It also protects the inner contents of the cell. It is absent in animal cells.

Plasma membrane

This is seen both in plant and animal cells. This is the outermost covering of the animal cell and provides shape to it . It is made up of double layer of phospholipids with proteins . It is selectively permeable because it allows certain substances only .

Protoplasm

The cell sap filled within plasma membrane is known as protoplasm. The term protoplasm includes cytoplasm and nucleus.

Cytoplasm

The protoplasm without nucleus is called cytoplasm. It is a homogeneous jelly like substance which fills the space between the nucleus and cell membrane. It consists of water, carbohydrates, proteins, mineral salts, vitamins and RNA. It includes various organelles.

Plastids

These are small variously shaped independent bodies found only in plant cells.

The kinds of plastids are

a. Leucoplast

These are colourless plastids. Their function is **storage**.

b. Chromoplast

These are coloured plastids which are red, orange and yellowish . They are responsible for the **colouration of flowers and fruits.**

c. Chloroplast

These are green plastids. They contain green pigment called chlorophyll. They are present in green plants. These are involved in **photosynthesis.**

Activity 9.1

Mount a fresh young Hydrilla. Observe the chloroplast under the high power microscope.

The following organelles are present both in plant and animal cells.

Mitochondria

These are granular, rod shaped organelles. They are found scattered throughout the cytoplasm. They supply energy for the various functions of the cell. So they are called as **"power houses of the cell".**

Endoplasmic reticulum

Endoplasmic reticulum is a network of cavities distributed in the cytoplasm. They unite plasma membrane and nuclear membranes. They give mechanical support. They also help in conduction of substances within the cell.

Ribosomes

These are tiny granules attached to the endoplasmic reticulum. They may be found free in the cytoplasm . They play a very significant role in protein synthesis.

Golgi bodies

These are tube like structures. These are involved in cell **secretion and storage** .

Lysosome

These are spherical vesicles present in the cytoplasm. These enclose digestive enzymes which are involved in extra cellular and intracellular digestion. So they are called **" suicidal bags"**.

Centrosome

It lies close to the nucleus. It plays an important role in **cell division** . This is most commonly seen in animal cell.

Nucleus

It is generally spherical in shape and found at the centre of the cell. It consists of the following parts like nuclear membrane, nucleoplasm, chromosomes and nucleolus .

Nuclear membrane

It is a double-layered covering known as nuclear envelope. It has pores through which the movements of chemical substances takes place between nucleus and cytoplasm.

Nucleoplasm

The sap inside the nucleus is called nucleoplasm. It is semisolid and granular. It contains network like structures called chromatin reticulum. It is made up of **Deoxy ribo nucleic acid** (DNA). It is concerned with **heredity**.

Nucleolus

The spherical body in the nucleoplasm is known as nucleolus. It does not have a limiting membrane. It stores the proteins.

Vacuoles

These are bubble like structures found in the cytoplasm. They are filled up with cell sap. They perform the function of storage and maintain the **internal pressure** of the cell.

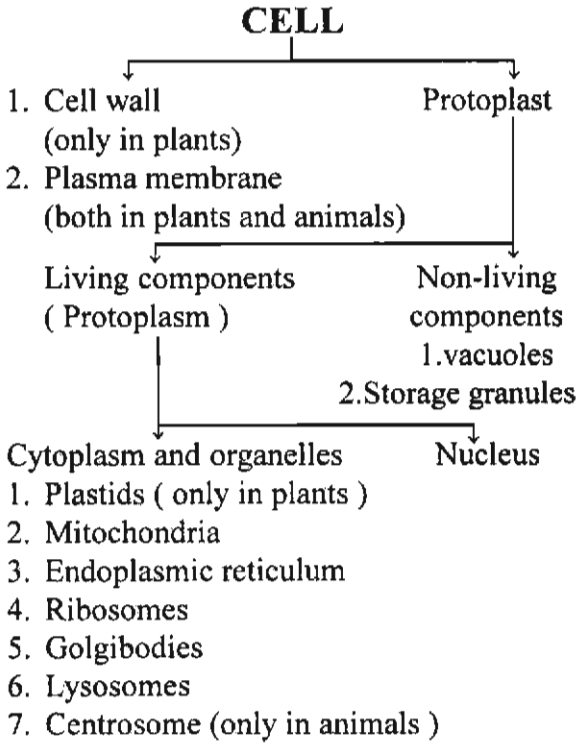
Storage granules

These are stored food materials and secretory substances. These are in various forms like oil droplets, yolk granules, secretory granules and glycogen granules.

Activity 9.2

Place an onion peel under microscope. Add a drop of water and cover it with a cover slip. Observe it under microscope. Draw what you see

The following parts are present in both plant and animal cells.



9.1.4 Size of cells

The cells exhibit great variation in size. Mostly the cells are microscopic. The size of a cell is measured by a unit called micron.

> 1 micron is 1/1000 of a mm(μ)
> 1 milli micron is 1/10,00,000 of a mm (mμ)

The smallest living cells are found among the bacteria PPLO **(Pleuropneumonia like organisms)** which are about 0.25 mμ in diameter. The **ostrich** egg is the largest cell and it measures 175 mm in diameter. Acetabularia is the largest unicellular plant measuring upto 6 cm in length (fig. 9.2).

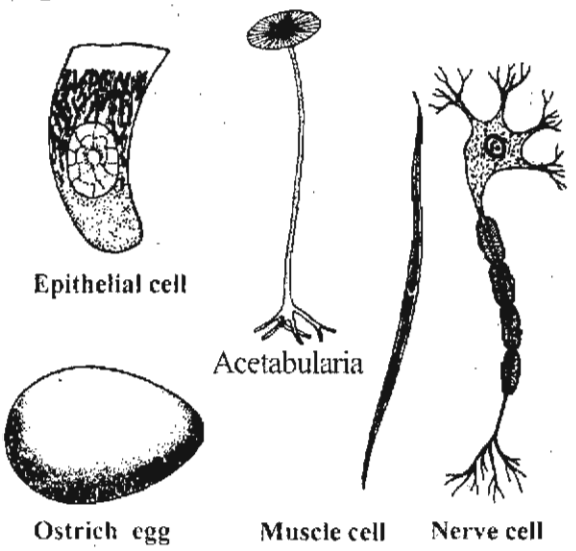


Fig. 9.2

9.1.5 Single celled organisms

Nearly all living organisms are made up of either single cell or group of cells.

In unicellular organisms, the single cell performs the various biological functions. There is no division of labour.

eg. Bacteria, Blue green algae, ***Chlorella, Amoeba, Euglena*** and ***Paramecium*** (fig. 9.3).

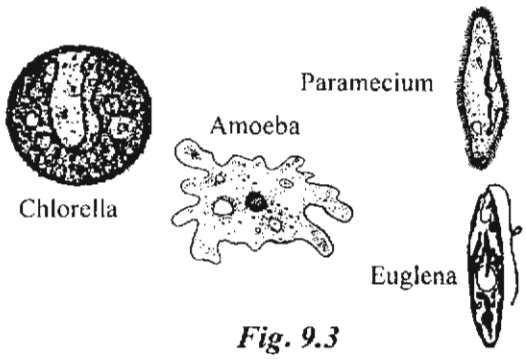


Fig. 9.3

Chlorella is simple non-motile, unicellular green algae. The cell is more or less spherical in shape. They lack flagella, eyespot and contractile vacuoles. They are able to carry out all important activities of life. Thus they lead an independent life.

Activity 9.3

Observe chlorella slide under a compound microscope and draw it in your record notebook.

9.1.6 Multicellular organisms

Most of the plants and animals are made up of many cells. Hence they are called multicellular organisms.

In multicellular organisms, the cells do not lead a totally independent life. The different group of cells perform different functions in the body of a multicellular organism. This is called division of labour.

For example

In Animals

1. Epithelial cell–protection
2. Sex cell–reproduction
3. Muscle cell–contraction

4. Nerve cell–sensory impulse and motor activities

In Plants

1. Epidermal cell – protection
2. Root hair – absorption
3. Xylem – transportation of water
4. Phloem – transportation of food materials.

In addition, multicellular organisms have a greater capacity for survival than unicellular organisms. For example, blood cells are continuously destroyed and replaced in the bone marrow where as damage may result in the death of the unicellular organisms.

9.2 Organization at tissue level

A group of cells that are similar in structure and performing similar function forms a tissue.

9.2.1 Organization of tissues in plants and animals

In unicellular organisms, all the life processes are carried out by a single cell. eg. ***chlorella*** and ***Amoeba***. But in multicellular organisms ,similar group of cells specialized as tissue perform common function. Thus they show tissue grade of organization.

Tissue level of organization is seen for the first time in coelenterata (***Hydra***) in animal kingdom and in Bryophyta **(Moss)** in plant kingdom .

In **Algae and Fungi**, cells are grouped together to perform various metabolic activities. In **Bryophyta**, parenchymatous tissue is specialized as epidermal, photosynthetic and storage tissue. In Fern plants **(Pteridophyta)**, parenchyma tissues are further differentiated into xylem and phloem. These are involved in conduction of water and food materials.

In lower group of multicellular animals like **sponges**, cells are grouped to perform various metabolic activities. In the next level of multicellular animals like ***Hydra,*** different cells perform different functions. They are grouped to form two tissue layers. In higher animals, cells are highly specialized and differentiated as tissues to perform different function (fig.9.4)

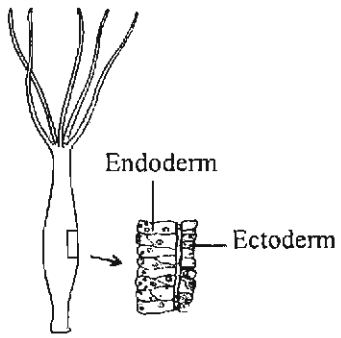


Fig. 9.4 Hydra - body wall.

9.2.2 Functions of tissues

In plants

1. *Dermal tissue*: It forms the covering of the plant body .

2. *Ground tissue*: It provides mechanical support and stores food material.

3. *Vascular tissue*: It conducts water and food materials.

In animals

1. *Ephithelial tissue*: It forms the covering of the body and lines the various cavities, tubes and vessels

2. *Muscle tissue*: It helps in movement

3. *Nerve tissue*: It enables the organism to understand the surroundings and to adjust itself accordingly

4. *Connective tissue*: It attaches muscles to bones

5. *Reproductive tissue*: It is involved in reproduction

9.2.3 Growth and transformation of tissues

The increase in size, shape, volume and weight is called growth. It is an important character of all the living beings. In plants, growth is continuous during the entire life. But, in animals growth takes place only upto certain time and is uniform throughout the body.

In plants, embryonic tissue present in the seed gets transformed to form a whole plant body. This process takes place in three stages.

1. *The juvenile stage*: During this stage the meristematic cells divide and multiply in number.
eg. germination of seed.

2. *The stage of growth and maturation*: Formation of permanent tissue takes place

3. *The reproductive stage* : Formation of reproductive parts.

Accordingly the tissues are differentiated in these three different stages (fig.9.5).

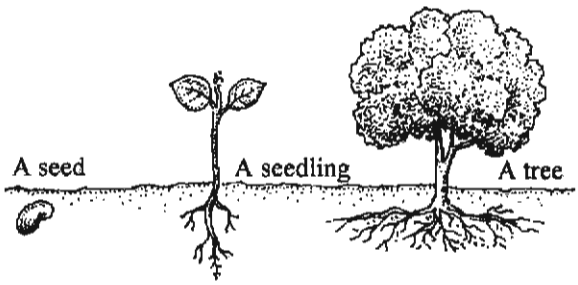


Fig. 9.5 A seed, growing into a seedling and into a tree

Activity 9.4

Sow some bean seeds in a pot, pour some water now and then. They will start germinating. Observe the stages.

9.3 Organs

An organ is formed by the combination of different kinds of tissues in order to perform specific functions.

9.3.1 Different organs in a multicellular organism

There are a number of organs in the animal body such as the stomach, the liver, the heart, the lungs and the kidneys each one performing specific function(fig.9.6a and fig.9.6b).

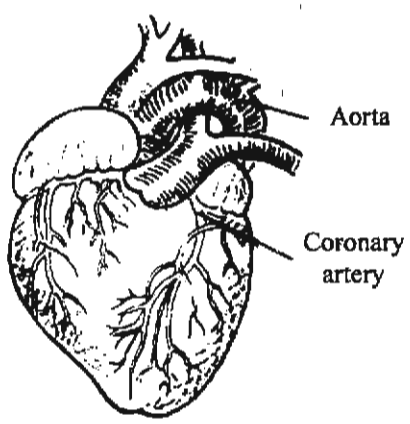


Fig. 9.6a Heart

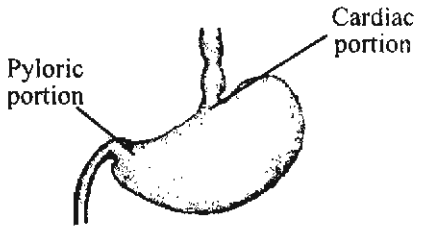


Fig. 9.6b Stomach

9.3.2 Organization of an organ with different tissues to perform specific function

For example the stomach is composed of epithelial, muscular connective and vascular tissues. Its function is to receive the food and digest it.

Similarly, heart is a muscular organ composed of cardiac muscle and connective tissue.

9.3.3 Functioning of organs

A series of other organs, for example small intestine and large intestine each composed of two or more tissues, perform the various process of digestion. The digested food is transported to various tissues through blood vessels.

In this way, it can easily be seen that every organ of the body provides functional support to the other organs. The organism exists and reproduces only through such interdependence.

9.4 Organ system

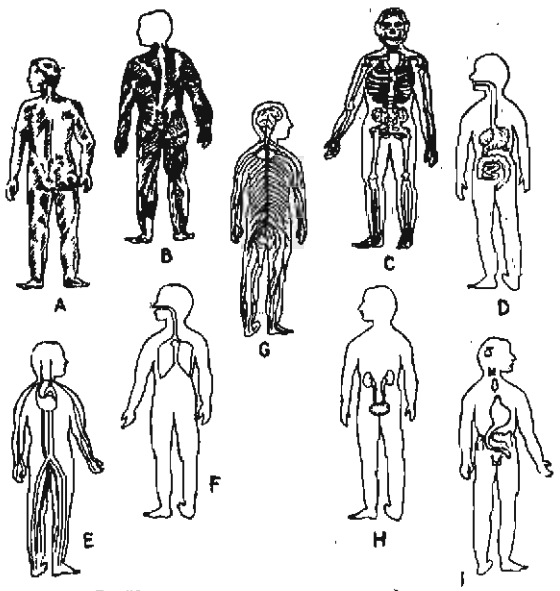
In a big house, we come across a number of rooms such as drawing room, bed room, kitchen, store room and toilet. So a house is constructed, combining a number of rooms each one serving a different purpose.

In the same manner,in the body of an animal or plant , a number of organs are united together to form an organ system that carries out one of the major functions of the body.

9.4.1 Different types of organ systems

There are a number of organ systems in an animal. They are the: (fig. 9.7)

1. Digestive System 2. Circulatory System 3. Respiratory System 4. Skeletal System 5. Muscular System 6. Excretory System 7. Nervous System 8. Reproductive System 9. Endocrine System



Different organ systems of man

A. Integumentary system; B. Muscular system;
C. Skeletal system; D. Alimentary system;
E. Circulatory system; F. Respiratory system;
G. Nervous system H. Excretory system;
I. Endocrine system.

Fig. 9.7

Plants are made up of organ systems called root system and shoot system (fig. 9.8).

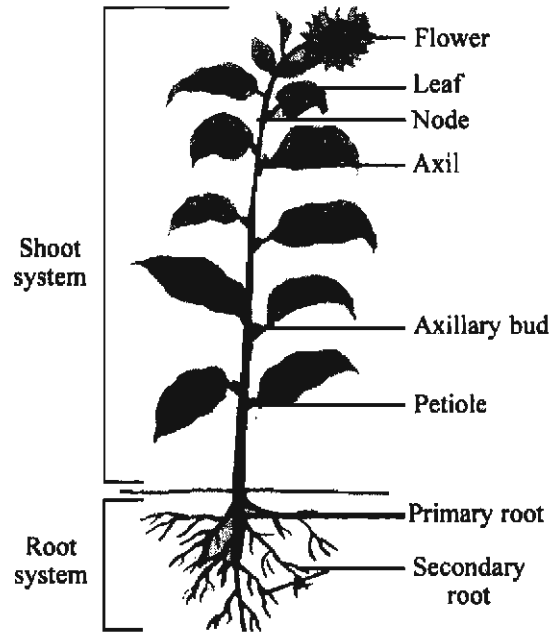


Fig. 9.8 Parts of a plant

Digestive System

The digestive system is composed of (1) the alimentary canal (2) the associated digestive glands.

The alimentary canal includes the following

1. Mouth-to chew food
2. Oesophagus-Conduction of food
3. Stomach-digestion of food
4. Small intestine – digestion and absorption of food.
5. Large intestine-absorption of water
6. Anus-defaecation

The digestive glands associated with the alimentary canal are the Salivary glands, Liver, Pancreas, Gastric glands and Intestinal glands.

Thus, the digestive system helps in the conversion of complex food substances into simple particles with the help of enzymes (fig.9.9).

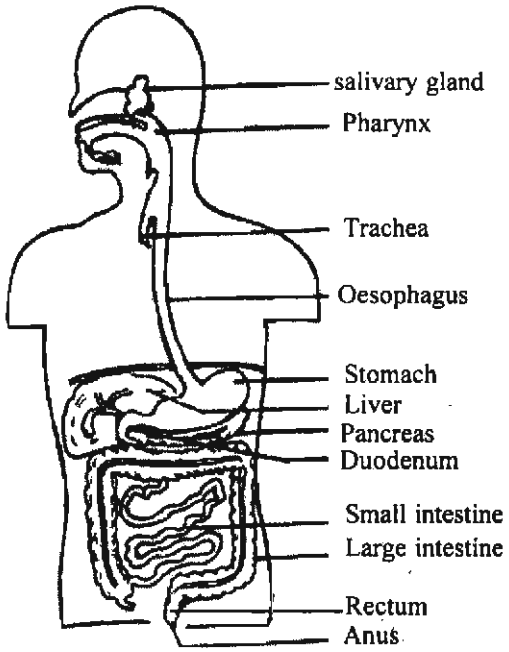


Fig. 9.9 Digestive system of man

9.4.2 Circulatory system

The circulatory system includes the heart and the connected blood vessels. The heart is composed of cardiac muscle fibres.

Structure of human heart

The heart is conical, hollow muscular organ, situated in the thoracic cavity between the lungs. It is covered by a double walled protective membrane called **pericardium.**

The heart consists of four chambers. Upper two chambers are called **auricles** and lower two chambers are called **ventricles.** The chambers are divided by partitions called septa. Auricles open into ventricles through openings which are guarded by valves.

Four **pulmonary veins** open into the left auricle. The **superior and inferior vena cava** which collect deoxygenated

blood from various parts of the body open into the right auricle. The **aorta** arises from the left ventricle. It carries oxygenated blood to various parts of the body. Pulmonary artery arises from the right ventricle. It carries deoxygenated blood to the lungs.

Valves

The opening between the right auricle and right ventricle is guarded by **tricuspid valve**. Similarly, the opening between the left auricle and left ventricle is guarded by **bicuspid valve or mitral valve**. These valves allow the blood to flow in one direction. The opening of pulmonary artery into the right ventricle is guarded by semilunar valve. In the same way, the opening of aorta into the left ventricle is guarded by semilunar valve.

Working of the heart

Heart is the pumping organ, which pumps the blood to various parts of the body. Left auricle relaxes and receive the oxygenated blood. At the same time right auricle receives the deoxygenated blood. Then auricles contract and blood enters into their respective ventricles. Ventricles then contract and the blood from the ventricles enter into their respective blood vessels. Blood flows from left ventricle into aorta and from right ventricle into pulmonary artery. The contraction of the heart is called **systole**. The relaxation of the heart is called **diastole**.

There are three types of blood vessels. They are the following: Arteries, Veins and Capillaries.

The arteries carry blood from the heart to the various parts of the body. Arteries are thick walled and are placed deep inside the body. They divide to form smaller branches called arterioles.

The arterioles divide and subdivide to form the Capillaries, which reunite to form the vein. The veins are thin walled. They are placed superficially. They carry blood from the different parts of the body to the heart (fig.9.10).

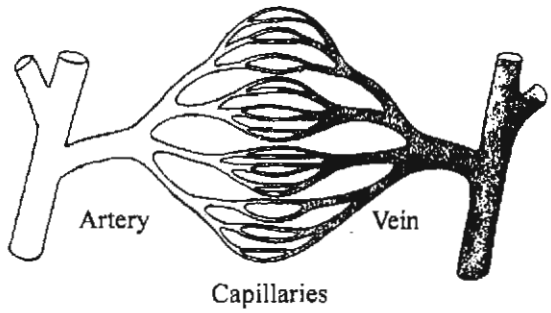


Fig. 9.10

Functions of blood

1. It absorbs the digested food materials from the intestine and distributes it to all parts of the body.

2. It collects the waste products from the cells and takes them to the respective excretory organs.

3. It carries oxygen from the lungs to the tissue and collects carbon dioxide from the tissue and takes it to the lungs.

4. White blood cells play an important role in protecting the body from disease causing germs.

9.4.3 Muscular system

The muscular system is composed of three different types of muscles namely the Striped, Unstriped and Cardiac muscle fibres.

The striped muscle helps to bring about locomotion and various movements of body. The Unstriped muscle fibres occur in the walls of the alimentary canal, blood vessels and urinary bladder.

The cardiac muscle fibres are found in the walls of the heart. They help in contraction and relaxation of the heart.

9.4.4 Root system

The portion of the plant body present below the soil is called root system. **In dicots, the taproot system is present,whereas in monocots fibrous root system is present.**

Functions

The root system fixes the plant in the soil and the root hairs absorb water and mineral salts. The different regions of the root and their functions are:

1. *Region of Root Cap*: It covers the apex of the root.
2. *Region of cell division*: The cells undergo repeated divisions.
3. *Region of Elongation*: Increase of growth in length takes place.
4. *Region of root hair*: Absorbs water and mineral salts.
5. *Region of maturation*: This provide anchorage to the plant (helps in fixing plant body) (fig. 9.11).

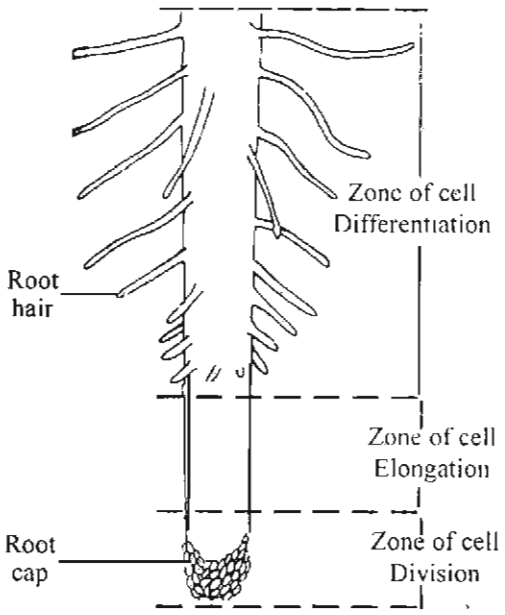


Fig. 9.11 Regions of the root

Activity 9.5

Pluck a dicot plant carefully without damaging the roots. Observe the root tip for the presence of root hairs.

You have already studied the taproot modified for storage. Now let us discuss the modifications of root for performing the function of respiration. These roots are called **respiratory roots or pneumatophores.**

These roots are seen in plants growing in marshy places and salt lakes. From the underground portion of the roots many conical spikes grow vertically upward around the tree trunk. They are provided with numerous pores or respiratory spaces through which air is taken in for respiration (fig. 9.12)

eg. ***Avicinnia*** and ***Rhizophora***

Roots that grow from any part of the plant body other than radicle are called

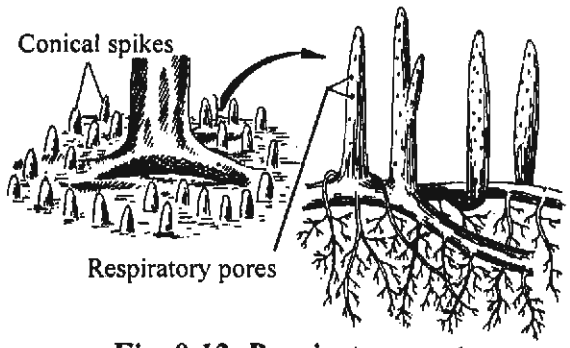


Fig. 9.12 Respiratory roots

adventitious roots. They are of various kinds and have diverse functions- Normal and specialized .

Those with normal Functions may be of the following types.

1. *Fibrous roots*: Cluster of roots are formed from the lowermost node of the stem. eg. Sugarcane and Bamboo.
2. *Foliar roots*: Cluster of roots arise from the petiole of leaf. eg. ***Pogostemon.***
3. *Adventitious roots* :Cluster of roots arise from any part of the plant body.

eg. ***Bryophyllum*** (Leaf margin), Coleus (branch cutting) (fig. 9.13)

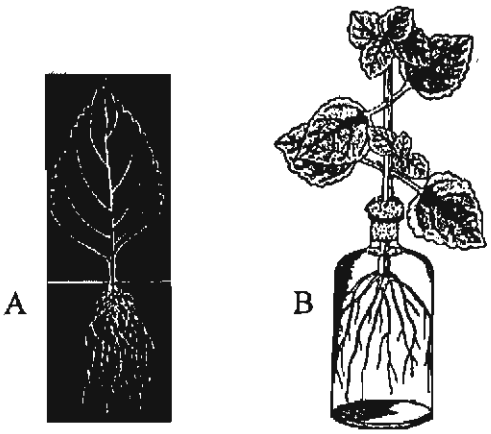


Fig. 9.13 A - Foliar root in Pogostemon
B - Adventitious root in Coleus

In some plants the adventitious roots are modified to perform some special functions like storage. eg. Sweet potato, mango ginger (fig. 9.14).

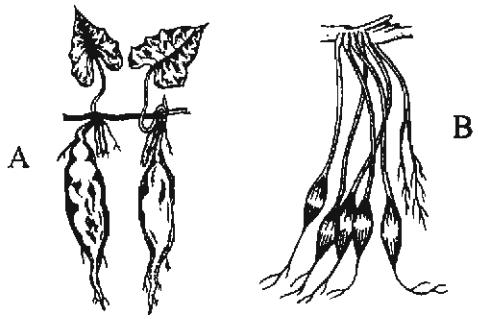


Fig. 9.14 Adventitious Roots
A. Tuberous roots of sweet potato
B. Nodulose roots of mango ginger

In some plants, roots are produced for mechanical support.You have already studied prop root in VI std. So let us discuss climbing roots and buttress roots.

1. *Climbing roots*: These roots are formed at the nodes for fixation eg. *Betel, Pothos* (fig. 9.15).

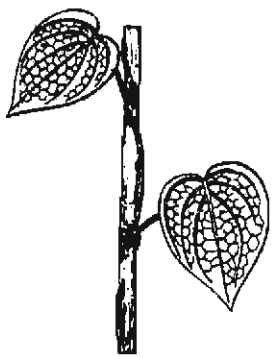


Fig. 9.15 Climbing roots of betel

2. *Buttress roots* : In some large forest trees, stout roots arise at the base of the trunk. They provide support eg. silk cotton tree.

9.4.5 Shoot system

The stem is aerial part of the plant.

This develops directly from the plumule.

Functions of stem

The main function of the shoot system is transporting the absorbed water and mineral salts. It also bears leaves, branches and flowers.

In some plants the aerial part of the stem is modified to perform some special functions. These are stem tendril for climbing, thorn for protection, phylloclade for food manufacture and bulbil for vegetative reproduction.

1. Stem tendril

It is thin, wiry, leafless, spirally curled branch, by which they attach themselves to neighbouring objects and climb them. eg. Passion flower, Sandwich island climber and balloon vine (fig. 9.16).

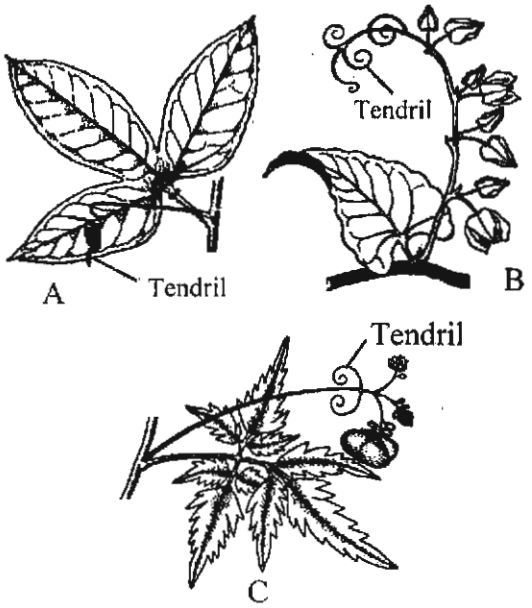


Fig. 9.16 Stem-tendril
A. Passion flower B. Sandwich Island climber C. Balloon vine climber

2. Thorn

The axillary bud is modified as a hard, straight and pointed structure. eg. Duranta and lemon (fig. 9.17).

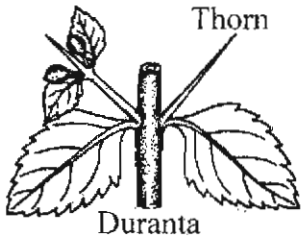


Fig. 9.17 Thorns

3. Phylloclade

It is a green, flattened stem, which performs the function of photosynthesis. It also stores water and mucilage. The leaves are modified into spines to reduce transpiration.

eg. ***Opuntia, Euphorbia*** (fig. 9.18).

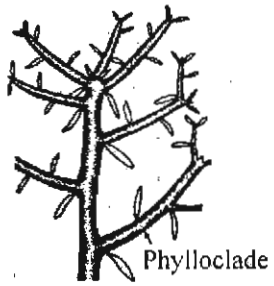


Fig. 9.18 Euphorbia tirucalli,

4. Bulbil

This is a special multicellular body of vegetative bud meant for reproduction of the plant.

eg. Agave, onion (fig. 9.19).

Fig. 9.19 A. Bulbil in Agave
B. Germinating Bulbil in Agave

9.5 Species

Individuals resembling one another in all important morphological characters and capable of reproducing among themselves are called species.

Look at the following picture. We see a number of fishes swimming in water. They all resemble one another in all respects. They all belong to the same species (fig. 9.20).

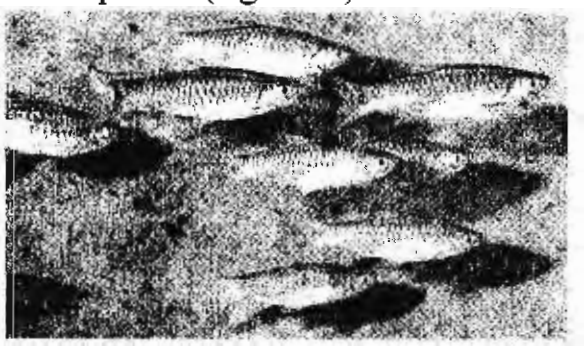


Fig. 9.20 Species

Members of one species can not breed with members of a different species.

A species forms only the basic unit of classification. More than one species having certain degree of similarity are grouped together as a genus.

Hibiscus rosasinensis plant, commonly called shoe flower, belongs to one particular species. All the members of this group are similar in character. They all belong to one species (fig. 9.21).

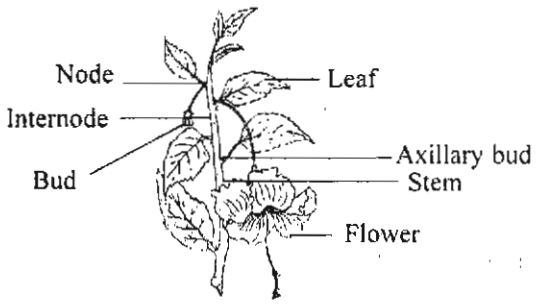


Fig. 9.21 Parts of a Hibiscus plant

9.6 Population

Population has been defined as the organisms inhabiting in an area at a given time. Each species represents a kind of population.

Census of India - 2001		
Figures at a glance - Tamil Nadu		
Total population	:	62,110,839 persons
Male	:	31,268,654
Female	:	30,842,185

9.6.1 Differences in the population strength of various organisms

Population is of two types.

1. Single species population and
2. Multi species population.

Look at the following diagram. All the fishes resemble one another in all respects. This is an example for single species population (fig. 9.22).

Fig. 9.22 A shoal of sweetlips swims freely in the upper regions of the ocean

Look at the next diagram. Here also we see a number of animals living under the sea. Though all these animals are aquatic, they do not resemble one

another. They belong to different species. This is an example for multi-species population (fig. 9.23).

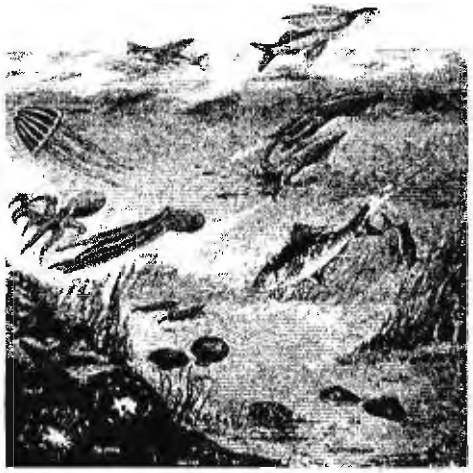


Fig. 9.23 Multi species population

Population density

The size of a population may vary depending upon the available space, food and other conditions. If the space is limited and the number of individuals per unit of space increases, then you can say the distribution of population is dense.

The following diagram (pyramid) illustrates the population strength of herbivores and carnivorous lion in the **Gir forest** (fig. 9.24).

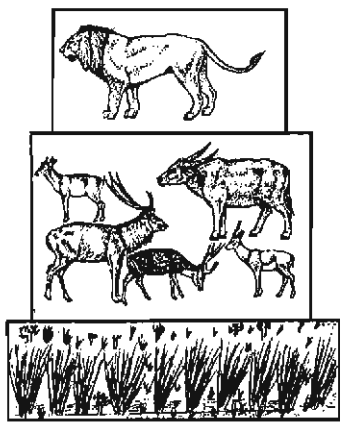
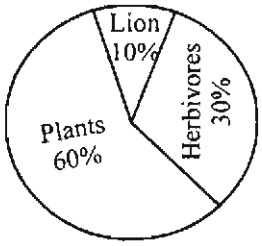


Fig. 9.24 The food pyramid of the Gir forest

The same idea can be better illustrated with the help of a pie diagram (fig. 9.25).



Fig, 9.25 Pie diagram

9.6.2 Factors responsible for population strength

Availability of food, shelter, mate and good climatic conditions, may increase the size of a population.

Non-availability of food and mate, bad climatic conditions and sudden epidemics may decrease the size of a population.

The population strength or population density of any organism in a given time and a given space is determined by the following characteristics. i) birth rate
ii) death rate iii) immigration rate iv) emigration rate.

i) Birth rate

It is the rate at which new members are added to a particular population by reproduction.

ii) Death rate

The rate at which the individuals die is called the death rate. You know that in every family, the birth of a new child increases the family size and a death reduces the number of the family members.

iii) Immigration rate

It is the rate at which individuals move into a population.

iv) Emigration rate

It is the rate at which individuals move out of the population.

Interaction with other organisms

A population of organisms is affected by other kinds of organisms. The deer in the Gir forest forms the food for both leopards and lions. If for some reasons, the population of deer is affected, it will naturally affect the population of lions and leopards.

9.7 Community

The association of several populations of different species in a particular locality is known as a community.

9.7.1 Biotic Communities

Have you ever noticed your school garden? What are the animals you see there? Ants, squirrels, birds, earthworms, garden lizards are normally found in any garden.

So, we come to know that no population can exist in isolation. In any environment, a population is associated with several different populations of plants and animals. It is often referred to as Biota or Biotic community.

9.7.2 Organization

The association of different kinds of plants and animals in a pond constitutes the pond community. Like wise the different kinds of organisms living together in a forest constitute the forest community.

For example, let us take a pond community. In a pond, aquatic plants are of three different types

i) Rooted plants – ***Lotus***

ii) The submerged plants – ***Hydrilla***

iii) The free floating plants – ***Pistia*** (fig. 9.26).

