

St. Andrews Scots Sr. Sec. School

9th Avenue, I.P. Extension, Patparganj, Delhi – 110092

Session: 2022-2023

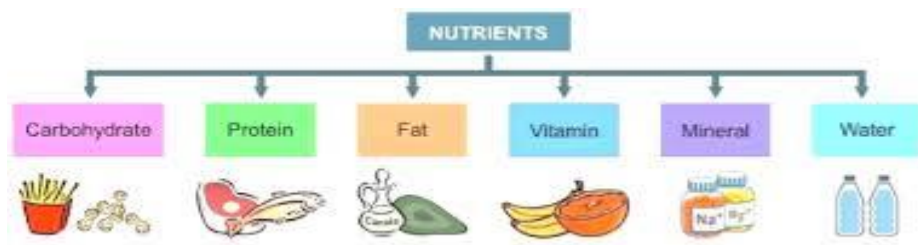
Class: VII

Lesson: 1- Nutrition in Plants

Topic: Notes

As discussed in previous class (VI), we learnt that:

- All living organisms require food.
- The food gives energy to the organisms for growth and maintenance of their body functions.
- Carbohydrates, proteins, fats, vitamins and minerals are the components of food.
- These components of food are necessary for our body and are called **nutrients**.



Various Nutrients Present in food

What is nutrition?

Nutrition is the process of taking food by any organism and its utilisation by the body. Green plants prepare their own food while humans and animals are directly or indirectly dependent on plants for their food.

What are the modes of nutrition?

Modes of Nutrition

The methods of obtaining food are called modes of nutrition.

There are mainly two modes of nutrition:

1. Autotrophic Nutrition
2. Heterotrophic Nutrition.

Autotrophic mode of Nutrition

Green plants take carbon dioxide (CO_2) and water (H_2O) from the environment and transform them into glucose and oxygen with the help of sun's energy, trapped by a green pigment called chlorophyll. This type of nutrition is known as **Autotrophic Nutrition**.

Those organisms which can make food themselves from simple substances by the process of **photosynthesis** are called **autotrophs**, and their mode of nutrition is called autotrophic nutrition. These green plants produce food not only for themselves, they also make food for non-green plants as well as for animals (including human beings)

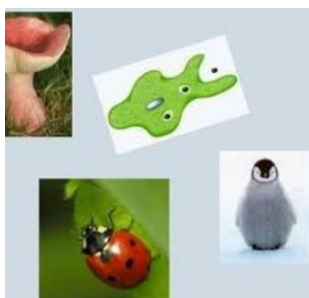


Green Plant

Heterotrophic mode of Nutrition

Those organisms which cannot make food themselves by the process of photosynthesis and take food from green plants or animals are called heterotrophs, and their mode of nutrition is called **heterotrophic nutrition**.

All non-green plants and animals (including human beings) are **heterotrophs**. Heterotrophic plants and animals depend on food produced by some other living organisms such as green plants for example; Cuscuta, many bacteria and fungi depend for their nutrition on the bodies of other plants and animals. Thus, all animals like cats, dogs, goats, cows, buffaloes, deer, lions and human beings are heterotrophs having a heterotrophic mode of nutrition.



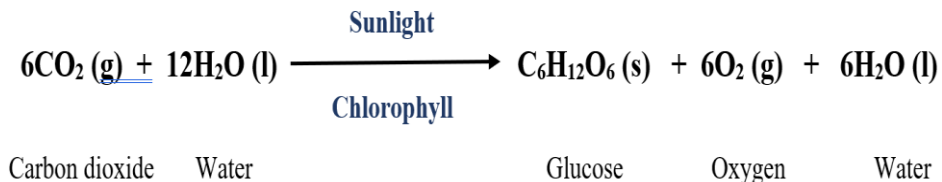
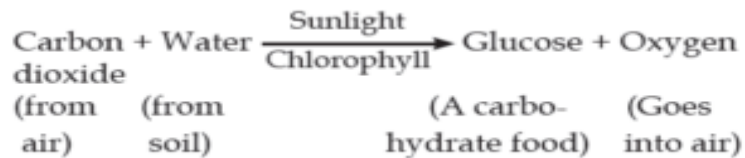
Heterotrophs

Let us understand the difference between Autotrophic and Heterotrophic nutrition:

Autotrophic	Heterotrophic
1. It occurs only in green plants	It occurs in all non-green plants and animals.
2. Carbondioxide and water are needed for the synthesis of food.	Heterotrophs derive their food from green plants or autotrophs directly or indirectly.
3. Chlorophyll and sunlight are essential for the synthesis of food.	Chlorophyll is absent and sunlight is not needed.

What is Photosynthesis?

