

Assignment Number-1

Class - 8th

Subject Biology

Lesson-Transport of food and minerals in plants

THEME 1

Transport of Food and Minerals in Plants

YOU WILL LEARN

Nutrition

- Classification on the Basis of Mode of Nutrition
- Heterotrophic Nutrition in Animals
- Heterotrophic Nutrition in Plants
- Autotrophic Nutrition in Plants

Photosynthesis

- Stomata
- Minerals for Plants
- Transport of Food Material to Different Parts

Transportation of Water and Minerals in Plants

- Xylem
- Phloem

Transpiration



All living organisms perform various vital activities to survive such as movement, transportation, circulation, respiration, nutrition, excretion, growth and reproduction. All these activities are collectively called life processes. Organisms may differ in shape and size but they perform certain similar activities. Nutrition is one such activity that is performed by all the living organisms.

NUTRITION

Living organisms require energy to perform life process activities, which is obtained through the food. Requirement of food in both plants and animals are basically the same. Foods are all those substances, which on reaching the body synthesise protoplasm after digestion and produce energy. This energy is utilised in all the vital activities of life.

The process of absorbing nutrients from food and processing them in the body to obtain energy in order to keep healthy or to grow is called nutrition.



CLASSIFICATION ON THE BASIS OF MODE OF NUTRITION

Green plants prepare their own food material. Humans and animals do not prepare their own food but depend upon plants. Thus, on the basis of mode of nutrition, living organisms may be divided into two:

1. Autotrophic
2. Heterotrophic

Autotrophic Nutrition

The organisms, which prepare their own food, are called **autotrophs** (auto-self, trophic-food) and this type of nutrition is called **autotrophic nutrition**. Green plants prepare their food and are also called **producers**. They possess chlorophyll, especially in their leaves that have the ability to utilise solar energy and convert it into chemical energy (food) with the help of carbon dioxide and water and oxygen is released. This process is called **photosynthesis**.

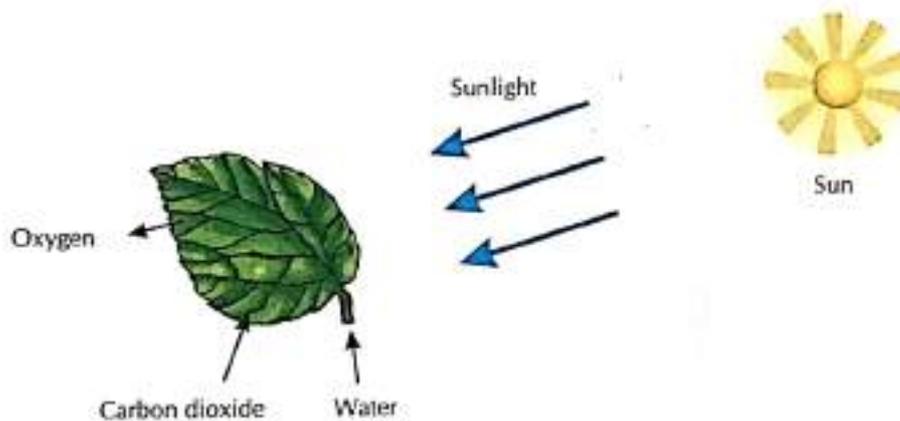


Fig. 1.1 The process of photosynthesis

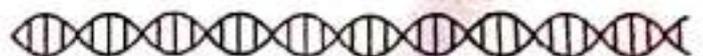
Heterotrophic Nutrition

The organisms which do not manufacture their own food material are called **heterotrophs** (hetero-different, trophs-food). They depend on other organisms for their food and are also called **consumers**. They include fungi, bacteria, humans and animals. The mode of nutrition of animals are called **holozoic type of nutrition**.

HETEROTROPHIC NUTRITION IN ANIMALS

The heterotrophs can be of following types:

1. **Herbivores**: The animals, which depend upon green plants (producers) for their food. They are also called **primary consumers**. Examples- goat, rabbit, cow, elephant, etc.
2. **Carnivores**: The flesh-eating animals are called carnivores, Examples- tiger, lion, snake, fox, etc.
3. **Omnivores**: The animals, which eat both flesh and plants. Examples- dog, man, cat, crow, etc.



4. **Scavengers** There are few animals that consume dead animals are called scavengers. Example- vultures.

