Plant Kingdom

IMPORTANT POINTS

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

Various Systems of classification

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

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 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) org. Some algae form association with fungi(lichen), with animals(on sloth bear)

Economic importance

They fix 1/2 of the total CO2,They are primary producers & is energy source for aquatic animals Eg- PORPHYRA, LAMINARIA, SARGASSUM are used as food. Algin (brown algae) & carrageen (red algae) produce hydrocolloids(water holding subst.) Agar is produced from Geledium & gracilaria. Chlorella and spirullina are used as space food (SCP-Single cell protein)

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



Table 3.1 Divisions of Algae and their Main Characteristics

Classes	Common Name	Major Pigments	Stored Food	Cell Wall	Flagellar Number and Position of Insertions	Habitat
Chlorophyceae	Green algae	Chlorophyll *a*, *b*	Starch	Cellulose	2-8, equal, apical	Fresh water, brackish water, salt water
Phaeophyceae	Brown algae	Chlorophyll *a*, *c*, fucoxanthin	Mannitol, laminarin	Cellulose and algin	2, unequal, lateral	Fresh water (rare) brackish water, salt water
Rhodophyceae	Red algae	Chlorophyll *a*, *d*, phycoerythrin	Floridean starch	Cellulose, pectin and poly sulphate esters	Absent	Fresh water (some), brackish water, salt water (most)

Isogamous

Gametes are similar in size
1) if motile- chlamydomonas
2) if nonmotile- spirogyra

Anisogamous

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

Oogamous

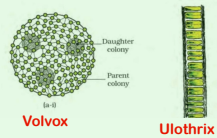
Female gamete is non motile but male is motile
Eg- volvox,fucus

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 rep.=> fragmentation,spores. Asexual =>by zoospores. Sexual=>isogamy,anisogamy,oogamy. Found in fresh,brackish,salty water. Have 2-8 equal & apical flagella

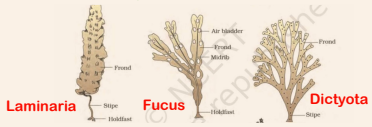
Eg- chlamydomonas,volvox,ulothrix,spirogyra,chara



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 (heterokont) 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.

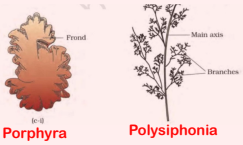
Eg- Ectocarpus,dictyota,laminaria,sargassum,fucus,kelps



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—> frag. 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 repro. Play important role in plant succession on bare rocks/soil. They also have thalloid like body but more differentiated than algae. Main members of bryophytes are mosses

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 produces gametes)

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 matts & prevents soil erosion.

Sex organs

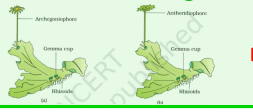
Sex organs are multicellular and jacketed. Male sex organ—> anthridium(antherozoid) Female sex organ—> archaegonium(eggcell)

Fertilisation & development

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

LIVERWORTS

Plant body is thalloid & thallus is dorsiventral & closely appressed to substrate. Leafy members have tiny leaf in rows looking like stem. Perform ASEXUAL by fragmentation or gemmae formation & SEXUAL as sex organs are present on same or diff. 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,riccia



MOSSES

Predominant stage is gametophyte. Consists of 2 stages—>protonema & leafy. Protonema develops from spore, creeping green,branched & frequently filamentous stage. Leafy develops from sec. protonema as a lateral bud,consist of spirally arranged leaves(this stage contains sex organs). Perform ASEXUAL by fragmentation & budding in sec. protonema or SEXUAL by antheridia,archaegonia. After fertilisation zygote develops into sporophyte. They have elaborate mechanism of spore dispersal.

Eg- funaria,sphagnum,polytrichum



PTERIDOPHYTES/ferns

Introduction

Includes horsetails & ferns. First to possess vascular tissue. Found in cool,damp,shady places though some may flourish in sandy soil condition.

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:- microsporophylls(selaginella) or macrosporophylls(ferns) sporophyte bears sporangia that are subtended by leaf like appendages called sporophylls & sometime it may form compact structure called STROBILI or CONES or LAX

Eg- selaginella,equisetum



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)

Life cycle

Meiosis in sporangia

↓

Spores (n)

↓

Germination

↓

Prothallus (Multicellular)

↓

Gametophyte (n)

↓

Male and female gamete (n)

↓

Fusion

↓

Zygote (2n)

↓

Sporophyte (2n)

Economic importance

Used for medicinal purposes and they also act as soil binders. They are also frequently grown as ornamentals.

Spilopsida
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. Possess tap roots (pinus have mycorrhiza & cycas have coralloid roots i.e. associated with N2 fixing cyanobact.). Stems may be branched (pinus,cedrus) or unbranched (cycas) they have simple,compound leaf. Cycas have pinnate leaf that remain for few years & withstand temp. 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



Figure 3.4 Gymnosperms: (a) Cycas

ANGIOSPERMS

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.



Figure 3.5 Angiosperms : (a) A dicotyledon (b) A monocotyledon

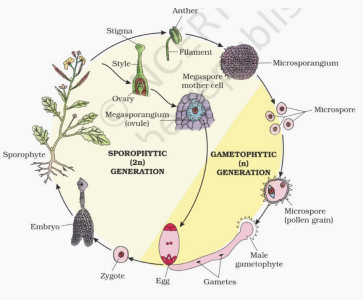


Figure 3.6 Life cycle of an angiosperm

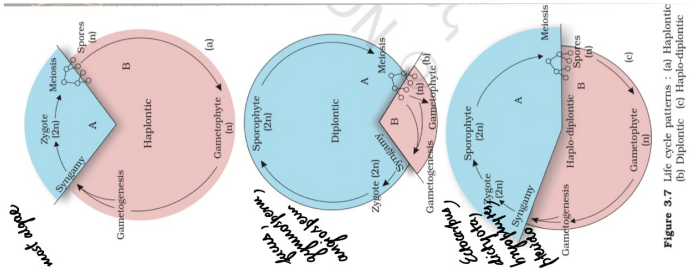


Figure 3.7 Life cycle patterns : (a) Haplontic (b) Diplontic (c) Haplo-diplontic