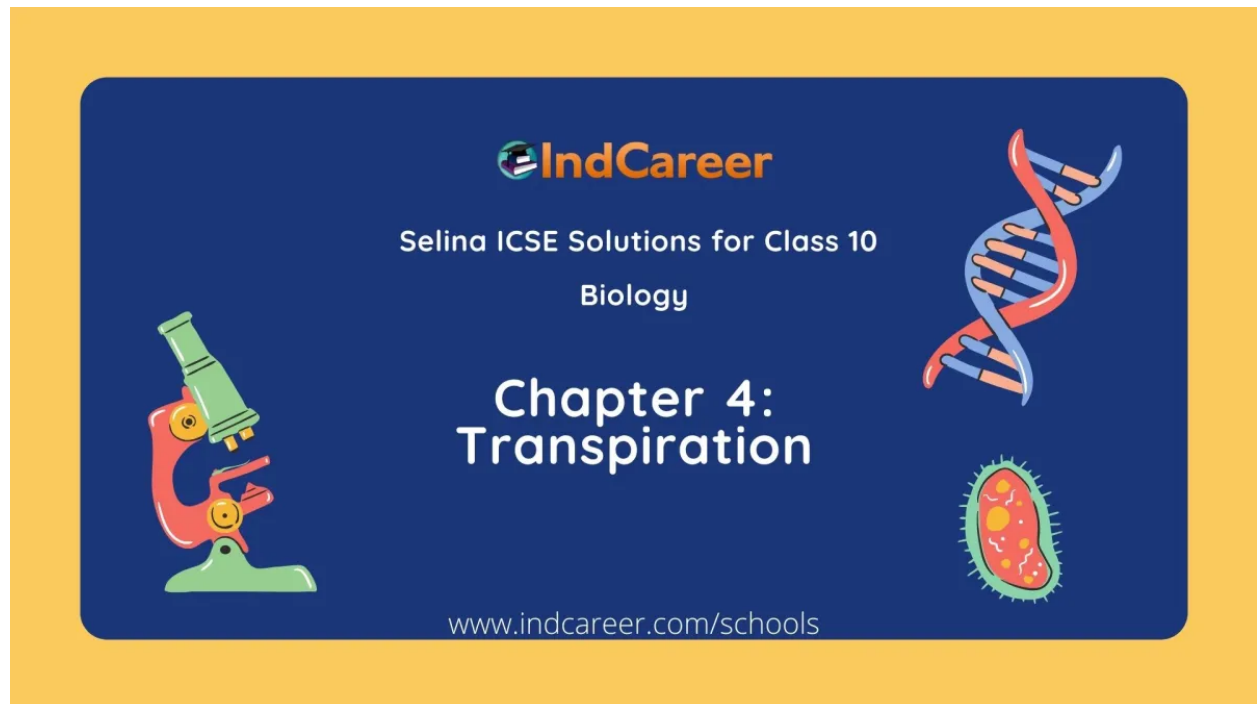


Selina Class 10 ICSE Solutions Biology :

Chapter 4- Transpiration



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Chapter 4- Transpiration

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Selina 10th Biology Chapter 4, Class 10 Biology Chapter 4 solutions

Exercise 2

Solution A.1.

(a) Open stomata, dry atmosphere and moist soil

Solution A.2.

(a) increase

Solution A.3.

(b) temperature is high

Solution A.4.

(c) sunken stomata

Solution A.5.

(d) hydathodes

Solution A.6.

(d) transpiration

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Solution A.7.

(d) hot, dry and windy

Solution A.8.

(b) Lenticels

Solution A.9.

(b) evaporation of water from the aerial surfaces of a plant

Solution B.1.

(a) Lenticels

(b) Guttation

(c) Potometer

(d) Nerium

(e) Ganong's photometer

(f) Stomata and cuticle

(g) Hydathodes

(h) Guttation

Solution B.2.

(a) vapour, aerial

(b) stomata, transpiration

(c) suction, water (heat)

Solution C.1.

(a) guttation

(b) protection and reduced transpiration

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- (c) transpiration
- (d) reduced transpiration

Solution C.2.

- (i) False
- (ii) True
- (iii) True
- (iv) False
- (v) Most transpiration occurs at mid-day.
- (vi) Potometer is an instrument used for measuring the rate of transpiration in green plants.

Solution C.3.

