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Research article

GENETIC VARIABILITY STUDIES IN DIFFERENT ADVANCED BREEDING GENOTYPES OF SPANISH BUNCH GROUNDNUT (*ARACHIS HYPOGEAE*)

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ABSTRACT: Significant differences were observed among thirty seven genotypes for all the traits studied. High genetic coefficient of variation was recorded for days to 50 per cent flowering. High heritability of 97.33 per cent was observed for pod yield per plant. High heritability and high genetic advance as percent of mean was recorded for plant height, haulms yield per plant, pod yield per plant and kernel yield per plant. These characters could be further improved through single plant selection. Moderate heritability and high Genetic advance as per cent of mean was observed for number of primary branches per plant, number of secondary branches per plant, number of mature pods per plant and 100 pod weight indicating the importance of both additive and non additive gene action in the inheritance of these characters.
Key words: Genetic variability, genotypes, bredding, Spanish bunch groundnut

INTRODUCTION

Groundnut is an important oil seed crop in India. Groundnut seed contains 25 % highly assumable protein. The basic key to bring about the genetic upgrading to a crop is to utilize the available genetic variability. The variability in the population is largely due to genetic cause with least environment effect, the possibility of selecting superior genotype is a pre-requisite for obtaining higher yield, which is ultimate expression of various yield contributing characters. Therefore, direct selection for yield could be misleading (Islam and Rasul 1998). It is difficult to judge what proportion of observed variability is heritable and non heritable i.e., environmental. The process of breeding in such population is primarily conditioned by magnitude and nature of interactions of genotypic and environmental variations in plant characters. It is important to partition the observed variability into its heritable and non-heritable components and to have an understanding of parameters like genetic coefficient of variation, heritability and genetic advance. This study was undertaken to estimate variability for pod yield and its contributing traits in advanced breeding lines of groundnut covering heritability and genetic advance for yield and yield attributes so that it would be possible to establish suitable selection criteria for higher pod yield.

MATERIALS AND METHODS

The experiment was conducted during *rabi* 2011-12 with thirty seven advanced breeding lines with three replications and adopted a spacing of 22.5 cm between rows and 10 cm plant to plant within a row at Regional Agricultural Research Station, Tirupati, Andhra Pradesh, India. Each plot consisted of 7 rows of 5mt length and observations were recorded on five randomly selected plants from each genotype per replication. Fertilizers were applied as per recommendation. Observations were recorded for days to 50 percent flowering, plant height, number of primary branches per plant, secondary branches per plant, number of mature pods per plant, number of immature pods per plant, 100 pod weight (g), shelling per cent, 100 kernel weight (g), sound mature kernel per cent, haulms yield per plant (g), pod yield per plant (g), kernel yield per plant (g) and stem rot incidence (%).
The coefficient of variability was calculated by formula suggested by Burton 1952. Heritability in broad sense and genetic advance were estimated by following formula developed by Allard (1960).

RESULT AND DISCUSSION

Analysis of variance showed highly significant variation among the genotypes for all the traits (Table -1). These results were confirmed with the finds of Nath and Alam (2002) who found highly significant variation among the genotypes for days to 50 percent flowering, plant height, pods per plant, 100 kernel weight, shelling per cent and pod yield per plant.

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The phenotypic coefficient of variation was slightly higher than genotypic coefficient of variation for all the traits (Table -2) indicating lower environmental effect for the traits. The highest genotypic coefficient of variation was observed for days to 50 percent flowering (455.87 %) followed by pod yield per plant (46.67 %), stem rot incidence (36.51 %), number of immature pods per plant (35.80 %) and number of secondary branches per plant (35.75 %).

Table 1: Analysis of variance (ANOVA) for design of experiment for yield and yield attributes in advanced breeding genotypes of groundnut

S. No.	Character	Genotype df : 36	Mean sum of squares df:2	Error df:72	F-Value
1	Days to 50 % flowering	18.72	6.23	0.54	34.66**
2	Plant height (cm)	86.06	44.23	8.75	9.83**
3	Number of primary branches per plant	3.43	0.17	0.85	4.05**
4	Number of secondary branches per plant	4.52	1.30	1.07	4.24**
5	Number of mature pods per plant	55.57	85.82	12.51	4.44**
6	Number of immature pods per plant	7.49	0.24	1.93	3.88**
7	100 - pod weight (g)	1027.52	81.69	212.21	4.84**
8	Shelling per cent	44.32	4.65	18.42	2.41**
9	100- kernel weight (g)	148.33	41.95	36.68	4.04**
10	Sound mature kernel per cent	173.75	44.62	26.79	6.49**
11	Haulms yield per plant (g)	93.02	0.35	1.36	68.21**
12	Pod yield per plant (g)	45.99	0.32	1.25	36.83**
13	Kernel yield per plant (g)	19.79	0.34	0.71	27.79**
14	Stem rot incidence (%)	131.55	25.41	63.54	2.07**

