Quadrant II – Transcript and Related Materials

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Notes

Transpiration: The excess of water is lost from the aerial parts of plants in the form of water vapours.

The speed at which a plant loses water is called the **rate of transpiration**.

Types of Factors Affecting Rate of Transpiration

A. EXTERNAL FACTORS

B. INTERNAL FACTORS

FACTORS AFFECTING RATE OF TRANSPIRATION

A. EXTERNAL FACTORS

1. **Atmospheric Humidity**
   - In humid atmosphere (when the Relative Humidity is high) the rate of transpiration decreases. It is because the atmosphere is more saturated with moisture and retards the diffusion of water vapours from the intercellular spaces of the leaves to the outer atmosphere through stomata.

- In dry atmosphere the relative humidity is low and the air not saturated with moisture and hence, the rate of transpiration increases.
- (Actual amount of moisture content present in the air is the absolute humidity. When it is expressed as a percentage of the total amount of moisture necessary to saturate the air at a particular temperature it is called as Relative Humidity).

2. Temperature

- An increase in temperature brings about an increase in the rate of transpiration by
  (i) Lowering the relative humidity, and (ii) Opening the stomata widely.

3. Wind

- When the wind is stagnant (i.e., not blowing) the rate of transpiration remains normal.
- When the wind is blowing gently the rate of transpiration increases because it removes moisture from the vicinity of the transpiring parts of the plant, thus facilitating the diffusion of Water vapours from the intercellular spaces of the leaves to the outer atmosphere through stomata.
- When the wind is blowing violently the rate of transpiration is decreased because it creates hindrance in the outward diffusion of water vapours from the transpiring parts and it may also close the stomata.

4. Atmospheric Pressure

- Ultimate effect of atmospheric pressure on the rate of transpiration is nil. The positive effect of low atmospheric pressure (e.g., at hills) is neutralised by the low temperature associated with it.
- Similarly, the negative effect of high atm. pressure in plains on the rate of transpiration is neutralised by comparatively higher temperature of the plains.

5. Light

- Light increases the rate of transpiration because: (i) in light stomata open, and (ii) it increases the temperature.
- In dark due to the closure of the stomata, the stomatal transpiration is almost stopped.

6. Available Soil Water

- Rate of transpiration will decrease if there is not enough water in the soil in such from which can be easily absorbed by the roots

7. CO_2

- An increase in CO_2, concentration in the atmosphere (over the usual conc.) more so inside the leaf, leads towards stomatal closure and hence, it retards transpiration.

B. INTERNAL FACTORS

1. Internal Water Condition

- It is very essential for transpiration. Deficiency of water in the plants will result in decrease of transpiration rate. Increased rates of transpiration continuing for longer periods it create internal water deficit in plants because absorption of water does not keep pace with it.

2. Structural Features

(a) Leaf orientation

- Solar radiations cause more heating when the flat surface of the leaf lies perpendicular to the incident light.
- The effect is minimum when it lies parallel to it as found in compass paints *Lactuca*.
- Leaves of Eucalyptus hang downwardly to avoid overheating during the hot periods of the day.

(b) Leaf size and shape

- With the decrease in the leaf size the rate of transpiration decreases. It is very little in needle shaped leaves
- Greater the leaf area greater will be the magnitude of transpiration.

(c) Leaf structure

- Leaf structure determines the rate of transpiration in three ways.
  (1) Thickness of cuticle
  (2) Number, density and thickening of the epidermal hairs.

(3) The ratio of internal exposed surface area to the external exposed surface area of the leaf. Cuticular transpiration depends on the degree of its thickness. The epidermal hairs increase the thickness of the adherent stationary air. They reduce the rate of transpiration. If more of the leaf cells are exposed to the intercellular spaces the internal air of the leaf will tend to become saturated rapidly losing more water in transpiration.

(d) Stomata

- The number, size, position and the movement of stomata affect rate of transpiration. The periodicity of the opening. Rate of transpiration in is little in xerophytes because their stomata remain open during the night and closed during the day.
- Sunken stomata reduce the rate of transpiration. When they are situated in grooves and sometimes protected by hairs, the rate of transpiration is further decreases

(e) Leaf modifications

- Like spines, thorns and scales show reduced rate of transpiration.

(f) Water content of the leaves

- Optimum transpiration continues only when the leaves have sufficient moisture.
- Low water content of the leaf generally brings down the rate of transpiration by decreasing water vapour pressure inside the leaf and closure of the stomata.

(g) Diseases

- The rate of transpiration is generally higher in the diseased plants as compared to healthy ones.