

2. Biological Classification

POINTS TO REMEMBER :

SYSTEMS OF CLASSIFICATION :

- Earliest Classification was given by Aristotle. Divided plants into herbs, shrubs and trees. Animals into those with RBC's and those who do not have it.

Two kingdom classification :

- Given by Carolous Linnaeus – Plant kingdom and Animal kingdom.

Five kingdom classification :

- By R. H. Whittaker. Monera, Protista, Fungi, Plantae and Animalia are the five kingdoms.

Kingdom Monera :

Bacteria :

- Have bacteria a sole member.
- Bacteria can have shapes like: Coccus (spherical), Bacillus (rod-shaped), Vibrio comma shaped) and sprillum (spiral shaped).
- Bacteria found almost everywhere and can be Photosynthetic autotrophs, Chemosynthetic autotrophs or Heterotrophs.

Archaeobacteria :

- Differs from bacteria having different cell wall structure.
- They live in most harsh habitats
- **Halophiles** (salt-loving)
- **Thermophiles** (in hot springs)
- **Acidophiles** (high acidic condition)
- **Methanogen** (marshy area)
- Methanogen are also found in the gut of ruminant and produces biogas.

Eubacteria :

- Called true bacteria having a rigid cell wall, and if motile a flagellum.
- They also known as blue green algae or **Cyanobacteria**.
- Cyanobacteria are **photosynthetic autotrophs**.
- Unicellular, colonial or filamentous, marine and terrestrial algae.
- Colonies are surrounded by **gelatinous sheath**.
- Some of these can fix atmospheric nitrogen by specialized cells called **heterocyst**, e.g. *Nostoc* and *Anabaena*.
- **Chemosynthetic autotrophs**: Oxidize various inorganic substances like nitrates/nitrites, ammonia and use released energy for their ATP production.
- Heterotrophic bacteria:
 - o Mostly decomposer
 - o Helpful in making curd from milk
 - o Produce antibiotics

- o Symbiotically associated with leguminous plant and fix nitrogen.
- o Some are pathogen causing diseases like cholera, typhoid, and tetanus.
- Bacteria reproduce mainly by **fission**, also produce **spore** in unfavorable condition.
- Reproduce sexually by transfer of DNA from one bacteria to other, the process called **conjugation**.

Mycoplasma :

- Completely lack cell wall.
- Smallest living cells.
- Can survive without oxygen.
- Pathogenic in animals and plants.

Kingdom Protista :

- All are unicellular and eukaryotic.
- Mostly aquatic, can live in moist places.
- Forms a link between plants, animals and fungi.
- The cell contain nucleus and membrane bound organelles.

Chrysophytes :

- Includes diatoms and **golden algae** (desmids)
- Found in freshwater or marine water.
- Mostly planktonic (passive swimmer)
- Photosynthetic.
- Cell walls overlap to fit together like a soap box.
- Cell wall contains silica hence indestructible.
- Their accumulation forms '**Diatomaceous Earth**'.
- Used in polishing, filtration of oils and syrups.
- Diatoms are the chief '**producers**' in the oceans.

Dinoflagellates :

- Marine, photosynthetic.
- Cell wall has stiff cellulose plates.
- Appears yellow, green, brown, blue or red depending on the pigments.
- Have two flagella – one longitudinal and other transversely in a furrow between wall plates.
- Red Dinoflagellates (**Gonyaulax**) form **red tides**.

Euglenoids :

- Mostly fresh water form found in stagnant water.
- Instead of cell wall they have protein rich layer 'pellicle' which makes body flexible.
- They have two flagella one short and one long
- Photosynthetic in presence of sunlight but become heterotrophs if they do not get sunlight. e.g. *Euglena*

Slime Moulds :

- Saprophytic Protists
- Form aggregates to form plasmodium grow on decaying twigs and leaves.

- Plasmodium forms fruiting bodies bearing spores at their tips.
- Spores have true walls which are extremely resistant and survive for many years.

Protozoans :

- All protozoans are heterotrophs and live as predators or parasites.
- Believed to be primitive relatives of animals.
- These are divided into four major groups on the basis of locomotory organelle they have.

Amoeboid protozoans :

- Move and Catch prey using pseudopodia, e.g., Amoeba.
- Many forms have silica shells on their surface.
- Some of them are parasitic e.g. *Entamoeba*.

Flagellated protozoans :

- Either free living or parasitic.
- They have flagella.
- Cause disease like sleeping sickness e.g., Trypanosome.

