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Research Note

Genetic variability and heritability studies in Virginia groundnut (*Arachis hypogaea* L.)

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Abstract
Sixty diverse genotypes of Virginia groundnut were evaluated during *kharif* 2013 for variability parameters. The estimates of PCV and GCV were high for plant height, number of primary branches per plant, number of mature pods per plant, 100-pod weight, 100-kernel weight, biological yield per plant, kernel yield per plant and harvest index. High heritability coupled with high genetic advance expressed as percentage of mean was observed for 100-pod weight, 100-kernel weight, biological yield per plant and kernel yield per plant indicating that these traits were mainly governed by additive gene action and responsive for further improvement of these traits.

Keywords
Groundnut, genetic variability, heritability, genetic advance,

Groundnut (*Arachis hypogaea* L.) is a highly self pollinated crop and can be grown successfully in tropical and subtropical areas. The crop has narrow genetic base therefore, it is essential to create more variability in the segregating materials. Genetic variability is the basic requirement for crop improvement as it provides wider scope for selection. Thus, effectiveness of selection is dependent upon the nature, extent and magnitude of genetic variability present in the material and the extent to which it is heritable. Hence, in present investigation an attempt was made to assess the variability of important pod yield and yield contributing traits, along with the indices of variability *i. e.* genotypic coefficient of variation (GV), phenotypic coefficient of variation (PV), heritability in broad sense genetic advance (Gs) and genetic advance as percentage of mean (GA). This study will facilitated an understanding behind expression of character and also role of environment therein.

Sixty genotypes of groundnut were sown in a Randomized Block Design (RBD) with three replications during *kharif* 2013. Each genotype was accommodated in a single row of 3.0 m length with a spacing of 60 cm between rows and 15 cm between plants within the row. The experiment was surrounded by two guard rows to avoid damage and border effects. The fertilizers in the experimental area was applied at the rate of 12.5 kg N_2 ha^{-1} and 25.0 kg P_2O_5 ha^{-1} as it is a recommended dose for *kharif* cultivation of groundnut in the region. Other recommended agronomical practices in vogue were followed for reaping good crop. Data were recorded on randomly selected five plants from each genotype and average value was used for the statistical analysis for 15 characters *viz*., days to 50% flowering, days to maturity, plant height (cm), number of primary branches per plant, number of mature pods per plant, 100-pod weight (g), 100-kernel weight (g), sound mature kernel (%), shelling out-turn (%), biological yield per plant (g), harvest index (%), kernel yield per plant (g), pod yield per plant (g), oil content and protein content (%). The data subjected to different statistical analysis *viz*., analysis of variance, magnitude of genetic variability were performed following the standard procedures, phenotypic (PCV) and genotypic (GCV) coefficients of variation were estimated as suggested by Burton (1952), heritability (broad sense) and genetic advance as followed by Allard (1960).

The analysis of variance showed significant differences among the accessions indicating sufficient variability exist among the accessions. The present experimental material showed a wide range of variation for plant height, number of mature pods per plant, 100-pod weight, 100-kernel weight, shelling out-turn, plant height, kernel yield per plant, pod yield per plant, biological yield per plant and harvest index (Table1). Wide range of phenotypic coefficients of variation (PCV) was observed for plant height, number of primary branches per plant, number of mature pods per plant, 100-pod weight, 100-kernel weight, biological yield per plant, harvest index, kernel yield per plant and pod yield per plant. High phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were recorded for plant height, number of primary branches per plant, number of mature pods per plant, 100 pod weight, 100-kernel weight, biological yield per plant, kernel yield per plant and harvest index.

Narrow differences observed between the PCV and GCV in certain cases like days to 50% flowering, days to maturity, sound mature kernels, biological yield per plant, oil content, and protein content indicated that these characters were less influenced by the environments. Similar results were also obtained for days to 50% flowering and protein content by Choudhary *et al.*, 2013, for days to maturity by Dolma *et al*., 2010, for sound mature kernels by Channayya *et al*., 2011, for oil content by Sonone *et al*., 2011. The highest value of GCV was observed for kernel yield per plant, 100-pod weight, 100-kernel weight, harvest index and pod yield per plant. High magnitude of GCV indicated the presence of wide variation for the characters under studied to allow further improvement by selection of the individual trait. High estimates of GCV in groundnut have been also reported for harvest index by Kumar *et al*., 2008, for kernel yield per plant by Kadam *et al*., 2007; Choudhary *et al.*, 2013, for pod yield per plant, 100-pods weight and100-kernel weight by Meta and Monpara, 2010.

