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Assessment of Genetic Variability and Correlation Coefficients analysis in Groundnut *(Arachis hypogaea* L.) for Yield and Quality Traits

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ABSTRACT

The experiment was conducted on 30 groundnut genotypes for 15 characters during *Kharif* 2022-23 and evaluated for genetic variability parameters and correlation coefficient. Analysis of variance revealed significantly notable genetic differences for all the features that were evaluated. In the current study PCV was found to be higher than GCV followed by high heritability coupled with high genetic advance percent mean was observed for 8 characters among the 15 observations. This estimated that there was less influence of environment and due to presence of high GA%M indicated necessity of utilizing these traits for further crop improvement programmes. The magnitude of genotypic correlation was higher than phenotypic correlation and significantly positive for maximum characters contributing to kernel yield per plant.

Key words*: GCV, PCV, Heritability, GA%M, Correlation.*

Introduction

Groundnut (*Arachis hypogaea* L.) is the most significant economic crop of the world with an area of 327 lakh hectares, production of 539 lakh tonnes and productivity of 1648 kg/hectare (Groundnut Outlook 2022). It belongs to Fabaceae family and has a chromosome number of 2n=40. Groundnut was originated from Brazil, South America. Groundnut has a high value of both Oil (40-52%) and Protein (24-26%) in it. Knowledge of genetic variability in a crop species is fundamental to its improvement. Breeder determine the level of variability in the germplasm through the study of PCV and GCV, scope and direction of selectionis done by study of heritability in broad sense and genetic advance. With higher heritability and high genetic advance as percent of mean the traits show additive gene action which is the most successful selection criteria. Correlation helps in examining the associations between the yield and its attributing traits for the formulation of selection criteria. Keeping the above facts in view the present research was conducted on both qualitative and quantitative characters for the 30 groundnut genotypes.

Materials and Methods

The Present Investigation was conducted during *Kharif* 2022, on 30 Genotypes of Groundnut grown in Randomized block design with three replications. The research farm used for experiment is CRC at School of Agriculture, ITM University, Gwalior, Madhya Pradesh. The experimental material consists of 30 genotypes obtained from RARS, Tirupathi and ARS, Kadiri, Andhra Pradesh. The total of 15

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observations were recorded based on the yield and attributing characters which are Germination percentage, Days to 50% flowering, Days to maturity, No. of branches, Plant height, No. of pods per plant, Test weight, Oil percentage, Protein percentage, Shelling percentage, Electrical conductivity, Harvest index, Biological yield, Pod yield per plant and Kernel yield per plant. Data was collected from 5 randomly selected plants and analyzed using appropriate statistical tools, which are: Analysis of variance by Panse and Sukhatme (1961), Estimation of GCV & PCV by Burton (1952), Estimation of heritability in Broad sense by Singh and Choudhary (1977), Genetic Advance by Johnsson *et al*., (1955) and Estimation of Correlation Coefficients by Miller *et al*. (1958).

Results and Discussion

The 30 genotypes mean sum of squares for the 15 attributes were highly significant, demonstrating the genetic diversity of the materials used for the study as shown in Table 1. This demonstrates that there is ample opportunity for the selection of possible lines for the existing gene pool for yield and its components.

The estimates of variability parameters are given in the Table 1. High GCV and PCV values were observed for kernel yield per plant, no of pods per plant, test weight and pod yield per plant.The results of the Phenotypic Coefficient of Variation were slightly higher than the Genotypic Coefficient of Variation, indicating that the bulk of the features were not that significantly influenced by the environment. The similar results were also recorded for Hampannavar *et al.* (2018), and Aditya veer and Vikar Kumar (2021).

Heritability in broad sense estimates were high for all characters except days to 50% flowering and shelling percentage which showed moderate heritability. Similar results were obtained by Bhargavi *et al*., (2016) and Kumar (2019). High heritability for Oil Percentage was also found by Shukla and Raj (2014). Genetic Advance as percent mean was high for kernel yield per plant, no of pods per plant, test weight, pod yield per plant, electrical conductivity, harvest index, biological yield and no of branches. Similar results were recorded by Maurya *et al.* (2014) and Kulheri *et al.* (2022).

