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STUDY OF GENETIC VARIABILITY FOR POD YIELD AND DROUGHT TOLERANCE IN GROUNDNUT

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Abstract: *A field experiment was conducted at Oilseeds Research station, Latur during rabi 2017-18 to evaluated twenty four genotypes of groundnut for variability, heritability and GAM for ten characters viz., number of pods per plant, number of seeds per pod, pod yield per plant, kernel yield per plant, shelling per cent, test weight, harvest index, oil content, SCMR and specific leaf area under stress and non stress conditions. The result revealed that high PCV and GCV was observed for kernel yield per plant and pod yield per plant under both conditions. High heritability accompanied with high genetic advance as per cent of mean was recorded for kernel yield per plant and pod yield per plant under non stress condition and kernel yield per plant, pod yield per plant, number of pods per plant and SCMR under stress condition indicated that there was lesser influence of environment and prevalence of additive gene action achieved in their expression.*

Keyword: *Groundnut, Seed, Pod, Yield and Environment.*

Introduction: Groundnut (*Arachis hypogaea* L.) is an annual legume cum oilseeds crop which is also known as peanut, earthnut, monkeynut and moongfali (Hindi). It is the 13th most important food crop and 4th most important oilseed crop of the world. It belonging to the family *Fabaceae*, native to South America (Brazil), being grown throughout the tropical, sub-tropical and warm temperate regions of the world. It is a segmental allotetraploid (2n=40) and self-pollinating annual legume. The groundnut kernel contains 40-55 per cent oil, 22-30 per cent protein and 10-20 per cent carbohydrate.

Groundnut yield in rain-fed areas has been limited by drought stress because pod yield and other growth parameters have been severely affected [1, 2, 3, 4]. Yield loss has been estimated to be 56-85% [5], depending on crop growth stages when the crop was exposed to drought [3], drought intensity and drought duration [2, 4]. Even in irrigated areas, groundnut is frequently exposed to drought because water supply is not sufficient as it is grown in marginal land with poor management. Limited water availability, especially, during flowering and peg penetration stages appears to be one of the important constraints to harness complete genetic potential yield of improved cultivars.

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 prerequisite for obtaining higher yield, which is the ultimate expression of various yield contributing characters.

Materials and Methods

The experiment was conducted during *rabi* 2017-18 at Oilseeds Research Station, Latur with 24 groundnut genotypes in Randomized Block Design with two replications each under both stress and non stress condition. The sowing was carried out at the spacing of 30 cm and 10 cm between the rows and plant respectively with dibbling as a method of sowing.

The following observations of 10 different yield contributing and drought tolerance characters were recorded with five selected plants from each genotypes for both the replications for yield contributing and drought tolerance characters *viz.*, number of pods per plant, number of seeds per pod, pod yield per plant, kernel yield per plant, shelling per cent, test weight, harvest index, oil content, SCMR and specific leaf area. Analysis of variance was carried out as per the method suggested [6]. Phenotypic and genotypic coefficient of variation (GCV & PCV) was computed [7], heritability (broad sense) and genetic advance as per cent of mean (GAM) [8].

Results and Discussion

Analysis of variance for 10 characters indicated that the mean sum of square due to genotypes were highly significant for all the characters indicating the presence of sufficient amount of variability in the present genotypes under both stress and non stress condition (Table 1).

Table 1: Analysis of variances for yield, yield contributing and drought tolerance related characters.

S. N.	Sources of variation / character	Mean sum of squares					
		Replication		Genotypes		Error	
		NS	S	NS	S	NS	S
	D.F.	1	1	23	23	23	23
1	No. of pods/ plant	9.18	0.65	26.61**	8.75**	3.40	1.19
2	No. of seeds/ pod	0.003	0.001	0.036**	0.084**	0.017	0.022
3	Pod yield/plant (g)	2.43	0.01	15.03**	5.39**	1.18	0.34
4	Kernel yield/plant(g)	0.04	0.002	6.41**	1.77**	0.37	0.09
5	Shelling (%)	8.92	0.24	27.01**	30.93**	13.07	14.63
6	Test weight (g)	2.34	2.29	17.34**	13.22**	4.59	4.08
7	Harvest index (%)	8.60	2.27	31.05**	18.81**	11.98	7.52
8	Oil content (%)	0.15	0.28	4.81**	3.97**	1.14	1.03
9	SCMR	5.50	17.92	70.85**	81.40**	8.35	11.69
10	SLA	1.63	23.53	144.68**	151.04**	68.88	69.15

The estimates of genetic parameters (Table 2) revealed that there were closer correspondences between GCV and PCV for all the characters except number of pods per plant and harvest index under both non stress and stress condition. Thus, the results indicated that most of the characters are largely under genetic control. The GCV and PCV estimates were relatively high for kernel yield per plant and pod yield per plant under both conditions. These finding were in accordance with the reports of [9, 10, 11, 12] for kernel yield per plant and pod yield per plant.