- (a) Transpiration increases with the velocity of wind. If the wind blows faster, the water vapours released during transpiration are removed faster and the area surrounding the transpiring leaf does not get saturated with water vapour.
- (b) When the rate of transpiration far exceeds the rate of absorption of water by roots, the cells lose their turgidity. Hence, excessive transpiration results in wilting of the leaves.
- (c) Plants absorb water continuously through their roots, which is then conducted upwards to all the aerial parts of the plant, including the leaves. Only a small quantity of this water i.e. about 0.02% is used for the photosynthesis and other activities. The rest of the water is transpired as water vapour. Hence water transpired is the water absorbed.
- (d) There are more stomatal openings on the lower surface of a dorsiventral leaf. More the number of stomata, higher is the rate of transpiration. Hence more transpiration occurs from the lower surface.
- (e) Cork and Bark of trees are tissues of old woody stems. Bark is thick with outermost layer made of dead cells and the cork is hydrophobic in nature. These properties make them water-proof and hence they prevent transpiration.

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(f) In both perspiration and transpiration, water is lost by evaporation from the body of the organism as water vapour. This evaporation reduces the temperature of the body surface and brings about cooling in the body of the organism.

(g) On a bright sunny day, the rate of transpiration is much higher than any other days. The leaves of certain plants roll up on a bright sunny day to reduce the exposed surface and thus reduce the rate of transpiration.

Solution C.4.

(a) False

Reason: Potometer is used to measure the rate of transpiration in a plant. Demonstration of transpiration occurring from the lower surface of a leaf is done by analyzing the changes in colour of pieces of dry cobalt chloride paper attached (and held in place) to the two surfaces of a leaf.

(b) True

Reason: Transpiration carried out by the large number of trees in a forest. This increases the moisture in the atmosphere and brings rain.

(c) False

Reason: Hydathodes are special pores present on the ends of leaf veins through which guttation occurs and water droplets are given out. Their openings cannot be regulated. Stomata on the other hand are minute openings in the epidermal layer of leaves through which exchange of gases as well as transpiration occurs. Water is given out as water vapour. Stomatal opening is regulated by guard cells.

(d) False

Reason: Transpiration is reduced during high atmospheric humidity. High humidity in the air reduces the rate of outward diffusion of the internal water vapour across stomata, thereby reducing the rate of transpiration.

(e) True

Reason: Desert plants need to reduce transpiration as much as possible so as to survive in the hot and dry environment. Hence some of them have sunken stomata as an adaptation to curtail transpiration.

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(f) True

Reason: During the day, the stomata are open to facilitate the inward diffusion of carbon dioxide for photosynthesis. During mid-day, the outside temperature is higher, due to which there is more evaporation of water from the leaves. Therefore more transpiration occurs during mid-day.

Solution C.5.

Guttation

It is the removal of excess of water from the plants because of excess water buildup in the plant.

Water escapes from specialised structures called hydathodes.

Bleeding

It is the removal of water from the plant because of injury.

Water escapes in the form of sap from the injured part of the plant.

Solution D.1.

Wilting refers to the loss of cellular turgidity in plants which results in the drooping of leaves or plant as a whole because of lack of water.

During noon the rate of transpiration exceeds the rate of absorption of water by roots. Due to the excessive transpiration, the cells of leaves lose their turgidity and wilt.

Solution D.2.

The lower surface of leaf is sheltered from direct sunlight. If more stomata are on the upper surface of a leaf, then excessive transpiration would occur, resulting in quick wilting of the plant. Hence most plants have more numerous stomata on the lower surface of a leaf to control the rate of transpiration.

Solution D.3.

Take the small potted rose plant and cover it with a transparent polythene bag. Tie its mouth around the base of the stem. Leave the plant in sunlight for an hour or two.

