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Research article

GENETIC VARIABILITY AND ASSOCIATION AMONG THE VARIOUS CHARACTERS IN GROUNDNUT (ARACHIS HYPOGAEA L).

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ABSTRACT: Seventy five groundnut genotypes were evaluated for yield and yield component characters indicated the existence of considerable genetic variation in the present investigation. The components of variance revealed that the phenotypic coefficient of variation (PCV) were higher than genotypic coefficient of variation (GCV) for all the characters studied indicating the role of environmental variance in the total variance. The magnitude of PCV and GCV was moderate to high for number of pods per plant, kernel yield, dry pod yield, hundred kernel weight, dry haulm yield. Heritability in broad sense was higher in most of the characters *viz.,* hundred kernel weight, plant height, kernel yield, dry pod yield and number of pods per plant. High heritability coupled with high genetic advance as percent of mean was observed for hundred kernel weight, plant height, kernel yield, dry pod yield and number of pods per plant indicating the role of additive gene in expressing these traits. Pod yield was positively correlated with kernel yield, number of pods per plant, hundred kernel weight and shelling percent. Non significant positive association of pod yield noticed with dry haulm yield. However, significant negative association with plant height and non significant negative association with days to 50 percent flowering and days to maturity were observed. Direct positive effect of kernel yield, no of pods per plant and hundred kernel weight was revealed on pod yield. Hence, a direct selection criterion should be followed for traits *viz.,* no of pods per plant and hundred kernel weight to improve the pod yield.

Key words: Variability, heritability, genetic advance, correlations and path analysis

INTRODUCTION

The cultivated groundnut (*Arachis hypogaea* L.) is one of the most important oil and food crop of the semi-arid tropics. Groundnut kernel contains 45-50% of high quality oil, more than 25% highly assumable protein and vitamin B and E. It is the most important source of quality edible oil in the world. It is an allotetraploid (2n =40) indeterminate and cleistogamous (Gregory *et al.,* 1973). The aim of most peanut breeding programme is to increase the yield of seed or oil, shelling and milling properties and enhance the quality of end use products (Coffelt and Hammons, 1974).

The basic key to bring about the genetic upgrading to a crop is to utilize the available or created genetic variability. If the variability in the population is largely due to genetic cause with least environmental effect, the probability of isolating superior genotypes is a pre requisite for obtaining higher yield, which is the ultimate expression of various yield contributing characters. For effective selection of high yielding genotypes knowledge on genetic parameters such as genetic variability, heritability, genetic advance is essential. Genetic variability for trait of interest in any breeding material is a pre-requisite as it provides the basis of selection. Heritability estimates helps in improvement of traits by utilizing heritable components of variation. Possible advance through selection based on phenotypic values can be predicted only from the knowledge of phenotypic and genotypic values. Genetic components of variation together with heritability estimates would give the best picture of the amount of advance to be expected from selection. To develop elite genotypes, knowledge on interrelationship among yield and its component characters and direct and indirect contribution towards yield is important. The purpose of this work is to estimate of variability, heritability and genetic advance for yield and yield contributing traits in 75 germplasm lines of groundnut and also to study the association among the seed yield and its component characters.

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MATERIALS AND METHODS

The experiment consists of 75 genotypes including three checks were sown in randomized complete block design (RBD) with two replications at Acharya NG Ranga Agricultural University, Regional Agricultural Research Station, Jagtial during *Rabi*, 2010-11. Each genotype was raised in 5m length with spacing of 30 X 10 cm. Recommended agronomic practices were followed to raise a good crop. Observations were recorded on days to 50% flowering, days to maturity, plant height (cm), Number of pods per plant, shelling percent, hundred kernel weight (g), dry pod yield (g), kernel yield (g) and dry haulm yield (g). The data were recorded on five randomly selected plants in each entry in each replication. The mean values were used for analysis of variance. The coefficient of variation was calculated as per Burton (1952). Heritability in broad sense and genetic advance were calculated as per Johnson *et al.,* (1955). The correlation coefficients and path analysis were carried out following the methods of Al-Jibouri *et al.,* (1958) and Dewey and Lu (1959) respectively.

