K C Meena
www.biokailashkvs.com

CHAPTER 2 - BIOLOGICAL CLASSIFICATION
XI CLASS BIOLOGY NOTES

The process of grouping living organisms into convenient categories based on simple characters is known as **biological classification**.

Importance of classification-

- It is not possible to study every organism. Study of one or two organism of a group gives sufficient information about the essential features of the group.
- It helps in identification of new organism.
- Classification helps in knowing the relationship amongst different groups of organisms.
- The organism of past cannot be studied without a proper system of classification.

Two Kingdom Classification- (Linnaeus)

Plantae & Animalia

- Plants. (autotrophs, cell wall, do not move)
- Animals (heterotrophic, no cell wall, can move)

Later found two kingdom classification was not sufficient because in that

1. Prokaryotes & Eukaryotes were grouped together.
2. Heterotrophs & Autotrophs were together.
3. No difference between unicellular and multicellular
4. Simple organisms were placed along with higher organism.

Five Kingdom Classification. (R.H Whittaker 1959)

Main criteria for classification:

1. Complexity of cell structure (prokaryotes/ eukaryote)
2. Body organization (unicellular/ multicellular)
3. Mode of nutrition (autotrophic / heterotrophic/ holozoic)
4. Life style (producers/ consumers/ decomposers)
5. Phylogenic relationships (revolutionary history)

Five kingdoms are

1. Kingdom Monera (bacteria) – prokaryotic unicellular
2. Kingdom Protista (amoeba) – eukaryotic unicellular
3. Kingdom Fungi - multicellular eukaryotic
4. Kingdom Plantae - multicellular eukaryotic
5. Kingdom Animalia – multicellular eukaryotic

Property	Monera	Protista	Fungi	Plantae	Animalia
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell organization	Mostly unicellular	Mostly unicellular	Multicellular and unicellular	Mostly Multicellular	Mostly Multicellular
Cell wall	Present in most	Present in some: absent in others	Present	Present	absent
Nutritional class	Phototrophic,heterotrophic or chemoautotrophic	Heterotrophic and phototrophic	Heterotrophic	phototrophic	Heterotrophic
Mode of nutrition	Absorptive	Absorptive or ingestive	Absorptive	Mostly Absorptive	Mostly ingestive
Motility	Motile or non motile	Motile or nonmotile	Nonmotile	Mostly nonmotile	Mostly Motile

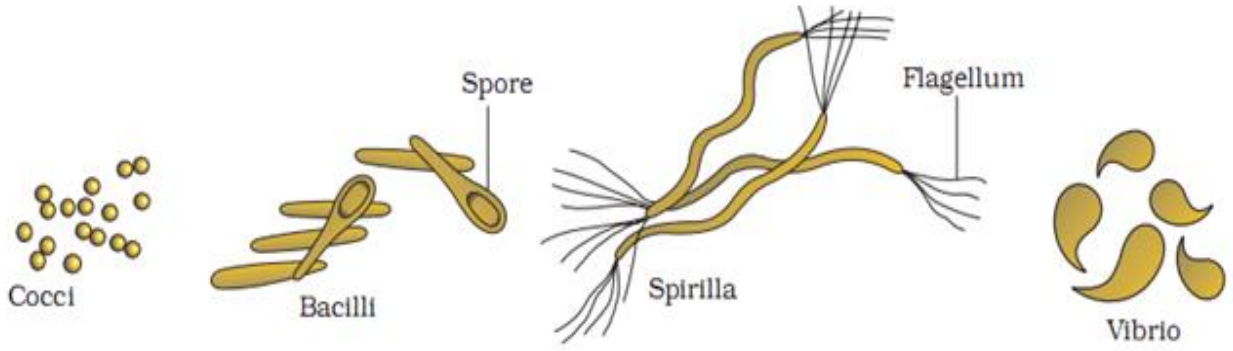
Kingdom - Monera (eg. Bacteria)

1. Unicellular, prokaryotes and contain the most primitive of living forms.
2. Habitats- omnipresent
2. The cells are microscopic and cell wall is generally present.
3. Genetic materials are not organized into nucleus and contain naked DNA.
4. Membrane bounded organelles are absent.
5. Reproduction is asexual except gene recombination.
6. Flagella may be present and are of single stranded.

