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Genetic Variability Study of Yield and Yield Related Traits in Spanish Bunch Groundnut

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Abstract

In the present investigation, conducted during *Kharif,* 2023 at Instructional Farm College of Technology and Engineering, MPUAT, Udaipur. The experimental material consisted of 35 genotypes including 3 checks, evaluated under Randomized Block Design with three replications. Analysis of variance indicated that the mean sum of square due to genotypes was found significant for all of the characters under this investigation showing that there is enough variability among genotypes for different traits. The estimates of Phenotypic Coefficient of Variation (PCV) were little higher than their corresponding Genotypic Coefficient of Variation (GCV) pointing out that the environment had minor effect on the expression of the different traits. Higher estimates for GCV and PCV were revealed for dry pod yield per plant followed by pods per plant, harvest index, number of branches per plant and biological yield per plant.Thecharacters had high heritability along with high genetic gain were dry pod yield per plant,harvest index, pods per plant, number of branches per plant and plant height.

Key words : *Genetic variability, GCV, PCV heritability and genetic gain.*

Introduction

Groundnut is an essential oilseed legume primarily cultivated in Asia, Africa and America and it is easily cultivated in semi-arid tropics. In India, it is considered as “king of oilseeds.” Groundnut was originated from Brazil and it was popularly known as peanut in America and it is well known as Mungphali in India. Groundnut, being an oilseed crop, contains 40 to 53 per cent oil and 24 to 36 per cent protein content in kernels. Also, groundnut is a good source of calcium, phosphorus, iron, zinc and boron. Groundnuts also contain vitamin E and small amounts of the vitamin B complex

In India the area of groundnut cultivation during 2022-2023 is 49.61 lakh ha with a production of 102.97 lakh tonnes and productivity is 2075 kg/ha (Anonymous, 2023). In India, groundnut cultivation is mostly confined to the southern states *viz.*, Gujarat, Karnataka, Andhra Pradesh, Tamil Nadu and Maharashtra. Some other important groundnut growing states are Madhya Pradesh, Rajasthan, Uttar Pradesh and Punjab. In Rajasthan, the area of groundnut cultivation during 2022-2023 is 8.05 lakh ha with a production of 19.32 lakh tonnes and productivity is 2400 kg/ha (1).

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 (2). 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. GCV, PCV, heritability, genetic advance, genetic gain (3).

Materials and Methods

The experimental material consisted of 35 genotypes including 3 checks, evaluated under Randomized Block Design with three replications. Two rows per genotype were sown in a plotof 5.0 mx0.60 m with inter and intra row spacing 30x10 cm and 5m row length. All the recommended package of practices were followed to raise a good and healthy crop. The observations were recorded on five randomly selected competitive plants for characters, *viz.,* number of branches per plant, plant height, pods per plant, shelling percentage (%), 100-kernels weight (g), sound mature kernel (%), dry pod yield per plant (g), biological yield per plant (g), harvest index (%), oil content (%) and protein content (%) whereas observations for kernels per pod were taken from five randomly selected pods from each of the five randomly selected plants and plot-based observations for days to 50 per cent flowering and days to maturity were taken. The analysis of variance was worked out separately for each character as per the method suggested by (4) in order to test the difference among the genotypes. The coefficient of genotypic and phenotypic variation was calculated by using the formula suggested by (5). Estimates of heritability (bs) was calculated as per the formula suggested by (6). Genetic advance and genetic gain was computed as per the formula described by (7).

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Table-1 : Variability parameters for various characters in groundnut.

Sl. No.	Characters	Range	Mean	GCV (%)	PCV (%)	h^2 (%)	GA	GG (%)
1.	Days to 50% flowering	29.06-36.06	32.76	4.40	5.83	56.85	2.24	6.83
2.	Days of maturity	101.09-111.44	107.20	1.93	3.68	27.56	2.24	2.09
3.	Plant height (cm)	15.21-34.29	23.54	19.17	19.84	93.34	8.98	38.15
4.	No. of branches per plant	5.23-12.53	7.94	21.40	22.41	91.16	3.34	42.09
5.	Pods per plant	7.4-18.04	12.52	23.49	24.93	88.81	5.71	45.60
6.	Shelling percentage	65.4-75.4	71.64	2.86	3.60	62.76	3.34	4.66
7.	100-Kernel weight (g)	31.62-47.44	40.30	10.98	12.50	77.08	8.00	19.85
8.	Sound mature kernel (%)	78.72-91.16	86.15	3.03	5.74	27.93	2.84	3.30
9.	Dry pod yield per plant(g)	6.07-18.06	11.38	27.14	29.39	85.29	5.88	51.63
10.	Biological yield per plant (g)	13.52-37.46	26.89	20.87	23.88	76.42	10.10	37.58
11.	Harvest index (%)	28.01-60.55	43.15	23.49	24.56	91.50	19.97	46.29
12.	Oil content (%)	40.85-49.55	43.87	4.93	5.49	80.57	4.00	9.11
13.	Protein content (%)	19-24.58	22.04	6.86	7.36	86.81	2.90	13.16

Results and Discussion

The analysis of variance for fourteen characters revealed the genotypes showed highly significant differences for all the traits under study *viz.,* days to 50 per cent flowering, days to maturity, plant height (cm), number of branches per plant, pods per plant, shelling percentage (%), 100-kernels weight (g), sound mature kernel (%), dry pod yield per plant (g), biological yield per plant (g), harvest index (%), oil content (%) and protein content (%). Selection of these characters is useful for groundnut improvement programme. Similar finding for such yield related traits have been reported by (8, 9).