RESULTS AND DISCUSSION

The analysis of variation revealed highly significant differences among the genotypes for all the characters studied *viz.,* days to 50% flowering, days to maturity, plant height (cm), number of pods per plant, shelling percent, hundred kernel weight (g) and dry pod yield (g), kernel yield (g) and dry haulm yield (g) indicating the existence of considerable genetic variation in the experimental material. Perusal the components of variance revealed that the phenotypic coefficient of variation (PCV) were higher than Genotypic coefficient of variation(GCV) for all the characters studied indicating the role of environmental variance in the total variance(Table 1). The magnitude of PCV and GCV was moderate to high for number of pods per plant, kernel yield, dry pod yield, hundred kernel weight, dry haulm yield. Heritability in broad sense was higher in most of the characters *viz.,* the characters hundred kernel weight, plant height, kernel yield, dry pod yield and number of pods per plant. The efficacy of selection not only depends on the magnitude of variability present in a trait but also the extent of heritability of the desirable character. Johnson *et al.,* (1955) had pointed out that in a selection programme, heritability values as well as genetic advance were more useful than heritability alone. High heritability coupled with high genetic advance as percent of mean was observed for hundred kernel weight, plant height, kernel yield, dry pod yield and number of pods per plant indicating the role of additive gene in expressing these traits.

Table.1 Estimates of variability, heritability and genetic advance in Groundnut

Character	Mean	Range	PCV (%)	GCV (%)	Heritability in Broadsence(H^2)	Genetic advance	GA as percent of mean
Days to 50% flowering	27.28	24.5 to 33	9.09	7.35	65.3	4.27	15.67
Days to maturity	113.40	105 to 122	3.74	2.77	54.8	6.13	5.40
Plant height(cm)	48.98	30.5 to 71.5	19.34	18.24	88.93	22.22	45.4
Shelling percent	65.28	59 to 71	5.63	3.87	47.3	4.59	7.02
Hundred kernel weight	46.40	31 to 72	22.33	21.71	94.6	25.87	55.74
No of pods per plant	17.33	8 to 35	39.58	36.78	86.4	15.65	90.26
Dry pod Yield(kg/ha)	1446.86	878 to 2732	23.70	22.16	87.3	790.81	54.66
Kernel yield	947.41	580 to 1882	26.05	24.42	87.8	572.35	60.41
Dry haulm yield	4026.97	2336 to 6717	27.43	21.00	58.6	1709.14	42.44

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Pod yield is a complex character governed by several contributing traits. Hence, it is important to understand the association of different characters with pod yield for enhancing the usefulness of selection criterion to be followed while developing varieties. In the present investigation the genotypic and phenotypic correlations are on par with each other suggesting the less influence of environment (Table 2). Invariably Pod yield was positively correlated with kernel yield, number of pods per plant, hundred kernel weight, shelling percent and dry haulm yield. However, significant negative association with plant height and non significant negative association with days to 50 percent flowering and days to maturity were observed. Chishti *et al*., (2000) reported positive and significant correlations between pod yield and the number of pods in plant, grain to pod weight, 100-grain weight and percent oil as well as a negative and significant correlation between pod yield and the number of days to maturity. Deshmukh *et al*., (1986) and Syamasonta (1992) also reported a positive and significant correlation between pod yield and the number of pods in peanut plant.

Table 2: Phenotypic and Genotypic correlations between seed yield and yield components in Groundnut

Character		DF	DM	PH	SP	HKW	NP/Pl	KY	DHY	DPY
Days to 50% flowering(DF)	P	1.0000	0.5597**	-0.0583	-0.0124	-0.0523	-0.0702	-0.0215	0.165	-0.0258
	G	1.0000	0.5963**	-0.1074	0.1476	-0.0426	-0.0741	0.0304	0.1392	0.0018
Days to maturity(DM)	P		1.0000	-0.0488	-0.1543	-0.1652	-0.0456	-0.082	0.0194	-0.0567
	G		1.0000	-0.1168	-0.2846*	-0.1951	-0.0227	-0.0618	-0.1123	-0.0193
Plant height(PH)	P			1.0000	-0.2157*	-0.4817**	-0.5514**	-0.7005**	-0.1481	-0.7112**
	G			1.0000	-0.2833*	-0.5332**	-0.6453**	-0.7998**	-0.2162*	-0.8213**
Shelling percent(SP)	P				1.0000	0.1763	0.1895	0.4293**	0.0802	0.2253*
	G				1.0000	0.2534*	0.3563**	0.5052**	0.2059	0.3725**
Hundred kernel weight(HKW)	P					1.0000	0.4981**	0.5834**	0.0867	0.5843**
	G					1.0000	0.5385**	0.6424**	0.1228	0.6499**
No of pods per plant(NP/Pl)	P						1.0000	0.7531**	0.142	0.7685**
	G						1.0000	0.855**	0.1951	0.8624**
Kernel yield(KY)	P							1.0000	0.1564	0.9754**
	G							1.0000	0.2425*	0.9885**
Dry haulm yield(DHY)	P								1.0000	0.1555
	G								1.0000	0.2663*
Dry pod Yield(DPY)	P									1.0000
	G									1.0000

