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Challenges and mitigation opportunities for the development of climate resilient cotton

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Abstract

Cotton has global importance, due to its status as a major fiber crop with high commercial value. It has a significant contribution in Pakistan's economy. Cotton plant faces various biotic and abiotic stresses from environment but, high temperature along with drought is a limiting factor to cotton productivity. It is reported that, the average temperature in Pakistan increased by 1.6 °C during the current century as compared to 0.89 °C globally which indicates that the increase in temperature in Pakistan is approximately two fold. Up to 2050, it is predicted to rise by 2.5 °C. Due to this increase in temperature, numerous morphological and physiological characters of cotton plant are adversely affected because of climate change and in response, yield of seed cotton is reduced significantly. Every growth stage of the cotton plant is susceptible to heat stress, but the squares, buds, flowers, and bolls are particularly vulnerable to high temperature. Besides, infestation of insect pests has also been increased due to change in temperature patterns. Likewise, prolonged stress causes pollen sterility, which results in the loss of unfertilized floral buds and ultimately yield loss. Keeping in view the losses, domestic agricultural production needs to be improved. In near future, the development of new agriculture strategies will be helpful to cope the problems of climate change. Various breeding and biotechnological tools can be used to develop heat-tolerant cotton cultivars. Diversity in population is a key feature for breeders but it may have been lost in elite gene pools. The crop can be protected against new biotic and abiotic challenges with the help of genes from exotic germplasms. These exotic germplasms may represent significant genetic diversity with improved production stability and resilience to stressful environment.