

agMOOCs

Crop-Weather Interactions: Cotton and Sugarcane

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Dear students in the last class we have seen crop weather interaction for sorghum, pigeon pea and groundnut. In this class we would like to see the crop of their interaction for cotton and sugarcane crop. These crops are cultivated in India and it is one of the most commercial crops. Let us see the crop weather interaction for cotton crop.

Cotton is one of the important crop cultivated for fiber. It is comes under C3 type plants based on the photosynthesis process.

Crop weather interaction

Cotton

Examples

- Seed germination is optimum under temperature ranged from 18 to 30°C, with minimum of 14°C and maximum of 40°C
- During the vegetative stage a temperature of 20°C to 30°C is required
- Proper bud formation and flowering requires a warm day temperature $>20^{\circ}\text{C}$ and night temperature $> 12^{\circ}\text{C}$, but should not exceed 40 and 27°C respectively
- Temperature between 27 and 32°C are optimum for boll development and maturation;
- Under temperature above 38°C , yield is reduced
- Minimum rainfall requirement is 500 to 650 mm

Let us see the crop weather interaction during the germination phase. For optimum temperature for a seedling emergence is 18 to 30 degree Celsius with a minimum of 14 degree Celsius as well as the maximum temperature is up to 40 degree Celsius is also existed. During the seedling emergence or seed germination it requests optimum moisture, optimum temperature, as well as oxygen. The cottonseed consisting of eight times more oil, five times more protein than the maize seed. It covers with a thick wax. It requires more moisture for imbibition as well as to catalyze the above said component into a labeled form it requests more oxygen. Therefore the optimum temperature is also very required for seed germination. It is around 20 to 30 degree Celsius.

Let us see the crop weather interaction for different growth stages. Let us see the crop weather interaction for a vegetative stage. Cool weather, prolonged cloudy weather harm the vegetative growth. This crop requests an optimum day temperature of about 20 degree Celsius and the night temperature of about 12 degree Celsius is always required for proper bud formation as well as flowering. Let us see the temperature requirement during the boll development and maturation. It is around 27 to 32 degree Celsius. Under the temperature of above 38 degree Celsius the yield is reduced. The minimum rainfall requirement of a cotton is 500 to 650 mm.

Sugarcane

Examples

- Sugarcane requires a long, warm growing season with a high incidence of radiation during day time.
- It requires adequate moisture, followed by a dry, sunny and fairly cool nights but frost-free during ripening and harvesting period
- Optimum temperature for sprouting (germination) of stem cuttings is 32 to 38°C
- Mean daily temperatures ranged 22 and 30°C is required for optimum growth.

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Let us see the crop weather interaction for sugarcane. Sugarcane requires a long warm growing season with high incidence of solar radiation during the daytime because sugarcane produce more than hundred tons of biomass it triggered by the photosynthesis process. Therefore it requires a long long growing season as well as with the high incidence of solar radiation is most essential. It requires an optimum moisture throughout the growth stages. It can be cultivated in early season and also in the late season. Early season starts from November to mid March and the late season starts from February to April. If you start the early season the plant takes almost 16 to 23 days. While if you are going with the late season during the hot weather period the germination is completed within 7 to 15 days. Therefore the temperature is determining the important factor for germination of or sprouting of sugarcane seeds.

The optimum temperature requirement for sprouting or a germination of a stem cutting is 32 to 38 degree Celsius for its maximum growth during more than 6 to 7 months. It requires an optimum temperature of at 22 to 30 degree Celsius is most essential. Though the growth period is very long so we should be considered the temperature factor. Therefore we should consider the base temperature. The base temperature for different stages like shoot emergence, tillering as well as internode elongation it requires 12 degree, 14 degree, and 18 degree respectively. The base temperature below which the plant cannot able to grow the activity is stopped.

Crop weather interaction
Sugarcane (Contd..)

- During active growth stage, minimum temperature requirement is approximately 20°C.
- Relatively low temperature (20 to 10°C) is required at maturity for the enrichment of sucrose in the cane
- Water requirements of sugarcane is 1500 to 2500 mm and it should be evenly distributed over the growing season

Let us see the maturity phase or the ripening phase. During this phase the sugarcane requires a cool night hours as well as warm temperature. The relative low temperature between 20 to 10 degree Celsius is required for the end of the season for better ripening.

Let us see the water requirement of sugarcane crop. Being a long duration crop it can stand up to the period of a 12 months in the field. It requires an optimum irrigation water throughout the growth period. It can be supplemented or it can be distributed, evenly distributed in all the months. It requests an optimum water is 1500 to 2500 mm.

Thank you.