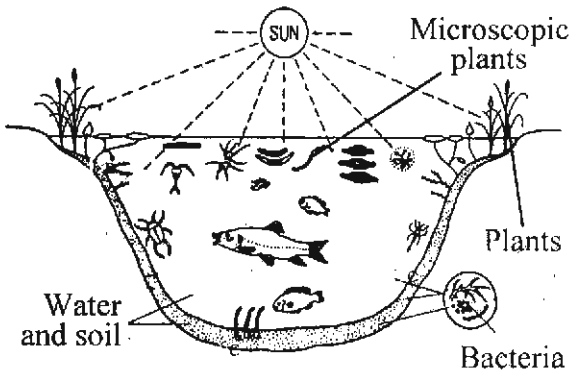


Fig. 9.26 Pond ecosystem

The various animals found in pond are microscopic organisms like amoeba, different types of annelids, arthropods, molluscs, snakes, herbivorous fishes and tadpoles of frogs. A large number of bacteria, fresh water mussels are found at the bottom of a pond.

9.7.3 Components of a community

The following are considered as the components of a community.

i) abiotic factors (non-living substances)

ii) biotic factors (living substances) This can be classified into three main groups namely

a) producers b) consumers and

c) decomposers

i) Abiotic Factors

In any community, we come across non-living substances such as water, air, soil, climate, light, carbon dioxide, oxygen, nitrogen, calcium, nitrates, phosphates and amino-acids.These are abiotic factors of a community.

ii) Biotic Factors

a) Producers

These are the green plants that can synthesize their own food from inorganic and organic compounds. They include the microscopic plants, rooted floating plants in ponds and lakes, algae in the ocean, grasses in the grasslands and trees, shrubs and herbs in the forests.

b) Consumers

These are the living members, which consume the food produced by the producers. These may be

i) Primary consumers

They eat the producers like plants and algae. They are also called herbivores. eg. deer and rabbit.

ii) Secondary consumers

They kill and eat the herbivores. eg. fox and wolf.

iii) Tertiary consumers

They kill and eat the secondary consumers. eg. lion and tiger.

c) Decomposers

These include micro organisms such as bacteria. They act on dead bodies of producers and consumers. They break up complex materials into simple substances. Thus we find that abiotic and biotic components are inter linked.

Energy flow

When the green plants prepare food in the presence of sun light, they store solar energy in the stored up food materials. When the consumers feed on the producers, the solar energy reaches the body of the consumers. After the death of producers and consumers, when the decomposers act upon their bodies, they also get some amount of solar energy. Thus, the flow of solar energy from one level to another level is called food chain (fig. 9.27).

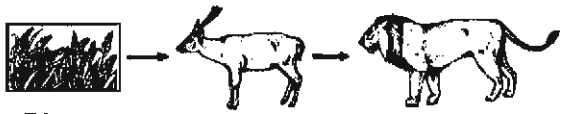


Fig. 9.27 A simple food chain

Look at the above diagram. Here the energy flow from grass to deer and then to the lion is represented.

In nature, a single animal may feed on so many other animals (fig. 9.28).

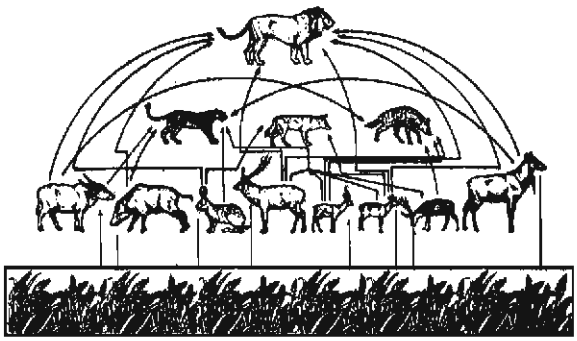


Fig. 9.28 A food web of the Gir forest

In this diagram animals such as cow, pig, deer, antelope and zebra become food for other carnivores such as lion, panther, wolf and tiger.

Similarly carnivores like lion and panther feed on several herbivores like deer, antelope, cow and zebra. This is what we mean by food web.

Thus a network is formed, interlinking many food chains. This is called **food web**.

9.7.4 Fresh water community

If the salt content and amount of dissolved substances are less, the water is considered as fresh. The fresh water habitat is generally divided into two natural divisions namely

1. Standing water habitat
   – ***ponds and lakes***
2. Running water habitat
   – ***Streams and rivers.***

1. Standing water habitat

It includes the plants like phytoplanktons, rooted and submerged plants. It also includes the animals like zooplanktons, fishes, turtles, mosquito larvae, water spider, hydra and frog (fig. 9.29).

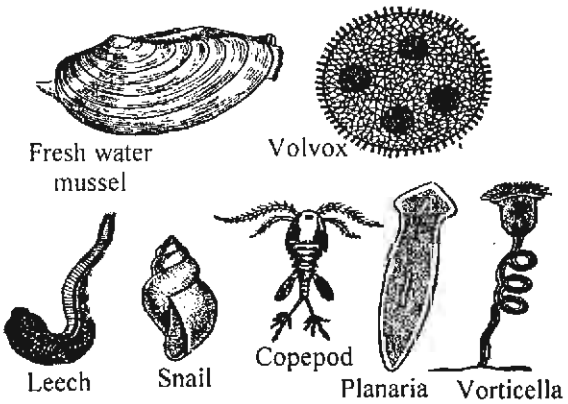


Fig. 9.29 Common invertebrates in a pond

2. Running water habitat

It includes aquatic plants with dissected leaves. eg. ***Limnophila heterophylla*** (fig.9.30) and animals like Larvae of dragon fly, may fly, flat worms, snails and variety of fishes.

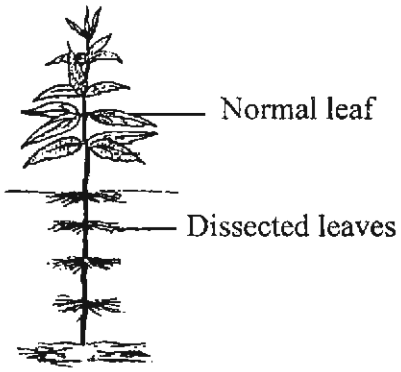


Fig. 9.30 Limnophila heterophylla

Marine community

Marine community includes non-living things and living things. The most characteristic feature of sea water is its high salt content.

The sea shore is divided into three main types. They are Sandy shore, Rocky shore and Muddy shore.

1. Sandy shore

It is formed by the deposition of wave-eroded materials. Sand is a mixture of particles of various sizes. Large particles are found in the upper part of the beach. This offers no surface for attachment (fig. 9.31).

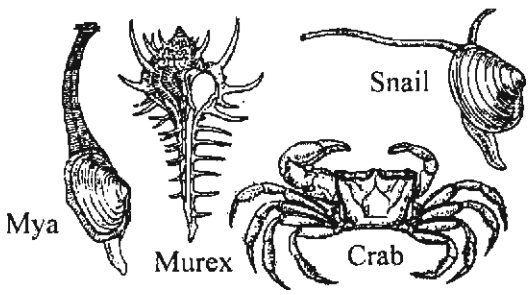


Fig. 9.31 Sandy and muddy shore forms

Adaptation of sandy shore animals

Most of them lead burrowing mode of life. They have special digging organs to burrow into the sand. They swallow the sand containing food and

digest them just like earthworms. The development of respiratory siphons is a common feature among molluscs. eg. crabs, snails, sea urchin and sea cucumber.(fig 9.32)

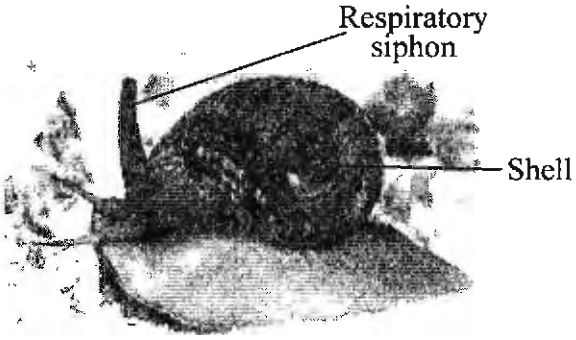


Fig. 9.32 Respiratory siphon

2. Rocky shore

If the seashore consists of rocks and stones, then it is called rocky shore.

Adaptations: A large number of sessile forms are found because rocky shore provides places for attachment. They have broad muscular foot. eg. chiton. In some animals locomotor organs are absent. The sense organs are well developed (fig. 9.33).

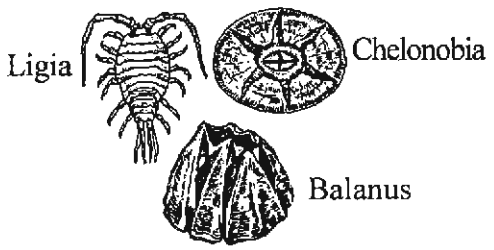


Fig. 9.33 Rocky shore forms

3. Muddy shore

These are formed by the deposition of silt from the water flowing into the sea from land. Poor animal population is seen due to the lack of oxygen.

Adaptations: These organisms are much more delicate than the sand dwellers. Their body is very weak and shells are very thin. They have poorly developed muscles. The burrowing organs are present in some snails. Degeneration and loss of eyes are common among mud-dwellers.

9.7.5 Terrestrial and Aerial community

Terrestrial community

The terrestrial habitat may be classified into forests, deserts, tundra, polar regions and caves. There are three principal types of forests. They are Tropical rain forests, Deciduous forests and Coniferous forests.

Lion, tiger and cheetah live in forests (fig. 9.34). Camel and kangaroo rat live in desert. Polar bear, seal and sea cow live in polar regions. Proteus and salamander live in caves .

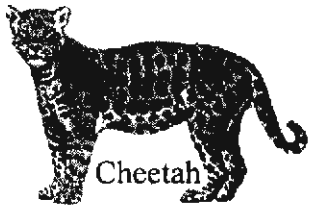


Fig. 9.34 Terrestrial animal

Aerial community

All birds, reptiles like draco and mammal like bat lead aerial mode of life.

Adaptations: Birds have different types of feathers and powerful muscles which help them to fly. Draco and bat fly with the help of a membrane called patagium(fig 9.35).

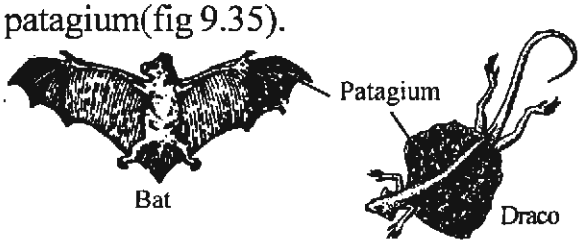


Fig. 9.35 Aerial community

SELF EVALUATION

I.*Choose the correct answer*

1. The suicidal bags in an animal cell are
   (a) Mitochondria (b) lysosomes
   (c) endoplasmic reticulum (d) golgi apparatus.
2. These cells are responsible for sensory impulse and motor activities.
   (a) muscle cells (b) epithelial cells (c) nerve cells (d) blood cells
3. This is an example for a rooted hydrophyte
   (a) Lemna (b) Nelumbium (c) Wolffia (d) Salvinia
4. Fibrous root system is seen in this plant
   (a) Avicennia (b) monocots (c) carrot (d) beet root
5. Phylloclade is seen in
   (a) Rhizophora (b) Agave (c) Opuntia (d) Duranta

II.*Fill in the blanks*

6. Cell wall is made up of _____
7. _____ tissue helps the animals to perform various kinds of movements.
8. The function of _____ is to receive the food and digest it.
9. Bulbils are seen in _____
10. The absorption of water takes place in _____ region of root tip.
11. _____ is the rate at which new members are added to a particular population by reproduction.
12. _____ and _____ live in cave.

III. Match the following

13.	Cell wall	–	xylem
14.	Pogostemon	–	contraction of heart
15.	Conduction of water	–	cell division
16.	Systole	–	cellulose
17.	Centrosome	–	Foliar roots
18.	Vacuole	–	Unicellular alga
19.	Chlorella	–	Cell sap

IV. ***Give short answers***

20. What is chromoplast?
21. Define cell.
22. What is growth?
23. What is the function of epithelial tissue?
24. Define an organ.
25. Define community.
26. What are the organ systems found in man?
27. What is a bulbil?
28. What are the different kinds of blood vessels?
29. Define species.
30. What are foliar roots?
31. What is phylloclade?
32. What are the adaptations found in rocky shore animals?
33. What are unicellular organisms?
34. What are the aerial adaptations?

V. ***Give detailed answers.***

35. Draw and describe the structure of a plant cell.
36. What are the parts of alimentary canal? Explain.
37. Briefly describe the structure of human heart.
38. Draw and describe the different regions of root.

10. Bio Diversity

In Standard VI you have studied that there are thousands of different kinds of living things found all over the earth. There are number of diversities among plants themselves based on cell number, growth, adaptation, nutrition, reproduction, vascular tissue and life span.

Some plants do not produce flowers but many plants produce flowers. Plants which do not produce flowers are grouped under **cryptogams. (non-flowering plants).** The plants which produce flowers, fruits and seeds are classified under a group called **phanerogams** (flowering plants) e.g. flowering plants - Balsam, Mustard, Jasmine, Brinjal, Hibiscus.

Non-flowering plants – Algae, fungi, Moss (Bryophytes), Ferns (Pteridophytes).

10.1 Non–vascular bryophytes

The vascular tissues like xylem and phloem are absent in bryophytes and therefore they are called non-vascular cryptogams. The life cycle of bryophytes show two distinct phases namely **Gametophyte** and **sporophyte**. These phases alternate each other in the life cycle.

Let us discuss the life cycle of Riccia as an example.

Systematic position

Division : *Bryophyta*
Class : *Hepaticopsida*
Order : *Marchantiales*
Family : *Ricciaceae*
Genus : *Riccia*

10.1.1 Gametophyte - Riccia

Habitat: Most of the bryophytes are land dwellers, which usually grow in damp, shaded and humid localities.

External structure

The plant body is a gametophyte. It is small, green, flat and are arranged in rosette form. The thallus is **dichotomously branched**. From the lower surface of the thallus the **unicellular rhizoids** are formed. These rhizoids help in fixation and absorption of water from soil. On the lower surface of the thallus, membranous **scales** are present. These are multicellular and protect the growing point (fig. 10.1).

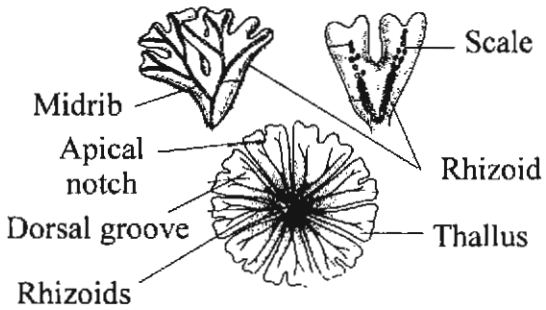


Fig. 10.1 Riccia -External structure

Internal structure of Riccia

A vertical section of the thallus shows two distinct regions.

1. An upper or dorsal photosynthetic region
2. A lower or ventral storage region.

1.Photosynthetic region

The dorsal region consists of many vertical rows of **chlorenchymatous cells.** Air canals are seen between the

rows of cells. The upper most cell of each row is colourless. They form a discontinuous layer called an upper epidermis.

2. Storage region

The ventral portion of the thallus consists of closely arranged parenchymatous cells. These cells **store water and starch**. The lower most cells of this region are arranged regularly to form lower epidermis. The rhizoids and scales are developed from this layer (fig. 10.2).

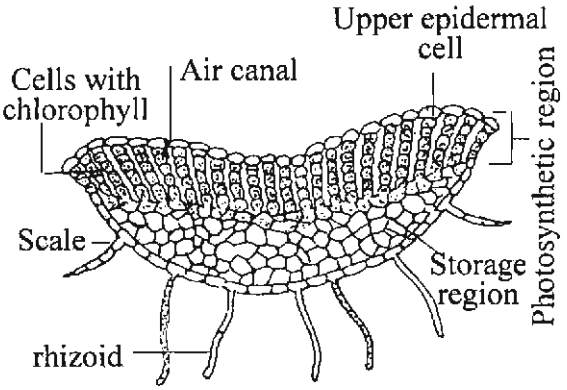


Fig. 10.2 Riccia - Thallus T.S

Reproduction

On maturity the Riccia thallus reproduces both by vegetative and sexual method.

10.1.2 Vegetative reproduction

Riccia thallus reproduces vegetatively by the following methods.

i) Fragmentation

The cells in the older portion die and the apical portion of the young lobe get separated. This grows into a new thallus.

ii) Adventitious branches

These branches arise from the ventral surface of the thallus. They grow into a new plant body.

10.1.3 Sexual reproduction

The gametophytic plant body reproduces sexually by producing gametes. The male sex organ is the antheridium and the female sex organ is the archegonium.

Antheridium

The antheridium is a pear shaped body with a short stalk.

Each antheridium has an outer sterile jacket layer and encloses a mass of fertile cells called androcyte mother cells. These cells produce many minute twisted **biflagellate** male gametes called **antherozoids** (fig. 10.3).

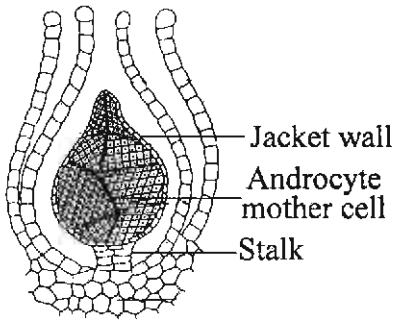


Fig. 10.3 Ricccia -Antheridium

Activity 10.1

Observe the preserved specimen or fresh species of Riccia. Identify the sex organs on the dorsal side and rhizoids and scales on the ventral side.

The antheridial wall disintegrate and liberate the antherozoids, which swim freely in a thin film of water.

Archegonium

Each archegonium is a flask shaped organ.

It consists of basal swollen venter and a long slender neck. The venter consists of an **egg cell**.

Fertilisation

It takes place in the presence of water. As the archegonium matures, the cells of the neck degenerate and form mucilage. Several antherozoids enter the archegonium, swim through the neck, but only one fuses with the egg to form zygote. This is the end of the gametophytic phase(fig. 10.4).

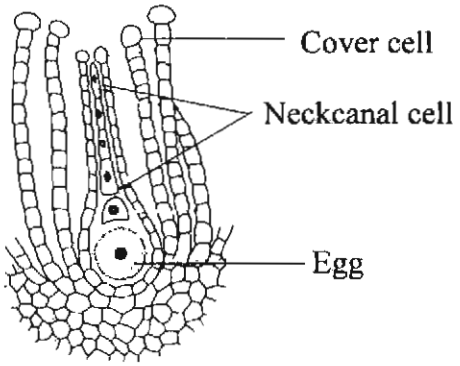


Fig. 10.4 Riccia - Archegonium

10.1.4 Sporophyte

The zygote develops into sporophyte.

The mature sporophyte consists of a spherical body called the **capsule or sporogonium**. The capsule wall encloses a mass of spore mother cells which produce spores. These spores are liberated and germinate into a new gametophytic plant body(fig. 10.5).

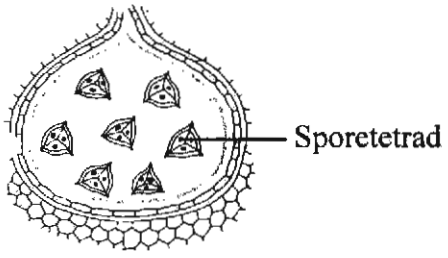


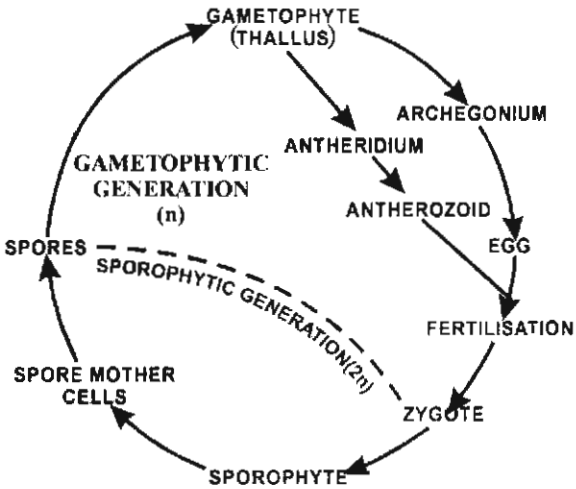
Fig. 10.5 Riccia-Sporogonium

Alternation of generation

Thus the plant body of Riccia passes through two successive generations. The gametophytic generation begins with the spore, reproduces sexually by gametes. These gametes fuse to form zygote, which is the first cell of the sporophyte. The sporophyte reproduces asexually by producing spores. These spores develop into gametophyte.

Thus the gametophytic phase and sporophytic phase alternate each other. This is called alternation of generation.

Life cycle of Riccia



10.2 Nephrolepis

10.2.1 Vascular structure – Pteridophyte–Nephrolepis

You have already studied that the group of cryptogamic plants that possess xylem and phloem are called vascular cryptogams. (Pteridophyte). In these plants xylem conducts water and phloem conducts food materials.

Fern–Nephrolepis

Ferns are a group of highly developed cryptogams. They are

distributed all over the world.

10.2.2 Sporophyte

The plant body of the fern plant is the sporophyte. It has root, stem and leaves. The stem is the underground rhizome. Cluster of adventitious roots grow from the rhizome.

The leaves of fern plant are large and are called fronds. They are pinnately compound, consisting of leaflets called pinnae. The young leaves coiled like a watch spring are called circinate vernation. The stem and the petiole are covered with numerous brownish scales known as the ramenta(fig. 10.6)

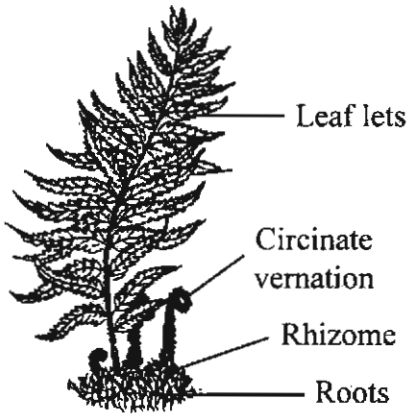
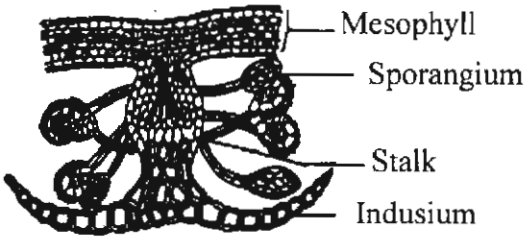


Fig.10.6 Nephrolepis

Reproduction

The sporophyte reproduces by spore. The spore bearing leaves are called as sporophyll. On the undersurface of the sporophyll, two rows of dark-brown structures are formed called Sori. (singular – sorus).

Each sorus consists of many spore sacs or sporangia which produce spores. It is covered by kidney shaped out growth called indusium (fig. 10.7).



Fig, 10.7 Sorus in section

Structure of Sporangium

Each sporangium consists of a long multicellular stalk and a capsule. The capsule is spherical in shape, encloses spore mother cells. These cells by meiosis produce four haploid spores. When the spores mature, the capsule dehisces and liberate the spores.

10.2.3 Gametophyte

The spore germinates to form the gametophyte. It develops into a small, green, heart shaped gametophyte known as prothallus. Many unicellular rhizoids develop on the underside of the prothallus.

The prothallus bears both the sex organs, the antheridia and archegonia, on its ventral surface (fig. 10.8).

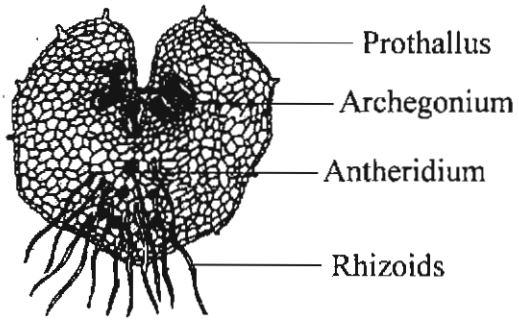


Fig. 10.8 Prothallus gametophyte

Antheridium

Each antheridium is oval shaped consisting of a jacket layer and antherozoid mother cell. Each cell develops into spirally coiled

multiciliate, antherozoid male gametes. When the antheridium matures, it bursts open and liberates the antherozoids (fig. 10.9).

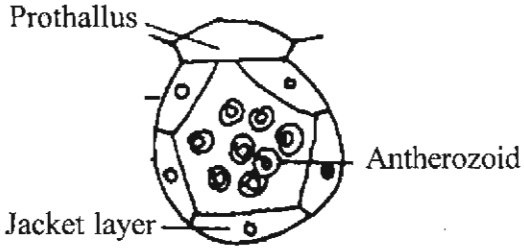
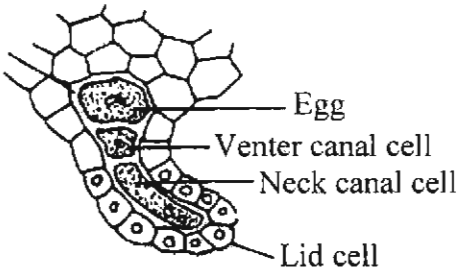


Fig. 10.9 Antheridium

Archegonium

Archegonia are formed behind the apical notch. Each archegonium is a flask shaped body, consisting of a swollen basal portion, a venter and a long slender neck. The venter consists of a large egg cell (fig. 10.10).



Fig, 10.10 Archegonium

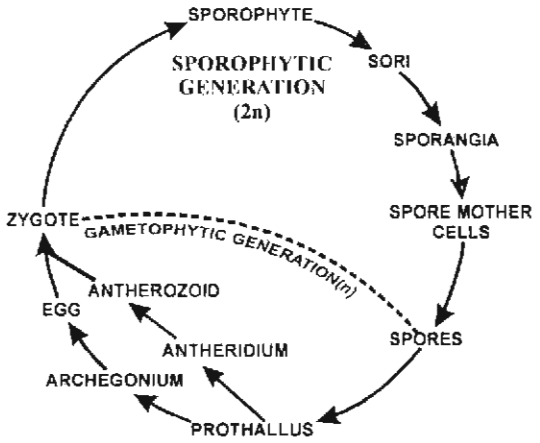
As the archegonium matures, the neck canal cells disintegrate and form mucilage. Antherozoids are attracted and single antherozoid fertilizes the egg cell and forms zygote.

The zygote divides and gives rise to an embryo. The embryo grows up into a young sporophyte.

10.2.4 Life cycle of fern

The fern plant shows two distinct phases in the life cycle. The sporophyte of the fern plant reproduces asexually by spores and gives rise to the gametophyte or prothallus. The gametophyte reproduces sexually by gametes (antherozoid and ovum) and gives rise to the sporophyte or the fern plant. Thus the two generations (gametophyte and sporophyte) regularly alternate each other.

Life cycle of Nephrolepis



10.3 Organisation of animals

Cockroach

Systematic position

Kingdom	–	Animalia
Sub-kingdom	–	Invertebrata
Phylum	–	Arthropoda
Class	–	Insecta
Genus	–	Periplanata
Species	–	americana

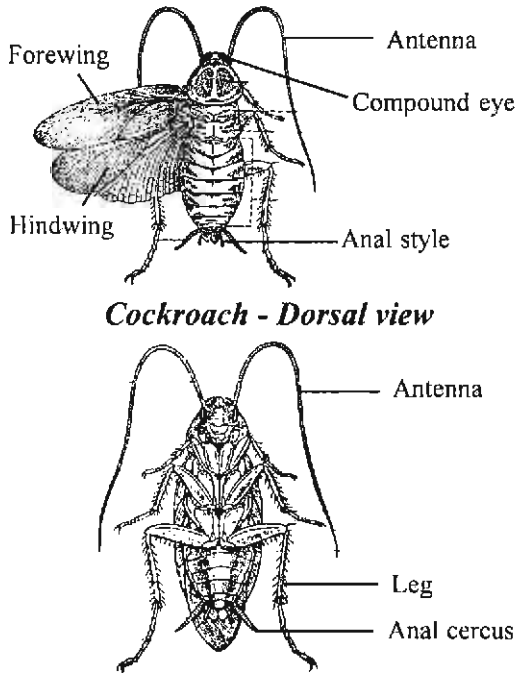
Cockroach is commonly found in kitchens, store rooms and in all dark places. It normally comes out during night time. So, it is nocturnal in habit.

10.3.1 Morphology

The body of cockroach consists of the head, the thorax and the abdomen.

The head has a pair of compound eyes, a pair of antennae and biting and chewing type of mouth parts.

The thorax is made up of three segments. It bears two pair of wings and three pairs of legs (fig. 10.11).



Cockroach - Dorsal view

Fig. 10.11 Cockroach - ventral view

The abdomen consists of ten segments. At the end of abdomen a pair of anal cerci are present. Abdomen of male is narrow whereas it is broad in female. In male, in addition to anal cerci, two anal styles are present.

The entire body of cockroach is covered by a dorsal plate, called tergum, a ventral plate called sternum and two lateral sides are connected by pleural membrane (fig. 10.12).

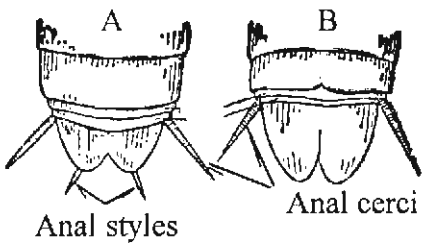


Fig. 10.12 Abdomen of Cockroach A) Male B) Female

10.3.2 Digestive system

The digestive system of cockroach includes the mouth parts, the alimentary canal and the salivary glands.

The alimentary canal of cockroach consists of the mouth which leads into buccal cavity. The buccal cavity leads into narrow oesophagus. Following oesophagus is a thin walled crop. Next to crop is a thick walled gizzard which is followed by midgut.

From the midgut arises eight finger shaped hepatic caecae. Midgut is followed by a short ileum which in turn is followed by a long coiled colon. Colon ends in a broad rectum. Fine yellow coloured thread like malpighian tubules are attached at the junction of midgut and hindgut.

The digestive glands include salivary glands and hepatic caecae.

Cockroach is omnivorous. It feeds on both plant and animal materials (fig. 10.13).

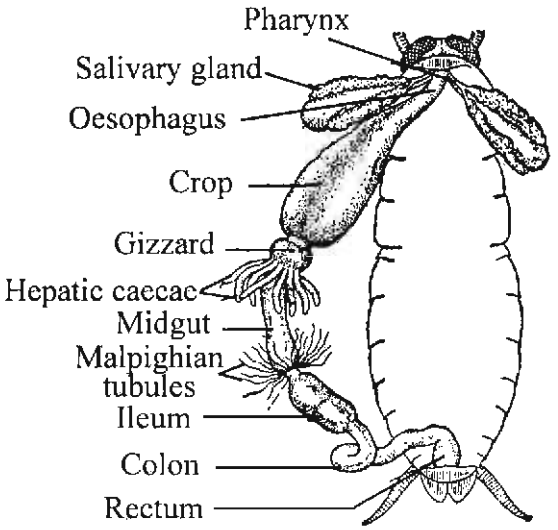


Fig. 10.13 Alimentary canal of cockroach

10.3.3 Cockroach – Reproductive system

Sexes are separate. Male can easily be distinguished from the female. Testes are the male reproductive organs and ovaries are female reproductive organs.

Cockroach–Male reproductive system

The male reproductive system of cockroach consists of a pair of testes which produce spermatozoa, a pair of vasa deferentia mushroom shaped gland and conglobate gland (fig. 10.14).

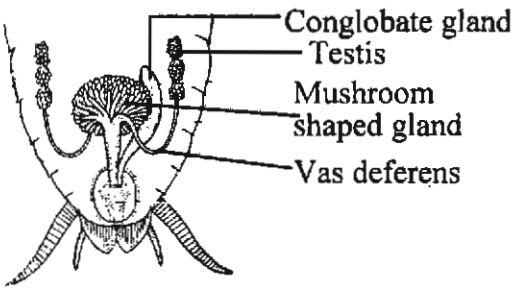


Fig. 10.14 Cockroach - Male reproductive system

Cockroach–Female reproductive system

The female reproductive system of cockroach consists of a pair of ovaries which produce eggs, a pair of oviducts, colleterial gland and a pair of spermathecae (fig. 10.15).

Fertilization takes place and eggs are formed. Female cockroach lays the fertilized eggs. Eggs are surrounded by egg case (fig. 10.16). When fully developed, the young one of the cockroach comes out. It is called nymph. Nymph moults seven times to become an adult.

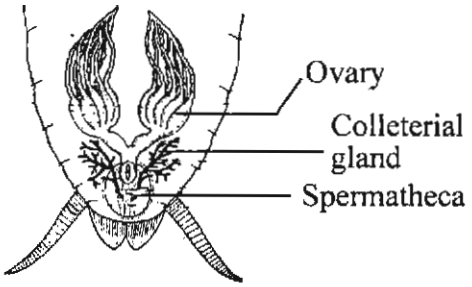


Fig. 10.15 Cockroach - Female reproductive system

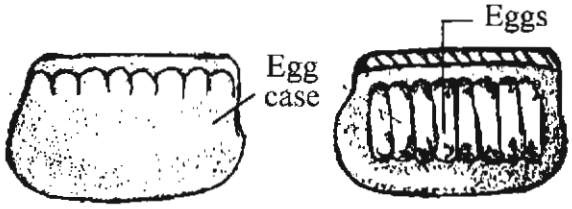


Fig. 10.16 Egg case of cockroach

10.3.4 Frog – External Morphology

Systematic position

Kingdom	–	Animalia
Phylum	–	Chordata
Class	–	Amphibia
Order	–	Anura
Family	–	Ranidae
Genus	–	Rana
Species	–	hexadactyla

The frog is very often found living in or near water. Amphibians lead a dual life. i.e. they are capable of living in water and on land.

External Characters

The body of frog consists of the head and the trunk. A distinct neck is absent. Head is triangular in shape. A pair of external nostrils are present at the tip of the snout. A pair of prominent eyes are present. Each eye is protected by an upper eyelid and a lower eyelid and a transparent nictitating membrane. A tympanum is present behind the eyes on either side.

The skin is loose, moist and slimy to touch. The trunk bears a pair of fore limbs and a pair of hind limbs. The forelimbs are short and are situated anteriorly. The hind limbs are longer and well adapted for hopping and swimming. Web is present between the toes. A tail is absent in the adult. At the posterior end, in between the hind limbs, there is an opening called cloaca. Cloaca is a common opening for both urinogential system and digestive system (fig.10.17).

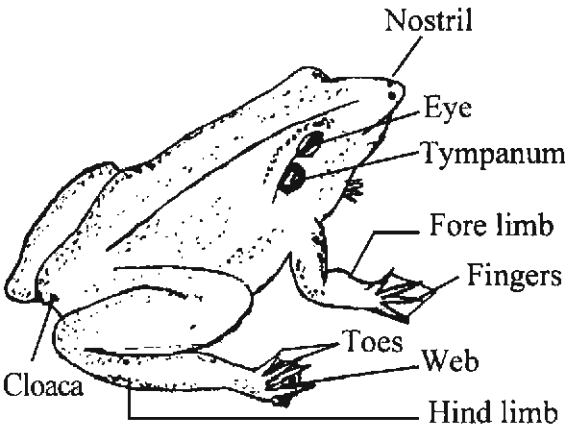


Fig. 10.17 Frog external structure

In the case of male frog a pair of vocal sacs are developed at the angles of the jaws ventrally during breeding season (fig.10.18). But vocal sacs are absent in female frog.

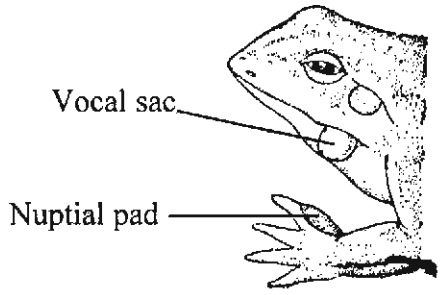


Fig. 10.18 Male frog

In male frog, at the base of the index finger, in each palm, a swelling called nuptial pad is present. These are absent in female frog.

10.3.5 Frog–Digestive system

The frog is a carnivorous animal. It feeds chiefly on living insects, spiders and worms. These are captured with the help of tongue and swallowed.

The digestive system of frog consists of the alimentary canal and its associated glands.

The alimentary canal starts in the mouth. The upper jaw has a row of maxillary teeth. There are no teeth in lower jaw. A bifid tongue is present in the lower jaw to capture the prey. Mouth leads into buccal cavity which in turn leads into oesophagus and muscular elongated stomach.