Bacteria Grouped in to 4 groups based on their shape.

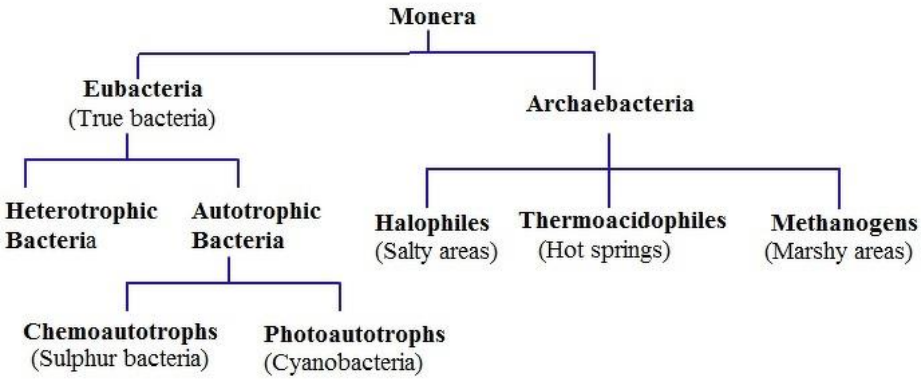
1. Coccus (spherical)
2. Bacillus (rod)
3. Vibrio(comma)
4. Spirillum (spiral)

Mode of nutrition – autotrophs and heterotrophs.



Kingdom Monera – includes;

1. Archaebacteria
2. Eubacteria (Cyanobacteria, Chemosynthetic and Heterotrophic)
3. Mycoplasma



a) Archaebacteria –

- Harsh habitats – Halophiles (saline)
- Thermoacidophiles (hot spring),
- Methanogens (gut of ruminants)

b) Eubacteria – True bacteria - Rigid cell wall - Motile flagellum

Autotrophic bacteria –

- Cyanobacteria (BGA) have chlorophyll a unicellular, colonial/ filamentous.
- Marine /terrestrial habitat/ gelatinous sheath
- Form blooms - can fix nitrogen in heterocysts.
- Eg. Nostoc, Anabaena.

Chemosynthetic bacteria –

- Oxidise nitrates , nitrites and ammonia .
- (eg. Pseudomonas, nitrobacter)

Heterotrophic bacteria –

- Decomposers – making curd from milk, antibiotics, nitrogen fixing (Rhizobium)
- some are pathogenic (cause diseases) cholera, T.B, diarrhea.
- Reproduction by binary fission, spore / sexual reproduction.

c) Mycoplasma.

- They are the simplest free living prokaryotes. They are also known as PPLO (Pleuropneumonia like organism). They lack cell wall and can survive without oxygen. They cause disease in plants and animals.
- **Anaerobic** – pathogenic in animals and plants.

2. Kingdom - Protista

- Unicellular – Eukaryotic .
- Aqutic
- Flagella / cilia presents
- Reproduce sexually / asexually

1. Chrysophyta :

- Planktons diatoms and golden algae (desmids)
- Fresh water/ marine
- Microscopic – photosynthetic
- In diatoms, cell wall is indestructible (silica) form diatomaceous earth, its being gritty used for polishing, filtration of oil and syrups.
- Chief producers in oceans

2. Dinoflagellates.

- Marine photosynthetic, yellow, green, blue or red pigments.
- Cell wall is cellulosic.
- Have 2 flagella.
- Red dionflagellate (Gonyaulax) forms red tides.

3. Euglenoid eg. Euglena

- Fresh water – stagnant water.
- No cell wall but protein rich layer is present, called pellicle.
- Pellicle is flexible with flagella.

- They are Myxotrophic, because Photosynthetic (in light) Heterotrophs (when no light).
- Myxotrophs – Mixture of both autotrophs and heterotrophs.

4. Slime moulds.

- Saprophytic – body moves on decaying twigs and leaves
- During suitable conditions form aggregation called plasmodium (mass of slime moulds)
- In Unfavorable conditions form spores and survive for many years.

