

NUTRITION IN LIVING ORGANISMS

You might have heard that before sowing a crop, the soil is tested and proper manuring is done in order to obtain a high yield. What is the reason behind this?

Soil testing provides information about the quantity of different nutritive elements present in the soil. Any deficiency of nutritive elements is made up by manuring the soil. All living beings need nutritive elements to carry out various metabolic activities and for body growth. They obtain these from their food.

9.1 Nutrition in Plants

All green plants make their own food in the presence of sunlight, using carbon dioxide and water. Such plants are called autotrophs. Let us understand this through an activity.



Activity - 1

Materials required :- Beaker, test tube, funnel, black cloth, Hydrilla(aquatic plant) and water.

Keep some Hydrilla twigs in a beaker filled with water. Keep an inverted funnel in the beaker in such a way that the plant is completely covered by it. Now place an inverted test tube filled with water over the pipe of the funnel. Keep the complete set-up in sunlight for half an hour. You will see bubbles of oxygen, formed during the process of photosynthesis, coming out of the plant and entering the test tube. The level of water in the test tube falls as more and more oxygen enters it. Measure the volume of oxygen collected in 30 minutes (fig.9.1)

Now, rearrange the apparatus as before, keep it inside a room and cover it with a black cloth.. Again measure the volume of oxygen collected in the same period of time and compare it with the earlier reading. You will see that photosynthesis does not take place in the dark.

In our surroundings we often come across certain plants with variegated leaves, do they also carry out photosynthesis?

Let's find it out with the help of an activity.



Activity - 2

Materials Required- Variegated leaves, dropper, test tube, iodine solution, water.

Take few variegated leaves, add few drops of water and mash them to make a paste, collect the extract by squeezing the paste (pulp). Put 5-6 drops of the extract into a test tube. Also add two drops of iodine solution. Note your observations.

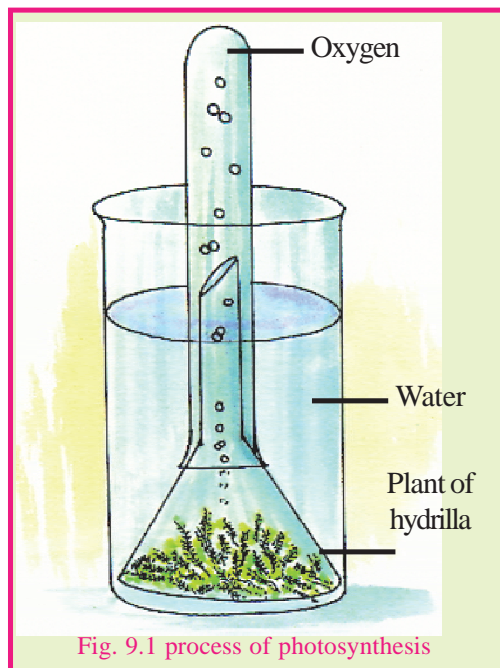
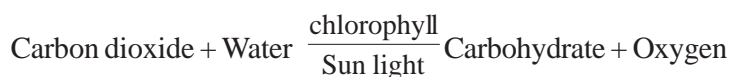


Fig. 9.1 process of photosynthesis

The colour of the leaf extract turns blue black. This shows the presence of starch in the leaves, produced by the process of photosynthesis, in the presence of chlorophyll. Non green (variegated) leaves also contain chlorophyll but the presence of red, brown and other pigmented chlorophyll masks the green chlorophyll. The photosynthesis carried out by such variegated leaves is also due to the presence of chlorophyll.



Some plants lack chlorophyll. How do they obtain their food? These plants depend upon other organisms for their food. Organisms which depend upon other organisms for nutrition are called heterotrophs. *Cuscuta* (amar bel) is a plant that coils around some other plant which is called the host. *Cuscuta* sends out special root-like structures called haustoria into the body of the host and draws nutrition from it. Thus, *Cuscuta* is a complete parasite.

Many green plants such as Mistletoe (Bhangra) and *Loranthus* (Banda) make their own food by photosynthesis, but depend upon the host plant for water and mineral salts. Such plants are called partial parasites.