HETEROTROPHIC NUTRITION IN PLANTS

There are plants like fungi and bacteria which do not possess chlorophyll and therefore can not prepare their own food. Heterotrophic nutrition in plants can be of the following types:

1. **Saprophytes**: The plants which depend upon dead, decayed and rotten materials for their nutrition. Example- some bacteria and fungi (mushroom).
2. **Parasites**: The plants which depend upon other living organisms (plants or animals) and take ready-made food from them. The plant taking such food is called a **parasite** and the organism from which food is taken is called the **host**. Examples- some bacteria, fungi, dodder (amarbel), etc.
3. **Symbiotic Plants**: The plants which live on other organisms and are mutually benefited form one another. Example- lichen. The body of lichen constitutes of algae and fungi where an alga contains chlorophyll and prepares food where as fungal part gives shelter to the algae.
4. **Insectivorous Plants**: The insects eating plants are called **insectivorous plants**. In these plants, the leaves are modified which help in catching the insects. Examples- pitcher plant, sundew plant, venus flytrap, etc.



Pitcher plant



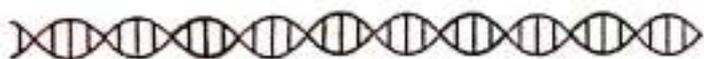
Sundew plant



Venus flytrap

Fig. 1.2 Some Insectivorous plants

Food prepared by the green plants is used by plants and the herbivores. Herbivores are eaten by carnivorous animals. In this way, one form of life supports the other form of life. This sequence of eating and being eaten is called food chain. Thus, a food chain is a series of living organisms connected together, since each one is food for the other. Food chains never occur independently in ecosystem but various food chains are interconnected with each other forming an interlocked system, which is known as food web. Thus, in a food web, there are many food chains, which support each other.



5. **Decomposers:** There are certain microorganisms as bacteria, fungi decompose the dead remains of plants and animals are called **decomposers**. They maintain the balance of nutrients in nature.)

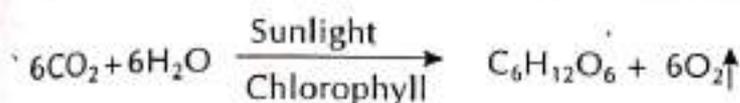
AUTOTROPHIC NUTRITION IN PLANTS

The green plants prepare their own food through a process, called **photosynthesis**.

Photosynthesis

All the green parts of the plants manufacture food material through the green pigment called **chlorophyll**. It is a process in which green plants synthesise food from carbon dioxide and water in the presence of sunlight. In this process, oxygen is released.

Carbon dioxide + Water $\xrightarrow{\text{Sunlight}}$ Food (Sugar) + Oxygen \uparrow



Photosynthesis is the most vital process, which is capable of using solar energy (sunlight). Do you know that it **is the largest single process which utilises about 200 billion tonnes of carbon in the form of carbon dioxide each year and manufactures food?** All the essential commodities of life such as food, coal, diesel, petrol, oil, oxygen, etc. are the by-products of this process.

Place of photosynthesis

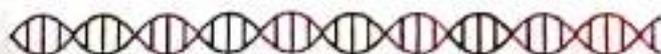
The phenomenon of photosynthesis takes place in the green parts of the plant. It occurs mainly in the leaf and sometimes in the green stems. The leaves have certain structures which help in photosynthesis. **The leaf has the following important structures that are helpful in photosynthesis:**

1. **Stomata:** These are the minute openings, found on the surface of the leaf. Carbon dioxide enters through these pores and oxygen is released.
2. **Chloroplast:** Photosynthesis occurs in the leaves and green stems within a special structure called the **chloroplast**.

Raw material

The following raw materials are required for photosynthesis:

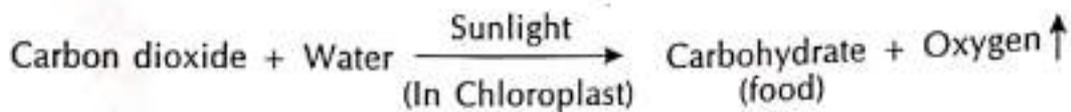
1. **Carbon dioxide:** It is taken from the atmosphere and enters through the stomata.
2. **Water:** Roots absorb water from the soil.



These raw materials are used during photosynthesis in the green pigments called **chloroplast**. This can take place only in the presence of sunlight.

End Product

The end product of photosynthesis is the food in the form of **carbohydrates**. In this process, **oxygen** is released, which is an important by-product, on which living organisms depend.



Thus, it can be said that the leaf is a factory for food manufacture where solar energy is converted into chemical energy (carbohydrate). These carbohydrates are ultimately converted into different types of food material and stored in the roots, stems and fruits.

