

ST.XAVIER'S SCHOOL

Belguma

Purulia

Subject- Biology

Phase- 1

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Chapter 1- Transport in Plants

Class-VIII

Subject Coordinator- Ms. Benazir Kamal

Instructions to the students

1. You have been provided with the study material relevant to the chapter for your better understanding. Use it as reference along with you textbook.
2. Solve the exercise multiple choice questions and short answer questions in the textbook and long answer questions in notebook respectively.
3. The assignment provided at the end of this study material must also be done in the notebook.

Introduction

- Plants use photosynthesis to convert light energy to chemical energy (in simple words prepare their food).
- Simple organic substances such as CO₂, H₂O and ions are used as raw materials to produce glucose and other substances.

The question that arises is-How does the plants obtain CO₂ and H₂O?

Transportation

The process in which substances absorbed or synthesized in one part of the plant are moved to other parts of the plants.

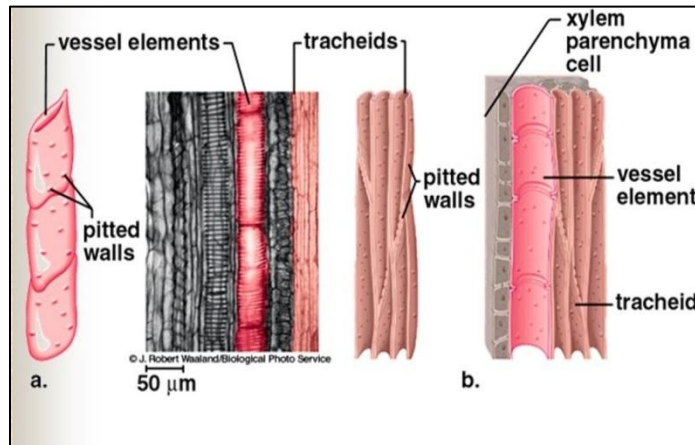
Transportation of water and food in the plants is carried out by a conducting system consisting of:

I. Xylem-

- i) Tissues that transport water and minerals from root to the aerial parts of the plant. Water and ions travel upwards(unidirectional).

Roots → Stems → Leaves → Flowers → Fruits

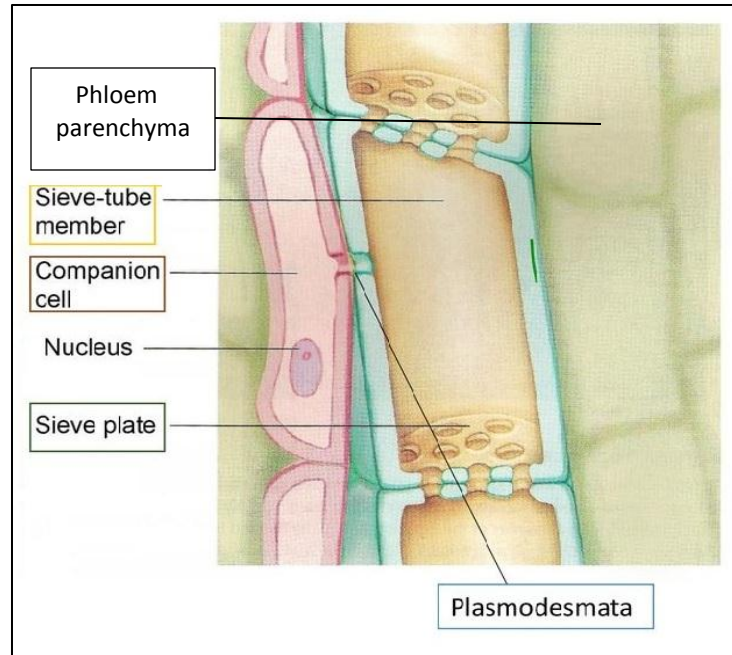
- ii) Xylem tissue consists of four types of cells-
 - a) Tracheids
 - b) Vessels
 - c) Xylem Parenchyma
 - d) Xylem fibres or xylem sclerenchyma
- iii) Xylem contains dead tissues except for parenchyma that are living tissues.



Longitudinal Section of Xylem

II. Phloem-

- i) Tissues that transports food manufactured by leaves to various parts of the plant. Sucrose and other assimilates travel upwards and downwards.
- ii) Phloem tissue consists of four types of cells-
 - (a) Sieve Tubes
 - (b) Companion Cells
 - (c) Phloem parenchyma
 - (d) Phloem Fibres
- iii) Phloem contains living tissues except for fibres that are dead tissues.



Longitudinal Section of Phloem

[Refer to page no.2 & 3 in your textbook for diagrams, functions, difference and other details]

Translocation of solutes

- Translocation is the long distance transport of food materials within a plant.
- Glucose produced by photosynthesis in leaf is converted to sugars(mainly sucrose) and translocated to different parts of the plant-
 - To storage organ (fruit) to be stored mainly as sugars.
 - To growing regions to be used as energy for growth.
 - To storage organ (tubers in roots) to be stored mainly as starch.

