GENETIC VARIATION FOR DROUGHT TOLERANCE IN ADVANCED BREEDING LINES OF GROUNDNUT (*Arachis hypogaea* L.)

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**ABSTRACT**

*Key words:* Groundnut, Genetic variability, Drought tolerance index

An investigation was carried-out on genetic variability, correlation, path analysis and drought tolerance in groundnut using 90 lines comprising 72 advanced breeding lines of ten different crosses and 18 parents. The lines were evaluated in a Randomized Block Design with three replications under four different conditions *viz*; well watered condition, Stress-I condition (drought imposed at peg formation stage, 55-60 DAS), Stress-II condition (drought imposed at pod development stage, 75-80 DAS) and Stress-III condition (drought imposed at peg formation & pod development stages, 55-60 DAS & 75-80 DAS) at the Main Oilseeds Research Station, J.A.U., Junagadh during Summer 2017.

The observations were recorded on five randomly selected plants in each entry and replication from each condition and their mean values were used for statistical analysis. The characters studied were specific leaf area (cm$^2$/g), SCMR-1, SCMR-2, days to 50% flowering, days to maturity, plant height (cm), number of branches per plant, number of hanging pegs per plant, number of pods per plant, number of mature pods per plant, number of immature pods per plant, pod yield per plant (g) shelling out turn (%), 100-kernel weight (g), sound mature kernel (%), biological yield per plant (g), harvest index (%) and oil content (%).

The analysis of variance showed significant differences among the genotypes for all the characters thereby suggesting presence of ample genetic variation in the advanced breeding lines used for the study. Wide to moderate range of variation was observed for majority of the characters under all the conditions. The results on mean of different yield components under well watered and three imposed drought conditions revealed that the imposed water stress greatly reduced the mean values of almost all the components.

The values of PCV were slightly higher than that of GCV for all the traits. Under all the conditions, estimates of GCV and PCV were high for number of hanging pegs per plant, number of immature pods per plant, number of mature pods per plant and plant height except for plant height under Stress-III condition. Moderate values of GCV and PCV were observed for number of pods per plant, 100-kernel weight, biological yield per plant and harvest index under well watered, Stress-I and Stress-II conditions. Under Stress-III condition, harvest index, plant height, 100-kernel weight, sound mature kernel, biological yield per plant, pod yield per plant and shelling out-turn exhibited moderate values of GCV and PCV. The GCV and PCV were low for specific leaf area, SCMR-1, SCMR-2, days to 50% flowering, days to maturity, number of branches per plant and oil content under all the four conditions.
High heritability estimates were observed for number of hanging pegs per plant, specific leaf area, number of immature pods per plant, sound mature kernel, 100-kernel weight, number of mature pods per plant, number of pods per plant, plant height, shelling out turn, harvest index, SCMR-1, SCMR-2, days to 50% flowering, biological yield per plant, days to maturity and pod yield per plant under well watered and imposed drought conditions. Heritability was moderate for oil content and low for number of branches per plant under all the conditions.

The genetic advance expressed as percentage of mean was high for number of hanging pegs per plant, number of immature pods per plant, number of mature pods per plant, plant height, number of pods per plant, 100-kernel weight, biological yield per plant and harvest index under well watered and imposed drought conditions except for biological yield per plant under Stress-I condition. The values of genetic advance were moderate for shelling out turn, sound mature kernel, specific leaf area, pod yield per plant, SCMR-1 and SCMR-2 under well watered condition; for biological yield per plant, sound mature kernel, specific leaf area and pod yield per plant under Stress-I condition; for shelling out turn, specific leaf area and SCMR-2 in Stress-II condition and for specific leaf area and SCMR-1 in case of Stress-III condition. The genetic advance was low for days to 50% flowering, number of branches per plant, oil content and days to maturity under well watered condition and for SCMR-1, SCMR-2, days to 50% flowering, oil content, number of branches per plant and days to maturity under three imposed stress conditions.

The values of genotypic correlation were higher than their corresponding phenotypic correlation indicating high degree of association between two variables at genotypic level and that there was an inherent relationship between the characters studied. Pod yield per plant exhibited significant and positive correlation with number of pods per plant, number of mature pods per plant, shelling out turn, 100-kernel weight, harvest index, oil content and sound mature kernel at genotypic and phenotypic levels under well watered and three imposed drought conditions except for sound mature kernel in well watered condition. Pod yield per plant showed significant positive association with biological yield per plant under well watered, Stress-I and Stress-III conditions at phenotypic level and in Stress-II condition at both the levels. Significant positive genotypic association was also observed between pod yield per plant and specific leaf area under Stress-I and Stress-II conditions.

The path coefficient analysis revealed high and positive direct effect of number of mature pods per plant, harvest index, biological yield per plant and number of immature pods per plant toward pod yield per plant under well watered and Stress-I condition. Under Stress-II condition, high and positive direct effect was exerted by number of pods per plant, biological yield per plant and harvest index while, under Stress-III condition, biological yield per plant, harvest index and number of mature pods per plant showed positive and direct effect on pod yield per plant. These characters may be considered as the most important yield contributing characters and due emphasis should be placed on these components while selecting for high yielding types in groundnut.

The lines SB-71, SB-4, SB-27, TPG-41, SB-68, SB-28 and SB-55 under Stress-I, SB-22, SB-26, SB-58, SB-71 and SB-27 under Stress-II condition and SB-27, SB-4, SB-71, SB-22 and SB-28 under Stress-III condition displayed maximum DTI values and thus, were rated as drought tolerant. Drought tolerant genotypes showed maximum DTI and minimum reduction in pod yield per plant due to stress condition and may be utilized in hybridization programme for pod yield improvement in groundnut under drought condition.