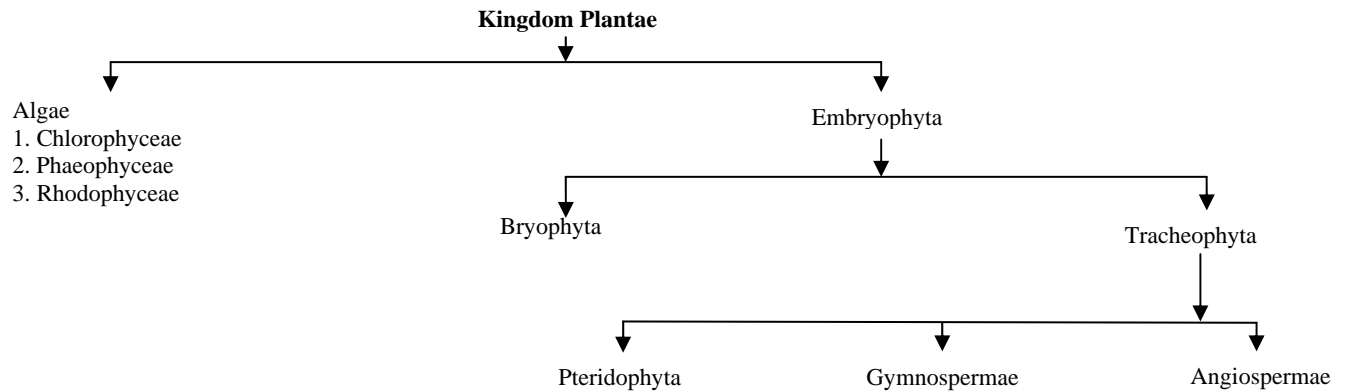


CHAPTER 3 PLANT KINGDOM

The Kingdom Plantae includes plants which are multicellular, eukaryotic, photosynthetic and producers. The cell walls possess mainly cellulose. The plant body may be thalloid or differentiated into root, stem and leaves. They may be non vascular or vascular. They have two stages in their life cycle- a **haploid, sexually reproducing gametophytic generation** and a **diploid, asexually reproducing sporophytic generation**. The two generations alternate. This is called **alternation of generations**.



3.1. ALGAE

Algae are mostly aquatic, autotrophic organisms. Their body is unicellular (*Chlamydomonas*), Colonial (*Volvox*) or filamentous (*Spirogyra*) or thalloid (*Sargassum*). They reproduce by vegetative (fragmentation), asexual (spore formation) and sexual methods. Sexual reproduction involves fusion of similar gametes (**isogamy**) eg:-*Spirogyra* or fusion between gametes of dissimilar in size (**anisogamy**) eg:- some species of *Chlamydomonas* or one large non-motile female gamete and a small motile male gamete (**oogamy**). eg:-*Fucus*, *Volvox*.

The algae are divided into three classes based on their main pigments—**Chlorophyceae**(Green algae) contain chlorophyll. e.g.*Chlamydomonas*, *Volvox*,*Ulothrix*,*Spirogyra*; **Phaeophyceae** (Brown algae) contain fucoxanthin e.g. *Ectocarpus*, *Dictyota*, *Fucus*,*Sargassum*, *Laminaria*; **Rhodophyceae** (Red algae) contain phycoerythrin e.g. *Polysiphonia*, *Porphyra*, *Gracilaria*, *Gelidium*

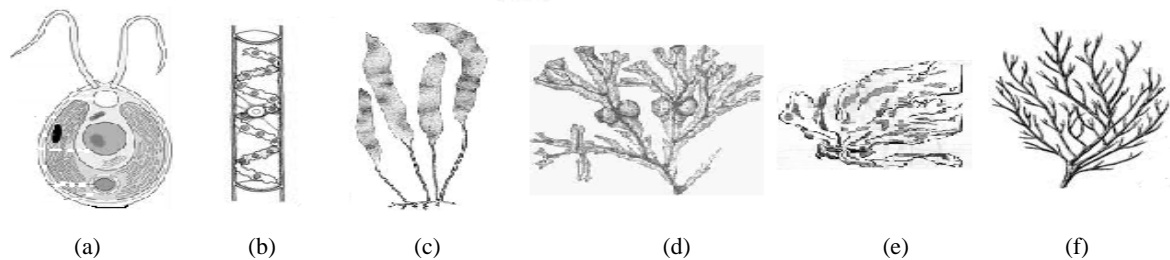


Fig. 3.1. Algae: a) *Chlamydomonas*, b) *Spirogyra*, c) *Laminaria* ,d) *Fucus*, e) *Porphyra*, f) *Polysiphonia*.

