

Apoplastic and symplastic movement of water

Water moves through plant roots by two main pathways: symplastic and apoplastic.

1. Apoplastic movement

The apoplast refers to the non-protoplasmic spaces of a plant. It includes the cell walls and the intracellular spaces. The apoplast of the root cortex is used for the movement of water to the xylem, which is absorbed by the root hair cells. This pathway is called the apoplastic pathway. The apoplastic pathway does not cross any cytoplasmic membrane at any time. That means the water moves through the passive diffusion. Therefore, the apoplastic pathway shows the least resistance towards the movement of water.

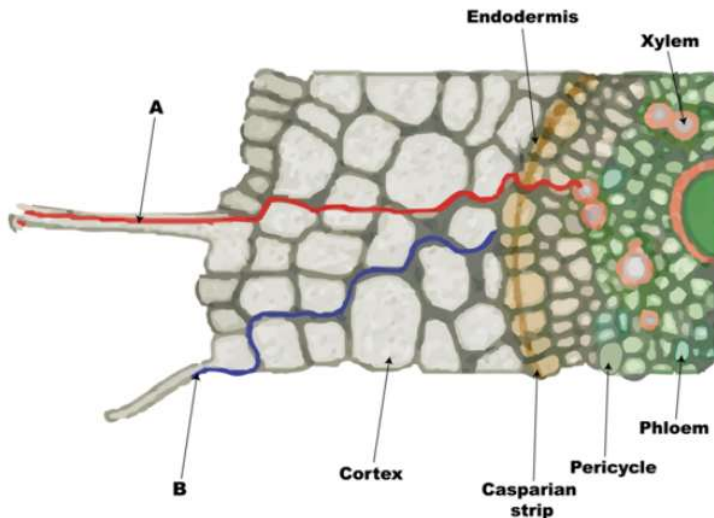


Figure: Apoplastic and Symplastic movement of water
A. Syplastic movement; B. Apoplastic Movement

In this pathway, water moves through the spaces between cell walls and the extracellular spaces, without entering the cell membranes. This movement is faster and more passive, but it is halted by the Casparian strip, a waxy barrier in the endodermis.

2. Symplastic movement

Symplast refers to the protoplasts present in plant cells, which are interconnected by the plasmodesmata. It is the inner part of the plasma membrane, which plays a vital role in transporting or free movement of water and other low-molecular-weight solutes such as sugars, amino acids, and other ions in between cells. The term symplastic pathway was proposed by Priestley (1949) when he observed the active and passive movement of water in plants.

In this pathway, water travels through the cytoplasm of cells. Water enters the root hair cells and moves cell to cell through *plasmodesmata* (tiny channels connecting adjacent cells). This route is slower but regulated, as the water must pass through the selectively permeable cell membranes, allowing the plant to control what substances enter the cells.