

CHAPTER - 4 ABSORPTION BY ROOTS

This lesson is for Class 9 for the subject of Biology.
Topic - 'Turgidity and Root Pressure', which is covered in 'Chapter 4 - Absorption by Roots - Processes involved' starting on Page No 37 of your text book titled Concise Biology Selina Publications and is being submitted to you on 21.10.2024.

Dear students in the last class we have learnt about 'turgidity'. Today let us learn about the uses of Turgidity to plants.

USES OF TURGIDITY TO PLANTS

(i) Turgid cells provide mechanical support in non woody tissues such as leaves. This is why the leaves of a plant droops down in sunny afternoon and the plant wilts. This happens because in the afternoon the water lost by plant during transpiration is more than the water absorbed through the roots.

In the evening when the Temperature lowers, thus the transpiration reduces, the water absorbed by plant exceeds the water lost through Transpiration. Thus the wilted leaves again stand out as their turgidity is restored.

→ Salting is method of preservation. Give reason.
Salting of pickle/meat draws out water from the bacterial cell by the process of plasmolysis by creating hypertonic conditions outside the bacterial cell. Thus water is drawn out by exosmosis leading to plasmolysis of bacterial cell.

→ Use of excessive fertilizers kill the crops. Give reason.

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→ Excessive application of fertilizers create hypertonic condition outside the plants/crops roots which withdraws out the water by exosmosis from the root cells leading to plasmolysis of root cells which kills them thus damages the roots/crops.

2) Turgor pressure developed in root cells help it to push through hard ground and go deeper in the earth in search of water. Sometime this pressure is high enough to crack the walls of buildings or concrete floor.

3) Turgor in the root cells build up root pressure

Aim - Experiment to demonstrate root pressure

Procedure - Cut a well watered potted plant [eg balsam] a few cm above the soil and immediately fix a glass tubing to it by rubber connection. Glass tube is connected with manometer

Observation - Water starts coming out of the cut end of the stem and rises up in the glass tubing. This pushes the mercury in glass manometer up. It shows that the upward flow of water is due to heavy pressure from the roots called the root pressure which is enough to rise the level of mercury. [Fig 4.11]

Thus we can define Root Pressure as -

Root pressure is the pressure developed in the roots due to continued inward movement of water through cell to cell osmosis which helps in the ascent of cell sap upward through the stem.

But due to root pressure cell sap can rise in the plant upto a certain height only and not reach upto the top of tall trees