The stomach leads into duodenum which is the first part of the small intestine. The duodenum leads into ileum which is the next region of the small intestine. The ileum opens into the rectum which opens into the cloaca.

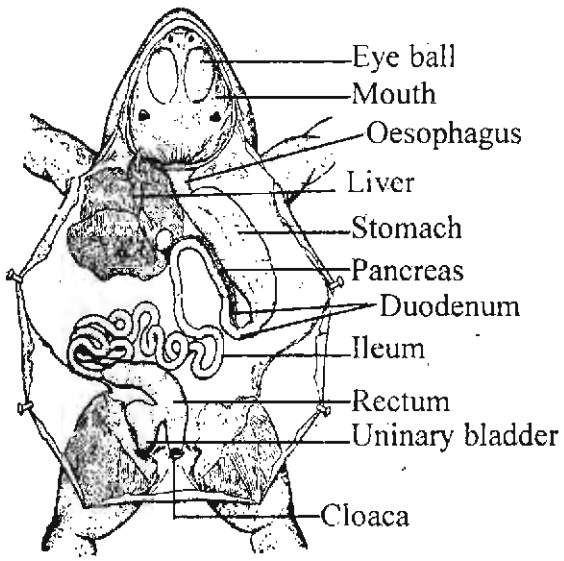


Fig. 10.19 Frog -digestive system

The two important associated digestive glands are the liver and the pancreas (fig.10.19).

10.3.6 Urinogenital system of male frog

The urinogenital system of male frog consists of two organ systems, an excretory or urinary system and a reproductive or genital system.

The excretory system

In frog, the main excretory organs are a pair of kidneys. From the outer border of each kidney arises a slender duct called the ureter which opens into cloaca.

The Reproductive system

The reproductive system of male frog consists of a pair of small yellowish elongated bodies, the testes. The testes produce sperms which are the male reproductive cells. In male frog, the ureter helps to conduct both urine as well as sperms. Hence, this tube is known as urinogenital duct (fig. 10.20).

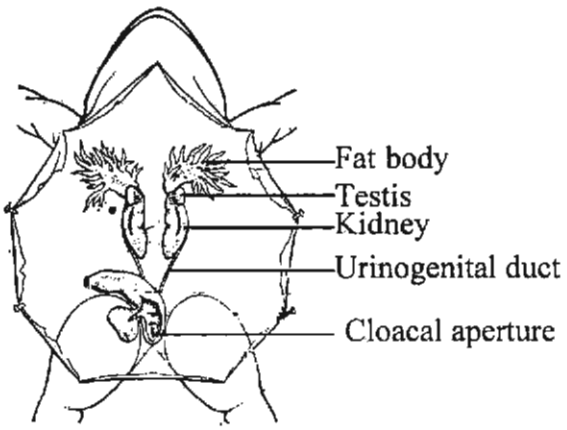


Fig. 10.20 Frog - male urinogenital system

Urino genital system of female frog

As in the case of male frog, the kidneys serve as the chief excretory organs.

The female reproductive system of frog consists of a pair of ovaries and oviducts. The oviducts are highly coiled. The openings of the oviducts known as the oviducal funnels lie one on either side of the oesophagus. The terminal part of the oviduct is expanded into ovisac.

The mature eggs are collected in the ovisac before they are discharged outside through the cloaca.

Unlike in male frog, in female frogs, urine is conducted through ureter and eggs are conducted through oviduct (fig. 10.21).

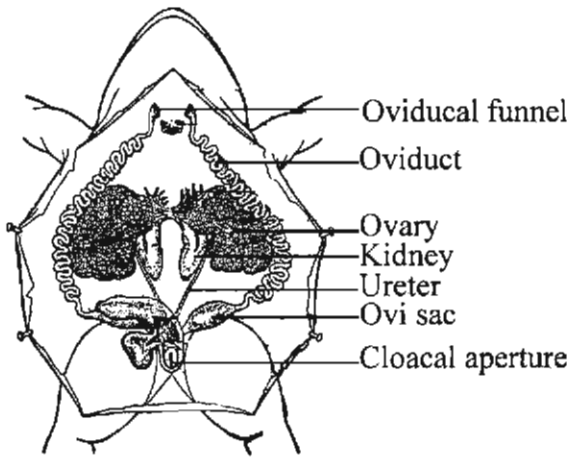


Fig. 10.21 Frog - female urinogenital system

10.4 Nutrition in plants and animals

In animals, the process of taking food is called nutrition whereas in plants the synthesis of various types of food, is called nutrition.

Green plants can synthesise their own food but animals depend upon sources like plants or other animals.

There are three types of nutrition. They are autotrophic nutrition, heterotrophic nutrition and special type of nutrition

10.4.1 Autotrophs

Green plants and some primitive animals like **Euglena** prepare their own food from inorganic substances. These are called autotrophs. They are classified into two types.

1) Photosynthetic autotrophs
2) Chemosynthetic autotrophs

1. Photosynthetic autotrophs

Those organisms which synthesize their food from carbon dioxide and water in the presence of sun light, are called photosynthetic autotrophs.

eg. purple sulphur bacteria, green sulphur bacteria and animal like ***Euglena***

2. Chemosynthetic autotrophs

Some bacteria obtain energy by biological oxidation of certain inorganic substances for the preparation of food instead of sun light. Such bacteria are called chemosynthetic bacteria.

eg. Nitrifying bacteria , sulphur bacteria, iron bacteria and hydrogen bacteria.

10.4.2 Heterotrophs

The non-green plants and animals are not capable of preparing their own food. They depend on other plants and animals for their food. They are called heterotrophs. They are classified into three types. They are parasitic nutrition, saprophytic or Saprozoic nutrition and holozoic nutrition (only in animals).

a) Parasitic nutrition

Parasitism is a one-sided relationship, where one partner gets the benefit at the expense of the other. The other partner is harmed. The partner which gets benefit is the parasite and the other partner is the host.

In plants, viscum album (mistletoe) is a stem parasite. It grows on the branches of oak and walnut trees. It absorbs minerals and water from the host with the help of haustoria (fig. 10.22).

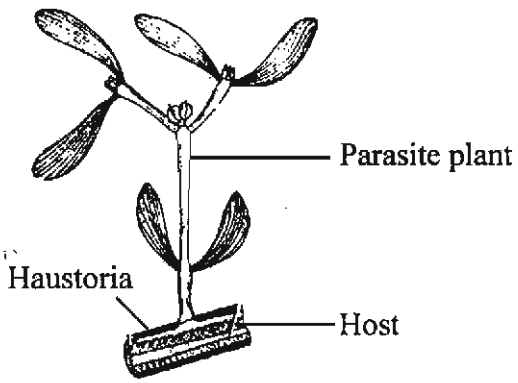


Fig. 10.22 Viscum album

The animal parasites may be

(1) Ectoparasites
(2) Endoparasites

1. Ectoparasites

The parasites which are often found on the outer surface of the host are called ectoparasites. eg. Ticks, Leeches (fig.10.23).

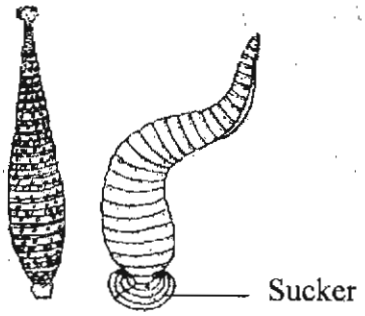
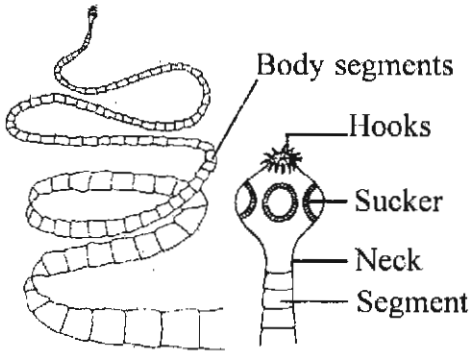


Fig. 10.23 Leeches

2. Endoparasites

If the parasites live inside the body of the host they are called endoparasites. eg. tape worm and round worm (***Ascaris***) (fig. 10.24).



Tape worm

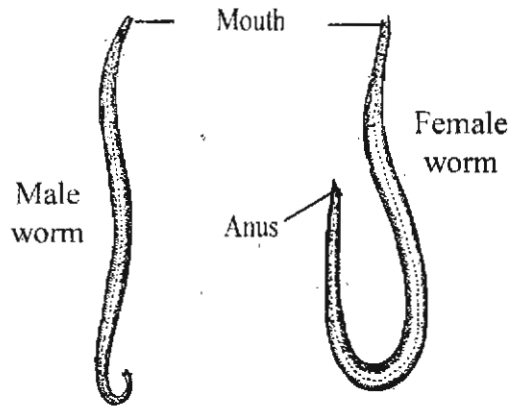


Fig. 10.24 Ascaris

b) Saprophytic / Saprozoic nutrition

This is met within plants and animals. They decompose the dead bodies of plants and animals into simpler compound and absorb the organic food passively through the body wall of the organisms.

eg. Bacteria, fungi and some protozoans.

Have you ever seen umbrella shaped structures appearing after rains on open grass land? These are mushrooms (***Agaricus***). They lead a saprophytic mode of nutrition. They depend on dead organic materials for their food. They secrete digestive enzyme into the medium and convert the food into simple soluble forms and absorb them through the root like structures, the rhizoids (fig. 10.25).

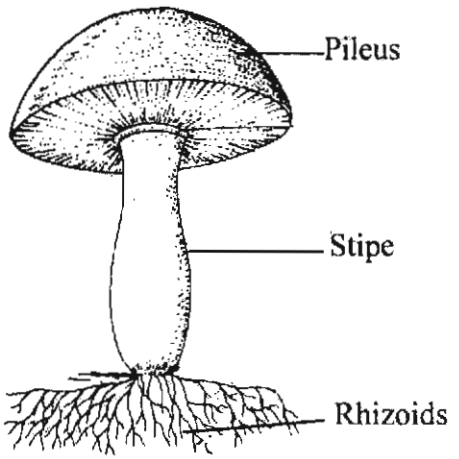


Fig. 10.25 Agaricus - common mushroom

c) Holozoic nutrition

Animals depend on plants or other animals for their food. The food thus taken is digested in the alimentary canal. Here, they are digested into simpler substances with the help of digestive enzymes. Residual products are removed. This type of nutrition is called holozoic nutrition. eg. all higher animals.

10.4.3 Insectivorous plants

Certain flowering plants, growing in nitrogen deficient soil, obtain nitrogen by killing small insects. They are green and autotrophic in their nutrition. These plants show beautiful devices for the capture of insects.

The following are some of the common examples:

1.Nepenthes

It is also known as pitcher plant. It is found in the Assam hills.

In this plant the lower part of the petiole is modified like a leaf and perform photosynthesis. The upper part is modified like a tendril. The leaf blade is modified into a brightly coloured pitcher. It secretes sugary fluid to attract the insects.

As the insect sits on the rim of the pitcher, it slips down and the lid closes. The insect is digested by the proteolytic enzyme secreted by the pitcher.

Finally the walls absorb the nitrogenous compounds present in the insect(fig. 10.26).

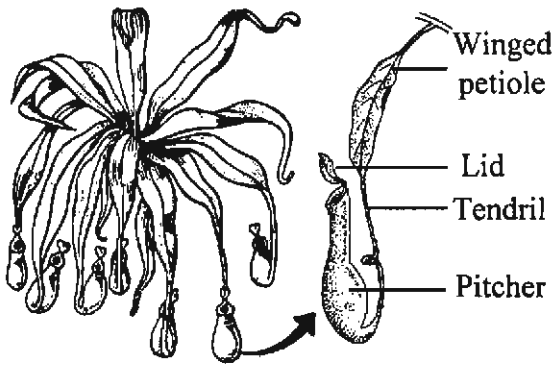


Fig. 10.26 Nepenthes - Pitcher plant

2. Drosera

It is also known as Sundew plant. It is grown in the hills of Kashmir.

They have long stalked leaves arranged in the form of a rosette (circular manner). The inflorescence arises at the center. The leaf blade is circular in shape and bears a number of tentacles on their margin. The swollen end of each tentacle secretes a sticky digestive fluid, which glitters in the sun like dew drops, hence the name Sundew for this plant. As the insect sits on the leaf, the tentacles cover the insect. The digestive glands produce the juice for the digestion of insects (fig. 10.27).

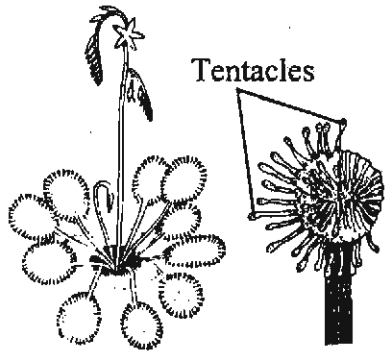


Fig. 10.27 Drosera

3.Utricularia

It is also known as bladderwort. It is found submerged in streams and ponds. These plants lack roots and possess small dissected leaves. Few leaves become modified into bladders. Each bladder is oval in shape, with glands and a valve. Many insects enter into the bladder, along with water stream. The valve becomes closed and digests the insects with the help of digestive juice (fig. 10.28).

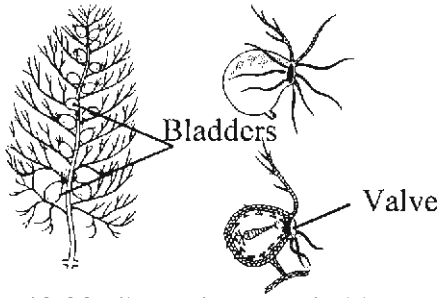


Fig. 10.28 Utricularia - Bladderwort

10.4.4 Intracellular digestion and Extra cellular digestion

Digestion is the process by which complex molecules of food are broken down into simple molecules. This process is more or less the same whether the animal is a single celled Amoeba or a complex multicellular organism like man.

There are two types of digestion in animals. They are (1) Intracellular digestion and (2) Extra cellular digestion.

1. Intracellular digestion

In unicellular organisms like ***Amoeba*** and ***paramecium,*** the food is ingested by means of pseudopodia and digested in food vacuoles by enzymes. The digested food is absorbed by diffusion. This type of digestion is known as intracellular digestion (fig. 10.29).

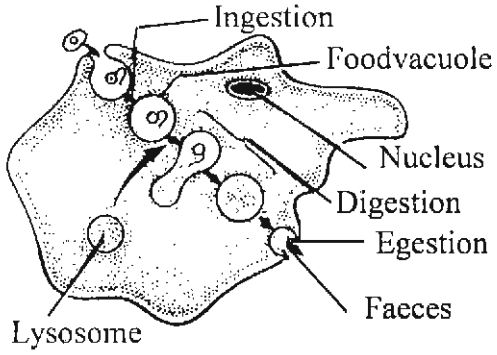


Fig. 10.29 Intracellular digestion of food in Amoeba

2. Extracellular digestion

In the higher organisms, there are special organs for the digestion of food. The food in these organisms passes through the alimentary canal. Here several digestive enzymes are secreted to break the complex food materials into simpler substances. In this type, digestion occurs not within the cell, but inside the cavities of the alimentary canal. This is called extra cellular digestion.

10.5 Habitat diversity

10.5.1 Introduction

The place where, plants and animals live is known as 'habitat'. It is classified into three types.

1. *Fresh water habitat*: ponds and lakes
2. *Marine habitat*: sea water
3. *Terrestrial habitat*: forest and mountains.

On the basis of water requirements, plants are classified into three types namely:

1. *Hydrophytes (Aquatic plants)*: Plants which grow in abundant water bodies like ponds, lakes, streams, rivers and ocean.
2. *Mesophytes*: plants which grow in places with moderate water supply like temperate and tropical regions.
3. *Xerophytes*: plants which grow in extreme dry habitats like deserts and sand hills.

10.5.2 Aquatic plants

Plants which grow in water either partly or wholly submerged are called

hydrophytes or aquatic plants. These plants may live in fresh water or sea water.

1.Planktons

Planktons are aquatic, free floating microscopic organisms. Those which contain chlorophyll are called phytoplanktons. They can prepare their own food. eg. *Diatoms, wolffia, Lemna, Pistia, Eichhornia* and *Azolla.* (fig. 10.30)

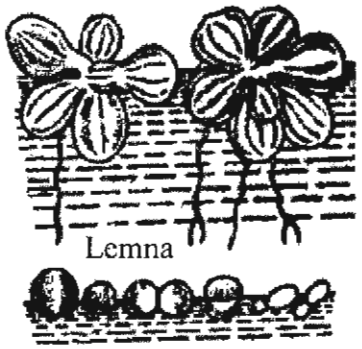


Fig. 10.30 Free floating hydrophytes

2.Benthos

Plants which grow in the shallow regions where they can get adequate supply of light are called Benthos. Some plants are completely submerged in water. They possess long stem and small leaves at the nodes. e.g. *Hydrilla, Ceratophyllum.*(fig. 10.31)

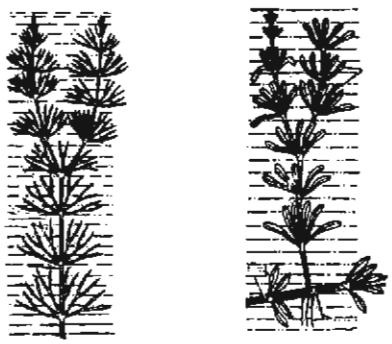


Fig. 10.31 Rooted submerged hydrophytes

Some plants have tuberous stem. The leaves are thin and ribbon shaped. eg. *vallisneria.*

But few submerged plants are rooted in muddy soil of ponds, rivers and lakes. Their leaves and flowering shoots float above the surface of water. eg. Water lily *(Nymphaea)*, Lotus *(Nelumbium)* (fig. 10.32)

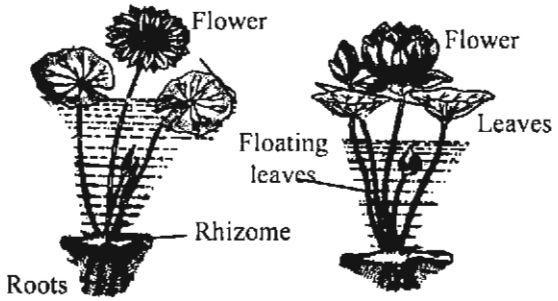


Fig. 10.32 Rooted floating hydrophytes

These green plants prepare the food material with the help of sunlight. The stored food is utilized by the animals. The oxygen evolved by the producers during photosynthesis is also utilized by all the living organisms for respiration.

10.5.3 Aquatic animals

Animals which live in water are called aquatic animals. They may live either in fresh water or in the sea.

1. *Sea water habitat*

Animals which live in sea water : eg. dolphin, shark, starfish and octopus.

2. *Fresh water habitat*

Animals which live in fresh water: eg. *Amoeba, vorticella, volvox* (fig. 10.33)

Fig. 10.33 Fresh water animals

1. Planktons (Zoo planktons)

The free living, free floating microscopic animals are called zoo planktons. These are the primary consumers in the ocean, ponds and lakes. eg. Larval stages of prawns and crabs (fig. 10.34).

Fig. 10.34 Zooplanktons

2. Deep sea animals

The ocean constitutes nearly 71% of the earth's surface. It is a big aquatic habitat which inhabits thousands of animals in various layers. Varieties of animals live 3000 feet below the sea surface. They are called deep sea animals. eg. angler fish, viper fish, star fish and prawn.

Deep sea animals are dwarfish in nature. They prey upon each other because they find it difficult to get food. They are normally brightly coloured. Deep sea is very dark. So these animals create their own light. This process is called Bioluminescence. They have well developed eyes (fig. 10.35).

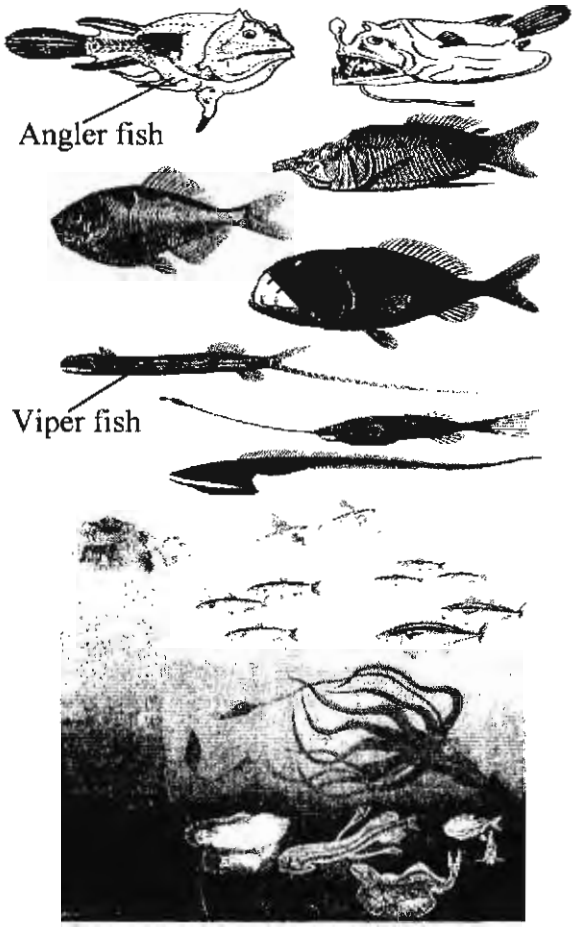


Fig. 10.35 Deep sea animals

10.5.4 Terrestrial Plants

Plants, which live on land, are called terrestrial plants. They can be classified into two types as mesophytes and xerophytes.

Mesophytes

These are intermediate plants between xerophytes and hydrophytes. With reference to their water requirements, they grow in habitats which are neither dry nor wet. Mesophytes need moderate amount of water and well-aerated soil for growth and development. Therefore they do not show any special structural adaptations to their mode of life. eg. sunflower, Hibiscus, mango tree,

garden plants, papaya and tamarind (fig.10.36).

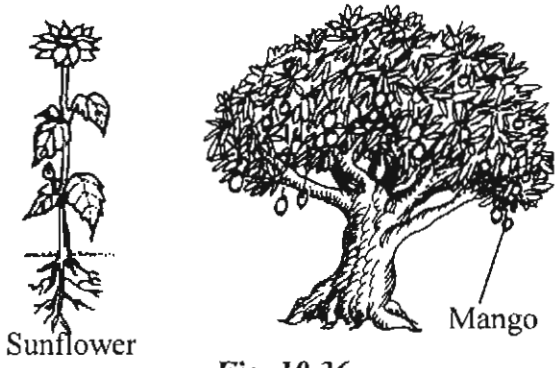


Fig. 10.36

Xerophytes

These plants live in deserts where there is scarcity of water due to poor rainfall. The air is hot and dry. There is intense light. The greatest need of desert plants is to absorb and conserve the available water. eg. Opuntia, Casuarina and Euphorbia, Asparagus, Nerium (fig. 10.37).

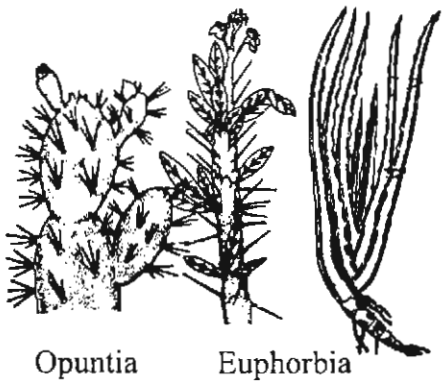


Fig. 10.37 Xerophytes

10.5.5 Terrestrial animals

Unlike fish and whale, we find large varieties of animals living on land. Such land dewelling animals are called terrestrial animals.

eg. Garden lizard, fox, ox and elephant.

Under terrestrial animals we are going to learn about :

(1) arboreal animals
(2) aerial animals
(3) cave dwelling animals.

Arboreal animals

Arboreal animals spend lot of their time on trees. eg. squirrels, chameleons, monkeys, birds etc. (fig. 10.38)

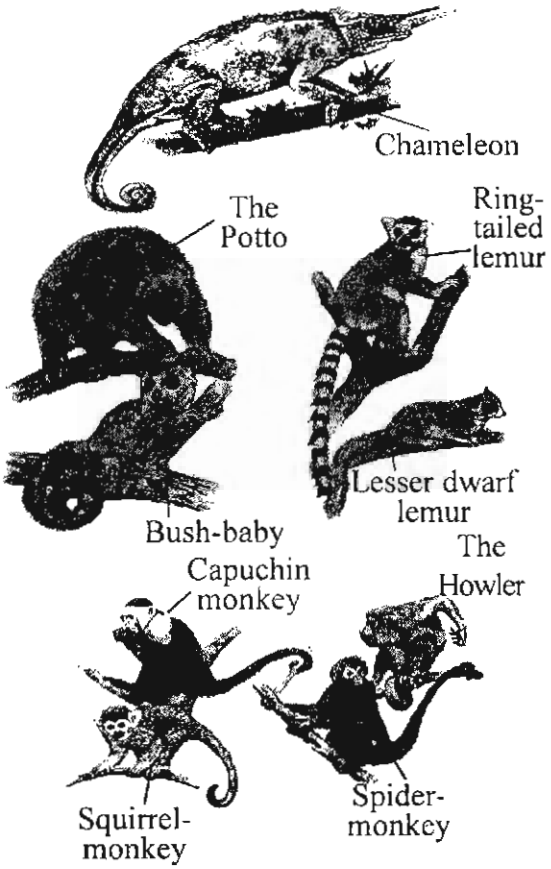


Fig. 10.38 Arboreal animals

Arboreal animals are comparatively small. Their chest, ribs and limbs are strong. They have claws or hooks to hold the tree branches. In monkey, the tail is **prehensile**. In the case of mammals the thumb and the great toe are **opposable**.

Aerial animals

Birds are best fitted for aerial mode of life. The body of bird is boat shaped. Their forelimbs are modified as wings. The exoskeleton is in the form of feathers, which help the birds to fly. They have powerful flight muscles. The jaws are modified as beaks. Their eyesight is keen and powerful. To reduce weight, they have hollow bones. Many of their bones are fused together. To get more energy, they have efficient breathing system (fig.10.39).

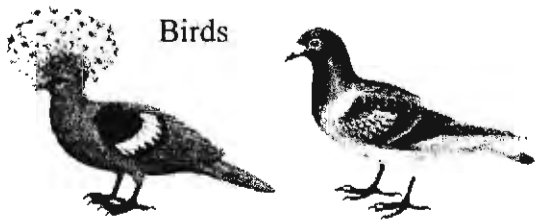


Fig. 10.39 Aerial animals

Cave dwelling animals

Cave is a natural hollow place in the earth or hill side with an opening.

Cave animals are either colourless or pale white colour. This is due to the absence of light. Their eyes are reduced in size or completely absent. But other sense organs are well developed. Body is elongated and slender. The cave arthropods are characterized by weak exoskeleton. The cave snails have thin shells. eg. Proteus and salamanders (fig. 10.40).

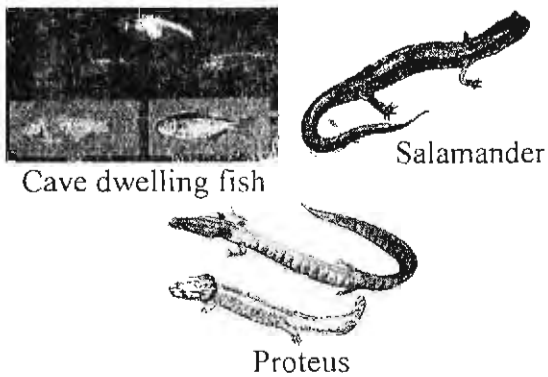


Fig. 10.40 Cave dwelling animals

SELF EVALUATION

I.*Choose the correct answer*

1. Riccia belongsto this class
   (a) Hepaticopsida (b) Bryopsida (c) Pteropsida (d) Gnetopsida
2. Conglobate gland is found in
   (a) male frog (b) male cockroach (c) female cockroach (d) female frog
3. Circinate vernation is found in
   (a) Riccia (b) Nephrolepis (c) Hibiscus (d) Opuntia
4. In Nepenthes _____ is modified into a pitcher
   (a) petiole (b) stalk (c) lamina (d) stem
5. An example for cave dwelling animal is
   (a) shark (b) toad (c) proteus (d) dragonfly

II. *Fill in the blanks*

6. In Riccia the zygote develops into _____
7. In Nephrolepis the spore bearing leaves are called _____
8. The young one of the cockroach is called _____
9. Vocal sacs are absent in _____
10. _____ is also known as bladderwort.
11. _____ and _____ are chemosynthetic autotrophs.
12. In birds, the jaws are modified as _____.

III. *Match the following*

13.	Cockroach	–	stem parasite
14.	Vocal sac	–	tick
15.	Viscum	–	insectivorous plant
16.	Ectoparasite	–	male frog
17.	Drosera	–	nymph
18.	Indusium	–	phytoplankton
19.	Diatom	–	sori

IV. *Give short answer*

20. Mention the two distinct regions of Riccia thallus.
21. What are the methods of vegetative reproduction in Riccia.
22. What is indusium?
23. Define alternation of generation.
24. How will you differentiate a male cockroach from a female cockroach?
25. Describe the female reproductive system of cockroach.
26. Differentiate forelimb and hindlimb of frog.
27. Draw and label the male urinogenital system of frog.
28. What are saprophytes?
29. What are mesophytes?
30. What is a habitat?

V. *Give detailed answer*

31. Explain the flight adaptations in birds.
32. What is intracellular digestion?
33. Explain the thallus structure of Riccia.
34. Draw and explain the sporophyte of fern.
35. Write short notes on alimentary canal of cockroach.
36. What are autotrophs? Explain the types.
37. Add a note on any two insectivorous plants.

11. Structural Organization

The branch of biology that deals with the study of cells is called cytology. It is also known as **cell biology.**

11.1 Cell theory

In early 19th century, **Theodar Schwann** and **Jacobs Schleiden** proposed the cell theory. It states that all organisms are made up of cells. They are formed from already existing cells.

11.1.1 History of cell studies

In 1665, **Robert Hooke** observed honey comb like structure, when he examined a cork slice under his microscope. He is an English botanist. In 1675, **Anton Van Leeuwenhoek** observed bacteria. In 1871,**Robert Brown**, an English botanist discovered nucleus. In 1840, **Purkinje** and **Mohl** discovered protoplasm. It is the living substance in the cell.

11.1.2 Types of cell

In plants, the cell is broadly classified into two types based on the organization.. They are i) Prokaryotic cell and ii) Eukaryotic cell.

i) Prokaryotic cell

The cell which shows **primitive cellular organization** is called prokaryotic cell. They do not have a nuclear membrane and nucleolus. So the nuclear components like DNA, RNA are scattered in the cytoplasm. The cell organelles like endoplasmic reticulum, Golgi complex, chloroplast, mitochondrion and vacuole are absent. e.g. ***Nostoc***, ***Oscillatoria*** and ***Escherichia coli*** (fig. 11.1).

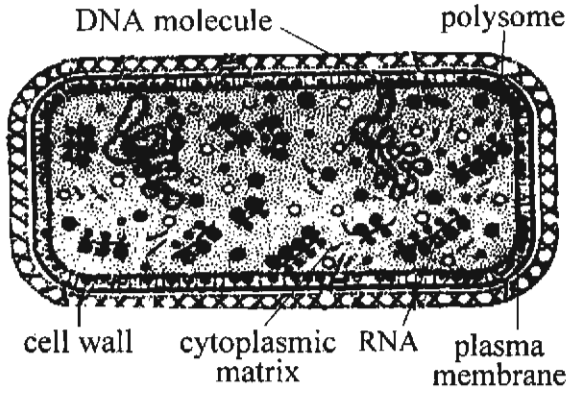


Fig. 11.1 A prokaryotic cell of Escherichia coli

ii) Eukaryotic cell

The cell which shows **advanced cellular organization** is called eukaryotic cell. They have an organized nucleus with nuclear membrane and nucleolus. DNA and RNA are found in the chromosomes. All the cell organelles are present in the cytoplasm. eg. All higher plants and animals (refer fig. 9.1).

Since majority of the cells are minute in their size, they cannot be seen by the naked eyes. Hence, microscope is important in the study of cells. A microscope is an instrument through which the organisms are seen magnified (fig. 11.2).

It consists of condenser lens, stage, objective lens, eye piece lens, and adjusting knobs.

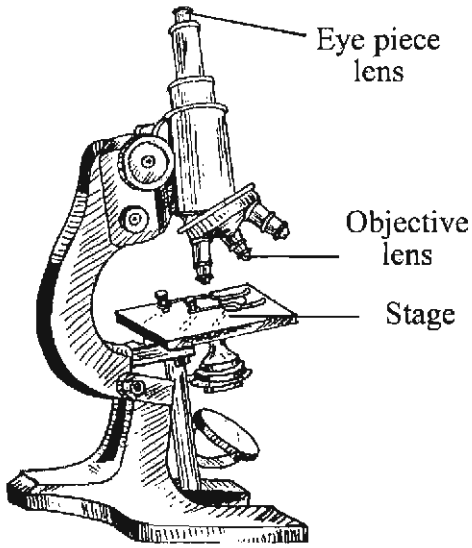


Fig. 11.2 Compound Microscope

Have you ever seen crow, lizard, frog and hen's egg? The eggs of these animals are unicellular and are bigger in size. Do you know why? The egg cells are bigger in size, because they store food materials in the form of yolk.

iii) Comparison of an animal cell and a plant cell

You have already learnt the structure of animal cell and plant cell in the Chapter 9. Even though they are similar in their structure, they show some differences.

Sl. No.	Animal cell	Plant cell
1.	The cell wall is absent.	The cell wall is present.
2.	Chloroplast is absent.	Chloroplast is present
3.	The vacuoles are smaller in size	The vacuoles are bigger in size
4.	Centrosomes are present	Centrosomes are absent.
5.	Golgi apparatus is well developed.	Golgi apparatus is not well developed.

11.2 Tissues

The body of a plant is made up of several kinds of cells. A group of cells having a common origin and performing the same function is called tissue.

The plant body contains two major types of tissues. They are

i) Meristematic tissue and

ii) Permanent tissue

i) Meristematic tissue

The meristematic cells are rectangular in shape. They are arranged without intercellular space. They are thin walled. They contain **prominent nucleus and dense cytoplasm**. These are found in the apices of root and shoot. Their function is to **undergo repeated divisions** and leads to growth of the plant (fig. 11.3).

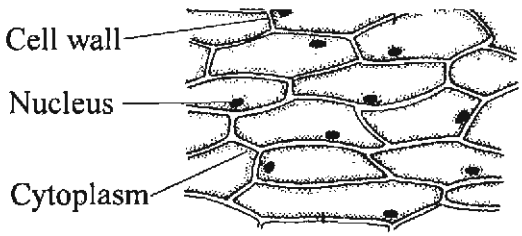


Fig: 11.3 Meristematic tissue

ii) Permanent tissue

The tissue which has lost the capacity of cell division is called permanent tissue. It is divided into two types. They are simple tissue and complex tissue.

11.2.1 Simple tissue

Simple tissue is made up of only **one type of cell**. They are similar in their structure and function. They are classified into three types, namely,

parenchyma, collenchyma and sclerenchyma.

i) Parenchyma

Parenchyma cells are oval in shape and are **thin walled.** They are **living** and are arranged with intercellular spaces. They are present in all the organs of a plant body and their main function is storage (fig. 11.4).

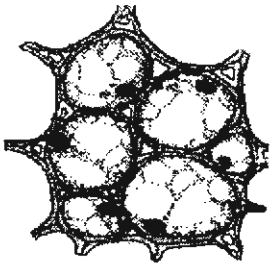


Fig. 11.4 Parenchyma cells

When the parenchyma cells contain chloroplasts, they are called **chlorenchyma.** They perform the function of photosynthesis. In aquatic plants, large intercellular spaces filled with air are called **aerenchyma**. It gives buoyancy to the plants.

ii) Collenchyma

Collenchyma cells are elongated. They have **uneven thickening** in the corners. The cell wall is made up of cellulose and pectin. These cells are living and are usually seen in the young stem and petiole. They provide support to the young organs (fig. 11.5).

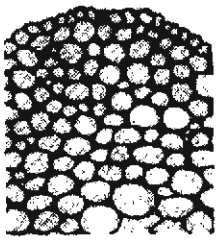


Fig. 11.5 Collenchyma cells

iii) Sclerenchyma

Sclerenchyma cells are polygonal. The cell wall is made up of **lignin**. These are dead cells, because of the absence of protoplasm. They provide mechanical support and strength (fig.11.6).