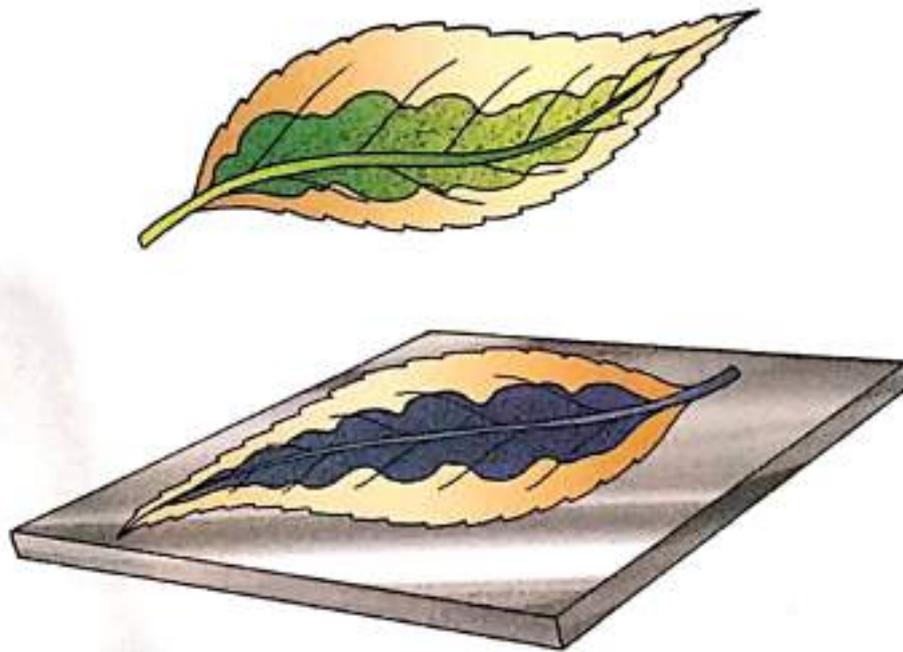


Fig. 1.3 Diagrammatic representation of photosynthesis

Stomata

The minute openings mostly on the lower surface of the leaves are called **stomata**. These openings are surrounded by two bean shaped cells called the **guard cells**. Guard cells contain chloroplasts. This structure, which includes the guard cells and a pore, is called the **stoma**. When the stomata open, carbon dioxide and oxygen pass in or out respectively. Stomata close at night.



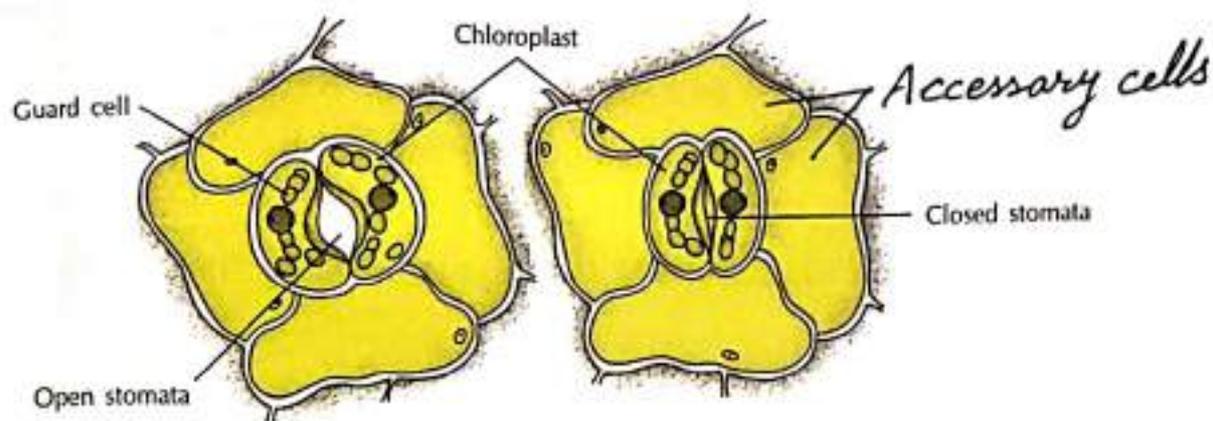


Fig. 1.4 Structure of stomata

Factors Affecting Photosynthesis

The process of photosynthesis is affected by the following factors:

1. **Light:** The rate of photosynthesis increases with the intensity of light. The rate of photosynthesis is maximum in red light.
2. **Carbon dioxide:** On increasing the concentration of carbon dioxide, the rate of photosynthesis increases. However, if the concentration is very high, it decreases.
3. **Temperature:** The optimum temperature for photosynthesis is between 25°C to 35°C.
4. **Water:** It reduces with the decrease of water content.
5. **Chlorophyll:** If chlorophyll concentration is less, the rate of photosynthesis is adversely affected.

ACTIVITY

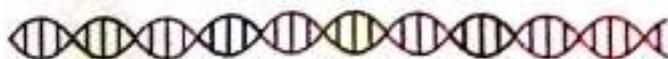
To demonstrate that light is essential for photosynthesis. **Learn**

Materials required:

A potted plant (leaves should be broad), black paper, iodine solution, alcohol, water, beaker, a test tube, tripod stand, wire gauge and a burner.

