Topic: Osmosis
B.Sc. Botany (Sub.) II
Group: C
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Osmosis

Osmosis is the net diffusion of water from a weak solution to the more concentrated solution when the two are separated by means of a semipermeable membrane. If the solution is separated from its pure solvent the molecules of solvent move from pure solvent to the solution

The movement of water (solvent) occurs in osmosis, due to the difference of chemical potential on two sides. The molecules of water move from a solution having less potential. Pure water has maximum water potential i.e., it has maximum number of free and active water molecules. Addition of any soluble substance decreases its potential i.e., reduces the number of free and active water molecules. A weak solution has less water potential as compared to strong solution. Therefore, when the two solutions are separated by means of a semipermeable membrane the molecules of water move from the region of higher potential to the region of lower potential. This movement of water is called 'Osmosis'.

There is a tendency for solutions separated by such membranes to become equal in molecular concentration. In plants the only solvent involved in living cells is water. The water can move from the environment into the cell as from the soil into the environment by the simple process of osmosis.

The osmotic process can be demonstrated by a very simple procedure. That a thistle funnel is submerged in a beaker of pure distilled water. The open broad end of thistle funnel is covered with a cellophane or goat's bladder (which acts as semipermeable membrane) and the funnel is filled with a 10% salt solution. The level of solution is marked in the vertical tube of the funnel. The concentration of salt solution is greater in the funnel as compared to the pure water in the beaker. Pure water has maximum potential or free energy as compared to less potential of

water present in the salt solution in the funnel. Water molecules move into the funnel through semipermeable membrane and the level of liquid in the vertical tube rises as a result of osmosis.

When a plant cell is placed in pure distilled water, the water enters into the cell. The plant cell wall is permeable both to solvent and to solute molecules. The plasma membrane on the other hand, is differentially permeable. The water molecules enter into the cell sap as a result of simple process of osmosis. This is known as endosmosis. If the direction of movement is reverse i.e., from cell sap to outside, the osmosis is termed exosmosis.

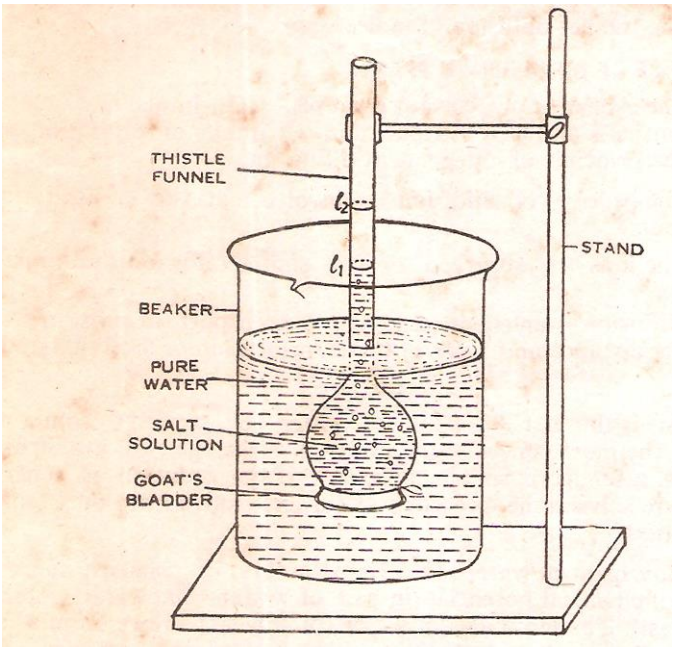

Fig. Demonstration of osmosis by thistle funnels method

There are three different types of solutions:

i. Hypertonic Solution

ii. Hypotonic Solution

iii. Isotonic Solution

i. Hypertonic solution- A solution having a concentration such that it gains water or solvent by osmosis across a semipermeable membrane from some other specified solution.

ii. Hypotonic solution- A solution having a concentration such that it loses water or solvent by osmosis across a semipermeable membrane to some other specified solution.

iii. Isotonic solution- A solution having a concentration such that it neither gains nor loses water by osmosis when separated by semipermeable membrane from a specified solution.

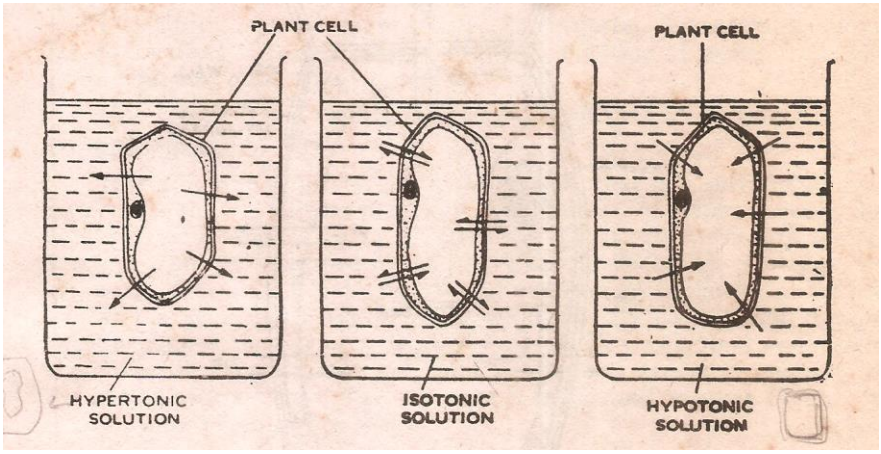

Fig. Explanation of hypertonic, isotonic, and hypotonic solutions in relation to cell sap