



Plant-Like Organisms (Algae, Mosses, Ferns) and Photosynthesis; Fungi



B10CH5



Learning Objectives

Upon completion of this topic, Learners will:

- describe the general characteristics, structures and life cycles of algae, mosses ferns, and Fungi;
- explain the economic importance of algae and fungi to human;
- describe the process of reproduction in algae;
- explain types of nutrition of fungi;
- describe symbiotic relationship of Fungi in relation to parasitism and saprophytism;
- list common fungal diseases of plants and animals such as (athlete foot, ringworm dishcloth, blight);
- explain the process of photosynthesis.

Plants include all the multicellular photosynthetic organisms and are characterised by the following features.

- Plants are **multicellular eukaryotes** in which the cells are covered with **rigid cell wall** made up of cellulose.
- They are fixed in the soil, a large number of them, however grow in water and may be free floating.
- They are **autotrophic** (prepare their own food) from water and carbon dioxide with the help of green pigment chlorophyll. This process is called photosynthesis.

Classification of Plants

In plants the first level of classification depends on whether the plant body has well differentiated plant body (i.e. bears distinct components like roots, stem, leaves etc., or similar parts). The next level of classification is based on whether of differentiated plant body has vascular tissues

(special tissues for the transport of water and other substances) within it. Further level is based on the ability to bear seeds and whether they are enclosed in the fruits. An outline summary of classification of plants is given below.

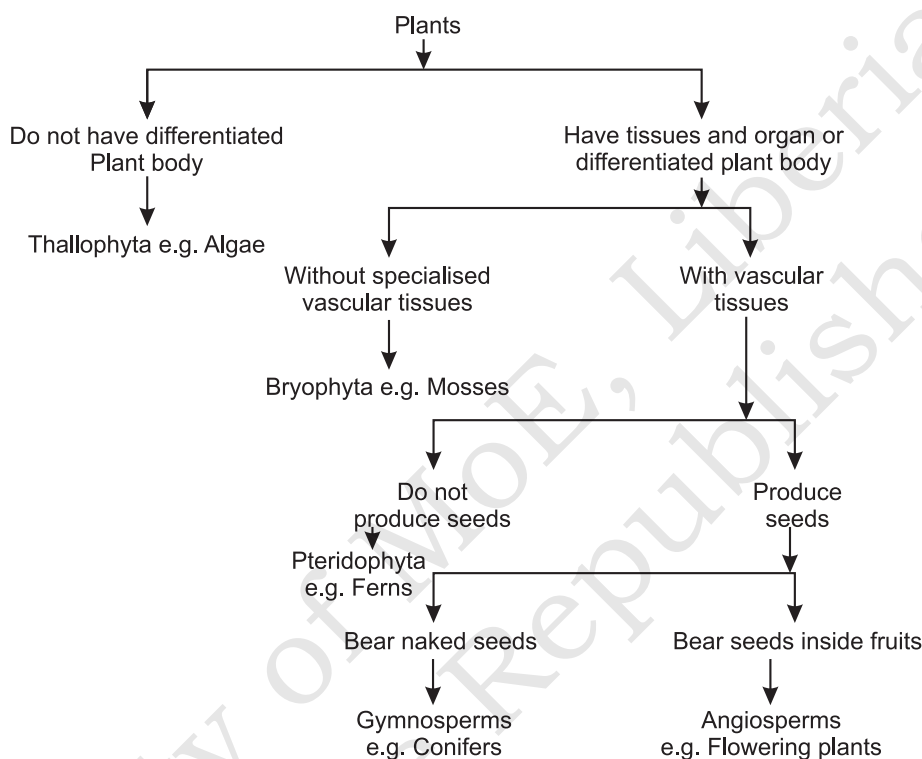


Fig. 5.1. Summary of plant classification

Thallophyta (G.K. *thallus* = undifferentiated, *phyton* = plants)

- This group include plants which are not differentiated into various parts like root, stem and leaves. In other words they lack tissues and organs. Such an undifferentiated body is called **thallus**.
- The lack vascular tissues. The main plants of this group are commonly called algae.

5.1. ALGAE

- Algae are aquatic found in both fresh water as well as sea water, and moist and damp soil.
- Their size may vary from colonial to filamentous forms. A few marine forms such as kelps have massive plant body which may be more than 100 metres long.

- Some of them found floating forming green scum on the surface of stagnant water of ponds, ditches and lakes.
- Algae reproduce **vegetatively** by fragmentation *i.e.* breaking of thallus into small pieces, and each grow into fully grown individual.
- **Asexual reproduction** takes place during favourable conditions by flagellated (motile) spores called **zoospores** or non-motile aplanospore.
- **Sexual reproduction** involves the fusion of male and female gametes to form a zygote. The zygote under favourable condition produce new individual directly or after forming zoospores or aplanospores.
- **Examples:** *Volvox* (colonial), *Ulothrix*, *Spirogyra*, *Cladophora* (filamentous), *Ulva*, *Chara*, (more elaborated plant body).

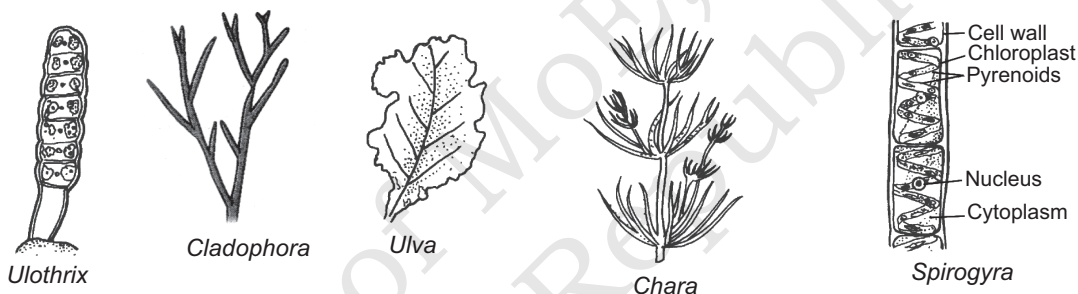


Fig. 5.2. Elaborated plant

5.1.1. Classification of Algae

Based on the type of pigments, the nature of reserve food algae are divided into three classes, namely Green Algae (**Chlorophyceae**), Brown Algae (**Phaeophyceae**) and Red Algae (**Rhodophyceae**). However, photosynthetic protists such as phytoplanktons (diatoms and desmids) are also sometimes included in algae.

