

Diffusion Pressure Deficit (DPD)

1. The term DPD was coined by B.S. Meyer in 1938 but was described originally under the name 'Suction Force' (Saugkraft) or 'Suction Pressure' (SP) by O.R. Renner (1915).
2. The diffusion pressure deficit is abbreviated as DPD.
3. It represents the difference in diffusion pressure between a solution and pure water (solvent).
4. The magnitude of DPD is usually expressed in atmospheres (with a positive sign).
5. The direction of water movement within cells is from low DPD to high DPD.
6. The DPD of a cell is equivalent to:
$$\text{DPD} = \text{OP} - \text{TP}$$

Water Potential (ψ)

The term water potential (ψ) was given by Ralph O. Slatyer and Sterling A. Taylor (1960).

Water potential is symbolized by the Greek letter or uppercase *psi*, ψ (pronounced "sigh").

It represents the difference in free energy between water molecules in pure water and in a solution.

The ψ is expressed in bar units (with a negative sign).

The movement of water between cells is from high ψ to low ψ i.e., in an energetically downhill direction or from less negative ψ to more negative ψ .

The water potential (ψ) is equal to the algebraic sum of three forces:

$$\psi = \underbrace{\Psi_{\pi}}_{(-)} + \underbrace{\Psi_m}_{(-)} + \underbrace{\Psi_p}_{(+)} \quad \text{— values}$$

Plasmolysis

1. The shrinkage of cytoplasm from the cell wall under the influence of hypertonic solution.
2. It remains essentially a laboratory phenomenon, seldom occurring in nature (with the possible exception of saline environment).
3. The protoplast volume of the cell progressively decreases as plasmolysis progresses. Does not normally give rise to a significant negative pressure.
4. The space or void between the cell wall and the protoplast is filled-up by the external solution.
5. Plasmodesmata are broken as the protoplast pulls away from the cell wall.

Wilting

The loss of turgor in plant tissues under water deficit* conditions.

This response is due to water-stressed environment.

Never ever the collapsing protoplast separates from the cell wall but significant negative pressure (tension) may develop.

No space or void ever develops between the cell wall and the protoplast.

Plasmodesmata are never broken between the adjacent cells.

* Resulting from excessive loss of water than water uptake or actual deficiency of water in the soil.