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# Chapter 1<sup>st</sup>

## Nutrition

### In

## Plants

## **Nutrition**

**The process of taking food by an organism as well as the utilisation of this food by the organism is called nutrition. Food is essential for all living organisms. Carbohydrates, proteins, fats, vitamins and minerals are components of food. These components of food are called nutrients and are necessary for our body.**

**Plants can make their own food but animals cannot make food themselves. They obtain food from plants or other animals that eat plants. Thus, human beings and animals depend on plants for their food, directly or indirectly**

## **MODES OF NUTRITION**

**On the basis of their modes of nutrition, all the organisms can be divided into two main groups:**

- 1. Autotrophs (or Autotrophic)**
- 2. Heterotrophs (or Heterotrophic).**

### **Autotrophic Mode of Nutrition**

**Those organisms which can make food themselves from simple substances (like carbon dioxide and water) by the process of photosynthesis, are called autotrophs (and their mode of nutrition is called autotrophic). All the green plants are autotrophs.**

### **Heterotrophic Mode of Nutrition**

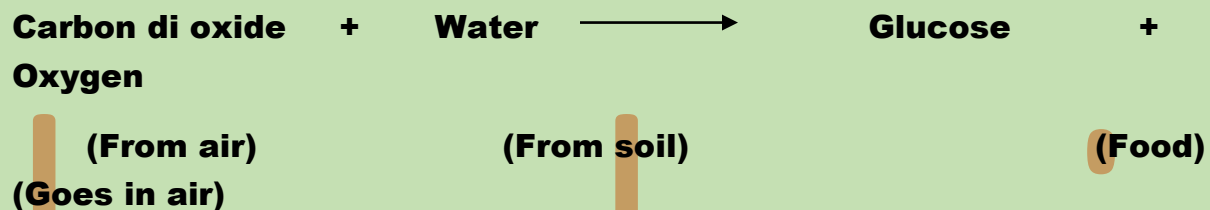
**Those organisms which cannot make food themselves by the process of photosynthesis and take food from green plants or animals, are**

**called heterotrophs (and their mode of nutrition is called heterotrophic).**

**All the non-green plants and animals (including human beings) are heterotrophs.**

## **PHOTOSYNTHESIS**

**The process by which green plants make their own food (like glucose) from carbon dioxide and water by using sunlight energy (in the presence of chlorophyll) is called photosynthesis.**



**Chlorophyll is present in the green leaves. So, the process of photosynthesis takes place in the leaves of a plant. Oxygen gas is produced during photosynthesis.**

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

**The process of photosynthesis first produces a simple carbohydrate called 'glucose' as food.**

**The glucose carbohydrate then gets converted into a complex carbohydrate called 'starch'.**

**This starch gets stored as food in the various parts of plant including leaves. In fact, the presence of starch in the leaves shows the occurrence of photosynthesis in a plant.**

**The leaves other than green also have chlorophyll. The large amount of red, brown and other pigments mask the green colour takes place in these leaves also. Photosynthesis takes place in this kind of leaves.**

**You often see slimy, green patches in ponds or stagnant water bodies. These are generally formed by the growth of organisms called algae. Why algae are green in colour? They contain chlorophyll which gives them the green colour. Algae can also prepare their own food by photosynthesis.**

## **Conditions Necessary for Photosynthesis**

### **1. How the Plants Obtain Carbon Dioxide for Photosynthesis**

**The plants take carbon dioxide gas from air through the tiny pores (called stomata) present on the surface of leaves.**

**Each pore (or stoma) is surrounded by a pair of guard cells. The opening and closing of stomatal pores in the 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 utilised in photosynthesis.**

**The oxygen gas produced in the leaves during photosynthesis goes out into 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**

### **2. How the Plants Obtain Water for Photosynthesis**

**The plants take water needed for photosynthesis from the soil. Soil always contains some water in it.**

**Water present in the soil is absorbed by the roots of a plant and then transported to the leaves through the vessels which run like inter-connected pipes throughout the roots, stem, branches and leaves.**

**The tiny, pipe-like vessels which transport water from the roots of a plant to its leaves are called xylem.**

### **3. The Role of Chlorophyll in Photosynthesis**

**Chlorophyll is a green substance which is present in the leaves of plants.**

**Chlorophyll can absorb the energy from sunlight.**

**The sunlight energy absorbed by chlorophyll is used to combine carbon dioxide and water in the green leaves to produce food (like glucose).**

### **The Role of Sunlight in Photosynthesis**

**The sunlight supplies energy for the food making process called photosynthesis. The sun's energy (or solar energy) is captured by plant leaves with the help of chlorophyll and converted into chemical energy of food.**

### **Photosynthesis by Plant Parts Other Than Leaves**

**The desert plants such as cactus have tiny, spine-like leaves to reduce the loss of water by transpiration. These tiny, spine-like leaves of a cactus plant cannot do photosynthesis. The stem and branches of a cactus plant are green which contain chlorophyll.**