Phytoplankton

Phytoplanktons are tiny autotrophic (self feeding) microscopic organisms found on the surface of both fresh water and marine water. They are also known as **microalgae**. They drift passively in water current. Phytoplanktons are the **chief producers** in the oceans. Two main types of phytoplanktons are **diatoms** and **desmids**. Their cell wall is made up of two interlocking halves, one fitted over the other like a soap box, which is made up of cellulose and silica, the cell walls are indestructable,

hence diatoms have left behind a large amount of cell wall deposits in their habitat called **diatomaceous earth** (diatomites). Being porous and inert, the diatomaceous earth is used in polishing and filtration of oils and syrups.

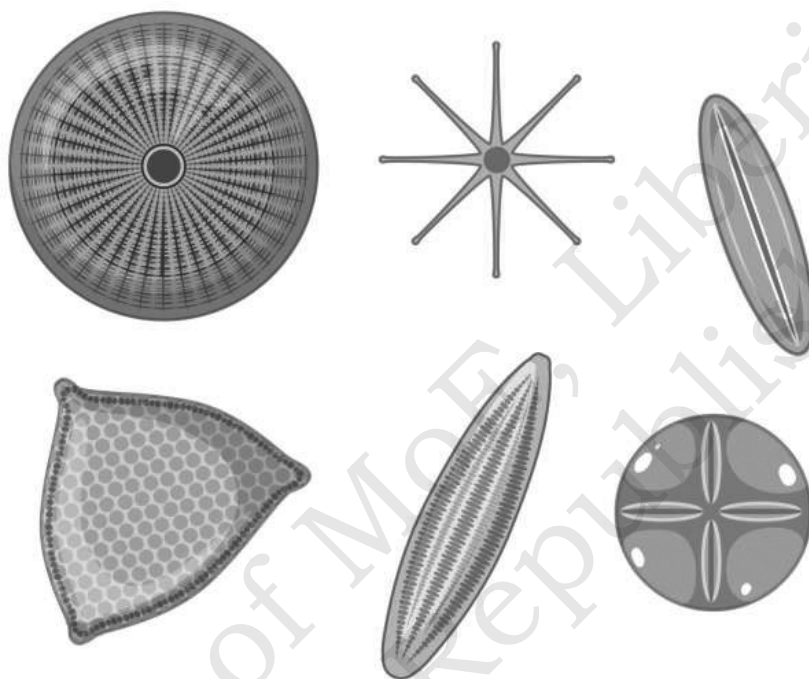


Fig. 5.3. Diatomaceous earth

Green Algae (Class – Chlorophyceae)

- They are found both in fresh water and marine water.
- Green algae usually appear grass green due to the predominance of pigments chlorophyll *a*, and chlorophyll *b*, they also possess carotenes and xanthophylls.
- These pigments are present in chloroplasts which may be of different shapes.
- The chloroplast of most of the green algae have one or more food storage body called pyrenoid. The food is stored in the form starch grains.
- Their cell wall is made up of two layers – the inner layer of **cellulose** and the outer layer of **pectose**.
- Most of the green algae reproduce vegetatively by fragmentation.

- Asexual reproduction occurs during favourable season by zoospores, which are pear shaped and bear paired optical flagella.
- Sexual reproduction (usually takes place at the end of growing season) involves fusion of gametes.

Examples: *Volvox*, *Ulothrix*, *Spirogyra*, *Chara*.

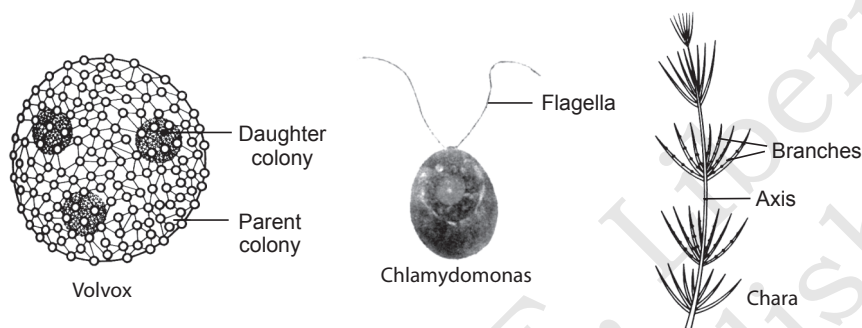


Fig. 5.4. Some green algae

Life Cycle of *Spirogyra*

- ***Spirogyra*** is a common fresh water unbranched filamentous, free floating green alga. It is popularly known as **pond scum** or **water silk**, as it form a **scum** on the surface of water and give a silky feeling on touching. It consists of several cylindrical cells joined end to end. Each cell contains one or more ribbon shaped spirally coiled chloroplasts. The chloroplasts bear a number of food storing bodies-pyrenoids.

Reproduction

- ***Spirogyra*** multiplies vegetatively through fragmentation.
- Asexual reproduction occurs rarely through non-motile **aplanospores**.
- Sexual reproduction takes place by **conjugation**, which involves fusion of two non-motile-gametes produced in the cells of the alga. Conjugation is of two types—**scalariform** and **lateral**.
- In **scalariform conjugation**. The cells of two oppositely lying filaments develop, tubular conjugation tube. The gamete of one cell move to the opposite cell and form **zygote**.
- In **lateral conjugation**. The gametes formed in the adjacent cells of the same filament fuse to form a **zygote**. The zygote may develop a thick wall and forms a resting **zygospore**. Under favourable condition zygospore germinate into a new filaments.

