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Genetic Variability and Correlation for Yield Attributing Traits of Advanced Generation Recombinant Inbred Lines of Groundnut (*Arachis hypogaea* L.)

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Abstract—*An experiment was carried out at the Main Agricultural research station, University of Agricultural sciences, Dharwad during kharif 2011 and 2012 seasons for the estimation of genetic variability, genetic parameters and correlation coefficients of different yield components in a randomized block design with two replications for 816 RILs were tested in the experiment. Highly significant variations were observed for all yield attributing characters viz.,kernel yield per hectare followed by kernel yield per plant, 100 kernel weight, shelling percentage days to maturity and days to 50 per cent flowering. The highest heritability were recorded for the parameters viz., days to 50 per cent flowering (83.38%, 8.78%), days to maturity (84.51%,95.2%), pod weight per plot (98.29%,90.71%), pod weight per plant (93.67%,85.09%), 100 kernel weight (95.61%,95.81%), shelling percentage(83.13%,94.31%), pod yield per hectare(98.29%,90.71%) and kernel yield per hectare(97.87%, 91.2%) for both the 2011 and 2012 kharif seasons respectively. Pod yield per hectare showed highly significant positive correlation for all the parameters except late leaf spot and rust. Therefore 100 podyield per plant, 100 kernel weight and shelling percentage are considered to be important characters which could be used in selection for yield.*

Keywords: *Genetic variability, Genetic advance, Groundnut, Heritability*

1. INTRODUCTION

The annual production of groundnut (*Arachis hypogaea* L.) in the country is 5.62 m tfrom 4.19 million ha of land during 2013-14. Groundnut is mainly used as a bakery food in our country. Therefore it can be used as a source of edible oil, fodder and green manuring crop for improvement of soil health. Ground nut oil contains 46 and 32 per cent of monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) respectively(USDA, 2014). Groundnut oil is also used in many preparations like soap making,fuels,cosmetics, leather dressing, furniture creams, lubricants etc.

Groundnut is aunpredictable crop due to its underground pods development. Nut yield is not only polygenically controlled, but also influenced by its component characters influenced by its component characters (Alam*et al.*, 1985).For improvement of yield in groundnut direct selection is often misleading. The knowledge of existing variability and degree of association between yield contributing characters and their relative contribution in yield is essential for developing high yielding genotypes in groundnut. The observed variability is a combined measure of genetic andenvironmental causes and the genetic variability is heritable from generation to generation. Heritability and genetic advance is a useful tool for breeders in determining the direction and magnitude of selection. Correlation studies provide anopportunitytostudythe magnitudeanddirectionofassociationofyield with its components and also among various components.Considering the abovepoints, the present study was undertakento evaluate the genotypes for yield and its components and to estimate the inter-relationship among the agronomic traits in groundnut.

2. MATERIALS AND METHODS

An experiment comprising of 816 RILs of groundnut was conducted in a Randomized Block Design with two replications at the Main Agricultural research station, University of Agricultural sciences, Dharwad during 15 June 2011 and 10 July 10 2012*kharif*seasons. The unit of plot size was one row of 1.5 meters length for both seasons. Rowtorow and plant to plant spacing were maintained at 30 cmand10cm. Recommendedculturalpracticeswerefollowedtoensurea goodcrop.Thedata on 8 morphological charactersnamelydaysto 50 per cent flowering, days tomaturity, 100kernel weight (g), shelling percentage, pod yield per plant, pod weight per plot, pod weight per plant and kernel yield per ha were recorded.

The data were subjected to statistical analysis using WINDOSTAT software. Componentsofgenetic parameters like genotypic and phenotypic variance, genotypic and phenotypiccoefficient of variation, heritability, genetic advance, genotypicand phenotypiccorrelation coefficient were estimated using excel based computer software programfollowingSingh and Chaudhury (1979).

3. RESULTS AND DISCUSSION

Theanalysisofvariancerevealedsignificant difference samongthegenotypesforallthe charactersindicating the prevalence of genetic variability. The mean,range, coefficients of genotypicandphenotypicvariation, heritability and genetic advance forvariouscharactersare giveninTheTable 1.Coefficient of variation at phenotypic and genotypic levels was relativelyhigh inPod weight per plot (g), Pod weight per plant (g), Pod yield (kg/ha), Kernel yield (kg/ha). Similar findings were reported by Alam*et al.,* 1985.On the other hand, days to 50 per cent flowering and days to maturity showed were very low differences between genotypic and phenotypic coefficient of variation, suggesting less environmental influence on the expression of traits. These findings are in good agreement with those reported by Venkataramana*et al.* (2001). The magnitude of PCV was higher than GCV for all the characters indicating the influence of environment upon these traits. The highest heritability observed inpod yield per hectare (98.29 %) in 2011 *kharif* and kernel yield per hectare (97.87%) in 2012 *kharif*season followed by100 kernel weight (95.61 and 95.81 %) in 2011 and 2012 *kharif* seasons respectively, shelling percentage (94.31%) in 2012 *kharif* season,days to maturity (92.33 and 94.51 %) in 2011 and 2012 *kharif* seasons respectively.