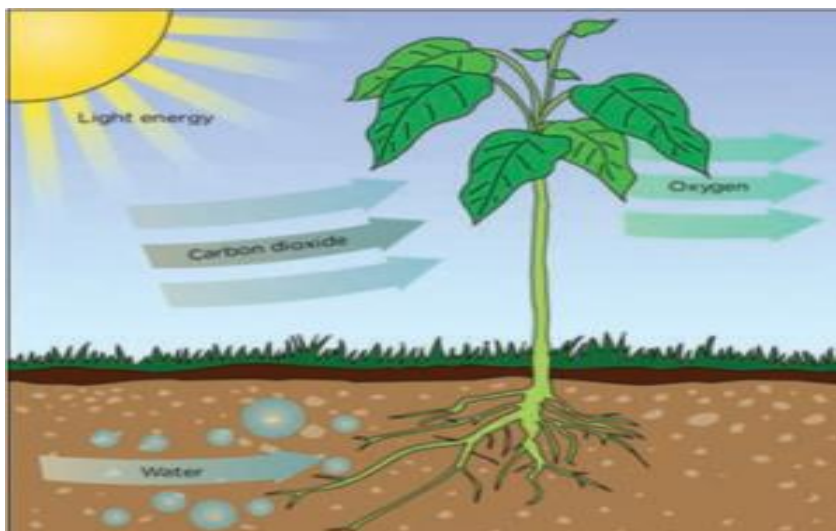
The process by which green plants make their own food (such as glucose) from carbon dioxide and water by using **sunlight** in the presence of **chlorophyll** is called photosynthesis. The process of photosynthesis can be represented by a word equation as follows:



Equation of photosynthesis

Oxygen gas is released during photosynthesis. This oxygen goes into the air. The oxygen gas released in photosynthesis is utilized by all the living organisms for their survival.

The process of photosynthesis can be shown with the help of a diagram:



Process of photosynthesis

Conditions Necessary for Photosynthesis

The conditions necessary for photosynthesis to take place are:

1. Carbon dioxide
2. Water
3. Chlorophyll
4. Sunlight

Plants take **carbon dioxide gas** from the air with the help of tiny pores (called stomata) present on the surface of leaves. (The singular of stomata is stoma). Each pore (stoma) is surrounded by a pair of guard cell. The opening and closing of stomatal pores in leaves is controlled by the guard cells.

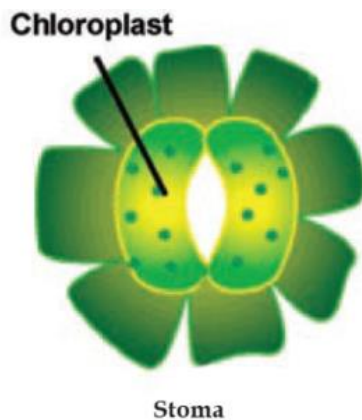
The carbon dioxide gas present in air enters the leaves of a plant through the stomatal pores present on their surface and is utilized in photosynthesis. The oxygen gas produced in the leaves during photosynthesis goes out into the air through the same stomatal pores. The stomatal pores of leaves open only when carbon dioxide is to be taken in or oxygen is to be released otherwise they remain closed.



Structure of stomata

Plants take **water** from the soil, needed for photosynthesis. Soil always contains some water in it. The roots of the plant absorb water and minerals from the soil and then transport it to the leaves through the vessels which run like inter-connected pipes throughout the roots, stems, branches and leaves. The tiny, pipe-like vessels which transport water from the roots of the plant to its leaves are called xylem.

Chlorophyll is a green colored substance, which is present in the leaves, due to which the color of leaves is green. The energy of the sunlight is absorbed by chlorophyll. Chlorophyll is present in every leaf of a plant in the form of hundreds of tiny structures called chloroplasts



The tiny green structures in the cells are chloroplasts which contain chlorophyll

Solar energy is absorbed by the leaves of the plant with the help of chlorophyll and is converted into chemical energy (food). Thus, solar energy is converted into chemical energy during photosynthesis and this chemical energy is stored in the form of plant food.

We know very well that **nitrogen** is present in abundance in gaseous form in the air. However, plants cannot directly absorb nitrogen in this form. Soil contains certain bacteria, called nitrogen-fixing bacteria that convert gaseous

nitrogen into nitrogenous compounds which are soluble in water and release them into the soil. These water-soluble nitrogen compounds are absorbed by the plants from the soil along with water. In this way, the plants fulfil their requirement of nitrogen.



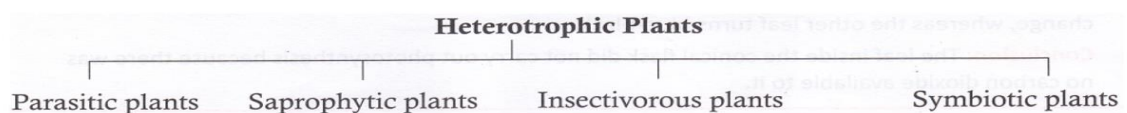
Process to absorb nitrogen by plants

Importance of Photosynthesis:

Photosynthesis is important for the existence of life on the Earth.