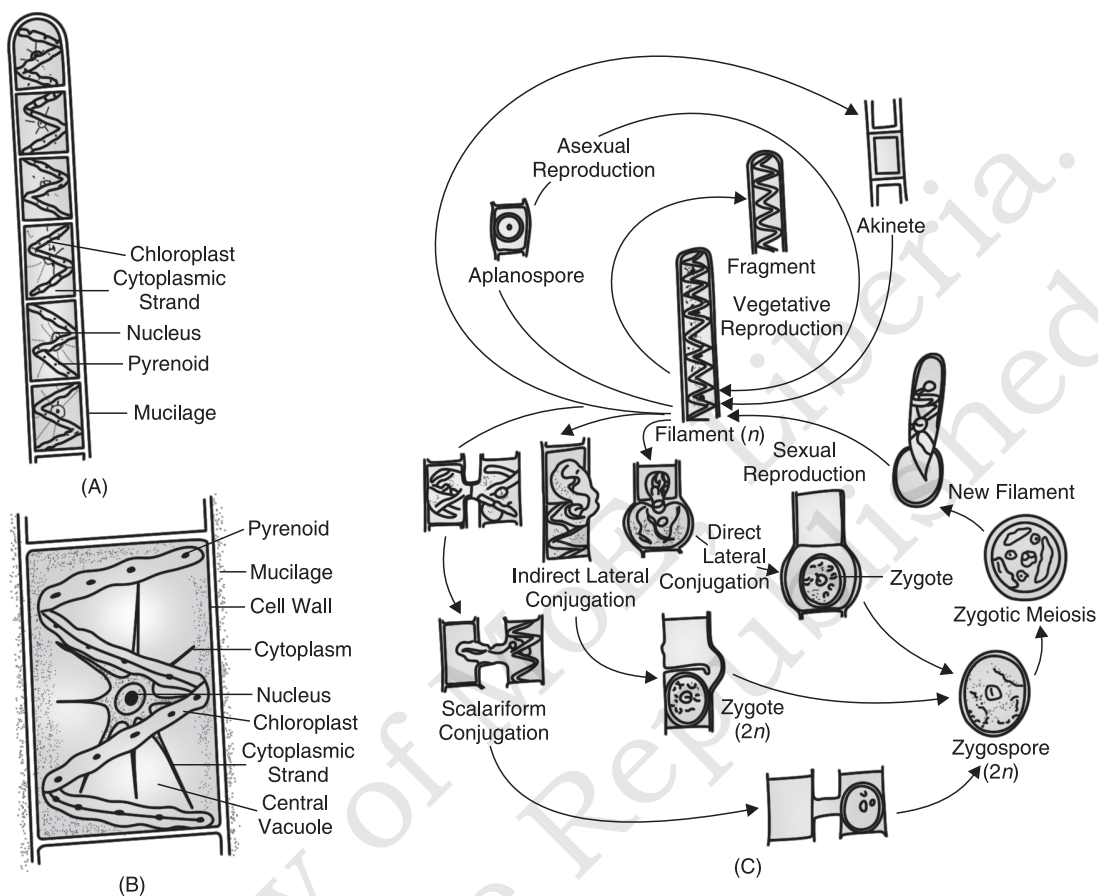


Fig. 5.5. *Spirogyra*. A. Part of filament, B. Cell, C. Haplontic life cycle

Brown Algae (Class-Phaeophyceae)

- Brown algae are found primarily in marine habitat.
- Their size may range from simple branched filamentous forms to profusely branched form which may reach a height of 100 metres or more.
- They possess a brown pigment **fucoxanthin** along with chlorophyll *a* and chlorophyll *c*, hence they have brownish colour.
- They have a cellulosic wall usually covered with a gelatinous substance called **algin**.
- Their plant body usually attached to substratum by a **holdfast**, and has a stalk like **stipe** and leaf like **fronds**.

- They produce pyriform (pear shaped) zoospores and gametes which bear two unequal laterally attached flagella.
Examples: *Ectocarpus*, *Laminaria*, *Dictyota*, *Sargassum*.

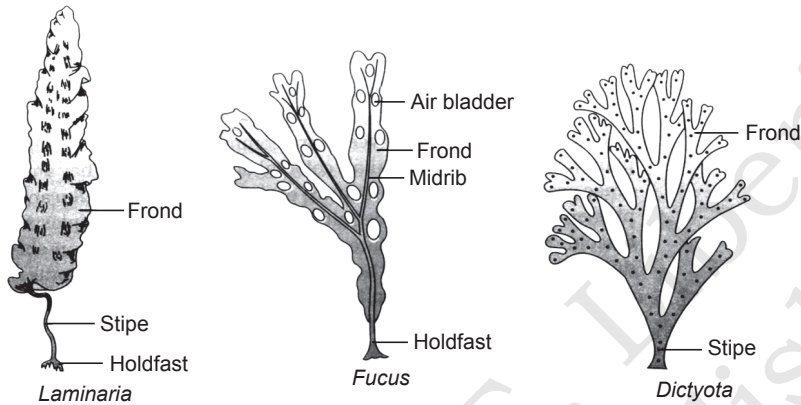


Fig. 5.6. Some Brown Algae

Red Algae (Class–Rhodophyceae)

- Red algae are mostly marine, and appear redish green due to the presence of red coloured pigment **phycoerythrin**, alongwith chlorophyll *a* and chlorophyll *d*.
- They are filamentous and some of them have complex body organisation.
- They reproduce by fragmentation, and non-motile spores and gametes.

Examples: *Polysiphonia*, *Porphyra*, *Gracilaria*, *Gelidium*.

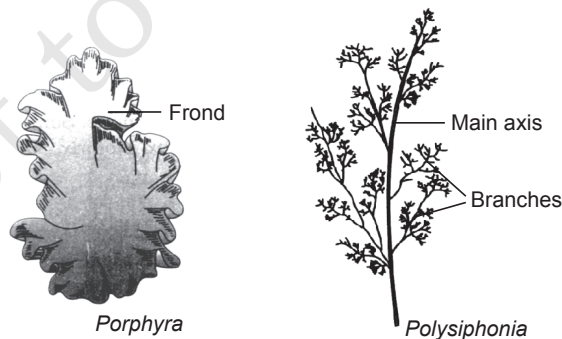


Fig. 5.7. Some red algae

5.1.2. Economic Importance of Algae

Algae are useful to human beings in number of ways.

As food: Many species of *Porphyra*, *Laminaria* and *Sargassum* are among to species of marine algae used as food. **Chlorella** and **Spirulina** are rich in proteins and are used as food supplements even by space travellers.

In Industries: A number of substances of industrial importance such as **algin** and **agar-agar** are obtained from brown algae and red algae respectively. They are used in food industries such as in making ice creams, jellies and candies. Algin is also used in sizing textiles, security glasses, cosmetics ointments, artificial silk and surgical threads. *Carageenin* is obtained from red algae is also used in making ice cream, chocolates and toothpastes.

Medicines: Some algae are used as antioxidants, source of vitamins and anticancer and antitumour agents. An antibiotic *chlorellin* is extracted out from **Chlorella**, **Laminaria** have antibiotic property.

Bryophyta

- They need presence of water for fertilisation, hence are called **amphibians** of plant kingdoms.
- They have flat plant body or the plant body is differentiated into stem and leaf like outgrowth appendages.