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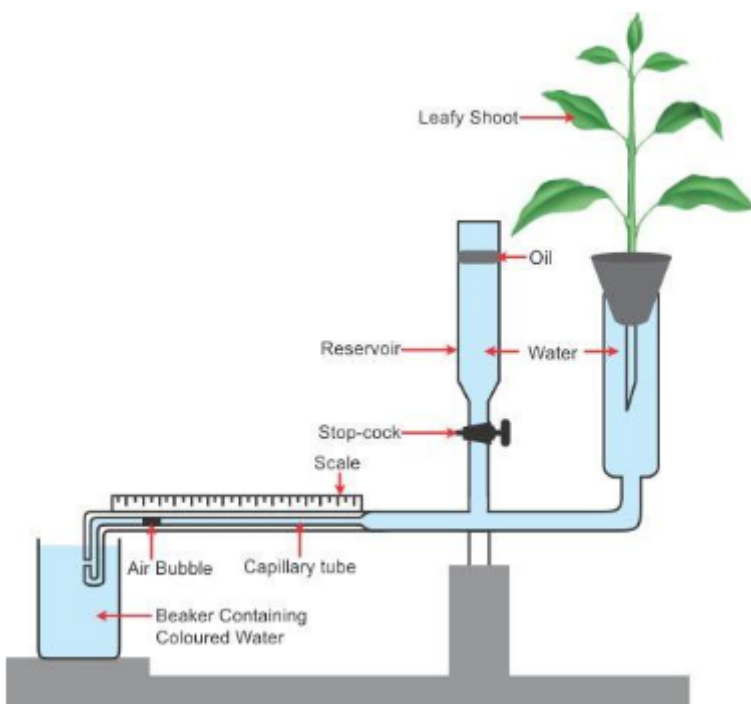


Drops of water will soon appear on the inner side of the bag due to the saturation of water vapour given out by the leaves. A similar empty polythene bag with its mouth tied and kept in sunlight will show no drops of water. This is the control to show that plants transpire water in the form of water. If tested with dry cobalt chloride paper, the drops will be confirmed as water only.

Solution D.4.

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Potometer is a device that measures the rate of water intake by a plant. This water intake is almost equal to the water lost through transpiration. Potometers do not measure the water lost due to transpiration but measure the water uptake by the shoot.

Solution D.5.

- Transpiration occurring through lenticels i.e. minute openings on the surface of old stems is called lenticular transpiration.
- Stomatal transpiration is controlled by the plant by altering the size of the stoma, whereas this does not happen in case of lenticular transpiration. This is because the lenticels never close, but remain open all the time.
- The amount of stomatal transpiration is much more than the amount of lenticular transpiration.

Solution D.6.

The factors that accelerate the rate of transpiration are:

- High intensity of sunlight
- High temperature
- Higher wind velocity

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- Decrease in atmospheric pressure
(Any three)

Solution D.7.

Forests have large number of plants especially trees. Each plant loses water in the form of water vapour everyday into the atmosphere through transpiration. A large apple tree loses as much as 30 litres of water per day. So huge amount of water is escaped into the atmosphere by forests. This increases the moisture in the atmosphere and brings more frequent rains.

Solution D.8.

The advantages of transpiration to the plants are:

- Transpiration brings about a cooling effect to the plant body since evaporation of water reduces the temperature of leaf surface.
- Transpiration helps in the ascent of sap by producing a suction force acting from the top of the plant.
- Transpiration helps in distributing water and mineral salts throughout the plant body.
- Transpiration helps in eliminating excess water.

Solution D.9.

1. If the water content of the leaves decreases due any reason, the guard cells turn flaccid, thereby closing the stomatal opening and transpiration stops.
2. Some plants have sunken stomata whereas others have reduced number of stomata to reduce transpiration.
3. In some plants, leaves may be dropped or may be absent or changed into spines as an adaptation to reduce transpiration.
4. The leaves may be covered by thick cuticle such as in Banyan tree, so as to reduce transpiration.

Solution D.10.

No, they are not dew drops.