3.2. BRYOPHYTES

The bryophytes include liverwort, hornwort and mosses. They are called **amphibians of the Plant Kingdom** because they live in soil but require water for sexual reproduction. They grow in moist shady places. The dominant phase in the life cycle is haploid **gametophyte**. It may be a flattened thallus or differentiated into stem-like, root-like and leaf-like structures. The root-like structures are called

rhizoids. The gametophyte bears sex organs called **antheridia** (male) and **archegonia** (female) which produce gametes called **antherozoids** and **eggs** respectively. The antherozoid fuses with the egg to produce **zygote**. The zygote produces a multicellular **sporophyte**. The sporophyte is dependent on the gametophyte. The sporophyte reproduces asexually by producing spores. Meiosis takes place during spore formation, hence they are haploid. The spores germinate to produce the gametophyte.

The bryophytes are divided into three classes – **Hepaticopsida** (Liverworts) e.g. *Riccia*, *Marchantia*; **Anthocerotopsida** (Hornworts) e.g. *Anthoceros*, *Notothylas*; **Bryopsida** (Mosses) – e.g. *Funaria*, *Sphagnum*, *Polytrichum*.

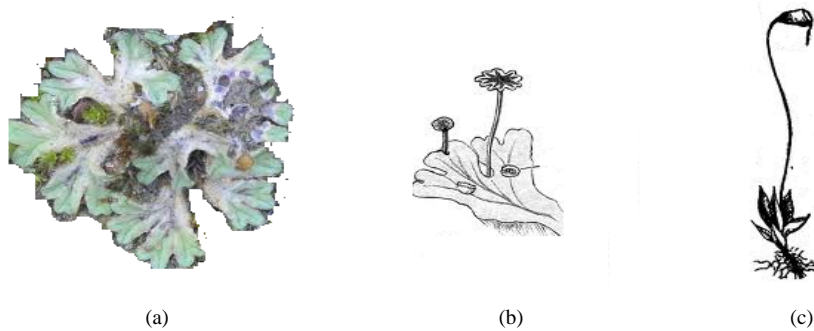


Fig. 3.2. Bryophytes: (a)*Riccia*, (b) *Marchantia*, (c)*Funaria*.

3.3. PTERODOPHYTES

They are the first land plants which possess vascular tissues i.e. **xylem** and **phloem**. The plant body is a **sporophyte** which is differentiated into root, stem and leaves. Majority of the pteridophytes produce only one kind of spores in sporangia and the plants are called **homosporous** (e.g.: *Nephrolepis*, *Lycopodium*). Some produce two kinds of spores- megaspores (large) and microspores (small). Such plants are called **heterosporous** (e.g.: *Selaginella*, *Salvinia*). The spore germinates to produce free-living, photosynthetic, haploid gametophyte called **prothallus**. The sex organs- **antheridia** and **archegonia** are produced on the prothallus. Fertilization results in the formation of zygote which develops into sporophyte.

The pteridophytes are divided into four classes- **Psilopsida** (Whisk ferns) e.g.: *Psilotum*, **Lycopsidea** (Club mosses) e.g.: *Lycopodium*, *Selaginella*, **Sphenopsida** (Horse tails) e.g.: *Equisetum* and **Pteropsida** (Ferns) e.g.: *Nephrolepis*, *Pteris*, *Adiantum*, *Dryopteris*.

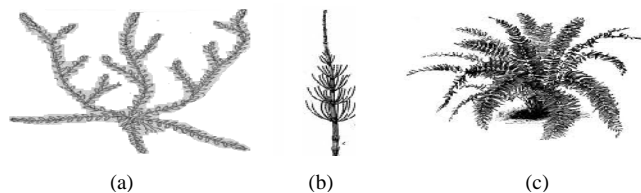


Fig.3.3. Pteridophytes: (a) *Selaginella*, (b) *Equisetum*, (c) *Nephrolepis*.

3.4. GYMNOSPERMS

They are called **naked seeded plants** since the seed is not covered by fruit wall. The plant body is a sporophyte. They gymnosperms are **heterosporous**. The gametophytes are dependent on sporophytes. The male gametophyte produces two male gametes and female gametophyte bears archegonia. The male gametophyte produces pollen tube to carry the male gametes towards archegonia. After fertilization the megasporangium develops into seed.

