TRANSPIRATION

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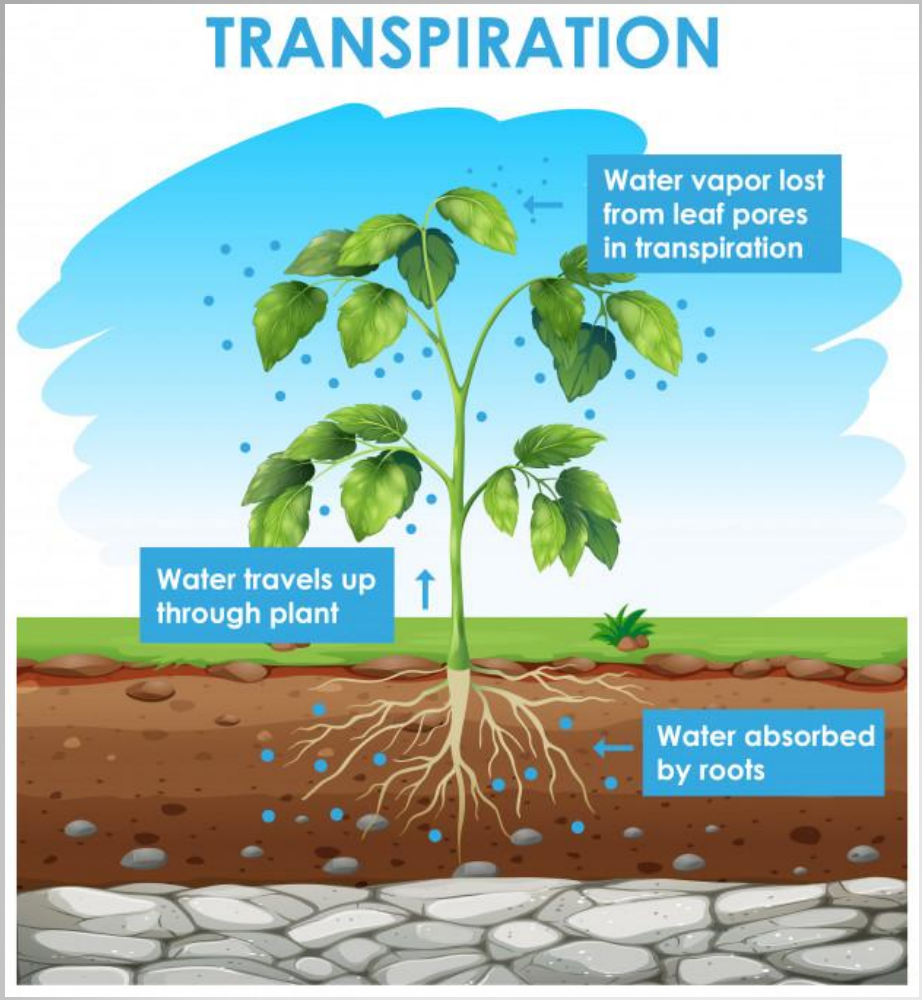


What is it?

The loss of water in the vapour form from the exposed parts of a plant is called transpiration. The loss of water due to **transpiration** is quite high.

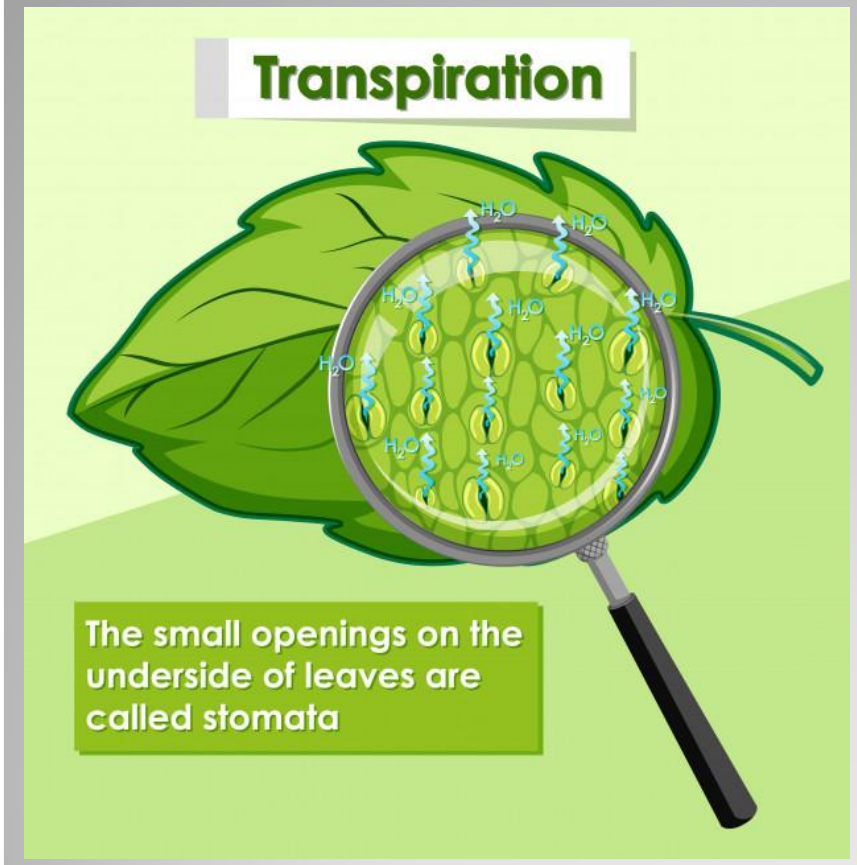
Rather 98-99% of the water absorbed by a plant is lost in transpiration. Hardly 0.2% is used in photosynthesis while the remaining is retained in the plant during growth.

