## 1. Comparative study of rates of transpiration in the upper and lower surfaces of leaf, using four-leaf experiment.

Date : / /

**Loss of excess water in the form of vapour through the aerial parts of the plant is called transpiration.**

**Aim :- To study comparative rate of transpiration in upper and lower surfaces of leaf by conducting four leaf experiment.**

**Requirements :-** Two stands, thread, four leaves of *Calotropis*/ banyan tree, Vaseline (petroleum jelly), etc.

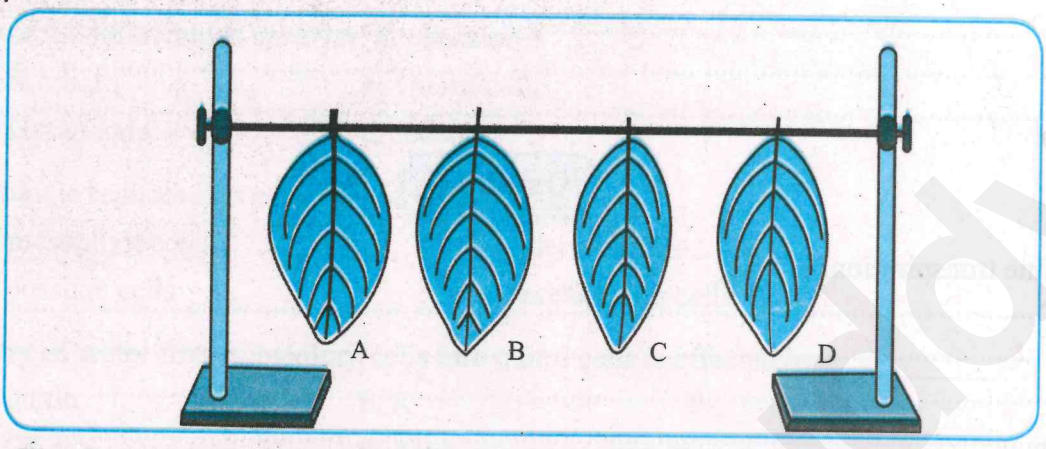



**Fig. Comparison of transpiration, demonstration by four leaf experiment**

**Figure:-**

**Procedure:-**

The leaves selected should be healthy preferably of same size and showing same stage of growth. Tie the different leaves of the same plant with thread in such a way that they will be equidistant and surfaces will be properly exposed to the sunlight.

Tie the thread to the stand at both ends.

Apply Vaseline to leaf surface in the following manner,

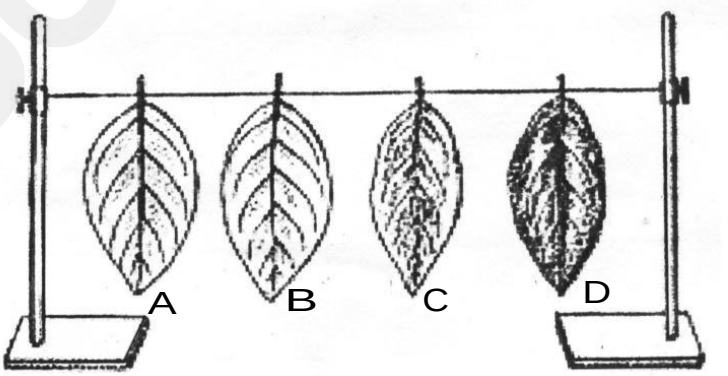
1. Leaf A: - Petroleum jelly is applied on both the surfaces
2. Leaf B: - Petroleum jelly is applied on lower surface only
3. Leaf C: - Petroleum jelly is applied on the upper surface only
4. Leaf D: - Petroleum jelly is not applied

**Observe the order of drying of these leaves, 2-3 days after setting of the apparatus and then prepare observation table.**

**Observation table:-**

| Sr. no. | Type of leaf | Observation |
|---|---|---|
| 1 | Leaf A | It looks fresh and green |
| 2 | Leaf B | It looks less fresh and green |
| 3 | Leaf C | It looks partially shrivelled/wilted It wilts completely |
| 4 | Leaf D | It wilts completely |

**Sketch and complete the diagram for the order drying of leaves.**




**Conclution :-**

(1)Leaf A looks fresh, turgid and green as there is notranspiration from any ofthe 2 surfaces.
(2)Leaf B also remains fresh, turgid and green as there are more stomata on thelower epidermis to which veseline is applied. Negligible transpiration occurs along the upper surface having less number of stomata.
(3)Leaf C is partially wilted as it loses a significant amount of water by transpiration along the lower epidermis.
(4)Leaf D transpires freely losing large amount of water and hence shows complete wilting. Thus leaves lose maximum water by transpiration along their lower surface (due to more number of stomata) than that along the upper surface(less number of stomata)

## Questions

1. Define transpiration.

The loss of water in the form of vapour through aerial parts of the plant is called transpiration.

2. What is stomata ?

Stomata are minute, elliptical apertures located in the epidermis of young stems and leaves.

3. Enlist different types of transpiration.

The three types of transpiration are -(i)Cuticular transpiration (8-10%)
(ii)Lenticular transpiration (0.1-1%)
(iii)Stomatal transpiration (90-93%)

4. How lenticels are different from typical stomata ?

Lenticel is a porous tissue consisting of loosely arranged cells. Lenticels are present in the periderm of secondary thickened organs and bark of woody stems of dicotyledonous plants. Lenticels are absent in leaves.Stomata are tiny apertures in the epidermis of leaves and yound stems.

5. Explain guttation.

(i)The loss of water in liquid form is called guttation.
(ii)Guttation occurs through hydathodes or water stomata.
(iii)Hydathodes are located along the leaf margins at the vein endings.

## Multiple Choice Questions

1. Maximum loss of water in form of water vapours takes place through _____

a. hydathode b. stomata
c. cuticle d. leticel

2. Which of the following is involved in guttation ?

a. Stomata b. Guard cell
c. Hydathode d. leticel

3. Thick cuticle reduces loss of water through _____

a. mesophyll cells b. epidermal cells
c. passage cells d. sclerenchyma cells

4. The entry of water from subsidiary cells into guard cells is effected by _____

a. auxin b. $K^+$
c. $Cl^-$ d. ABA

5. Loss of excess water in the form of liquid, occurring along the margins of leaves of certain plants is knowns as _____

a. transpiration b. respiration
c. guttation d. photosynthesis

6. Stoma widens when the guard cells become _____

a. flaccid b. rigid
c. cupid d. turgid

*Remark and Signature of Teacher* .....