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GENETIC VARIABILITY AND CORRELATION STUDIES ON PHYSIOLOGICAL, YIELD AND YIELD ATTRIBUTES IN GROUNDNUT (*Arachis hypogaea* L.)

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ABSTRACT

The extent of genetic variability and association of important physiological, yield and yield characters were determined in a set of 32 groundnut genotypes. Analysis of variance revealed the existence of significant differences among genotypes for all the characters studied. The characters, pod yield plant^{-1}, 100 seed weight and SLA at 60 DAS recorded moderate to high GCV, high heritability coupled with high genetic advance as percent of mean indicating that these traits were mainly under the influence of additive gene action and simple selection may be effective for improvement of these traits. Correlation and path co-efficient studies indicated that shelling percentage should be given major emphasis for the development of high yielding genotypes.

KEYWORDS: Correlation, groundnut, heritability, Path co-efficients, SPAD Chlorophyll Meter Reading (SCMR), Specific Leaf Area (SLA), Relative Water Content (RWC)

INTRODUCTION

The cultivated Groundnut (*Arachis hypogaea* L.) is a major crop in most tropical and subtropical regions of the world and in India it ranks first among edible oilseed group. It is of high value because of their high contents of oil (43-54%) and protein (25-30%). Genetic variability is the prerequisite for crop improvement as this 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. Hence, in present investigation an attempt was made to determine the performance of 32 groundnut genotypes to assess the variability of the important traits and to determine correlations between these traits.

MATERIALS AND METHODS

The experimental material consisted of 32 genotypes of groundnut. The experiment was laid out in a randomised block design with two replications during *rabi,* 2017-18 at Regional Agricultural Research Station, Tirupati. Each genotype was sown in single row of 5 m length and 0.9 m width with a spacing of 22.5 cm between the rows and 10 cm between the plants within rows. Recommended package of practices were followed in raising of the crop.

Data were recorded on SPAD Chlorophyll Meter Reading (SCMR) at 60 DAS, Specific Leaf Area at 60 DAS, Relative Water Content at 80 DAS, shelling percentage, 100-seed weight and pod yield plant^{-1} on five randomly chosen competitive plants in each genotype in each replication. The mean values of selected competitive plants were averaged and expressed as mean of the respective characters per replication. Data were subjected for Analysis of Variance (Panse and Sukhatme, 1961) and genetic parameters *viz*., Phenotypic Coefficient of Variation (PCV), Genotypic Coefficient of Variation (GCV), heritability and genetic advance were estimated as per Lush (1940), Burton (1952), Allard (1960) and Johnson *et al*. (1955). Genotypic and phenotypic correlation co-efficients were calculated using the method given by Johnson *et al.* (1955). The direct and indirect effects of the yield components on the yield were estimated by path co-efficient analysis as suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Analysis of variance for all the characters studied revealed significant differences among the cultivars indicating variation in the material studied for most of the traits. Phenotypic coefficient of variation was found to be higher than genotypic coefficient of variation for all

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the traits indicating the role of environment in the expression of characters.

GCV was found to be high for pod yield plant^{-1} (29.24%) and was moderate for 100-seed weight(16.66%) and SLA at 60 DAS (12.37%). GCV was low in case of SCMR at 60 DAS (5.47%), RWC at 80 DAS (5.55%) and shelling percentage (3.47%) (Table1).

Heritability was high for all the characters except for shelling percentage (52.40%) for which it was recorded and moderate. GAM was high for SLA at 60 DAS (25.40%), 100-Seed weight (34.11%) and Pod yield plant^{-1} (50.83%). GAM was moderate for RWC at 80 DAS (25.40%) and it was low for SCMR at 60 DAS (9.06%) and shelling percentage (5.17%).

Bhavya *et al.* (2017) reported low to moderate PCV, GCV, high heritability and low to moderate GAM for SLA and SCMR, low PCV, GCV moderate heritability and GAM for shelling percentage and high PCV, GCV, heritability and GAM for pod yield plant^{-1}. Srivalli and Nadaf (2016) observed low to moderate PCV, GCV, high heritability coupled with low genetic advance as percent of mean for SLA, SCMR and RWC traits. Balaraju and Kenchanagoudar (2016) observed low GCV, PCV, high heritability and low GAM for shelling percentage and moderate GCV, PCV, high heritability and high GAM for 100-Seed weight. Vasanthi *et al.* (2015) reported low GCV, heritability and GAM for shelling percentage and moderate GCV, high heritability and GAM for 100-seed weight

From the perusal of above findings, it is to be concluded that phenotypic selection would be more effective for improvement of SLA at 60 DAS, 100-seed weight and pod yield plant^{-1} in early generations.