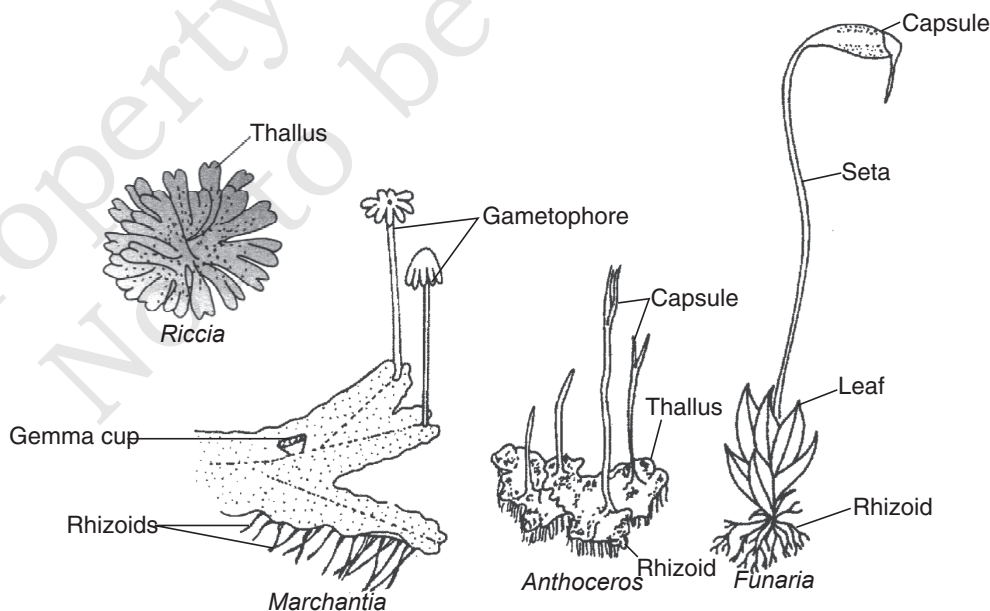


Fig. 5.8. Some common Bryophytes

5.2. MOSSES

- Mosses are small non-vascular flowerless plants belong to plant division Bryophyta.
- They grow as dense green clumps or mat in damp and shady locations.
- They lack specialised tissue for the conduction of water and other substances from one part to another.

Examples: *Brachymerium*, *Funaria*.

5.2.1. Brachymerium

- *Brachymerium* is a newly identified moss species in tropical rain forests.
- It is a small plants having a stem like axis covered with rows of thin, narrow, long leaves.
- The axis is branched, and branches bear reproductive organs—**Antheridia** (the male reproductive organ) and **Archegonia** (the female reproductive organs), which produce male and female gametes respectively.
- Since the leafy plant produce gametes for sexual reproduction it is called **gametophyte**.
- Fertilization occurs only in presence of water in the archegonia and zygote is formed.
- The zygote develops into an elongated spore producing structure called **sporophyte**, the **sporophyte** remain attached to the gametophyte and is dependent on it.
- The terminal end of the sporophyte bears a sac like structure called **capsule** that produce **spores**.
- The spores are released from the capsule at maturity and germinate into new plants.

Alternation of Generation

In the life cycle of mosses, there is alternation of a gametophyte (gamete producing) plant body and a sporophyte (spore producing) body. It is called **alternation of generations**.

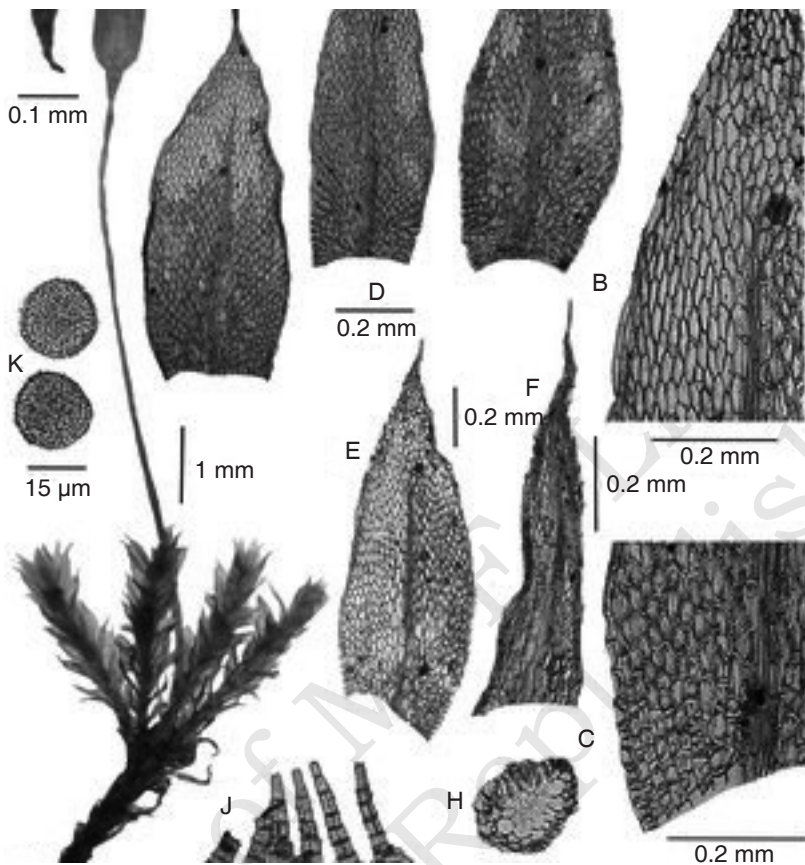


Fig. 5.9. Brachymerium

ACTIVITY 5.1

Draw a labelled sketch of life cycles of a moss and a fern on your notebook from the chart or diagrams given below.

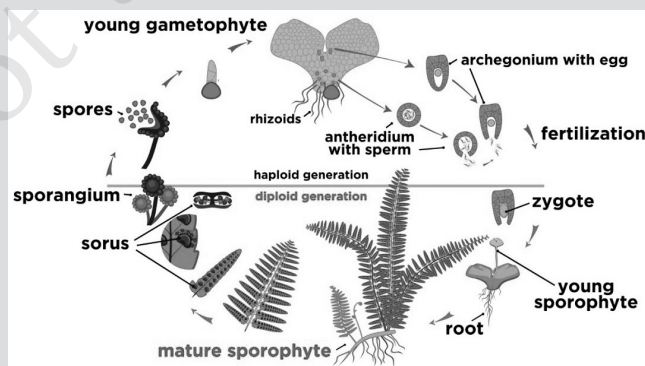


Fig. 5.10. Life cycle of funaria (Moss)

5.2.2. Funaria

- *Funaria* is a typical moss plant that grows in moist and shady places forming dense carpet on soil, rocks and tree trunks.
- It is a small plant found attached to the substratum by means of branched **rhizoids**.
- It bears small, thin leaves on the axis. The axis bears **antheridia** and **archegonia**, which produce male and female gametes respectively. It is called **gametophyte** (gamete producing) plant body.
- Like other mosses, *funaria* also requires the presence of water for fertilization. The male gametes reach the archegonia through water and fuse with the female gamete (egg) to produce a zygote.
- Zygote develops into a spore producing structure called **sporophyte**. The spores are formed in the terminal part of the sporophyte called **capsule**.
- The spores germinate to produce gametophyte. Thus, there is alternation of **gametophyte** and **sporophyte** in the life cycle of *funaria*.

