SCHOOL OF SCHOLARS | Teacher: Suyog Sir

LIFE PROCESSES IN PLANTS

Chapter 10

Plants, like all living organisms, carry out vital life processes such as nutrition, respiration, transport of minerals and nutrients and growth to survive and function. Unlike animals, plants do not obtain food by feeding on other organisms. Instead, they produce it themselves. This chapter explores how these interconnected processes enable plants to live, grow and adapt to their environment.

10.1 Growth in Plants

The growth in plants includes various changes like emergence of new leaves and branches, an increase in height and the thickening of the stem. All these changes require essential factors like nutrients, water, sunlight, soil and air.

Do You Know? Vrikshayurveda, an ancient Indian text, records useful observations about plant growth, soil and agricultural practices which help to improve crop health, growth and production. It seems to be based on practical experiences and patterns seen over time. These ideas were then systematically documented to guide farming practices. For instance, there are references to different methods of organic manure preparation, such as mixing water, barley and various seeds, like green, black and horse grams.

10.2 Nutrition in Plants

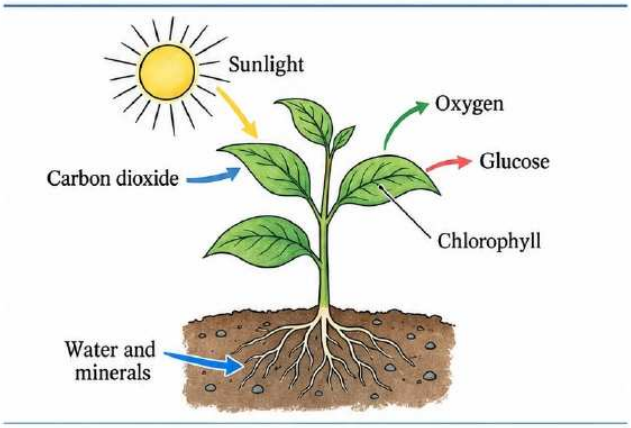
Green plants can prepare their own food, while humans and animals are directly or indirectly dependent on plants for their food.

Photosynthesis: Food Making Process in Plants

The process by which autotrophic green plants make their own food by using carbon dioxide, water and minerals in the presence of sunlight and chlorophyll is known as photosynthesis.

The whole process of photosynthesis can be represented by the following equation.

Carbon dioxide (from air) + Water (from soil) → Glucose (carbohydrate/food) + Oxygen (released in air)



A diagram showing photosynthesis



Stages of plant growth

PHOTOSYNTHESIS AND TRANSPORT

Know the Scientist: Rustom Hormusji Dastur (1896-1961) was an Indian scientist and a major contributor to the study of photosynthesis. He served as the Head of the Botany Department at the Royal Institute of Science, Bombay (now the Institute of Science, Mumbai), from 1921 to 1935. He studied the effects of the amount of water and temperature on photosynthesis. He examined the importance of water, temperature and the colour of light in the process of photosynthesis.



Site of Photosynthesis

The process of photosynthesis takes place in green leaves; therefore, leaves are referred to as the food factories of plants. The leaves are generally broad and flat and have a green pigment called chlorophyll. The chlorophyll helps the leaves to capture the energy of sunlight. The photosynthetic process also occurs in other green parts of a plant like stem, but it is not enough for meeting all the needs of plant.

Do You Know? Some plant leaves appear red, violet or brown because they contain a higher amount of coloured pigments than green chlorophyll. This hides the green colour. However, some of these pigments also take part in photosynthesis. To confirm whether photosynthesis has occurred in such leaves, an iodine test can be used to detect the presence of starch.

Leaf surfaces have tiny pores called stomata, which play a crucial role in the exchange of gases. These stomata are surrounded by guard cells that control their opening and closing.

Products of Photosynthesis

Carbohydrates (glucose) and oxygen are the products of photosynthesis. Glucose is produced as main food material. This later gets converted into starch. The presence of starch in leaves indicates the occurrence of photosynthesis.

Try These 10.1

1. A plant kept in a dark room with dry soil for many days shows no new leaves or stem growth. What could be the possible reasons for the lack of growth?
2. Non-green plants cannot prepare their own food. Instead, they depend upon the green plants directly or indirectly. Name the mode of nutrition they exhibit.
3. Name the part of the plant known as the food factory.
4. A green coloured pigment present in the leaves of plant aids in synthesis of food. Name that pigment.
5. A student wants to confirm if photosynthesis has occurred in a red or violet leaf. Which test can be used for this purpose?

