

Study no. - 01

Name of the study: Study on demonstration of osmosis with the help of potato tuber osmoscope

Osmosis:

Diffusion of solvent (usually water molecules) from a hypotonic solution (low concentration of dissolved substances) to hypertonic solution (higher concentration of dissolved substances) through a semi-permeable membrane.

Or

Net movement of water molecules through a semi-permeable membrane from an area of higher water potential to an area of lower water potential.

Types of Osmosis:

1. **Endo-osmosis:** The inward flow of water into the cell through the semi-permeable membrane to the influence of external hypotonic solution.
2. **Exo-osmosis:** The outward flow of water from a cell through the semi-permeable membrane to the influence of external hypertonic solution.

Solution:

A solution is a homogeneous mixture of two or more substances in which the particles of one or more substances (the solute) are distributed uniformly throughout another substance (the solvent).

Solvent:

Solvent is a liquid that dissolves one or more solid/liquid/ gaseous solute. In a solution amount of solvent is always higher than that of solute. e.g., Water, Alcohol, Ether etc.

Solute:

In solution the substance dissolved in solvent is called solute. e.g., Sugar, Salt (NaCl, KCl etc.)

Types of Solution:

Solutions are three types -

1. **Hypertonic solution:** The solution having **higher solute concentration** than that of reference solution or concentration of protoplast of plant living cell referred to as hypertonic solution.
2. **Hypotonic solution:** The solution having **lower solute concentration** than that of reference solution or concentration of protoplast of plant living cell referred to as hypotonic solution.
3. **Isotonic solution:** The solutions having **same solute concentration** (both protoplast of plant living cell and outer condition) referred to as isotonic solution.

Requirement:**A) Materials:**

1. Potato tuber
2. Scalpel/knife
3. Beaker
4. Petridish
5. Pipette
6. Pin

B) Chemicals

1. Water
2. Sugar/ NaCl (Salt) crystal or their concentrated solution

Procedure: A healthy potato tuber was taken for the experiment. The tuber was cut into two halves. The tuber was peeled to make a cup like structure to use as osmoscope. A groove was made in the centre of the tuber to give a cup shape. The bottom of the tuber was made flattened and cup wall was made as thin as possible. Then sufficient amount of sugar/salt solution kept inside the groove. A pin was placed in the inner wall of the potato tuber to mark the initial level of the solution. The potato cup kept inside a petridish was full of pure water. The potato tuber with petridish was kept in an undisturbed place for sufficient time to observe osmosis process.

Observation: After some hours it was observed that the level of salt/sugar solution rose beyond the pin mark level.

Inference: From the experiment it was found that solvent to enter into the potato tuber cup by the process of osmosis.

Precautions:

1. The potato tuber should be healthy.
2. Care should be taken so that potato tuber wall does not get damaged.
3. The solution inside the potato cup should be stronger enough.
4. Pin should be placed carefully.
5. Water of the petridish should not over flow the potato cup.
6. Sufficient time should be allowed to complete the osmotic process.

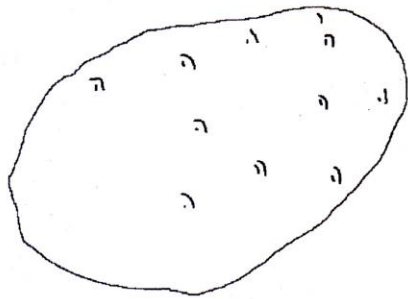


Figure: A potato tuber

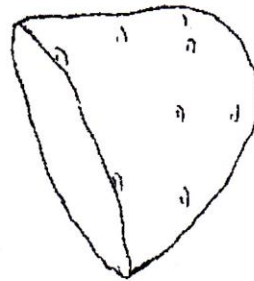
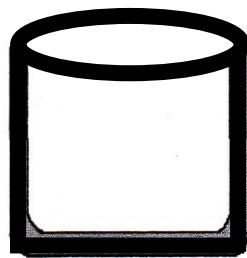


Figure: Half of a potato tuber



Potato tuber cup

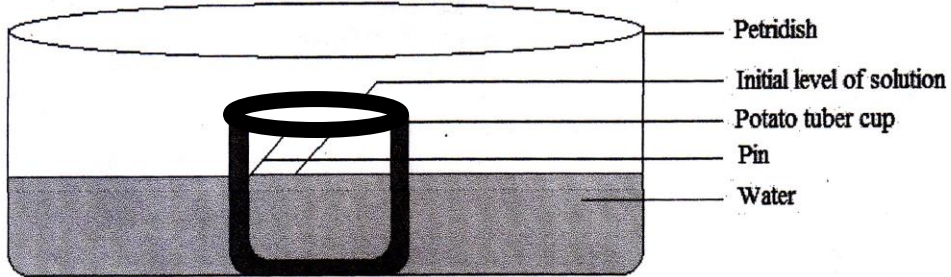


Figure: Potato tuber osmoscope at initial stage

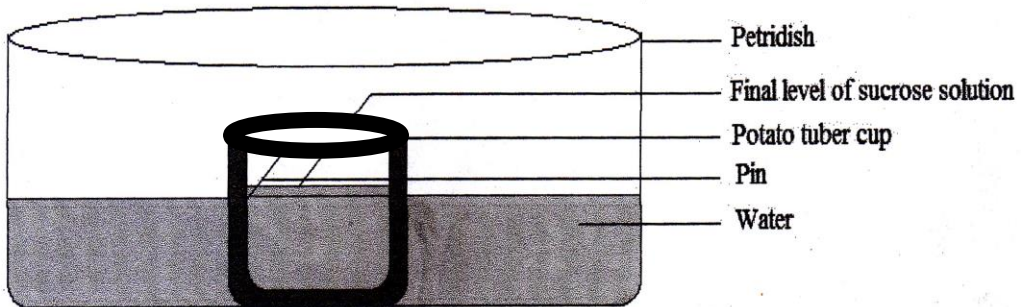


Figure: A Potato tuber osmoscope at final stage

Figure: Demonstration of osmosis with the help of potato tuber