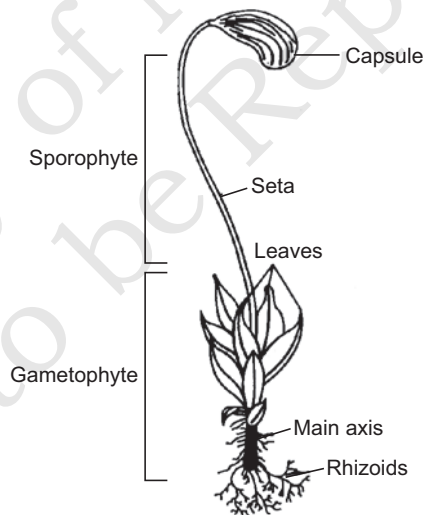


Fig. 5.11. Funaria

5.2.3. Economic Importance of Mosses

- Some mosses provide food for herbaceous animals like birds and rodents.
- *Sphagnum* a moss provides **peat** which is used as **fuel** and also as

packing material for trans-shipment of live materials due to its high water holding capacity.

- Mosses form dense mats on soil, hence prevent soil erosion.
- Mosses along with lichens are the first to colonise rocks and make the substratum suitable for the growth of higher plants.

5.3. FERNS

- Ferns are medium sized plants, which grows in cool moist shady places belong to plant division **Pteridophyta**.
- Their plant body is well differentiated into root, stem and leaves.
- They possess vascular tissues for the transport of water and other substances like food material.
- They do not produce seeds, hence are called **seedless vascular plants**.
- They produce spores for reproduction in sac like sporangia, which are borne on specialised leaves called sporophylls.
- The spore germinate into a small, heart shaped, plant body called **gametophyte** or **Prothallus**. It is an independent plant body.
- The gametophyte bears sex organs **antheridia** (male) and **archegonia** (female). Fertilization results in the formation of a zygote, which develops into a well differentiated plant body called **sporophyte**. Thus, there is alternation of a **sporophyte** (spore producing) plant body with gametophyte or prothallus (gamete producing) plant body. Thus, two generations alternate with one another in the life cycle of ferns, it is called **alternation of generation**.

Example: *Nephrolepis*, *Platyserium*.

5.3.1. Nephrolepis

- *Nephrolepis* is a common fern in tropical and sub-tropical countries. Which grow in moist and shady places. It is also grown in houses and parks as an ornamental plant.
- Its plant body is a **sporophyte** and is well differentiated into roots, stem and leaves. Its stem is underground and is called rhizome.
- Some leaves of it bear sac like **sporangia** on their ventral surface called sporophylls.

- Spores are produced in sporangia, which germinate into a tiny, thalloid, independent, autotrophic **gametophyte** or **Prothallus**.
- The prothallus bears sex organ—**antheridia** and **archegonia** and reproduces sexually to produce a sporophytic plant body.

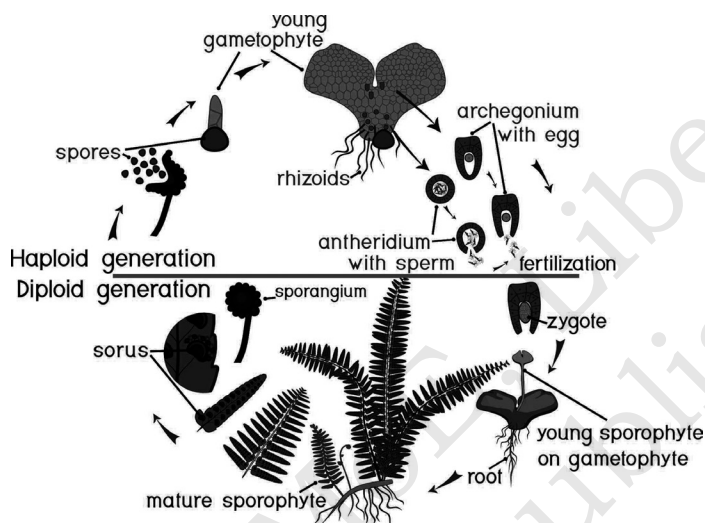


Fig. 5.12. Life cycle of nephrolepis

5.3.2. Platycerium (Staghorn Fern)

- *Platycerium* is a large epiphytic fern may be up to 3 meters long and 1.5 metres across when fully grown.
- It has a short, fleshy branched stem called **rhizome**, which remain hidden in the basin formed by large leaves commonly called **fronds**. Rhizome produces two types of fronds (leaves).
 - (i) **Infertile nest fronds** which form crown like basket to trap leaf detritus from host tree, and own old leaves, roots of the fern obtain nutrients from this decaying detritus.
 - (ii) **Fertile fronds** are narrow linear and long (up to 2 m) pendulous bifurcating repeatedly to form hanging net like structure below nest fronds. These bear brown coloured **sporangia** which produce **spores**.
- Because of its perennial nature and beautiful leaves, the staghorn fern is usually cultivated/mounted on tree-branches/trunks in houses and gardens.

- The spores by the adult sporophyte germinate into a heart shaped gametophyte, which is thin, single celled thick and is without root, stem and leaves. It bears both male and female sex organs (antheridia and archegonia). The male gametes swim in water to reach archegonia. Fertilisation results in the formation of zygote, which grows into a new sporophyte.



Fig. 5.13. Platycerium

5.3.3. Economic Importance of Ferns

- Ferns are grown as ornamental because of their graceful foliage.
- The rhizomes and petioles of some ferns (like *Dryopteris*) yield a vermifuge drug.
- Sporocarps of *Marsilea* (a water fern) are used as food by certain tribes.

