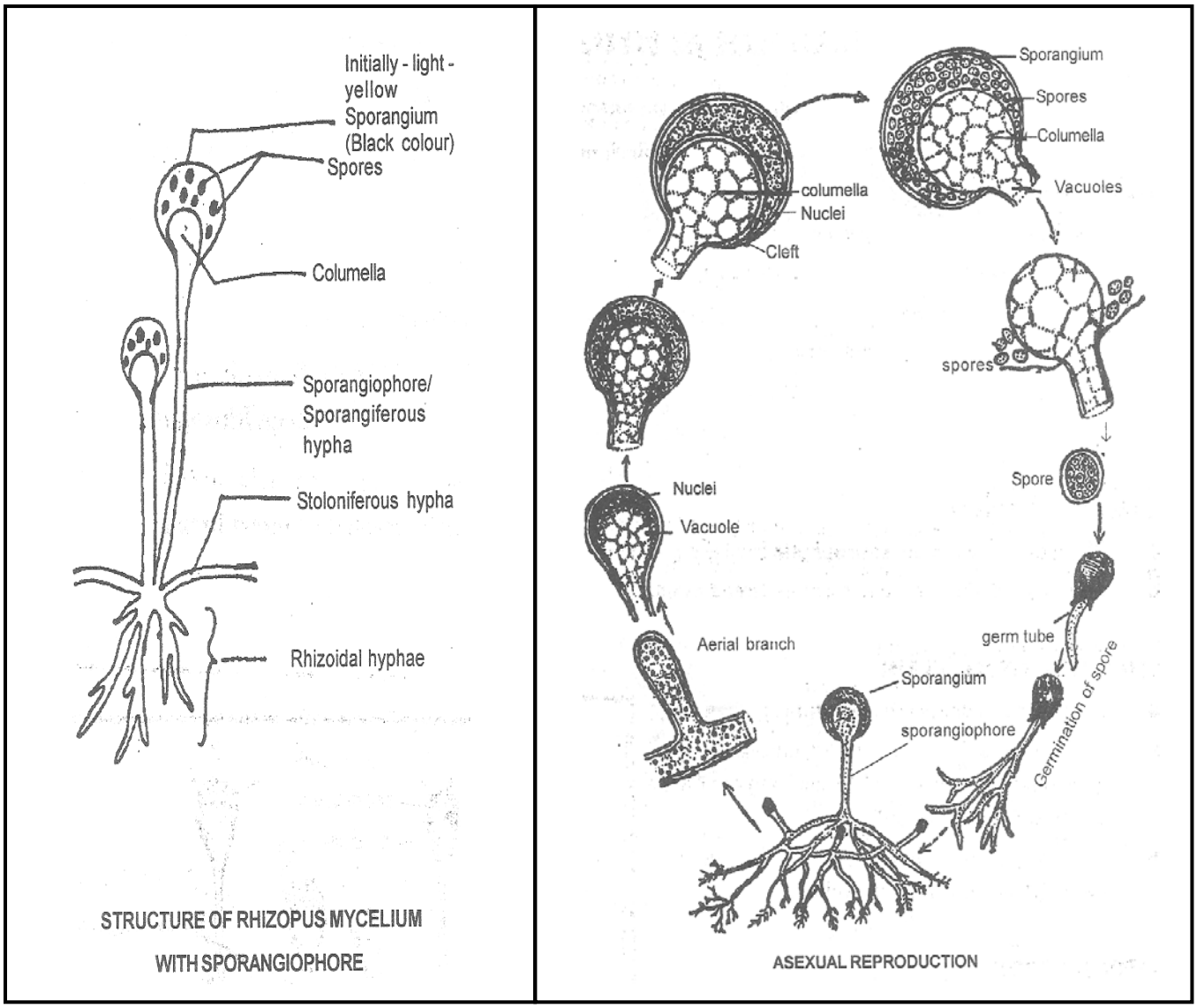
(i) Vegetative reproduction - It takes place by fragmentation.