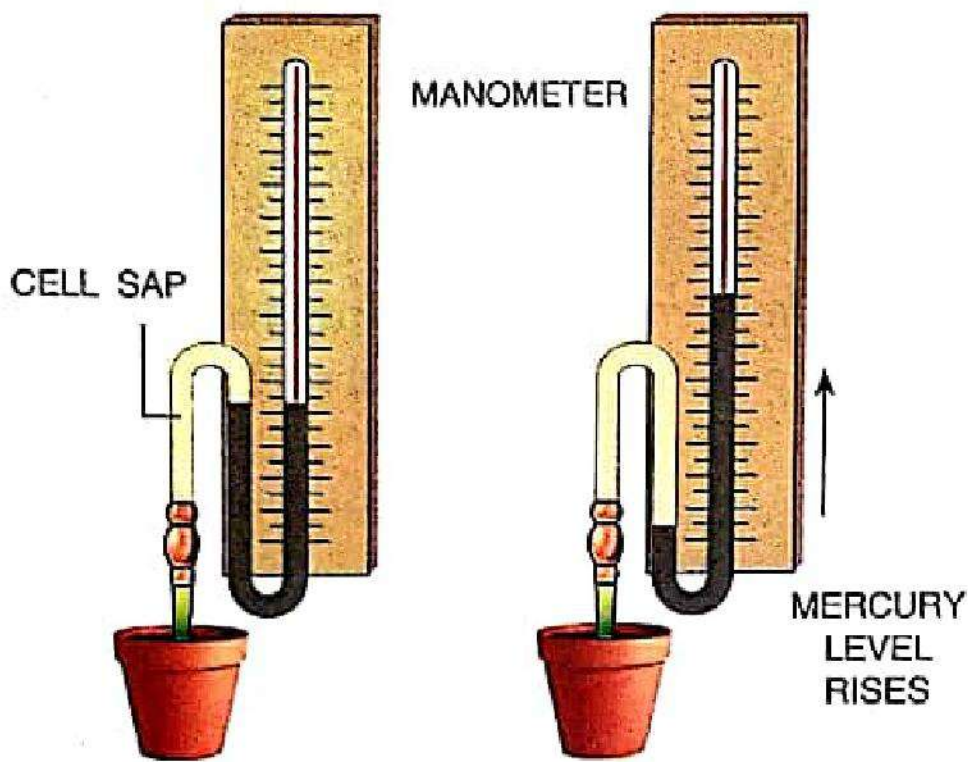


Fig. 4.11 : An experiment to demonstrate root pressure

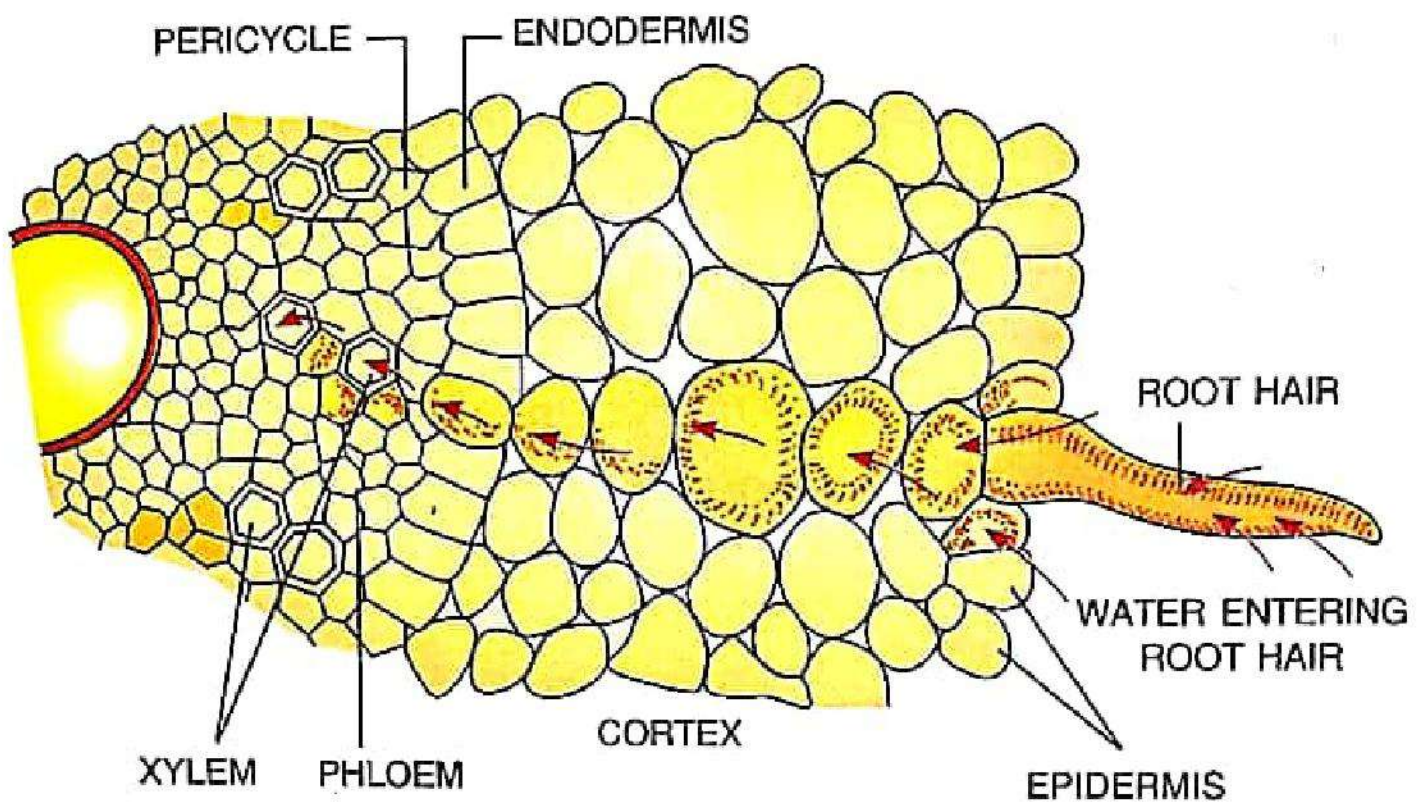


Fig. 4.13 : Diagrammatic cross-section of a part of a root showing by arrows the cell-to-cell conduction of water from a root hair to xylem

BLEEDING Loss of water through a cut stem is called bleeding.

