

Nutrition in Plants

- **Autotrophic Nutrition**

- Synthesis of food by photosynthesis, Photosynthesis equation



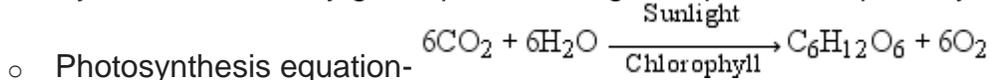
- - Leaves are the sites for the synthesis of food.
 - The green pigment called chlorophyll is present in leaves.
 - Chlorophyll traps solar energy, which is used to prepare food from CO₂ and water. Sun is the ultimate source of energy.
 - Green plants absorb CO₂ from atmosphere through tiny pores called stomata.
 - Stomata are present on the surface of leaves.
 - Water and minerals are absorbed from soil and are transported to leaves via tiny vessel-like structures present in roots.
 - Chlorophyll, sunlight, CO₂, and water are essential raw materials for photosynthesis.
 - Carbohydrates such as starch and oxygen are the product of photosynthesis.
 - All green plants including green algae show autotrophic nutrition.
 - Since the autotrophs manufacture their own food, they are called producers.
 - They form the first link in the food chain and all organisms on the earth obtain the energy directly or indirectly from them.

- **Heterotrophic Nutrition**

- - Generally derive energy from plants and animal sources.
 - The heterotrophs that derive their energy directly from plants are called herbivores and those who derive their energy indirectly i.e. by eating herbivores are called carnivores.
 - **Omnivores**- feed on both plants and animals e.g. bear, rat, man etc.
 - **Decomposers**- obtain nutrients by breaking down remains of dead plants and animals, includes some bacteria and fungi.
 - **Mainly of three types**—holozoic, parasitic, and saprophytic.
 - **Digestion**- mechanical and chemical reduction of ingested nutrients.
 - **Human digestive system**- consists of the long alimentary canal.
 - **Alimentary canal includes**- mouth, pharynx, oesophagus, stomach, small intestine, and large intestine
 - **Accessory organs**- pancreas, liver.

- **Autotrophic nutrition**

- Synthesis of food by green plants through the process of photosynthesis.



- Events of photosynthesis
 - In the grana region of chloroplast:
 - Absorption of light energy
 - Splitting of water in hydrogen and oxygen
 - Synthesis of ATP and NADPH₂
 - In the stroma region of chloroplast:
 - Reduction of carbon dioxide to carbohydrates

Plants carry out photosynthesis with the help of structures called stomata.

- Minute pore like structures surrounded by two guard cells
- Help in exchange of CO₂ and O₂

Photosynthesis is affected by factors like:

- CO₂ concentration
- light
- temperature

- The end product of photosynthesis i.e carbohydrates fulfill the carbon , hydrogen and oxygen requirements of plants.
- Plants also needs nitrogen to synthesize other food components like proteins.
- Plants cannot obtain nitrogen directly from the atmosphere.
- Some bacteria (*Rhizobium*) convert atmospheric nitrogen into usable form and release it into soil.
- The usable form of nitrogen are absorbed by plant roots along with water.

- A **bacterium**, called *Rhizobium*, fixes atmospheric nitrogen and converts it into a usable form for the plant. It shows symbiotic relationship with the plant.
- *Rhizobium* is mainly found in association with legume plants (pulses, gram, pea, etc).
- **Bacterium** converts atmospheric nitrogen into usable form for plant and in turn, plant provides food and shelter to the **bacterium**.

- *Cuscuta* (*Amarbel*) is a parasite that obtains food from host plant.

- **Pitcher plant** is an insectivorous plant (insect-eating plant). Its leaf gets modified into a pitcher-like structure, which traps the insects. It has both autotrophic and heterotrophic mode of nutrition.
- **Fungi** are saprotrophs. They obtain nutrition from dead or decaying organic matter.
- **Lichens** are organisms formed by a symbiotic relationship between algae and fungi in which algae provide food to fungi while fungi absorb water and nutrients for algae and also provide shelter to algae.
- **Symbiosis** is the association between two organisms where they live together and share shelter and nutrients without harming each others.
- **Ferns** and **orchids** are epiphytes which depend on host plant for support and moisture needs.

- - Soil becomes deficient in nutrients after harvesting.
 - Manures and fertilizers contain essential nutrients like nitrogen, phosphorous and potassium.
 - Manures and fertilizers are added from time to time so that soil regains its fertility.
- **Nutrient management**
 - There are 16 nutrients that are essential for plants
 - Carbon, hydrogen and oxygen are called the framework elements
 - The nutrients required in relatively large quantity for growth and development of plants are called **macro nutrients**. These are nitrogen, phosphorous, potassium, calcium, magnesium and sulphur
 - The nutrients required in small quantity are called **micro nutrients**. These are iron, manganese, boron, zinc, copper, molybdenum and chlorine.