Movement of molecules

1. **Diffusion**-The movement of molecules of gas, liquid or solid from higher concentration to lower concentration.
Mostly soil water and minerals move in root hair by diffusion, carbon dioxide diffuses from atmosphere into the leaf by this process.
2. **Osmosis**- The movement of water molecules from its region of higher concentration through a selectively permeable membrane to the region of its lower concentration.

[**Note:** A selectively permeable membrane is a membrane which allows movement of water molecules but restricts the movement of larger molecules through it].

<https://m.youtube/watch?v=QXdL2H11up4>

<https://m.youtube/watch?v=aCtzlQL3GaM>

<https://m.youtube/watch?v=GxztO8MM9F4>

[Click on the links above for a video on diffusion and osmosis]

- 3. Active Transport-** The movement of ions or molecules from their lower concentration into a region of higher concentration requiring energy in the form of ATP molecules. Generally minerals are transported by this process.

Water absorption by the roots

- Water absorption in plants occur through roots.
- The root system of plants consists of main root and lateral roots which bears fine out growth also called **root hairs**.

- **Root hair cell Structure and Function**

Adaptation	Function
Root hair cell has long and narrow protuberance	Increase surface area for faster absorption of water and minerals
Higher concentration of cell sap than surrounding soil water	Facilitates osmosis
Selectively permeable cell membrane	Allows selective substances to pass

Transpiration

The loss of water from the aerial parts of the plant in the form of water vapour is known as transpiration.

Factors affecting the rate of Transpiration

Factors	Rate of transpiration	Why?
1.Sunlight	Speeds up transpiration	The stomata opens
2.Temperature	Speeds up transpiration	Evaporation occurs faster
3. Wind	Speeds up transpiration	Moist air around the leaf is blown away
4. Humidity	Slows down transpiration	Air around the leaf is already full of moisture

Ascent of Sap

The ascent of sap in the xylem tissue of plants is the upward movement of water and minerals (sap) from the root to the crown (stem and leaves).

Forces contributing to Ascent of Sap

- ✓ **Transpiration pull**-Evaporation of water molecules from leaf cells creates a suction force inside xylem tissue causing water to move up from the xylem vessel in the roots to the stem and finally to the leaves. This force is call Transpiration pull.
- ✓ **Root Pressure**- The pressure developed in the roots due to continuous in flow of water into it and responsible for pushing the cell sap upwards.
Cohesion It is tendency of the water molecules to bond with one another by a force.
Adhesion- It is the tendency of water molecules to bond with other substance, in this case the xylem vessels.
- ✓ **Capillary Action**- The cohesion and adhesion act together to maintain the water column all the way up from the root to the stomata. The tendency of water to rise in a thin tube (xylem vessels) due to cohesion and adhesion is called capillary action.

Importance of Transpiration in Plants

- **Cooling Effect**- . The leaf of the plant exposed to direct sunlight will absorb heat. This heat in long run could damage the leaf .The water that gets evaporated during transpiration utilizes the heat from the leaf surface (latent heat) thus cooling the plant in the process.
- **Maintenance of cell sap concentration**- The roots continuously absorb water from soil causing the cell sap to become dilute. This would stop osmosis preventing further absorption. Transpiration helps in removal of excess water facilitating further absorption of water and minerals.

Uses of Water in the Plant

- **Transportation**- Water helps to transport substances in solution form.
- **Food production**- Water is required as a raw material in the process of photosynthesis.
- **Cooling**- The latent heat of the plant is utilized when water evaporates from leaf surface bringing a cooling effect to the plant.

Importance of Minerals

Nutrients

The inorganic raw materials that plants absorb from surrounding and utilize the same for growth and completion of life cycle. Lack of nutrients lead to deficiency in plants and can affect them adversely.

Macronutrients

Also known primary nutrients, are those which are required in the larger concentrations by the plants.

Example- Nitrogen, phosphorous, potassium, calcium.

Micronutrients

The essential elements which are required in tiny amounts compared to macronutrients.

Example- Iron, boron, manganese, copper, molybdenum.

[Refer to table 1.1 on page no. 9 in the textbook]

Exercises -Long answer questions (to be done in notebook)

Find the answers for questions

Q1) At Page no. 5. Q 2) At Page no. 7. Q3) At page no. 6. Q4) At page no. 8. Q5) At page no. 7. Q6) At page no. 8. Q7) At page no. 8. Q8) At page no. 9. Q9) At page no. 3

Assignments to be done in the notebook

1. Define Diffusion, Translocation of solutes, Ascent of sap.
2. What is active transport? Give one example where active transport is used by the plants.
3. Name the living and dead components of Xylem and Phloem.
4. How root pressure contributes to ascent of sap?
5. Why standing under a tree during a hot summer day gives cooling effect?
6. Which nutrient deficiency leads to appearance of purple and red spots on leaves? Mention its role in plant growth.