Economic Importance :

Yeast is also called as fermentation fungi, because different types of products are formed by fermentation with the help of yeast. Some of them are –

- ***Saccharomyces cerevisiae* -** It is used as fermentation agent in backery (bread industry) and brewery (wine industry). So ***Saccharomyces cerevisiae*** is also called **"Baker's yeast"**
- Riboflaving (vitamin B_2) is obtained from ***Saccharomyces cerevisiae.***

BASIDIOMYCETES

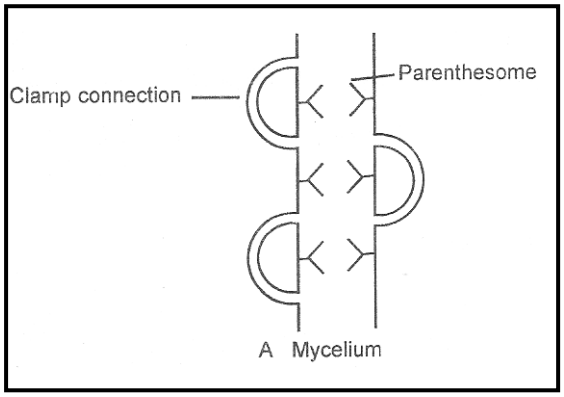
"Club fungi"

Mycelium :-

Septate and uni or binucleate (dikaryotic)

In basidiomyceetes, septum are of special type and they are called **dolipore septum.** One big pore is present between every septum. The boundary of pore is spread on both sides, this boundary is called as **parenthosome.** Due to the spreading of the boundary on both sides, the shape of septum becomes **dome shaped** due to which it called as **dolipore septum.** This septa allow cytoplasm and nucleus to pass from one cell to other cell.

Clamp connection : it is a tubular relationship between two neighboring cells. With the help of this connection the nucleus of one cell can migrate to the neighboring cell, due to which the other cell becomes **dikaryotic (binucleate).** Clamp connection is used to change **monokaryotic mycelium to dikaryotic mycelium** in basidiomycetes.



Sexual reproduction :-

Sexual reproduction is done by two methods.

(1) Somtogamy (2) Spermatization

(1) Somatogamy :-

This is the most common method of reproduction among the members of Basidiomycetes.

e.g. *Ustilago, Agaricus, Polyorus, Lycoperdon*

(a) First of all, the two mycelium come close to each other.

(b) Now their apical ends fuse with each other (Plasmogamy), as a result of which dikaryon is formed.

(c) Now, with the help of clamp connection all the cells of mycelium becomes binucleate or dikaryotic.

(d) Now both the nucleus of each cells fused with each other (karyogamy), due to which each cell becomes diploid.
Now a club shaped structure is formed on every cell, which is known as **basidium.**

