

Original Research Article

Character Association and Variability Studies of Yield and Its Attributing Character in Groundnut (*Arachis hypogaea* L.)

P. B. Wadikar, A. D. Dake*, M. V. Chavan and G. S. Thorat

Department of Agricultural Botany, College of Agriculture, Latur, Vasanttrao Naik Marathwada
Krishi Vidyapeeth, Parbhani 431 402 (M.S.), India

*Corresponding author

ABSTRACT

Forty diverse genotype of groundnut were raised to measure genetic variability and character association for viz., Days to 50 percent flowering, Days to maturity, Plant height (cm), No. of primary branches per plant, Shelling percentage (%), Strong Mature Kernel (%), Test weight (g), Harvest Index (%), Oil content (%), No. of seeds per pod, No. of pods per plant, Kernel yield per plant (g), Pod Yield Per plant(g) at Oilseeds research station, latur. It is essential to know the association and variability among yield and yield related traits in the material generated for effectual selection. Analysis of variances recorded significant differences among genotypes for all the characters indicating the presence of considerable amount of variability. Higher PCV and GCV values observed for kernel yield per plant followed by pod yield per plant, no. of pods per plant indicating good amount of variation for these characters. High heritability coupled with high genetic advance as per cent of mean has been noticed for kernel yield per plant, no. of pods per plant, pod yield per plant. The character association studies indicated that the highly significant positive association kernel yield per plant followed by harvest index, no. of pod per plant and test weight with pod yield at both genotypic and phenotypic level.

Keywords

Character association,
Groundnut,
GCV,
Heritability,
PCV, Pod
yield

Introduction

Groundnut (*Arachis hypogaea* L.) is one of the most important legume crops of the world which is native to Brazil in the South American leguminous oilseed (Hammons 1982). It is cultivated for cheap source of vegetable oil, good quality feedstuff, improvement of soil health through nitrogen fixation as well as a source of fuel for the rural population. Besides, it is consumed and utilized in diverse way due to its nutritional and medicinal value (Bhargavi *et al.*, 2016). In India, the plant was introduced by the Portuguese in 16th century as an oilseed crop for commercial cultivation. The composition of peanut kernel is oil 47.5%, protein 28.5%,

crude fiber 2.8%, and total carbohydrates 13.3%. The groundnut is a good source of all vitamins B except B₁₂. Groundnut is mostly cultivated under rainfed condition in India. Groundnut is grown in 22.2 m. ha in more than 100 countries in the world with a total production of 34.5 M. t. and an average productivity of 1.55 t/ha. India share 23 percent of the world's groundnut area and production. In India, it is grown over in area of 6.40 million hectares with total production of 6.25 million tones. The average yield of groundnut in India has 980 kg ha⁻¹. Breeding high yielding varieties of crop require information on the nature and

magnitude of variation in the available materials, association of the character with yield and among themselves. Pod yield is a complex character, which is largely influenced by environmental and hence a low heritability. Plant Breeders are seldom interested in one character and therefore, there is the need to examine the relationships among various character's especially between pod yield and other characters. Hence for improving selection and yield levels in groundnut study of genetic variability, heritable variation and character association has carried out.

Materials and Methods

A field experiment was conducted at Oilseeds Research Station, Latur with 40 groundnut genotypes in Randomized Block Design with two replications under rainfed condition. The sowing was carried out at the spacing of 45 cm and 15 cm between the rows and plant, respectively with dibbling as a method of sowing. Recommended all agronomic practices were followed to raise a healthy crop.

The following observations of 13 different quantitative characters were recorded with five selected plants from each genotypes for both the replications for pod yield and yield contributing characters *viz.*, Days to 50 percent flowering, Days to maturity, Plant height, No. of primary branches per plant, Shelling percentage (%), Strong Mature Kernel (%), Test weight (g), Harvest Index (%), Oil content (%), No. of seeds per pod, No. of pods per plant, Kernel yield per plant (g), Pod Yield Per plant(g). The observations obtained in respect of above characters were subjected to analysis of variance and calculation of variability components. The analysis was based on the model suggested by Cochran and Cox (1957) and the phenotypic and genotypic components of variances based on analysis

of variance were estimated by using the following relation (Johnson *et al.*, 1955).

