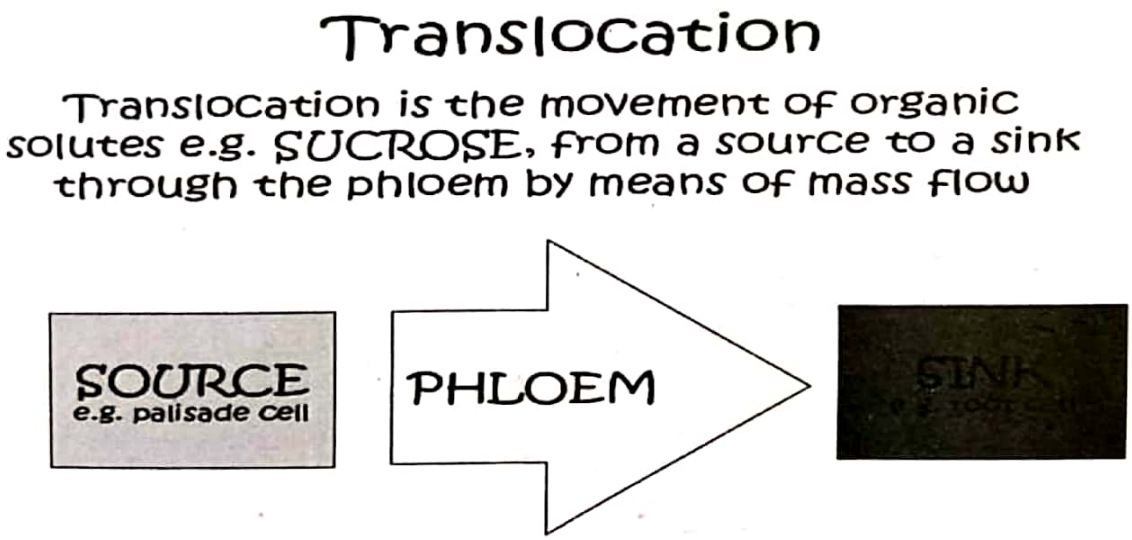
Transport of organic solutes

Definition: The transport of organic solutes from source of assimilates to the sink of assimilates is called translocation of organic solutes

Leaves are called source of assimilate. Leaves are the photosynthetic machineries where glucose is produced during photosynthesis.

The glucose is then converted into sucrose and transport through phloem to all parts of plant.

Sink of assimilates: Leaf and floral buds, seeds, fruits, stem and underground stem are called sink of assimilates.



➢ Mechanism of translocation of organic solutes

The organic solutes are transported from sources of assimilates to sink of assimilates through phloem. Unlike xylem, where flow of water occurs only in one direction, transport of organic solutes may be in any direction.

In normal conditions the translocation of food occur from leaves to stem, seeds, buds, root etc. however, in early spring season when plants do not have enough leaves to produced food so stored sugar in roots become source of food and is translocated to various parts of plant.

Pressure flow or mass flow hypothesis

Discovery: This theory was proposed by Ernst Munch (1930).

Glucose is produced in source of assimilates (leaves) and then converted into sucrose.

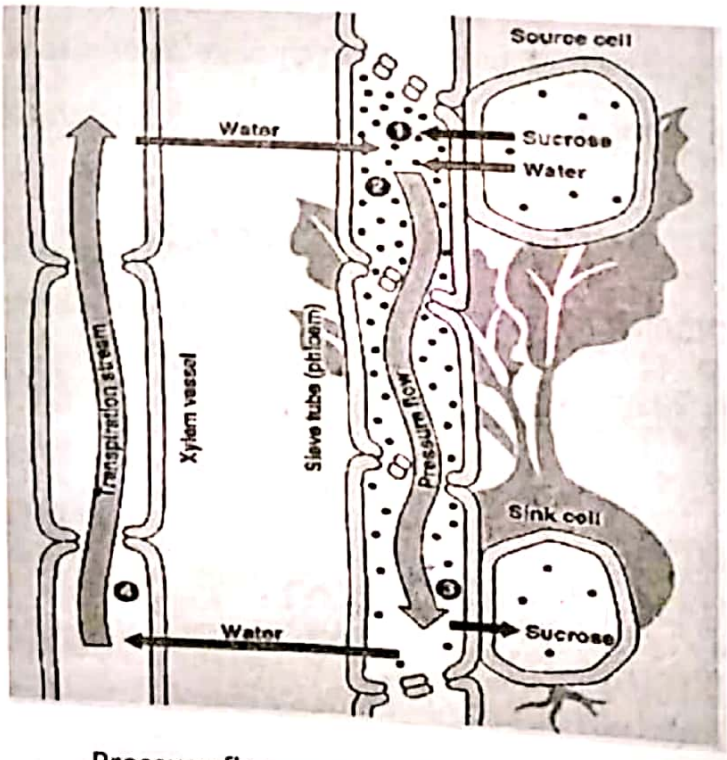
Phloem loading: The transport of organic solutes from source of assimilates (leaves) to phloem is called phloem loading.

Concentration of organic solutes usually remains high in phloem and organic solutes produced in leaves are transported to phloem through active transport. As a result sieve tube solute potential is increased so water from adjacent vessel elements (xylem) move to phloem (sieve tubes) by osmosis where it exert pressure on organic solutes and push them through sieve tubes to the sink of assimilates.

Phloem unloading: The transport of organic solutes from sieve tube of phloem to sink of assimilates is called phloem unloading. It is also an active transport.

As soon as organic solutes are transported from phloem to sink of assimilates, solute potential of phloem decreases then water move to the xylem.

As the movement of organic solutes in sieve tube phloem to the sink of assimilates occur through pressure exerted by water, therefore, this theory is known as pressure flow mechanism theory.



Pressure flow or mass flow hypothesis

Types of solution

There are three types of solutions on the basis of solute concentration:

1. Isotonic solution
2. Hypertonic solution
3. Hypotonic solution

1. **Isotonic solution:** A type of solution in which concentration of dissolved solutes in intracellular (inside cell) and extracellular (outside cell solution) environment is same, it is called isotonic solution.

   When cell is placed in isotonic solution, nothing will happen to the cell due to the same solutes concentration in and outside the cell.

2. **Hypertonic solution:** A type of solution in which extracellular environment is more concentrated (more solutes and less water) than intracellular environment. When cell is placed in hypertonic solution, exosmosis of water occurs and results in shrinkage of protoplasm (plasmolysis).

3. **Hypotonic solution:** A type of solution in which intracellular environment is more concentrated (more solutes and less water) than extracellular environment (more water and less solutes) is called hypertonic solution e.g. fresh water.

   When cell is placed in hypotonic solution, endosmosis of water to the cell occurs. As a result cell becomes turgid.