5.4. FUNGI

- Fungi is a kingdom that includes eukaryotic heterotrophic organisms which are non green (a chlorophyllous) having an absorptive mode of nutrition.
- Mostly they are multicellular, with the exception of yeast which is unicellular.
- The body of a fungus consists of thread like structures called **hyphae** which form a network called **mycelium**.
- The hyphae have cell wall made up of **chitin** and **polysaccharides**.

- Many of them obtain their nutrients (food) from decaying organic materials. They are called **saprophytes**, others obtain readymade food from other living organisms called **parasites**; some live in association with algae as in **lichens**.
 - They reproduce vegetatively by fragmentation (breaking of hyphae) or budding (as in yeast).
 - Asexual reproduction takes place by the formation of flagellated or motile spores called **zoospores** or non-motile **spores**.
 - Sexual reproduction involves fusion of male and female gametangia or **hyphae** to form zygote. The zygote germinates to produce spores.
- Examples:** *Mucor* (Pin mould), *Rhizopus* (Bread mould/black mould), Yeast, *Penicillium* (Green mould), Mushroom (Club fungi), Bracket fungi.

ACTIVITY 5.2

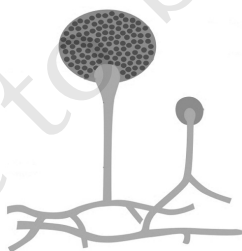
To observe and identify the fungi on moulded bread under the microscope. Draw and label the parts of the hyphae of *Rhizopus*.

Obtain a moulded piece of bread or make a piece of bread moulded by sprinkling water on it and placing it at a warm and dark place for 4–5 days. Different types of moulds (such as *Rhizopus*, *Mucor*, *Aspergillus*, *Penicillium* etc) will appear on it.

Observe these moulds under the microscope and draw their labelled diagrams on your notebook.



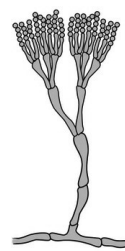
Rhizopus



Mucor



Aspergillus

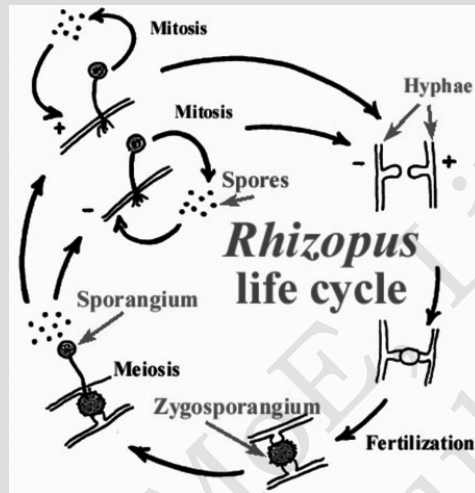


Penicillium

ACTIVITY 5.3

Illustrate the life cycle of *Rhizopus*

Draw the life cycle of *Rhizopus* on your notebook from the chart.



ACTIVITY 5.4

Collect and study a bracket fungus and identify annual rings on it.

- Bracket fungi commonly grow on decaying wood logs or tree stump during rainy season. Collect the same from forested area of your locality and see circular rings on it.



Bracket of Fungus

5.4.1. Disease Caused by Fungi

Many fungi grow as parasites and cause diseases in plants and animals including humans. Some of the common diseases caused by fungi are as follows.

Plant diseases caused by fungi

- (i) **Late blight of potato** is caused by *phytophthora*
- (ii) Smut of wheat and other cereal crops is caused by *ustilago*
- (iii) **Rust of wheat** is caused by *Puccenia*.



Fig. 5.14. Infected leaf with these disease

Human diseases caused by the fungi.

- (i) **Athlete's foot** also called **Tinea pedis** disease is caused by some fungi called *dermatophytes*. Damp rocks and shoes and warm humid conditions favour the growth of pathogen. The disease is characterised by scaly rash between the toes and other parts causing itching and burning.
- (ii) **Candidiasis** is another fungal disease caused by a yeast known as *candida*. The yeast normally live on skin, mouth, gut and vagina without causing problems. It grows out of control, it may reach internal organs like, kidney, heart, brain causing great damage.
- (iii) **Ringworm** is a most infectious disease of skin related to Athletes's foot caused by fungi like *Microsporus*, *Trichophyton* and *Epidermophyton*. Heat and moisture help these fungi to grow in skin folds and between toes. The symptoms of the disease include dry scaly lesions on various parts of the body such as nails, scalp with intense itching. It spreads by direct contact with an infected person or sharing his/her comb, clothes etc or from soil.
- (iv) **Eczema** also called **Atopic dermatitis** characterised by dry, itchy and red inflamed skin patches. It is caused by a

combination of factors like sweat, temperature change, soap, detergents.

- (v) **Dish cloth blight.** The sponges used in kitchens often get contaminated with several microbes including pathogenic bacteria and other. These act as potential vehicles of spreading a number of disease in man. Therefore it is advisable to keep these always clean to avoid infections that may occurs by them.

ACTIVITY 5.5

Suggest the ways to prevent fungal infection.

Write down the ways that can prevent fungal infections, such as

- Maintain good hygiene
- Don't share clothing, towels or personal items with others.
- Wear clean clothes every day particularly socks and underwear.
- Choose clothing and shoes that breathe well (i.e., have aeration)
- Dry off properly with a clean dry towel after showering bathing or swimming.

Always keep the food items covered

- Avoid moving bare foot on soil/mud.

5.4.2. Economic Importance of Fungi

Many fungi are useful to the mankind. Some useful fungi have been discussed below.

- 1. As food:** *Agaricus* (mushroom), and *morchella* (morel) are the common edible fungi often cooked with rice and vegetables.
- 2. Medicines:** Antibiotic drug *penicillin* and *griseofulvin* are obtained from *Penicillium*. Another drug *ergotene* is obtained from *clevises puspurea*. The drug is used for uterine contraction in case of delayed child birth.
- 3. In Industries:** Yeast *Saccharomyces cerevisiae* is used in baking (bread, pastry making) industries and in brewing (alcoholic beverages making) industries. Some fungi are also used in preparation of cheese, and organic acids.