**So, the green stem and green branches of a cactus plant carry out the process of photosynthesis to make food for the plant.**

### **Synthesis of Plant Foods Other Than Simple Carbohydrate**

#### **i) Plants Make Starch as Food.**

**Some of the simple carbohydrate 'glucose' made by the plants through photosynthesis is converted naturally into a complex carbohydrate called 'starch'. The starch is a food which is stored in various parts of a plant such as roots, stem, leaves and seeds.**

## **ii) Plants Make Oils (or Fats) as Food.**

Certain plants convert the simple carbohydrate glucose made during photosynthesis into oils and store them in their seeds. Such seeds are called oil-seeds and give us oil (or fats) for cooking food. For example, the seeds of sunflower plant contain a lot of oil stored in them.

## **iii) Plants Make Proteins as Food.**

Plants combine some of the glucose carbohydrate made during photosynthesis with nitrate minerals (obtained from soil) to make amino acids which are then made into proteins. In this way, plants make proteins as food. Proteins are nitrogenous substances which contain nitrogen element.

## **(iv) Plants Make Vitamins as Food.**

Vitamins are highly complex substances which are an important part of our food. Vitamins are made by plants. Vitamins are contained in vegetables, fruits and cereals made by plants.

## **OTHER MODES OF NUTRITION IN PLANTS**

Most of the plants have green pigment called chlorophyll and can make their own food. They are called autotrophic. Some plants, however, do not contain chlorophyll and hence cannot synthesise their food. They are called heterotrophic and depend for food on other organisms.

Depending on their mode of obtaining food, all the heterotrophic plants can be divided into two main groups:

- (i) Parasites, and
- (ii) Saprophytes

## **Parasites**

**A plant (or animal) which lives on or inside another organism (called host) and derives the food from it, is called a parasite.**

**The living organism (from whose body food is obtained) is called host of the parasite. The parasite plants climb on the host plants from which they get all the food.**

## **Saprophytes**

**Those non-green plants which obtain their food (or nutrition) from dead and decaying, matter are called saprophytes.**

**The non-green plants called fungi derive their food from dead and decaying organic matter, so fungi are saprophytes.**

**Fungi such as mushrooms, bread mould and yeast are saprophytes.**

## **Insectivorous Plants**

**There are some green plants which obtain their food partly from the soil and atmosphere, and partly from small insects. The insectivorous plants have specialised leaves to catch the insects. The insectivorous plants grow only in those soils which do not contain sufficient nitrogen mineral.**

**These insectivorous plants trap insects by various methods, kill them and digest them to obtain nitrogen compounds (like amino acids) for their growth.**

**Some common examples of the insectivorous plants (or carnivorous plants) are: Pitcher plant, Sundew, Venus fly-trap and Bladderwort**

## **Symbiotic Plants**

The living together of two different species of plants as if they are parts of the same plant and help each other in obtaining food is called symbiosis (and such plants are known as symbiotic plants).

This type of nutrition involving symbiosis occurs in the plants called 'lichens'. In lichens, the green coloured plant called 'alga' (autotroph) and non-green plant 'fungus' (saprophyte) live together.

## **HOW NUTRIENTS ARE REPLENISHED IN THE SOIL**

### **1. Replenished In the Soil by Adding Fertilisers and Manures**

Fertilisers and manures contain plant nutrients (or minerals) such as nitrogen, phosphorus and potassium, etc. So, when fertilisers and manures are added to the soil in the fields, then the soil gets enriched with nutrients like nitrogen, phosphorus and potassium, etc.

This is done to provide essential nutrients for the growth of plants so that we get healthy plants. The two most common fertilisers which are used to provide plant nutrients (or minerals) in the fields are NPK and Urea.

### **2. Nitrogen can be replenished in the Soil by Growing Leguminous Crops**

Though a lot of nitrogen gas is present in the air but the plants cannot use nitrogen in gaseous form. The plants need nitrogen in the form of water soluble compounds (such as nitrates).

The leguminous plants have root nodules in them which contain Rhizobium bacteria. Rhizobium bacteria can convert nitrogen gas of air into nitrogen compounds (like nitrates). So, when a leguminous crop is grown in a field, the Rhizobium bacteria present in the root nodules of leguminous plants convert nitrogen gas of air into nitrogen compounds (like nitrates).



**Some of these nitrogen compounds are used by the leguminous plants for their own growth. The remaining nitrogen compounds made by Rhizobium bacteria mix with the soil in the field and enrich it. Thus, the soil in the fields gets enriched with nitrogen compounds in the natural way.**

**The growing of leguminous crops in the fields is also importance for the farmers. This is because the farmers do not need to put nitrogen fertiliser in the fields in which leguminous crops have been grown earlier.**

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