Correlation coefficient analysis (Table 2) of kernel yield was found to be positive and significantly correlated to both genotypic and phenotypic levels with maximum characters which are germination percentage, days to maturity, no of pods per plant, test weight, oil percentage, protein percentage, harvest index, biological yield and pod yield per plant. Whereas negative significant correlation was observed for days to 50% flowering towards kernel yield per plant. The genotypic correlation coefficients seemed larger in scale in comparison to their corresponding phenotypic correlation coefficients. Similar results were also reported by Tirkey *et al.* (2018) and Pachauri and Sikarwar (2022). For oil and protein percentage it was also seen for Kumar *et al.* (2014) and Kiranmai *et al.* (2016). Negative signifi-

Table 1. Estimation of Variability, Heritability, Genetic Advance for 15 yield and quality ascribing characters among 30 genotypes

Characters	Mean	Min	Max	GCV (%)	PCV (%)	H (bs)	GA	GA% mean
Germination percentage	91.64	84.44	94.67	3.18	3.19	99.43	5.99	6.53
Days to 50% flowering	26.27	24	28.67	4.76	6.34	56.33	1.93	7.35
Days to maturity	112.21	93.33	128.67	8.06	8.17	97.52	18.41	16.4
No of branches	8.27	6.43	9.97	13.24	13.9	90.84	2.15	26
Plant height (cm)	45.68	42.39	49.69	5.04	5.32	89.73	4.49	9.84
No of pods per plant	22.7	12.67	37.6	26.71	27.55	94.03	12.11	53.36
Test weight (g)	42.37	25.84	69	23.46	24.48	91.86	19.63	46.32
Oil percentage	46.12	40.54	52.4	6.97	7	99.38	6.6	14.32
Protein percentage	27.04	26.16	28.56	2.6	2.67	94.81	1.41	5.21
Shelling percentage	69.76	65.27	73.33	2.79	3.93	50.6	2.85	4.09
Electrical conductivity	0.76	0.44	1.01	19.7	20.66	90.92	0.3	38.69
Harvest index (%)	58.98	34.2	79.63	15.06	16.52	83.15	16.69	28.29
Biological yield (g)	52.05	36.53	65.98	14.67	16.01	83.88	14.4	27.67
Pod yield (g/ plant)	30.73	15.13	42.68	21.45	22.38	91.84	13.01	42.34
Kernel yield (g/plant)	20.27	10.72	35.92	26.92	27.68	94.53	10.93	53.91

Table 2. Genotypic correlation between Kernel yield per plant and its contributing traits

Characters	GP	D50%F	DTM	NB	PH	NPPP	TW	OP	PP	SP	EC	HI	BY	PYPP	KYPP
GP	1	0.197	0.314**	0.097	-0.074	0.531**	0.454**	0.466**	0.484**	-0.145	0.15	0.169	0.605**	0.507**	0.594**
D50%F			-0.360**	-0.035	-0.690**	-0.139	0.221*	0.115	0.177	0.158	0.391**	0.006	-0.167	-0.12	-0.227*
DTM				-0.085	0.343**	0.472**	0.197	0.203	0.347**	-0.432**	0.078	0.435**	0.332**	0.509**	0.496**
NB					0.018	-0.208*	-0.054	0.096	0.134	-0.071	-0.217*	-0.108	0.017	-0.076	-0.033
PH						0.244*	-0.255*	-0.012	-0.095	-0.460**	-0.379**	0.027	0.077	0.038	-0.033
NPPP							0.360**	0.619**	0.402**	-0.278**	0.280**	0.360**	0.729**	0.742**	0.673**
TW								0.306**	0.523**	-0.239*	0.387**	0.318**	0.414**	0.495**	0.466**
OP									0.348**	-0.093	0.008	0.275**	0.580**	0.602**	0.662**
PP										0.107	0.370**	0.228*	0.382**	0.383**	0.519**
SP											0.026	-0.165	-0.220*	-0.244*	0.063
EC												0.133	0.118	0.176	0.159
HI													0.101	0.739**	0.435**
BY														0.734**	0.641**
PYPP															0.749**
KYPP															1

*,** significant at 5% and 1% respectively

GP: germination percentage, D50%F: days to 50% flowering, DTM: days to maturity, NB: no of branches, PH: plant height, NPPP: no of pods per plant, TW: test weight, OP: oil percentage, PP: protein percentage, SP: shelling percentage, EC: electrical conductivity, HI: harvest index, BY: biological yield, PYPP: pod yield per plant, KYPP: kernel yield per plant.

cant correlation between days to 50% flowering was also found by Rao *et al.* (2019).