Methodology:

- Keep the plant in a dark place for 2-3 days for destarching.
- Partly cover the leaf with black paper so that sunlight does not reach the leaf.
- Keep the plant in light for 6 hours. Pluck the leaf from the plant.



- Remove the chlorophyll from the leaf by keeping it in boiling water.
- Wash the leaf in fresh water and spread over a dish.
- Spread a few drops of iodine solution over the leaf.

Observation:

The exposed part (to the light) of the leaf turns blue in colour. The covered portion of leaf remains colourless.

Conclusion:

Starch is formed due to photosynthesis where light could reach. Therefore, it proves that light is essential for photosynthesis.

Note: By keeping the plant in a dark place destarching is done. Since light is essential for photosynthesis, no starch formation will be there.



ACTIVITY

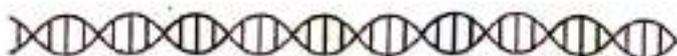
To demonstrate that chlorophyll is essential for the photosynthesis. **Learn**

Materials required:

Potted plant (*Croton* or *Coleus*) which have green and yellow parts, iodine solution, alcohol, water, beaker, test tube, tripod stand, wire gauge and burner.

Methodology:

- Keep the plant in a dark place for 2-3 days for destarching.
- Keep the plant in light for 6 hours. Pluck the leaf from the plant.



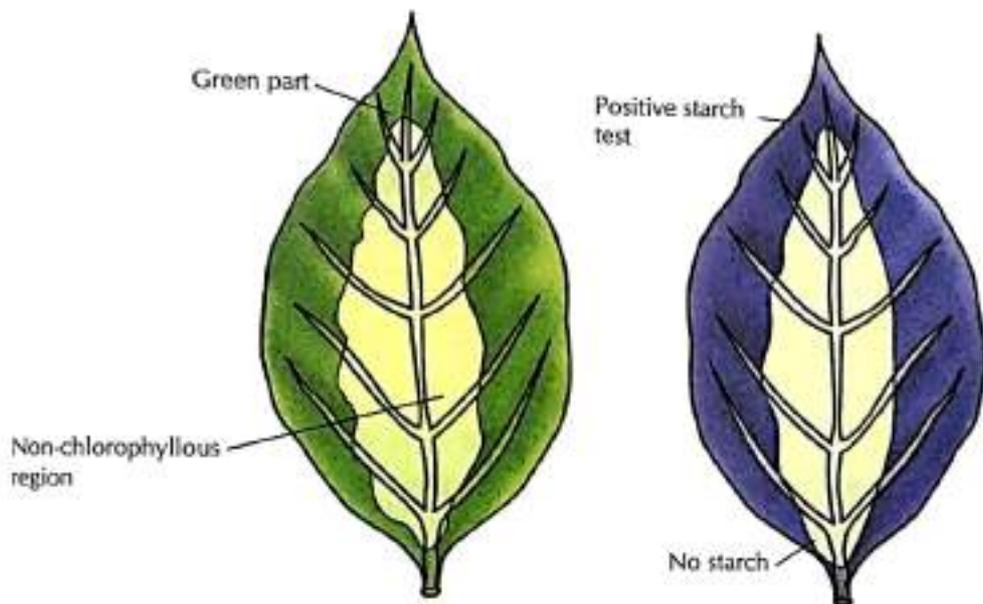
- Remove the chlorophyll from the leaf by keeping it in boiling alcohol.
- Wash the leaf in freshwater and spread over a dish.
- Spread a few drops of iodine solution over the leaf.

Observation:

Dark blue colour is seen only in the green parts but the yellow parts do not turn blue.

Conclusion:

This shows that starch formation takes place only in that part of leaf, which has chlorophyll.



ACTIVITY

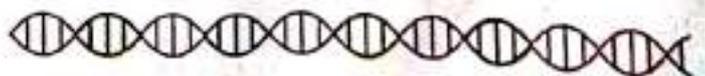
To demonstrate that oxygen is evolved in the process of photosynthesis. **Learn**

Materials required:

Beaker, test tube, funnel, *Hydrilla* plant (aquatic plant), water, and candle.

Methodology:

- A water filled beaker is taken along with *Hydrilla* plants.
- Insert some *Hydrilla* plants in the inverted funnel.
- A test tube filled with water is inverted on the funnel.
- Keep this apparatus in sunlight.

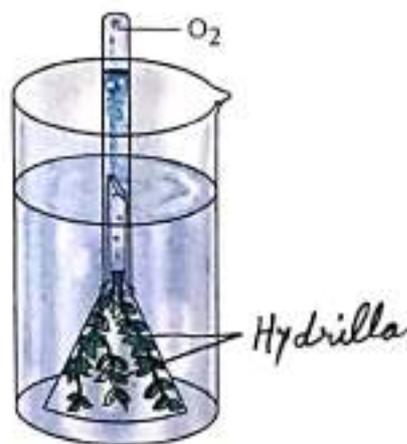


Observation:

You will see the bubbles of gas, which displaces the water downwards.