The parameters of genetic variability *viz.*, mean, range, phenotypic and genotypic coefficient of variation (%), heritability (%) in broad sense, genetic advance and genetic advance as per cent of mean (genetic gain) for each trait are presented in Table-1. In this study, the phenotypic coefficient of variation (PCV) is slightly higher than the genotypic coefficient of variation (GCV) for most of the traits indicating little effect of environmental variations on the characters. The magnitude of the highest genotypic coefficient of variation was recorded for dry pod yield per plant (27.14 %) followed by pods per plant (23.49) and harvest index (23.49 %), plant height (21.10 %) and biological yield per plant (20.87 %). High values of the genotypic coefficient of variation for most characters demonstrated the presence of substantial levels of genetic variability. The moderate values (10-20%) for GCV was found for number of branches per plant (19.17 %) and 100 kernel weight (10.98 %). The value of GCV was low (<10%) for days to maturity (1.51%), shelling per cent (2.86 %), Sound mature kernel (3.03 %), days to 50 per cent flowering (4.40 %), oil content (4.93 %) and protein content (6.86%). Similar results have also been reported (10, 11, 12).

The magnitude of the highest phenotypic coefficient of variation was recorded for dry pod yield per plant (29.96 %) followed by pods per plant (24.93 %), harvest index (24.56 %), biological yield per plant (23.88 %) and plant height (22.41 %). High values of the phenotypic coefficient of variation for most characters demonstrated the presence of substantial levels of genetic variability. The moderate values (10-20%) for PCV was found for number of branches per plant (19.84 %) and 100 kernel weight (12.50 %). The value of GCV was low (<10%) for shelling per cent (3.60 %), days to maturity (3.68 %), oil content (5.49 %), sound mature kernel (5.74 %), days to 50 per cent flowering (5.83 %) and protein content (7.36 %) (10, 12).

Broad sense heritability was estimated for all the traits under study. Presence of high heritability is an important aspect for choosing the suitable trait for selection. The characters under investigation exhibited High value of heritability (>60%) were recorded for number of branches per plant (93.34 %), harvest index (91.50 %), plant height (91.16 %), pods per plant (88.81 %), protein content (86.81 %), sound mature kernel (85.29 %), oil content (80.57 %), 100-kernels weight (77.08), biological yield per plant (76.42) and shelling per cent (62.76%). Highest value of heritability was found for number of branches per plant (93.34 %) while the lowest value of heritability was found for days to maturity (27.56). Moderate values for heritability were found for days to 50 per cent flowering (56.85) and the low values of heritability was observed for days to maturity (27.56 %) and dry pod yield per plant (27.93 %). These finding were like (13).

Highest value for genetic advance was observed for harvest index (19.97) followed by biological yield per plant (10.10) and number of branches per plant (8.98). Low values (<10) for genetic advance was found for all the characters except harvest index (19.97) followed by biological yield per plant (10.10). Similar findings were reported by (10, 11).

The estimates of genetic advance are expressed as percentage of mean*i.e.* Genetic gain was found high for dry pod yield per plant (51.63 %), harvest index (46.29 %), pods per cent (45.60 %), number of branches per plant (42.09 %), plant height (38.05 %) and biological yield per plant (37.58 %). The characters showed low values (<10 %) for genetic gain were oil content (9.11 %), days to 50 per cent flowering (6.83 %), shelling per cent (4.66 %), sound mature kernel (3.30 %), and days to maturity (2.09 %). For the remaining characters *viz*., 100-kernels weight (19.85 %) and protein content (13.16 %) showed moderate vales for heritability. (11, 14) were also observed the similar results.

Conclusion

Analysis of variance indicated that there is a presence of huge amount of variability among the materials under study. The estimated values of Phenotypic Coefficient of Variation (PCV) were in general little higher than their corresponding Genotypic Coefficient of Variation (GCV) pointing out that the environment had minor effect on the expression of the different traits. High heritability coupled with high genetic gain was observed for the traits likedry pod yield per plant, harvest index, number of pods per plant,number of branches per plant, plant height and biological yield per plant. Indicating that all these traits are regulated by additive gene action and the direct selection of these traits are expected to show genetic improvement in spanish bunch groundnut.

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