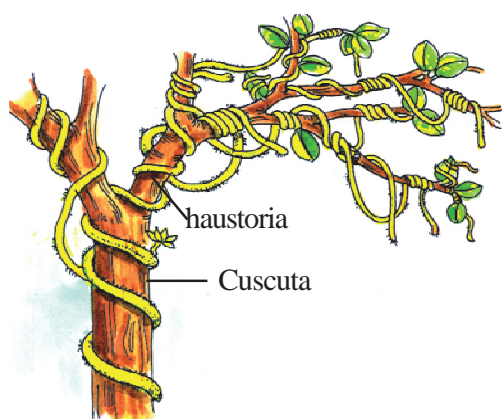


Fig. 9.2 : *Cuscuta* (Complete Parasite)



Fig. 9.3 : Mushroom (Saprophyte)

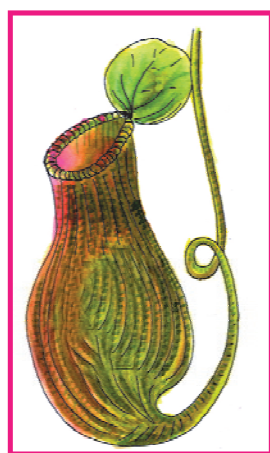


Fig. 9.4 : Pitcher plant (Insectivores)

You might have seen that black spots appear on bread pieces, pickle, jelly, etc. when these are kept in moist places. These black spots are plants called fungi. After a while the eatables start decaying. This process of decay occurs due to microorganisms. The microorganisms and fungi obtain their food from dead or decaying materials. Hence, they are called saprophytes. You must have seen mushrooms (kukurmutter) growing on dead and decaying matter, especially during the rainy season. These do not have chlorophyll. A few plants manufacture their own food but also obtain a part of their nutrition by ingesting insects. Leaves of these plants are specially modified to trap insects. They are called insectivores, e.g. Pitcher plant, Bladderwort, *Drosera*, etc. These

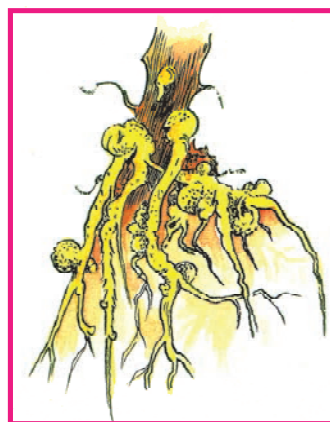


Fig. 9.5 : Roots of pea plant (Symbiotic)

plants are found in marshy areas, which are deficient in nitrogen. Hence, they meet their nitrogen requirements from insects. Nodule-like structures are found on the roots of leguminous plants like Pea, Gram, Groundnut etc. Special kind of bacteria living in these nodules fix and convert atmospheric nitrogen into nitrogenous compounds. These nitrogen compounds are useful to the plants. The bacteria also take food prepared by the plant. In this way, plant and bacteria live with the help of each other. Hence they are said to have a symbiotic relationship and the process is called symbiosis.

9.2 Nutrition in Animals

Animals are called heterotrophs because, for their food requirements, they depend upon the food prepared by plants.

Different organisms adopt different modes to obtain food. Amoeba takes in its food with the help of pseudopodia, Hydra does so with the help of tentacles and frog traps its food with its tongue. Butterfly and honey bee have special tube-like mouth parts for sucking liquid food (fig.9.6).

Vertebrates have developed jaws and teeth with the help of which they can hold, cut and grind food material.