4) Turgor helps in opening and closing of stomata. Thus opening/closing of stomata depends on turgidity of guard cells. Each guard cell is a bean shaped cell having thick wall on the inner side and thin wall on outer side. As a result of photosynthesis occurring in the guard cells, glucose is formed. This glucose makes the cell contents/protoplast of guard cells - hypertonic and increases their osmotic pressure and they absorb more water from the neighbouring cells and become turgid. Due to turgidity, guard cells become more convex on the outside and the aperture between them widens, thereby opening the stoma. Guard cells become flaccid at night due to exosmosis of water. Their walls become straight and stomata close.

5) Turgor movements - Examples -

(a) Folding and unfolding of leaflets in Oxalis

(b) Drooping of leaflets of sensitive plant -

Touch me not [*Mimosa pudica*] If any leaflet is touched it folds up and within 2-3 seconds the entire leaf droops. Stimulus of touch leads to loss of turgor pressure at the base of the leaflets and petioles. Slowly the leaf/leaves recover and again stand erect.

(c) Opening and closing of lids in insectivorous plants whose leaves close up to entrap a living prey. Eg. *Nepenthes* and *Drosera*.

(d) Bending movements of certain plants' flowers towards the sun. Eg. Sun flower

e) Sleep movements of leaves of certain plants

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at night are also turgor movements
Now before going further in the chapter let us recapitulate what we have learnt so far.

Answer the following questions during a short 3 minutes break -

Q1 Name the term given to the pressure developed in the roots due to continuous inward movement of water through cell to cell osmosis leading to ascent of cell sap upward through the stem.

Q2 Name a plant that shows turgor movement

Q3 Name the term given to - Loss of water through a cut stem.

You may pause the lesson for 3 mins break now. Break is over children.

Listen to the correct answers -

A1 Root pressure

A2 Mimosa pudica

A3 Bleeding.

Now let us resume the topic with the discussion of -

Structure of Root - Crosssection of root Fig 4.13 shows the following parts in sequence
Root Hair [epidermis] → Cortex → Endodermis → pericycle → Phloem → xylem.

EPIDERMIS

Outermost layer of cells that is protective in function. Outgrowth of epidermal cells form the root hair.

CORTEX Inner to epidermis we have simple parenchyma cells forming the cortex Bulk of root is formed by cortex cells which help to store food and water in root.

Endodermis and pericycle are surrounding the conducting tissues [xylem and phloem] and protecting them.

Phloem - helps to conduct food in the plant

Xylem - helps to conduct water in the plant.

GUTTATION - In some herbaceous plants, water droplets ooze out through their leaf margins in the morning. This particularly happens in plants growing in warm humid conditions. A humid environment hampers transpiration while the roots continue to absorb water from the soil. Thus when the root pressure is high and transpiration is low water drops ooze out through special marginal structures (present on margins of the leaves) at the tips of veins in the leaf called the hydathodes to allow this exudation. Guttation can be observed in many plants and is quite common in banana, garden nasturtium, tomato etc.

With this I am ending today's discussion children. Kindly go through the given explanation carefully and answer the following home assignment questions in your notebooks -

HOME ASSIGNMENT -

- Q1. Draw a well labelled diagram of
 - a) Cross-section of part of Root.
- Q2. Study the experiment to demonstrate root pressure Fig 4.11 and on basis of the experiment, answer the following questions.

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Experiment 4 [Fig 4.11 Page 46 of text book]

- Q1. What is the aim of the experiment?
- Q2. Name the process depicted and define it
- Q3. What is the result of the experiment as observed?
- Q4. What is the purpose of manometer used here?

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