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GENETIC CONTROL OF HEAT TOLERANCE IN WHEAT AS MEASURED BY MEMBRANE THERMO-STABILITY AND CANOPY TEMPERATURE DEPRESSION

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Heat stress is an important production constraint for wheat and affects many plant biological activities. The study was conducted to determine the genetic mechanism of heat tolerance through diallel analysis biometric technique in two environmental conditions i.e. stress free (timely planting) and heat stress regime (late planting). 150 wheat strains of diverse origin were screened and identified six thermo-tolerant and four thermo susceptible strains during year 2014-15. A total of 45 F1's were developed by crossing ten strains following 10×10 diallel fashion (without reciprocal) during 2015-16. Response of 55 genotypes (45 F1 and 10 parents) to high temperature stress was measured by canopy temperature depression (CTD), cell membrane thermo stability (CMT) and grain yield per plant during 2016-17. Mean data were subjected to diallel analysis of variance and estimation of variation of genetic parameters. Additive gene effects were highly significant for three traits in all the environments. The overall dominance components were smaller but highly significant in stress free and heat stress indicating important role of dominance. In the same way, highly significant b1 indicated the directional dominance deviations of the genes. Symmetrical gene distribution and unimportant role of specific genes for canopy temperature depression and grain yield per plant were represented by non-significant b2 (symmetry of gene distribution) and b3 (specific gene effects) respectively. Regression and array variances analyses suggested the adequacy of model for canopy temperature depression and grain yield per plant. Estimation of genetic components of variation indicated the importance of additive gene effects in acquired thermo-tolerance for all the traits in three testing environments. Based on the present results of CMT and CDT measurements, it is suggested that heat tolerance can be enhanced by utilizing the genetic variability existing within genetic resources. It can be concluded that, diallel biometrical technique and integrated use of modified pedigree method of selection by involving parents like DBW 16, Raj 3765, Raj 4246, DBW 72, HD 2733 and HD 2985 and use of specific crosses like DBW 16 x Raj 3765, Raj 4246 × HD 2733 and DBW 72 x HD 2733 would be more effective for the development of thermo-tolerant spring wheat varieties for heat stress environment.

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