10.3 Transport in Plants

Plants absorb water and dissolved minerals from the soil through their roots and transport it to their leaves. The leaves use water and carbon dioxide for synthesising their food by the process called photosynthesis. The food prepared by the leaves is transported to all parts of the plants.

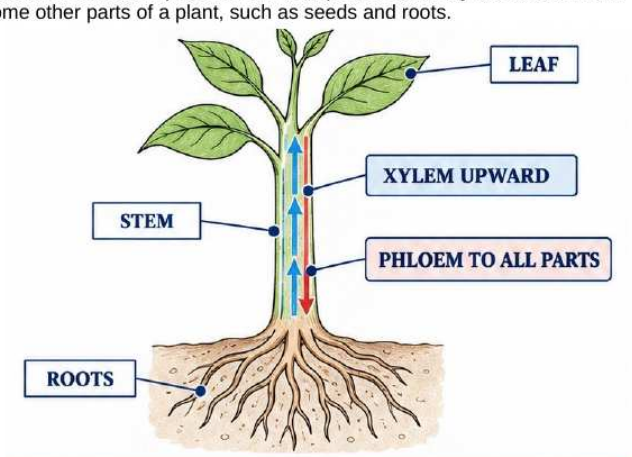
Transport of Water and Minerals

Water and minerals in plants are transported in the following ways:

- The roots of the plants absorb water and minerals from the soil.
- Water and minerals are then moved from the roots up to the stem and leaves through the tube-like vascular tissue called xylem.
- Xylem tissue forms the continuous network of channels that connect roots to the leaves through the stems and branches. It thus, transports water and minerals to the entire plant.

Transport of Food Material

The food prepared by plants in the leaves is transported to all parts of the plant. This food is transported through another set of thin tube-like structures called the phloem. The transported food may also be stored in some other parts of a plant, such as seeds and roots.



Transport of water, minerals and food in a plant



Leaf surface with magnified stomata and guard cells

RESPIRATION IN PLANTS

10.4 Respiration in Plants

Each part in plant body is capable of performing respiration, independently. During respiration, glucose is broken down in the presence of oxygen, releasing carbon dioxide, water and energy. The word equation for the process of respiration is as follows:

Glucose + Oxygen → Carbon dioxide + Water + Energy

The energy produced during respiration is used by plants for their growth and development. All parts of a plant, green or non-green, carry out respiration.



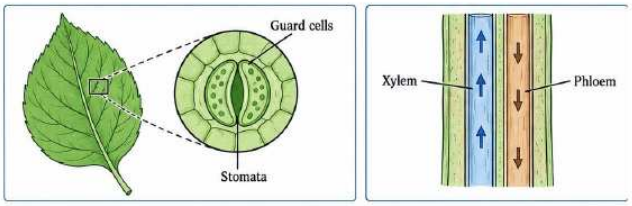
A complete plant with its root system

Know the Scientist: Kamala Sohonie (1911-1998) was a woman scientist of India. She received a Ph.D. degree for her remarkable contribution in the area of respiration in plants from Cambridge University. She returned to India and worked at the Lady Hardinge Medical College in New Delhi and later at the Nutrition Research Laboratory, Coonoor. Thereafter, she moved to the then Royal Institute of Science, Bombay, where she was eventually appointed as Director. Much of her work helped improve the nutritive values of plant foods. She also worked on the sap of the coconut palm as a nutritive drink called Neera.



Science Glossary

Autotrophic	It is the mode of nutrition in which organisms prepare their own food.
Photosynthesis	It is the process by which green plants prepare their own food from carbon dioxide and water in the presence of sunlight and chlorophyll.
Chlorophyll	It is a photosynthetic pigment found in all green plants.
Stomata	Tiny pores present on the surface of leaves that are used for gaseous exchange.
Guard cells	These are specialised cells that surround each stoma and control its opening and closing.
Xylem	Vascular tissue that transports water and minerals from the roots to other parts of the plant.
Phloem	Vascular tissue that transports food material from leaves to other parts of the plant.
Respiration	The process by which living organisms breakdown food to get energy.



Stomata, guard cells, xylem and phloem

Try These 10.2

1. Plants absorb water via roots, but how do they transport it to different parts of the body?
2. Name the tissue through which the food from the kitchen of the plant is transported to all the parts of the plant.
3. Through what process does oxygen reach all the cells in a leaf?
4. What process in plants helps breakdown glucose to release energy for growth?