

Botany - Paper VI

Section I - "Plant Biochemistry and Stress Physiology"

Unit 03 – Stress Physiology

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Plant Stress

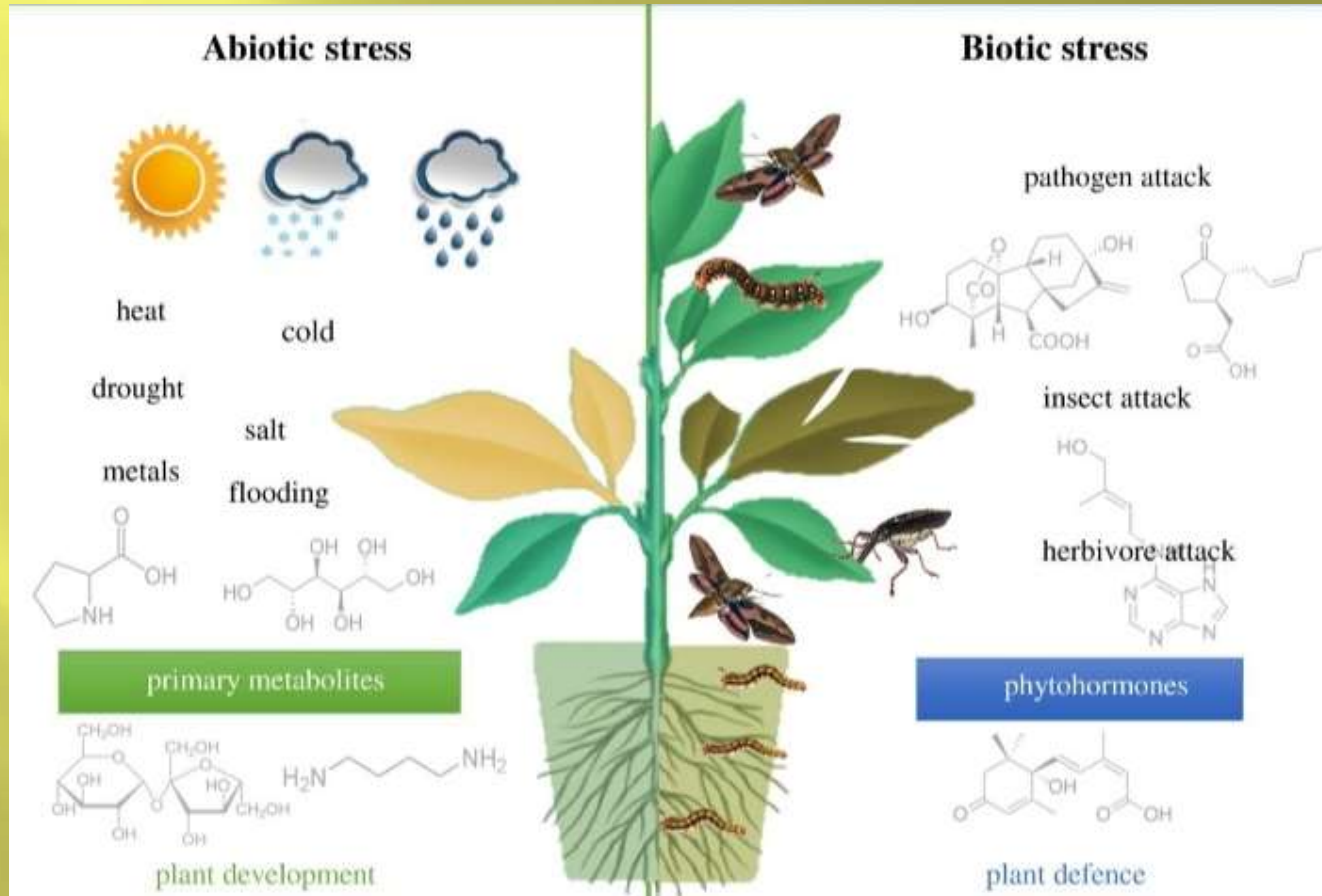
- In both natural and agricultural conditions plants are frequently exposed to environmental stresses.
- All other living organisms, plants are also frequently subjected to various environmental stresses such as water deficit and drought, cold, heat, salinity and air, pollution etc.
- Stress in plants refers to external conditions that adversely affect growth, development or productivity of plants.

- Stresses trigger a wide range of plant responses like altered gene expression, cellular metabolism, changes in growth rates, crop yields etc.
- According to Jacob Levitt (1972) - The study of functioning of plants under adverse environmental conditions is called stress physiology.
- A common sign for plant stressed is it's dropping leaves and flowers.
- Stressors can include lack of water, over watering, temperature change, less light.

Stress terminology

- Any environmental factor potentially unfavorable to plant is called as stress.
- The effect of stress on plant condition is called as strain.
- Stress is the action and strain is the reaction.
- A body of a plant subjected to stress is in a state of strain.

Basically there are two types of stresses Abiotic and Biotic stress.



Types of Stress

Abiotic Stresses

- Temperature (high/low)
- Water (high/low)
- Salt
- Radiation

Biotic Stresses

- Fungi
- Bacteria
- Insects
- Herbivores

Plant Stress

- Plants can respond to stress in several ways. Plants may escape the effects of stress by completing their growth during less stressful periods or they may suffer injury if the stress is present and they cannot cope.
- Stress resistant plants can tolerate a particular stress. Many plants have the capacity to resist stress through either stress avoidance or stress tolerance.

- **Stress resistance** - Ability of the plants to survive under adverse environmental condition is termed as stress resistance.

- The stress resistance of biological organisms or plant is of two main types.

1. Elastic Biological strain

2. Plastic Biological strain

- Biological strain is the reduced or changed function of the plant in response to stress.

- **Elastic Biological Strain**

Elastic biological strains are those changes in plant function that return to optimum level when environmental conditions are again normal (i.e. when stress is removed).

- Elastic Biological Strain e.g. -

Reduced photosynthesis in response to low light which return to normal rate with increase in light levels.

2. Plastic Biological Strain

A plastic body is unable to return to its original size and shape even on removal of the deforming force.

e.g. – Water deficit, Drought force, Heat, Salinity etc.

- **Stress Tolerance** - Tolerance differs from avoidance. In avoidance the plant responds by reducing the impact of environmental stress.

e.g. - Plants which are grown in desert they avoid dry soil by penetrating its root deep into the water table, so the plant just tolerate the adverse condition.

e.g. - Another example *Larrea tridentata* is draught tolerant so it can withstand in extreme dehydration of its protoplasm and survives, even when it dries out.



Larrea tridentata

- Stress plays a major role in determining how soil and climate limit the distribution of plant species.