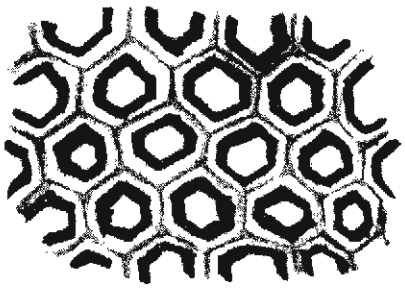


Fig. 11.6 Sclerenchyma cells

11.2.2 Complex tissues

The tissue containing **more than one type of cell** and performing same function is called complex tissue. They are of two types namely xylem and phloem.

i) Xylem

It is a complex tissue. It contains four different types of cells. They are

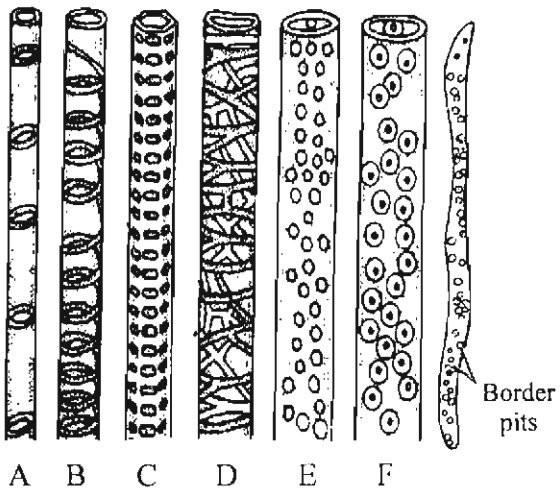


Fig. 11.7 Various kinds of vessels. A-Annular; B-Spiral; C-Scalariform; D-Reticulate; E&F-Pitted.

vessels, tracheids, xylem fibres and xylem parenchyma. Its function is to conduct **water and minerals** from root to shoot (fig.11.7).

ii) Phloem

It is a complex tissue. It contains four different types of cells. They are sieve tubes, companion cells, phloem fibres and phloem parenchyma. Its function is to transport **food materials** from green parts to the storage regions of the plant (fig 11.8).

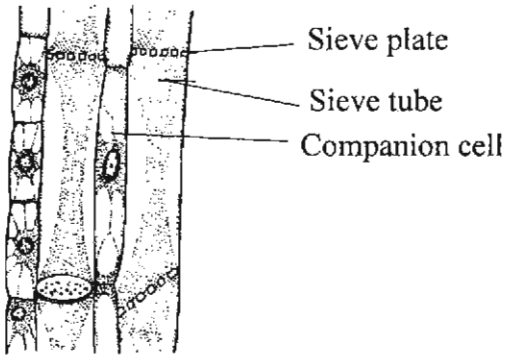
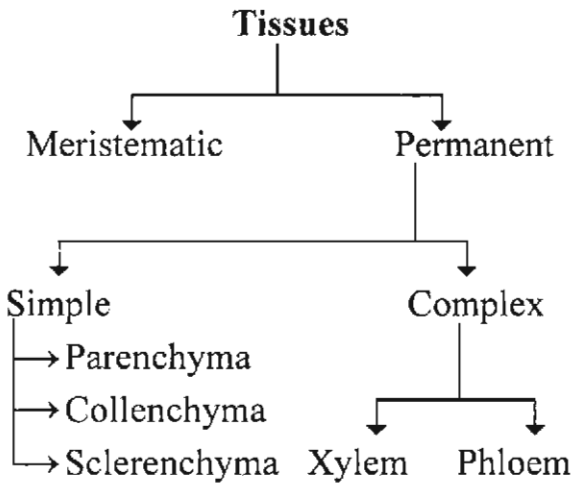


Fig. 11.8 Phloem-Sieve element and companion cell



Activity 11.1

Obtain a white lily flower with a short stalk and dip it in water coloured with eosine dye. Observe the stem and the petals after one hour.

11.3 Animal Tissues

11.3.1 Tissue concept

The body of an animal is made up of several kinds of cells. A group of cells that are similar in structure and origin, performing the same function is called **tissue**.

11.3.2 Types of tissues

There are several kinds of tissues in animals. They are

i) Epithelial tissue
ii) Muscular tissue
iii) Nervous tissue
iv) Bone tissue
v) Blood tissue
vi) Reproductive tissue

i) Epithelial Tissue

Epithelial tissue forms the covering of the body. It also lines the various cavities. Based upon their shape, function and arrangement, it is divided into six types namely, 1) Columnar epithelium 2) Ciliated epithelium

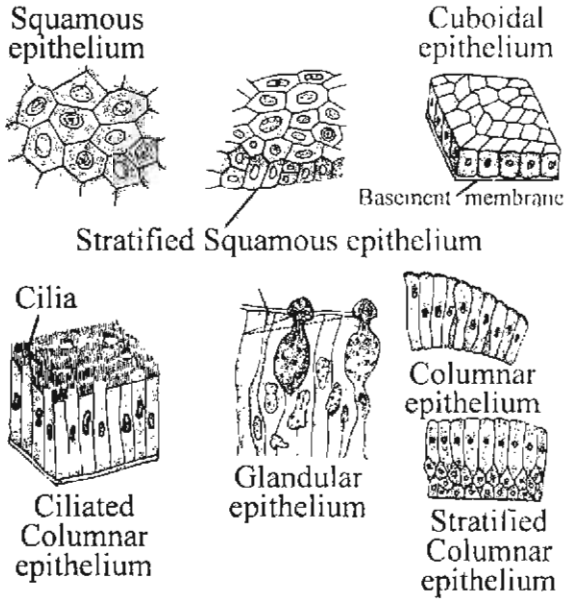


Fig. 11.9 Different types of epithelial tissues

3) Squamous epithelium 4) Cuboidal epithelium 5) Glandular epithelium 6) Germinal epithelium (fig. 11.9).

ii) Muscular tissue

The muscle cells, which are long and fibre- like, are called muscle fibres. They possess the property of **contraction** and **relaxation**.

There are three types of muscular tissues, namely a) Striped muscles b) Unstriped muscles and c) Cardiac muscles

a) Striped muscles

Striped muscle cells are long and cylindrical. These muscles lie attached to the hand and leg bones. They help in movement (fig.11.10).

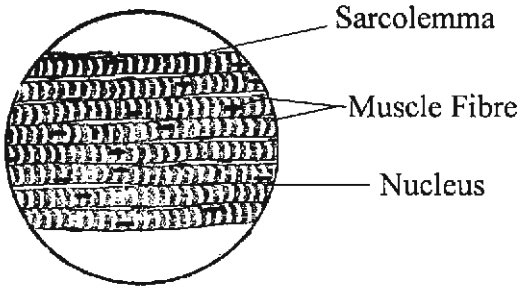


Fig. 11.10 Striped muscle fibres

b) Unstriped muscles

Unstriped muscle cells are small, spindle shaped with tapering ends. They occur in the wall of the alimentary canal, blood vessels and urinary bladder (fig.11.11).

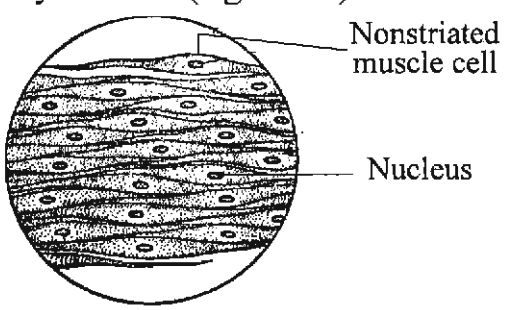


Fig. 11.11 Unstriped muscle fibres

c) Cardiac muscles

Cardiac muscle cells are short and branched. They have nucleus and number of stripes in the cytoplasm. The **wall of the heart** is made up of cardiac muscle (fig. 11.12).

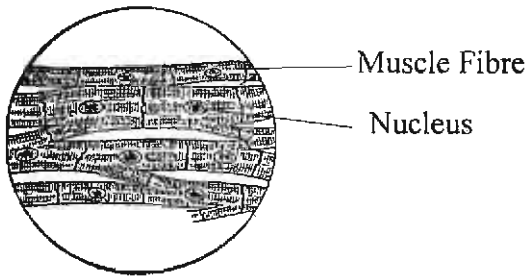


Fig. 11.12 Cardiac muscle fibre

iii) Nervous tissue

The nervous tissue is made up of neurons or nerve cells. These are long and fibre like. They are also called as nerve fibres. Each nerve cell consists of a large cell body or cyton containing a distinct nucleus and branched processes called Dendrons or Dendrites. One of these processes is long and unbranched and is called axon. **Brain** and **spinal cord** are made up of nerve cells (fig. 11.13).

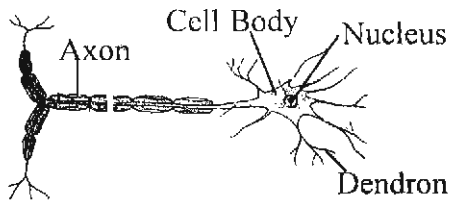


Fig. 11.13 Nerve Cell

iv) Bone tissue

Bone tissue is strong and rigid and made up of a number of bone cells. The cross section of bone shows certain longitudinal canals called **Haversian canals**. Inside these canals, lie blood vessels and nerves. Surrounding each

haversian canal there are many bone cells. Each bone cell lies in a space called **lacuna**. All the bone cells are connected with each other and with the haversian canals by narrow channels called **canaliculi**. The bone cells obtain oxygen and food materials and get rid of waste materials through these canaliculi (fig. 11.14).

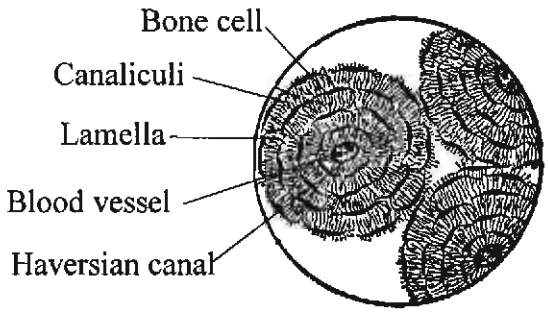


Fig. 11.14 T.S of bone

v) Blood tissue

Blood is the only tissue in the **fluid form** . Blood consists of a fluid matrix called plasma and solid components called the corpuscles.The blood cells are of three types. They are Red blood cells White blood cells and Platelets.

Plasma

It is a clear, transparent, straw coloured fluid. It consists of 90% of water and 10% of dissolved substances like proteins, carbohydrates, salts, hormones, enzymes and antibodies.

Red blood cells are circular, biconcave and disc shaped without any nuclei. They contain a pigment called **haemoglobin.** It gives red colour to the blood. They play an important role in the transportation of oxygen and carbon dioxide.

White blood cells are irregular in shape, with a nucleus. They are **colourless** and exhibit amoeboid movement. They fight against the pathogen.

Platelets are small and colourless. They do not contain any nucleus. They play an important role in the **clotting of blood** (fig. 11.15).

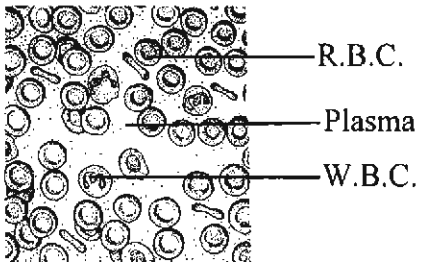


Fig. 11.15 Blood smear under the microscope

vi) Reproductive tissue

Testis is the male reproductive organ. It produces the sperms. The **ovary** is the female reproductive organ. It produces the ova.

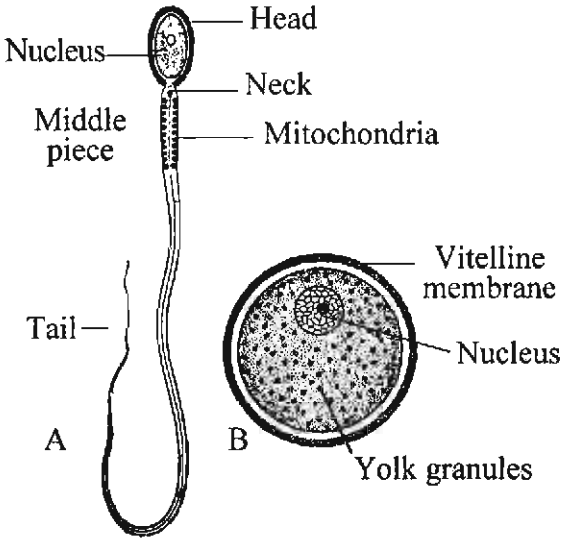


Fig. 11.16 A. The sperm B. The ovum

The sperms are very active and motile. The ova contain the reserve food materials called yolk. They are non motile (fig.11.16).

11.4 Dermal system in plants

The tissues in the higher plants are arranged in a specific way to perform specific function. This is called tissue system.

Each tissue system consists of only one type of tissue or several types of tissues. They have common origin and perform the same function.

All the external covering tissues that protect the internal parts of the plant are called epidermis.

11.4.1 Types of tissue systems in a plant

The tissue system is classified into three main types. i)The dermal or epidermal tissue system ii) The fundamental or ground tissue system and iii) The vascular tissue system.

11.4.2 Dermal system – definition and function

The plant body is covered by a layer called dermal system. In the aerial parts of the plant, the outer walls of the epidermis have a waxy covering called the cuticle.

Functions of dermal system

1. It protects the internal tissues from mechanical injury and heat or cold.

2. It prevents the evaporation of water with the help of the thick cuticle and wax.

3. The epidermis also protects the plant against the attack of herbivorous animals.

4. This layer stores water in many xerophytic plants.

5. Some of the epidermal cells develop into absorbing hairs of roots.

11.4.3 Epidermis –stomata –bark

Epidermis

Epidermis is made up of single layered, parenchymatous cells. These cells are arranged without intercellular space. The epidermis of leaves and green stem possess stomata. They are non -living at maturity. Some of the cells are filled with tannin, gum, mucilage, toxins and irritants (fig. 11.17).

The outermost layer of the root is called epiblema. The cuticle and stomata are absent.

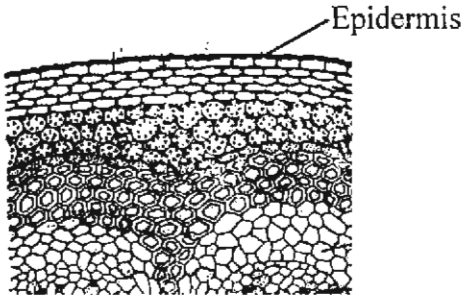


Fig. 11.17 Transverse section of stem

Stomata

These are minute openings formed in the epidermal layer of the leaves. Each stomata is surrounded by two bean shaped cells known as guard cells. These are living and contain chloroplast. The inner walls of the guard cells are thick and the outer walls are thin. Stomata occur on both upper and lower epidermis of leaf. They are numerous on the lower epidermis. In **floating hydrophytes** like water Lily they are present on the upper epidermis. In submerged plants

stomata are absent. **In xerophytic plants** stomata are present in the grooves or pits (fig. 11.18).

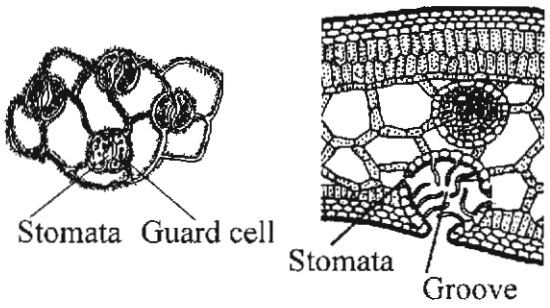


Fig. 11.18 Stomata in leaves

Function

1. Stomata are used for interchange of gases between the plant and the atmosphere.

2. Evaporation of water also takes place through stomata.

Bark

It is one of the protective tissue. It includes all the dead tissues present outside the vascular cambium of the stem (fig.11.19).

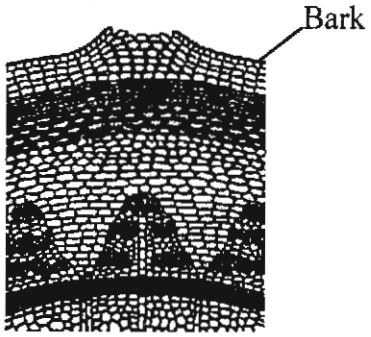


Fig. 11.19 Transverse section of dicot stem secondary growth

11.4.4 Hairy outgrowths on stems and roots

In many plants, epidermal cells bear outgrowths, known as hairs or trichomes. These are either unicellular or multi cellular. They may be simple or branched. The multi cellular hairs may be branched in one plane called stellate hairs.

The glandular hair in ***Jatropha***, secretes a sticky pungent fluid. The stinging hairs of ***Nettles*** secrete an irritating fluid. The tip of this hair is sharp and hard. When the body of animal or human being contact with some force, the tip is broken off. The sharp pointed end penetrates the skin and injects the fluid into the skin. This causes an irritation. Thus these plants are protected from grazing animals (fig.11.20).

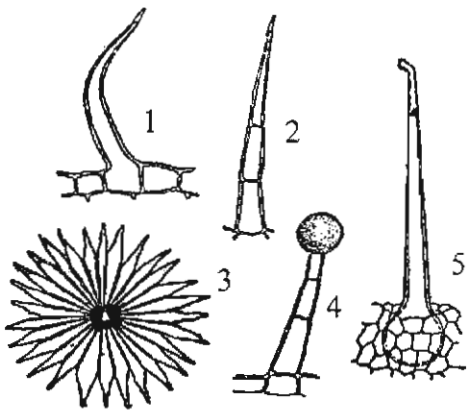


Fig. 11.20 Epidermal hairs
1. Unicellular hair 2. Multicellular hair
3. Stellate hair 4. Glandular hair
5. Stinging hair.

The outer walls of roots form tubular, unicellular out growth called root hairs. It is mainly concerned with the absorption of water and mineral salts from the soil.

11.5 Dermal system in animals

Integument is the outer covering of animals – the skin and associated organs and structures. It is the protective coat of an animal. It is the first defence mechanism of the animal.

11.5.1 Skin in man

The skin in man consists of two layers.

1. Upper epidermis

It is the superficial layer of the epidermal cells.

2. Dermis

The deep layer of the skin is called Dermis. This layer contains a number of blood vessels and capillaries. It also consists of a large number of sweat and sebaceous glands (oil glands)

The fat is deposited beneath the skin. The uppermost layer of the lower epidermis is Malpighian layer. It contains melanin pigments which are responsible for skin colour. The hair develops from the hair follicles (fig. 11.21)

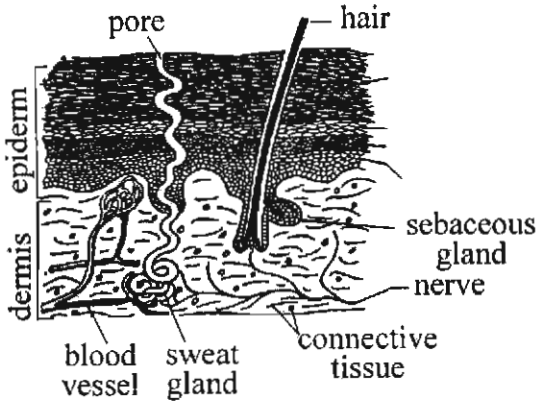


Fig. 11.21 Diagram of section through human skin.

Functions of the skin

1. The skin protects the organs from mechanical injury and microbes.

2. It removes waste materials from the blood through sweat.

3. The secretion of the oil glands moistens the skin and the hair.

4. It acts as s sense organ.

5. It helps to maintain the body temperature.

In fire accidents, the skin is completely burnt. So there is no protection for the internal organs. Due to this, people die of infection. Hence, skin is the first order of defence.

11.5.2 Integumental modifications

The modifications seen in the skin of animals to perform some specific function is called integumental modification. The following are the types of modifications.

Glands

The mucous glands, sebaceous glands, sweat glands, poison glands and mammary glands are found in the skin.

a) The mucous glands

These are found in the skin of fish and frog. These glands secrete a colourless watery fluid, the mucus that keeps the skin moist, glistering and sticky. These glands help the animals to escape from enemies. In frog, they help in cutaneous respiration.

b) Sebaceous glands

The sebaceous glands secrete an oily secretion which keeps the hair and skin greasy.

c) The sweat glands

The sweat glands remove excess of salt and water from the blood.

d) The poison glands

The poison glands are present in the skin of animals like frogs and toads.

These glands secrete a mild poison that protects the animal to some degree from the enemies.

e) The mammary glands

The mammary glands in mammals secrete milk to feed the young ones.

Nails, horns, claws and Hooves

Nail

The nails are hard, horny and slightly curved plates. They are protective in function. The nails grow continuously throughout the life.

Horns

Horns are found in both male and female goats, sheep, cattle and mountain sheep. The horns protect these herbivores from carnivores .

In Rhinoceros the horn is present on the snout. It is very strong. It is not formed of bone but of hairs which have fused together (fig.11.22).

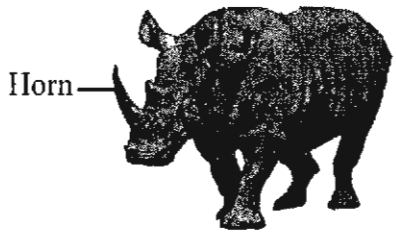


Fig. 11.22 Rhinoceros

Claws

The claws are horny points produced on the ends of the digits. Claws are used in different ways.

a) Cats use their claws for holding and killing their prey.

b) The chicken use their claws for scratching on the ground.

c) Eagles use their claws for seizing their prey (fig.11.23).

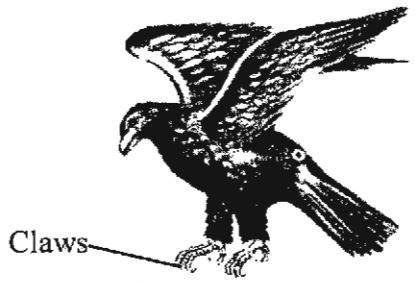


Fig. 11.23 Eagle

Hooves

The horny substance covering the foot of certain animals such as horse and deer is called Hoof. Pigs, musk deer, camel, giraffe, antelope, sheep, goat are hoofed herbivorous animals (fig.11.24).

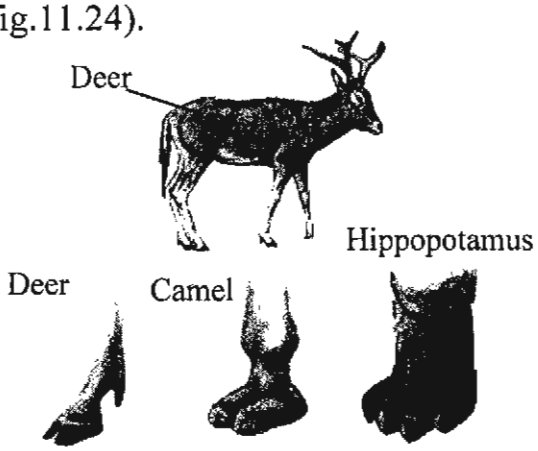


Fig. 11.24 Some types of hoof

Scales

The scales are found in the skin of fish. These scales are of three types namely, placoid scales, cycloid scales

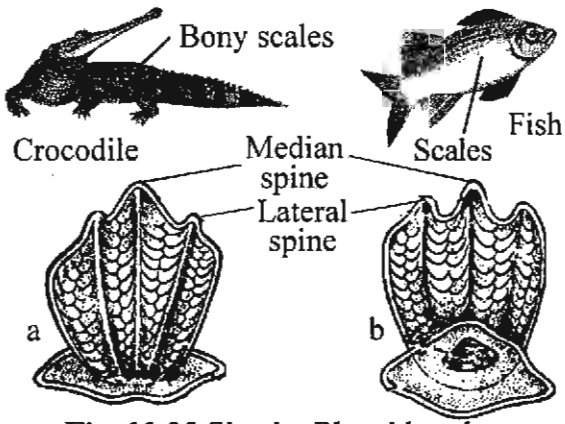
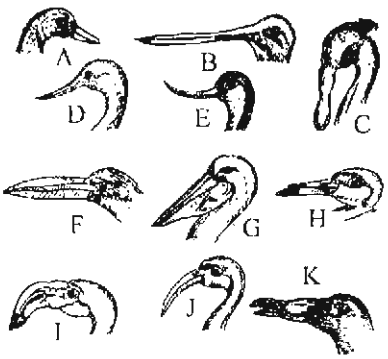


Fig. 11.25 Shark Placoid scales. a-Dorsal view; b-Ventral view.

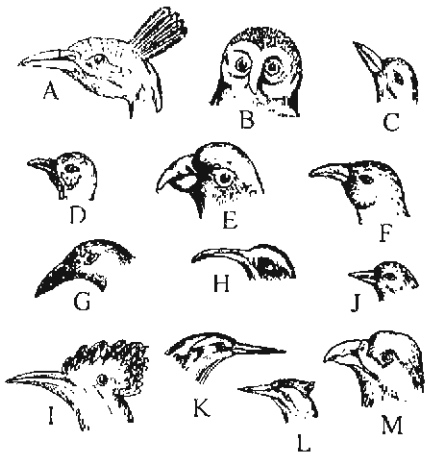
and ctenoid scales. The scales are also found in animals such as snakes and garden lizards. In crocodile, the skin is covered by bony scales (fig.11.25).

Beaks

Beaks are horny sheaths enclosing the bones of the upper and lower jaws. They are modified according to their modes of feeding. Beaks also help the birds to hold their prey and fight with their enemies (fig.11.26).



Beaks of aquatic birds.(A) Anser,(B) Capella,(C) Platales,(D) Plotus,(E) Avocet, (F) Anastomus,(g) Palecanus, (H) Rhynchops,(I) Phaenicopterus,(J) Ibis, (K) Spatula.



Beaks of terrestrial birds. (A) Peacock, (B) Owl, (C) Thrush, (D) Pigeon, (E) Parrot, (F) Magpie, (G) Crow, (H) Sun bird, (I) Sparrow, (J) Hopper, (K) King fisher, (L) Woodpecker, (M) Kite.

Fig. 11.26

Feathers

Feathers are the exoskeleton of birds. The presence of feathers is one of the important characteristics of birds. The different types of feathers found in birds are 1) quill feathers (fig.11.27) 2) contour feathers 3) Filoplumes and 4) Down feathers.

Fig. 11.27 A quill feather

Hairs

Hairs are found only in mammals (fig. 11.28). They cover the whole body but in some mammals, they are present in the form of sensory hairs.

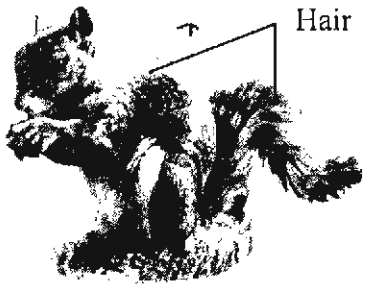


Fig. 11.28 The Squirrel

In porcupine, the body is covered with long erectile spines which are modified,hairs (fig. 11.29).

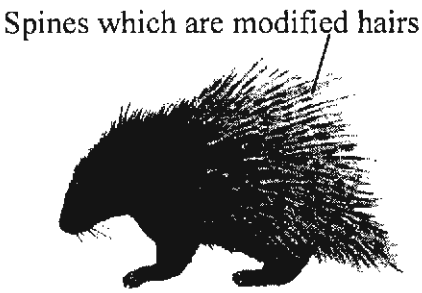


Fig. 11.29 The common porcupine

SELF EVALUATION

I. Choose the correct answer

1. The nucleus was discovered by
   (a) Robert Hooke (b) Purkinje (c) Robert Brown (d) Mohl
2. The secondary walls of sclerenchyma are made of
   (a) lignin (b) cellulose (c) Pectin (d) Suberin
3. _____ glands keep the hair and skin greasy
   (a) mucous glands (b) sweat glands
   (c) sebaceous glands (d) mammary glands
4. The glandular hairs are present in
   (a) Jatropha (b) Nettles (c) cucurbita (d) hairs
5. In crocodile, the skin is covered by
   (a) Hooves (b) bony scales (c) beaks (d) hairs

II. Fill in the blanks

6. Plastids are present in _____.
7. _____ tissue stores the food materials.
8. The long and unbranched process of nerve cell is called _____.
9. The plant body is covered by _____ system.
10. _____ are the exoskeleton in birds.
11. RBC contain a pigment called _____.
12. Phloem is a _____ tissue.

III. Match the following

13.	Nettles	–	Camel
14.	Bony scale	–	Horn
15.	Hoof	–	Prokaryotic cell
16.	Rhinoceros	–	Sebaceous gland
17.	Skin	–	Haemoglobin
18.	RBC	–	Phloem
19.	Companion cell	–	Crocodile
20.	Nostoc	–	Stinging hair

IV. *Write short answers*

21. Define cytology
22. Write any two differences between an animal cell and a plant cell
23. What is aerenchyma?
24. What are the various kinds of Xylem vessels?
25. Name the cells that help in blood clotting.
26. Describe the structure of a sperm.
27. What is bark?
28. What is stinging hair?
29. What is hoof?
30. Write any four functions of the skin.
31. What are the different kinds of scales found in fishes?
32. Define tissue.
33. What are prokaryotic cells?

V. *Write detailed answers*

34. Briefly explain simple permanent tissues.
35. Add a note on stomata.
36. Explain the components of blood.
37. Add a note on Horns,claws and hooves.
38. Write notes on hairy outgrowth on the stem.

12. Our Environment

The region of the world where we live is called our **environment.** The environment literally means the surrounding. The different regions of the earth have different environment. Soil, temperature, humidity, pressure, sun light and rainfall are environmental factors.

The natural place where organisms live is called **habitat**. It implies a particular set of environmental factors. For example fish lives in water. It cannot live on land. So fish has **aquatic habitat**. Does a rat live in water? No, it cannot live in water because it is adapted for land. So it has **terrestrial habitat** (fig. 12.1).

Fig. 12.1 Terrestrial and aquatic habitats

12.1 Biosphere

Any living plant or animal is called an **organism**. The living organisms exist in variety of habitats. The habitats may be land, water and air. The world of living organisms together with land, water and air on the surface of the earth is called **biosphere**.

12.1.1 Living components of Biosphere

The living component of the biosphere consists of three organisms. They are producers, consumers and decomposers. They are also known as **biotic components**. The producers are plants; the consumers are animals whereas the decomposers are bacteria and fungi. Thus the living component of the biosphere consists of plants and animals.

12.1.2. Non-living components of biosphere

The non-living component of the biosphere consists of physical environment. It includes soil, water and air. They are also known as **abiotic components**. Sun light, temperature, pressure and humidity are examples for abiotic components. They constitute the climatic conditions. The climate of an area determines the type of organisms.

The biotic components interact with the abiotic components in different ways for their survival. The effect of fire on forest and the effect of strong wind on the branch growth of the plants can be observed from the figures 12.2 and 12.3.

Fig. 12.2 Effect of fire on forest

12.1.3 Structure of biosphere

The biosphere consists of three parts namely lithosphere, hydrosphere and atmosphere (fig.12.4). The lithosphere, the hydrosphere and the atmosphere are enveloping the earth.

Fig. 12.3 Effect of strong wind on the growth of a plant

(i) Lithosphere

In Greek 'lithosphere' means stony sphere. The earth has soil and rocks on its surface. The solid outer portion of the earth containing soil and rocks is called lithosphere.

(ii) Hydrosphere

The water region on the surface of earth is called **hydrosphere**. There is a lot of water on the surface of earth in the form of ponds, lakes, rivers, oceans and underground water. The marine habitat occupies the major portion. To improve the underground water source, rainwater harvesting is essential. In fact the life originated first in water and later spread to land and air. Organisms can exist in water upto about four kilometres below the sea level.

(iii) Atmosphere

The earth's air envelope is called **atmosphere**. It is a mixture of gases. The air is a gaseous component of the earth. The organisms can exist upto seven to eight kilometres in air above the sea level.

The lithosphere, the hydrosphere and the atmosphere consist of solid, liquid and gaseous matter respectively. These three zones alongwith plants and animals constitute the **biosphere**. In the biosphere there is a constant interaction between living and non-living components.

Activity 12.1

With your teacher visit a lawn or paddy field or school garden or park or pond. Record various biotic components.

12.2 Energy flow

Every biological activity needs energy. Solar energy is the prime source of energy for all living organisms. This

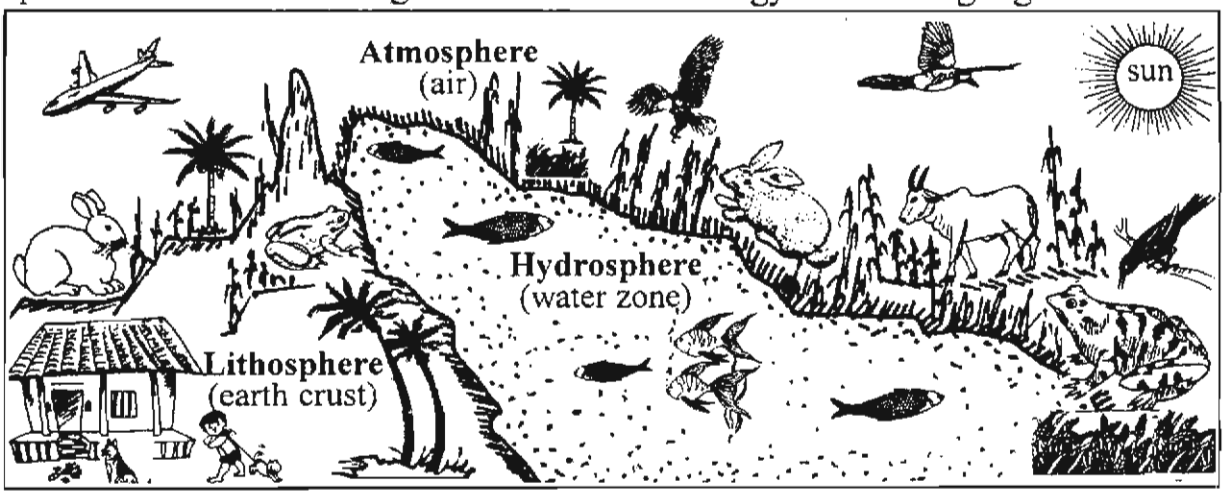


Fig. 12.4 The structure of biosphere

energy is transformed into chemical energy in plants.

The green plants prepare starch by **photosynthesis**. The energy trapped by the plants is made available to different kind of animals. The figure 12.5

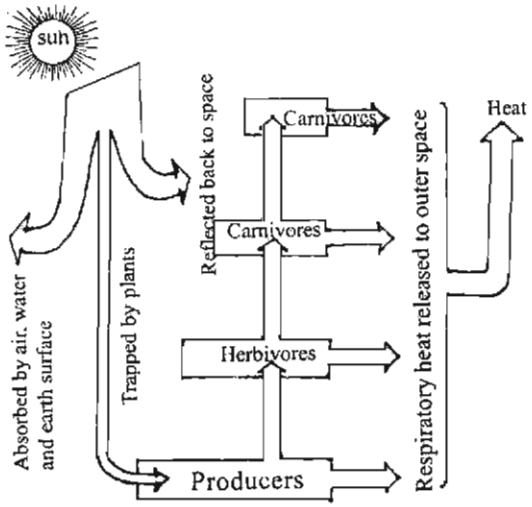


Fig. 12.5 Flow of energy from the sun to different organisms

illustrates the flow of energy from the sun to different organisms.

12.2.1 Food chain

The nutrient of the organisms is called food. The organisms eat to survive. The food contains energy. Energy can be transferred from one organism to another through **food chains**. All food chains begin with green plants. They are the original sources of energy.

Let us discuss an example to understand the meaning of food chain. In a paddy field, there exists a variety of organisms. Plants can be eaten up by grasshopper. The grasshopper in turn, can be eaten up by a frog. The frog can be eaten up by a snake. Finally the snake can be consumed by hawk (fig. 12.6). So we find that there is a sequence in which one organism eats up other organisms for its survival. *The sequence of living organisms in which one organism consumes another organism to transfer food energy is called food chain.*

Illustrations for simple food chain

1. The grass is eaten up by animals like deer. This deer is then consumed by a lion (fig. 12.7). In this energy transfer there are three levels, so it is called three links food chain.

