# **Transportation in Plants**

# Introduction

Plants have a well-developed transportation system to move water, minerals, and food throughout their structures. The two main tissues responsible for transportation are xylem and phloem. Xylem is responsible for the upward transport of water and minerals, while phloem distributes the food produced in leaves to different parts of the plant.

# **Transportation of Water in Plants**

#### **Steps in Water Transport:**

- i. Absorption by Roots: Water is absorbed from the soil by root hairs through the process of osmosis.
- ii. Movement to Xylem: Water moves from root hairs to the xylem vessels.
- **iii.** Ascent of Sap: The upward movement of water through the xylem is known as the ascent of sap.

#### Factors Affecting Water Transport in Xylem:

- **i. Root Pressure:** Root cells actively pump ions into the xylem, causing water to move up due to osmotic pressure.
- **ii.** Capillary Action: Water moves upward in narrow tubes due to capillary action, which occurs due to the small diameter of xylem tubes.
- iii. Adhesion-Cohesion Mechanism:
  - **Cohesion:** Water molecules stick to each other, forming a continuous column inside the xylem.
  - Adhesion: Water molecules stick to the walls of xylem vessels, preventing the column from breaking.

#### iv. Transpiration Pull:

- **Transpiration:** The loss of water vapor from leaves through small pores called stomata.
- This creates a suction force or transpiration pull, which helps draw water upward in the xylem.

# **Flowchart of Water Movement in Plants:**

Soil  $\rightarrow$  Root hairs  $\rightarrow$  Root xylem  $\rightarrow$  Stem xylem  $\rightarrow$  Leaf xylem  $\rightarrow$  Stomata (evaporation via transpiration)

# **Transportation of Food in Plants**

### **Process of Food Transport:**

- The food prepared in leaves through photosynthesis needs to be transported to different parts of the plant for use and storage.
- This transport occurs through the phloem and is called translocation.

## **Phloem Structure & Function:**

- Sieve Tubes: Specialized phloem cells that transport food.
- Phloem Sap: The food moves in a soluble form known as phloem sap.

## **Steps in Food Transport:**

- i. Source to Sink Movement: The movement of food occurs from a sugar source (leaves) to a sugar sink (roots, fruits, and storage organs).
- ii. Process Involved:
  - **Diffusion & Osmosis:** The movement of food involves diffusion and osmosis to facilitate transport.

## **Conclusion:**

- Xylem transports water and minerals upward from the roots.
- Phloem transports food both upward and downward from leaves to other parts.
- Root pressure, capillary action, adhesion-cohesion, and transpiration pull help in water movement.
- Phloem sap movement (translocation) ensures that all parts of the plant receive necessary nutrients.