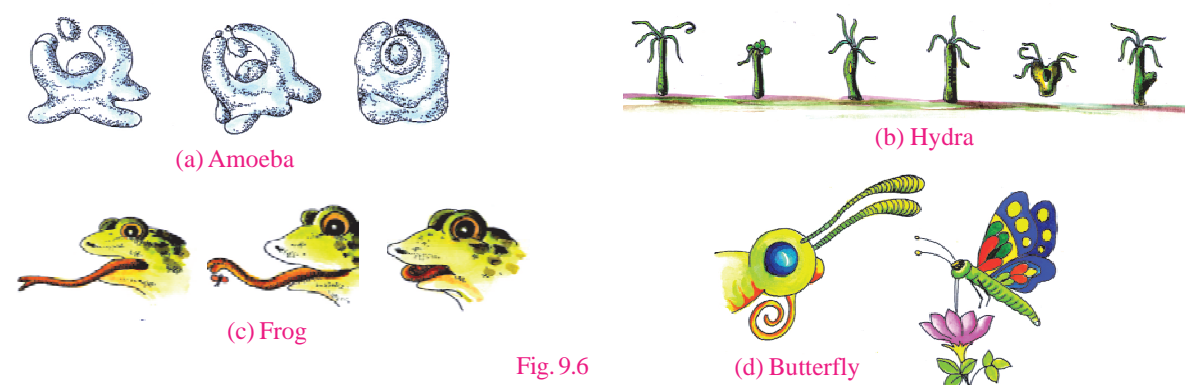


Fig. 9.6

9.2.1 Digestion of Food in Human

You must have noticed that your teeth vary in appearance and also perform different functions. Accordingly they are given different names-Incisors, Canines, Premolars and Molars which have their specific functions of cutting and biting, piercing and tearing, chewing and grinding respectively (fig 9.7)



Table 9.1 Types of Teeth and its functions

S.No.	Name of teeth	No. of teeth		Position	Shape	Function
		Upper jaw	Lower jaw			
1.	Incisors	Four	Four	In front	Like chisel	Cutting and biting
2.	Canines	Two	Two	Behind Incisor	Pointed	Piercing and tearing
3.	Premolars	Four	Four	Behind Canine	Like grinder	Grinding and chewing
4	Molars	Six	Six	Behind Premolar	Like grinder	Grinding and chewing

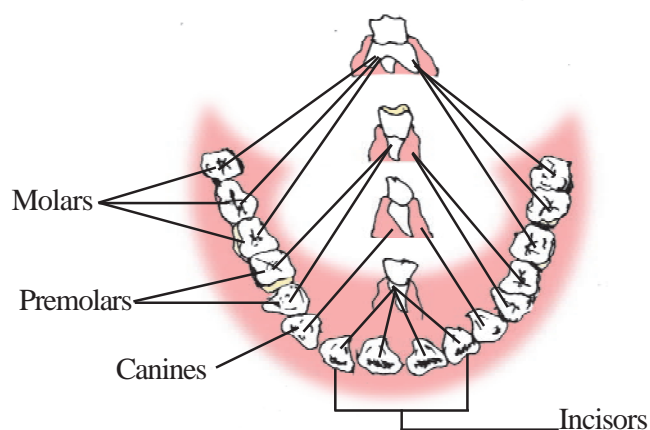


Fig 9.7 Types of teeth in human being

This process is called digestion and it takes place in the internal organs of the body (fig.9.8) and hence it is not possible to observe it. Digestion of starch, however, starts in the mouth itself and we can observe the process. Let us try to understand it by means of an activity.



Activity - 3

Materials required :- Piece of chapatti, test tubes, iodine solution, dropper, wheat flour, beaker, water.

Chew the piece of chapatti slowly. Does the taste change after some time? If yes, what is the change in the taste? In the beginning, it was not sweet but later on its taste begins to change and becomes sweet. What can be the reason behind this change? What is the sweet food material that we consume almost daily? We can understand this process by another activity.

Dissolve $\frac{1}{2}$ spoon of flour in a beaker filled $\frac{1}{4}$ th with water. Keep 10-12 drops of this solution in a test tube or in a small bottle, add 2 drops of iodine solution to it. If the solution turns blue or black, it indicates the presence of starch. Stick two small pieces of paper on two clean test tubes and mark them A and B. Pour 25 drops of the flour solution in each test tube.

Add some saliva only to test tube A, and not to test tube B. Leave the test tubes standing for half an hour. After that, add two drops of iodine to each of the test tubes. Draw table 9.1 in your notebook and write the results of your experiment in it.



Table - 9.2

Test Tube	Saliva present / Absent	Appearance of blue or black colour with iodine	Starch present / Absent
A
B

Most of the food material that we ingest can not be utilized as such by the body. It is necessary to first convert it into simpler substances which can be utilized by the body.

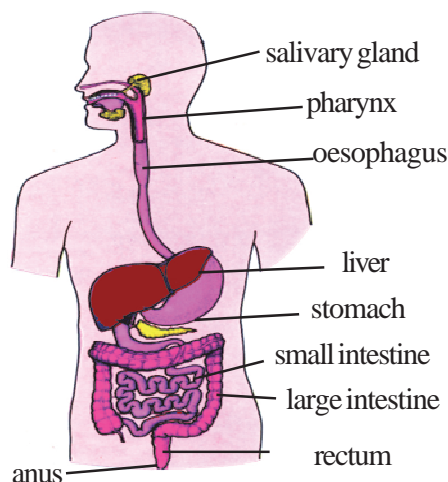


Fig. 9.8

Food reaches the stomach from the buccal cavity via the oesophagus. Enzymes coming from stomach, intestine and digestive glands mix with the food and digest the remaining starch as well as other carbohydrates, proteins and fats. In this way, the complex compounds in the food are converted into simpler forms. These simpler compounds are absorbed by the small intestine, and finally reach the tissues via blood. This is called assimilation. Undigested matter (faecal matter) is excreted from the body.

