Variability Studies in Bunch and Spreading Types of Groundnut at High and Low Fertility Levels

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Groundnut, *Arachis hypogaea* (L.) is an important source of edible oil and is also rich in protein. The oil percentage and yield of groundnut have reached a plateau so there is urgent need to study genotypic coefficient of variation along with heritability estimate to get the information on genetic advance through selection. The present study was theretore undertaken to findout variability, heritability and genetic advance under high and low tertility levels in bunch and spreading groundnut with respect to yield and its component in the existing germplasm.

Fifteen varieties each of the spreading and bunch groundnut types were sown with two experiments under high (25 kg N & 50 kg P_2O_5/ha) and low (12.5 kg N & 25 kg P_2O_5/ha) fertility levels were laid out separately in randomised complete block design with three replications in the *kharif* season of July, 1983 at Main Oilseeds Research Station, Gujarat Agricultural University, Junagadh. Each plot consisted of single row of 5 m in length. The crop was raised with all recommended agronomical practices. Observations were recorded on 10 randomly selected plants as mentioned in tables.

The value of range showed considerable amount of variation for most of the traits due to the application of higher dose ot fertilizer. The characters like height of main axis, number of primary branches, number of pegs, number of pods, number of mature pods, days to maturity and pod yield showed moderately high phenotypic range under high fertility level in both groups, while 100 kernel weight showed high phenotypic range in bunch group (Table-1). Similar results have also been reported by Dixit *et al.* (1970) and Chauhan and Shukla (1985).

The genotypic variances was more or less equal to phenotypic variances for all the traits under high fertility level in both groups which indicated that improvement in these traits can be easily brought by phenotypic selection under high fertility. While high estimates of genotypic variances over error variances indicated that variation due to genetic causes was higher than due to non-genetic factors. In the present study high genotypic co-efficient of variation was observed for pod yield, number of primary branches, number of pegs, number of pods and height of main exis under high fertility level as compared to low fertility level in both groups indicated high degree of genotypic variability in

TABLE 1

Phenotypic range, overall mean with standard error, Genotypic (6^2_g), Phenotypic (5^2_p) and Error (6^2_e) variances of twelve characters for bunch (B) and spreading (S) types of groundnut under high (H) and low (L) fertility levels (FL).

Character	F.L.	Phenotypic range		Mean ± S. Em.		Variance components					
						6^2_g		6^2_p		6^2_e	
		B	S	B	S	B	S	B	S	B	S
1. Pod yield (g) per plant	H	4.42 - 9.15	7.40 - 14.22	6.56 ± 0.405	9.82 ± 0.811	1.739	4.037	2.231	6.012	0.492	1.975
	L	5.25 - 8.25	6.32 - 11.15	6.68 ± 0.357	8.22 ± 0.610	0.733	2.188	1.073	3.294	0.340	1.106
2. Days to 50% flowering	H	26.00 - 30.00	32.67 - 36.67	27.73 ± 0.440	34.78 ± 0.628	1.100	1.270	1.680	2.454	0.580	1.184
	L	27.33 - 31.33	33.00 - 37.00	28.87 ± 0.452	35.13 ± 0.664	1.173	1.162	1.787	2.476	0.616	1.314
3. Height of main axis (cm)	H	20.40 - 30.20	25.44 - 46.55	25.33 ± 0.633	30.23 ± 0.987	8.933	30.730	10.133	33.650	1.200	2.920
	L	20.40 - 28.85	25.30 - 43.12	24.65 ± 0.552	29.45 ± 0.826	5.653	24.069	6.566	26.114	0.913	2.045
4. Number of primary branches/plant	H	3.40 - 6.75	3.85 - 7.57	5.01 ± 0.430	5.61 ± 0.529	0.911	1.094	1.458	1.933	0.547	0.839
	L	3.72 - 6.10	3.20 - 6.68	4.80 ± 0.300	5.30 ± 0.436	0.300	0.692	0.570	1.262	0.270	0.570
5. Number of secondary branches/plant	H	1.50 - 3.50	4.10 - 12.55	2.24 ± 0.223	8.25 ± 0.543	0.370	5.287	0.520	6.172	0.149	0.885
	L	0.50 - 3.40	4.94 - 13.44	2.12 ± 0.212	8.01 ± 0.474	0.440	4.183	0.570	4.856	0.133	0.673
6. Number of pegs/plant	H	13.45 - 27.28	17.60 - 31.63	21.80 ± 0.976	25.46 ± 0.997	15.787	15.410	18.644	18.390	2.857	2.980
	L	12.88 - 24.37	18.56 - 27.47	20.65 ± 0.800	23.70 ± 1.367	9.059	6.550	10.976	12.154	1.917	5.604
7. Number of pods/plant	H	7.45 - 14.25	9.45 - 19.75	11.65 ± 0.681	14.16 ± 1.056	3.335	7.613	4.726	10.959	1.391	3.346
	L	7.15 - 14.75	9.20 - 16.34	11.40 ± 0.749	12.20 ± 1.079	2.810	4.630	4.492	8.123	1.682	3.493

