Chapter Nineteen

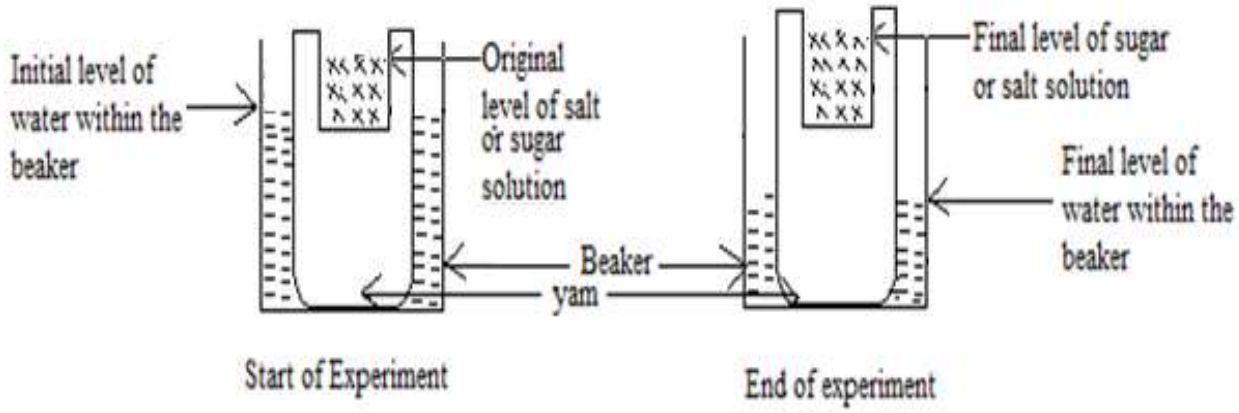
Osmosis, Diffusion And Transpiration

- The absorption and transportation of materials in plant involves two processes, and these are osmosis and diffusion.

Osmosis:

- This is the movement of small solvent molecules such as water molecules, from a region of low concentration to that of a high concentration, through a semi-permeable membrane.
- A semi-permeable membrane is the type of membrane whose holes are sufficiently large enough to allow small molecules to pass through.
- This implies that such a membrane is selective and as such, can also be referred to as the selective membrane.
- If equal amount of water is placed into two similar cups, and let say two cubes of sugar are dissolved in the water within the second cup, then the water within the second cup will be at a higher concentration that within the first one.
- Also if two cubes of sugar are dissolved in the water within the first cap, while five cubes are dissolved in the water within the second cup, then the second solution within the second cup will be at a higher concentration than the one within the first cup.

An experiment to show or demonstrate osmosis in a living tissue:

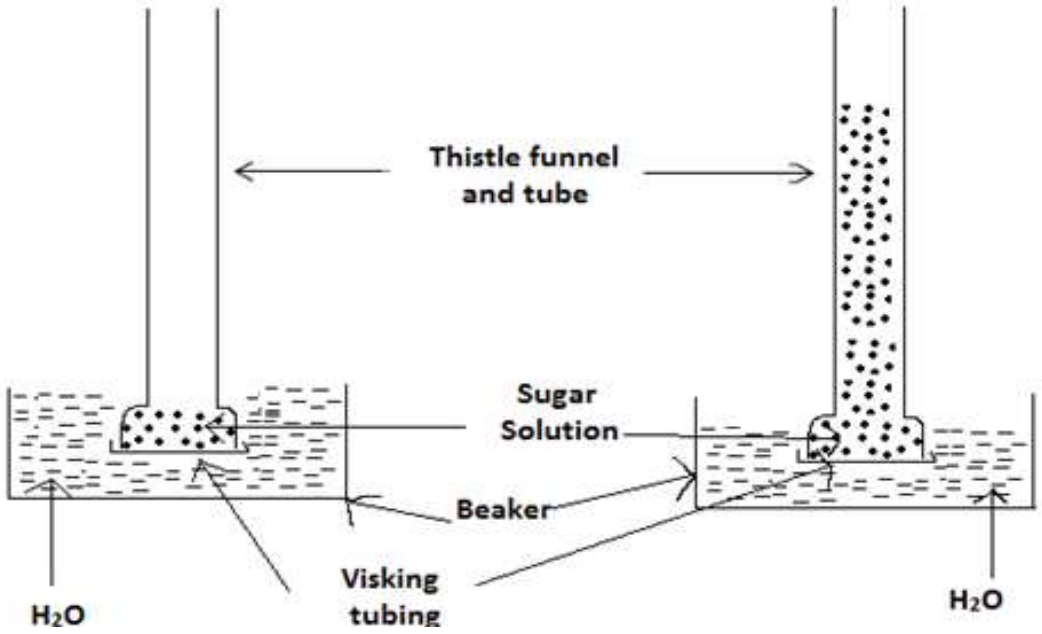


- To show osmosis in a living tissue, a piece of yam is used.
- The yam is flattened at the bottom and top so that it can stand upright.
- A large hole is made in the centre of the yam, and a strong sugar or salt solution is poured into this hole to a certain level.
- The piece of yam with the strong sugar or salt solution, is then placed into a beaker containing ordinary water.
- The level of this sugar or salt solution in the piece of yam as well as the level of water in the beaker is marked.
- The set up is allowed to stand till the next day, and when the levels of the liquids are checked, it will be observed that the level of salt solution has risen, while the level of water in the beaker has fallen.
- This is an indication that water has entered the yam from the beaker, by the process of osmosis.
- The salt solution is of high concentration while water is of low concentration, and the outer wall of the yam acted as a semi-permeable membrane.

However, when the same experiment is performed with water being placed into the hole instead of sugar or salt solution, the level of water in the hole and the beaker remains unchanged or the same.

This is due to the fact that osmosis cannot occur, since both liquids have the same concentration.

Experiment to demonstrate osmosis in a non-living cell or tissue:



Start of experiment After an hour

(1) A thistle funnel and a tube are connected together as shown in the diagram.

(2) A visking tubing which acts as a semi-permeable membrane is stretched across the mouth of the tube.

(3) A sugar or salt solution is placed inside the tube, and the tube is then placed into a beaker which contains water.

(4) The level of water within the beaker is then marked or noted.

(5) It will be observed that after an hour, the level of water within the beaker has fallen or decreased, while the level of sugar solution has risen into the thistle funnel.

(6) We can therefore conclude that water molecules from the beaker have passed through the visking tubing into the salt or the sugar solution.

(7) For this reason, osmosis has occurred in a non-living tissue.