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Research Paper

Analysis of physiological and biochemical parameters with yield components in cotton genotypes under drought stress

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ABSTRACT : Drought stress adversely affects the growth, development and ultimately yield of cotton. The growth and productivity of cotton plants depend largely on their vulnerability to environmental stress. Water deficit is the major constraint that limits agricultural production. Cotton cultivars that can endure and recover from drought are needed to minimize yield loss in dry land areas and to reduce the water needs of irrigated production. Several efforts have been taken to improve cotton production under water limiting conditions through conventional breeding techniques. However, progress in traditional breeding approach has been slow due to limited knowledge on genetics of drought tolerance and involvement of several complex tolerance mechanisms. A study was conducted to determine the association analysis of physiological and biochemical and yield parameters related to water stress in cotton. Genotypic correlation coefficients between different characters were worked out. The present study indicated that seed cotton yield showed significant positive association with photosynthetic rate, NRase activity, SPAD and total chlorophyll content at genotypic level indicating that these characters can be improved simultaneously.

Key Words : Leaf photosynthetic rate, Stomatal diffuse resistance, Soluble protein, Nitrate reductase activity, Total chlorophyll, Yield

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Cotton is relatively drought-tolerant, but severe water stress can slow plant development, cause small bolls and squares to shed, and thus reduce the seed cotton yield. This is of agricultural importance since the incidence to stress is unpredictable and plants may be exposed to drought stress at any time during their life cycle under field conditions. Maintenance of adequate soil moisture is essential for successful crop production. Drought endurance recovery needs the special characters to minimize yield loss and reduced water has for irrigated crops. Water stress is considered to be a moderate loss of water, which leads to stomatal closure and limitation of gas exchange. Water stress is characterized by reduction of water content, turgor and total water potential leads to closure of stomata, decrease in cell enlargement and growth. Severe water stress may result in arrest of photosynthesis, disturbance of metabolism, and finally death (Amarjit *et al*., 2005). Hsiao (1973) concluded that water stress inhibits cell enlargement more than cell division. It reduces plant-growth inhibition of various physiological and biochemical processes, such as photosynthesis, respiration, ion uptake, carbohydrates translocation, nutrient metabolism and hormones (Bhatt and Srinivasa Rao, 2005).

Correlation coefficients between different characters were worked out as per Falconer (1964). Genotypic correlation coefficients were further portioned into direct and indirect effects by path analysis as suggested by Dewey and Lu (1959).