

Climatic Requirements of Crops

Crop	Climate Type	Temperature (°C)						Moisture (cm)	Radiation (Mj/m ²)
		Germi nation	Vegetativ e growth	Tillering/b ranching	Flowerin g	Seed formatio n	Maturit y		
Rice	Sub-Trop	20-35	31	25-31	30-32		20-25	125	
Wheat	Temperate	15-20					25	50-60	
Maize	Humid	32-35	24					41-64	
Soybean	Humid	30			25-27	26-30		65	
Cotton	Sub-Trop	25-30	21-29		27-32	27-32		50-65	8-9 hrs
Sugarcane	Sub-Trop	30	35					125-165	
Groundnut	Tropical	20-25				23 Soil Temp		60	
Sorghum	Sub-humid/Semi-arid	32-35	26-29					28-35	

AgroMet Observations

- 1) Solar radiation
- 2) Air Temperature
- 3) Soil temperature
- 4) Atmospheric Pressure
- 5) Wind
- 6) Humidity
- 7) Precipitation
- 8) Moisture status in field
- 9) Evaporation and Transpiration
- 10) Cloudiness
- 11) Leaf Wetness Duration
- 12) Dew point temperature

Importance

Solar radiation: Solar radiation is the primary source of energy which supports all lives on the earth. Crop production is an exploitation of solar radiation. The shorter than visible wavelength in the solar spectrum is harmful to the plants when exposed to excessive amounts. The ultra violet radiation of this segment reaching the earth is very low and is normally tolerated by plants. The infra red radiation has thermal effect on plants by supplying necessary energy for evaporation of water from the plants. The visible solar radiation is referred as light which is essential for photosynthesis of plants. UV radiation has detrimental effects on harmful pathogens and can be used as solarization.

Soil Temperature: In many instances soil temperature is of greater importance to plant life than air temperature. For example beech and oak trees can withstand air temperature of -25°C but roots of these trees cannot tolerate even upto -16°C . It influences the germination of seeds and root activities. It influences the soil borne diseases like seedling blight, root rot, etc. and decomposition of organic matter. Greater the soil temperature higher will be the decomposition of organic matter. It controls the nutrient availability. In the tropics high temperature of soil causes degeneration of potato tubers. It affects nodulation in legumes. It also control the respiration from roots.

Importance

Relative humidity: RH is associated with moisture content of air. As the atmospheric humidity increases the evapotranspiration decreases. This phenomenon increases the heat load of the leaves, because not much of heat energy is used under reduced transpiration. As such, the leaves suffer from excessive heat and closure of stomata, the entry of CO_2 is reduced. Reduction in transpiration reduces the translocation of food materials and also uptake of nutrients. A moderately high 60-80% R.H. is conducive for growth and development of plants. A very high R.H. is beneficial to maize, sorghum, sugarcane, etc. while it is harmful to crops like sunflower and tobacco. The relative humidity influences the water requirement of crops through its effect on evapotranspiration. For almost all the crops it is always safe to have a moderate R.H. of above 40%.

Rainfall: Crops depend on rainfall for their moisture need. There are rivers, tanks and wells which supply irrigation water as a supplementary to rainfall. These sources also dependent on the water supply from rains. Deficient rains limits crops growth and heavy rains are even more harmful for crops. They induce soil erosion and leaching of nutrients. Occurrence of drought and famines are mainly due to inadequate rainfall over a continuous period of time. Rainfall is also responsible for lowering temperature.

Importance

Air Temperature: Air temperature is the most important weather parameter which affects plant life. The growth of higher plants is restricted to a temperature between 0 to 60°C and the optimum is 10 to 40°C. Beyond these limits, plants are damaged severely and even get killed. The maximum production of dry matter occurs when the temperature ranges from 20 and 30°C. High night temperature favours growth of shoots and leaves and also it affects plant metabolism. Most of the plants are injured when the night temperature is low. Tender leaves and flowers are very sensitive to low temperature and frost.

Every plant has its own maximum, optimum and minimum temperature limits for its normal growth and reproduction. The vital physiological activities of a plant stop below a minimum level, similarly at a maximum level. On the other hand at the optimum levels of temperature maximum plant responses are observed. The development of plant is dependent on heat units, which is in fact expression of temperature.

Importance

Air pressure and wind: Air pressure does not directly affect the growth and development of plants but it is responsible for wind movement. Wind movement is necessary for evapotranspiration and CO₂ supply in plant leaves. Wind also affect the plant by mixing the atmosphere, thus compensating temperature in different regions. Winds are also responsible for precipitation.

Cloudiness: Cloudiness is the amount and duration of cloud present in atmosphere. Cloudiness does not directly affect growth and development of plant. But it affects the air temperature due to reflectance of longwave radiation. It also increase the humidity in atmosphere which is responsible for increasing pest and disease attacks.

Leaf Wetness Duration: The observation of leaf wetness duration are taken because it is responsible for disease infestation. The longer LWD increase the possibility of plant being infected by disease as it provide congenial atmosphere of spore germination.

Importance

Evaporation & Transpiration: Evaporation and transpiration are of primary importance in meteorology as a source of water vapour. It is also important in agriculture as it affects soil conditions, plant growth, and water storage. Nutrients from soils are absorbed by the plants with water, and water uptake is possible due to transpiration. The second important effect of transpiration is evasion of heat losses from the plant canopy.

Moisture status in field: Moisture is very important for growth and development of plants. Moisture plays a great role in nutrient absorption as well as translocation of plant materials. Moisture status is observed in a small plot in the observatory for irrigation scheduling. It also gives an impression of water losses through percolation and runoff.

Dew Point Temperature: Dew point temperature is important for forecasting of frost occurrence. On the basis of frost forecasting, different measures can be adopted for minimizing crop losses.

Weather and Livestock

Weather and climate play a great role in survival, growth, reproduction, milk, and wool production of livestock. Two factors; temperature and atmospheric humidity are very significant as far as livestock production is concerned.

- 1) The milk, wool, meat, and egg production are dependent on temperature. If temperature is not in the thermoneutral range, the livestock production will be less than the potential production.
- 2) The partitioning of dietary energy intake is dependent on temperature and atmospheric humidity.
- 3) The animal traits are selected on the basis of weather conditions.
- 4) Morbidity and injuries in livestock are dependent on weather conditions.
- 5) The pest and diseases in animals are also dependent on prevailing weather conditions.
- 6) The housing requirements of livestock are also dependent on temperature and humidity.
- 7) The tactical decisions such as moving animals to shelters or operation of sprinklers for animals is dependent on weather conditions.