(ii) Asexual reproduction -

(a) By aplanospore formation -

- Sporangia are aseptate and aerial. Sprorangium develops on sporangiosphores. Sporangiophores are branched **(Mucor mucedo)** or unbranched ***(M. Jenevensis)***
- Sporangiophores come out from mycelium and their distal ends swell up. The swollen apices accumulate cytoplasm, nuclei and food. Now it is called sporangium (plural-sporangia).
- In this stage protoplast of sporangium is differentiated into a peripheral dense multinucleated region and central region with small flattened vacuole. Nucleus are arranged in peripheral region. The peripheral region of sporangium is fertile and central vacuolated region is sterile. It is hmispherical or club shaped which is called columella.

  At the stage of spore formation protoplast of peripheral region of sporgangium get divided into many multinucleated segments **(2-10 nuclei** in each segment**).** Each segment secretes a wall around itself and form aplanospores

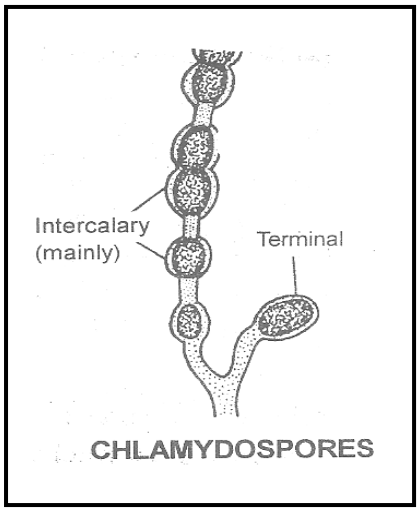


when they mature outer wall of sporangium raptures to release the spores in air. These spores germinate in **favourable conditions** and form new mycelium.

(b) By Chlamydospores -

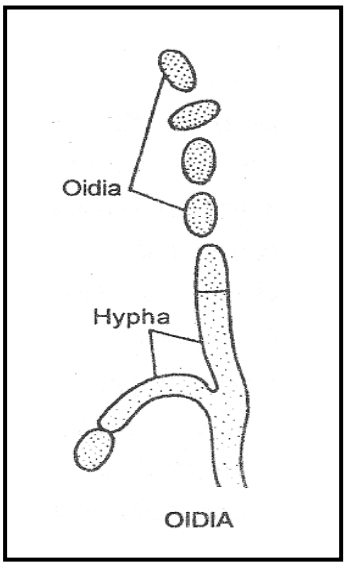
- Asexual reproduction also takes place by **chlamydospores.**
- When unfavourable condition comes, mycelium becomes septate. Protoplast of each cell aggregates, to become spherical and secretes a thick wall around itself.

  Note : Chlamydospores are may be **intercalary** and **terminal** in origin.
- These are **perennating** structures which can survive in **unfavourable conditions.**
- In favourable conditions these spores are germinate and form new mycelium.



(c) Oidia -

- When mycelium grows in a **liquid medium** then it becomes **septated** and **thin-walled.** These cells are formed, called **oidia.**
- Oidia are similar to buds of **yeast.**
- **Fermentation** takes place by oidia in **sugar solution** and **alcohol** is formed and oidia are formed in a chain. This stage is called **torula stage.**