5.5. PHOTOSYNTHESIS

All living organisms require inorganic and organic nutrients in the form of food for their vital activities and survival. Green plants make their own food by using inorganic substances through a process called **photosynthesis**. Photosynthesis can be defined as:

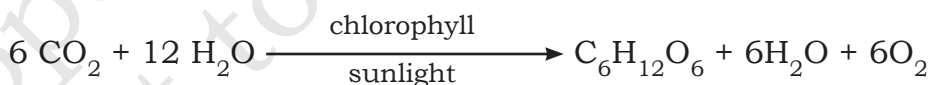
The process by which green plants their own food using carbon dioxide and water with the help of green pigment chlorophyll and sunlight is called photosynthesis.

5.5.1. Conditions of Photosynthesis

To perform photosynthesis, plants need three things, **carbon dioxide**, **water** and **sunlight** in addition of green pigment **chlorophyll**. Land plants obtain carbon dioxide (CO_2) from the atmosphere through minute pores present on the lower surface of leaves. They absorb water from the soil by their roots. The absorbed water along with some inorganic nutrients is transported to the leaves through xylem. Plants receive sunlight from solar radiations during the day time. The leaves of plants contain green photosynthetic pigment **chlorophyll** and some others in **chloroplasts** present in their cells chloroplasts are the actual site of photosynthesis in leaves.

Each chloroplast has many membrane bound flattened sac like structure called thylakoids which remain stacked at places forming grana. The remaining part of the chloroplast is called **stroma**.

By taking in water through the roots carbon dioxide from the air and light energy from the sun, plant perform photosynthesis to make glucose and oxygen. The process can be represented as.



5.5.2. Leaf Adaptations to Photosynthesis

The leaves of plants are so designed, that their structure fully suited for photosynthesis. The stomata on the under surface of the leaves which help diffusion of carbon dioxide into the leaves but regulate their water loss. The leaves have a thin structure so that they provide short distance for carbon dioxide to diffuse into leaf cells. The veins of leaves help to transport water to all parts of the leaves. Leaves also provide large surface area for maximum absorption of sunlight.

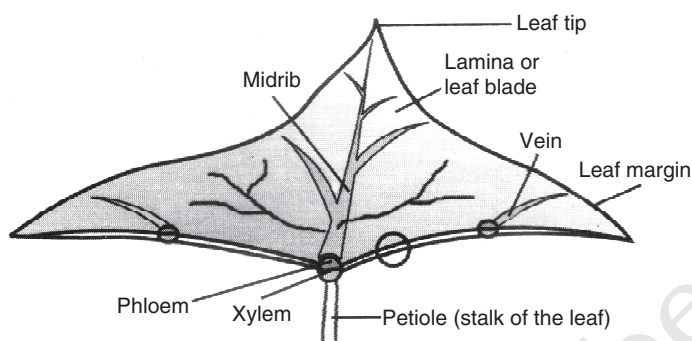


Fig. 5.15. Structure of leaf

5.5.3. Mechanism of Photosynthesis

Photosynthesis occurs in two phases:

- (i) The first phase is dependent on light (*i.e.* occurs only in presence of light and is called **light reaction** or **photo chemical phase** and
- (ii) The second phase is independent of light (*i.e.*, can occur in presence as well as in absence of light) and is called **dark reaction** or **biosynthetic phase**.

(i) Light reaction: It occurs in grana part of the chloroplasts when light falls on leaves, the chlorophyll present in chloroplasts absorbs light, and split water molecules into its components—protons (H^+), electrons (e^-) and molecular oxygen (O_2). This process is **photolysis of water**.



The molecular oxygen (O_2) is released into the atmosphere. The protons (H^+) and electrons (e^-) are used in the synthesis of **assimilatory power** in the form of NADPH (nicotinamide adenine dinucleotide phosphate reduced) and ATP (adenosine triphosphate).



(Adenosine di-phosphate)

(Adenosine tri-phosphate)

(ii) Dark reaction: It occurs in stroma part of chloroplast. It is light independent-reaction, but depends on the products of light reaction. *i.e.* NADPH and ATP. The NADPH and ATP

produced during light reaction are utilised for the reduction of carbon dioxide to form carbohydrates (glucose and other carbohydrates). The reactions of dark reaction occur in a cyclic manner, and were discovered by **Melvin Calvin**. Hence this phase is also called **Calvin Cycle**.

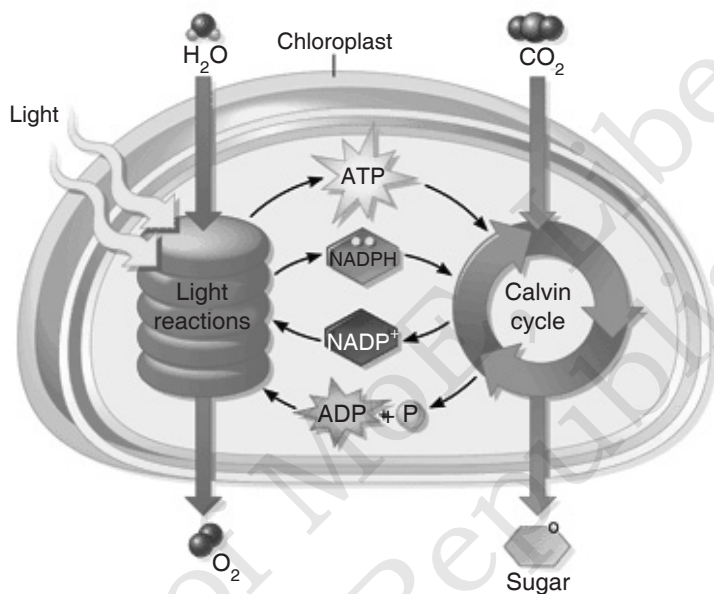


Fig. 5.16. Light reaction and dark reaction

5.5.4. Fate of Photosynthetic Products

A part of sugar (glucose) made in the chloroplast is transported in the form of sucrose to various parts where they are used up in the synthesis of various types of organic molecules of plant cells (like protein, lipids and others). Some part of it is consumed as fuel for cellular respiration in mitochondria to produce energy. The remaining part of the carbohydrates is stored as starch in protoplasts of the cells of storage organs like roots, tubers, seeds and fruits.

5.5.5. Effects of Macronutrients and Micronutrients on Photosynthesis

Plants absorb a number of inorganic **macronutrients** (inorganic nutrients required in larger quantities) and micronutrient (inorganic nutrients required in traces/minute quantities). Many such nutrients play important roles in the process of photosynthesis.

Magnesium (Mg) is a component of chlorophyll, **Iron** (Fe) is essential for the synthesis of chlorophyll. The deficiency of these nutrients in the plants may result yellowing of leaves and thus decrease in the photosynthetic yield.