5. Protozoans –

- Heterotrophs.
- predators/ parasites .

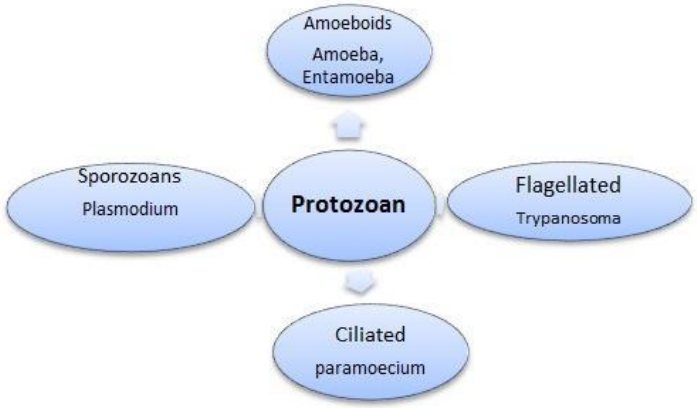
There are 4 major groups;

- **Amoeboid protozoans**. Fresh water, sea and moist soil -pseudopodia – marine forms have silica shells . *Entamoeba* (parasite) cause Amoebic dysentery

- **Flagellated protozoans** - free living / parasites have flagella – parasites cause diseases – Sleeping sickness (*Trypanoroma*)is a parasite of flagellated protozoans.

- **Ciliated protozoans** – aquatic cilia, cavity gullet eg. *Paramoecium*.

- **Sporozoans** – Spore stage in their life cycle. *Plasmodium* causes malarial fever.

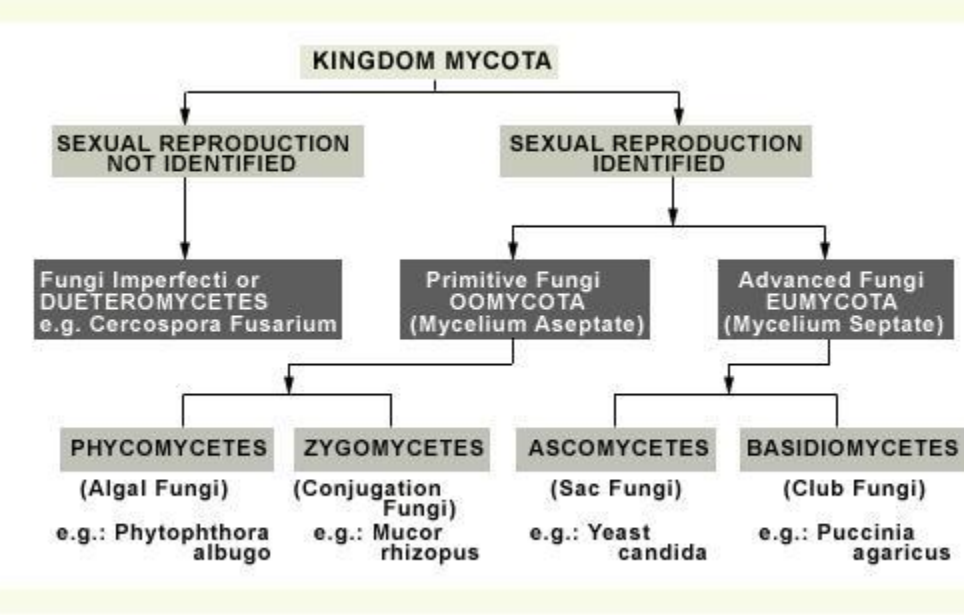


3. Kingdom - Fungi:

- Multicellular, eukaryotic, heterotrophic, cosmopolitan, grow in warm and humid places.
- Fungi are filamentous with long, slender thread like Hyphae and the net work of

hyphae is known as Mycelium – They can be septate or non septate (aseptate)

- Multinucleated cytoplasm (coenocytic hyphae)
- Cell wall is made up of chitin.
- Parasitic/ symbionts (Lichens and Mycorrhizae)
- Symbionts of algae and fungi (Lichens) and Pine trees roots and fungi (Mycorrhizae)on roots to absorb water.