In the present study, moderate values of GCV were observed for shelling out-turn by Korat *et al*., 2009 and Dolma *et al*., 2010; for plant height by John *et al*., 2009 and Korat *et al*., 2009 as well as for numbers of primary branches per plant by Dolma *et al*., 2010.

The low estimates of GCV were observed for days to maturity by Choudhary *et al.*, 2013, for days to 50% flowering by John *et al*., 2009; Sonone *et al*., 2011, for oil content by Channayya *et al*., 2011 thereby indicating narrow genetic variability for these characters in the material studied.

High heritability estimates have been reported for protein content followed by oil content, 100-pod weight, 100-kernel weight, biological yield per plant, sound mature kernels, day to 50% flowering and kernel yield per plant. Similarly high estimates of heritability were observed for oil content by Vekariya *et al*. 2010, for biological yield per plant by Korat *et al*., 2009, for 100-pod weight by Wani *et al*., 2004, for 100- pod weight by Korat *et al*., 2009, for 100- kernel weight by John *et al*. 2006 and for days to 50% flowering by John *et al.*, 2009.

The heritability estimates were found to be moderate for days to maturity, plant height, shelling out-turn, harvest index, number of primary branches per plant and pod yield per plant. Moderate heritability values were observed by Korat *et al.*, 2009 for harvest index, for number of primary branches per plant by Mothilal *et al.*,2004, for shelling out-turn by John *et al.*,2006, for days to maturity by John *et al.*, 2005. The estimates of heritability were low for number of mature pods per plant.

High estimates of heritability coupled with high genetic advance expressed as percentage of mean was observed for 100-kernel weight, 100-pod weight, biological yield per plant and kernal yield per plant, which may be attributed to the preponderance of additive gene action and these traits possess high selective value. Therefore, it was amply clear that these traits were less influence by the environment changes and hence improvement in these traits would be more effective through the selection owing to their additive gene effects. Similar results were also obtained for kernel yield per plant by Dolma *et al*., 2010 and Choudhary *et al*., 2013.

High heritability with moderate or low genetic advance observed for days to 50% flowering, sound mature kernel, oil content and protein content revealed the presence of non-additive gene action and influence of environment in the expression of these characters and thus, the selection would be less effective.

References

Allard, R.W. 1960. *Principles of Plant Breeding.* John Willey and Sons, New York. Pp. 20-24 and 88-89.

Burton, G. W. 1952. *Quantitative inheritance in grasses*. Proc. 6th Int. Grassland Congress. Pennsyvania State College, PA, US **1**:227-83.

Channayya, P., Hiremath, Nadaf, H. L. and Keerthi, C. M. 20 11. Induced genetic variability and correlation studies for yield and its co mponent traits in groundnut (*Arachis hypogaea* L.). *Electron. J. Plant Breed.*, 2(1):135-142.

Choudhary, M., Sharma, S. P., Dashora, A. and Maloo, S. R. 2013. Assessment of genetic variability, correlation and path analysis for yield and its components in groundnut *(Arachis hypogaea* L.). *J. Oilseeds Res*., **30**(2):163-166.

Dolma,T.; Sekhar, M. R. and Reddy, K. R. 2010. Genetic variability, correlation and path analysis for yield its components in late leaf spot resistance in groundnut (*Arachis hypogaea* L.). *J. Oilseeds Res*., **27**(2):154-157.

John, K., Vasanthi, R. P.; Venkatewarlu, O. and Haranath Naidu, P. 2005. Variability and correlation studies for quantitative traits in Spanish bunch groundnut. *Legume Res.*, **28**(3):189-193.

John, K., Vasanthi, R. P. and Venkatewarlu, O. 2006. Variability and heritability studies in groundnut. *Legume Res*., **29**:225-227.

John, K., Vasanthi, R. P. and Venkateswarlu, O. 2009. Studies on variability and association in Spanish bunch groundnut (*Arachis hypogaea* L.). *Legume Res*., **32**(1):65-69.