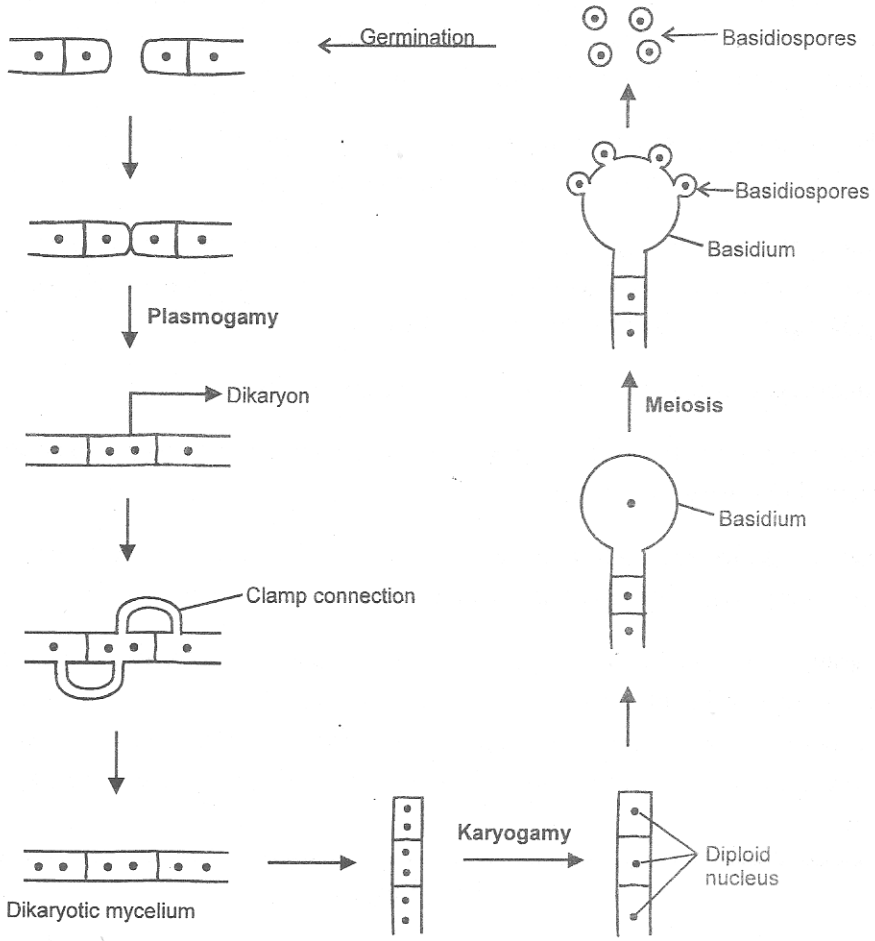
(e) After that diploid nucleus goes in to this Basidium and divides by meiosis, as a result of which four **haploid spores** are formed on every basidium which re known as **basidiospores.**

(f) Now the surrounding fungal hyphae grows to form a fruiting body, which is known as **basidiocarp.**

(g) Now the basidiopores become free from basidium and produce a new mycelium through germination.

Note :-

- It is belied that **basidium is similar to ascus,** because both of them produces spores.
- But basidiospore is different from ascospores because the origin of ascopores is **endogenous** and that of basidiospores is **exogenous.**



(2) Spermitization :-

This types of reproduction is more commonly seen in those fungi that develop rust.

e.g. - Rust fungi – ***Puccinia***

Three different species of Puccinia develop rust in wheat

- ***Puccinia graminis*** - Black rust or stem rust
- ***Puccinia recondita*** **-** Brown rust or leaf rust
- ***Puccinia striigormis*** **-** Yellow rust or stripe rust

Puccinia is a **heteroeciou** fungi i.e. the fungus that needs two types of host to complete its life cycle.

(1) Wheat **(2) Barberry**

Method :-

(a) In it, the infection takes place mainly on wheat plant i.e. the Barberry plant acts as an **alternate** host.

(b) First of all this fungus infect the Barberry plant. Due to the infection many cup shaped structures are formed on leaf of barberry. These structures are known as **pycnidial cups** (Pycnia or spermogonia). Mycelium are filled in the pycnidial cups. Pycnidial cup are formed on upper surface of leaf, which open out side through a pore, that is known as ostiole. Mycelium or fungal hyphae filled in the pycnidial cup and each cell of mycelium contains one haploid nucleus. It means these hypae are haploid. Each cup contains one type of hyphae (+ or -).

(c) Some hyphae in the each cup act as sporophore and form spores by division These spores are called as **spermatia** or **pycniospores.** Each cup contains one type of phciospoers (+ve or -ve in separate cup). Those hyphane on which pycniospores are not formed act as receptive hyphae.

(d) After that the phycniospores of one strain reach the receptive hyphae of other strain by air and attach with them due to which the receptive hyphae of each cup becomes dikaryotic.

(e) Now these dikaryotic receptive hyphae divide many times and form another cup shaped structure on the lower surface of leaf, which is known as **aecidial cup.** In this cup shaped structure, **aeciospores** are formed from these dikaryotic hyphae. These aeciopores are dikaryotic.

(f) Now these aeciospore attack on wheat plant and develop rust disease.