**** Significant at 1 per cent level, * Significant at 5 per cent level**

Inter correlation among yield components reveled days to 50% flowering has significant positive association with days to maturity. Days to maturity has significant positive association with hundred kernel weight. Days to maturity has significant negative association with shelling percent. Plant height has significant negative association with shelling percent, hundred kernel weight, number of pods per plant, kernel yield and dry haulm yield. Shelling percent has significant positive association with hundred kernel weight, number of pods per plant and kernel yield. Hundred kernel weight has significant positive association with number of pods per plant and kernel yield. Number of pods per plant has significant positive association with kernel yield.

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Table 3 Direct (diagonal) and indirect effects of yield contributing characters in Groundnut

Character		DF	DM	PH	SP	HKW	NP/Pl	KY	DHY	DPY
Days to 50% flowering(DF)	P	-0.0052	-0.0029	0.0003	0.0001	0.0003	0.0004	0.0001	-0.0009	-0.0258
	G	-0.0146	-0.0087	0.0016	-0.0022	0.0006	0.0011	-0.0004	-0.002	0.0018
Days to maturity(DM)	P	-0.0028	-0.005	0.0002	0.0008	0.0008	0.0002	0.0004	-0.0001	-0.0567
	G	0.0045	0.0076	-0.0009	-0.0022	-0.0015	-0.0002	-0.0005	-0.0009	-0.0193
Plant height(PH)	P	0.001	0.0009	-0.0176	0.0038	0.0085	0.0097	0.0123	0.0026	-0.7112**
	G	0.0036	0.004	-0.0339	0.0096	0.0181	0.219	0.0272	0.0073	-0.8213**
Shelling percent(SP)	P	0.0029	0.0364	0.0509	-0.236	-0.0416	-0.0447	-0.1013	-0.0189	0.2253*
	G	-0.0229	0.0441	0.0439	-0.155	-0.0393	-0.0552	-0.0783	-0.004	0.3725**
Hundred kernel weight(HKW)	P	0.0004	0.0011	0.0033	-0.0012	-0.0069	-0.0034	-0.004	-0.0006	0.5843**
	G	-0.0003	-0.0014	-0.0038	0.0018	0.0072	0.0039	0.0046	0.0009	0.6499**
No of pods per plant(NP/Pl)	P	-0.0003	-0.0002	-0.0026	0.0009	0.0023	0.0047	0.0035	0.0007	0.7685**
	G	-0.0015	-0.0005	-0.0131	0.0072	0.0109	0.0203	0.0173	0.004	0.8624**
Kernel yield(KY)	P	-0.0228	-0.0872	-0.7449	0.4565	0.6203	0.8008	1.0633	0.1663	0.9754**
	G	0.0308	-0.0628	-0.8118	0.5128	0.6521	0.8678	1.015	0.2461	0.9885**
Dry haulm yield(DHY)	P	0.0011	0.0001	-0.0009	0.0005	0.0006	0.0009	0.001	0.0064	0.1555
	G	0.0021	-0.0017	-0.0032	0.0004	0.0018	0.0029	0.0036	0.0149	0.2663*

Residual effect (P) = 0.0500 Residual effect (G) = 0.0259 P=Phenotypic G=Genotypic

The correlation values denote only the nature and degree of association present between the pairs of characters. A dependent character like pod yield is controlled by several mutually associated characters. If correlation between dependent and independent characters arises due to direct effect of character, it reflects a true association relationship between them. Selection can practiced for such character to improve the dependent character. The direct and indirect effects of different yield components on seed yield at phenotypic and genotypic level are presented in Table 2. Among the yield components the highest direct positive effect of kernel yield, no of pods per plant and hundred kernel weight was revealed on pod yield. Hence, a direct selection criterion should be followed for traits *viz.,* no of pods per plant and hundred kernel weight to improve the pod yield. The direct negative effect of plant height on pod yield indicates selection of short stature plants is more advantageous to obtain higher pod yield. The results are in consonance with earlier reports (Arunachalam and Bandyopadhyay, 1984; Deshmukh *et al.,* 1986; Syamasonta, 1992 and and Siddiquey *et al*., 2006) in which 100-grain weight was found to have significant positive and direct effect on pod yield.

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