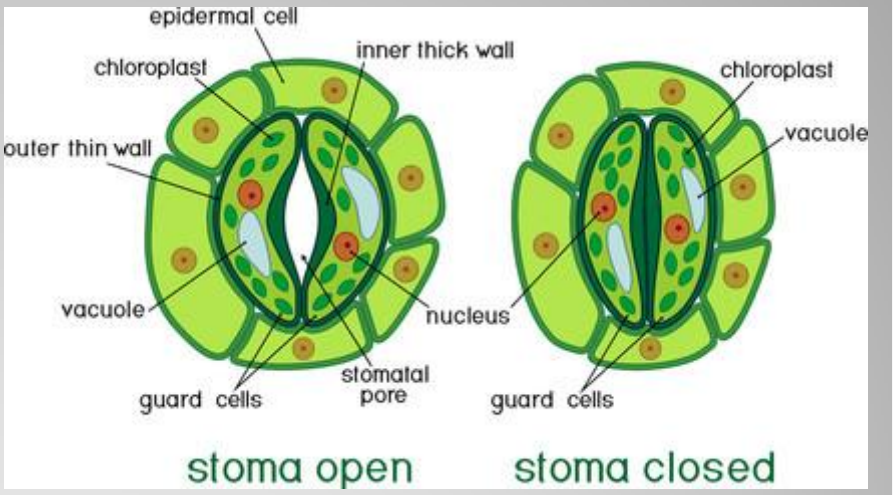
Most of the transpiration occurs through foliar surface or surface of the leaves. It is known as foliar transpiration. Foliar transpiration accounts for over 90% of the total transpiration.

Transpiration occurs through young or mature stem is called as Cauline transpiration.

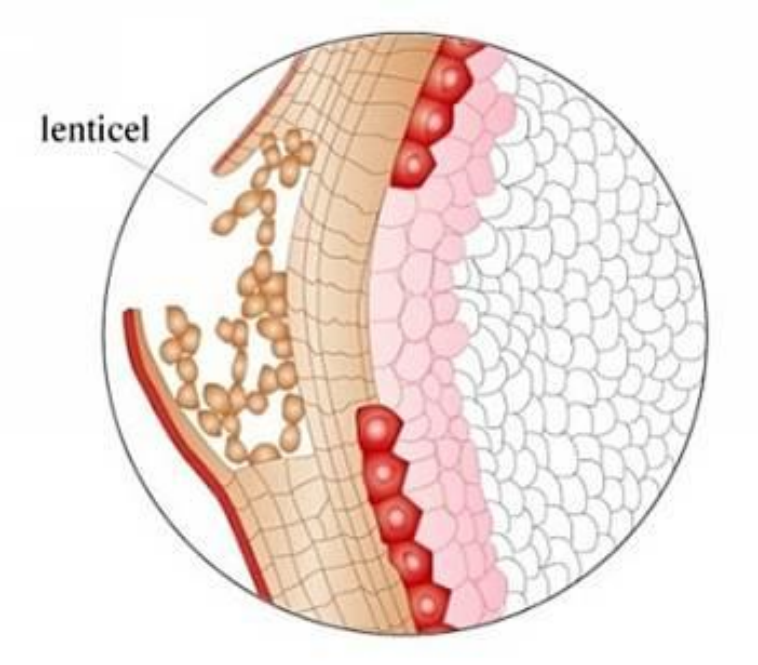
Depending upon the plant surface, transpiration is classified into three types:

Stomatal Transpiration	• Water vapour diffuses out through minute pore (stomata) present in soft aerial part of plant is known as Stomatal Transpiration
Lenticular Transpiration	• Sometimes water may evaporate through certain other openings present on the older stems. These openings are called Lenticels and the transpiration that takes place through term is known as Lenticular Transpiration.
Cuticular Transpiration	• Loss of water may also take place through cuticle, but the amount so lost is relatively small • This type of transpiration depends upon the thickness of the cuticle and presence or absence of wax coating on the surface of the leaves.