(g) These aeciopores germinate on wheat plant and form dikaryotic mycelium. **Uredospores** are formed on these mycelium They are also dikaryotic.
These uredospores attack other wheat plants through air. And when the growing period of wheat plant is at its end then a new stage (new spores) **teleutospore** is formed instead of uredospore on the leaf of wheat plant.

(h) Now **karyogamy** takes place in teleutospores as a result of which its nucleus becomes diploid. Now basidium is formed from telutospore. After that meiosis takes place in this nucleus, due to which **basidiospores** are formed on basidium. These basidiospores are haploid. These basidiospores then again infect barberry plant through air, and form mycelium after germination, on which Pycnidial cup and **pycniospores** (spermatia) are formed again.

Imp. Points

- Life cycle of ***Puccina*** - called rust cycle
- Rust cycle was discovered by **Prof. K.C. Mehta.** he had done a lot of hard work on rust.
- Starting of rust disease on wheat plants through aeciospores i.e. Primary infection taken place

  through **aeciospores** and secondary infection takes place through **uredospores.**

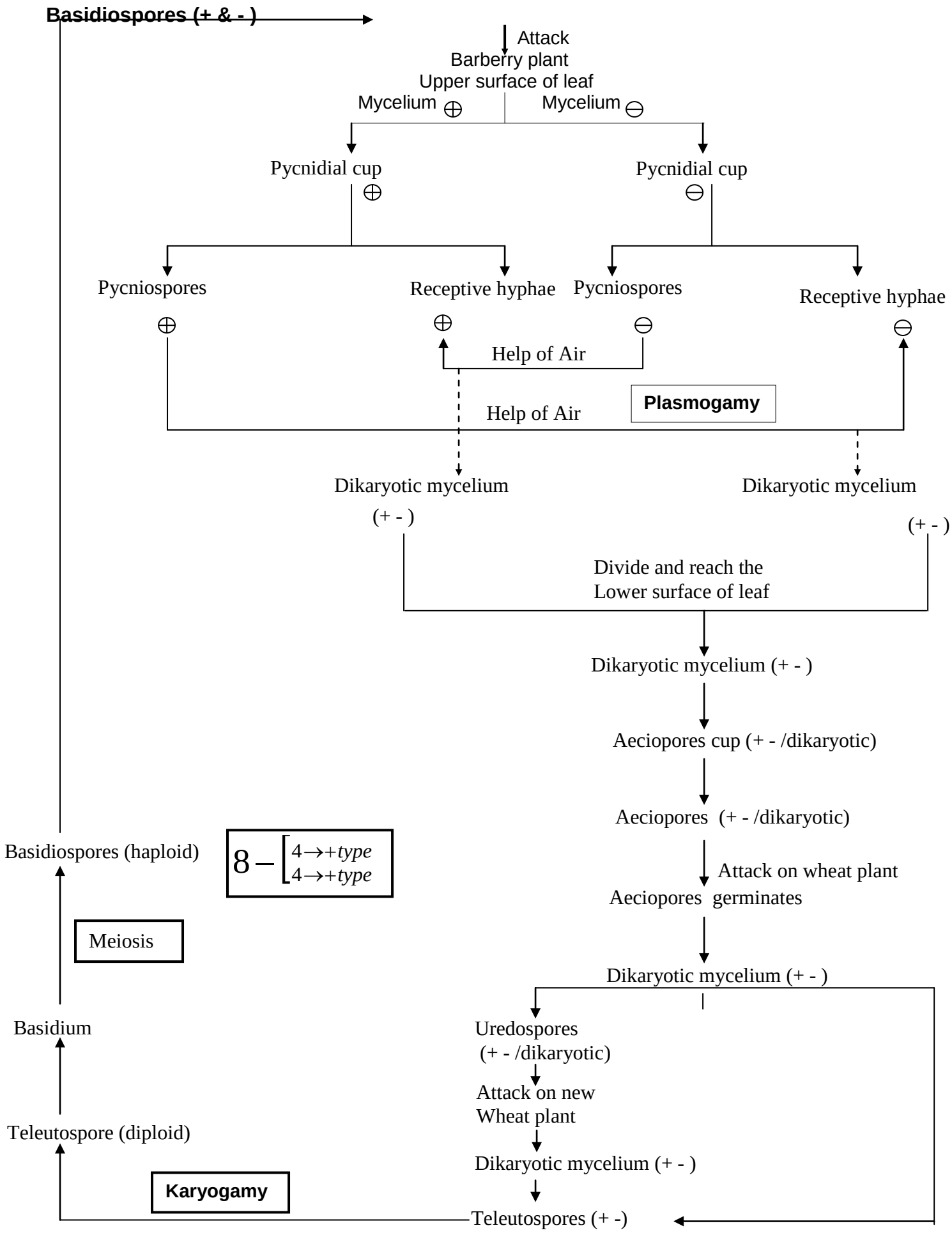
1) **Bracket or Shelf fungi :-**
These are epixlyic fungi i.e. these like to grow on wood. Their fruiting body is similar to bracket therefore they are called as bracket fungi.

