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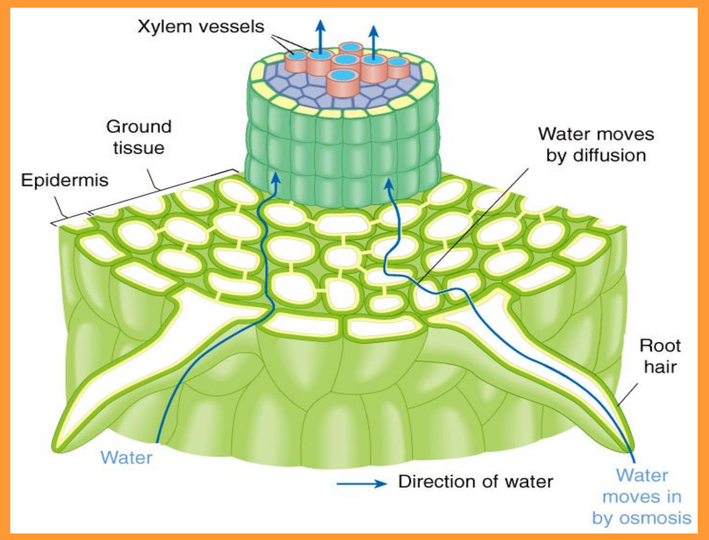
3.3.1 Mineral Nutrition in Plants

Transport of water in flowering plants

Water enters the root hair by osmosis then diffuses across the ground tissue into the xylem.

Reasons for water entering root hairs

1. Root hairs have a large surface area.
2. They have thin walls.
3. Their cytoplasm is more concentrated then the soil water.



Mineral uptake by plants

Minerals are dissolved in the water and enter the plant by diffusion.
They follow the same pathway as water.

Mechanisms that contribute to the upward movement of water through the stem

1. Root Pressure

As water molecules move into the root by osmosis they push the ones in front of them up the xylem.

2. Transpiration

As water evaporates from the leaf by transpiration, more water is pulled upwards through the xylem into the leaf.

Details of transpiration

Every time a water molecule is lost from the leaf by transpiration an osmotic gradient (difference in concentration) occurs between the leaf (spongy mesophyll) and the xylem vessels.

The leaf therefore becomes less turgid.

A water molecule from the xylem vessel enters the leaf to replace the one lost by transpiration.

What controls the water lost by leaves?

A waxy cuticle and closed guard cells both stop excess water being lost by the leaf.

The cohesion-tension model of water transport

By Henry Dixon and John Jolly, two Irish scientists.
It explains how water is transported against the force of gravity in plants.

- Water molecules stick to each outer (cohesion) and to the xylem vessels (adhesion).
- This causes the water molecules to form a thin continuous column.
- As each molecule is lost by transpiration, it pulls the next water molecule up the xylem to replace it.
- This continues all the way down to the roots causing a tension.
- The tension is hard to break and can pull a column of water molecules to great heights in plants.

Function of transport system

To transport materials needed for metabolic processes including respiration and photosynthesis.