Fig. 12.7 Food chain - three links

2. The four links food chain operating in a grass land is illustrated in the figure 12.8.

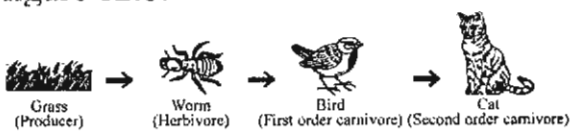


Fig. 12.8 Food chain - four links

12.2.2 Biotic Components

(i) Producers

The organisms which prepare their own food are called **producers**. So the green plants are called producers. Since

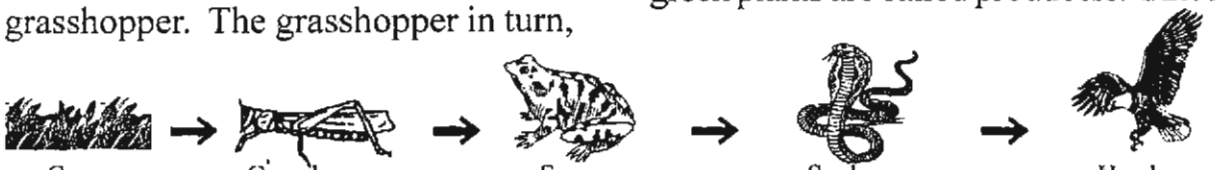


Fig. 12.6 Food chain - five links

the plants are self feeder organisms, they are also known as **autotrophs**. The carbon dioxide is present in the atmosphere. Water is absorbed by the root from the region of hydrosphere. The green pigment is present in the plants. Making use of carbon dioxide and water, the green plants convert the light energy into chemical energy of carbohydrates.

The plants which are growing on land are called **terrestrial plants**. eg. mango, ***Opuntia***, paddy, etc.,(fig. 12.9). Certain

Fig. 12.9 Terrestrial plants

plants are also growing in water. These plants are known as **aquatic plants**. eg. ***Pistia, Vallisneria, Eichhornia,*** etc., (fig. 12.18).

(ii) Consumers

The animals which feed on plants and other animals are called **consumers**. They are further divided into three groups namely herbivores, carnivores and omnivores. The animals which feed only on plants are called **herbivores**. eg. deer, goat, cow, horse, etc., (fig. 12.10). These animals are also known as **primary consumers**. They occupy second energy level in the energy flow.

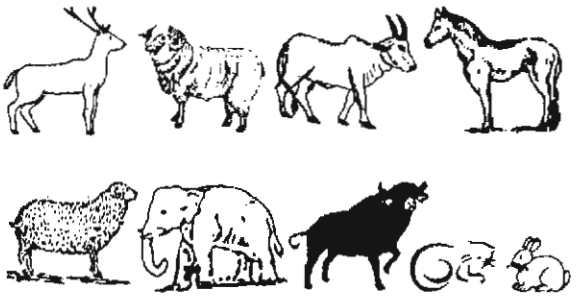


Fig. 12.10 Herbivores

Those animals which do not feed on plants but feed only on herbivores are called flesh eaters or **carnivores**. eg. frog, lion, tiger, snake, etc., (fig. 12.11). These animals are also known as **secondary consumers**. They occupy third energy level in the energy flow.

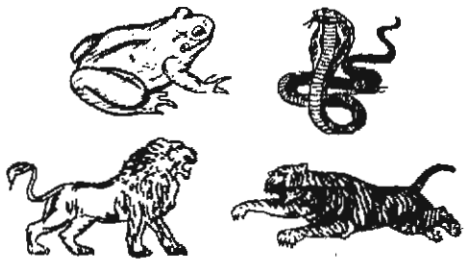


Fig. 12.11 Carnivores

Those animals which feed on both plants and animals are called **omnivores**. e.g. crow, pig, cock, man, etc., (fig. 12.12). These animals occupy the top level in the energy flow.

Fig. 12.12 Ominivores

(iii) Decomposers

The dead and decaying organisms are termed as **detritus**. The detritus and the waste products of animals are

decomposed by bacteria and fungi. Hence they are known as **detrivores** or **decomposers.**

Activity 12.2

After a week of raining, visit a detritus area. Mark out a square measuring 1 m x 1 m. Put a peg at each corner. Don't stand on the area which is under your investigation. Observations may be made by kneeling down besides the square. Record the living things that you have observed in the given area.

12.2.3 Introduction to ecological pyramids

Each step in food chain is called **energy level**. It is also known as trophic level. The diagram showing the transfer of energy in a given set of organisms is called **ecological pyramid**. It is another way of representing energy transfer in a food chain.

Let us construct an ecological pyramid for the food chain illustrated in the figure 12.6. We count the number of plants, the number of grasshoppers, the number of frogs, the number of snakes and the number of hawks in the given area. The number of plants is very large; the number of grasshoppers is lesser; the number of frogs is still lesser; the number of snakes is still more lesser whereas the number of hawks is the least.

The plants are the producers and therefore they constitute the first trophic level. They occupy the base of the pyramid, as they are large. As we go up, the number of living organisms in the given area decreases. The herbivores occupy the second trophic level. The first order carnivores constitute the third trophic level followed by second order carnivore in fourth trophic level. The top carnivore occupies the top trophic level.

The various trophic levels can be represented diagrammatically as shown in the figure 12.13.

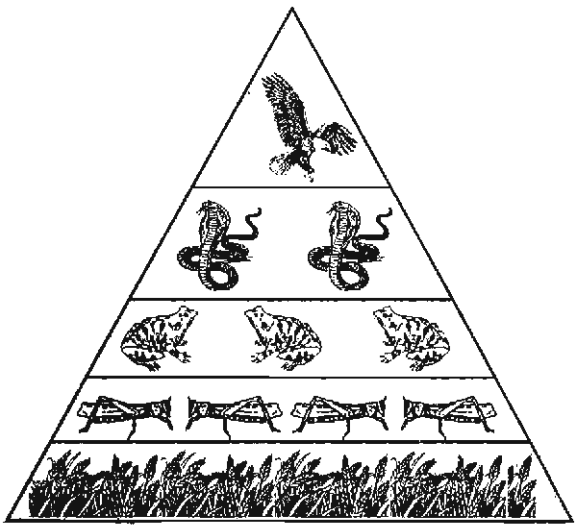


Fig. 12.13 Ecological pyramid of numbers

A simple pyramid of numbers showing three trophic levels grass → deer → tiger is shown in the figure 12.14.

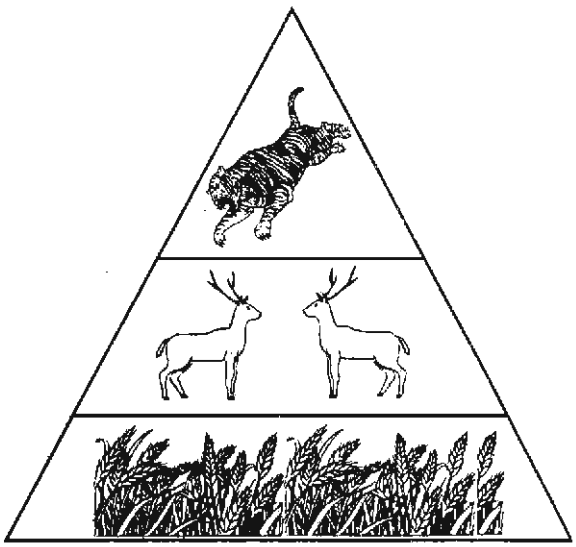


Fig. 12.14 Ecological pyramid of numbers

Activity 12.3

Go with your teacher to a natural habitat. Select two places that are very different, the wet and dry land.

Do different kinds of living things live in the same place?

12.2.4 Food web

The network of large number of food chains existing in the given set of organisms is called **food web**. It has many intercrosses and linkages. A food web is shown in the figure 12.15.

In this food web, we can see a number of pathways along which the energy flows. The food web starts with plants and ends with top carnivore. There are six linear food chains operating in the given food web. They are given below.

1. Plants → rabbit → hawk
2. Plants → rat → hawk
3. Plants → grain eating bird → hawk
4. Plants → rat → snake → hawk
5. Plants → grasshopper → hawk
6. Plants → grasshopper → frog → snake → hawk

The figure 12.16 illustrates another food web in a grassland. In this illustration there are five possible food chains interlocked one another. Will you write down the possible five linear food chains?

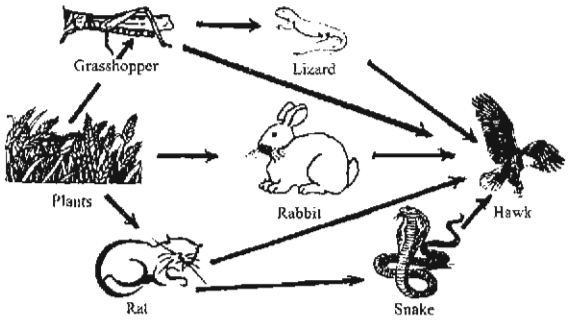


Fig. 12.16 Diagram showing a food web

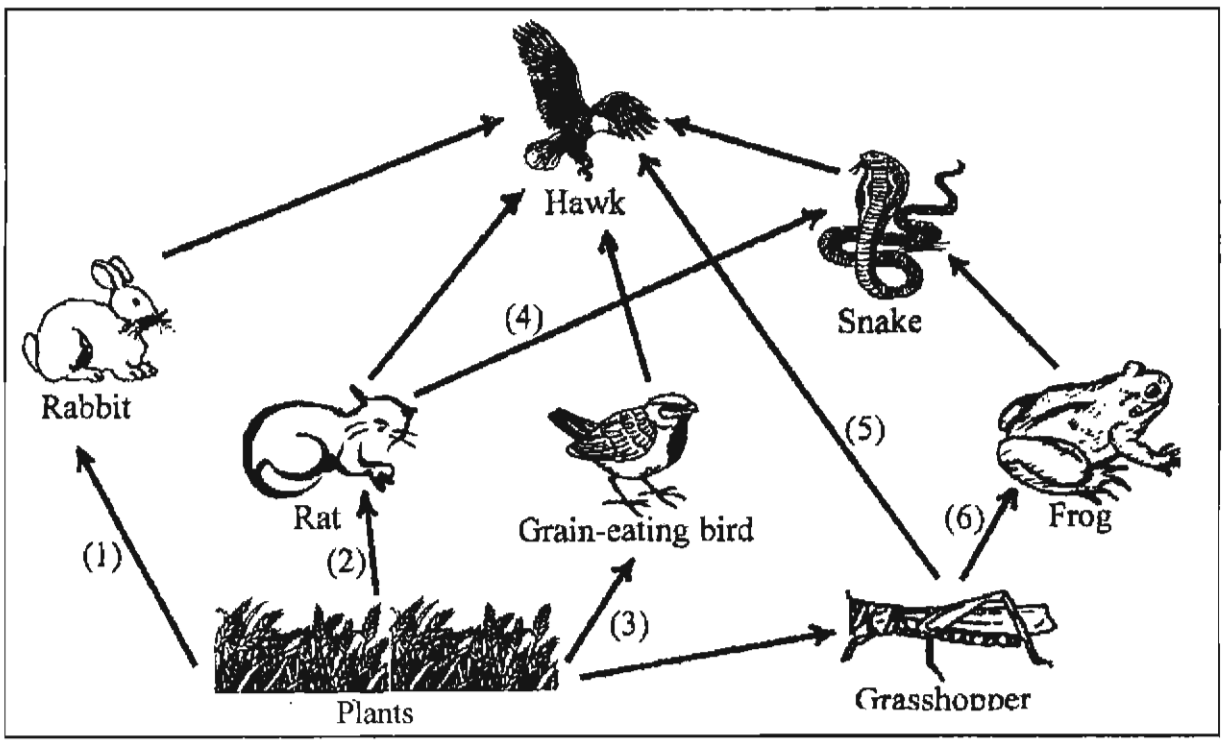


Fig. 12.15 Diagram showing a food web

12.2.5. Energy transfer

The living world depends on the sun for its energy. The energy which sustains the world life is the light energy and it comes from the sun. In fact, the sun is the original and ultimate source of all energy. The food and energy enter the living components of biosphere through the producers. The light energy is converted into chemical energy of carbohydrates by plants. The energy is transferred to herbivores from producers and then to carnivores from herbivores. Thus in the given set of organisms, energy flows from one organism to other. This is called **energy transfer** (fig. 12.17).

Let us discuss the energy transfer in detail. The green plants convert the light energy into chemical energy. This is the first step in the energy transfer. This energy is stored as carbohydrates. They utilize a portion of energy for their survival.

In the second step, the plants are eaten up by herbivores. The chemical energy stored in plants is transferred to the herbivores. The herbivores utilize a portion of energy for their existence.

In third step, the herbivores are eaten by first order carnivores. The chemical energy stored in the flesh of herbivores is transferred to the first order carnivores. They utilize a portion of energy for their survival. These animals are again consumed by top carnivores. Thus the transfer of energy takes place from one organism to another organism.

12.3 Adaptations of plants and animals

Any organism which lives on land faces the physical environment. Some plants and animals live in very dry places. Most of the plants and animals live where the conditions are usually fairly moist. Some other plants and animals live purely in water. The largest mammal, infact the largest animal known to man called blue whale lives in water. Most of the plants and animals including man are adapted to their habitats.

12.3.1 Adaptations of hydrophytes

Plants that are growing in wet places or in water are called **hydrophytes**. They are also known as aquatic plants. e.g. **Lotus, *Vallisneria, Hydrilla, Pistia, Eichhornia, Marsilea*,** etc., (fig. 12.18).

The aquatic plants have the following adaptations :

1. In most of the hydrophytes, the development of root is very poor. Due to availability of water in plenty, the roots become insignificant.

2. The root hairs and root caps are absent in them.

3. In ***Eichhornia*** and ***Pistia*** the root caps are replaced by 'root pockets'. They anchor the free floating plants.

4. The stem is thin and delicate. It is green or yellow in colour.

5. The leaves are reduced in size e.g. ***Hydrilla***. They are long and ribbon shaped as in ***Vallisneria***. They are very large and broad as in **lotus**.

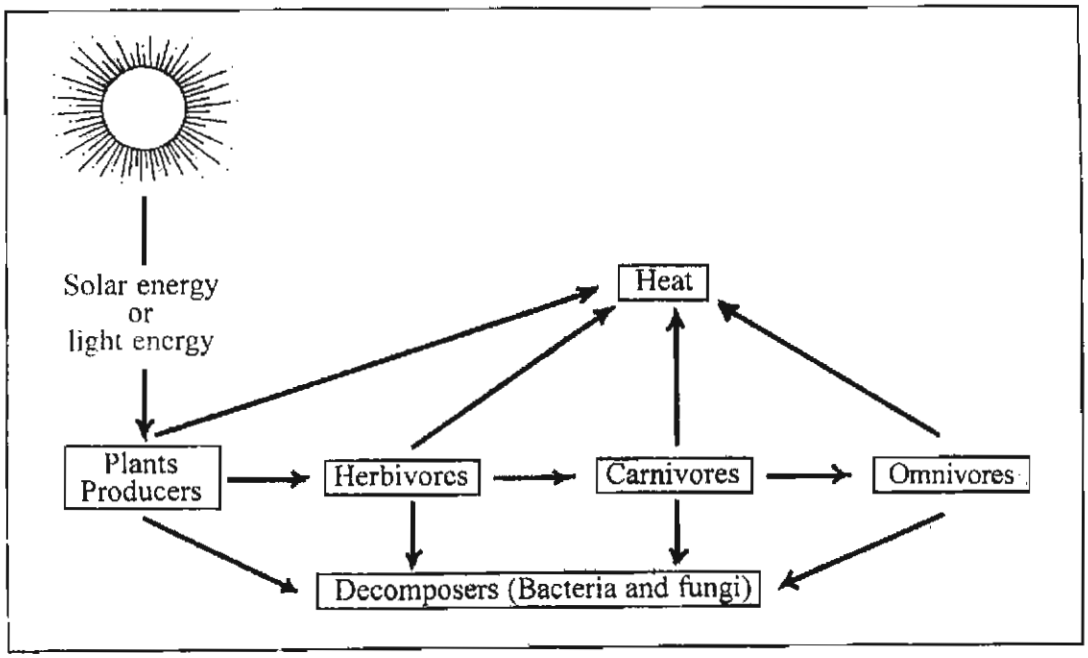


Fig. 12.17 Flow of energy from the sun to different organisms

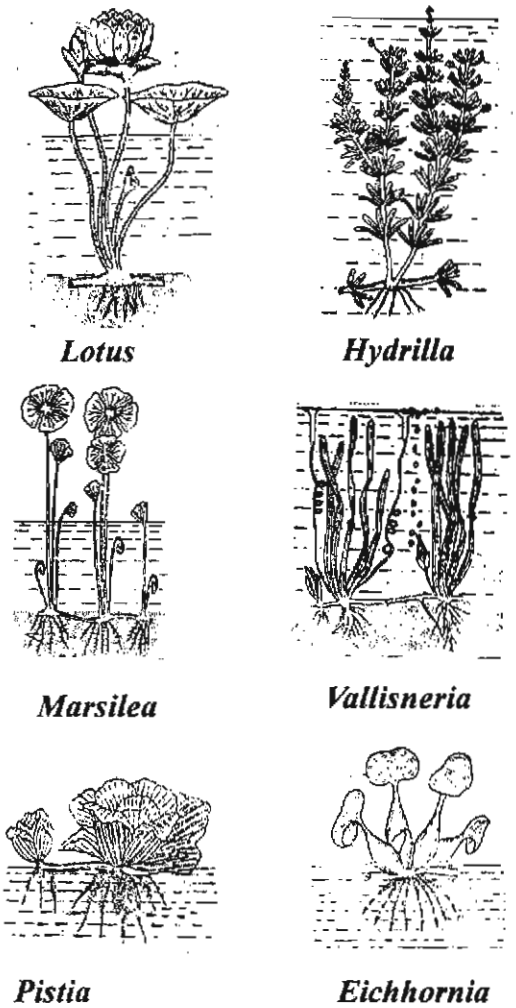


Fig.12.18 Hydrophytes

6. In **lotus**, the petiole shows indefinite power of growth and it keeps the upper surface of the leaf exposed to air. The upper surface is coated with wax which do not allow droplets of water to stagnate on the surface of leaf.

7. In **lotus,** ***Eichhornia*** and ***Pistia*** the petioles are provided with large number of air chambers. They are filled with respiratory and other gases. They provide buoyancy and mechanical support to aquatic plants.

12.3.2 Adaptations of Xerophytes

The plants that are growing in dry lands are called **xerophytes**. They are also known as desert plants (fig. 12.19).

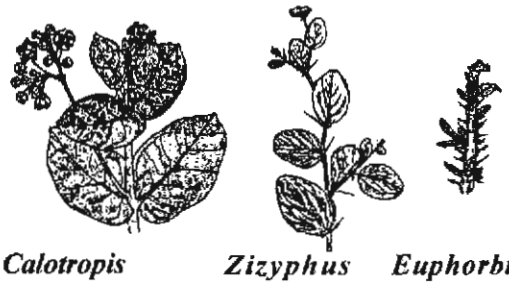


Fig. 12.19 Xerophytes

These plants have to withstand high temperature, high intensity of light, scarcity of water, high velocity of wind, etc.

The xerophytes have the following adaptations.

1. The stem is stunted in growth and it gives bushy appearance.

2. The stems are very hard, woody and covered by thick bark e.g. ***Zizyphus.***

3. In ***Opuntia,*** the stem is flat and fleshy. The leaves are modified into spines to check the water loss. In the absence of leaves, the stem becomes fleshy, green and leaf like to perform the functions of leaf. Such modified stem is called **phylloclade.**

4. In ***Euphorbia,*** the stem becomes fleshy and green. The leaves are reduced and the stem is provided with a number of spines.

5. In ***Nerium*** and ***Calotropis,*** the leaves are thick, leathery and shiny. They have a thick waxy coating on the upper surface. This prevents water loss and reflects light.

6. Certain xerophytes shed their leaves during dry period to prevent water loss. eg. ***Casurina.***

7. The root system is well developed and root hairs are provided with root caps.

Activity 12.4

Observe any aquatic plant and a xerophyte. Tabulate your findings.

12.3.3 Aquatic adaptations of fish

So far we have discussed how plants get themselves adapted with abundance of water, with normal supply of water and with scarcity of water. Animals are also subjected to the problems of abundance of water as well as scarcity of water. Animals of aquatic conditions are called **hydrocoles.** e.g. fish.

Let us discuss the adaptations of a fish in its habitat.

1. The head, body and tail of the fish are compressed to give an elongated spindle shaped body. It helps the fish to swim without hardship.

2. Presence of fins facilitates the movements. Pectoral and pelvic fins are paired whereas median, dorsal, anal and caudal fins are unpaired. The pectoral and dorsal fins act as **balancers** and the caudal fin provides a forward push to the body.

3. The muscle fibres are arranged in the form of bundle to give spindle shape to the body.

4. Respiration takes place through gills which separate the dissolved oxygen from water.

5. Air-bladders filled with air act as organs of hydrostatic.

6. Neurosense organs are present on the lateral line system of fish and they are helpful in locating the objects in water. Hence they are called **rheoreceptors.**

7. Integument is rich in mucous glands and the body is protected by scales.

12.3.4 Terrestrial adaptations in Cockroach

The cockroach is a well known household pest. It is commonly found in kitchens and in store-rooms. During day time, it hides in dark places and avoids light. It has the following adaptations.

1. The body of the cockroach has three distinct regions namely head, thorax and abdomen. Head, thorax and abdomen are compressed to form elongated flat body. Its flat body enables it to creep into the narrow crevices (fig. 12.20).

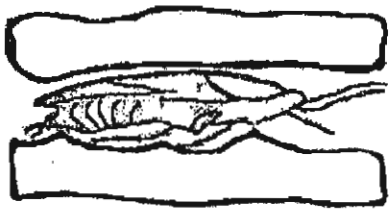


Fig. 12.20 Cockroach in hiding place

2. The body of the cockroach is covered by chitin coat. It protects the delicate organs within the body. This chitinous cuticle forms the exoskeleton.

3. Terrestrial environment requires an efficient mechanism for procurement and conservation of water. Conservation of water is fulfilled by the presence of an impermeable water proof chitinous exoskeleton.

4. It bears the organs of locomotion wings and legs.

5. The head bears a pair of antennae or feelers meant for smelling.

6. The eye of cockroach contains many number of eyes assembled together. The eye is therefore called a compound eye. It can see the objects on its front and to its lateral sides.

Infer

Why does a buffalo wallow in water and marshes?

The Indian buffalo is actually a wetland animal. When it gets too hot, it cannot cool itself by sweating, since it does not have efficient sweat glands. Thus it wallows in water and marshes. No wonder it relaxes most of the time in water. The rhinoceros and the hippopotamus are also similar in this aspect.

12.4 Animal - Plants association

Two species in a habitat depend on each other for their welfare. Each depends on other for some of its own needs. You might have seen small birds perched on the buffalo (fig 12.21). This

Fig. 12.21 The cattle and the egret

bird is called egret. It takes a ride on the buffalo all the time. It eats lice, ticks and other insects found on the skin of the animal. The buffalo benefits in this aspect, because it is freed from insects. In this relationship both the buffalo and the bird are benefitted and neither of them is harmed. We shall now discuss various kinds of such relationships among the living organisms.

12.4.1 Inter-relationship between plants

Epiphytes

The plants that grow on the aerial parts of other plants and are not rooted on the soil, are called **epiphytes.** eg. ***Vanda,*** orchid, etc., (fig. 12.22).

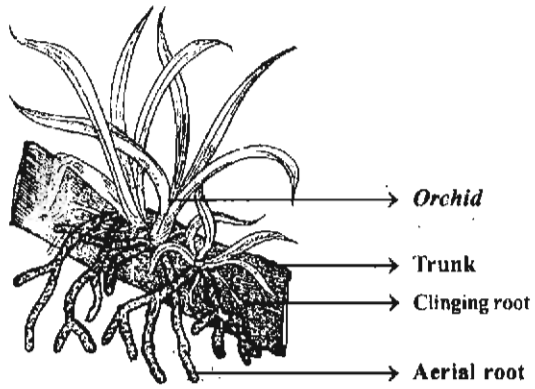


Fig. 12.22 An epiphyte - Orchid

They manufacture their own food. They grow in places where there is plenty of humidity in the atmosphere. They are more common on tree trunks. The plant on which the epiphyte found fixed is called **host.**

The epiphytes fix themselves on the host by means of **clinging roots,** while the **aerial roots** absorb moisture from atmosphere. The epiphytes depend on the host only for support. They do not depend for water and food supply.

12.4.2 Parasitism

A **parasite** is an organism living on another living organism. It does not live on dead organisms. A wide variety of plants and animals is parasitic in the mode of existence.

Dodder is a highly specialised parasitic plant (fig. 12.23). It twines up the stem of host. The dodder plant gets its food from the host by a specialised

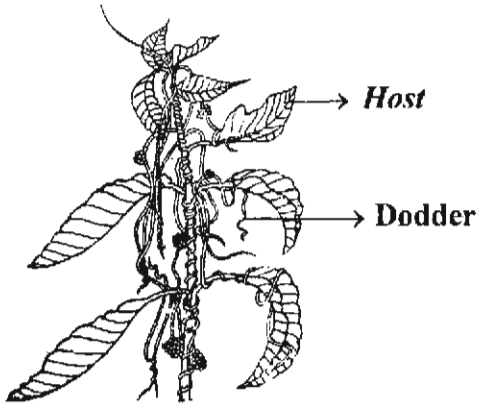


Fig. 12.23 Parasitic plant - Dodder

organ called **haustorium.** The haustorium enters into the tissue of host plant and absorbs nutrients.

Plasmodium is a unicellular parasitic and **coenocytic organism** (fig. 12.24). It has two hosts, man and mosquito. It causes **malarial** disease to mankind. It lives in red blood cells of man.

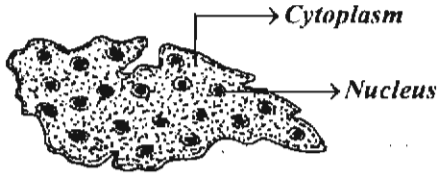


Fig. 12.24 Plasmodium

Infer

In 1880 ***Lavern*** *first observed* ***Plasmodium*** *in the RBC.* ***Sir Ronald Ross*** *first described its complicated life cycle. He was awarded the Nobel prize for this work in 1902.*

Ascaris lumbricoides is a common round worm found in the small intestine of human beings. It is one of the largest parasites growing about 25 cm to 35 cm in length (fig. 12.25). It has an unsegmented body with pointed ends. The posterior end of the female is straight and that of the male is curved like a hook. In small numbers, it does

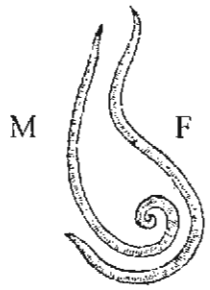


Fig. 12.25 Ascaris lumbricoides
M - Male F - Female

not cause serious discomfort to the host. In large numbers, this causes intestinal obstruction.

12.4.3 Commensalism

In the association of members of two different species, only one organism is benefitted and neither of them is harmed is called **commensalism.** We have already discussed that ***Vanda*** is an epiphyte. In the epiphytic relationship, the host is neither benefitted nor affected by the epiphyte, but the epiphyte only is benefitted. This illustrates the commensalism in the plant world.

Sea anemone and hermit crab

Sea anemone lives on the back of the crab. Since it has stinging cells, it provides protection to the crab. In turn the **hermit crab** carries the sea anemone to fresh feeding sites. Thus sea anemone is also benefitted. This illustrates the **mutualism** among the members of animal world (fig. 12.26).

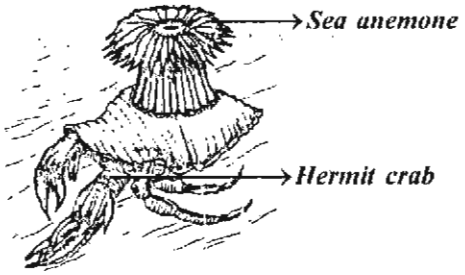


Fig. 12.26 Sea anemone and hermit crab

12.4.4 Symbiosis

The condition in which there is a close physical association between individuals of a pair of species is called **symbiosis.** In this association both the organisms are benefitted and no one is harmed. Let us discuss symbiosis in details with illustrations.

Illustration 1

Symbiotic relationship between groundnut plant and ***Rhizobium***

Groundnut, pea, pulses and soyabean belong to the family fabaceae. The root system of these plants contains beads like outgrowth called **nodules** (fig. 12.27). A bacterium called ***Rhizobium*** lives in these root nodules. ***Rhizobium*** helps the plants to absorb nitrogen from the atmosphere. In turn, the plants offer nutrients and shelter to ***Rhizobium***.

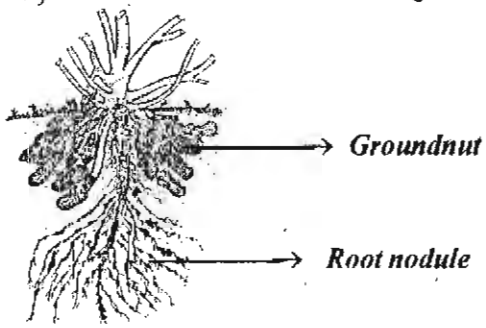


Fig. 12.27 Groundnut

Illustration 2

Symbiotic relationship in ***Lichens***

The ***Lichens*** are the composite plants. They contain both algae and fungi. The algal component is generally unicellular. The fungal component supplies moisture, shelter and minerals to algae. The algal component prepares food for the fungi. The fungal component of ***Lichens*** cannot live, if algal component is removed (fig.12.28).

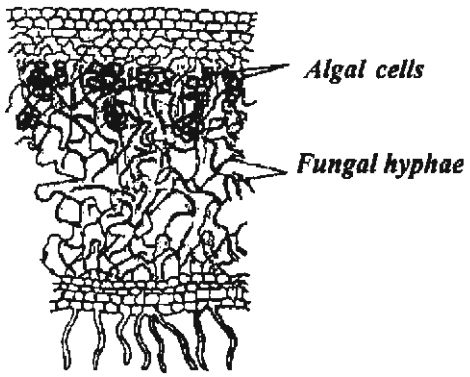


Fig. 12.28 Lichen showing algal and fungal components

Illustration 3

Symbiotic relationship in mycorrhiza

Mycorrhizae are short and forked roots. They are commonly seen in pines, oaks and birches. These roots have no root caps. The outer zone of roots contains fungus. These roots are more efficient in mineral absorption. Thus the plants are benefitted by fungus. In turn, the plants offer nutrients and shelter to the fungus (fig. 12.29).

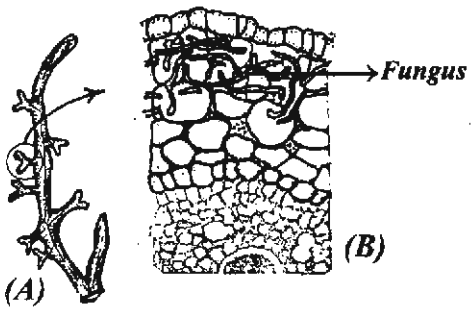


Fig.12.29 Mycorrhiza root
A. Forked root
B. Fungus in outer zone (Enlarged)

Activity 12.5

With your teacher visit a groundnut field. Pluck a groundnut plant and observe the root system. Do you find beads like structure in it? What are they?

12.4.5 Leech

Leech belongs to the phylum annelida. It is found in freshwater ponds. It feeds on the blood of man and cattle. The Indian cattle leech belongs to genus ***Hirudinaria*** (fig. 10.23).

The leech attaches itself to the victim. It makes an incision in the skin with its jaws. The blood is sucked and it pours its saliva on the wound. The saliva contains an active substance called **hirudin** which prevents the blood of the victim from clotting. The blood that is sucked is stored in its crop. Once the leech has a full feed, it can remain without further feed for several months.

12.5 Wild life and its management

The term **"wild life"** gives the impression of ferocious animals. They live in jungles. Tiger, rhinoceros, antelope, giraffe, zebra, elephant, wolf, crocodile, etc., are some of the wild animals (fig. 12.30). The wild life refers to any living organism in its natural habitat. It mainly includes plants and animals found in jungle.

The wild life management involves the protection, the preservation and the control of rare species of plants and animals. It is important not only for maintaining the beauty but also for keeping the balance of nature.

12.5.1 Wild life and ecosystem

You have already studied that all living organisms are closely inter related. You have also learnt how does energy flow from one level to another in food chain and in food web.

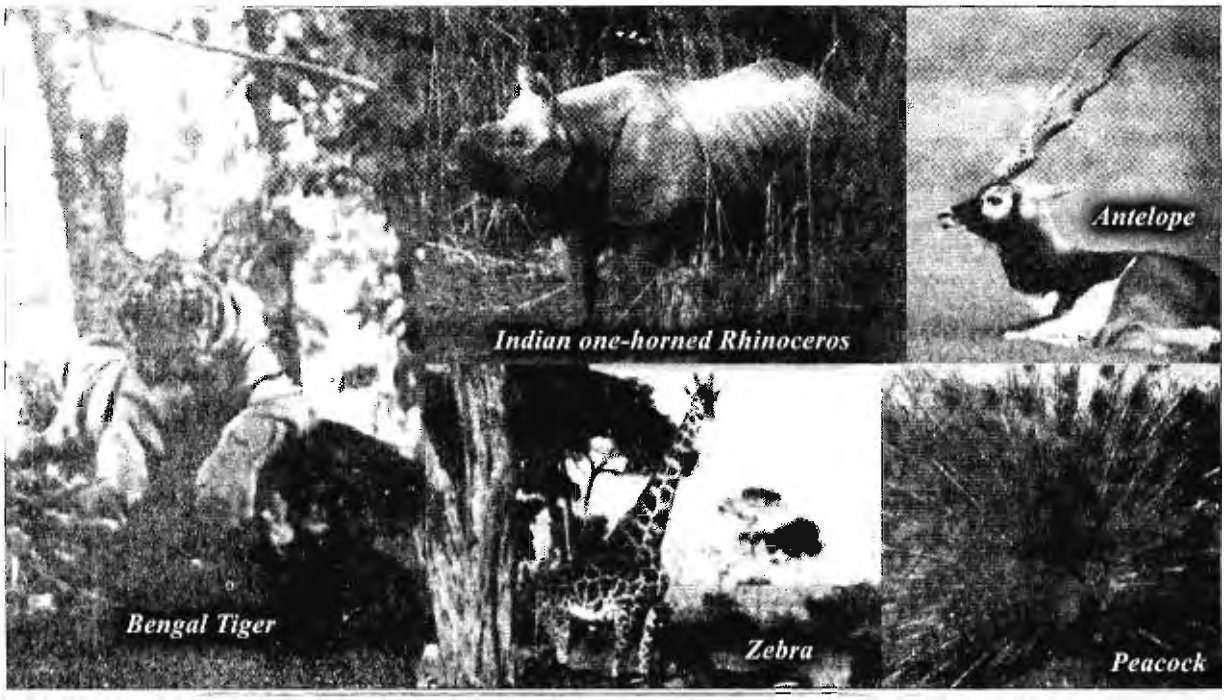


Fig. 12.30 Wild animals in their natural habitats

Some important wild life sancturies and National Parks in India.

S.No.	Name of protected area	State	Important animal
1	Guindy national park, Chennai.	Tamil Nadu	Deer types.
2.	Bird's Sanctuary, Vedanthangal.	Tamil Nadu	Seasonal migratory birds.
3	Mudumalai Wild Life Sanctuary, Nilgiri.	Tamil Nadu	Elephant, bison, wild boar.
4.	Anamalai Sanctuary, Coimbatore.	Tamil Nadu	Elephant, tiger, panther barking deer and wild boar.
5.	Periyar Sanctuary, Thekkadi	Kerala	Elephant and wild boar.
6.	Kaziranga National park (Famous for one horned rhinoceros)	Assam	Rhinoceros, elephant, tiger, wild boar, bird and python.
7.	Sundar Bagh (Tiger Reserve)	West Bengal	Tiger, deer, Gangetic dolphin and crocodiles.
8.	Hazaribagh National park	Bihar	Tiger, bear, hyaena and wild boar.
9.	Corbett National park	Uttar pradesh	Tiger and elephant.
10.	Gir National park	Gujarat	Asiatic lion, panther, antelope
11.	Kanna National park (Mandia)	Madya pradesh	Elephant, panther and deer types.
12.	Bandipur National park	Karnataka	Elephant, tiger, bear and wild boar.