Kadam, P. S., Desai, D. T., Jagdish, U., Chauhan, D. A. and Shelke, B. L. 2007. Variability, heritability and genetic advance in groundnut. *J. Maharashtra agric. Univ.*, **32**(1):71-73.

Kumar, C. V. S., Kumar, V. I. and Rajmani, S. 2008. Genetic variability, correlation and path analysis in groundnut. *Prog. Agric.*, **4**:69-70.

Korat, V. P., Pithia, M. S., Savaliya, J. J., Pansuriya, A. G. and Sodavadiya, P. R. 2009. Studies on genetic variability in different genotypes of groundnut (*Arachis hypogaea* L.). *Legume Res.*, **32**(3): 224-226.

Meta, H. R. and Monpara, B. A. 2010. Genetic variation and trait relationships in summer groundnut, (*Arachis hypogaea* L.). *J. Oilseeds Res*., **27**(1): 8-11

Mothilal, A., Nallathambi, G. and Sankara Pandian, R. 2004. Genetic variability in confectionery groundnut (*Arachis hypogaea* L.) genotypes. National Symposium: *Enhancing Productivity of Groundnut for Sustaining Food and Nutritional Security*. NRCG, Junagadh, October 11-12, 2004, pp. 1-9.

Sonone, N. G., Thaware, B. L., Bhave, S. G., Jadhav, B. B., Joshi, G. D. and Dhekale, J. S. 2011. Multivariate studies in groundnut *(Arachis hypogaea* L.). *J. Oilseeds Res*., **28**(1): 24-28.

Vekariya, H. B., Khanpara, M. D., Vachhani, J. H., Jivani, L. L.,Vagadiya, K. J. and Revar, H. J. 2010. Correlation and path analysis in bunch groundnut (*Arachis hypogaea* L.). *Internat. J. Plant Sci.*, **6**(1):11-15.

Wani, S. C., Deshmukh, S. N. and Satpute, G. N. 2004. Variability in advance generation lines of groundnut (*Arachis hypogaea* L). National Symposium: *Enhancing Productivity of Groundnut for Sustaining Food and Nutritional Security.* NRCG, Junagadh October 11-12, 2004.

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Table 1. Range of variation, mean, phenotypic (PCV) and genotypic (GCV) coefficients of variation, heritability (b. s.), genetic advance (GA) and genetic advance expressed as per cent of mean (GA%) for 15 characters of Virginia groundnut

Characters	Range of variation		Mean	PCV (%)	GCV (%)	Heritability in broad sense h^2(bs)	Genetic advance (GA)	GA expressed as % of mean
	Minimum	Maximum						
Days to 50% flowering	29.33	38.33	34.07	8.14	7.05	75.17	4.29	12.60
Days to maturity	110.3	123.33	115.52	2.99	2.19	53.96	3.84	3.32
Plant height (cm)	25.13	48.73	36.37	17.11	12.78	55.78	7.15	19.67
No. of primary branches/plant	4.19	6.60	5.27	17.09	11.39	44.47	82.64	15.65
No. of mature pods/plant	10.30	18.47	14.57	16.83	9.07	29.03	1.46	10.06
100-pod weight (g)	68.25	156.92	97.59	18.80	18.38	95.54	36.12	37.01
100-kernel weight (g)	24.86	74.16	39.07	18.77	17.97	91.63	13.84	35.44
Sound mature kernel (%)	70.31	98.96	91.10	6.87	6.09	78.55	10.13	11.12
Shelling out-turn (%)	51.20	75.46	63.69	10.53	8.34	62.74	8.67	13.61
Biological yield/plant (g)	28.82	54.43	40.63	15.86	14.27	80.95	10.74	26.44
Harvest index (%)	23.88	50.62	33.29	20.80	15.76	57.42	8.19	24.61
Kernel yield/plant (g)	5.68	12.77	8.49	23.56	20.12	72.98	3.01	35.42
Pod yield/plant (g)	9.54	19.87	13.32	19.43	15.29	61.92	3.30	24.78
Oil content (%)	41.96	54.51	47.95	5.31	5.21	96.17	5.05	10.53
Protein content (%)	24.07	31.48	28.21	5.83	5.74	97.03	3.28	11.65