Conclusion:

This gas can be tested by introducing a burning candle, which remains burning. This proves that evolved gas is oxygen.



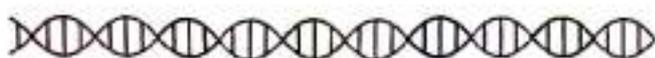
MINERALS FOR PLANTS

The plants need certain minerals for their growth. On the basis of required quantities, they are classified into following:

1. **Macronutrients:** These are the elements that are required in large quantities. Example- Nitrogen, phosphorus, potassium, calcium, iron, sulphur and magnesium.
2. **Micronutrients:** These are the elements that are required in a very small quantity. Example- Copper, zinc, boron, manganese, and molybdenum. They are also called trace elements.

Learn: TABLE 1.1 Deficiency diseases due to lack of nutrients

Nutrients	Diseases
Nitrogen	Yellowing of leaves, chlorosis
Phosphorus	Poor growth, premature leaf fall
Potassium	Shortening of plants
Iron	Yellowing of leaves
Calcium	Plants remain dwarf, margin of leaves curled
Sulphur	Leaves become yellow or red



TRANSPORTATION OF WATER AND MINERALS IN PLANTS

Like animals, plants also have a mechanism of **transportation of mineral solution**. This takes place through a system called **vascular system**. In plants, vascular system consists of two types of conducting tissues:

XYLEM

Xylem consists of mainly thick and tubular cells forming a pipe like structure. It conducts water and minerals from the ground to the stems and leaves.

PHLOEM

These are long, thin tubular structures placed one above the other. It conducts food produced in the leaves to the stems, roots, storage parts and reproductive organs.)

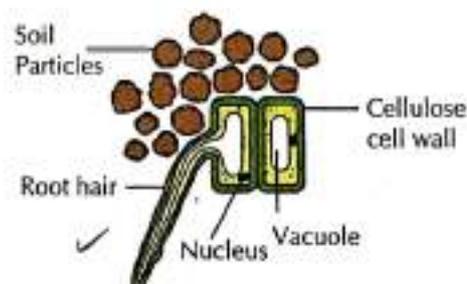
The movement of food substances from the region of synthesis to the region of utilisation is called **translocation**. Thus, during transportation three processes are involved:

- Absorption of water and mineral solution.**
- Rise of cell sap (Ascent of sap),**
- Translocation of food material.**

Absorption of water and minerals

Plants absorb water and mineral salts from the soil with the help of their roots. The solution of water and mineral salts is termed as **capillary water** and present between the soil particles called **pore spaces**. Along with water, mineral salts also enter the roots of plant by the process of **osmosis, diffusion** and **active transport**.

- Osmosis:** It involves the movement of solvent molecules (water) from a region of their higher concentration to a region of their lower concentration through a semi-permeable membrane. In root-hair cell, the cell sap is more concentrated than the surrounding capillary water. Thus, water moves into the root-hair cell by the process of osmosis.
- Diffusion:** It involves the movement of any molecules (solid, liquid or gas) from the region of higher concentration to the region of lower concentration.
- Active transport:** It involves the movement of substances from a less concentrated region, by utilizing energy in the form of ATP. Mineral salts are absorbed by the roots through active transport.



Water lost by transpiration

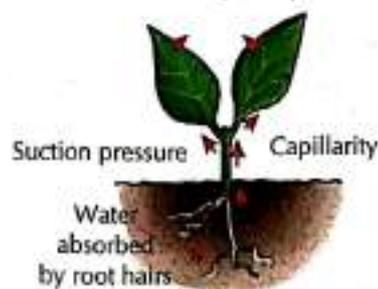
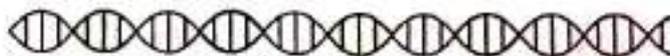


Fig. 1.5 Absorption of water and minerals with the help of root hairs

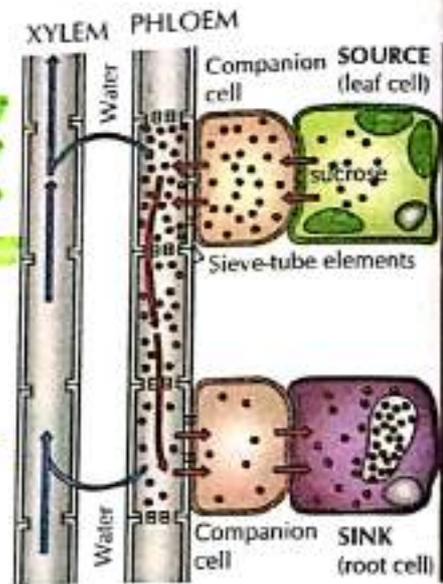


Rise of cell sap (Ascent of sap)