Conclusion

Now for the conclusion of the discussion characters such as no of pods per plant, pod yield per plant, test weight, harvest index and biological yield showed high heritability, GA%M, GCV, PCV and positive significant correlation with kernel yield per plant hence these traits can be used for further crop improvement and breeding programmes.

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References

Bhargavi, G., Rao, V.S. and Rao, K.L. 2016. Genetic variability, heritability and genetic advance of yield and related traits of Spanish bunch groundnut (*Arachis hypogaea* L.). *Agricultural Science Digest-A Research Journal*. 36(1): 60-62.

Burton, G.W. 1952. Quantitative Inheritance in Grasses. *Proc. 6th International Grassland Cong.* 1: 277-283

Groundnut Crop Outlook January to December, 2022 Source: https://angrau.ac.in/downloads/AMIC/OutlookReports/2022/10-Groundnut%20Outlook%20Report%20-%20January%20to%20December%202022.pdf

Hampannavar, M.R., Khan, H., Temburne, B.V., Janila, P. and Amaregouda, A. 2018. Genetic variability, correlation and path analysis studies for yield and yield attributes in groundnut (*Arachis hypogaea* L.). *J. Pharmacogn. Phytochem.* 7(1): 870-874.

Johnson, H.W., Robinson, H.F. and Comstock, R.E. 1955. Estimates of genetic and environmental variability in soybeans 1. *Agronomy Journal*. 47(7): 314-318.

Kiranmai, M.S., Venkataravana, P. and Push, H.D. 2016. Correlation and path analysis studies in groundnut under different environment. *Legume Research-An International Journal*. 39(6): 1048-1050.

Kulheri, A., Sikarwar, R.S. and Rajput, S.S. 2022. Genetic variability studies for yield and yield related traits in groundnut (*Arachis hypogaea* L.).

Kumar, N., Ajay, B.C., Rathanakumar, A. L., Radhakrishnan, T., Mahatma, M.K., Kona, P. and Chikani, B.M. 2019. Assessment of genetic variability for yield and quality traits in groundnut genotypes. *Electronic Journal of Plant Breeding.* 10(1): 196-206.

Maurya, M.K., Rai, P.K., Kumar, A., Singh, B.A. and Chaurasia, A.K. 2014. Study on genetic variability and seed quality of groundnut (*Arachis hypogaea* L.) genotypes. *International Journal of Emerging Technology and Advanced Engineering.* 4(6): 818-823.

Miller, P.A., Williams, J.C., Robinson, H.F. and Comstock, R.E. 1958. Estimation of genetic and environmental variance and covariance and their implication in selection. *Agron. J.* 50: 126-131.

Pachauri, P. and Sikarwar, R.S. 2022. Correlation and path analysis of different environments for yield and component traits in groundnut (*Arachis hypogaea* L.). *The Pharma Innovation Journal.* 11(2): 1181-1186.

Panse, V.G. and Sukhatme, P.V. 1961. *Statistical Methods for Agricultural Workers*. 2nd Ed., Indian Council of Agricultural Research, New Delhi. pp. 22

Rao, V.T. and Venkanna, V. 2019. Studies on character association and path analysis in groundnut (*Arachis hypogaea* L.). *Journal of Pharmacognosy and Phytochemistry.* 8(5): 76-78.

Shukla, A.K. and Rai, P.K. 2014. Evaluation of groundnut genotypes for yield and quality traits. *Annals of Plant and Soil Research.* 16(1): 41-44.

Singh, R.K. and Chaudhary, B.D. 1977. *Biometric Methods in Quantitative Genetic Analysis.* Kalyani Publishers, New Delhi, P. 266.

Tirkey, S.K., Ahmad, E. and Mahto, C.S. 2018. Genetic variability and character association for yield and related attributes in groundnut (Arachis hypogaea L.). *Journal of Pharmacognosy and Phytochemistry.* 7(1S): 2487-2489.

Veer, A. and Kumar, V. 2021. Assessment of genetic variability, heritability and genetic advance among groundnut (*Arachis hypogaea* L.) genotypes. *Ind. J. Pure App. Biosci.* 9(1): 214-218.