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# Variability and heritability studies in bunch groundnut (*Arachis hypogaea* L.)

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## ABSTRACT

**Fifty diverse genotypes of bunch groundnut were evaluated during *Kharif* 2009 for genetic parameter *viz*., variability, heritability and genetic advance. The estimates of PCV and GCV were high for number of mature pods per plant, protein content, kernel yield per plant, harvest index, biological yield per plant and 100-kernel weight. High heritability coupled with high genetic advance expressed as percentage of mean was observed for number of mature pods per plants, kernel yield per plant and pod yield per plant indicating that these traits were mainly governed by additive gene action and responsive for further improvement of these traits.**

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**Key words :** Genetic variability, Heritability, Genetic advance, Groundnut

## INTRODUCTION

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 (GCV), phenotypic coefficient of variation (PCV), heritability in broad sense ($h^2_{bs}$), genetic advance (Gs) and genetic advance as percentage of mean (GAM). This study will facilitate an understanding behind expression of character and also role of environment therein.

## MATERIALS AND METHODS

Fifty genotypes of groundnut were sown in a Randomized Block Design with three replications during *Kharif* 2009. Each entry was accommodated in a single row of 3.0 m length with a spacing of 45 cm between rows and 10 cm between plants within the row. The fertilizer in the experimental area was applied at the rate of 25.0 kg N and 50.0 kg $P_2O_5$ $ha^{-1}$ as it is a recommended dose for *Kharif* cultivation of groundnut in the region. All the recommended package of practices were followed for raising healthy crop. Data were recorded on randomly selected five plants from each genotype and average value was used for the statistical analysis for sixteen characters *viz*., days to first flower, days to 50% flowering, days to maturity, plant height, primary branches per plant, number of mature pods per plant, number of immature pods per plant, 100-pod weight, 100- kernel weight, shelling out-turn, oil content, protein content, kernel yield per pod, pod yield per plant, biological yield per plant and harvest index. The data subjected to different statistical analysis *viz*., analysis of variance, magnitude of genetic variability were performed following the standard procedures, phenotypic and genotypic coefficient of variation as suggested by Burton (1952), heritability (broad sense) and genetic advance as followed by Allard (1960).

## RESULTS AND DISCUSSION

The analysis of variance showed significant differences among the accessions indicating sufficient variability exists 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 mature pods per plant, 100-

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**Table 1 : Phenotypic and genotypic coefficients of variation, heritability, genetic advance and genetic advance expressed as percentage of mean for various characters in bunch groundnut**

| Characters | Range of variation | Mean ± S.E. | PCV (%) | GCV (%) | Heritability in broad sense | Genetic advance (GA) | GA expressed as % of mean |
|---|---|---|---|---|---|---|---|
| Days to first flower | 26.00 - 34.67 | 29.34 ± 0.58 | 7.25 | 6.97 | 92.41 | 4.05 | 13.79 |
| Days to 50% flowering | 30.33 - 37.67 | 33.66 ± 0.64 | 6.08 | 5.77 | 90.04 | 3.80 | 11.28 |
| Days to maturity | 111.67 - 123.00 | 116.93 ± 1.48 | 2.42 | 2.06 | 72.33 | 4.22 | 3.61 |
| Plant height (cm) | 17.33 - 36.20 | 29.06 ± 1.63 | 15.05 | 13.95 | 85.90 | 7.74 | 26.62 |
| Primary branches/plant | 3.40 - 6.27 | 4.57 ± 0.46 | 13.44 | 8.78 | 42.74 | 0.54 | 11.83 |
| No. of mature pods/plant | 5.33 - 20.87 | 9.74 ± 0.66 | 42.89 | 42.33 | 97.44 | 8.39 | 86.08 |
| No. of immature pods/plant | 3.40 - 6.20 | 4.82 ± 0.46 | 17.50 | 14.63 | 69.92 | 1.21 | 25.20 |
| 100-pod weight (g) | 62.10 - 128.75 | 94.97 ± 6.59 | 18.68 | 17.31 | 85.92 | 31.40 | 33.06 |
| 100-kernel weight (g) | 27.35 - 65.55 | 46.71 ± 2.74 | 20.99 | 20.14 | 92.04 | 18.59 | 39.80 |
| Shelling out-turn (%) | 48.48 - 89.04 | 70.62 ± 5.27 | 10.58 | 12.48 | 73.32 | 15.55 | 22.02 |
| Oil content (%) | 42.01 - 52.39 | 47.35 ± 1.55 | 4.28 | 2.73 | 40.55 | 1.69 | 3.58 |
| Protein content (%) | 23.89 - 32.04 | 28.65 ± 1.03 | 40.60 | 39.38 | 71.77 | 2.91 | 10.14 |
| Kernel yield/plant (g) | 3.13 - 13.55 | 6.06 ± 0.59 | 33.37 | 32.55 | 94.06 | 4.77 | 78.67 |
| Pod yield/ plant (g) | 4.48 - 15.68 | 8.55 ± 0.62 | 6.86 | 5.81 | 95.16 | 5.59 | 65.41 |
| Biological yield/plant (g) | 10.08 - 28.31 | 15.67 ± 1.29 | 22.62 | 21.03 | 86.43 | 6.31 | 40.27 |
| Harvest index (%) | 28.87 - 85.75 | 55.66 ± 5.33 | 27.61 | 25.86 | 87.72 | 27.78 | 49.90 |

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. High phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were recorded for number of mature pods per plant, protein content, kernel yield per plant, biological yield per plant and harvest index. These finding are in accordance with reports of John *et al.* (2008) and Khote *et al*. (2009) for kernel yield per plant, Khote *et al*. (2009) for biological yield per plant and Kadam *et al*. (2007) and Khote *et al*. (2009) for harvest index in groundnut. The PCV and GCV estimates were moderate for plant height, number of immature pods per plant, 100-pod weight and 100-kernel weight. Similar results were also reported by John *et al*. (2008). Low GCV and PCV values obtained in the present study for days to maturity, oil content, days to 50% flowering and pod yield per plant are in accordance with the results of and John *et al*. (2008). The high magnitude of GCV further revealed greater extent of variability present in these characters, thereby suggesting good scope for improvement through selection. Low values of genotypic variation indicated the need to create variability either by hybridization or mutation followed by selection.

High heritability estimates have been reported for number of mature pods per plant followed by pod yield per plant, kernel yield per plant, days to first flower, 100-kernel weight and days to 50% flowering. Similarly high estimates of heritability were observed by Savalia *et al*. (2005) for number of pods per plant and pod yield per plant. Khote *et al*. (2009) recorded high heritability for days to flowering. Whereas, harvest index, biological yield per plant, 100-pod weight, plant height, shelling out-turn, days to maturity and protein content showed moderate heritability estimates indicating substantial influence of environment on these characters.

High estimates of heritability coupled with high genetic advance expressed as percentage of mean was observed for number of mature pods per plants, kernel yield per plant and pod 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 influenced by the environment changes and hence improvement in these traits would be more effective through the selection owing to their additive gene effects. These results are akin to the findings of Jhon *et al*. (2009). High heritability with moderate or low genetic advance observed for days to first flower, days to 50 % flowering, days to maturity, number of immature pods per plant, protein content, kernel

yield per plant and biological yield per plant 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.

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