In plants, it is an important feature to carry out vital activities, which occur through xylem and phloem. Water is absorbed through the roots and conducted to other parts of the plant where it is used for various purposes. The minerals in the form of water solution are also absorbed by the xylem from the soil. Thus, **xylem acts as a pipeline for conducting water. The water and mineral solution that is absorbed by the roots and are conducted upwards to the stems, leaves, flowers and other parts of the plant is called ascent or rise of cell sap.**

Translocation of food material

The prepared food material reaches from leaf to different plant organ is called translocation of food material. It is known that **phloem cells** are involved in the transport of soluble food material from leaves to different plant organs. This movement of food from the phloem cells is bi-directional i.e. food can move up and downwards simultaneously.



✓ Fig. 1.6 Translocation of food in plants

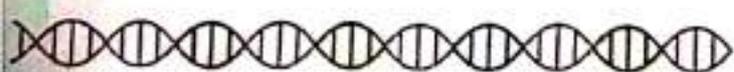
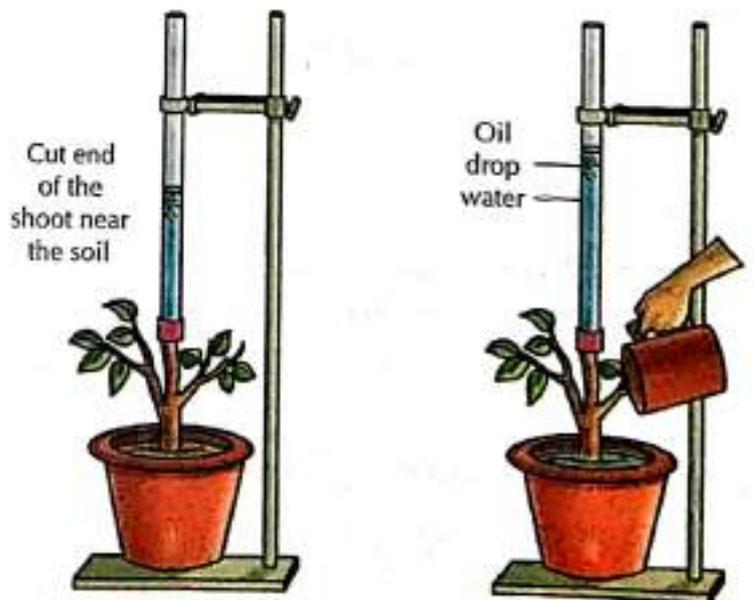


ACTIVITY

To show the upward movement of water in plants. **Learn**

Method: Take a fresh potted plant of tomato. Cut its shoot near the soil. Fix a glass tube and tighten the connection with a rubber band. Add water in the tube so that the cut surface does not dry up. Add two or three drops of oil to prevent evaporation. Add water in the pot and see to the level of water rising up. This is due to root pressure caused by the absorption of water.

Result: The level of water rises up due to root pressure caused by the absorption of water. This shows the upward movement of water.

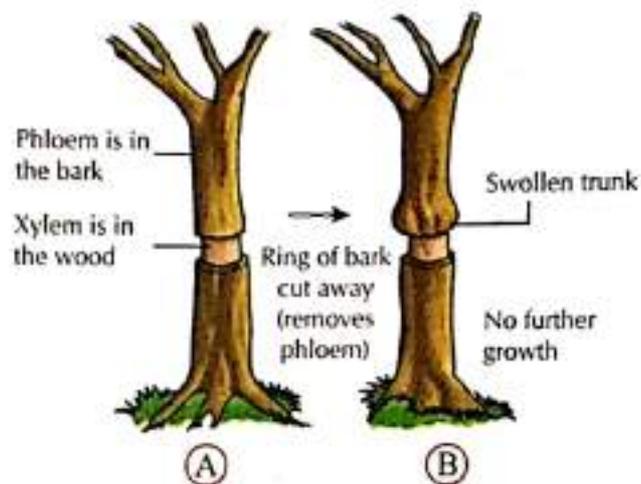


ACTIVITY

To prove that translocation of food material occurs through phloem. *Learn*

Method: In a woody stem, all the outer parts i.e. phloem is removed in the form of ring or girdle. This includes phloem along with the bark. It is kept moist by keeping wet cloth around the ring. After 2-3 days, a swelling is observed just above the ring. This portion of stem swells up due to the accumulation of food material in the tissues. This is because, the prepared food by the leaves does not reach below the ring due to removal of phloem.