eg. Polyporus

(2) **Puff balls -** These are saprophytic fungi. Fruiting body of puff balls is large and beautiful. It touched, fruiting body bursts violently to release a black powder (basidiospores) out side.

eg. ***Lycoperdon, Clavatia***

Note :- ***Clavatia*** **-** A drug **'clavatin'** is obtained from it. It is an **anticancer medicine.**


Basidiospores (+ & -)
Attack
Barberry plant
Upper surface of leaf
Mycelium ⊕
Mycelium ⊖
Pycnidial cup
⊕
Pycnidial cup
⊖
Pycniospores
⊕
Receptive hyphae
⊕
Pycniospores
⊖
Receptive hyphae
⊖
Help of Air
Plasmogamy
Help of Air
Dikaryotic mycelium
(+ -)
Dikaryotic mycelium
(+ -)
Divide and reach the
Lower surface of leaf
Dikaryotic mycelium (+ -)
Aeciopores cup (+ - /dikaryotic)
Aeciopores (+ - /dikaryotic)
Attack on wheat plant
Aeciopores germinates
Dikaryotic mycelium (+ -)
Uredospores
(+ - /dikaryotic)
Attack on new
Wheat plant
Dikaryotic mycelium (+ -)
Teleutospores (+ -)
Karyogamy
Teleutospore (diploid)
Basidium
Meiosis
Basidiospores (haploid)
8 – [4→+type
4→+type]

(3) Mushrooms - These are umbrella like fungi often seen growing in grounds during rainy season. Some mushroom, are edible.

- Most delicious mushroom - *Agaricus bisporus*
- World's most poisonous mushroom - *Amontia muscoides*

  (Poisonous mushrooms are known as Toad - stool)
- Inky cap mushroom - *Coprinus muscatus*

(4) **Smut fungi :** It causes smut disease on plant. Smut diseases mainly affect the seeds of crop plant. Smut fungi infest seeds and form black sooty spores inside the seed.

eg. ***Ustilago nuda or Ustilago tritici -*** It causes "loose smut of wheat". This diseases spreads by infected flowers and seeds.
Ustilago maydis - Smut of maize. This disease spreads by infected seeds.
Ustilago hordie - Covered smut of barley
Ustilago scitaminea - Whip smut of sugarcane

Note :- Prfo. J.C. Luthra discovered a technique to control smut.

(5) ***Agaricus :*** It is called as **"gill fungi"** because gills like pores are present in its fruitings body. It is also called fairy rings because its fruiting body looks like rings.

Note : **Basidiomycetes -** It is also called as **"club fungi"** because a club shaped basidium is formed in it. It is also called as **"ray fungi".**

DEUTEROMYCETES

It is also called **"fungi Imperfecti",** because perfect stage or sexual reproduction is absent in this calss of fungi. Those fungi are included in this class in which sexual reproduction is absent is absent or is not discovered at yet.

Mycelium :-

Sepate and multinucleate or uninucleate.

Asexual reproduction :-

Takes place with the help of conidia.

