



Environmental Optima (favourable conditions) for crop Growth & Development

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Environmental Factors

Environmental factors which effects crop growth and development includes

- ❖ Precipitation
- ❖ Light
- ❖ Temperature
- ❖ Relative humidity
- ❖ Wind
- ❖ Air



water



- **Rainfall** is the most common form of **precipitation**.
- **Rainfall** is the falling of water in droplets on the surface of the Earth from clouds
- Water comprises about 70-90% of the plant body
- About 1 percent or less water is used in the various biochemical processes.
- Water participates directly or indirectly in all metabolic processes



Cont...

- It is a chemical reactant in photosynthesis hence vital to life
 - It is responsible for cooling of plants through the process of Transpiration
 - Serves as a growth medium in hydroponics
 - It serves as a transport medium for mineral nutrients from the soil, as well as in the translocation of organic substances within the plant
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Light



- The visible portion of the solar radiation or electromagnetic spectrum
- It is a form of kinetic energy that comes from the sun in tiny particles called **quanta or photons**, travelling in waves.
- Three properties of this climatic factor that affect plant growth and development are light quality, light intensity, and day length
- **Light quality** refers to the specific wavelengths of light
- **light intensity** is the degree of brightness that a plant receives
- **Daylength** is the duration of the day with respect to the night period



Cont...

- It is essential in the production of chlorophyll and in the process of photosynthesis
- Plant processes that are enhanced or inhibited by light are
 - Stomatal conductance
 - Phototropism
 - Translocation,
 - Mineral absorption
 - Abscission



Temperature

- The degree of hotness or coldness of a substance is called temperature
 - Plants survive within a temperature range of 0 to 50 C
 - Enzyme activity and the rate of most chemical reactions generally increase with rise in temperature
 - Doubling of enzymatic reaction with every 10 C temperature increase
 - But at excessively high temperatures, denaturation of enzymes and other proteins occur.
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Cont...

- Excessively low temperatures can also cause limiting effects on plant growth and development
- Below the freezing point of water as it solidifies in living cells causes the rupture of the cell walls
- Three temperature categories
 - **Cool:** 15.55-21.11 C (day), 10-12.77 C (night)
 - **intermediate:** 21.11-26.66 C (day), 12.77-18.33 C (night)
 - **warm:** 26.66-32.22 C (day), 18.33-21.11 C (night).



Cont...

- ▶ Temperature influences all plant growth processes such as
 - Photosynthesis
 - Respiration,
 - Transpiration,
 - Breaking of seed dormancy
 - Seed germination,
 - Protein synthesis
 - Translocation



Relative humidity

- The amount of water vapor in the air, expressed as the proportion (in percent) of the maximum amount of water vapor it can hold at certain temperature.
- Water vapor in the air ranges from 0.01% by volume to 5%
- Warm air has the capacity to hold more water vapor than cold air
- Almost one-half reduction in the amount of water vapor that the air can hold for every 10 C drop in temperature



Cont...

- ▶ The relative humidity affects the
 - Opening and closing of the stomata which regulates loss of water from the plant through transpiration as well as photosynthesis.
 - Newly collected plant cuttings and bare root seedlings are protected against desiccation by enclosing them in a sealed plastic bag.
 - The propagation chamber and plastic tent are also commonly used in propagating stems and leaf cuttings to ensure a condition with high relative humidity.



Wind

- ▶ Air movement or **wind** is due to the existence of pressure gradient on a global or local scale caused by differences in heating.
- ▶ Air that is close to the ground cools, it contracts and the pressure rises
- ▶ when it warms, it expands and loses pressure.



Cont...

- It serves as a vector of pollen from one flower to another
 - Essential in the development of fruit and seed from wind-pollinated flowers as in many grasses
 - Moderate winds favor gas exchanges, but strong winds can cause excessive water loss
 - Closure of the stomata may ensure which will restrict the diffusion of carbon dioxide into the leaves.
 - As a result, there will be a decrease in the rate of photosynthesis, growth and yield
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Thank you !