Reproduction may be vegetative (fragmentation, fission or budding), asexual (conidia, sporangiospores or zoospores) or sexual reproduction by oospores, ascospore and basidiospores.

- Sexual reproduction has three steps.

1. Fusion of protoplasms between two motile or non-motile gametes called plasmogamy.
2. Fusion of two nuclei called karyogamy.
3. Meiosis in zygote resulting in haploid spores.

Based on morphology of mycelium mode of spore formation, fruiting bodies, there are 4 classes;

1. Phycomycetes
2. Ascomycetes
3. Basidiomycetes
4. Deuteromycetes

1. **Phycomycetes** :
    - Aquatic decaying wood mycelium is aseptate, coenocytic

- asexual reproduction by zoospores (motile) / aplanospores (non motile)
- Eg. Rhizopus, mucor.

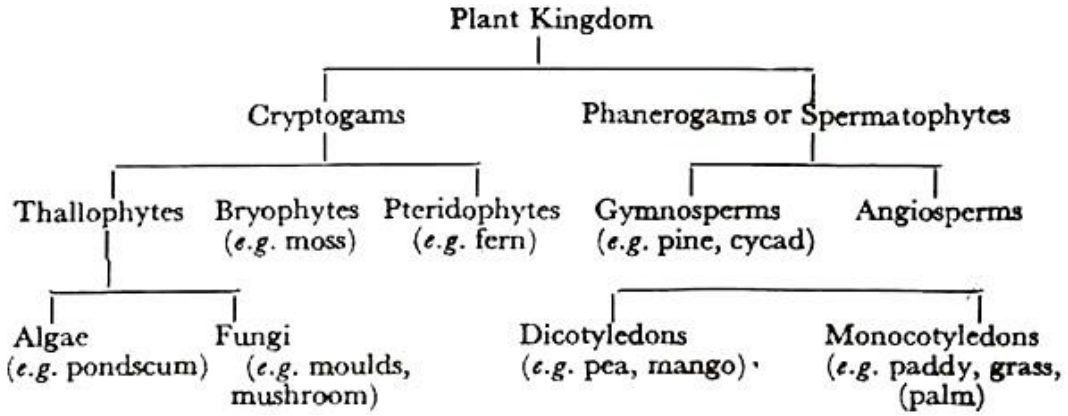
2. **Ascomycetes** :(Sac fungi)
   - Multicellular (penicillium)/Unicellular (yeast)
   - Saprophytic – decomposers – parasitic – coprophilous
   - Mycelium is branched and septate –asexual spores are called conidia
   - Sexual spores are called ascospores.
   - Eg. Aspergillus, Neurospora

3. **Basidiomycetes :** (Eg. Mushroom/ bracket fungi/ puffballs)
   - Grow in soil, logs, tree stumps, in plant bodies as parasitic (as rust and smuts)
   - Mycelium is branched and septate
   - Reproduction by fragmentation
   - Dikaryon – basidium –karyogamy
   - Eg. Agaricus(mushroom)

4. **Deuteromycetes :**
   - Commonly known as imperfect fungi because only the asexual or vegetative phases of these fungi are known. When the sexual forms of these fungi were discovered they were moved into classes they rightly belong to.
   - Saprophytes/ parasitic / decomposers
   - Help in Mineral cycling
   - Eg. Trichoderma, Alternaria

4.Kingdom - Plantae :

Autotrophs – size varies from herbs to tall trees. There are different groups;



5.Kingdom Animalia :

- Heterotrophic, eukaryotic organisms that are multicellular and cell wall is

absent in the cell.

