CHAPTER

4 Biological Classification

Table 1: Characteristics of Five Kingdoms proposed by Whittaker (1969)

Characters	Five Kingdoms				
	Monera	Protista	Fungi	Plantae	Animalia
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	Noncellulosic (Polysaccharide + amino acid)	Present in some	Present with chitin	Present (cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organisation	Cellular	Cellular	Multicellular/ loose tissue	Tissue/organ	Tissue/organ/ organ system
Mode of nutrition	Autotrophic (Chemosynthetic and photosynthetic) and Heterotrophic (sapro-phytic/ parasitic)	Autotrophic (Photosynthetic) and Hetero-trophic	Heterotrophic (Saprophytic/ Parasitic)	Autotrophic (Photosyn-thetic)	Heterotrophic (Holozoic/ Saprophytic etc.)

Kingdom Monera

- Bacteria can be classified into two categories that is archaebacteria and eubacteria.
  - **Archeabacteria:** It includes halophiles, thermoacidophiles and methanogens.
  - **Eubacteria (true bacteria):** Based on their nutrition they can be classified into autotrophs and heterotrophs.
- **Autotrophic bacteria** are of two types that is photosynthetic autotrophs and chemosynthetic autotrophs.

Photosynthetic autotrophs

- They have chlorophyll *a* & includes cyanobacteria.
- They can fix nitrogen through heterocyst.
- E.g., *Nostoc*, *Anabaena*, etc.

Chemosynthetic autotrophs

- They oxidise various inorganic substance.
- They play important role in nutrient cycling.

Heterotrophic bacteria

- Majority of them are important decomposers.

Kingdom Protista (Single-celled Eukaryotes)

Crysophytes

- Includes diatomes and golden algae (desmids).
- Diatoms forms 'diatomaceous earth' and are chief producers' in the oceans.

Dinoflagellates

- Mostly marine and phtosynthetic.
- Toxins released by *Gonyaulax* make the sea appear red (red tides).

Euglenoids

- Majorly fresh water organisms.
- Presence of pellicle makes their body flexible.
- E.g., *Euglena*

Slime Moulds

- Saprophytic protists.
- They form plasmodium and fruiting bodies under favourable and unfavourable conditions respectively.

Protozoans

- Heterotrophs and live as predators or parasites.
- 4 major groups are as follows:
  - Amoeboid protozoans
    - Live in fresh water, sea water or moist soil.
    - *e.g.*, *Amoeba*
  - Flagellated protozoans

- Either free living or parasitic
- *e.g.*, *Trypanosoma*

✦ Ciliated protozoans
- Aquatic and actively moving organisms.
- *e.g.*, *Paramoecium*

✦ Sporozoans
- They have infectious spore like state in their life cycle.
- *e.g.*, *Plasmodium* (Malarial parasite)

Kingdom Fungi (Heterotrophic Organisms)

❖ Reproduction is of three types i.e.,
✦ Vegetative means: Fragmentation, fission and budding.
✦ Asexual reproduction (spores): Conidia/sporangiopores/ zoospores.
✦ Sexual reproduction: Oospores, scospores and basidiospores.

❖ Sexual cycle follow plasmogamy, karyogamy and meiosis in zygotes.

❖ On the basis of morphology of mycelium, mode of spore formation and fruiting bodies, fungi are classified into four different classes (Table 2).

Table 2: Classification of Fungi

Classes	Typical Examples	Sexual Reproduction	Asexual Reproduction	Hyphae
Phycomycetes	*Rhizopus, Mucor, Albugo*	Zygospores	Zoopores (motile) Aplanospores (non-motile)	Aseptate and Coenocytic
Ascomycetes (Sac fungi)	*Penicllium* (multicellular), yeast (unicellular), *Aspergillus*, *Claviceps*, *Neurospora*, morels and truffles	Ascospores produced endogenously in sac like asci	Conidia produced on conidiophore	Branched and septate
Basidiomycetes (Club fungi)	Mushrooms (*Agaricus*) smut (*Ustilago*), Rust (*Puccinia*) bracket fungi or puff balls.	Basidiospores produce exogenously on the basidium	Generally asexual spores are not found but reproduce vegetatively by fragmentation	Branched and septate
Deuteromycetes (Imperfect fungi)	*Alternaria, Colletotrichum, Trichoderma*	Sexual phase has not been observed	Conidia	Septate and branched

Kingdom Plantae

❖ Includes all eukaryotic chlorophyll-containing organisms commonly called plants.

Kingdom Animalia

❖ This kingdom is characterised by heterotrophic eukaryotic organisms that are multicellular and their cells lack cell walls.

Virus

❖ The viruses are non-cellular organisms that are characterised by having an inert crystalline structure outside the living cell.

❖ Viruses contain protein and genetic material, that could be either RNA or DNA.

Viroids

❖ In 1971, T.O. Diener discovered a new infectious agent that was viroids and they contain only RNA.

Prions

❖ It is a types of infectious protein aggregates that can cause different types of disease. *E.g.*, bovine spongiform encephalopathy (BSE) commonly called mad cow disease in cattle and its analogous variant Cr–Jacob disease (CJD) in humans.

Lichens

❖ A symbiotic form of algae and fungi, in which algae provide food and fungi provide shelter as well as nutrition to algae.

❖ Lichens are very **good pollution indicators**—they do not grow in polluted areas.