The moderate GCV and PCV values were observed for number of pods per plant, SCMR, number of seeds per pod and harvest index. Similar finding reported [13, 14, 15] for number of pods per plant and harvest index [16, 17] for harvest index. The lowest GCV and PCV values were recorded for test weight, SLA, shelling per cent and oil content under both the situations. The similar finding reported [15, 11] for shelling per cent and oil content [18, 14] for shelling per cent [17] for SLA.

The highest heritability in broad sense was recorded for kernel yield per plant (88.86%) followed by pod yield per plant (85.41%) and SCMR (78.91%) under moisture non stress condition. and kernel yield per plant (89.41%) followed by pod yield per plant (88.13%), number of pods per plant (76.04%) and SCMR (74.88%) under moisture stress condition.

In the present study, high heritability coupled with high genetic advance as per cent of mean has been noticed for kernel yield per plant and pod yield per plant under non stress situations and kernel yield per plant, pod yield per plant, number of pods per plant and SCMR under stress condition indicated that there was lesser influence of environment and prevalence of additive gene action achieved in their expression. Thus selection for improvement of those characters would be more effective. The results were in accordance with [13, 18, 17, 19, 11, 12] for kernel yield per plant, pod yield per plant and number of pods per plant.

Moderate heritability coupled with moderate to low genetic advance as per cent of mean recorded by SCMR, test weight, harvest index, number of pods per plant, oil content, number of seeds per pod, shelling per cent and SLA under non stress condition and test weight, harvest index, oil content, number of seeds per pod, shelling per cent and SLA indicated the presence of non additive gene action and influence of environment in the expression of this character thus, the selection would be less effective under both situation. The similar finding reported [20] for test weight, shelling per cent and harvest index, [9] for test weight, [17] for SCMR and SLA and [17] for SCMR and oil content.

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Table 2: Parameters of genetic variability for yield and yield contributing and drought tolerance characters in groundnut.

Sr. No.	Parameters	Range		Mean		GV (δ^2g)		PV (δ^2p)		GCV (%)		PCV (%)		Heritability (BS) (%)		Genetic advances		GAM (%)	
		NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S
1	Number of pods/plant	10.10 to 24.00	6.50 to 14.30	17.05	9.83	5.94	3.78	15.01	4.98	14.30	19.78	22.73	22.69	39.58	76.04	3.16	3.49	18.53	35.53
2	Number of seeds/pod	1.55 to 2.10	0.95 to 1.70	1.86	1.35	0.01	0.03	0.03	0.05	5.26	13.02	8.81	17.13	35.68	57.72	0.12	0.28	6.48	20.37
3	Pod yield/plant (g)	4.40 to 16.00	3.00 to 9.80	8.81	5.29	6.92	2.53	8.11	2.87	29.87	30.03	32.33	31.99	85.41	88.13	5.01	3.07	56.87	58.08
4	Kernel yield/plant (g)	2.60 to 10.10	1.40 to 5.30	5.60	2.74	3.02	0.84	3.40	0.94	31.05	33.37	32.93	35.29	88.86	89.41	3.37	1.78	60.29	65.00
5	Shelling (%)	57.00 to 71.45	42.46 to 57.42	63.22	51.44	6.97	8.15	20.05	22.79	4.18	5.55	7.10	9.28	34.77	35.76	3.21	3.52	5.07	6.84
6	Test weight (g)	26.60 to 38.10	21.35 to 31.25	32.34	26.55	6.37	4.57	10.97	8.66	7.81	8.05	10.24	11.10	58.08	52.79	3.96	3.20	12.25	12.05
7	Harvest index (%)	22.50 to 41.02	18.32 to 30.29	32.01	23.39	9.54	5.65	21.52	13.17	9.65	10.16	14.49	15.52	44.33	42.87	4.24	3.21	13.23	13.71
8	Oil content (%)	45.80 to 51.70	41.26 to 47.25	48.30	44.18	1.84	1.47	2.98	2.51	2.81	2.75	3.58	3.58	61.64	58.75	2.19	1.92	4.54	4.34
9	SCMR	25.40 to 46.82	21.00 to 44.51	34.72	31.26	31.25	34.86	39.60	46.55	16.10	18.89	18.12	21.83	78.91	74.88	10.23	10.52	29.46	33.67
10	SLA	92.51 to 124.28	88.22 to 115.10	107.27	100.51	37.90	40.95	106.78	110.10	5.74	6.37	9.63	10.44	35.49	37.19	7.56	8.04	7.04	7.99

GV-Genotypic variance, PV-Phenotypic variance, GCV-Genotypic coefficient variation, PCV-Genotypic coefficient variation, GAM-Genetic advance as % of mean
NS = Non Stress
S = Stress.