Character	F.L.	Phenotypic range		Mean ± S. Em.		Variance components					
						σ^2_g		σ^2_p		σ^2_e	
		B	S	B	S	B	S	B	S	B	S
8. Number of Mature pods/ plant	H	6.70 - 11.25	6.20 - 14.66	8.53 ± 0.443	8.70 ± 0.807	1.290	4.911	1.870	6.813	0.580	1.952
	L	6.40 - 10.66	6.20 - 11.56	7.99 ± 0.330	8.12 ± 0.838	1.138	2.212	1.452	4.221	0.314	2.109
9. Days to maturity	H	96.00 - 107.33	111.00-121.33	101.04 ± 0.704	116.54 ± 0.867	10.330	9.745	11.820	12.002	1.490	2.257
	L	97.33 - 110.00	112.00-123.63	102.69 ± 0.600	117.18 ± 0.772	13.013	10.676	14.083	12.464	1.070	1.788
10. Shelling percentage	H	65.30 - 71.80	62.36- 70.92	68.24 ± 0.700	67.34 ± 0.840	2.768	7.703	4.223	9.801	1.455	2.098
	L	66.60 - 71.50	63.55- 71.58	68.35 ± 0.777	67.55 ± 0.631	1.970	6.710	3.780	7.903	1.810	1.193
11. 100 kernel weight (g)	H	28.68 - 45.72	32.57 - 47.70	33.52 ± 0.527	38.76 ± 0.707	19.215	21.070	20.048	22.569	0.833	1.499
	L	28.85 - 44.40	29.05 - 46.35	33.71 ± 0.690	38.90 ± 0.777	15.210	24.950	16.631	26.759	1.421	1.809
12. Oil percentage	H	46.30 - 50.20	46.70 - 50.62	48.28 ± 0.214	48.51 ± 0.210	0.917	0.987	1.055	1.119	0.138	0.132
	L	46.40 - 50.60	46.50 - 50.45	48.33 ± 0.171	48.54 ± 0.223	0.990	1.046	1.078	1.209	0.088	0.163

TABLE 2

Genotypic coefficient of variation, heritability, expected genotype advance and genetic advance expressed as percentage of mean of twelve characters for bunch (B) and spreading (S) types of groundnut under high (H) and low (L) fertility levels (FL).