Results and Discussion

Analysis of variances recorded significant differences among genotypes for all the characters indicating the presence of considerable amount of variability. The genotypic and phenotypic variances were calculated using respective mean square values from the variance table. There was a closer correspondence between GCV and PCV (Table 1) for all the traits except harvest index indicated that most of the characters were largely under genetic control. The PCV values were greater than GCV for all the characters such similar findings by Ladole *et al.*, (2009). Higher GCV and PCV values observed for kernel yield per plant (36.06 and 37.70) followed by pod yield per plant (31.18 and 32.65), no. of pods per plant (30.74 and 31.46) and test weight (25.10 and 25.15) indicating good amount of variation for these characters. These results are confirmative with the findings of John *et al.*, (2007) for kernel yield per plant and pod yield per plant, Mahalaxmi *et al.*, (2005) for no. of pods per plant and John *et al.*, (2005) for test weight. Heritability estimates provides information about the variation attributes due to additive genetic effect and the phenotype strongly reflects the genotype. In the present study most of the characters recorded high heritability indicating that these characters were less influenced by environment. High heritability coupled with high genetic advance as per cent of mean has been noticed for kernel yield per plant (71.10), no. of pods per plant (61.90), pod yield per plant (61.38) indicated the presence of lesser environmental influence and prevalence of additive gene action in their expression and suggesting the distinct possibility of improving these traits through selection would be effective.

Table.1 Parameters of Genetic variability for yield and yield contributing characters in groundnut

Sr. No.	Parameters	Range	Mean	Genotypic Variance	Phenotypic Variance	GCV (%)	PCV (%)	Heritability (B.S.) %	Genetic Advance	Genetic Advance as % of mean
1.	Days to 50 % Flowering	39.50 - 29.50	33.75	6.63	6.68	7.63	7.66	99.3	5.28	15.64
2.	Days to Maturity	113.50 - 100.50	105.74	8.51	9.39	2.76	2.90	90.7	5.72	5.41
3.	Plant Height (cm)	46.40 - 19.88	29.90	46.32	55.21	22.76	24.85	83.9	12.84	42.94
4.	No. of Primary Branches / Plant	9.83 - 3.82	6.01	1.58	1.60	20.90	21.03	98.8	2.57	42.77
5.	Shelling (%)	79.32 - 47.46	66.78	41.36	43.62	9.63	9.89	94.8	12.9	19.32
6.	Sound Mature Kernel (%)	93.94 - 17.12	75.46	189.10	192.09	18.22	18.37	98.4	28.11	37.25
7.	Test Weight (g)	74.23- 23.90	44.76	126.25	126.72	25.10	25.15	99.6	23.1	51.61
8.	Harvest Index (%)	43.54 - 26.50	35.98	11.27	24.26	3.33	13.69	46.5	4.71	13.09
9.	Oil Percent (%)	48.40 - 41.55	46.10	2.75	2.85	3.60	3.66	96.5	3.35	7.27
10.	No. of Seed /Pod	2.35 - 1.55	1.91	0.02	0.02	7.27	7.55	92.7	0.28	14.64
11.	No. of Pods / Plant	24.18 - 7.17	15.88	23.83	24.95	30.74	31.46	95.5	9.83	61.90
12.	Kernel yield per Plan (g)	20.17 - 5.28	10.01	13.04	14.25	36.06	37.70	91.5	7.12	71.10
13.	Pod Yield / Plant (g)	24.87 - 6.91	16.18	25.45	27.90	31.18	32.65	91.2	9.93	61.38

Table.2 Estimates of Genotypic and Phenotypic correlation coefficient among pod yield and yield Contributing characters in groundnut