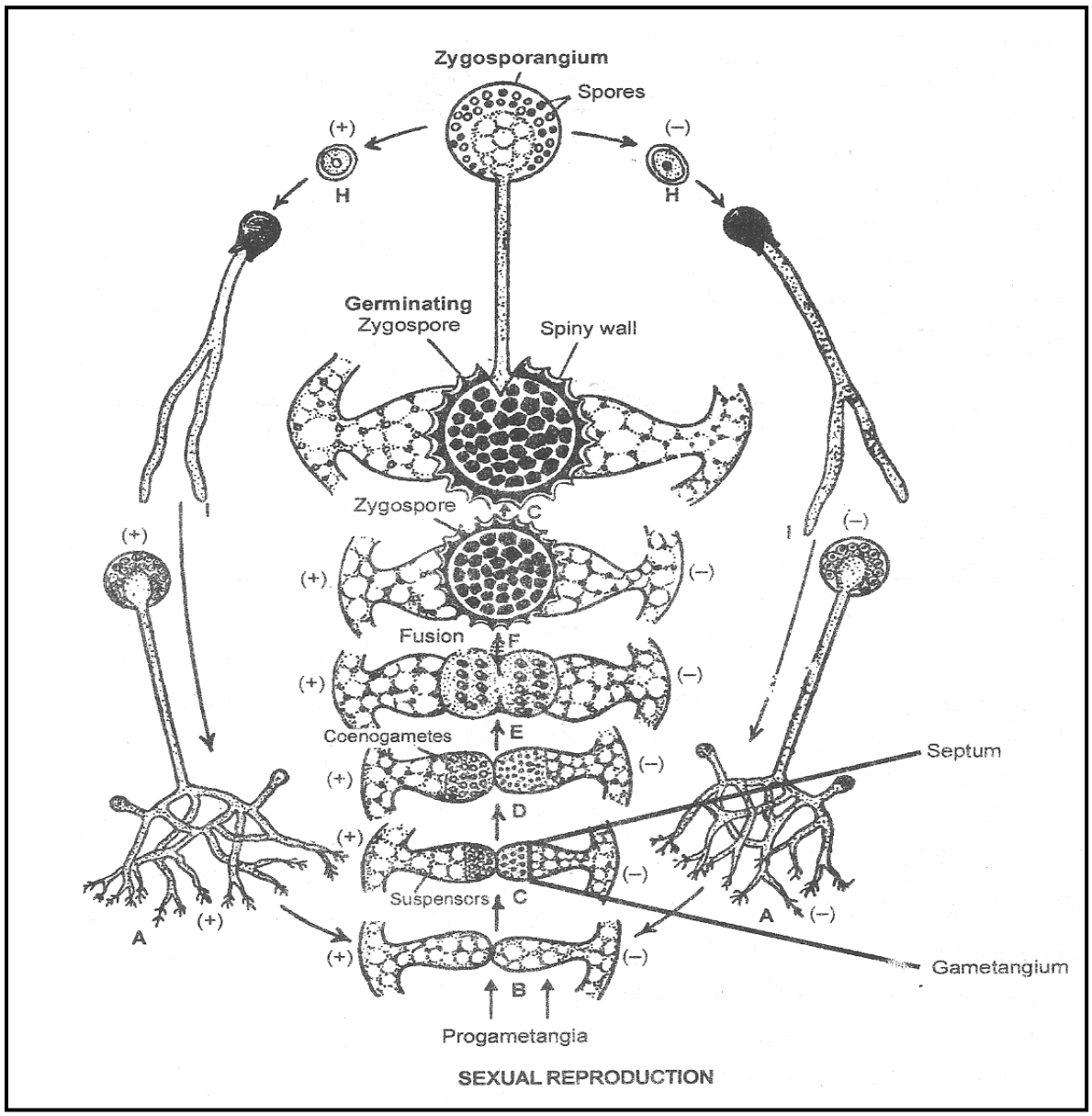


OIDIA

SEXUAL REPRODUCTION → **Isogamous** type

It takes place during the **absence of nutrient substances.** In this process **gametangial copulation** tkes place between **two gametangia.**

- Both homothallic and heterothallic species are occur in these fungi. But most of the species are **heterothallic.**



SEXUAL REPRODUCTION

- In **homothallic** species fungal hyphae which participate in sexual reproduction are of same strains i.e. either (+) strains or (-) strains.
- In **heterothallic** species fungal hyphyae which participate in sexual reproduction are of different strains. In **heterothallic species** sexual reproduction **always takes place between hyphae** of different strains i.e. (+) and (-).