Result: This proves that phloem is essential for the translocation of food material



TRANSPIRATION

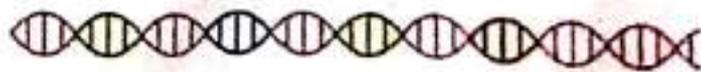
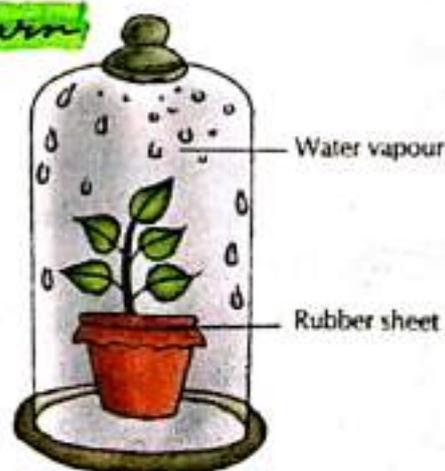
You know that plants absorb a large amount of water from the soil but the plants do not consume the entire water. Only 2-5% of the total absorbed water is utilised by the plants. Rest of the water is lost from the aerial parts of plants in the form of water vapour. Thus, **the process in which excess water is lost from the leaves in the form of water vapour is called transpiration.**

ACTIVITY

To show that transpiration occurs through leaves. *Learn*

Method: Take a well-watered potted plant on a glass plate and cover it by a dry bell jar. The apparatus is made air tight through vaseline. After sometimes, the bell jar becomes misty and a few small droplets will also be seen on the inner surface of the bell jar.

Result: This shows water vapour formed during transpiration has condensed on the inner surface of the bell jar in the form of droplets.





TERMS TO LEARN



- Saprophytes** : Organisms that depend upon dead, decayed and rotten materials for their nutrition.
- Osmosis** : Solution of lower concentration moves towards the solution of higher concentration through semi-permeable membrane.
- Parasites** : Organisms that depend upon other living organisms (plants or animals) and take ready-made food from them.
- Symbiotic Plants** : The plants that live on other organisms and are mutually benefitted from one another.



Learn:

1. The living organisms perform various vital activities such as movement, transportation, circulation, respiration, nutrition, excretion, growth and reproduction. All these activities are called life processes.
2. The process of absorbing nutrients from food and processing them in the body to obtain energy, in order to keep healthy or to grow, is called nutrition.
3. Green plants prepare their own food material and are called autotrophs.
4. The organisms that depend upon others for food are called heterotrophs. They may depend upon plants (herbivores), on animals (carnivores) or both (omnivores).
5. The heterotrophic plants can be saprophytic, parasitic, symbiotic and insectivorous.
6. The green plants can manufacture their food material through the process of photosynthesis. It is a process in which green plants synthesise food from carbon dioxide and water in the presence of sunlight. In this process, oxygen is released.
7. The minute openings on the surface of the leaves are called stomata which help carbon dioxide and oxygen to either pass in or out.
8. The plants need minerals for their growth.
9. In plants, transportation of water and minerals takes place through xylem and phloem.
10. Xylem conducts water and minerals from the ground to stems and leaves.
11. Phloem conducts food produced in the leaves to different parts of the plant.
12. The process in which excess water is lost from the leaves in the form of water vapour is called transpiration.

MEMORY TIPS



PROBLEMS TO SOLVE



A. Answer the following questions briefly: *Note: Do them in your notebooks.*

1. What is nutrition?
2. Why is the nutrition necessary for living organisms?
3. Describe heterotrophic nutrition in animals.
4. Why are plants called autotrophs?
5. What is photosynthesis?
6. Name the end products of photosynthesis.
7. Which part of the plant is responsible for the transport of material in the plants?
8. Describe the structure of stomata.

B. Answer the following questions in detail: *Note: Do them in your notebooks.*

1. What are the life process activities? Name them.
2. Describe heterotrophic nutrition in plants.
3. Differentiate between the following:
 - a. Autotrophs and Heterotrophs
 - b. Parasites and Saprophytes
 - c. Herbivores and Carnivores
 - d. Xylem and Phloem
4. How does the transportation of water and nutrients take place in plants?

© Macronutrients and micronutrients

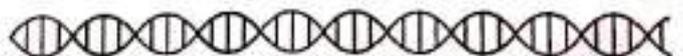
C. Match the following: *(Do in the text book)*

Column A

1. Plants
2. Mushroom
3. Gaseous exchange
4. Nitrogen deficiency in plants
5. Starch test
6. Oxygen
7. Loss of water
8. Translocation

Column B

- a. Movement of food
- b. Photosynthesis
- c. Autotrophs
- d. Iodine
- e. Stomata
- f. Yellowing of leaves
- g. Saprophytes
- h. Transpiration



D. Fill in the blanks with suitable words: *(Do in the text book)*

1. The organisms that prepare their own food are called _____.
2. Saprophytes depend upon _____ and _____ materials for nutrition.
3. _____ depend upon plants for their food.
4. In photosynthesis, water and _____ is used as a raw material in the presence of _____.
5. In the plants, gaseous exchange takes place through _____.
6. _____ is lost through leaves is called _____.