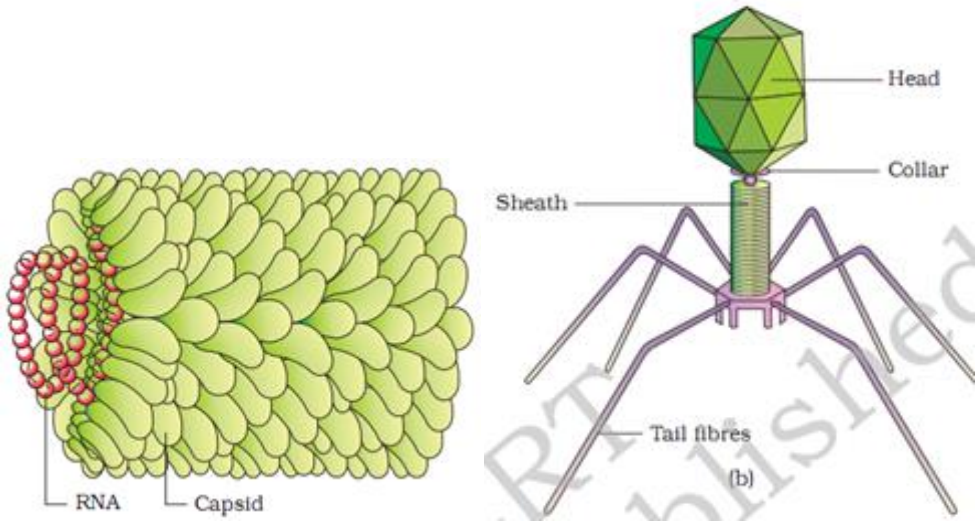
- Mode of nutrition is holozoic and reserve food is glycogen or fats.
- Sexual reproduction is by copulation between male and female followed by embryological development.

Virus, Viroids and Lichens

Five kingdom system of classification do not includes Virus, Viroids and Lichens

Virus:

- Viruses are non-cellular organisms having inert crystalline structure outside the living. When they enter the living cell, they take over the machinery of living cell to replicate themselves.
- D.J.Ivanowsky recognized certain microbes as causal organism of mosaic disease of tobacco.
- Pasteur coined the term virus, which means Venom / poison.
- It is made of a outer protein coat and a centre genetic material (RNA / DNA). A virus is a nucleoprotein and the genetic material is infectious.
- Virus that infect plants have single stand RNA and those infect animals have either single or double RNA or double stranded DNA.
- Bacteriophages are viruses that infect the bacteria.
- Viruses cause disease like mumps, small pox, herpes, influenza and AIDS.
- In plants the symptoms can be mosaic formation, leaf rolling, and curling, yellowing, dwarfing and stunted growth.

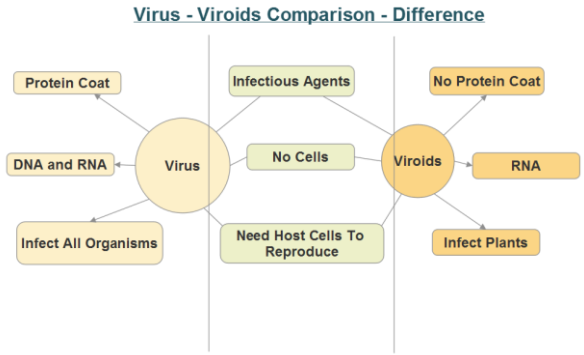


Viroids

- T.O. Diener discovered a new infectious agent that was smaller than viruses

and caused potato spindle tuber disease.

- It has only a free RNA and lacked the protein coat, so named as viroid.



Lichens

- Symbiotic association between algae and fungi.
- Phycobiontis algal component, which prepare food for fungi and Mycobiont is a fungal component, which provide shelter and absorb mineral nutrients and water for its partner.

Miscellaneous

Features	**Bryophyta**	**Pteridophyta**	**Gymnosperms**	**Angiosperms**
Dominnant phase	Gametophyte	Sporophyte	Sporophyte	Sporophyte
Ploidy of main plant body	Haploid	Diploid	Diploid	Diploid
Differentiation of body	Thallus and rhizoids	Roots, stem and leaves	Roots , stem and leaves	Roots, stem and leaves
Vascular bundles	Absent	Present	Present	Present
Nature of spores	Homospores	Homospores or heterospores	Heterospores	Heterospore
Seed and its coverings	Seed absent	Seed absent	Seed naked without covering	Seed with coverings
Flower	Absent	Absent	Absent	Present

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