Sexual reproduction :

Sexual reproduction is absent in this class. Instead a ***parasexual*** cyclke is present. Prasexual cycle was discovered by Pontecorvo & Roper.

- Parasexual cycle is a method for producing variation in these fungi.
- Importance of Parasexual cycle - Mitotic recombination
- During mitosis, recombination takes place in these fungi due to which variations are develop.
  e.g.

- ***Arthrobotrytis***
- ***Dactylella***

These are **entomophagous** fungi i.e. insect predating fungi. These fungi can be used in biological control of insect pests.

The fungi included in this class causes many disease.

	Fungi	Disease
(1)	***Alternaria solani***	Early blight of Potato.
(2)	***Cercospora personata***	Tikka disease of groundnut.
(3)	***Colletrotrichum falcatum***	Red rot of surgarcane.
(4)	***helminthosporium oryzae***	Leaf spot of Rice.
(5)	***Fusarium udum***	Wilt of pigeonpea.

Note : Leaf spot of rice - This disease is known as famine of Bengal (1945).

Plectenchyma -

Fungal hyphae closely packed together to form a false tissue which is called plectenchyma.

Plectenchyma is of two types

(1) Prosenchyma - It is rather a loosely woven tissue of hyphae. The hyphae composing it do not lose their identity.

(2) Pseudoparenchyma - In higher fungi the hyphae become woven and intertwined into a compact mass. The wall of hypae in the mass get fused and they lose their individuality. It bears a striking superficial resemblance to the parenchyma tissue of higher plants and in called pseudoparenchyma.

KINGDOM – PLANTAE

All the multicellular eukaryotic plants are placed in Kingdom - Planate. They are autorophic i.e. they manufacture their food by photosynthesis.

Following plant groups are included in Kingdom - Plantae

(1) ALGAE (2) BRYOPHYTA (3) PTERIDOPHYTA
(4) GYMNOSPERM (5) ANGIOSPERM

ALGAE

- Term "Algae" was given by **Linnaeus.**
- Phycology - Study of algae.
- Father of Phycology - **Fristch** → Book → **"Structure & Reproduction of algae"**
- Father of Indian phycology - **M.O.P. Iyengar**

NATURE -

(1) Algae are found in both fresh and marine water.
(2) Algae are found in many forms like filamentous, colonial.
(3) Algae is surrounded by mucilagenous sheath and below the sheath cell wall is present which is made up of **cellulose** & **pectin.**
(4) On the basis of structure, algae are thalloid i.e. plant body is not differentiated into root, stem and leaves. **Tissue system** is also absent in algae.
(5) On the basis of nutrition, algae are photoautotrophic. They have chloroplast in which photosynthetic pigments are present. Classification of algae is mainly bases on pigments. **Chl-a** and β **carotene** are **universal pigment** of algae.

REPRODUCTION

(1) Vegetative (2) Asexual (3) Sexual

Vegetative reproduction :-

(i) Binary fission - Cell is divided into two parts and nucleus is also divided into two parts by mitosis.
eg. Found only in unicellular algae

(ii) Fragmentation - Filaments break down into small pieces & from new filaments.
e.g. All filamentous algae

Asexual reproduction :-

It is a method of protection in all unfavourable conditions.

Sexual reproduction :-

(i) Male sex organ is called **antheridium** and female is called **oogonium.** The sex organs of algae are **unicellular** & **jacketless.** But exceptionally sex organs of green algae ***Chara*** (Chara - green algae - known as stone wort) are multicellular and Jacketed.

The Male sex organ of ***Chara*** is known as **globule** and female is known as **nucule.**

(ii) Plant body of algae is haploid so sexual repro take place through **zygotic meiosis.** So their life cycle is **haplontic.** But exceptionally brown algae is diploid so that sexual repro. takes place through gametic meiosis in it. So its life cycle is **dipolo haplontic** but ***Fucus*** (brown algae) have diplontic life cycle.

(iii) Algae reproduce by **zygotic meiosis** i.e. development of zygote by meiosis so embryo is not formed.