Different types of proteins are found inside the cell. Some of these proteins catalyze the reactions taking place in the cell. These are called enzymes. Different types of enzymes are found in saliva and in digestive juices.

Digestion in man is extracellular (outside the cell), but in unicellular animals like Amoeba, food particles directly enter the cell where they are digested by digestive juices. This type of digestion is called intracellular.

The entire process of taking in food, its digestion, utilization of the digested food by the body and excreting the undigested part of food is called nutrition.

9.2.2 Digestion in grass eating animals

Have you observed cows, buffaloes and other grass eating animals chewing continuously even when they are not eating? Actually they quickly swallow the grass and store it in a part of the stomach called rumen (fig 9.9)

In rumen, food gets partially digested and is called cud. But later the cud returns to the mouth in small lumps and animal chews it again. This process is called rumination and these animals are called ruminants.

The grass is rich in cellulose, a type of carbohydrate. In ruminants, the cellulose of the food is digested by the action of certain bacteria present in the rumen of grass eating animals. Many animals including humans cannot digest cellulose due to the absence of such bacteria.

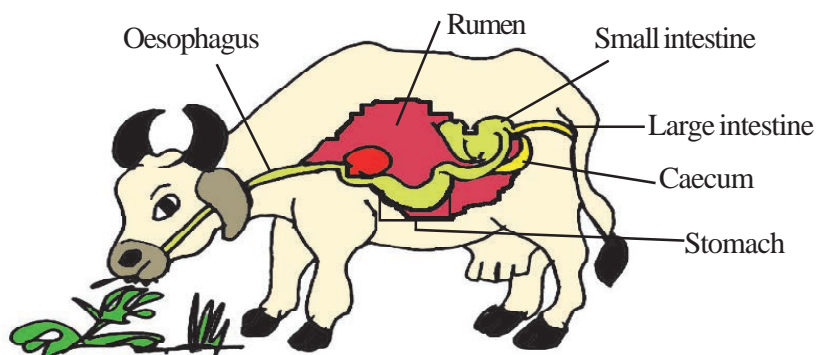


Fig. 9.8 Digestive system of ruminant



We have learnt

- Nutrition is necessary for life.
- Green plants make their food with carbon dioxide and water in the presence of sunlight,
- Most plants are autotrophs while all animals are heterotrophs.
- Some plants may be parasites (Cuscuta), partial parasites (Mistletoe), saprophytes (mushroom), symbionts (with symbiotic bacteria), or insectivores (Pitcher Plant)
- The process of nutrition in animals includes intake of food, digestion, absorption, assimilation and excretion.
- In human beings, digestion takes place due to the coordinated action of organs of digestion and digestive glands.
- During digestion, complex compounds are broken up into simple molecules.
- Simple molecules are absorbed by the small intestine and are transported to each tissue by blood.
- Digestion is intracellular in unicellular organisms like amoeba.
- Variegated leaves also contain chlorophyll hence, undergo photosynthesis.
- Ruminants have cellulose digesting bacteria present in their rumen.



Questions for practice

1 Fill in the blanks-

1.are needed to carry out metabolic activities.
2. Food is digested by formed in digestive glands.
3. Digestion in Amoeba is
4. In human beings, digested food is absorbed in
5. In cow, cellulose is digested in the

2 Answer the following question.-

1. What is the difference in the mode of nutrition in autotrophs and heterotrophs?
2. Explain parasites, saprophytes and symbionts with examples.
3. Which organs help Amoeba and Hydra in ingesting food?
4. Draw a labeled diagram of the human digestive system and .
explain the process of digestion of starch.
5. Explain digestion in grass eating animals.



Do these also

Collect small plants, or the branches or other parts of big plants from your locality and classify them into autotrophs, parasites, saprophytes, and symbionts. With the help of your teacher, preserve them in the form of specimens in the biology laboratory of your school and label them as shown below:

Name – Cuscuta (Amarbel)

Mode of nutrition - Parasite

