ABSTRACT

This study was a genetical approach to investigate the genetic nature of cotton plants to response with heavy metals stresses, in order to reuse treated water in irrigating this crop. The work was extended to study the adaptability and stability of cotton genotypes to such stress conditions. Also, these cotton genotypes were subjected for clustering analysis based on their tolerance indices to heavy metals to help in choosing genotypes that are more tolerant to such metals. To achieve these goals, a set of cotton genotypes, *G. barbadense L*, were screened for their response to cadmium (Cd), lead (Pb) and nickel (Ni) and six genotypes were chosen and used as parents representing low and high tolerant genotypes. Giza 83 (P_1), Giza 90 (P_2), and Giza 91 (P_3) were high tolerant parents and Giza 70 (P_4), Pima S6 (P_5) and Giza 87 (P_6) were low tolerant parents.

A set of crosses were made using the high tolerant parents as females and the low tolerant parents were served as male parents to obtain nine F_1 crosses. Selfed seeds of the parental genotypes and seeds of their nine F1 crosses were grown in a complete randomized block design experiment. Thirty days old plants were treated with heavy metals solutions at concentration of 70 ppm Cd, 20 ppm Pb and 40 ppm Ni ions as sprayers. One week later, four plant samples were taken from each replicate for laboratory analysis. The fifty days old plants were retreated again with the same heavy metals and the same

concentrations, in order to study their effects on fertility and yield. Samples of mature floral buds were taken for microscopic examination, representing four plants from each replicate. At maturity, cotton yield was ginned from ten individual plants for each replicate in each treatment. All these estimates were used in calculating two response parameters: induced reduction%, as an index of sensitivity to heavy metals and tolerance% as tolerance index.

The results of that analysis of variances for induced reduction effects or tolerance indices for growth, leaf pigments, fertility and cotton yield revealed significant variations among parents or F_1 crosses. Also, Tolerance indices of heavy metals determined on root or shoot growth and on leaf pigments, could be served as early reliable and rapid indicator of environmental pollution and for genotype screening as phytoremidiator of polluted agents. Analysis of variance for stability of the studied characters among cotton genotypes under heavy metals environments revealed significant genotype-environment interactions for all attributes showing genetic differences among these entries for their regression on the environmental indices.

Clustering analysis based on tolerance indices under heavy metals stresses produced different patterns and variable grouping of cotton populations, revealing a sort of instability in clusters composition which might due to their interaction with heavy metals.

So, this study might suggest some possibilities to reuse treated-water in cotton irrigation, once at least, since cotton plants appeared to be able to accumulate heavy metals ions in their tissues and could be used as a potential crop for cleaning heavy metals pollutions.

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