PLANT KINGDOM

IMPORTANT POINTS

Monerans, protists, Fungi were earlier included in plant Kingdom but not now BGA is also not an algae anymore.

Various Systems of classification

Earlier systems were based on gross morphology like habitat, colour, no. & shape of leaves

Artificial system

• Based mainly on vegetative characters (easily affected) or on the androecium structure. Eg- Linnaeus classification of plants based on no. of androecium.
• It had drawbacks like it separated closely related species, were based on few characters & equal weightage given to vegetative & sexual characters

Natural system

• Based on natural affinities among organisms & consider external, internal, ultra structure, anatomy, embryology, photochemistry.
• Eg- George Bentham & Joseph Dalton Hooker classification of flowering plants.

Phylogenetic system

• Most acceptable, based on evolutionary relationships.
• Organisms belonging to Same taxa have common ancestor.

DIFFERENT KINDS OF TAXONOMY

NUMERICAL TAXONOMY
• Based on all observable characters using computers (no. & codes are assigned to each character)
• Each character is given equal importance.

CYTOTAXONOMY
• Based on chromosome no., structure, behaviour

CHEMOTAXONOMY
• Chemical constituents of the plant to resolve confusions

ALGAE/THALLOPHYTA

INTRODUCTION

• They are chlorophyll bearing simple thalloid, autotrophic & largely aquatic (both fresh & marine) organisms.
• Some algae form association with fung (lichen) & with animals (as on sloth bear).

ECONOMIC IMPORTANCE

• They fix 1/2 of the total CO_2.
• They are primary producers & are energy source for aquatic animals Eg- *Porphyra, Laminaria, Sargassum* are used as food.
• Algin (brown algae) & carrageen (red algae) produce hydrocolloids (water holding substances.)
• Agar is produced from *Gelidium* & *gracilaria.*
•*Chlorella* (rich in protein) is used as space food.

SIZE & FORM

Chlamydomonas(microscopic unicellular), *Volvox*(colonial), *Ulothrix* & *Spirogyra*(filamentous), kelps (massive marine form).

REPRODUCTION

VEGETATIVE: By fragmentation. Each fragment develops into thallus.

ASEXUAL: By production of zoospores (motile).

SEXUAL: By fusion of 2 gametes.

Isogamous

Gametes are similar in size
1) if motile- *Chlamydomonas*
2) if non motile- *Spirogyra*

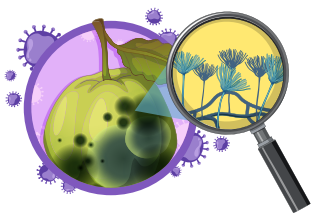
Anisogamous

Gametes are different in size but of same capability to move Eg- some species of *Chlamydomonas* i.e. *Udorina*

Oogamous

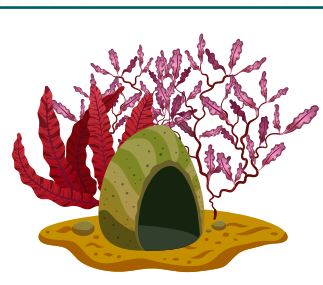
Female gamete is non motile but male is motile Ex- *Volvox, Fucus*

TYPES OF ALGAE



Chlorophyceae /green algae: Plant body is unicellular/colonial/ filamentous. Possess chl-a & b. Possess different shapes. Have stored food as starch or oil. Have pyrenoid(starch synthesis) body in chloroplast for storing protein. Inner cell wall → cellulose & outer wall → pectose. Vegetative reproduction → fragmentation, spores. Asexual → by zoospores. Sexual → isogamy, anisogamy, oogamy. Found in fresh, brackish, salty water. Have 2-8 equal & apical flagella
Eg-*chlamydomonas, Volvox, Ulothrix, Spirogyra, Chara*

Phaeophyceae /brown algae: Branched, filamentous (*Ectocarpus*). Have chl a, c, xanthophylls, caroteins. Have stored food as laminarin or mannitol. Have cellulosic cell wall. Have gelatinous covering of ALGIN. Plant parts are Holdfast, stipe, frond. Vegetative → by fragmentation; Asexual-by zoospores; Sexual → by iso,aniso,oogamy. Gametes are pyriform (pear shaped) & bear a laterally placed flagella. Found rarely in fresh water, mostly in brackish & salt water. Have 2 unequal lateral flagella. Cellulose, pectin & polysulphate esters are found in cell wall.
Eg-*Ectocarpus, Dictyota, Laminaria, Sargassum,Fucus, Kelps* (may reach a hight of 100 metres).