Destruction of one kind of animal will upset the ecological balance. For example, destruction of snakes will lead to increase in rat population. See figure 12.15. Does it not destroy the crop to the maximum extent? Thus the wild life has its ecological importance.

It has genetic importance, since new breeding varieties are obtained from wild life.

Fur, skin, musk, lac, leather and honey are obtained from animals. Fish provides us food. Thus wild life has commercial significance.

Visiting a sanctuary is a thrilling experience. Green forest, lovely birds and other animals give us beautiful sensation. So wild life has its own aesthetic and enjoyment values.

Extinction of wild life

Extinction means the complete elimination of a particular wild species. It is natural but a slow process. Many animals become extinct due to unplanned activities of man.

Hunting for money and hunting for pleasure are the major causes for wild life destruction.

Increasing urbanisation, agriculture expansion, overgrazing, deforestation and over exploitation of natural resources are the main causes leading to destruction of habitats. Destruction of habitats is the serious threat to wild life.

Endangered species

When a species is represented by a fewer number in its natural habitat, then it is called as an **endangered species.** Living organisms require suitable climate for their survival. Or else they do not survive. When the conditions are not favourable for living and reproduction, the number of species becomes lesser and lesser. If the same factors continue in the given habitat, the particular species would become extinct soon.

In India 18 species of reptiles and 81 species of mammals are regarded as endangered species. One horned rhinoceros, wild buffalo, musk deer, Indian rock python and Kashmir stag are some other endangered species.

Infer

The International Union for Conservation of Nature and Natural resources (IUCN) is located in Morgis, Switzerland. It maintains a Red Data Book, which furnishes a record of animals that are known to be in danger.

12.5.2 Role of Government in conserving wild life

In India, we can see different varieties of plants and animals. It is due to diverse climate. In our earth, about 4,00,000 species of plants and more than 75,000 species of animals are living. They are to be conserved for better ecological balance.

With an aim to preserve the wild life, the Government of India has taken the following steps.

1. Indian Board for Wild Life (IBWL) was constituted in 1952.

2. A wild life week is being observed to educate the people about the importance and needs of conservation of wild life since 1955.

3. National Wild Life Action plan was introduced in 1983-84. It requires rehabilitation of endangered species by careful breeding.

4. Creation of National Parks and Biosphere Reserve was started in 1986.

5. To protect and conserve wild life, Indian Government enforced Wild Life Protection Act 1972. It provides legal measures for the protection of wild animals. It prohibits the hunting of wild life. It is essential to prevent further deterioration and extinction of wild life.

6. International Union for Conservation of Nature and Natural resources is also taking steps to conserve the wild life. In Haryana state, all the tourist resorts have been named after the names of birds. This is to make awareness to the people about the importance of birds.

Rules and regulations alone do not help to conserve the wild life. There must be a change in the attitude of man towards the wild life.

The day must come when man must feel that it is exciting to shoot with camera than with a gun.

Protected area in India

A National Park is an area which is strictly reserved for the betterment of the wild life. In such area grazing or cultivation are not permitted. 66 National Parks have been setup in India for the betterment of wild life.

A Biosphere Reserve comprises of wild animals and plants. It also includes cultivated plants and domesticated animals. It is regulated by tribes under the frameworks of Government. 17 Biosphere Reserves have been setup in our country. Some important recently established Biosphere Reserves are given below.

(i) *The Nilgiri Biosphere Reserve.* It includes parts of Karnataka, Kerala and Tamil Nadu.

(ii) *The Uttrakhand Biosphere Reserve.* It includes the parts of north-western Himalayas.

(iii) *The Nokrek Biosphere Reserve.* It includes the parts of north-eastern Himalayas.

In a sanctuary, protection is given only to animals. In such areas shooting of birds by gun is prohibited. Harvesting of fuel timber, collection of minor forest products and private ownership rights are permitted, so long as they do not interfere with the well being of the animals. 368 sanctuaries are located in India (fig. 12.31).

Fig.12.31 A portion of sanctuary

Activity 12.6

With your teacher visit the nearest sanctuary. Observe and tabulate your findings.

12.6 Pollution

Pollution is an undesirable change in the living habitats of plants and animals. Any substance that has deleterious effect on living organisms is called **pollutant.** The pollution can be classified as air pollution, water pollution, land pollution and noise pollution.

12.6.1 Air Pollution

The earth's air envelope is called atmosphere. It consists of 78% nitrogen, 21% of oxygen and 1% of other gases like helium, neon, argon, krypton, xenon, water vapour, carbon dioxide and sulphur dioxide (fig. 12.32).

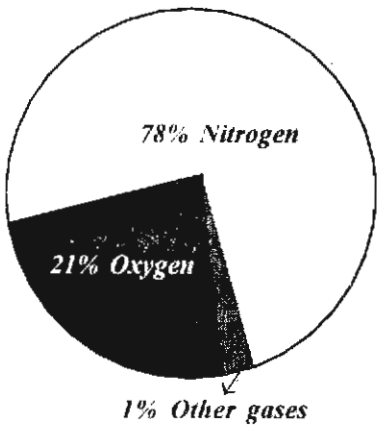


Fig. 12.32 Atmospheric gases

Ozone layer protects us from most harmful ultraviolet rays of the sun. It absorbs 99 percent of ultraviolet rays from the sun.

The air is mainly polluted by smoke. It contains carbon monoxide, carbon dioxide, unburnt hydrocarbons, oxides of nitrogen, oxides of sulphur and some metals like mercury, lead, copper and iron (fig. 12.33). Radioactive dusts from atomic bomb test and nuclear power stations also pollute the atmosphere and cause deleterious effect on living things.

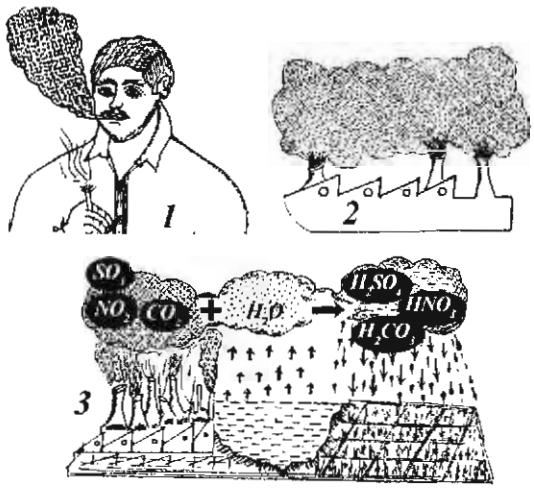


Fig. 12.33 Air pollution
1. Tobacco smoke causes cancer 2. Emission of poisonous gases from a factory 3. Acid rain formation

Biological effects of air pollution

1. Respiratory diseases like bronchitis, emphysema and asthuma are aggravated by smoke polluted atmosphere.

2. Carbon monoxide is highly poisonous to most animals. When carbon monoxide is inhaled, it reduces the oxygen carrying capacity of blood.

3. Smoking cigarette affects the air spaces in the lungs and causes lung cancer. Smoking cigarette is injurious to health (fig. 12.33). The cigarette smoke not only affects the smoker but also infects the non-smokers. It is the source for many diseases. Smoking cigarettes is banned in public places. Smoke contains **benzopyrene** which causes cancer.

4. Burning of polythene cover, plastic pipe and other plastic items should strictly be avoided. When they are burnt, **dioxane** and **phosphophene** are emitted. They affect central nerve system of children.

5. Printed papers contain more amount of lead. The fast food culture in thickly populated towns encourages the use of printed papers as dining plates. Lead affects the central nervous system and kidneys.

6. Oxides of sulphur, nitrogen and carbon dissovle in water droplets to produce sulphuric acid, nitric acid and carbonic acid respectively. They constitute acid rain (fig. 12.33).

Control of air pollution

Government and private sectors are taking major steps to control air pollution. Pollution control board implements the following anti-pollution measures to check the pollution.

1. There must be a world-wide compaign to banish smoking of cigarettes in public places, as the smokers affect the health of non-smokers.

2. Use of good quality of automobile fuels without adulteration will reduce the pollution.

3. Planting trees on both sides of the road and on vacant lands, laying of parks and gardens will also reduce the problem of pollution.

Infer

Cigarette smoke contains seven polycyclic hydrocarbons and radioactive polonium - 210. They cause cancer. An average smoker has the risk of developing ***cancer ten times*** *more than a non-smoker. The risk of* ***lung disease*** *is six times as compared to a non-smoker. The risk of heart diseases is twice as compared to a non-smoker.*

12.6.2 Water pollution

Water pollution adversely changes the quality of water. Bacteria, viruses and algae are **biological pollutants.** Organic and inorganic chemicals, heavy metals like arsenic, lead, cadmium and mercury are **chemical pollutants.** Hot water from industries and oil spills from oil carriers are **physical pollutants.** Domestic sewage and industrial effluents are the major pollutants of water.

Domestic sewage

Liquid wastes from kitchen, toilet, and waste of cattles constitute domestic sewage (fig. 12.34). It mostly carries organic wastes which are biodegradable.

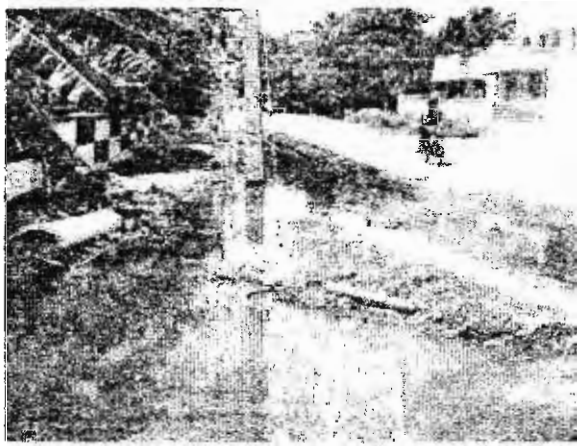


Fig. 12.34 Open drainage water running like a channel

Industrial effluent

Both small-scale and large-scale industrial activities produce wastewater. The waste products of refineries, chemical industries and tanning factories contaminate water. Most of the components of industrial effluents are non-biodegradable.

When domestic sewage, industrial effluents and hot water from industries

are discharged into the water sources, the water is drastically polluted and not suitable for drinking. Almost all the rivers of India including Ganges are polluted.

Infer

The pH of rainwater ranges from 5.6 to 6.5. The rainwater does not contain pollutants. It is almost pure. Water without pollutants is called ***pure water.*** *Most of the aquatic animals like fish and molluscs cannot tolerate pH below 5.0. Whereas annelid worm and insect larvae can survive in highly polluted water. Thus the death of fish and survival of insect larvae indicate that the water is polluted.*

Biological effects of water pollution

1. Polluted water causes diseases like cholera, typhoid, jaundice, amoebiosis, polio, etc.

2. Cadmium polluted water can cause a disease called **itai-itai.** Pain in bones and joints is the major symptom of this disease.

3. Excess of nitrate in drinking water is dangerous for human health. It reacts with **haemoglobin** and forms non-functional haemoglobin called **methaemoglobin.** It impairs oxygen transport.

4. Arsenious contaminated water causes diarrhoea, failure of peripheral nerve system and skin cancer.

5. Higher the temperature of water, lower is the rate of dissolution of oxygen in water. The discharge of hot water from industries lowers the dissolved oxygen content in water.

High amount of fluorine is present in drinking water in 13 states of India. The maximum amount of fluorine that the human body can tolerate is 1.5 mg per litre of water. When excess of fluoride is ingested over a long period of time, it causes **fluorosis.** Its symptoms are dental disorder and severe skeletal disorder. Hence it is very essential to check the fluoride content of water used for drinking and cooking purposes.

Control of water pollution

1. Domestic wastewater and industrial effluents are treated suitably before releasing them into the water bodies.

2. Proper filtering mechanism must be used to control water pollution.

3. Use of herbicide and pesticide should be minimised.

12.6.3 Land pollution

Land gets polluted by dumping of municipal wastes, industrial wastes and hospital wastes. Industrial wastes are the major sources of land pollution. The land pollutants are distinguished into degradable and non-degradable pollutants.

(i) Degradable pollutants

Domestic sewage is a degradable pollutant. It can be rapidly decomposed by the natural process. Domestic waste is decomposed by bacteria. Large amount of carbon dioxide and hydrogen sulphide gas is released into the atmosphere from sewers.

(ii) Non-degradable pollutants

Ceramics, PVC pipe, plastic bags, polythene covers and pesticides are some examples for non-degradable pollutants. There is no treatment mechanism available to decompose these pollutants. Hence make use of cloth and gunny bags for shopping purposes and avoid the usage of polythene covers and plastic bags.

Decomposing garbage emits methane and open sewers emit hydrogen sulphide. Exposed garbage and sewers are the breeding grounds for mosquitoes, flies, germs and bacteria (fig 12.35).

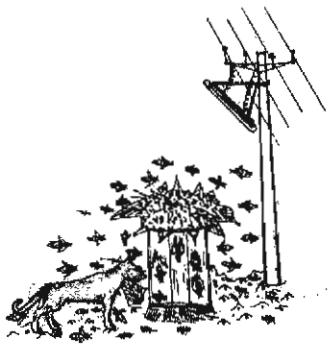


Fig. 12.35 Decomposing carbage and open sewer

Mining operations completely devastate the topsoil and contaminate the area with toxic metals and chemicals (fig. 12.36).

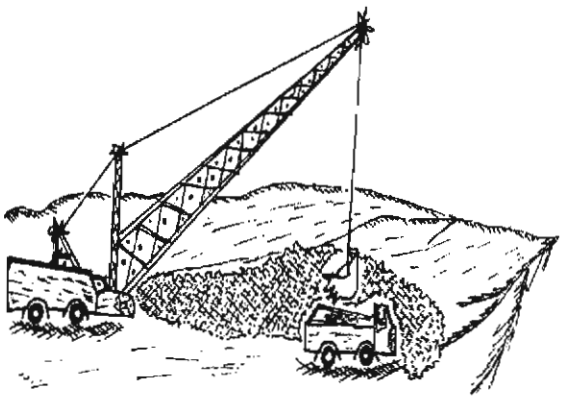


Fig. 12.36 Mining activity

Discharge of more and more detergents on land will affect the fertility of the soil. Use of insecticides, pesticides and detergents denatures the chemical composition and texture of the soil.

Control of soil pollution

1. Control measures for soil pollution involve the management of solid wastes. It includes the following three steps.

a) Collection and categorisation of wastes.

b) Recovery of resources for recycling and reuse

c) Safe disposal with minimum environmental hazards.

2. The non-degradable industrial wastes, poisonous chemicals and hospital wastes may be used as bedding materials for road construction.

3. The industrial solid wastes may be decomposed by **pyrolysis**.

4. The municipal solid wastes can be transformed into organic manure for agriculture.

5. Closed type of sewers may be used to reduce the production of mosquitoes and flies.

12.6.4 Noise pollution

Any unpleasant sound dumped into the atmosphere and responsible for adverse effect in man is called **noise pollution.** The source of noise pollution is broadly divided into industrial source and non-industrial source.

Generators, grinders and compressors are examples for industrial

sources. Loud speaker, aircrafts, space stations, road traffic, TV stations, etc. are examples for non-industrial sources.

Man-made noise originates from industrial machines, transport vehicles, sound amplifiers, crackers, etc. The unit of sound is decibel (dB). The noise level from 81 dB to 120 dB is permissible to human ear.

Biological effects of noise pollution

1. Noise seriously affects heart beat, cardiovascular problem, peripheral circulation and breathing patterns.

2. Persistent noise environment can cause impairment of hearing, irritability, mental disturbance, headache and sleeplessness.

3. Peptic ulcer and asthma are also aggravated by noise.

Control of noise pollution

1. Industrial workers and traffic control personnel may use earmuffs to protect themselves from unwanted noise exposure.

2. '*Silent zone*' or '*No horn*' around 100 metres of hospitals and schools can give comfort to ailing patients and help the students to concentrate on their studies.

3. The noise section of the factory like generators should be located far away from the site of work.

4. Planting trees in and around the industry can reduce the noise pollution.

SELF EVALUATION

I. Choose the correct answer

1. The producers are
   (a) plants (b) animals (c) bacteria (d) fungi
2. An example for non-living biotic component is
   (a) paddy (b) grasshopper (c) frog (d) water
3. The solid outer portion of the earth containing soil and rock is called
   (a) hydrosphere (b) atmosphere (c) lithosphere (d) ionosphere
4. An example for carnivore is
   (a) tiger (b) deer (c) goat (d) cow
5. The plants that are growing in dry lands are called
   (a) hydrophytes (b) mesophytes (c) xerophytes (d) halophytes
6. Stinging cells are seen in
   (a) hermit crab (b) sea anemone (c) Leech (d) Lichen
7. An example for endangered species is
   (a) goat (b) rhinoceros (c) crocodile (d) elephant
8. Parts of Karnataka, Kerala and Tamil Nadu are included in
   (a) Uttarkhand Biosphere Reserve (b) The Nanda Devi Biosphere Reserve
   (c) The Nilgiri Biosphere Reserve (d) The Nokrek Biosphere Reserve

9. Malarial fever is caused to man by
   (a) mosquito (b) plasmodium (c) bacterium (d) virus
10. Oxygen carrying capacity of blood is reduced by
   (a) nitrogen (b) carbon dioxide
   (c) carbon monoxide (d) sulphur dioxide

II. Fill in the blanks

11. The region of the world where we live is called _____
12. The primary source of energy for all living organisms is _____
13. The organisms which prepare their own food are called _____
14. Root packets are seen in _____
15. Animals of aquatic conditions are called _____
16. The organs of locomotion of cockroach are _____ and _____
17. The organism which lives only on other living organism is called _____
18. The posterior end of male ***Ascaris lumbricoides*** is _____
19. A particular species becomes extinct due to _____ of man.
20. The number of National Parks setup in India is _____

III. *Match the following*

21.	Herbivores	–	fungi
22.	Carnivores	–	goats
23.	producers	–	tigers
24.	Omnivores	–	plants
25.	Decomposers	–	men

IV. *Give short answers*

26. What is biosphere?
27. What is food chain?
28. What are autotrophs? Give an example.
29. Explain ecological pyramid.
30. What is endangered species?

V. *Give detailed answers*

31. Explain the relationship of orchid with a host plant.
32. Illustrate commensalism with an example.
33. Write any five adaptations of hydrophytes.
34. Write any five roles of Government in conserving wild life.
35. Write the importance of wild life.
36. Write an essay on air pollution.
37. Write a brief account of noise pollution.

13. Applied Biology

Plants and animals are the feeders of mankind. Without plants and animals we cannot survive. The use of fertilizers has greatly increased the productivity of crops. The use of pesticides increases the period of storage of grains. The fertilizer, the pesticides and the high yielding varieties are the new lines in biology. They will minimise the hunger and will improve the quality of life.

13.1 Pests and their management

Insects, mites and nematodes cause damage to the plants. Hence, they are called pests. A pest may be defined as any organism that lowers the economic and physical well being of man. They reduce the quality and the quantity of yields. 30 percent of potential crop yield is lost through the pest actions. Apart from loss in economy, the valuable food goes waste. This emphasises the need for management of pests.

Pesticides

Pesticides are chemicals used to kill pests especially insects. Diphenyl-dichloro-trichloro ethane (DDT), Benzene hexa chloride (BHC), baygon, mosquito coils and mosquito mats are some examples for pesticides.

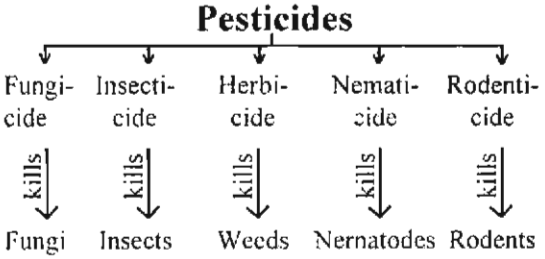


Table 1. Types of pesticides

13.1.1 House pests

Cockroach, housefly, mosquito and beetle are some examples for house pests. In the previous chapter, you have learnt the adaptations of cockroach. It is a omnivore insect. It feeds on paper, leaf-blade, vegetable and fruits. It avoids light. During dark time, it appears in large numbers in search of food. Thus it shows **nocturnal periodicity**.

When cockroach, housefly and beetles feed on food items, they are spoiled by their saliva and excretions. Houseflies spread **cholera**. Hence all the cooked food items, sweets, fruits and vegetables should be kept in the closed containers to prevent from contamination.

13.1.2 Pests of stored food grains

After harvesting, drying the food grains in sunshine is essential to remove excess of moisture. The foodgrains should be dried by spreading them over plastic sheets or on cemented floor. The moisture content of the foodgrain should be lesser to ensure safe storage.

Removal of straw, earthern particles, stone pieces and other weeds from the foodgrains is the second step in storage. Finally the dried and cleaned foodgrains should be stored properly in gunny bags or grainsilos.

Vegetables and fruits get spoiled more easily than foodgrains like wheat

and rice. Why? Because they contain higher moisture content. 30 to 40 percent of vegetables and fruit crops is damaged due to lack of proper storage facilities.

Temperature plays a vital role in the storage of foodgrains. 30^0 C and lower temperature is suitable for storage, because insects and micro organisms are less active at low temperature.

Six rats consume as much food grains as a man consumes. They destroy about five to six times of what they eat. Therefore, proper storage is necessary to protect the foodgrains from rats and pests. They not only consume foodgrains but also pollute the stored grains. Eating of contaminated food can cause damage to liver.

The attack by insects, worms and micro organisms on the stored grains is called infestation. Infestation lowers the quality and finally makes the foodgrains unfit for consumption.

The following precautions should be kept in mind while storing foodgrains in gunny bags.

1. New gunny bags should be used for storing foodgrains. However, old gunny bags are used, after they have been washed in boiling water and dried in the sun shine.

2. The gunny bags should be clean, dry, cool and free from insects.

3. After filling the foodgrains, the mouth of gunny bags should be tightly stitched.

4. The grain filled gunny bags should be kept in such a way that they do not touch the walls of godowns.

5. Path ways are to be provided in the godown between the various stacks of grain filled bags.

6. Periodical inspection, spraying pesticides and fumigation to protect the stored grains are necessary.

7. Malathion, pyrethrum, DDT, aluminium phosphide and zinc phosphide are the pesticides used in godowns. The pesticides used for killing rats are zinc phosphide and warfarin.

13.1.3 Pests of agricultural crops

Pests depend on crop plants for their feed. Based on the mode of feeding, the pests are classified into three categories. They are given below.

(i) Pests with biting and chewing mouth parts.

(ii) Pests with piercing and sucking mouth parts and

(iii) Pests that are vectors of pathogen.

Pests damage can be grouped into six categories. They are given below.

1. Sown seeds and seedlings
2. Stem
3. Root and tubers
4. Leaves
5. Flowers and buds and
6. Fruits and seeds.

Let us discuss two categories in details.

(i) Damage to leaves

Leaves are the primary organs of a plant. Photosynthesis, respiration and transpiration are the chief functions performed by leaves. The leaves are damaged by pests in different ways (fig. 13.1).

a) Leaf margin is notched by *broad nosed weevils.*

b) Citrus leaf lamina with ventral pits is caused by *citrus psyllids.*

c) Leaf lamina with small holes is caused by *beetles.*

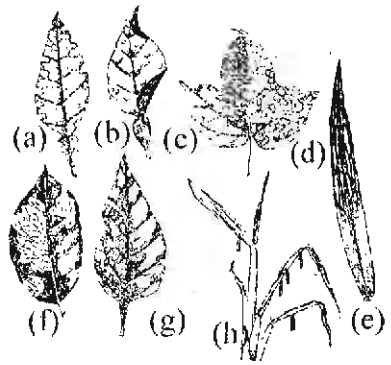


Fig. 13.1 Damage to leaves

d) Leaf lamina with larger and regular shaped holes is produced by *tortoise beetles.*

e) Paddy leaf with elongated deep scarification is caused by leaf beetles and larvae of *hispid beetles.*

f) Leaf lamina is extensively skeletonised by *leaf skeletonisers.*

g) Leaf lamina with ladder - like windowing leaving veins intact is caused by *epilachna beetles.*

h) Small leaf cases on rice leaves are caused by rice *caseworms.*

(ii) Damage to fruits and seeds

Fruits and seeds are very important storage regions of a plant. Seeds are meant for continuance of species. Both fruits and seeds are attacked by a variety of pests (fig.13.2).

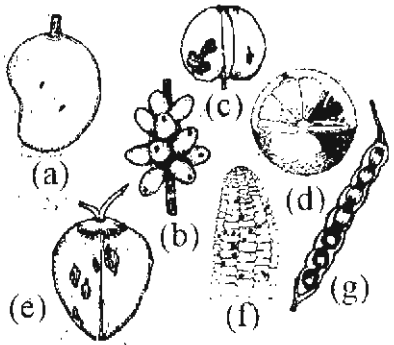


Fig. 13.2 Damage to fruits and seeds

a) Mango fruit is bored by larvae of *mangoweevil.*

b) Coffee berries are gnawed by caterpillars of *coffee berry moths.*

c) Apple is bored by *codling moth* larvae.

d) Orange is attacked by *fruit fly maggots.*

e) Coconut is scarred by toxic saliva from feeding *coconut bug.*

f) In maize cob, the seeds are bored by *maize weevil.*

g) Pea pod is bored and seeds are eaten by *pea pod borer.*

(i) Rice

The binomial of rice is ***Oryza sativa.*** Rice originated from China to India. Rice is a crop of great importance throughout tropics and subtropics. It is a staple grain and also a cash crop.

Rice is attacked by a number of pests. *Green rice leafhopper* causes

damage to young leaves. *White-backed planthopper* delays grain formation and causes stunted growth. *Rice bug* sucks the sap from developing grains at the 'milky stage'. It causes 10 to 40 percent loss of yield. *Rice shield bug* feeds on grain in milk stage causing loss of grain. *Black paddy bug* feeds at the base of stems just at water level. *Rice caseworm* attacks green tissues. So the leaf becomes dried. In heavy infestation, the plant appears sickly and twig-like (fig. 13.3).

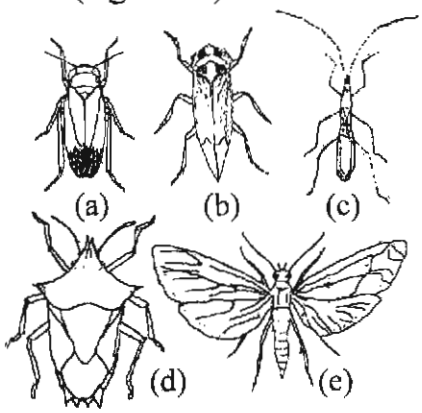


Fig. 13.3 Different kinds of pests on rice plant

(a) Green rice leafhopper (b) White-backed planthopper (c) Rice bug (d) Rice shield bug (e) Rice caseworm

Life cycle of white rice borer

White rice borer can bore into the base of the stem and then into the tiller. It consists of four stages namely egg, larva, pupa and adult (fig. 13.4).

Eggs are laid together in one cluster of about 50. They are attached to the leaf by a cement like paste. As the paste dries up, the leaf becomes rolled. Thus the egg mass is enclosed inside a foliar envelope.

Larvae are transparent and white with

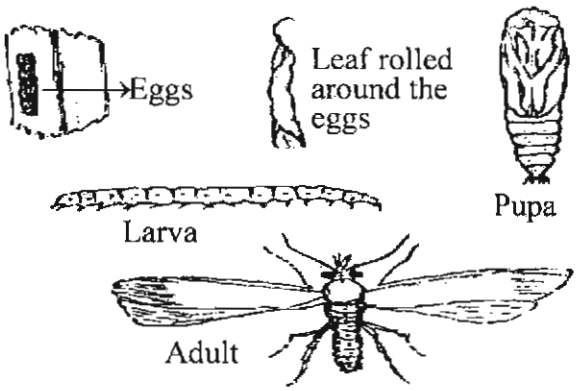


Fig. 13.4 Life cycle of white rice borer

dark brown head. They gradually turn yellowish and get fatter. Larvae can be dispersed by wind. They suspend on a silken thread. The matured caterpillars measure about 18 mm long. They can go into resting stage during dry season upto 20 weeks.

Pupation takes place in a loose cocoon in the rice stem. The pupa is cocoon with a red spot on the dorsal side of the fifth abdominal segment.

The adult male measures about 15 mm long and the female is about 18 mm long. The wingspan is from 23 to 29 mm. Forewings are reddish-brown and hindwings are white. There are usually 3 to 4 generations per year.

Control measures

1. Removal of grass weeds from and around the paddy fields will lower the pest population.

2. Cutting off of the tips of the rice leaves at the beginning of infestation will also reduce the pest population.

3. Spray of pesticides like dieldrin, endrin, phosphamidon, DDT, BHC, diazinon, fenitrothion and fenthion is recommended.

(ii) Potato

The binomial of potato is ***Solanum tuberosum***. It is a herbaceous plant. It contains 2% protein and 17% starch. It is propagated vegetatively from stem tubers.

The potato plant is attacked by a number of pests. *Potato tuber moth* is an important pest of potato. Infestations are essentially in the field and continue during storage of the tubers. The leaves have silver blotches caused by the larvae. Leaf, veins, petioles and the stem are tunnelled. This is followed by wilting of the plants. Eventually the tubers are bored by large caterpillars.

Life cycle of potato tuber moth

It consists of four stages namely egg larvae, pupa and adult (fig.13.5). The

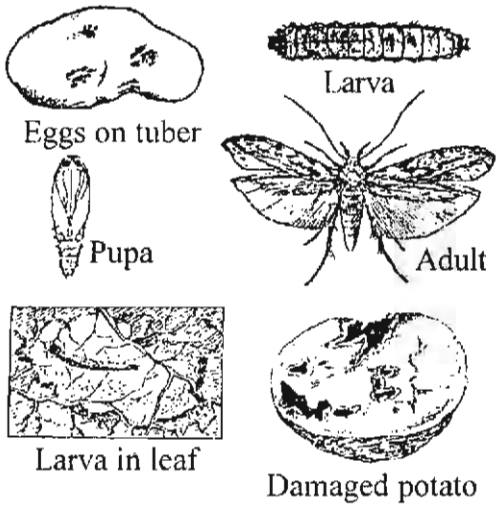


Fig. 13.5 Life cycle of potato tuber moth

eggs are laid singly on the underside of the leaf or near the eye of the tuber. Each female lays about 150 to 250 eggs. The eggs on the leaves hatch in 3 to 15 days.

The first larvae bore into the leaf where they make mines. The caterpillars are pale greenish. They gradually eat the leaf veins and the petioles, then they gradually move down the stem and sometimes into the tuber. The full grown caterpillar measures about 9 to 11 mm long. The larval period lasts from 9 to 33 days.

Pupation takes place in a cocoon in the surface of the tuber. It requires 6 to 26 days according to the temperature.

The adult is a small moth with narrow wings. The forewings are grey-brown with dark spots. The hindwings are dirty white. The wingspan is about 15 mm. The moths are very short-lived. One generation takes 3 to 4 weeks and there can be 12 generations per year.

Control measures

1. DDT, dimethoate, demephion and permethrin are effective insecticides.

2. As a preventive measure sprays should be applied every 14 days, after first mines are found on the leaf lamina.

3. Aldicarb, disulfoton and phorate may be incorporated into the soil.

(iii) Banana plant

Its binomial is ***Musa paradisiaca***. More than 470 species of insects and mites attack banana plant with a large number of nematodes (fig.13.6).

i) *Banana aphid* is the vector of the virus bunchy top disease. The aphids are found under the old leaf

sheath and at the base of pseudostem. Ants always accompany the aphid colonies.

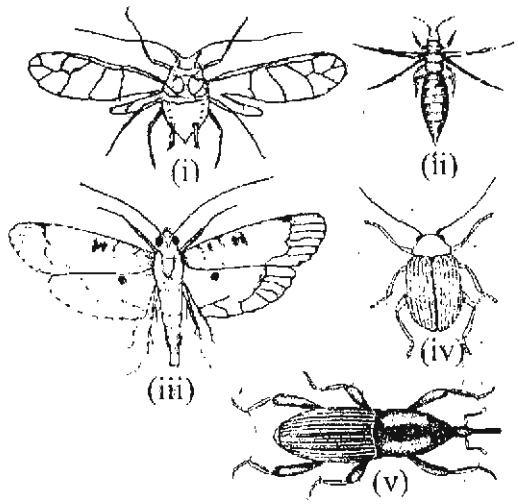


Fig. 13.6 Different kinds of pests on banana plant
(i) Banana aphid (ii) Banana thrips (iii) Banana scab moth (iv) Banana fruit-scarring beetle (v) Banana weevil

ii) *Banana thrips* is a serious pest of banana. It causes severe damage to fruits. Brown patches covered with small black spots are found on the fruits. The skin of severely infested fruit may crack and this allows the fruits to rot.

iii) *Banana scab moth* is also a serious pest to banana. The caterpillars feed on the inflorescence of banana and cause scab on the developing fruits.

iv) *Banana fruit-scarring beetle* feeds on the young unfurled leaves and stem of banana plants. It eats the skin of young fruits and spoils the fruits.

v) *Banana weevil* is a major pest of banana. The larvae bore into the rhizome and pseudostem at ground level. If the stem is small, the plant will die.

Control measures

1. Aldrin and dieldrin are the insecticides applied around the base of the pseudostem.

2. Carbofuran and pirimiphos-ethyl are also effective sprays.

(iv) Mango tree

Its binomial is ***Mangifera indica***. It is attacked by a number of pests. Let us discuss the *mango seed weevil* pest (fig. 13.7).

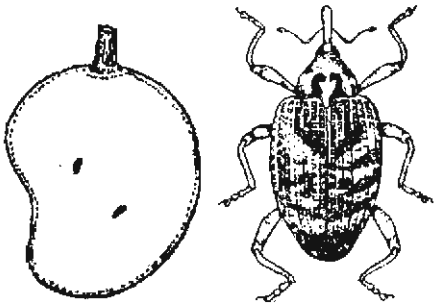


Fig. 13.7 Mango and mango seed weevil

The female weevil makes small cuts on the skin of young fruits and inserts a single egg through each cut. The cuts normally heal over and become invisible to the naked eyes.

On hatching, the larva bores through the pulp of the fruit and into the developing seed. It feeds on seed until it matures. Pupation takes place in the seed within the stone of the fruit. The adult dark brown weevil measures about 6 to 9 mm. It is a small and stout weevil with a reduced head. The total life cycle takes 40 to 50 days.

Chemical control measures are not practical against this pest.

(v) Sugarcane

Its binomial is ***Saccharum officinarum***. It is an important cash crop in India. It is attacked by more than 1300 species of pests (fig.13.8).

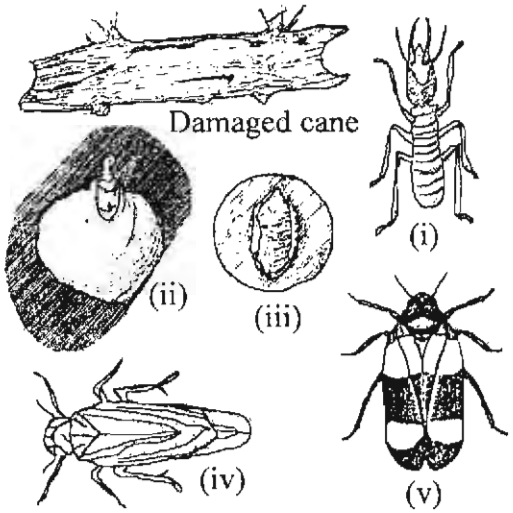


Fig. 13.8 Different kinds of pests on sugarcane

(i) Sugarcane termite (ii) Sugarcane scale (iii) Sugarcane mealybug (iv) Sugarcane planthopper (v) Sugarcane spittlebug

i) *Sugarcane termite* is a major pest of sugarcane. It affects the germination of sugarcane setts.

ii) *Sugarcane scale* is a stem-inhabiting pest. It does not occur on leaves. The bulk of infestation is found under the leaf sheath.

iii) *Sugarcane mealybug* is the most important pest of sugarcane. It causes appreciable damage to sugarcane. This mealybug is usually situated on the stem beneath the sheath. Sometimes it is found on the stem just below the ground level. The leaves often turn red at the base. Various species of ants are associated with the mealybug colonies on the sugarcane.

iv) *Sugarcane planthopper* feeds on leaves and sucks the sap. Damage also includes laceration of tissue with subsequent reddening.

v) *Sugarcane spittlebug* feeds on leaves and roots of sugarcane. The enzymes in the saliva cause necrosis of the plant tissue. In heavy attacks, the leaves turn yellow, then brown and finally wilting. The necrosis spreads longitudinally to form streaks. It results in loss of sucrose content by 30% to 70%.