Mangnese (Mn) and **chlorine** (Cl) are required for photolysis of water and evolution of oxygen during the light reaction of photosynthesis. Their deficiency also slows down the rate of photosynthesis. Some nutrients act as catalysts in the reactions of photosynthetic pathways and thus effect photosynthesis.

SUMMARY

- Plants are **multicellular eukaryotes** in which the cells are covered with rigid cell wall made up of cellulose.
- They are fixed in the soil, a large number of them, however grow in water and may be free floating.
- The lack vascular tissues. The main plants of this group are commonly called algae.
- Algae are aquatic found in both fresh water as well as sea water, and most and damp soil.
- Some of them found floating forming green scum on the surface of stagnant water of ponds, ditches and lakes.
- These pigments are present in chloroplasts which may be of different shapes.
- Their cell wall is made up of two layers – the inner layer of **cellulose** and the other layer of **pectose**.
- They are filamentous and same of them have complex body organisation.
- They need presence of water for fertilisation, hence are called **amphiloians** of plant kingdoms.
- Since the leafy plant produce gametes for sexual reproduction it is called **gametophyte**.
- The terminal end of the sporophyte bears a sac like structure called **capsule** that produce **spores**.



GLOSSARY

1. **Autotrophs:** The organisms that prepare their own food.
2. **Vegetative reproduction:** Formation of a new individual from vegetative/somatic part of the organisms.
3. **Phytoplanktons:** Tiny green (photosynthetic) organisms which float on the surface of water and drift along with water current.
4. **Sporophyte:** A plant body that produce spores/reproduce by spores.
5. **Gametophyte:** A plant body that produce gametes/reproduce sexually through gametes.
6. **Antheridia:** Multicellular male sex organs of bryophytes and pteridophytes.
7. **Archegonia:** Flask shaped multicellular female sex organs of bryophytes and pteridophytes.
8. **Prothallus:** A simple thallus like minute Gametophytic plant body of pteridophytes.
9. **Fronds:** Large sized leaves present in many ferns.
10. **Sporocarp:** Sporangia containing fruits bodies in same pteridophytes.
11. **Antibiotic:** A type of organic compounds produced by some microbes, and have antibacterial properties, hence are used as drugs against certain pathogens.
12. **Assimilatory power:** Chemical compounds synthesized during light reaction of photosynthesis and are used in the reduction of carbon dioxide in dark reaction.



EXERCISES

I. Multiple choice questions.

1. The mode of nutrition in fungi is
 - (a) Autotrophs
 - (b) Holozoic
 - (c) Heterotrophic
 - (d) Ingestive
2. Water silk is the common name of
 - (a) *Ulothrix*
 - (b) *Volvox*
 - (c) *Chlorella*
 - (d) *Spirogyra*

3. Most of the algae are
- (a) Aquatic (b) Epiphytic
(c) Terrestrial (d) Alpine
4. One of the algae that can be used as food supplement even for space travellers is
- (a) *Chlorella* (b) *Spirogyra*
(c) *Ulothrix* (d) *Volvox*
5. Moss plants are commonly found growing
- (a) on dry soil (b) on damp and shady places
(c) in sea water (d) in rivers and canals
6. The ferns are usually found
- (a) in shady, cool and moist places
(b) in dry climate
(c) in marshy places
(d) along with crop plant.
7. The leaves of a fern bearing sporangia are known as
- (a) fronds (b) sporophylls
(c) sporophytes (d) sporocarps
8. Formation of sporophyte and gametophyte in the life cycle of a fern is called
- (a) metagenesis (b) alternation of generation
(c) metamorphosis (d) oogenesis
9. *Rhizopus* is commonly called
- (a) green mould (b) pink mould
(c) bread mould (d) club fungi
10. The common name of *Penicillium* is
- (a) Green mould (b) pink mould
(c) Pin mould (d) black mould
11. Rust of wheat is caused by
- (a) *Ustilago* (b) *Puccinia*
(c) *Mucor* (d) *Agaricus*
12. *Phytophthora* causes
- (a) late blight of a potato (b) rust of wheat
(c) smut of wheat (d) red rot of sugar cane.

13. Which one of the following is an edible fungi
(a) *Morchella* (morel) (b) *Rhizopus*
(c) *Ustilago* (d) *Mucor*
14. The light dependent phase of photosynthesis is called
(a) Dark reaction (b) Light reaction
(c) Calvin cycle (d) Biosynthetic phase
15. Which one of the following is released during photosynthesis
(a) Oxygen (b) Carbon dioxide
(c) Hydrogen (d) Nitrogen

II. Write true (T) and false (F) for the following statements.

1. Algae belong to plant group called thallophyta.
2. Bryophytes have vascular tissue for transport of water and food.
3. Ferns possess vascular tissues and do not produce seeds.
4. Gymnosperm bear seeds which are produced inside fruits.
5. Angiosperms are commonly called flowering plants.

III. Match the items in Column A with those of Column B

Column A	Column B
(a) Green algae	(i) <i>Spirulina</i>
(b) Brown algae	(ii) <i>Chlorella</i>
(c) <i>Chlorellin</i>	(iii) Red algae
(d) Agar-Agar	(iv) Fucoxanthin
(e) Food supplements	(v) <i>Spirogyra</i>

IV. Fill in the blanks from the words given in the bracket.

1. Sugar synthesized during photosynthesis is stored as _____ is storage organs. (Sucrose/Starch)
2. The dark reaction of photosynthesis is also called _____. (Photochemical reaction/Biosynthetic phase)
3. The macronutrient _____ is a constituent of chlorophyll. (Magnesium/Iron)
4. A micronutrient required in photolysis of water is _____. (Manganese/Copper)
5. The light dependent phase of photosynthesis is called _____ (dark reaction/light reaction)

V. Give brief answer to the following

1. Where do we find algae?
2. What are the methods of reproduction in algae?
3. Why are mosses called amphibians of the plant kingdom?
4. Mention the uses of algae as food.
5. What is alternation of generation? Give one example of it.
6. State five features of ferns.
7. Write any five features of fungi.
8. Mention any three common diseases of crop plants caused by fungi.
9. How are fungi used in industries?
10. Write the adaptations of leaves to photosynthesis.
11. Mention the conditions needed for photosynthesis.
12. Write the cause and symptoms of the following human diseases:
 - (a) Athlete's foot
 - (b) Candidiasis
 - (c) Ring worm
13. How can fungal diseases in humans be prevented?
14. Write the economic importance of mosses.