Rhodophyceae /red algae: They are multicellular. Have red pigment r-phycoerethrin. Found in warmer areas & occur in all light regions. Stored food is floridean starch which is similar to amylopectin & glycogen in structure. Vegetative → fragmentation Asexual → nonmotile spores; Sexual → oogamous by non motile spores. Found some in fresh & brackish water but most in salt water. Do not have any flagella.
Eg- *Polysiphonia, Porphyra, Glacilaria, Geledium*

BRYOPHYTES
(AMPHIBIANS OF PLANT KINGDOM)

INTRODUCTION

Live in soil but dependent on water for sexual reproduction Play important role in plant succession on bare rocks/soil They also have thalloid body but more differentiated than algae. Main members of bryophytes are mosses

SEX ORGANS

Sex organs are multicellular and jacketed. Male sex organ → Antheridium (produce antherozoid); Female sex organ → archaegonium (produce egg)

STRUCTURE/PLANT BODY

It is thallus like, prostrate & erect. Have rhizoids in place of roots. Lack true root, stem, leaf but may possess structure like them. Main plant body is haploid (gamatophytic cause it to produce gametes)

FERTILISATION & DEVELOPMENT

Antherozoids (n) released in water come in contact with archaegonium/egg(n) → zygote (2n) → sporophyte(2n) → spores(n) → germination → gametophyte(n)

ECONOMIC IMPORTANCE

Some mosses provide food for herbaceous mammals, birds, other animals. Species of *Sphagnum,* a moss provide peat that have long been used as fuel, and because of their capacity to hold water used as packing material for transshipment of living material. Mosses with lichens are first to colonise rocks & hence are of great ecological importance. Act as Decomposers of rocks making suitable for growth of higher plants. Form green mats & prevents soil erosion.

LIVERWORTS

Plant body is thalloid & thallus is dorsiventral & closely appressed to substratum. Leafy members have tiny leaf in rows looking like stem. Perform Asexual reproduction by fragmentation or gemmae formation & sexual reproduction as sex organs are present on same or different thalli. Sporophyte is consist of foot + setae + capsule. Spores are produced within capsule. They have free living gametophyte & sporophyte is parasitised on it. Eg- *Marchantia.*

MOSSES

Predominant stage is gametophyte. Consists of 2 stages → protonema & leafy. Protonema develops from spore, creeping green, branched & frequently filamentous stage. Leafy develops from secondary protonema as a lateral bud,consist of spirally arranged leaves (this stage contains sex organs). Perform asexual reproduction by fragmentation & budding in secondary protonema or sexual reproduction by antheridia, archaegonia. After fertilisation zygote develops into sporophyte. They have elaborate mechanism of spore dispersal. Eg-*funaria, Sphagnum, Polytrichum.*

PTERIDOPHYTES

01.

Introduction
Includes horsetails and ferns. First terrestrial plant to possess vascular tissue. Found in cool, damp, shady places through some may flourish in sandy soil condition.

02.

Structure/plant body
Main plant body is sporophyte but also have free living gametophyte. Differentiation is seen in true root, stem & leaf. Leaves may be of 2 types:- microphylls (*Selaginella*) or macrophylls (Ferns) sporophyte bears sporangia that are subtended by leaf like appendages called sporophylls & sometime it may form compact structure called strobili or cones Eg-*Selaginella, Equisetum.*

03.

Sexual reproduction
Gametophyte bears antheridia & archaegonia. Water is required for transfer of male gamete to archaegonium. Antherozoid + egg ⟶ zygote(2n) and it will further form sporophyte.
Types of sporophyte -
Homosporous-all spore of same kind. Eg-*Dryopteris, Pteris, Equisetum* (majority)
Heterosporous-2 types of spores are produced(microspore & megaspore) Eg-*Selaginella and Salvinia*
Development of zygote into young embryo takes place within the female gametophyte (precursor to seed habit considered an important step in evolution).

04.

Life cycle
Meiosis in sporangia ⟶ Spores ⟶ Germination ⟶ Prothallus (Multicellular) ⟶ Gametophyte ⟶ Male and female gamete ⟶ Fusion ⟶ Zygote (2n) ⟶ Sporophyte

05.

Economic importance
Used for Medicinal purposes and they also act as soil binders. They are also frequently grown as ornamentals
Psilopsida-*Psilotum*
Lycopsida-*Selaginella, Lycopodium*
Sphenopsida-*Equisetum*
Pteropsida-*Dryopteris, Pteris, Adiantum*

GYMNOSPERMS (NAKED SEEDS)

Ovules are exposed i.e. no ovary wall is present. Seeds are naked. They include medium trees, tall trees & shrubs. Giant redwood tree Sequoia is one of the tallest plants. Possess tap roots (Pinus have mycorrhiza & cycas have coralloid roots i.e. associated with N_2 fixing BGA). Stems may be branched (*Pinus, Cedrus*) or unbranched (Cycas). They have simple,compound leaf. Cycas have pinnate leaf that remain for few years & withstand temperature, humidity & wind. All conifers have needle like leaves that reduces the surface area & reduce water loss. They are always heterosporous. The sporophylls may arranged spirally to form lax/strobili/cones. Strobili bearing microsporophyll/ microsporangia is called microsporangiate/male strobili. Male & female cones on same tree⟶Pinus, and male & female cone on different tree ⟶cycas

ANGIOSPERMS(COVERED SEEDS)

Smallest angiosperm ⟶ *Wolfia*, tallest angiosperm ⟶ *Eucalyptus*. They provide food, fodder, fuel, medicines. Characteristic of dicots are tetramerous/pentamerous flower & that of monocot is trimerous flower. PEN (primary endosperm nucleus) develops into endosperm. Each embryo sac has 3 celled egg apparatus. Synergids and antipodals degenerate after fertilisation.