Table 2: Variability for yield and yield attributes in advanced breeding genotypes of groundnut

S. No.	Character	Mean	Range	Variance		Coefficient of Variance		Heritability in broad sense	Genetic advance	Genetic advance as per cent of mean
				Genotypic	Phenotypic	Genotypic	Phenotypic			
1	Days to 50 % flowering	34.58	28.00 - 37.00	6.06	6.6	455.87	475.75	91.8	4.86	14.05
2	Plant height (cm)	27.25	18.00 - 37.33	83.14	91.89	33.46	35.18	90.48	17.78	65.25
3	Number of primary branches per plant	5.05	3.67 – 8.33	0.86	1.71	18.36	25.89	50.29	4.05	80.20
4	Number of secondary branches per plant	3.00	1.33 – 6.33	1.15	2.22	35.75	49.67	51.80	1.57	52.33
5	Number of mature pods per plant	14.66	6.67 – 24.00	14.35	26.86	25.82	35.33	53.43	5.66	38.58
6	Number of immature pods per plant	3.81	2.33 – 10.00	1.86	3.76	35.80	50.89	49.47	1.96	51.44
7	100 - pod weight (g)	110.44	80.67–149.67	271.60	483.81	14.92	19.92	56.14	25.33	22.94
8	Shelling per cent	65.86	56.00 – 74.33	38.18	56.6	10.11	11.42	67.46	10.35	15.71
9	100- kernel weight (g)	46.89	34.33 – 59.67	37.22	73.9	13.01	18.33	50.37	8.86	18.90
10	Sound mature kernel per cent	80.03	60.67 – 94.33	48.99	75.78	8.75	10.88	64.65	11.47	14.33
11	Haulms yield per plant (g)	15.88	6.77 – 35.53	30.55	31.91	34.81	35.72	95.7	11.06	69.65
12	Pod yield per plant (g)	14.53	7.30 -25.20	45.57	46.82	46.67	47.09	97.33	13.67	94.08
13	Kernel yield per plant (g)	9.55	4.80 – 15.57	6.36	7.07	26.41	27.84	89.96	4.88	51.10
14	Stem rot incidence (%)	13.04	4.33 – 29.33	22.67	86.21	36.51	71.20	26.30	4.97	38.11

Low genotypic coefficient of variation was observed for sound mature kernel percent (8.75 %). High heritability values were observed for days to 50 percent flowering, plant height, shelling per cent, sound mature kernel per cent, haulms yield per plant, pod yield per plant and kernel yield per plant. The estimation of heritability was high which suggested that larger portion of variation for this character in the material was not due to environmental factors. Moderate heritability values were recorded for number of primary branches per plant, number of secondary branches per plant, number of immature pods per plant and 100 pod weight.

High genetic advance as per cent of mean were recorded for plant height, number of primary branches per plant, number of secondary branches per plant, number of mature pods per plant, number of immature pods per plant and 100 pod weight, haulms yield per plant, pod yield per plant, kernel yield per plant and stem rot incidence. Moderate genetic advance as per cent of mean were observed for days to 50 percent flowering, shelling per cent, 100 kernel weight and sound mature kernel per cent. High heritability (>60%) high genetic advance as percent of mean (>20%) were showed by the traits plant height, haulms yield per plant, kernel per plant and stem rot incidence. The genotypes were found genetically different from each other which are similar with the finding of Naazar *et al* (2000), Singh and Singh (1999) and John *et al* (2006), Kadam *et al* (2007) and Khote *et al* (2009) for plant height and pod yield per plant. The highly heritable characters with high genetic advance as percent of mean could be further improved through individual plant selection. High heritability and moderate genetic advance as per cent of mean were observed for days to 50 percent flowering, shelling per cent and sound mature kernel per cent. High heritability coupled with moderate genetic advance earlier reported by Venkataramana (2001) and John *et al* (2005) suggested that the heritability and genetic advance when calculated together would be more useful in predicting the resultant effect of section. Moderate heritability and high genetic advance as percent of mean was observed for number of primary branches per plant, number of secondary branches per plant, number of mature pods per plant, number of immature pods per plant and 100 pod weight also indicated limited scope for the improvement through individual plant selection.

In the present study, it can be concluded that high genetic advance was not always associated with high heritability for the characters studied. In that situation, variation in base population should be taken into consideration rather than heritability alone for isolating superior types. Thus, results clearly suggested that the chances for improvement in 100 pod weight, shelling out-turn, sound mature kernel per cent, haulms yield per plant and pod yield per plant would be fairly high as magnitude of genotypic coefficient of variation for their characters indicating the presence of wide spectrum of genetic variation suggesting that they merit maximum emphasis in selection for improvement of pod yield in groundnut.

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