Mucor mucdo (Dung mold)	**-**	**heterothallic**
M.hiemalis	**-**	**homothallic**
Rhizopus nigricans	**-**	**heterothallic**
R.sexualis	**-**	**homothallic**
R. stolonifer	**-**	**heterothallic**

- When two fungal hyphate which are respectively (+) and (-) strains come close to each other, then these fungal hyphae produce some outgorwths. These outgrowths re called **"progametangia".**
- Anterior parts of progametangia are filled with **cytoplasm** and **nuclei.** Now these progammetangia are **(which are different in strains)** come in contact and as **septum** is formed just behing the contact place. Now the terminal part is called gametangium & long basal part is called suspensor, which is vacuolated. The multinucleate undifferentiated protoplast of each gametagium is termed as **coenogamete** or aplanogamete.

  In mature gametangium at the place of contact, wall of gametangia are dissolved and fuse together and **zygote is foremd, then zygospore** is formed. In zygospore **diploid nuclei** are formed. Haploid nuclei are degenerate. A black coloured, thick and ornamented coat is found around the zygospore [Dormant stage approximately **6 months (*In Rhizopus)***]

GERMINATION OF ZYGOSPORE

- During germiantion outer wall of zygospore get ruptured. A germ tube protruded out from this reptured place, it is called **"promycelium".** AT the apex of promycelium, a sporangium is foremd which is called **"germsporangium"** or **"zygosporangium"**
- In **Rhizopus,** at the time of germination **Meiotic division** takes place in zygospore where as in **Mucor** meiotic divisioin takes place in zygospore soon after karyogemy followed by mitotic division. Each nucleus is converted into spore. Only one type of (+ or -) sproe are formed in the germsporangium in **homothallic** species as where in heterothallic spcies both types of spores (+ & -) are formed. These spores germianate to form fungal hyphae.

HETEROTHALLISM

- **"Blakeslee"** discovered heterothallism first in ***Mucor mucedo.***
- According to **Blakeslee** two types of species are found in order mucorales which are called respectively **homothallic** and **heterothalli** species. When zygospore is formed by the fusioin of two hypae of same mycelium derived from single type of sproe (+ or - strain) then such species are called **homothallic e.g. M.hiemalis.**
- In **heterothallic** species the sexual reproduction takes place between hyphae of **genetically different strains** i.e. (+) and (-) strains. (In heterothallic species geneticallysimilar strain are **inter-sterile** e.g.)

  M. mucedo and R. nigricans.
- According to **Blakeslee** in htereothallic species seperate (+) and (-) strains does not form zygospore, only **sporangia** are formed. But in heterothellic species (+) and (-) strains grow together then fused and **zygospore** is formed. According to some scientisits (+) and (-) strains fungal hyphe are morphologically similar but functionally dissimilar.