Ciliated protozoans :

- These are aquatic, actively moving organisms due to presence of thousands of cilia. e.g., *Paramecium*.
- They have a cavity called gullet that opens to outside the cell.

Sporozoans :

- Lack any locomotory organelle.
- All members are parasitic.
- Have infective spore like stage in life cycle, e.g., *Plasmodium* which causes Malaria.

KINGDOM FUNGI :

- With the exception of yeasts which are unicellular all others are multicellular and filamentous.
- Consists of long slender thread like structure called hypha.
- Non chlorophyllous
- Network of hyphae called mycelium.
- Uninucleated or multinucleated (coenocytic)
- Cell wall made of complex polysaccharide called **chitin**.
- Grow in warm and humid places.
- Saprophytic, parasitic, symbiotic (**Lichen**)
- Reproduce asexually by spores conidia sporangiospores or zoospores.
- Sexual reproduction is by oospores, ascospores and basidiospores.
- Sexual cycle involves the following three steps:
- **Plasmogamy**: fusion of protoplasts between two motile or non-motile gametes.
- **Karyogamy**: fusion of two nuclei
- **Meiosis**: zygote undergoes meiosis resulting haploid spores.

e.g., *Puccinia* (rust causing), *Penicillium*.

CLASSES OF FUNGI -

Phycomycetes :

- Found in aquatic habitat, on decaying wood in moist and damp places.
- Some of them are obligate parasite on plants.
- Mycelium is **aseptate** and **coenocytic**
- Asexual reproduction by zoospores (motile) or by aplanospores (nonmotile).
- Spores are produced endogenously in sporangium.
- **Zygospore** produced by fusion of gametes.

e.g., *Rhizopus*, *Albugo*.

Ascomycetes :

- Commonly known as '**sac fungi**'.
- Unicellular (yeasts) or multicellular (e.g. *Penicillium*)
- Saprophytic, decomposers, parasitic or coprophilous.
- Mycelium branched and septate.
- Asexual spores are called conidia produced exogenously on the conidiophores. Conidia on germination produce mycelium.
- Sexual spores are called ascospores produced endogenously in ascus produced inside fruiting body called **Ascocarp**.

e.g., *Aspergillus*, *Neurospora*.

(iii) Basidiomycetes

- Common known forms called mushrooms, bracket fungi or puffballs.
- Mycelium septate and branched.
- Asexual spores generally are not found.
- Vegetative reproduction by fragmentation.
- Sexual reproduction by fusion of vegetative or somatic cells of different strains to form basidium produced in basidiocarp.
- Basidium produces four basidiospores after meiosis.

e.g., *Agaricus*, *Ustilago*.

Deuteromycetes :

- Called as '**Fungi Imperfecti**' as sexual form (perfect stage) is not known for them.
- Once sexual form is discovered the member is moved to Ascomycetes or Basidiomycetes.
- Mycelium is septate and branched.
- Are saprophytic, parasitic or decomposers.

e.g., *Alternaria*, *Colletotrichum*.

Viruses :

- They did not find a place in classification. Take over the machinery of host cell on entering it but as such they have inert crystalline structure. So, difficult to call them living or non-living.
- Pasteur gave the term 'Virus' i.e., poisonous fluid.
- D. J. Ivanowsky (1892) found out that certain microbes caused Tobacco Mosaic Disease in tobacco plant.

- M. W. Beijerinck (1898) called fluid as 'Contagium vivum fluidum' as extracts of infected plants of tobacco could cause infection in healthy plants.
- W. M. Stanley (1935) showed viruses could be crystallised to form crystals of protein which are inert outside their specific host.

Structure of Virus :

- Its a nucleoprotein made up of protein called Capsid. Capsid is made up of capsomeres arranged in helical or polygeometric forms. Have either DNA or RNA as genetic material which may be single or double stranded.
- Usually plant viruses have single stranded RNA; bacteriophages have double stranded DNA and animal viruses have single or double stranded RNA or double stranded DNA.

Diseases caused : Mumps, Small pox, AIDS etc.

Viroids :

- Infectious agent, free RNA (lack protein coat)
- RNA has low molecular weight.
- Causes potato spindle tuber disease.
- Discovered by **T. O. Diener in 1971**

Lichens :

- Symbiotic association between algal component (**Phycobiont**) and fungal component (**Mycobiont**). Algae provide food. Fungi provide shelter and absorb nutrients for alga.
- Good pollution indicators as they do not grow in polluted areas.