

# ENVIRONMENTAL NEEDS OF THE COTTON PLANT

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## TEMPERATURE

Although cotton of origin is a tropical or sub-tropical plant, the majority of cotton is produced outside the tropics. The temperature factor is therefore of vital importance when considering areas suitable for economical cotton production. Yield and fibre quality are to a great extent determined by air temperature during the growing season. With a normal growing period of 200 days, the cotton plant requires a relatively high temperature over a long growing season. Temperatures under 20°C have a slowing down effect on the growth of the plant, especially during the flowering and boll phases. In practice, low temperatures just after planting time, when germination occurs, as well as low night temperatures during any stage of growing can be potentially harmful to the plant. To ensure good germination, the soil temperature in the seedbed should at least be 18°C. In South Africa this requirement as a rule does not present any problems in the recognised cotton production areas. Cold weather after emergence of the plant can be harmful to seedlings. Sufficient knowledge of climatic conditions in springtime is required in order for the grower to ensure the most advantageous growing season for his crop. Particularly low temperatures (15°C or lower) during the period of boll development will adversely affect both fibre yield and quality.

Cotton growth and development is at an optimum when the average summer temperature is above 25°C. The most critical period is the three month period from December to February when boll development normally takes place. Given the high average temperature it is clear that cotton should be able to endure extreme high temperatures. Although cotton can also be adversely affected by high temperatures, it is unlikely that this would be a limiting factor in South Africa, except if it is accompanied by dry conditions.

## SUNLIGHT

The cotton plant flourishes in abundant sunshine especially during the period from December to February. Adequate sunshine is necessary for boll production and maturing. Sunshine hours of between 60% to 90% of the day length are required for successful development during the growing season. The Lower Orange River area serves as an example of favourable sunlight conditions. Excessive cloudiness

(less than 50% sunshine) results in retarded growth and greater loss of flower buds and young bolls through weaning.

## **MOISTURE**

Cotton is a drought tolerant plant and can still provide relatively good yields under dryland conditions, even in areas where the rainfall is less than 500mm annually. For profitable yields which comply with quality requirements, a higher rainfall, evenly spread, is however required. High air moisture during the ripening stage and the period just before harvesting can on the other hand lead to boll decay.

The actual moisture need of the cotton plant varies from area to area and from year to year. The reason is that environmental differences occur i.r.o. temperature, rainfall, soil, length of the growing season, evaporation, cultivar planted, etc. Globally, the amount of moisture needed to ensure an average crop varies from about 500mm to 1250mm. In South Africa with its erratic rainfall, an average summer rainfall of 600mm can be considered as the minimum for a reasonable consistent production.

All seed requires moisture to germinate and grow and insufficient moisture during these stages will be detrimental to the crop. The most critical period however as far as moisture requirements are concerned, is from the flowering stage up to maturing of the bolls. Insufficient moisture during this period can result in excessive weaning of flowers and bolls. Excessive moisture can however also lead to unwanted vegetative growth. Both instances will lead to lower yields.

Due to the fact that the most favourable combination of the abovementioned aspects are mostly absent under dryland conditions, cotton in South Africa is mainly cultivated under irrigation.

## **HAIL**

The cotton plant is very sensitive to hail and areas that are prone to hail storms should be avoided.

## **SOIL**

The cotton plant performs best in deep, fertile, sandy loam soils with reasonable drainage. Cotton does not do well in sandy soils as well as heavy clay soils as the latter present problems with the germination of seedlings. Generally cotton prefers a deep soil, one metre or more and any impenetrable layers such as plough soles or stone reefs or even a high water table, can be detrimental to root development

and result in poor yields. As cotton is very susceptible to waterlogged conditions, soils with poor drainage should be avoided.

Although cotton is relatively tolerant as far as pH is concerned, the best results are obtained with a pH of between 5.5 and 7.5. Fertilisers should always be sufficient and never in excess, especially in the case of nitrogen. Cotton also has a relative high tolerance to brackish soil. The plant is quite sensitive to aluminium poisoning and should therefore not be planted in soils with a pH value of below 5.5 (determined in water) where the aluminium concentration is high. A concentration of above 0.2 m e/100g soil is regarded as high but the activity of aluminium is influenced by factors such as clay and organic material content.

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