Control measures

Dieldrin, phorate, toxaphene, endosulfan and malathion are the insecticides sprayed.

13.2 Timber yielding plants

Timber means wood that has been used for various constructional purposes. Various plants of gymnosperms and angiosperms are timber yielding plants.

The dark coloured central portion of a log is called **heartwood**. It is also known as hard wood. The outer portion of the plant stem is lighter in shade known as sapwood. It is also known as **soft wood**. The sapwood, as the name indicates, is meant for the conduction of the sap. Heartwood gives rigidity, strength and mechanical support to the plant. Heartwood is more durable than the sapwood. It is comparatively quite resistant to decay and to attack of fungi, termites and borer insects. Heartwood usually takes

high polish and is greatly used. The sapwood is weaker and is more likely to be destroyed by fungi and termites.

13.2.1 Uses of wood

1. Among the forest products, wood is the most importatnt for various industrial and domestic uses. Wood is widely used for the construction of bridges and buildings.

2. Good quality of timbers are used for making furniture and other wooden ornaments. Teak, sandal wood, rose wood, mahogany and walnut are used for these purposes.

3. Vehicles like carts, railway carriages, wagons, bus and lorry bodies are built up by different varieties of woods.

4. Durable and water resistant woods are used for the construction of ship, boat and catamarans.

5. Tough and durable woods are used as railway sleepers.

6. Light, strong and flexible woods are used for making various sports materials. Cricket bats are made of willow woods. For making hockey sticks and cricket stumps, mulberry wood is used.

7. In recent years plywood industry has shown an advanced progress. Thin sheets of wood are placed one above the another with an intervening glue layer which acts as strong adhesive and joins them firmly. This kind of man made wood is called **plywood**. It is commonly used for making door panels, walls, partitions cabinets, shelves, table tops, etc.

8. Wood is an important source for paper pulp. The cellulose present in the cell wall is the raw material for paper. ***Agathis***, chir and spruce are utilised for making the pulp.

9. Soft, white and cheap woods are used for making match boxes and match splints.

10. **Ephedra** is an important medicinal plant. The medicine **Ephedrine** extracted from the wood of the plant is used for treating asthma.

11. Now there is a very great demand for wood. Aluminium frames, iron rods and thick PVC pipes are used as substitutes for wood in many constructional activities. Granite sheets are used as table tops. Steel doors and windows become popular and cheap. Plastic and water-proof sheets are used for making partition. Cement concrete blocks are used in railway sleepers. Wax coated paper is used in making match splints. Steel is used for making steel chairs and tables.

13.2.2 Sandal wood

It is small evergreen glabrous tree. Its binomial is ***Santalum album*** (fig. 13.9). This wood has many timber

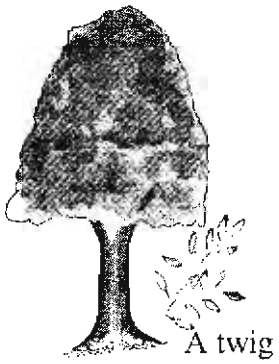


Fig. 13.9 Sandal tree

values. The bark is dark grey and the flowers are brownish purple. It is used for construction of buildings. Its sapwood is white and scentless whereas the heartwood is yellowish brown and strongly scented. This wood is mainly used for ornamental carvings. Distillation of this wood gives oil which is used in medicine. It is also exported to China. The sandal wood is used in funeral ceremonies.

The sandal wood plantation is especially seen in Mysore, Coimbatore and plains of northern parts of Nilgiris upto 3000 feet. It is also grown on western ghats and eastern slopes in Mysore.

13.2.3 Teak wood

It is a very large deciduous tree. Its binomial is ***Tectona grandis*** (fig.13.10). It is the principal timber

Fig. 13.10 Teak tree

of India. The most notable plantation of teak in India is Nilambur of Malabar. It is scattered in Western Ghats, both sides of Godavari, Deccan and Karnatic hill forests. The leaves are very large. The wood is golden yellow. Teak is imported from Burma in large quantities and it is the best quality. Burma and South Indian teaks are stronger and lighter than the teak obtained from other places. Its sapwood is greyish white and the heartwood is light golden brown. It has the characteristic smell of old leather.

Teak is chiefly used for making high class furniture. Boat and ship are constructed using teak. This wood is also used for making chairs, tables, dinning tables, cabinets, plywood, musical instruments, combs and varieties of toys. Distillation of this wood yields the valuable tar oil used as substitute for linseed oil.

13.2.4 Forest fires

Charcoal

Increase in population requires more and more cultivable land. It leads to deforestation. Due to over population, man's needs for food, shelter and wood are constantly increasing. Again it leads to exploitation of natural resources.

The half-burnt residue of wood is called **charcoal**. It is obtained by burning woody plants. ***Casurina*** and other forest plants are the sources for charcoal.

13.3 Apiculture - beekeeping

To rear bees for the extraction of honey in large amounts is called **apiculture**. It includes beekeeping and management of honey bees. They are essential for the process of pollination in plants.

13.3.1 Artificial beehive

An artificial beehive has frame works in which the bees can develop small compartments. Each compartment in the beehive is called a cell. It is also known as honey comb (fig. 13.11). Laying of eggs by queen

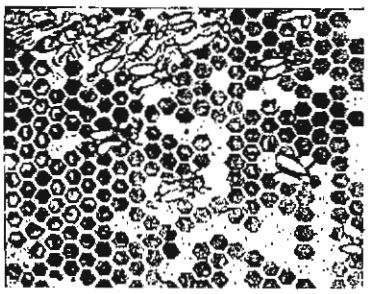


Fig. 13.11 Honey comb

bee, rearing of the larvae and up keep of pupae by worker bees apart from storage of honey are the activities taking place in a beehive (fig. 13.12).

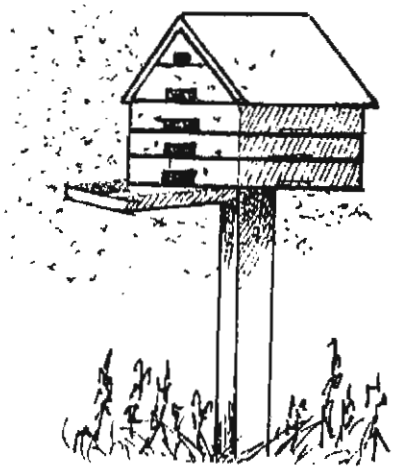


Fig. 13.12 Artificial beehive

Honey extraction from these artificial combs is done by honey extractor. It is a box like frame work. It has a central axis that rotates the frames from a central point. The central axis is rotated by means of handle. It is fixed at the upper part of the device. At the bottom of the box, there is a hole through which honey is collected (fig. 13.13).

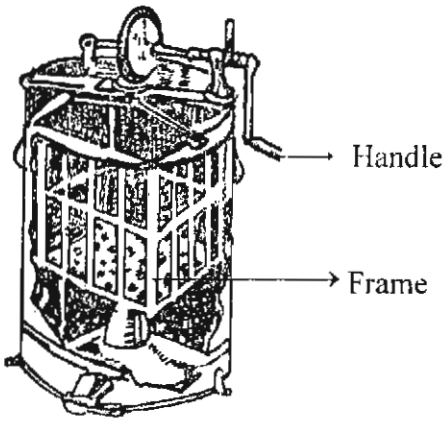


Fig. 13.13 Honey extractor

In our country apiculture is done in small scale and large scale organizations. Agriculture universities have large scale and middle scale apiaries. 12 kg of honey can be extracted from a single hive. A large number of honey extraction village industries are located in Marthandam, Kanya Kumari district.

13.3.2 Rearing of bees

Honey bees are the most economically valuable insects. They are commonly reared for the honey and beeswax. The honey bee is a social insect. They can survive only as members of community. The honey bee community consists of three different types of bees. They are queen bee, worker bees and drone bees (fig.13.14).

(i) Queen bee

Only one queen bee is present in a comb. The queen bee is bigger than other two bees. It is a fertile female bee. It has neither wax glands nor pollen

baskets. But it has a sting. The main function of queen bee is to lay the eggs and to increase the population of the hive.

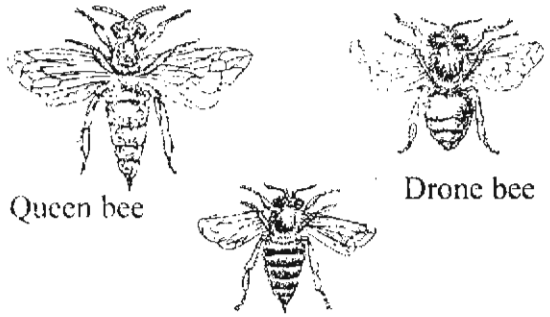


Fig. 13.14 Three kinds of honey bees

(ii) Worker bee

90 percent of population in the comb is worker bees. The worker bees are sterile females and they perform various functions.

Collection of nectar, pollen and water, conversion of nectar into honey, secretion of wax and building of hives are the functions performed by them. Apart from these functions, they nourish the larvae and protect the hive from enemies. They have pollen basket in the hind legs to collect pollen dust. Wax glands are present in the skin. At the end of the abdomen, a sting is present to attack enemies.

All the larvae are fed by **royal jelly** for first three days. After three days, the larvae are fed with a mixture containing royal jelly, honey and pollen. But the queen larvae are fed with only by royal jelly. Due to very hard work, the worker bees do not live more than seven weeks.

(iii) Drone bee

The drone bees are bigger than the worker bees. They do not have the pollen basket, wax glands and sting. The main function of drone bee is to fertilize the queen bee.

Activity 13.1

Observe the shape of the cells in natural honey comb.

A perfect system of communication exists among the honey bees. The worker bees discover new garden and the source for nectar. They suck nectar and return to the hive. They perform unique dances to communicate other bees to the place where the nectar is available. Round dance in front of the hive conveys that the nectar is available very near to the hive. Wriggling dance conveys that the nectar is available far away from the hive.

Activity 13.2

With the help of your teacher observe the types of dances performed by the honey bees infront of the hive. Don't go nearer to the hive.

13.3.3 Products from apiculture

The main products from apiculture are honey and beeswax.

(i) Honey

It is a sweet and supersaturated dense sugar solution prepared by bees to feed their larvae. It has high nutritive value and is easily digested by our system. It has good medicinal value.

It is used in Ayurvedic to prepare medicines. It is used to cure burns and the ulcer. It also helps in the purification of blood.

(ii) Beeswax

The wax glands present in the skin of worker bees secrete the wax. It is plastic-like substance and yellow in colour. This is called beeswax. It is used for the building of honey comb. Bleached wax is used as the raw materials for making moulds and candles. It is also used as a sealing material.

Activity 13.3

With your teacher visit an apiary.

Infer

Honey is expensive and has many nutrients. It is adulterated by a strong sugar or gur solution. It is quite simple to test the honey, whether it is pure or impure. Put two drops of honey in water. If it is pure, it forms fine threads through the depth of water. If it is adulterated, the droplet dissolves immediately.

13.4 Needs of vermiculture

In the previous chapter, you have learnt that the detritus is decomposed by bacteria and fungi. So the fertility of the soil increases. The soil provides bed for varieties of plants to grow. It is essential to enrich the fertility of the soil periodically. Or else the crop yield cannot be improved.

The use of fertilizers and pesticides increases the agricultural production but at the same time they change the texture of the soil. Earthworm is one of the living components of soil system. It plays a vital role in improving the fertility of the soil. It ploughs the land and assists in the recycling of organic matter for the efficient growth of plants. The soil system is loosened, stirred up and aerated by the actions of earthworm (fig. 13.15). Rearing of earthworms to

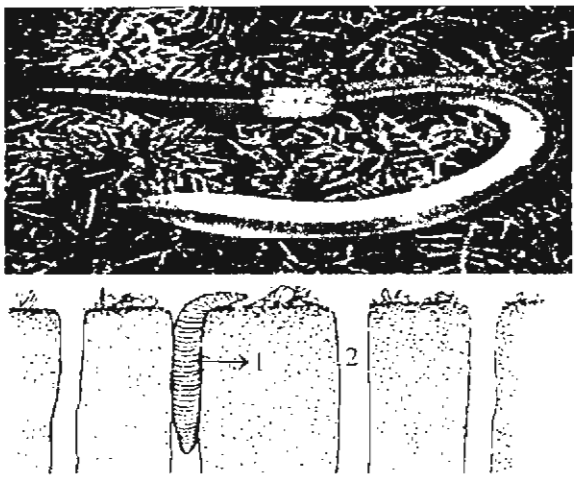


Fig. 13.15 Earthworm and its habitat
1. Earthworm 2. Hole

enrich the fertility of the soil by adding vermicompost is called **vermiculture**.

13.4.1 Vermiculture technology

Vermiculture technology is a noval method by which vermicompost can be made by the earthworm from the decomposable wastes. The vermitech can be done either in the field or in the garden (fig.13.16).

The following steps are involved in this process.

1. Digging a pit of any dimension in the field or in the garden.

Fig. 13.16 Photograph of a project site

2. The bottom layer of the pit is filled by broken bricks and coarse sand. Upper to the bottom layer, moist loamy soil is placed. This loamy layer forms the vermibed (fig. 13.17).

Fig. 13.17 Vermicompost pit
1. Broken bricks 2. Sand 3. Loamy soil
4. Cattle dung 5. Organic waste

3. Earthworms of any kind are introduced into the loamy layer.

4. Over the vermibed, fresh cattle dung is placed at random. Cover the pit by coconut or palm leaves.

5. After two to three weeks spread wet detritus over the loamy layer. Add any type of decomposable garbage into the pit periodically. Now the pit is called **compost pit**.

6. After a month, the compost pit is allowed to dry for 3 to 4 days. The worms usually occupy the vermibed. Without disturbing the vermibed, dig out the vermicompost.

7. The vermicompost is used as manure in the field to enrich the fertility of the soil.

Activity 13.4

Observe the moist skin of earthworm. Pour salt or some fertilizer over the earthworm. Observe and tabulate your findings.

Activity 13.5

Construct a vermipit in your school campus to prepare vermicompost.

13.4.2 Advantages of Vermiculture

1. Vermicompost is an excellent balanced organic manure with rich nutrients. It has a potential to support a wide variety of plants.

2. It encourages the growth and development of soil organisms. Whereas the fertilizers and pesticides will not do so.

3. Preparation of vermicompost is a simple process and economical.

4. By this vermitech, recycling of decomposable waste of our daily life is possible.

5. The decomposable waste is converted into precious manure.

6. Healthy foodgrains without chemical toxins can be produced.

Activity 13.6

Select three pots. One is filled by natural soil, second is filled by the mixture containing soil and any chemical fertilizer and third is filled by vermicompost. Sow the seeds of ragi

or bean in all the three pots. Add equal and sufficient quantity of water in all the three pots. After 25 days observe all the three pots and list out your findings.

13.5 Spices yielding plants

The use of spices adds flavour, delicious taste and colour to the food stuffs. The spices increase the pleasure of eating as well as the rate of digestion. They also serve as preservative and antibiotic.

The spices are classified based on their sources of extraction. The spices are obtained from (i) Roots and under ground stems (ii) Barks (iii) Flower buds and flowers (iv) Fruits (v) Seeds and (vi) Leaves.

13.5.1 Spices from underground parts

Turmeric

Turmeric is obtained from aromatic rhizome of **Curcuma domestica** (fig. 13.18). It is a popular spice of

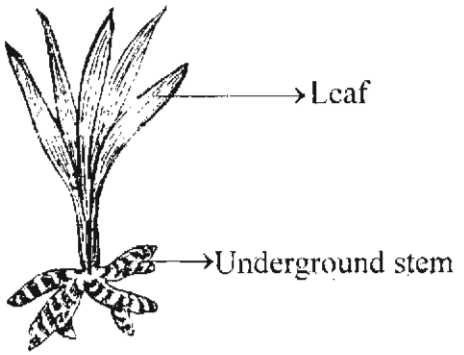


Fig. 13.18 Turmeric plant

India. The rhizome is thick and branched. The inner tissue of rhizome is bright yellow and has a pungent bitter taste. It is cultivated in Tamilnadu, Maharashtra, Bengal, Andhrapradesh and Orissa.

It is extensively used to flavour various food stuffs. In India it is used in the religious functions and auspicious occasions. It is a common constituent of curry powders and used as native medicine. It is antiseptic. The rhizome also yields a yellow orange dye used for dyeing purposes. It readily dyes cotton silk and woollen fabrics. Turmeric is also used in the preparation of cosmetics.

13.5.2 Spices from barks

Cinnamon

The bark of ***Cinnamomum zeylanicum*** is called cinnamon (fig. 13.19). It is a native of Srilanka

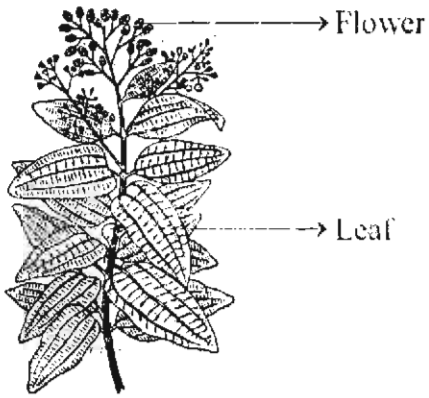


Fig. 13.19 Cinnamon

and South India. The plant is a small ever green tree with aromatic leaves. This plant produces very small yellow flowers. The shoot system is cut, when the plant has reached a height of about 6 to 7 feet. The bark is carefully removed, cleaned and dried. It contains cinnamon oil.

Cinnamon is extensively used in flavour cakes sweets and other food stuffs. It is also used in perfumery. It is used in medicine as a cardinal

stimulant. The cinnamon oil contains cinnamaldehyde. It is used as antiseptic.

13.5.3 Spices from flower buds

Clove

Clove is the dried flower bud of ***Syzygium aromaticum*** (fig.13.20).

A. A twig with flower buds

B. Dried flower bud

Fig. 13.20 Clove

It is native of Moluccas. This spice was first introduced from Moluccas to Courtallam in Tamilnadu by East India company in 1800. The stem is forked with two to three main branches at its base. It is cultivated in the Nilgiris, Thenkasi hills, Kanyakumari, Southern region of Trivandrum, Cochin and on the slopes of Western Ghats.

Clove is used for flavouring of foodstuffs. The dried flower buds are stimulant and aromatic. The clove oil is used in medicine. It is also used as an aid for digestion. It has antiseptic and antibiotic properties.

13.5.4 Spices from fruits

(i) Pepper

It is a branching shrub. The binomial of black pepper is ***Piper nigrum*** (fig. 13.21). It is one of the most ancient crops cultivated in India. There are three types of pepper. They are black pepper, white pepper and Indian long pepper. India is a leading producer and exporter of pepper. Pepper is mainly grown in Kerala, Tamilnadu, Karnataka and Assam.

Fig. 13.21 Pepper - A branch with fruits

Pepper fruits are used as condiments. Green and young pepper is used for preparing pickles. Black and white peppers are employed in cooked foods. Black pepper has its aroma and characteristic pungent taste. White pepper is less pungent. Pepper stimulates the flow of saliva and gastric juice. It is used in modern Indian medicine.

(ii) Chillies

They are herbs growing about two to three feet height. Its binomial is ***Capsicum frutescens*** (fig. 13.22).

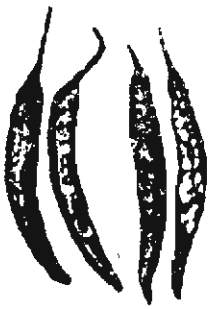


Fig.13.22 Chilly fruits

It is the native of West Indies. It is a many seeded fruit. The ripe fruits are dried in the sun and powdered for use.They are used in pickles. They stimulate the flow of saliva.

(iii) Cardamom

The plant is a herb growing about 6 to 12 feet height. Its binomial is ***Elettaria cardamomum*** (fig. 13.23). It is the native of India. It has long leaves.

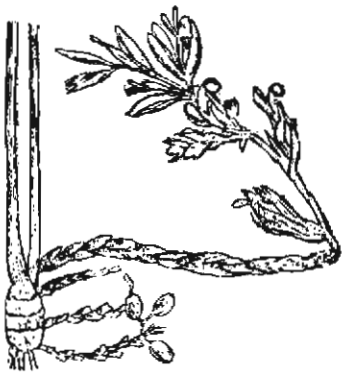


Fig. 13.23 Cardamom plant

Cardamom is used in foodstuffs and pickles. The seeds are used as masticatory either alone or with betel leaf. The seed oil is used in flavouring beverages. The fruits are used in medicines as stimulant.

13.5.5 Spices from seeds

Mustard

It is a herb growing about 2 to 6 feet. Its binomial is ***Brassica hirta*** (fig. 13.24). There are three types.

Fig. 13.24 Mustard plant

They are white mustard, black mustard and Indian mustard. The seeds are used as condiments in foodstuffs and pickles. The seed oil is used for cooking purposes. The seeds are used as stimulants and also used to treat snakebite.

13.5.6 Vegetable oils

Vegetable oils are liquids at ordinary temperature. They usually contain fatty acid called oleic acid and glycerine. Fatty oils are stored in seeds of many plants. Several fatty oils are edible and used for cooking purposes. Vegetable oils are commonly used for perfuming soaps and beverage products.

(i) Sources of oils

The sources of oils are generally seeds. Groundnut, castor, seasame, mustard, coconut, safflower and soyabean are some of examples for oil yielding seeds (fig. 13.25). Whereas

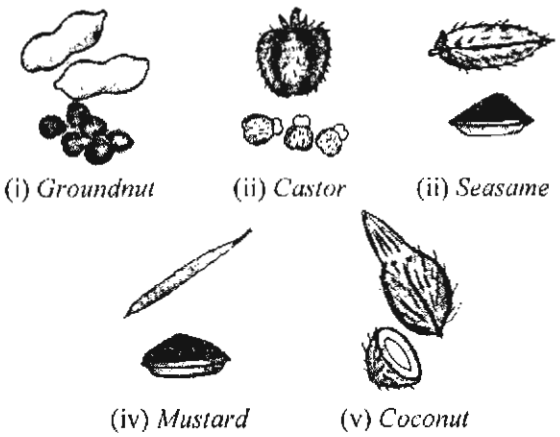


Fig. 13.25 Different kinds of oil seeds

jasmine oil is extracted from flowers; eucalyptus oil is extracted from leaves; orange oil is obtained from peels of fruits; cyperus oil is obtained from tubers and sandal wood oil is distilled

from the roots and the heartwood of sandal wood tree.

(ii) Oil extraction

Various methods are employed to extract oil from plant sources. The country treadmill, steam distillation, crushing under pressure and extraction by cold pressure are methods employed in oil extraction. Sesame oil is extracted by cold pressure. Castor oil is obtained by solvent extraction method. Coconut oil is obtained by hydraulic pressure method.

Safflower oil

It is obtained from the seeds of safflower plant. Its binomial is ***Carthamus tinctorius***.This plant is cultivated on large scale. It is widely grown in Africa, China and USA. It is a herb growing to a height of one to four feet. The fruit contains a single seed. It contains 24 to 37 percent of oil and 15 to 22 percent of proteins.

Extraction is done by pressure. The fruits are gathered and dried for a few weeks. Pericarp is removed and the seeds are isolated. Oil is extracted from the seeds by crushing and pressure. It is then filtered and refined.

It is mainly used in the preparation of paints, varnish and soap. In India this oil is used as food and for cooking. It does not increase the cholesterol and therefore, it is recommended for heart patients. The white paints prepared from this oil do not turn yellow on long exposure.

(iii) Nutritive value of oils

Vegetable oils usually contain more amount of fats and proteins. For example sunflower seeds contain 40 to 50 percent of fats and 7 to 13 percent of proteins. It also contains vitamins A, D and E. Soyabean oil contains 30 to 45 percent of proteins and 19 to 22 percent of fats. It also contains vitamin A and D apart from small amount of esters. Sunflower seeds make a nutritious food for cattle, poultry and cage birds.

13.6 Ornamental fishes

Fish lives in water. It is adapted to survive in water. They are eaten for their high nutritive value. It contains maximum proteins. Some fishes are called ornamental fishes. Those fishes that are reared as free time job are named as game fishes.

Ornamental fishes have highly attractive colours. They are different in size and shape. They are very sensitive to the environment in which they live. Common fish, gold fish, angel, rosy barb, tiger barb and window tetra are fresh water ornamental fishes. Parrot fish, oscar fish, neon tetra, discuss and red tail shark fish are rare and costly. Some species of fish give birth to young ones. They are called viviparous fishes. eg. molly, guppy, platy and sword tailed fish (fig. 13.26).

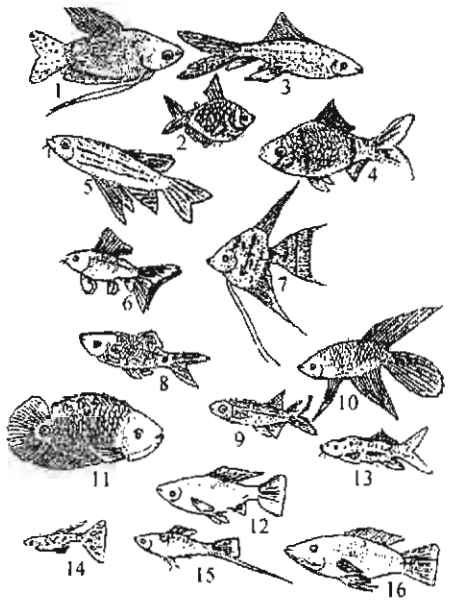


Fig. 13.26 Different kinds of fishes

1. Blue gourami 2. Window tetra 3. Red tail shark 4. Tiger barb 5. Zebra taenia 6. Gold fish 7. Angel fish 8. Rosy barb 9. Neon tetra 10. Fighter fish 11. Oscar fish 12. Platy fish 13. Koe carp fish 14. Guppy 15. Sword tail fish 16. Black molly fish

13.6.1 Aquarium and relaxation

Water filled glass tank in which aquatic plants and fishes are kept is called **aquarium** (fig.13.27). The

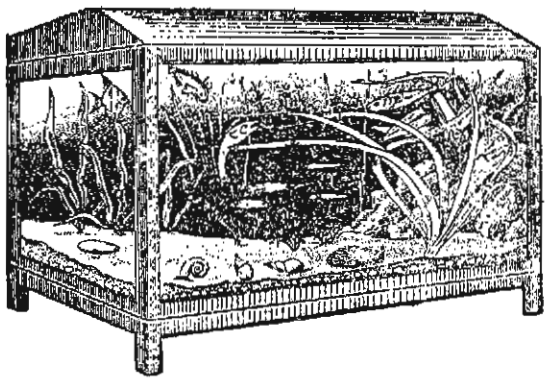


Fig. 13.27 An Aquarium

bottom of the aquarium contains pebbles and coarse sand bed. Aquatic plants like ***Valleisneria, Hydrilla,*** tape grass, needle grass and Indian ferns are planted in the sand bed.

The aquarium at home stimulates a natural environment by keeping shells of molluscs, shell like chunk, oyster and minitoys. The ornamental fishes usually relax in the shades of aquatic plants. These plants supply oxygen to fish and remove the debris. An aerator must often be used for additional supply of oxygen.

The following points are kept in mind for maintaining an aquarium.

1. Aquarium should be placed where the standard temperature and proper ventilation are available.

2. Avoid falling of direct sunlight.

3. It should be closed with proper lid.

4. Avoid using sharp stones inside the aquarium to prevent injuries to the fishes.

5. Fishes should not be handled by hands. Hand-fish-net should be used for handling the fishes.

6. Do not allow large fishes in small grouping fish.

Female fishes are generally bigger than the male fishes. For example, the male adult guppy fish weighs about 2.5 gram whereas the female adult guppy fish weighs about 5 gram. The male fishes are attractively and brightly coloured. In male fishes green, yellow, blue and red coloured dots and stripes are seen on the surface of body and on the broader tail fins.

13.6.2 Maintenance of ornamental fishes

There are two important points for the proper maintenance of ornamental fishes in the aquarium. They are given below.

(i) Quality of water and

(ii) Proper food supply.

(i) Quality of water

Pond or lake water is used for the maintenance of aquarium. Chlorinated tap water should not be used, since all the fishes die in chlorinated water. Limestones should not be used in the place of pebbles, as they dissolve in water and affect the quality of water. Too much of algae and other water plants inside the aquarium should be avoided, since they will affect the oxygen content in water during night time.

When there is oxygen depletion in the aquarium, the fishes come to the surface of water. So an aerator device is to be used to supply fresh oxygen from outside. Periodical change of water in the aquarium, washing the pebbles by boiling water and cleaning of aquarium are properly done.

Addition of dye or colouring agent to the aquarium should be avoided. A constant temperature is to be maintained.

(ii) Proper food supply

As the fishes are grown in limited space and in limited water, it is essential to supply proper food. Required quantity and nutritious food should be given to them. Usually the pond and the lake water contain zooplanktons and phytoplanktons. They are consumed by the fishes as natural food. Biofood like bloodworms and earthworms can be supplied to them, as they do not contaminate the water.

Ready made fish food from market and protein rich foodgrains can be supplied to them. Giving same type of food is to be avoided. The food is supplied to them two times a day. Ornamental fish culture is encouraged as small-scale industry.

Activity 13.7

Make an aquarium with a big size bottle.

Activity 13.8

Construct an aquarium in your school.

Do you know?

1. The African goliath beetle is the heaviest insect in the world. It weighs upto 100 gram and measures upto 11 cm.

2. The world's biggest fish is the whaleshark. It weighs upto 43 tonnes and its length is upto 18.5 metre.

3. 'Millipede' means a thousand legs. But millipedes do not have a thousand legs. They generally have 200 legs and the maximum number of legs can be 240.

SELF EVALUATION

I. Choose the correct answer

1. Which one of the following shows nocturnal periodicity?
   (a) House fly (b) Cockroach (c) Frog (d) Rat
2. Mango fruit is bored by larvae of
   (a) mango weevil (b) mango maggot (c) mango moth (d) mango fly.
3. Black paddy bug feeds on
   (a) the leaves (b) the matured grains
   (c) the base of the stem (d) the grains in milk stage
4. The binomial of patato is
   (a) *Solanum tuberosum* (b) *Musa paradisiaca*
   (c) *Oryza sativa* (d) *Mangefera indica*
5. Honey is adulterated by
   (a) fruit juice (b) oil extract
   (c) wax like substance (d) gur solution
6. Turmeric is used in the preparation of
   (a) fertilizers (b) cosmetics
   (c) woollen fabrics (d) pesticides
7. Rearing of bees is called
   (a) vermiculture (b) sericultlure (c) apiculture (d) agriculture
8. Soyabeen oil contains
   (a) 30 to 45% of protein (b) 2 to 10% of protein
   (c) 30 to 45% of fat (d) 2 to 10 % of fat
9. Fish contains maximum
   (a) proteins (b) carbohydrates (c) fats (d) vitamins
10. For the construction of aquarium ————————is used.
    (a) chlorinated water (b) tap water (c) lake water (d) sewage water

II. *Fill in the blanks*

11. DDT is an example for ————————
12. Apple is bored by ————————
13. The potato is mainly attacked by ————————
14. The dark coloured central portion of a log is called ————————
15. The medicine ———— is extracted from Ephedra.
16. Aluminium frames and PVC pipes are used as ———— for wood.

17. Honey extraction from artificial combs is done by ————————
18. Vermicompost is an excellent ————————
19. In vermiculture, the earthworms are introduced into ————————
20. Ornamental fishes have ————————

III. Match the following

21.	Teak wood	–	Damage to fruits
22.	Sandal wood	–	*Agathis*
23.	Making paper	–	Inflorescence
24.	Banana scab moth	–	*Santalum album*
25.	Banana thrips	–	*Tectona grandis*
26.	Timber yielding plant	–	Sunflower
27.	Spices yielding plant	–	Ephedra
28.	Medicinal plant	–	Plywood
29.	Oil yielding plant	–	Mahogany
30.	Subsitute for wood	–	Turmeric

IV. Give short answers

31. What is pesticide? Give an example.
32. What is vermicompost?
33. Write the names of different kinds of pests on rice plant.
34. What is plywood?
35. What is an aquarium?

V. Give detailed answers

36. Write the steps involved in vermiculture technology.
37. What are the problems encountered in maintaining ornamental fishes?
38. What are the precautions to be taken to store foodgrains?
39. What are the benefits of vermiculture?
40. Write an account on social life of honey bees.
41. What are the uses of wood?

14. Health and Hygiene

14.1 Health and hygiene

Last year, in sixth standard, you have learnt about health. Health is a general state of a person's physical, mental and social viability.

In this chapter you are going to study about quantity and quality of food that you need for keeping good health, personal domestic hygiene and role of secured food.

Food

Do you ever think about what type of food that you eat? Are you choosy in your food habit? Or do you eat the same kind of food daily? What is the use of food that you eat? As you know, food has many different nutrients: carbohydrates, proteins, fats, mineral salts, vitamins and water. Each nutrient has its own function like producing energy, formation and regeneration of cells and growth of cells, regulating the functions of all body organs etc.,. So food is essential for us to do work, to grow and maintain life and to keep healthy. Yes, food is the fuel for living organism as petrol is for a motor cycle.

14.1.1 Vitamins and minerl salts

Vitamins (vital+amines) are complex organic compounds present in small amount in our food.

Vitamins do not provide energy. They do not promote growth yet they are essential for normal body activities. Mineral salts regulate the functions of all body organs. Deficiency of vitamins and mineral salts lead to several unhealthy conditions, which are termed as **deficiency diseases**.

14.1.2 Types of vitamins -sources and uses

Vitamins can be classified into two types on their solubility in fat and water.

1. *Fat soluble vitamins* :
Vitamins - A, D, E and K.

2. *Water soluble vitamins*:
Vitamins B and C.

Each vitamin has its own chemical name and very complicated chemical formula. However, for simplicity they are represented by letters such as A, B, C, D, E, and K.

Sources of vitamins

Our body cannot make most of the vitamins. Vitamin D can be formed in our body by the action of sunlight on fat under the skin and Vitamin K is formed by the bacteria which are lodged in our large intestines to some extent. Almost all the food items contain more than one vitamin in varying amount. See table 14.1 for its sources and uses (figs. 14.1 to 14.6).

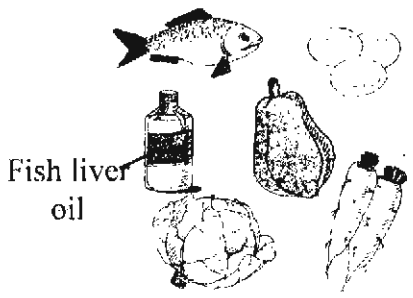


Fig. 14.1 Sources of vitamin A

Sources of vitamins

Fig. 14.2 Vitamin B

Fig. 14.3 Vitamin C

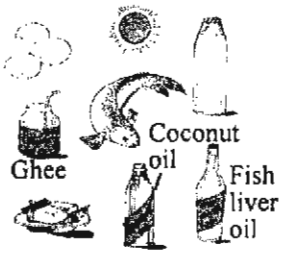


Fig. 14.4 Vitamin D

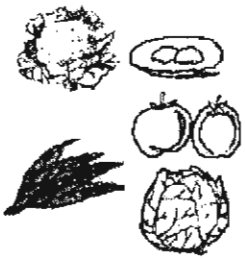


Fig. 14.5 Vitamin K

Table 14.1 Importance of some vitamins

Vitamins	*Importance*	*Where it is found*	*Deficiency*
A	Helps to keep eyes, hair and skin healthy	In carrots, butter, sweet potatoes, papaya and mango	***Night blindness and Xeropthalmia***
B_1	Helps the digestive and nervous system to work well	In eggs, meat whole cereals and yeast	***Beri-Beri***
B_2	Keeps the skin and mouth healthy	In green leafy vegetables, peas, beans and milk	***Retarded growth and bad skin***
B_{12}	Needed for healthy blood and red blood cells	Mostly in meat and nonvegetarian food	***Anaemia***
C	Helps to resist infections, of teeth, gums and joints	In almost all fresh fruits, specially lemon, oranges and goose berries and guava	***Scurvey***
D	Aids in the normal strengthening of bones	In fish liver oils, milk, meat	***Rickets in children Osteomalacia in adult.***
K	Helps in the clotting of blood	In green leafy vegetables, tomatoes, and egg yolks.	***Excessive bleeding after injury- Haemophilia***

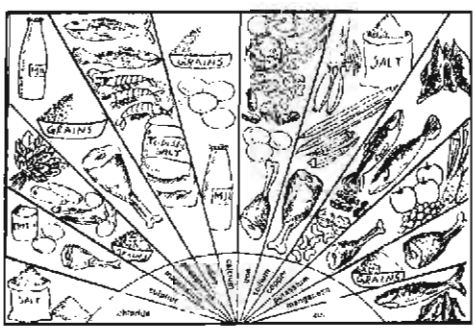


Fig. 14.6 Sources of minerals

14.2 Food deficiency diseases

Every individual needs an adequate supply of nutritional food for good health.