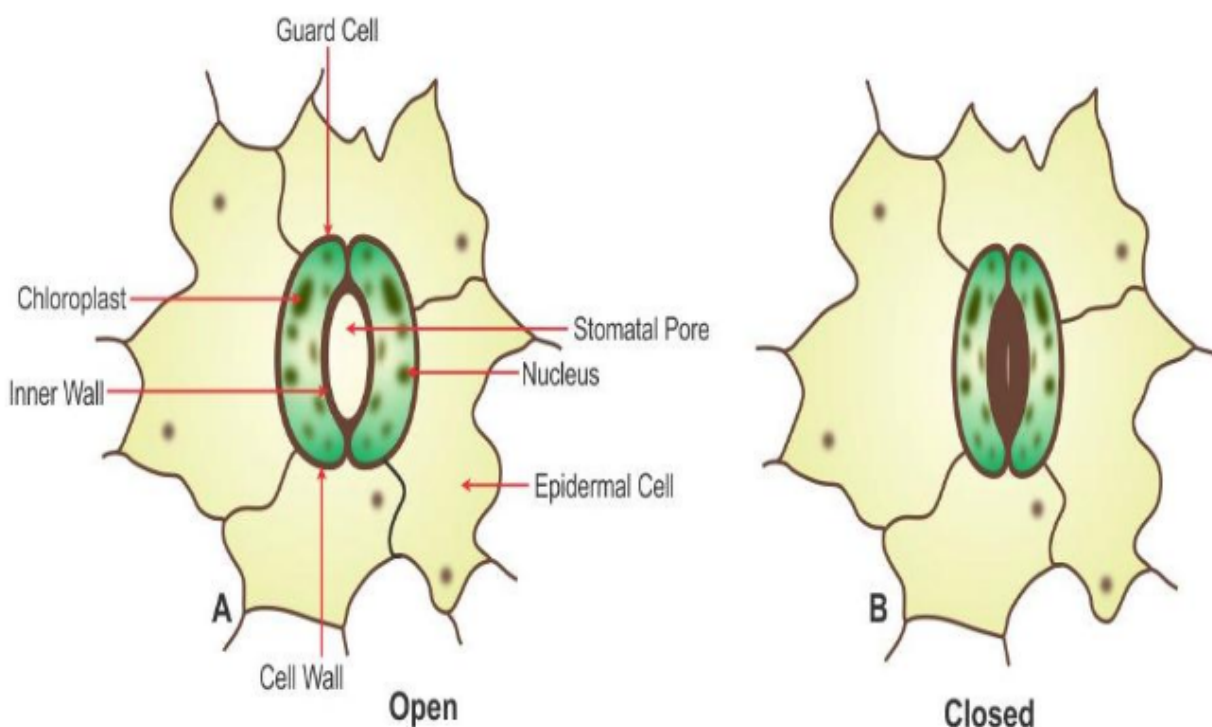
This is water given out by the plant body through guttation. Since the banana plant is growing in humid environment, transpiration is hampered. But the roots continue to absorb water from the soil. This builds up a huge hydrostatic pressure within the plant and forces out the excess water from the hydathodes, which are pores present at the tips of veins in the leaf. This is observed especially during the mornings.

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Solution D.11.

(a) Intensity of light – During the day, the stomata are open to facilitate the inward diffusion of carbon dioxide for photosynthesis. At night they are closed. Hence more transpiration occurs during the day. During cloudy days, the stomata are partially closed and the transpiration is reduced.



(b) Humidity of the atmosphere – When the air is humid; it can receive very less water vapour. Thus, high humidity in the air reduces the rate of outward diffusion of the internal water vapour across stomata, thereby reducing the rate of transpiration.

Solution E.1.

(i) The leaf D would become most limp. This is because water would be lost through transpiration from upper as well as the lower surface of leaf D since it is uncoated.

(ii) The least limping would be shown by leaf C since its upper and lower surfaces have been coated with vaseline. So no water is lost from the leaf through transpiration since the stomatal openings get blocked by vaseline.

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Solution E.2.

(a)

Guard Cell

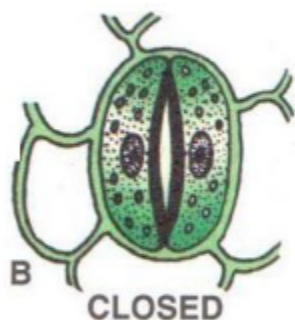
Inner wall of the Guard Cell

Stoma/Stomatal Aperture

(b) Open state

(c) The structure of stoma remains same in monocots as well as in dicots. Hence, the stoma from the diagram can be of a monocot leaf or of a dicot leaf.

(d)



B – Guard cells flaccid, the stoma closes.

Solution E.3.

(a) Transpiration

(b) Oil is put on the surface of water to prevent loss of water by evaporation.

(c) Yes, the transpiration rate will increase. Transpiration would occur faster. The observable changes will occur in less time.

(d) The spring balance progressively measures the change in weight of the set-up. This because as the plant transpires, it creates the suction force in plant which allows roots to absorb

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more water from the test tube. Hence, the water in the test will get reduced. Thus, the weight of the entire set will decrease.



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