Sr. No.	Character	F.L.	Genotypic coefficient variation %		Heritability (B.S.) %		Expected genetic advance (K = 2.06)		Genetic advance expressed as% of mean%	
			(B)	(S)	(B)	(S)	(B)	(S)	(B)	(S)
1.	Pod yield (g) per plant	H	20.10	20.46	77.95	67.15	2.40	3.40	36.56	34.62
		L	12.82	18.00	68.31	66.42	1.46	2.48	21.83	30.22
2.	Days to 50 % flowering	H	3.78	3.24	65.48	51.75	1.75	1.67	6.37	4.80
		L	3.75	3.07	65.64	46.93	1.81	1.52	6.26	4.33
3.	Height of main axis (cm)	H	11:71	18.34	88.16	91.33	5.78	10.91	22.64	36.10
		L	9.62	16.66	88.04	92.17	4.54	9.70	18.45	32.92
4.	Number of primary branches/plant	H	19.05	18.64	62.50	56.60	1.56	1.62	31.03	28.90
		L	11.41	15.70	62.60	54.83	0.82	1.27	17.07	23.94
5.	Mumber of secondary branches/ plant	H	27.05	27.87	71.31	85.66	1.07	4.38	47.05	53.14
		L	31.28	25.53	76.77	87.14	1.20	3.91	56.46	48.82
6.	Number of pegs/ plant	H	18.23	15.42	84.68	83.80	7.53	7.41	34.55	29.10
		L	14.58	10.76	82.53	53.89	5.63	3.87	27.28	16.28
7.	Number of pods/ plant	H	15.68	19.49	70.57	69.47	3.16	4.74	27.13	33.46
		L	14.70	17.64	62.56	57.00	2.73	3.35	23.96	27.43
8.	Number of mature pods/ plant	H	13.32	25.47	69.00	71.56	1.94	3.86	22.80	44.39
		L	13.35	17.86	78.37	49.92	1.95	2.11	24.41	25.99
9.	Days to maturity	H	3.18	2.68	87.39	81.19	6.19	5.79	6.13	4.97
		L	3.51	2.79	92.40	85.65	7.14	6.23	6.95	5.32
10.	Shelling percentage	H	2.44	4.12	65.55	78.59	2.78	5.07	4.07	7.53
		L	1.77	3.84	44.82	84.90	1.68	4.92	2.46	7.29
11.	100 kernel weight (g)	H	13.08	11.85	95.84	93.36	8.84	9.14	26.37	23.57
		L	11.57	12.84	91.46	93.24	7.68	9.94	22.79	25.54
12.	Oil percentage	H	1.98	2.05	86.92	88.20	1.84	1.92	3.81	3.96
		L	2.06	2.11	91.84	86.52	1.96	1.96	4.06	4.04

the above traits. The low genotypic coefficient of variation for oil percentage indicated that for this trait, the variation had reached a plateau. Therefore, there is a need for collecting new materials.

High heritability estimates for pod yield, number of primary branches, number of pegs, number of pods and 100 kernel weight under high fertility level in both groups, indicated that cyclic selection becomes very effective resulting in a faster rate of improvement as the environmental effect is less. Though the oil percentage and days to maturity recorded high heritability, but with low genotypic coefficient of variation, it makes it unsuitable for direct selection for improvement, while 100 kernel weight showed high heritability value indicates possibilities of evolving bold seeded table varieties for export purpose by putting proper selection pressure for a reasonable period of time.

The result of the present study indicated that the direct selection for number of secondary branches (high values of genotypic coefficient of variation, heritability coupled with high genetic advance expressed as a percentage of mean) could be effective in yield improvement at lower fertility level in bunch group and at high fertility level in spreading group pod yield, number of primary branches, number of pegs, number of pods showed high genotypic coefficient of variation and heritability values coupled with high genetic advance expressed as a percentage of mean under high fertility level in both the groups, suggested that the characters can be improved through direct selection under high fertility level. Chauhan and Shukla (1985) and Swamy Rao T. *et al.* (1988) also reported similar results. Oil percentage showed high heritability and low genetic advance expressed as a percentage of mean under both fertility levels in both the groups which suggested that high heritability was probably due to non-additive gene action. Poor genetic advance indicated that the character is lees variable.

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