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[GROUP- C]

- (i) IMBIBITION.**
(ii) PLASMOLYSIS.

Imbibition And Plasmolysis

Imbibition or Hydration

Imbibition (Imbibe: to absorb) →

"The absorption of water by hydrophilic colloids is known as imbibition or hydration." Imbibition of water increases the volume of the imbibitor due to which pressure is created which is known as imbibitional pressure. Imbibitional pressure is the potential maximum pressure that an imbibitor will develop if it is submerged in water. The relationship of diffusion pressure deficit (DPD), imbibitional pressure (IP) and turgor pressure (TP) is as follows -

$$[DPD = IP - TP]$$

Different types of organic substances have different imbibing capacity. Proteins have a very high imbibing capacity, starch less and cellulose least. That is why proteinaceous seeds swell more on imbibition than starchy wheat seeds. The amount of water imbibed by a substance is also determined by the degree of cohesion of mole-

cules of the imbibing substance. (2) woods swell more than gelatinous bodies there is more of cohesive attraction between wood molecules than gelatin. Increase in temperature brings about an increased imbibition. The presence of solute also affects rate of imbibition. Increase in concentration of the solute decreases imbibition. Type of solution may also affect it. Some ions inhibit imbibition much more than others. Imbibition is also affected by acidity and alkalinity. Proteins being amphoterics in nature imbibe best in neutral medium. Toward pH 1 or 14 the imbibition increases till a maximum is reached and then again fall down. During imbibition some energy is also released as heat. This is indicated by the warming of kneaded flour.

The phenomenon of imbibition has three important characteristics -

① Volume change → In course of imbibition the volume of the system increases i.e. swelling occurs. The total volume of the water imbibed plus the imbibing material is less

after imbibition than before. Evidence⁽³⁾ indicated that there is an actual compression of water, i.e.; water molecules on being arranged on the surface of the imbibitions occupy less volume than the same molecules do when they are free in the normal liquid.

2) Production of heat → As the water molecules are arranged on the surface of the imbibition they lose some of their kinetic energy which when appears as heat in the system.

3) Development of pressure → If an imbibing system is combined, great pressure may be developed by the swelling.

Plasmolysis

Plasmolysis [Plasma: Protoplasm, lysis = breakdown]

"Shrinkage of protoplasm is called plasmolysis." when a plant cell is kept in hypertonic solution or a solution having high concentration than that of the cell sap, exosmosis occurs and

water comes out from within the protoplasm, as a result of which the protoplasm shrinks and leaves the cell wall. Since cell wall is permeable, the space between protoplasm and cell wall is filled with the external solution. The shrinking of protoplasm is called plasmolysis.

If a plasmolyzed cell is again placed in hypotonic solution or a solution less concentrated than the cell sap, water from outside enters the protoplasm or endosmosis occurs, with the result of the protoplasm again comes back in its original position and stretches up with the cell wall. This process is termed as deplasmolysis.

The point at which the plasmolysis just starts is called incipient plasmolysis.

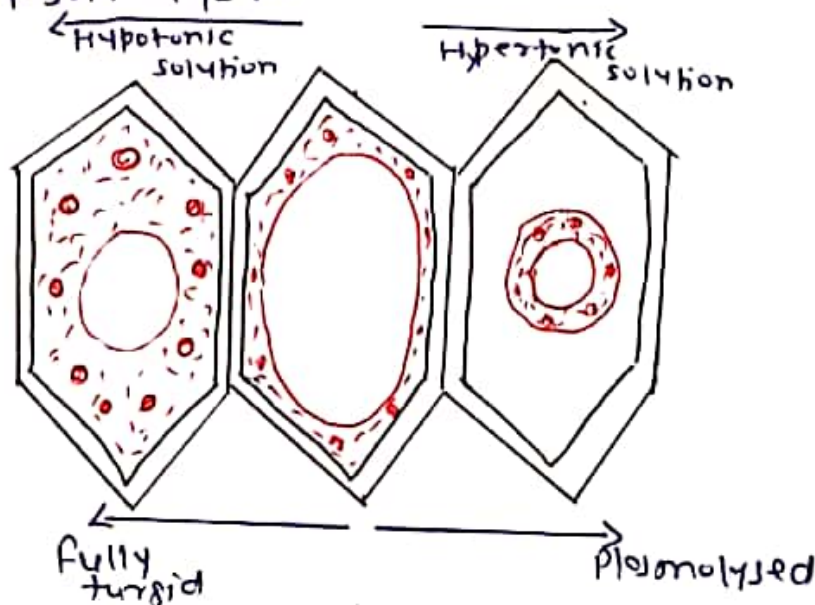


Figure - cell showing endosmosis and exosmosis when kept in hypotonic and hypertonic solutions, respectively.

If a cell is kept in iso-⁽⁵⁾tonic solution i.e., a solution the concentration of which is just equal to the concentration of the cell sap, neither shrinking nor swelling of the protoplasm will occur.

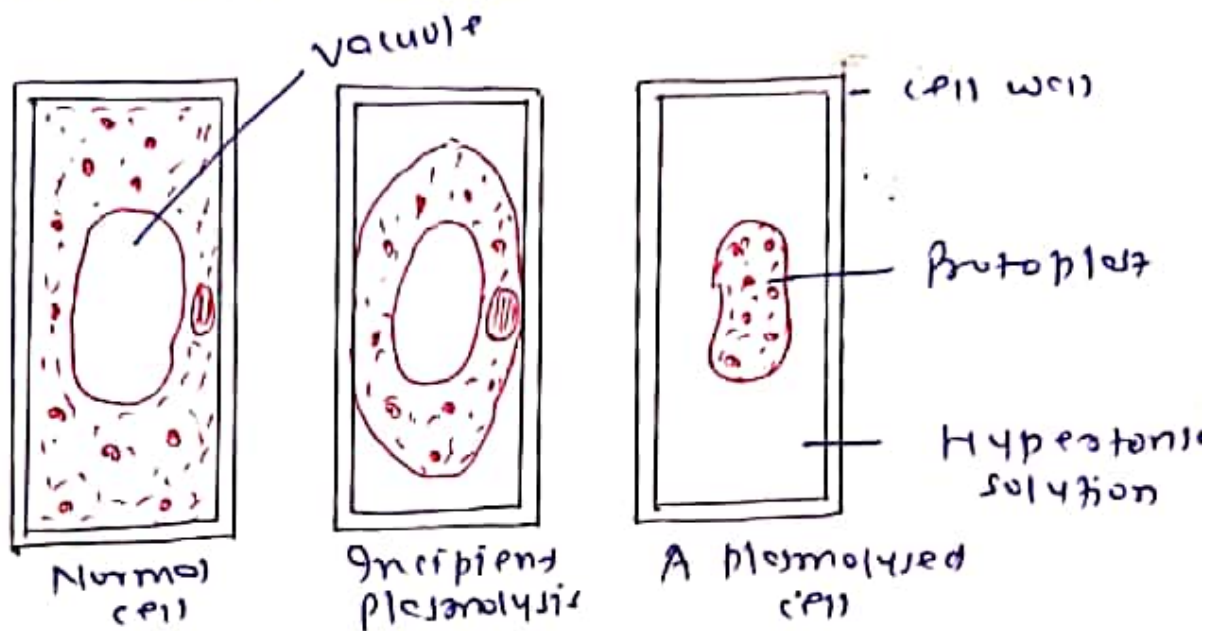


Figure - Stages of Plasmolysis.

Importances of Plasmolysis

Plasmolytic method can be a good method for finding out OP or ΔP of cell sap. It can also help in finding out the osmotic pressure of an unknown solution.

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