Sr. no.	Parameters		Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	No. of Primary Branches / Plant	Shelling (%)	Sound Mature Kernel (%)	Test Weight (gm)	Harvest Index (%)	Oil Percent (%)	No. of Seeds / Pod	No. of Pods / Plant	Kernel yield per Plant (gm)	Pod Yield / Plant (gm)
1	Days to 50 % Flowering	G	1.00	0.096	0.008	0.181	0.494**	-0.187	-0.202	-0.257*	0.169	-0.215	-0.199	-0.004	-0.141
		P	1.00	0.122	0.009	0.182	0.489**	-0.178	-0.186	-0.148	0.154	-0.168	-0.165	0.015	-0.110
2	Days to Maturity	G		1.00	0.288*	0.230*	-0.045	-0.295**	0.216	0.381**	-0.096	0.179	0.048	0.277*	0.207
		P		1.00	0.279*	0.222	-0.007	-0.274*	0.213	0.251*	-0.097	0.182	0.093	0.303**	0.235*
3	Plant Height (cm)	G			1.00	-0.317**	0.077	-0.105	-0.150	0.124	0.111	0.138	-0.058	-0.077	-0.033
		P			1.00	-0.284*	0.102	-0.081	-0.135	-0.021	0.086	0.082	-0.053	-0.050	-0.042
4	No. of Primary Branches / Plant	G				1.00	-0.182	0.151	0.178	-0.222	-0.232*	0.026	-0.110	-0.166	-0.045
		P				1.00	-0.169	0.150	0.178	-0.134	-0.226*	0.034	-0.099	-0.150	-0.029
5	Shelling (%)	G					1.00	0.051	-0.160	0.047	0.387**	-0.105	-0.097	0.122	0.081
		P						1.00	0.062	-0.147	0.054	0.362**	-0.070	-0.071	0.151
6	Sound Mature Kernel (%)	G						1.00	0.146	0.067	0.261*	0.009	0.136	0.055	0.141
		P						1.00	0.148	0.049	0.254*	0.013	0.129	0.054	0.140
7	Test Weight (g)	G							1.00	0.436**	-0.209	0.031	-0.278*	0.297**	0.394**
		P							1.00	0.300**	-0.204	0.040	-0.260*	0.289*	0.377**
8	Harvest Index (%)	G								1.00	-0.152	0.240*	0.542**	1.023	0.627**
		P								1.00	-0.117	0.206	0.371**	0.710**	0.497**
9	Oil Percent (%)	G									1.00	-0.428**	-0.029	0.021	0.152
		P									1.00	-0.402**	-0.020	0.019	0.150
10	No. of Seeds / Pod	G										1.00	0.311**	0.157	0.229*
		P										1.00	0.306**	0.161	0.238*
11	No. of Pods / Plant	G											1.00	0.601**	0.481**
		P											1.00	0.609**	0.489**
12	Kernel yield per Plant (g)	G												1.00	0.751**
		P												1.00	0.746**
13	Pod Yield / Plant (g)	G													1.00
		P													

*at 5% level of significance

** at 1 % level of significance.

These results are in accordance with earlier reports of John *et al.*, (2005) and Sawargaonkar *et al.*, (2010) for kernel yield per plant and pod yield per plant. High heritability with moderate genetic advance as per cent of mean was observed for test weight, plant height No. of primary branches per plant, Strong mature kernel (%). High heritability with low genetic advance as per cent of mean for shelling percentage (19.32) followed by days to 50 per cent flowering (15.64), No. of seed per pod (14.64), harvest index (13.09), oil content (7.27) with least value in days to maturity (5.41) indicated the need to create variability either by hybridization or mutation followed by selection. Similar finding for oil per cent with high heritability with low genetic advance as per cent of mean was observed by Varman and Raveendran (1996).

In the present study, the genotypic and phenotypic correlation coefficients obtained from forty genotypes for thirteen yield component characters (Table 2) are discussed as below. The genotypic correlation coefficients were higher than the phenotypic correlation coefficients suggesting strong inherent association among the character studied. The pod yield per plant exhibited positive and highly significant association with kernel yield per plant followed by harvest index, No. of pod per plant and test weight. Similar kind of association were reported by John *et al.*, (2005), John *et al.*, (2007) and Kadam *et al.*, (2009) for kernel yield, Kadam *et al.*, (2009) and John *et al.*, (2008) for harvest index, Sharma and Dashora (2009) and Kadam *et al.*, (2009) for no. of pods per plant. While positive and significant association of pod yield per plant was observed with only one parameter *i.e.* number of seeds per pod at both genotypic and phenotypic level. Hence, these characters kernel yield per plant, harvest

index, no. of pod per plant, test weight and number of seeds per pod could be given due emphasis in formulating selection criterion for improvement of yield in groundnut.

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