Correlation and path analysis: Through correlation and path analysis, the nature and extent of association between different characters influencing yield and causes of association can be better understood which helps in formulation of selection criteria for improvement of yield. In general, the genotypic correlation co-efficients were higher than the corresponding phenotypic correlation co-efficients showing the inherent association between the traits.

Pod yield plant^{-1} showed significant positive correlation with shelling percentage and highly significant negative correlation with RWC while it exhibited non-significant negative correlation with SLA at 60 DAS and SCMR at 60 DAS. On contrary 100-Seed weight showed non-significant positive association with Pod yield plant^{-1} (Table 2).

The results of path co-efficient analysis revealed that shelling percentage and RWC had maximum direct contribution to Pod yield per plant.Significant positive correlation observed between shelling percentage and pod yield per plant, attributed to its positive direct effect followed by positive indirect effect via RWC. Similarly significant and negative correlation observed between RWC and pod yield per plant, primarily due to its high negative direct effect followed by low negative indirect effect via shelling percentage (Table 3).

Similar kind of significant and positive association of Pod yield per plant with Shelling percentage was reported earlier by Gupta *et al.* (2015) whereas highly significant negative correlation of pod yield with RWC was in contrary to the report of John and Reddy (2016).

Non-significant negative correlation of Pod yield per plant with SLA at 60 DAS was in accordance with the reports of Kyaw *et al.,* (2017). Nirmala and Jayalakshmi, (2015) reported non-significant negative correlation of Pod yield per plant with SCMR at 60 DAS. while non-significant positive correlation with 100-Seed weight.

Character association analysis indicated that for selection of a high yielding groundnut genotypes, indicated that emphasis should be laid out on shelling percentage. However, caution should be exercised in increasing the RWC as it has negative correlation with pod yield plant^{-1}.

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Table 1. Genetic parameters for physiological, yield and yield attributes groundnut

Sl. No.	Character	Mean	Range		Variance		Co-efficient of variation		Heritability (Broad sense %)	Genetic Advance	Genetic Advance as per cent of mean (%)
			Min.	Max.	Geno-typic	Pheno-typic	Geno-typic (%)	Pheno-typic (%)			
1	SCMR at 60 DAS	48.85	43.20	54.10	7.14	11.04	5.47	6.80	64.63	4.42	9.06
2	SLA at 60 DAS	134.91	108.22	171.00	278.61	280.51	12.37	12.42	99.33	34.27	25.40
3	RWC at 80DAS	88.98	79.90	97.20	24.40	24.65	5.55	5.58	98.88	10.12	11.37
4	Shelling percentage	65.59	57.00	72.00	3.52	6.71	3.47	4.79	52.40	2.80	5.17
5	100 seed weight	38.36	27.00	52.00	40.82	41.31	16.66	16.76	98.81	13.08	34.11
6	Pod yield plant^{-1}	8.21	3.78	13.05	5.76	8.09	29.24	34.66	71.20	4.17	50.83

Table 2. Correlation analysis of Pod yield per plant and its components in Groundnut

Character		SLA	RWC	Shelling per cent	100 Seed Weight	Pod yield per plant^{-1}
SCMR	r_p	0.150	0.100	0.103	0.251*	-0.229
	r_g	0.200	0.136	0.204	0.285*	-0.294*
SLA	r_p	1	0.295*	-0.122	0.183	-0.220
	r_g	1	0.300*	-0.167	0.187	-0.284*
RWC	r_p		1	-0.301*	-0.142	-0.414**
	r_g		1	-0.442**	-0.148	-0.491**
Shelling per cent	r_p			1	0.216	0.249*
	r_g			1	0.266*	0.548**
100 Seed Weight	r_p				1	0.009
	r_g				1	0.025
Pod yield per plan	r_p					1
	r_g					1

** - Significant at 1% level, * - Significant at 5% level

Table 3. Path coefficient analysis for Pod yield plant^{-1} and its components in Groundnut

		RWC	Shelling per cent	Pod yield plant^{-1}
RWC	P	**-0.37267**	-0.04132	-0.414**
	G	**-0.30913**	-0.18158	-0.491**
Shelling per cent	P	0.11221	**0.13724**	**0.249***
	G	0.13654	**0.41111**	**0.548****

P = Phenotypic path co-efficient: 0.81148; G = Genotypic path co-efficient = 0.62315

Bold: Direct effects; Normal: Indirect effects

* Significant at 5% level; ** Significant at 1 % level