ECONOMOMIC IMPORTANCE

***Rhizopus stolonifer* -** causes soft rot disease of vegetabel crops.

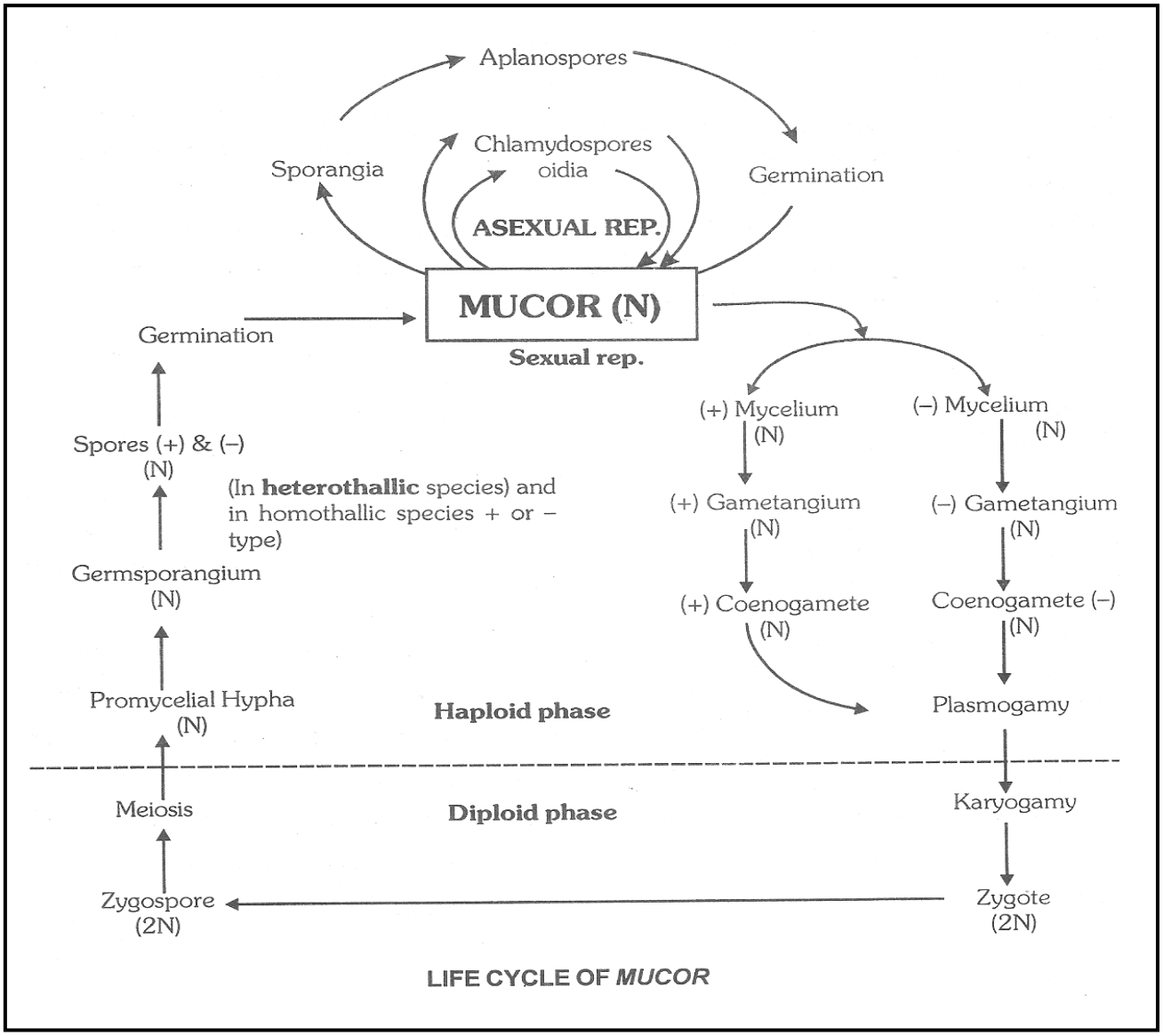
***M.pusilus* -** infects genitalia of human beings

***Rhizopus arrhizus* -** Causes fruit rot of apple.

***R.artocarpi* -** fruit drop of Jack fruit.

DIFFERENCE BETWEEN RHIZOPUS & MUCOR

Rhizopus	Mucor
1. Mycelium is differentiated into three kinds of hyphae **stolons, rhizoids** and **sporangiophores.** 2. **Rhizoids present.** 3. Food material is absorbed mainly by rhizoids. 4. Sporangiophores occur in tufts from the stolons opposite the rhizoids. 5. Spores easily disseminated by wind.	Mycelium is undifferentiatte, i.e. it has only one kind of hyphae. **Rhizoid absent** Food is absorbed by the entire mycelial surface Sporangiophores usually occur singly from any point on the mycelium Spores remain adhered to columella and thus spores are not easily disseminated.



LIFE CYCLE OF *MUCOR*