E. Write True or False against each statement: *(Do in the text book)*

1. The flesh-eating animals are called omnivores.
2. The leaves of the plants are like a food factory.
3. Photosynthesis can take place in root and stem.
4. The rate of photosynthesis increases with the intensity of light.
5. Phloem conducts water and minerals from the ground to stem and leaves
6. Transportation of food in plants is called transpiration.

F. Tick (✓) the most suitable answer of the following: *(Do in the text book)*

1. Which process occurs in green leaves?

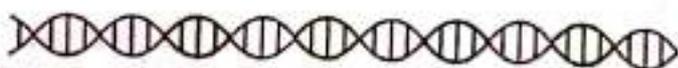
a. Germination	<input type="checkbox"/>	b. Respiration
c. Absorption	<input type="checkbox"/>	d. Photosynthesis
2. Raw material for photosynthesis is:

a. CO_2	<input type="checkbox"/>	b. Water
c. CO_2 and water	<input type="checkbox"/>	d. Glucose
3. Water vapour is lost from the leaves by the process of:

a. Respiration	<input type="checkbox"/>	b. Transpiration
c. Diffusion	<input type="checkbox"/>	d. Osmosis
4. Osmosis occurs through:

a. Cell wall	<input type="checkbox"/>	b. Semi permeable membrane
c. Without membrane	<input type="checkbox"/>	d. Membrane
5. Translocation of food occurs through:

a. Phloem cells	<input type="checkbox"/>	b. Xylem cells
c. Both xylem and phloem	<input type="checkbox"/>	d. None of the above



EXPLANATIONS

* **Photosynthesis** : Photosynthesis is the process in which green plants synthesise food from carbon dioxide and water in the presence of sunlight and chlorophyll and oxygen gas is evolved.

* **Scavengers** : The animals that consume dead animals are called scavengers. This name is given to them because they keep the environment clean by breakdown of organic matter and recycle it into the ecosystem as nutrients.

* **Symbiotic plants** : The plants which live on other organisms and are mutually benefited from one another are called symbiotic plants.
Eg - Nitrogen fixing bacteria (rhizobium) present in the root nodules of leguminous plants and lichen which is a combination of an alga and fungi.

* **Food chain and food web** : The chain of food dependence is called food chain.

Eg - grass---->rabbit---->tiger

All food chains are interconnected with each other. A food web is a set of interconnected food chains circulating energy in the ecosystem.

SOLVED QUESTION ANSWERS

Q) Why is nutrition necessary for living organisms?

A) Nutrition is necessary for living organisms because they require energy to perform life process activities which is obtained through the food .

Q) Which part of plant is responsible for the transport of material in the plants?

A) Conducting tissue (Xylem and Phloem) is responsible for the transport of material in the plants.

Q) How does the transportation of water and nutrients take place in plants?

A) The transportation of water and nutrients takes place in plants by conducting tissue (Xylem and phloem). During transportation three processes are involved-

1) **Absorption of water and mineral solution** : plants absorb water and mineral salts from the soil with the help of their roots. The solution of water and mineral salts is termed as capillary water and present between the soil particles called pore spaces. Along with water mineral salts also enter the roots of plants by the process of osmosis, diffusion and active transport

2) **Rise of cell sap (Ascent of Sap)** : The water and mineral solutions that are absorbed by the roots and are conducted upwards to the stems, leaves, flowers and other parts of plant is called ascent of sap. It is done by xylem

3) **translocation of food material** : The prepared food material reaches from leaves to different plant organs by the process called translocation

of food material. Phloem cells are involved in translocation of food material.

EXTRA QUESTIONS (TO BE DONE IN NOTEBOOK)

Q) Write a short note on the factors affecting photosynthesis.

Q) Define the following terms:-

1) Osmosis

2) Diffusion

3) Active transport

4) Transpiration

Q) Draw the following diagrams and label them:-

1) Process of photosynthesis (fig-1.1)

2) Structure of stomata (fig-1.4)

3) Absorption of water and minerals (fig-1.5)

4) Translocation of food in plants (fig-1.6)

PROJECT WORK : "TRANSPORT SYSTEM IN PLANTS"

Collect the matter on the above mentioned topic from the internet and your textbook and support it with the help of pictures or photographs. You have to write 15 pages and paste the pictures on the plain side.

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