Lack of essential nutrients in the diet is called **malnutrition**. It means the persons are generally weak and sick.

Many people in our country and other developing countries suffer from malnutrition because of poverty; malnutrition specially affects the health of children severely. To control malnutrition government has taken several steps like noon meal scheme for school children and functioning ICDS.

A seventh class student like you needs about 2200-2500 calories daily (see Table 14.2)

Table 14.2 Recommended daily needs of some nutrients

Age group	12-15 year Girls	12-15 year Boys
Carbo hydrates	300 grams to 320 grams	300 grams to 320 grams
Proteins	2.5 g. per Kg of Body Weight	2.5 g. per Kg of Body Weight
Fats	30 to 50 g	30 to 50 g
Minerals	10 to 30 mg	10 to 30 mg
Vitamins	1 mg. of Vit. A. 1 mg of Vit. B. 50 mg of Vit. C.	1 mg. of Vit. A. 1 mg of Vit. B. 50 mg of Vit. C.
Total Calories	2200 to 2500	2200 to 2500

Table 14.3 Caloric requriments of adult according to age

Age	Men	Women
20-30	3200	2300
30-40	3100	2230
40-50	3000	2160
50-60	2750	2000
60-70	2500	1800
70-	2200	1500

14.2.1 Protein deficiency

The deficiency of proteins severely affect the children in our country in age group of 1-5 years.

Major types of diseases

1. Kwashiorkar
2. Marasmus

Kwashiorkar

This disease develops from the replacement of mother's milk by high caloric and low protein diets in a child more than one year.

Symptoms

Thinning of limbs, stunted growth retarded mental abilities. The abdomen, feet and legs are swollen in nature (fig. 14.7).

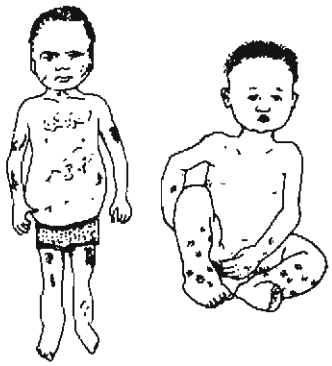


Fig. 14.7 Children suffering from Kwashiorkar disease.

Marasmus

This disease develops when the mother's milk is replaced too early by other foods, which are poor in both proteins and energy food.

Symptoms

Head of child is large, limbs look like stick, loss of body weight, impaired growth and brain development (fig. 14.8).

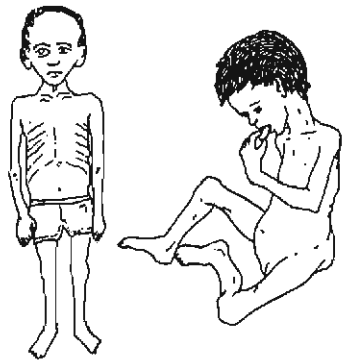


Fig. 14.8 Children suffering from Marasmus disease

a b

Fig. 14.9 The rat (a) was fed a diet lacking in vitamin A. The other(b) had a properly balanced diet. Note the eyes and fur on both cases.

Table 14.4 Vitamins and mineral deficiency diseases

Deficiency Diseases	*Deficient Nutrients*	*Major Symptoms*
Night blindness	Vit. A.	no vision in dim Light
Xeropthalmia	Vit. A	dryness of cornea-Blindness (fig. 14.9)
Rickets (in Children)	Vit. D & Calcium	weak, soft, thin bones, swelling on wrist, elbow and knee (fig. 14.11)
Osteomalacia (In adult)	Vit. D & Calcium	weak bones of vertebral columns
Bleeding disease	Vit. K.	delayed blood clotting, so profuse bleeding
Beriberi	Vit. B_1	numbness, weakness, fluid accumulation in tissues.
Pernicious anaemia	Vit. B_{12}	Immature red cells without haemoglobin, very fatal. (fig. 14.10)
Scurvey	Vit. C	bleeding of gums, falling teeth
Goitre	Iodine	enlargement of Thyroid gland, impaired metabolism (fig. 14.12)
Anaemia	Iron	number and size of red blood cells & haemoglobin content reduced

Fig. 14.10 Feeding a diet containing vitamin B restored good health in this chick

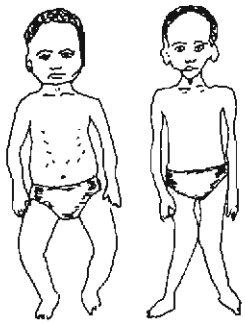


Fig. 14.11 Children suffering from Rickets

Fig. 14.12 The photograph of woman suffering from Goitre

Mineral deficiency in plants

The basic needs of plants and animals are the same. They require carbohydrates, proteins, fats, minerals vitamins and water for their growth and development. Green plants can prepare their food from simple substances through the process called photosynthesis. There are three sources that supply inorganic nutrients to plants. These sources are soil, air and water.

Plants absorb a wide range of mineral elements. Out of more than 105 elements discovered, only about 20 elements are essential for normal growth of plants. There are some elements which are required in large quantities by the plants. They are called **macronutrients**. They include carbon, hydrogen, oxygen, nitrogen, phosphorous, sulphur, potassium, calcium, magnesium and silicon. NPK are the three main mineral elements supplied to crops as chemical fertilizers.

There are some elements which are required in less amount by the plants. They are called **micronutrients**. They include iron, manganese, copper, molybdenum, zinc, boron and chlorine.

Deficiency of any element in plants may lead to symptoms such as chlorosis,necrosis, stunted growth and other characterisitic symptoms.

Carbon, hydrogen, and oxygen are the building blocks of macromolecules like carbohydrates, fats and proteins. Now you will study the roles of some other elements in plants.

(i) Nitrogen

This is the mineral element required by plants in plenty. It is absorbed as nitrites, nitrates and ammonium ions. This is very essential for meristematic tissues. i.e. growing tips of plants. It is one of the constituents of proteins, nucleic acids, vitamins and hormones. Its deficiency causes yellowing of older leaves – chlorosis, stunted growth, late flowering and inhibition of cell division.

(ii) Phosphorus

It is absorbed by plants in the form of phosphate ions. It is one of the constituents of cell membrane and nucleic acids. Its deficiency causes delay in seed germination, and premature fall of leaves and flower buds.

(iii) Potassium

It is absorbed as potassium ions. It is more abundant in meristematic tissues. It is essential for maintaining acid base balance in cells and opening and closing of stomata. Its deficiency causes shortening of inter nodes, yellow edges to leaves and premature death.

(iv) Magnesium

It is absorbed by the plants in the form of magnesium ions. It is a constituent of chlorophyll pigment. Its deficiency induces chlorosis between leaf veins.

(v) Boron

It is absorbed in the form of borate ions. It is essential for pollen germination, cell elongation, cell differentiation and carbohydrate translocation. Its deficiency includes formation of lesions in the stem and roots. Its deficiency also causes stunted growth.

14.2.2 Nutritional diseases in human

Some eat only roti or breads, while others prefer rice. In costal regions, people eat a lot of fresh and dried fish and in mountain regions, fruits and meat.

We eat a variety of food according to our taste and availability of food material. This constitute our food habits. Now the Globalization-concept of consumerism insists more on us to change our food habits from diverse food culture to mono food culture.

Unwanted change of food habits-i.e. more caloric value with sugar and fat leads to number of diseases like obesity, diabetes and cancer etc.,.

Obesity

Obesity means fatness. This is due to in take of more amount of high caloric value food. Over eating lead to overweight. Insufficient exercises, hormonal imbalance, hereditary are also the general causes of Obesity.

Fig. 14.13 An obese child

Regulated food, proper exercise and routine medical help can check this disease (fig. 14.13).

Cancer

Cancer is abnormal cell growth. 30-35% of cancer link with diet practice. Adulteration in food, over heating and use of reheated oil, use of synthetic chemical dye for artificial colouring, and some food preservatives are the major cause for cancer in normal man.

14.2.3 Balanced diet

For being healthy and strong, you must eat the right amount of food containing the right amount of each nutrient component. Such a food is **balanced food**.

A meal in which you eat balanced food is called a **balanced meal**.

A group of balanced meals taken during the day is called a **balanced diet**.

Balanced diet has three important qualities

1. It is rich in essential quality such as vitamins, minerals and certain amino acids.

2. It provides enough energy raw materials for growth of cells, tissues, and organs.

3. It provides the energy required by the body (see table 14.5).

Activity 14.1

Choose your friends and make a list of their diet on a particular day. Tabulate their nutrients intake and check whether it is balanced or not.

Activity 14.2

Prepare a nutritive value of your daily food.

14.2.4 Toxicology

Toxicology is a branch of science that deals about the nature and effect of poison.

Food toxicology means any condition in which foods cause toxic reactions. Excessive use of chemical fertilizers and pesticides add toxins in the food items. These polluted chemical toxins leads to severe health problems like cancer, nervous disorder, even sterility.

Activity 14.3

Why should we use chemical fertilizers and pesticide? List out any alternate?

Activity 14.4

It is a common belief that the expensive food materials are of better quality. Is it true? Let us examine.

For instance, take the case of grapes and amaranthus. Grapes are available only during certain seasons. But what about amaranthus? Amaranthus is much cheaper than grapes yet we prefer grapes. Many people believe

Table 14.5 Various food stuffs needed to give us a balanced diet (quantity in grams)

Food Stuffs	*Average Man*	*Average Woman*	*Adolescent (13-15 Yrs.)*	*Child (5 years)*
Cereals (Rice, wheat etc.,)	520	440	420	270
Pulses (Various dhal-ground nuts, coconut, seeds can substitute)	50	45	45	35
Green leafyVegetables	40	100	50	50
Other vegetables(raw or cooked)	70	40	50	50
Roots and Tubers(potato, sweet potato, yam, tapioca)	60	50	30	20
Milk	200	150	250	250
Fats and Oil	45	25	40	25
Sugar and Jaggery	35	20	45	40

Note: Non-vegetarians can replace pulses = 2 eggs = 50 gms meat = fish

that there is more nutritive value in grapes. Is it true? Look at the Table.

S. No	Nutritive factors	100 g of grapes	100 g of amaranthus
1.	Proteins	0.5 g.	2 g.
2.	Fats	0.3 g.	0.7 g.
3.	Carbohydrates	20.0 g.	29 g.
4.	Minerals	0.06 g.	1.7 g.
5.	Vitamin A	nil	3 µg.
6.	Vitamin C	1 mg.	30 µg.

On analyzing the table, what inferences you have arrived at. Note down:-

1. ---- 2.---- 3.----

4.---- 5.---- 6.----

14.3 Dental care and oral hygiene

Teeth are hard, calcified structures, attached to the upper and lower jaws of vertebrates and of a few lower animals.

Human teeth

Human teeth serve major functions other than chewing. The teeth are directly involved in the process of speech. The teeth also affect the appearence of face and modified by the loss of neighboring teeth or by any irregularity in tooth growth or colouring.

14.3.1 Structure and arrangement of teeth

Teeth arrangements

In buccal cavity, different types of teeth are arranged in definite order and embedded in gum socket (fig. 14.14).

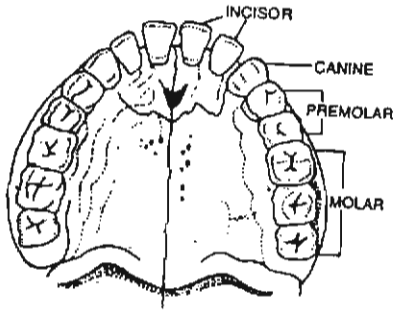


Fig. 14.14 Arrangement of teeth in the jaws

Tooth structure

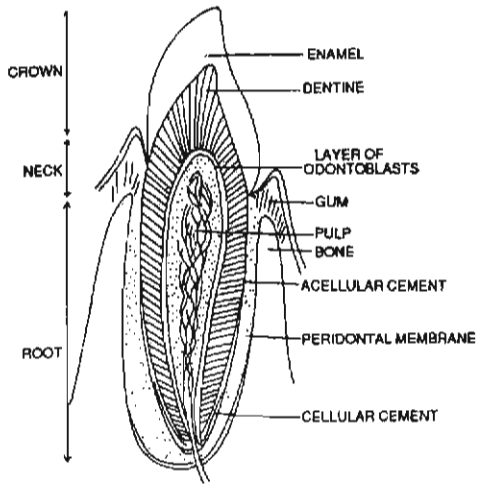


Fig. 14.15 V.S. of a Tooth

Human teeth consist of three parts; **crown, neck** and **root**. Only the crown part is exposed. Neck is surrounded by gum (fig. 14.15).

The root is embedded in a bony socket of the jaw. The outer layer of the crown is composed of calcified tissue known as **enamel**-the hardest and shiny substance in the body.

Internally the tooth contains a cavity called **pulp cavity** because it has a nourishing and sensitive material called **pulp**. The pulp is made of gelatinous connective tissues, lymph vessels, blood capillaries and nerve endings. Stellate cells called odontoblast line the pulp cavity.

Odontoblasts produce a substance called **dentine**, a bone like substance extending from the inner surface of the enamel into the jaw to form the root. Dentine is further covered over by another hard substance in the region of root and neck. It is called cement.

Activity 14.5

Make a model showing teeth arrangement by paper pulp or synthetic clay and paint it properly.

Activity 14.6

Collect specimen of teeth from a dentist and preserve them

Milk or temporary teeth and permanent teeth

In human, one set of 20 teeth is produced for use during early jaw development; these are called the milk or baby teeth.

A second set of 32 larger permanent teeth replaces the milk teeth as the jaw matures. As a result of the growth and enlargement of the jaw, the roots of the milk teeth separate, allowing space for the larger permanent teeth to develop between them. The pressure of developing permanent teeth causes the tissues of the jaw to resorb, or suck up, the roots of the corresponding milk teeth.

Types of teeth

All the teeth in our mouth are not like. There are four types of teeth in our mouth. These are called **incisors, canines, premolars** and **molars**. The incisors are for biting the food, the canines for cutting and tearing the food and premolars and molars for grinding the food. So the teeth chew the food well (fig. 14.16).

Wisdom teeth are the third molar teeth, which do not usually erupt until adulthood.

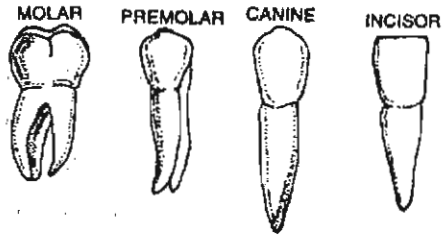


Fig. 14.16 Types of teeth

Dental formula

It is a symbolic representation of dentition in which the numbers of teeth of each type are shown for one half of mouth cavity, where those of the upper jaw as numerators and those of the lower jaw as denominators. Thus the dental formula for permanent teeth of human being is:

$$\frac{\text{I } 2.\text{C } 1.\text{PM } 2.\text{M } 3}{\text{I } 2.\text{C } 1.\text{PM } 2.\text{M } 3} = \frac{8}{8}$$

I - Incisor C - Canine
PM - Pre Molar M - Molar

Activity 14.7

Look into a mirror and count your teeth. How many of them are premolar and molar?

Activity 14.8

Look into the mouth of one of your friends. How many incisors and canines are present in your friend's mouth?

14.3.2 Care of teeth

Oral hygiene

Proper oral hygiene and periodic dental examination help or prevent dental diseases.

Diet plays a vital role in maintaining dental health. A well balanced diet with a minimum of carbohydrates may minimize dental infections.

Eat as much as self cleaning foods, such as, raw vegetables, carrots, radish, spinach, cabbage fresh fruits and other food rich in vitamins and minerals.

Avoid eating sticky foods like sweets, chocolates, toffees and ice creams.

Brushing the teeth after meals to remove food residues helps to reduce decay. Teeth should be brushed in the direction of their growth to avoid gum irritation.

14.3.3 Tooth disease

Dental caries

Teeth are extremely susceptible to a process of decay - **dental caries**. You must have seen yellowing of teeth in, some of your friends and elders. This is due to a sticky film of food particles, saliva and bacteria, called **Plaque**.

Fig. 14.17 Tooth decay

If you eat sweets between meals, the plaque on your teeth absorbs the sugar like a sponge. Bacteria in the plaque changes this sugar into acid, which dissolves away the tooth enamel. The breakdown of the enamel permit other bacteria to penetrate the dentine. Ultimately, this makes a hole or cavity in the tooth, resulting severe pain.

Plaque is harmful for gums also. Plaque builds up where the teeth meet the gums and makes a space between them. Bacteria that grow in this space cause the teeth to become loose and fall out in many instances (fig. 14.17).

14.3.4 Gums pyorrhoea

pyorrhoea a chronic disease that attacks the gums and bone surrounding and supporting the teeth.

The disease begins with accumulation of tartar and debris from trapped particles of food beneath the gum margins. These accumulations cause inflammation of the gums. This affects the supporting bones and loosens the teeth. The most important cause of this is poor dental hygiene.

14.3.5 Halitosis

Offensive breath cause more and more dental decay.

14.3.6 Mumps

Mumps, the acute infectious disease is caused by a virus that mainly attacks glandular and nervous tissues, frequently characterized by swelling of

the salivary glands. Improper oral hygiene and dental decay also infect the salivary glands. These leads to swellings of the salivary glands, below the sides of lower jaw. Its incidence is highest between the ages 5-9.

14.4 Zoonotic diseases

Zoonoses are defined as "those diseases and infections which are naturally transmitted between vertebrate animals and man". Zoonotic diseases may be due to viruses, bacteria, fungi, helminthes, protozoa, and arthropods (fig. 14.18).

Some of the important zoonotic diseases are given below:

- *Bacterial zoonoses* : Plague, Leptospirosis
- *Viral zoonoses* : Rabies and Japanese encephalitis.
- *Ptotozoan zoonoses* : malaria, trypanosomiasis, and kala azar.
- *Helminthic zoonoses*: taeniasis, ascariosis, and filariosis.
- *Fungal zoonoses*: Mycotic diseases
- *Ectoparasitic zoonoses*: Infestation with ticks and mites of dog.

Zoonotic diseases cause much damage to mankind by affecting the health or shortening the human life.

14.4.1. Men and animal relation -pets.

Our cave dwelling ancestors used dogs as the co-partner in hunting job. Subsequently, in all civilization dogs were used as guards, companions and hunters and in times of war. So first pet animal of man was dogs, then cats, horses and some birds (figs. 14.19, 14.20).

Pet animals kept for pleasures and companionship are usually domesticated and selectively bred for coexistence with human beings.

Besides their value as pets, pets serve utilitarian purposes protecting homes and property, destroying vermin and providing means of transport.

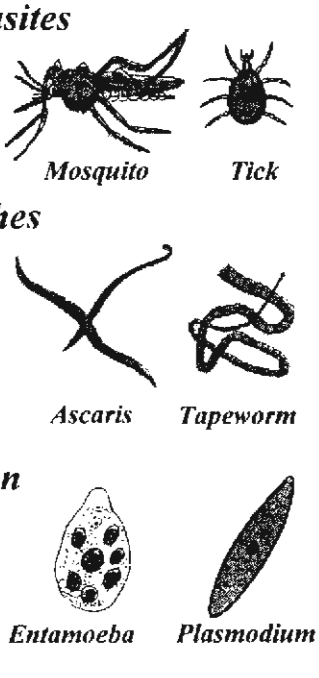


Fig. 14.18 Zoonoses - causative agents

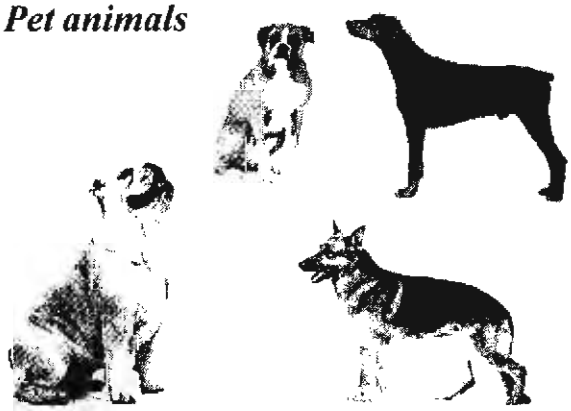


Fig. 14.19 Pet Dogs

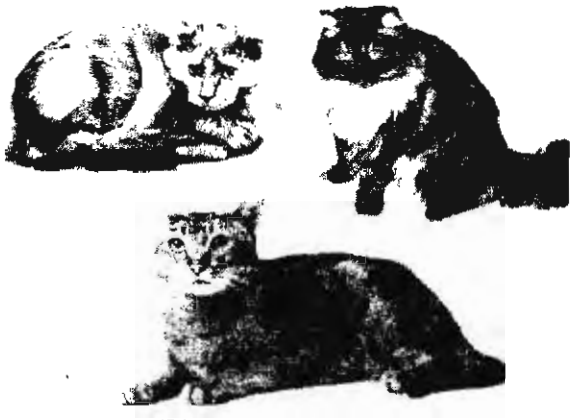


Fig. 14.20 Pet Cats

Activity 14.9

You prepare a chart showing various animals and the diseases they spread.

14.4.2 Diseaeses caused by animals

At least 40 different diseases can be transmitted from pets to people. They may be acquired from direct contact with infected animals or from the animal's excreta. Sometimes just breathing the air in the vicinity of man, infected pet can cause illness. (Table 14.6)

14.4.3 Protection from zoonotic diseases

- Acquire pets only from a reliable dealer who practises good sanitations. Do not attempt to take wild or sick animals or monkeys as pets.
- Have a veterinarian check over a new pet and provide needed immunizations.
- Keep your pet clean and properly housed. Empty litter boxes daily.
- Practise good hygiene.
- Always wash your hands after handling a pet.
- Don't let it lick your face. Keep pet's eating utensils separate.
- Keep pets out of people's bed.
- Health education to the general public should be accorded top priority.
- The high risk group should be protected by administration of specific immunization.
- Infested pets and the areas where the pets commonly reside should be treated with appropriate insecticides for fleas, ticks and mites and their larvae.

14.4.4 Protection of pet animals

- Proper food, a dry bed, sufficient exercise and affectionate care are necessary to keep animals, a happy and healthy member of the family.
- Owners should learn how to pick up pet animals correctly
- Periodic veterinary check up should be done.

Vaccination and medication

Vaccination is a very effective method of preventing infection of microorganisms, especially of bacteria and viruses.

Domesticated pet animals. such as dogs and cats are generally immunized against various infections like

- Rabies, canine distember, which affects the nervous system.
- Infectious canine hepatitis, which affects the liver

Table 14.6 Some diseases caused by animals.

Name of disease	Causative agent	Aquired from	Symptoms	Prevention and control	Treatment
Anthrax	Bacillus anthracis-Bacterium	through open cut in skin, by inhaling spores, as from animal hair or wool or by consuming, contaminated meat or milk.	skin eruption respiratory tract inflammation and suffocation, may be fatal.	If there is any abnormal changes in skin, or any suffocation.	1. Compulsory inoculation of pet animals. 2. Workers of tannery and wool factories are to be vaccinated.
Rabies (Hydrophobia)	Rabies virus	Virus infected stray dogs and cats	Rabies dogs are mad, changed voice and excessive salivation with high mucous content. In man, rabies virus destroy brain cells and spinal cells, severe headache, high fever restless and inability to swallow even liquid due to choked throat.	Eradication of stray dogs and cats	Compulsory immunization of pet dogs and cats. *Anti Rabies vaccine* should be given immediately after the dog` bite.
Hydatidosis	Dog tape worm	Man acquires infection on eating food or drinking water contaminated with egg.	Eggs are developing into water haydatid or bladder worm in intestine liver, lungs and other organs. Causes inflammation in those organs. Liver is enlarged. Vomiting, diarrhoea and eosinophilia and other intestinal disorders.	Avoid playing with pet dogs, hands are thoroughly washed before eating, dogs should not be allowed to eat raw meat.	Men may be treated with drug like *Atrabin.* Dogs are treated with medicine called *Arecline hydrobromide.*
Leptospirosis	Leptospiro Bacterium	Spread thro' contaminated water, dead rats, dead domesticated animals, pet animals or even rat's urine may contaminate water.	Affecting normal functions of kidneys, liver, brain, eyes, uterus, lungs, intestine etc., vomiting, headache, fever, body pain, jaundice, acute renal failure, internal haemorrhage, blood vomiting leads to heart attack.	Dead rats and dead animals are disposed scientifically, rain water, should not be logged in major path. Strictly avoid self medication	after proper diagnosing, proper antibiotic medicine should be given.

- ❖ The highly contagious intestinal disease caused by virus.
- ❖ Inoculation against Leptospirosis.
- ❖ Treatment for internal and external parasites· (worms, fleas, ticks and lice).
- ❖ Cats can be periodically inoculated against many serious diseases.

Activity 14.10

How do you differentiate Anopheles with culex mosquitoes?

Activity 14.11

Visit any pet clinic and discuss with veterinary doctor about pet diseases.

14.5 Food Poisoning

If food is not properly preserved it can go bad, and lead to poisoning. Sometimes it can be sensed by an unpleasant smell and taste. Food decomposes as a result of the action of the enzymes contained itself, as well as the action of the bacteria and fungi that grow in it.

14.5.1 Factors causing food poisoning

❖ Bacteria and fungi play important role in food poisoning. Their toxic substances affect the quality of food and their intoxication and infections affect the general health factors.

eg. Mycotoxins-from fungi; Botulism by bacteria.

❖ Handling food: preparation of food also need more care. The improper cooking and food handling leading to food poison

❖ Poor personal hygiene in food handlers

❖ Cross contamination between raw and cooked food.

14.5.2 Food poisoning and health

As you know, food is very important for all living organism to perform all life activities. If food gets contaminated and poisoned, it will affect total upkeep of body health. Usually, intoxication of food shows some symptoms like vomiting, and intestinal disorders, which will recover with in a week.

Excess use of pesticides on crops, spraying pesticides in godown causes longterm damage to human health and cattle (fig. 14.21).

Pesticidal residues can also enter our body directly if we do not properly wash farm products like vegetables, fruits greens etc., before consuming them. DDT and related chlorinated hydrocarbons are some toxic chemicals. These chemicals damage all major systems like nervous system, circulatory system, reproductive system and immune system etc., in man.

Food hygiene: Food hygiene and food sanitation is a way of life.

Cleanliness and hygiene in food handling is very important.

Practise the following rules for cleanliness and hygiene of food:

- ❖ Tie hair neatly before starting food preparation.

Fig. 14.21 Spraying pesticide in godown

- Wash hands thoroughly with soap and water before starting preparation.
- Food should be carefully washed to ensure removal of insecticide, worms, eggs and other parasites sticking to it.
- All drinking water should be boiled.
- Boil milk in a clean container as soon as possible after receipt and keep covered.
- Milk bottles need to be rinsed thoroughly with water and then washed with soap and water.
- Utensils and equipment used for preparations should be cleaned well.
- Cooked food should be stored and covered, preferably in the container in which it is, cooked.
- Reheating before use is advisable. But repeated heating should be avoided. Reusing the oil and reheating the oil should be totally avoided.

14.5.3 Food adulterants

Since food, like air and shelter, is an essential requirement of our life, any attempt to purposely degrade its quality is punishable under the law. Still there are some antisocial persons who adulterate food to make easy money.

When the quality of food, is lowered or affected either by addition of other inferior or injurious substances that causes damage to health.

A good example of this is the addition of water into milk or removal of fat from milk.

Adulterants are the substances (below standard) mixed with original food. Theses cause much danger to our body health as well as our society. The nutritional value of food is lost (See Table 14.7)

14.5.4 Spoilage of food

Decaying is a natural process, which makes all types of food to get spoiled sooner or later.

Causes of food spoilage

Food varies greatly in the length of time for which they can be held in their natural form without spoilage. These foods have high moisture content and are highly susceptible to spoilage.

Foods are spoiled by the action of

1. Physical means; mishandling of food

2. Microorganism,
3. enzymes
4. Insects (rats, weevils and so on).

Food spoilt by microbes (bacteria and fungi) can cause illness by their extensive growth in it or by the toxins (poisonous substances).

Considerable amount of food and food materials are lost in every home due to wasteful practices and inefficient management of food. As food forms the single largest 'budget of the families, food management awareness is very important.

Activity 14.12

Testing of some food adulterants.

1. *Saw dust or Brick powder in Red chilly powder: If it mixes with water, saw dust floats, brick powder settles faster than the powder.*
2. *Papaya seeds in Black pepper: Put them in water, papaya seeds float.*
3. *Sugar solution in Honey: Dip cotton wick and burn. If wick burns with crackling sound adulteration is confirmed. (Honey will not burn)*

Table 14.7 Some common food adulterants and their harmful effects

FOOD ARTICLE	ADULTERANT	HARMFUL EFFECTS
Coffee powder	Chickory powder or Tamarind seed powder	Stomach disorder giddiness Joint pain and diarrohea
Tea	Used up tea leaves or Saw dust	Liver disorder, digestion problem
Milk, Kova & Cheese	Starch or water	Digestion problem and contaminated water could result in ill health
Sugar	Chalk powder	Can't be digested and leads to digestion problems
Black pepper	Papaya seeds or rotten pepper	Stomach, liver problems
Jaggary	Washing soda or chalk powder	Diarrhoea and vomiting.
Common Salt	Chalk powder	Digestion problems.
Mustard Oil	Argemone oil	Loss of eye sight, heart diseases and cancer epidemic infection similar to beri beri
Coconut oil	Mineral oil	Damage to liver and heart, sometimes even leading to cancer
Chilly powder	Saw dust or brick powder	Stomach disorder
Sweets and Aereated drinks	Inedible colour and chemical additives	Abnormalities of eyes, bone, skin, lungs, ovaries and testes. Sometimes leading to cancer.
Pulses (red gram)	Kesari dal	Cripping paralysis
Grains, spices and pulses	Sand, marble chips or artificial grains	Affect teeth gums, stomach, liver and intestine
Sweet, meats, icecream and bakery goods	Saccharine or other chemicals	Gastro intestinal disorder even cancer.

4. *Try to find out whether you are able to see any adulterants in the food items you buy from the market. If so, make a list of them.*

14.5.5 Food preservation-various methods

Centuries ago people knew that if food was not stored or handled properly, the food would go "bad" and this could lead to sickness. Consequently, they learnt how to preserve food using salting, drying, pickling, smoking, and freezing methods to stop it deteriorating through the action of bacteria, yeast, and moulds.

Some appropriate methods and techniques of preservations can considerably reduce wastage of perishable food materials. Food preservation, in fact, offers several advantages:

- ❖ Augmenting food supply, especially out of season.
- ❖ Reducing food wastage making up for dietary inadequacies
- ❖ Increasing the storage period of food stuff, and
- ❖ Ensuring their availability in distant places.

Food preservation essentially means longer retention of the nutritive value of perishable food materials.

Methods of Food Preservation:

The different methods of food preservation are

1. drying and dehydration
2. canning
3. refrigeration
4. addition of food preservatives
5. pasteurization.

Drying and dehydration: Drying and dehydration remove water from food. The micro organisms are therefore unable to grow without water. Thus spoilage of food is prevented to some extent. Vegetables, fruits, meat and fish are dried by spreading them out in the sun. Thus these can be stored.

Canning: By cooking, we kill the micro organism but cooked foods cannot be kept fresh for a longer time. Canning is the method by which food can be preserved for a long time. In canning the food stuffs are exposed to high temperatures to kill the harmful micro organisms and to inactivate the enzymes. These foodstuffs are then sealed immediately in the air tight containers. Canned food can be preserved in a good condition for many months.

Refrigeration: Refrigeration is the method by which food is preserved at low temperature. By this method preserved foods are kept as fresh as possible without much loss of vital food values.

Addition of food preservatives: Salt, sugar, honey and oil are good preservatives. Salt and oil are used for preserving meat, fish, vegetables and pickles. Sugar and citric acid are added as preservatives in the preparations of jam and jellies.

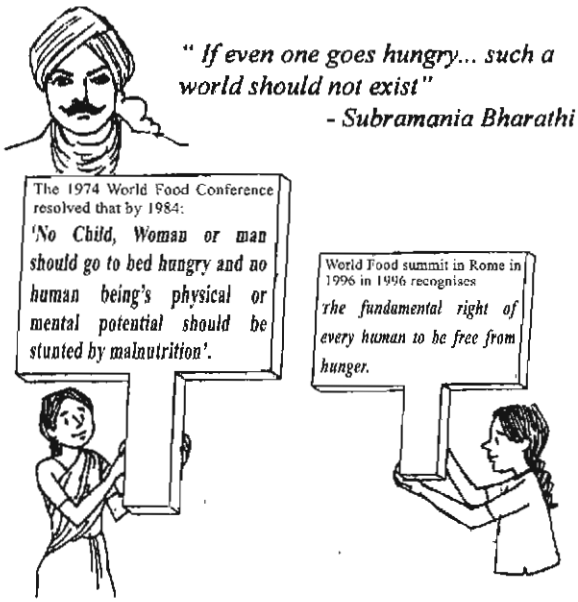
Pasteurization: Pasteurization is a process by which the disease causing bacteria in the milk are destroyed without losing its nutritive values. The milk is boiled at 60^0C for thirty minutes and cooled quickly. This is the contribution of Louis Pasteur.

Whatever the method is used for preservation of food, cleanliness and general sanitary conditions are important. Every effort should be taken to avoid contamination of food by dust, dirty utensils, soiled work surface and hands.

Activity 14.13

Find and list out the methods used in olden days to keep food grains and other edibles without damage or decay.

Nutrition is the basic requirement of health. It is the minimum need of a life of diginity-of life itself.



But achieving this still remains a distant dream...

SELF EVALUATION

I. *Choose the correct answer*

1. Mango has chief source of vitamin
   (a) A (b) B (c) E (d) K
2. In children vitamin D deficiency disease is _____
   (a) Beri-Beri (b) Night Blindness (c) Marasmus (d) rickets
3. Goitre disease established due to lack of _____ mineral.
   (a) Sodium (b) Iodine (c) calcium (d) phosphorus
4. Number of milk teeth in man _____
   (a) 24 (b) 20 (c) 18 (d) 22
5. Viral Zoonoses _____
   (a) Plague (b) Kalaazar (c) Rabies (d) Malaria
6. This is the contribution of Louis pasteur
   (a) canning (b) pasteurization (c) drying (d) dehydration

II. *Fill in the blanks*

7. _____ deficiency in diet cause anaemia.
8. _____ calories required for the boy at age of 12 – 15.
9. Protein deficiency disease is _____
10. _____ is the hardest substance in our body.
11. Teeth should be brushed in the direction of _____
12. _____ disease caused by dog tape worm.
13. _____ and _____ are the common adulterants in chilly powder.

III. Match the following

14.	Scurvey	–	chlorophyll
15.	Magnesium	–	rat's urine
16.	Enamel	–	food preservative
17.	Leptospirosis	–	vitamin C
18.	Honey	–	hardest and shiny part

IV. *Give short answer*

19. Define the term deficiency diseases?
20. Write some important sources of vitamin D.
21. What is malnutrition?
22. Mention the difference between the milk teeth and permanent teeth.
23. Write the Dental formula of man.
24. What is the function of molar and premolar teeth?
25. What are the wisdom teeth?
26. What is leptospirosis?

V. *Write detailed answer*

27. Why is rabies considered a dangerous disease?
28. Name the vaccination and drugs used to immunize the animals.
29. Mention the micro organism responsible for food poisoning.
30. What are food adulterants? Give some examples.
31. How is dry fish prepared? What is the principle involved in it?
32. Mention the effect of using chemical fertilizer in farming?
33. Tabulate the differences between kwashiorkar and marasmus.
34. List out the vitamin deficiency diseases and their symptoms.
35. Write a short note on (a) obesity (b) cancer.
36. What is balanced food?
37. What is food toxicology?
38. Explain any two tooth diseases.
39. What are the common diseases affected with pet animals?
40. Explain the method of food preservations.