1. Photosynthesis enables the green plants to make their own food. In the absence of photosynthesis, there would not be any plants.
2. The survival of all animals in the world, directly or indirectly, depends upon the food made by the plants.
3. Oxygen, which is essential for the survival of all living organisms, is produced during the process of photosynthesis. Hence, photosynthesis maintains a balance between oxygen and carbon dioxide in the atmosphere. So, in the absence of photosynthesis, life would be impossible on the Earth.

Other Modes of Nutrition in Plants:



Flowchart to show heterotrophic modes of nutrition in plants

Parasitic Plants

A parasitic plant is one that lives inside or outside the other organism and derives their food from them. The plant (non-green) which obtains their food from another organism is called a parasite and the living organism from whose body food is obtained is called a host, e.g. *Cuscuta*. It takes readymade food from a host through a special type of roots called sucking roots which penetrate into the host plant and suck food material from the host.



Cuscuta plant climbing up the host plant

Saprotrophic Plants

The mode of nutrition in which organisms take their nutrients from dead and decaying matter is called saprotrophic nutrition.

Plants which use the saprotrophic mode of nutrition are called saprotrophs, e.g. fungi like mushrooms are non-green plants that grow on the dead and decaying matter for their food. Bread moulds (fungi) and yeast are saprophytic plants.

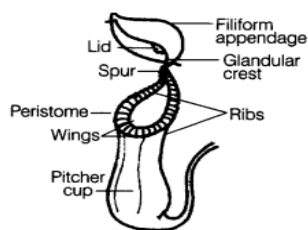
Insectivorous Plants

There are some plants which can trap insects and digest them for their nutrition. These plants are green in color but lack nitrogen elements. To overcome this problem, these plants eat insects. Hence, they are called insectivorous plant or carnivorous plants. These have specialized leaves, the apex of which forms a lid that can open and close the mouth of pitcher. There is hair inside the pitcher which are used to entangle the insects.

When an insect comes in contact of the lid, it gets closed and traps the insects. The insect inside the pitcher is digested by digestive juices secreted by the pitcher to obtain nitrogen compounds (amino acids) from them.

e.g. pitcher plant, sundew, Venus flytrap and bladderwort.

Since these can synthesize their own food but fulfil their nitrogen deficiency by eating insects, therefore these are called as **partial heterotrophs**.



Structure of pitcher plant



A pitcher plant

Symbiotic Plants

Sometimes, two plants of different species live together and help each other in obtaining food and shelter. This association is called symbiosis and such plants are called symbiotic plants.

The relationship in which two different organisms live together and share shelter and nutrients is called symbiotic relationship, e.g. lichens and Rhizobium.

Lichen is an association in which algae and a fungus live together. The fungus provides shelter, water and minerals to the algae and in return, the algae provide food which it prepares by photosynthesis.

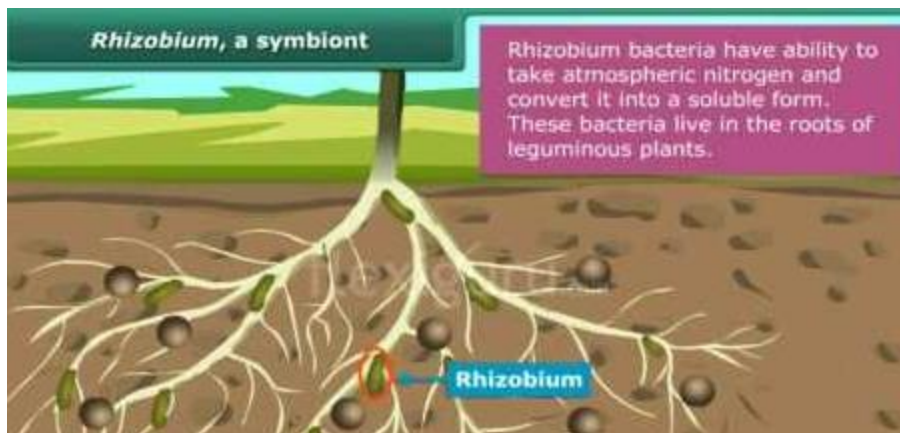


Lichens on the bark of a tree

Replenishment of Nutrients in Soil

Crops require a lot of nitrogen to make proteins. After the harvest, the soil becomes deficient in nitrogen. Plants cannot use the nitrogen gas available in the atmosphere directly.

The action of certain bacteria can convert this nitrogen into a form readily used by plants. Rhizobium bacteria live in the root nodules of leguminous plants. These bacteria take nitrogen gas from the atmosphere and convert it into water-soluble nitrogen compounds making it available to the leguminous plants for their growth.



Nutrient replenishment in the soil

In return, leguminous plants provide food and shelter to the bacteria as Rhizobium cannot prepare its food. They, thus have a symbiotic relationship. This association is very important for the farmers, as they do not need to add nitrogen fertilizers to the soil in which leguminous plants are grown.