The gymnosperms are divided into three classes- **Cycadopsida** (e.g.:- *Cycas*), **Coniferopsida** (e.g.:- *Pinus*, *Cedrus*, *Sequoia*) and **Gnetopsida** (e.g.:- *Gnetum*, *Ephedra*, *Ginkgo*)

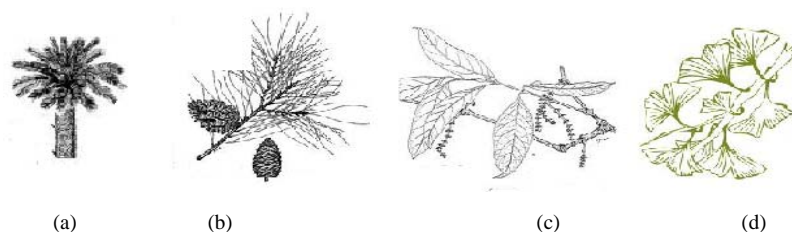


Fig. 3.4. Gymnosperms: (a) *Cycas*, (b) *Pinus*, (c) *Gnetum*, (d) *Ginkgo*

3.5. ANGIOSPERMS

These plants are called **flowering plants** which bear flowers and produce **fruit enclosing the seeds**. The plant body is a sporophyte which differentiated into underground root system and aerial shoot system. The flowers have male parts (stamens) and female parts (carpels). The anthers of the stamens produce pollen grains. The ovary of the carpel encloses ovules. A highly reduced haploid female gametophyte called **embryo sac** develops inside the ovule. The pollen grain germinates to produce the male gametophyte (pollen tube) containing two male gametes which are released into the embryo sac. The two male gametes fuse with two female gametes inside the embryo sac. This is called **double fertilization**. After fertilization the ovary develops into fruit and the ovules develop into seeds.

Angiosperms are divided into two classes-**Dicotyledonae** (eg:- Mustard, Bengal gram etc) and **Monocotyledonae** (eg:- Grasses, Coconut etc)

SUMMARY

Plant Kingdom includes Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms. Algae are mostly aquatic, simple, photosynthetic, thalloid forms. They are classified into Chlorophyceae, Phaeophyceae and Rhodophyceae. They reproduce vegetatively by fragmentation, asexually by spore formation and sexually by isogamy, anisogamy or oogamy.

Bryophytes are amphibians of plant kingdom. Dominant phase of their life cycle is a haploid gametophyte which is simple thallus or having root-like, stem-like, leaf-like structures. They are attached to the substratum by rhizoids. The gametophyte bears sex organs-antheridia (male) and archegonia (female) which produce antherozoids and eggs respectively. The male and female gametes fuse to produce a diploid zygote which develops into the sporophyte. The sporophyte produces haploid spores which germinate to form gametophytes.

Pteridophytes possess well differentiated sporophyte with root, stem and leaves. The sporophyte bears sporangia which produce spores. The spores germinate to form an independent gametophyte. The

gametophyte bears male and female sex organs. The male and female gametes fuse to produce a zygote which produces sporophyte.

Gymnosperms are naked seeded plants. The plant body is a sporophyte. The spores are of two types- megaspores and microspores. Megaspores produce female gametophyte and microspores produce male gametophyte. After fertilization the ovule develop into seed.

Angiosperms are flowering plants bearing flowers having male parts (stamens) and female parts (carpels). The anther of the stamen produces haploid pollen grains. In the ovary of the carpel, ovules are present. The female gametophyte (embryo sac) develops within the ovule. The pollen grain produces a pollen tube which releases two male gametes. It fuses with two female gametes. Thus there is double fertilization and triple fusion. It is the unique feature of angiosperms.

EXERCISE

1. Name the classes of algae based on the main pigment.
2. Mention the types of sexual reproduction in algae?
3. Name the sex organs of bryophytes.
4. Why the bryophytes are called amphibians of plant kingdom?
5. Which are the first terrestrial plants to possess vascular tissues?
6. Name the gametophyte of ferns.
7. Why gymnosperms are called naked-seeded plants?
8. Match the following:

a. <i>Sargassum</i>	1. Gymnosperm
b. <i>Pteris</i>	2. Bryophyte
c. <i>Cycas</i>	3. Brown alga
d. <i>Marchantia</i>	4. Pteridophyte
9. Name the female gametophyte of angiosperms.
10. Name the two classes of angiosperms.
11. In which group of plants double fertilization takes place?

Exercises – Answers

1. Classes Chlorophyceae, Phaeophyceae and Rhodophyceae.
2. Isogamy, anisogamy and oogamy.
3. Antheridia (male) and archegonia (female) are the sex organs of bryophytes.
4. Bryophytes require water to complete their sexual reproduction. So they are called amphibians of the plant kingdom
5. Pteridophytes
6. Prothallus
7. In gymnosperms, the seeds are not covered by fruit walls. So they are called naked-seeded plants
8. a – 1, b -4, c -1, d – 2
9. Embryo sac
10. Class Dicotyledonae and Class Monocotyledonae
Angiosperms (flowering plants)