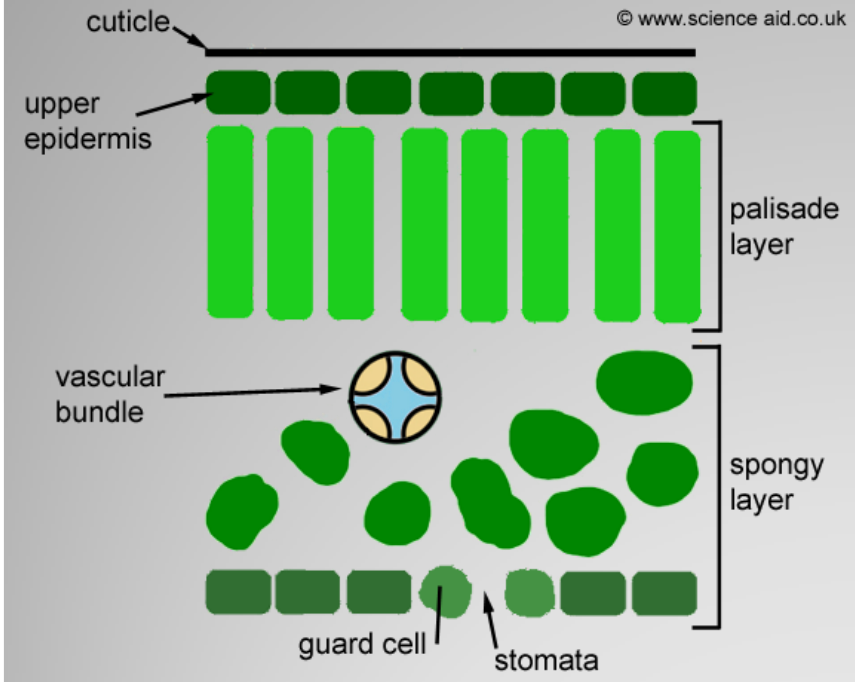




Stomatal Transpiration



Lenticular Transpiration



Cuticular Transpiration

Factors Affecting Transpiration:

Water Stress: Whenever the rate of transpiration exceeds the rate of absorption, a water deficit is created in the plants and results in the incipient wilting of leaves. The development of internal water deficit in a plant causes Ψ gradient between the guard cells and the mesophyll and epidermal cells surrounding the cells.

Carbon Dioxide: Stomatal mechanism is sensitive to carbon dioxide concentration. Stomata close in the presence of high concentrations of CO_2.

Oxygen: This gas is essential for the opening of stomata. Its deficiency quickens stomatal closure.

Hormones: ABA causes stomatal closure whereas cytokinins are essential for the intake of K^+. Moreover, ABA works only in the presence of CO_2.

Light: Generally, stomata open when exposed to illumination and close in the dark. In majority of the cases, blue light absorbed by a special pigment system, affects opening.

Temperature: When all other factors are equal, stomatal opening increases with rise in temperature up to 25°- 30°C and decreases at still higher temperatures.
In most species stomata fail to open at or near 0°C. In some species high temperatures of about 40°C cause stomatal opening instead of closing even in the dark.

Mineral deficiencies: With the deficiency of any of minerals such as, nitrogen, phosphorus and potassium, the stomatal movements become sluggish. Different ions affect the stomatal aperture differently.

Wind: Stomata close when the leaf is exposed to high wind velocities. This may be due to the loss of water by the guard cells during transpiration or the effect may be indirect through leaf temperature.

Mechanical shock: Various types of shocks, such as rough handling of leaves may result in stomatal closure. It is found that stomata may close in light when nearby tissue is wounded.

Significance:

I. Transport of minerals
II. Lowering of leaf temperature
III. Optimum turgidity
IV. Bringing water to the top of a plant

Disadvantages

The conclusive fact about transpiration is that it is harmful. It is loss of one of the essential components of life and one of the substrates of most important process for the plant life- photosynthesis. It may be added that the existence of transpiration in plants may not be taken to mean that it is useful to the plant body.

For photosynthesis wet cell walls and open stomata are essential and these involve transpiration. This is accomplished through diffusion. The danger is when the amount of diffused water exceeds the amount entering the roots, the wilting may be caused and this results in lowering the yield or even the death of a plant.

Make Notes.

Focus on the concept.

Be thorough with diagrams.

Ask questions.

Find answers.

Thank You!