BREEDING FOR DROUGHT TOLERANCE IN COTTON (*Gossypium spp.*)

By

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B.Sc. Agric. Sc. (Agronomy), Ain Shams University, 2005

M.Sc. Agric. Sc. (Arid Land Agric. Graduate Studies & Research Inst.), Ain Shams Univ., 2011

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ABSTRACT

Mohamed Ali Abdel-Kader Mohamed: Breeding for Drought Tolerance in Cotton (*Goossypium spp*.). Unpublished Ph. D. Thesis, Department of Agronomy, Faculty of Agriculture, Ain Shams University, 2015.

Drought stress is the most important factor limiting crop productivity and adversely affects yield. Cotton (*Gossypium* spp.) is drought sensitive crop causing incentive reduction in yield. Most of the breeding programmes depend on agronomic traits as indicators of drought tolerance which are directly related to yield or its attributes. Conventional breeding has been successful in developing drought tolerant cotton genotypes. Such indicators slowed the breeding progress and it consumed more time and required more labors. So, screening cotton seedling germplasms for drought tolerance by using morphological and physiological traits, non enzymatic and enzymatic antioxidant systems are important to screen large amounts of plant materials in the shortest time possible.

An objective of this investigation is to study the possibility of use morphological and physiological traits, enzymatic and non enzymatic antioxidant systems to screen large amounts of plant materials in the shortest time possible under drought condition compared with the traditional selection criteria (yield and its components) used in this respect; Second objective is to study genetic analysis of yield, yield component, and fiber properties, and to determine the coefficient of correlation and path analysis between morphological, physiological, biochemical and yield to identify the more important selection indices for screening plant materials to drought tolerance.

21 cotton genotypes (6 parents and 15 F_1 crosses) were evaluated under two irrigation treatments i.e., 100 % ETc, 1269 mm/season (normal) and 60 % ETc, 761 mm/season (drought). The growth, yield

earliness, yield, yield attributes, fiber properties, heterosis, general and specific combining ability, heritability, drought indices, morphological and physiological traits, enzymatic and non enzymatic antioxidant are determined. Also, correlation and path analysis between yield and its attributes, morphological, physiological traits and antioxidant activities were determined.

The results indicated that some cotton genotypes (such as Giza 80, Giza 90, Giza 90 x Giza 90 Australian, Giza 90 x Deltapine, Giza 80 x Giza 90, Tamcot C. E. x Deltapine and Giza 80 x Tamcot C. E.) showed notable drought tolerance as measured by the common or conventional indices such as; yield, yield attributes, fiber properties, drought tolerance indices (stress susceptibility, stress tolerance index, tolerance index, yield index, yield stability index, mean productivity and geometric mean productivity). Meantime, the same above mentioned genotypes have also proved to be drought tolerant as measured by studied morphological, physiological traits and enzymatic and non-enzymatic antioxidant systems which were significantly correlated with yield. Therefore, morphological, physiological traits and enzymatic and non-enzymatic antioxidant systems could be used as effective selection criteria for screening cotton genotypes for drought tolerance in the shortest time possible, especially if the breeder has large genetic pool.

Key words: Cotton, Drought, Yield, Selection, Tolerance indices, Correlation and Path analysis.

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