Table 1: Estimation of statistical and genetical parameters of 8 characters 8 for different genotypes of groundnut

Sl. No	Traits	Season	Mean	Range	GCV %	PCV %	h^2_{bs} (%)	Genetic advance	GAM
1	A	2011	31.77	27-34.50	4.321	4.73	83.35	2.58	8.12
		2012	30.77	26-34.00	4.461	4.88	83.78	2.58	8.39
2	B	2011	111.18	101.5-117	2.61	2.69	94.51	5.82	5.23
		2012	108.21	98-114	2.69	2.76	95.2	5.87	5.42
3	C	2011	3.45	3-8	31.6	31.29	98.8	2.23	64.77
		2012	3.45	3-8	31.37	31.51	99.08	2.21	64.33
4	D	2011	3.62	3-9	40.9	41.23	98.87	3.04	83.97
		2012	3.61	3-9	40.96	41.18	98	3.03	83.93
5	E	2011	174.32	25.00-302	28.56	28.8	98.29	101.68	58.32
		2012	168.45	14-332	32.16	33.77	90.71	106.3	63.1
6	F	2011	19.39	4.90-36.5	26.87	27.76	93.67	10.39	53.58
		2012	19.73	4.59-35	24.22	26.26	85.09	9.08	46.03
7	G	2011	40.51	23.5-49	9.87	10.09	95.61	8.05	19.88
		2012	38.53	21.5-47	10.41	10.64	95.81	8.09	21
8	H	2011	70.75	50-80	5.44	5.97	83.13	7.233	10.22
		2012	69.91	40.5-77.75	7.98	8.22	94.31	11.17	15.97
9	I	2011	3870	555-6704.5	28.56	28.8	98.29	2257.4	58.32
		2012	3740	310-7370.4	32.16	33.77	90.71	2360.1	63.11
10	J	2011	2763	334-4926.3	30.8	31.13	97.87	1734.8	62.77
		2012	2611.3	142-5674	36.37	36.54	91.2	1818.6	68.33

A= Days to 50 % flowering, B=Days to maturity, C=90 days rust, D= 90 days LLS, E= Pod weight/ plot, F=pod yield/plant (g),G= 100 kernal weight, H= Shelling %, I=pod yield (kg/ha), J=Kernal yield (kg/ha)

Johanson*et al.* (1955) mentioned that the only heritability value provides no indication of the amount of genetic progress that would result from selecting the best individuals. However,Johanson*et al.*(1955) suggested that heritability estimates along with genetic advance would be more useful in predicting yield under phenotypic selection than heritability estimate alone. In the present study the character pod yield per ha (98.29 %, 58.32), pod yield perplant(93.67%,53.58%),kernel yield per hectare(97.87%,62.77%) showedthehighestheritabilityhighgenetic advance as per cent mean respectively in 2011 *kharif* season and podyield per ha (90.71 %, 63.11)pod yield per plant(85.09%,46.03%), kernel yield per hectare(91.2%, 68.33%) showed the highest heritability high genetic advanceas per cent mean respectively in 2012 *kharif* season. These results indicate that the characters are governed by additive geneaction and there are in agreement with theresultsreportedbyZaman *et al.* (2011).Moderate genetic advance as percent mean were observed for 100 kernel weight (19.8%, 21.1%) and shelling percentage (10.2 and 15.9%) but with high heritability, whereas high heritability with low genetic advance as percent mean was shown fordays to 50 per cent flowering (83.35%,8.12 % and 83.78%, 8.39%) and days to maturity (92.33%,9.52 %and 94.51%,5.23%) respectively for 2011 and 2012*kharif* seasons Therefore, selection should be madeonthebasisof podyield per plant, pod yield per hectare

and kernel yield per hectare. For breedingprogramofgroundnut100kernelweight andshelling percentagemightbe considered as a important selection criteria be considered as a important selection criteria. The present study for high habitability for these characters was conformed to those observed by Shinde et al., 2010 Sharma and Gupta, 2011 groundnut trials.

The genotypic and phenotypic correlations were calculated for all pairs of characters for both seasons mentioned in table 2 and 3. The genotypiccorrelation coefficients were higher than the corresponding phenotypiccorrelation coefficient means in general, all pairs of characters mean that environmentaleffect suppressed the associationatphenotypic levels, indicatingthat both environmentalandgenotypic correlation in those cases actin same direction and finally maximizetheirexpression at phenotypic level.Pod yield per ha and kernel yield per haexhibitedhighlysignificantand

Table 2: Correlation among 9 characters of groundnut in 2011 kharif

		A	B	C	D	E	F	G	H	I
A	P	1	0.37**	-0.67**	-0.71**	0.23**	0.39**	-0.42**	-0.52**	0.37**
	G	1	0.41**	-0.73**	-0.77**	0.25**	0.43**	-0.50**	-0.59**	0.41**
B	P		1	-0.45**	-0.46**	0.21**	0.29**	-0.32**	-0.36**	0.27**
	G		1	-0.47**	-0.47**	0.22**	0.30**	-0.36**	-0.38**.	0.28**
C	P			1	0.95**	-0.37**	-0.54**	-0.55**	-0.67**	-0.51**
	G			1	0.96**	-0.37**	-0.55**	-0.61**	-0.69**	-0.52
D	P				1	-0.39**	-0.56**	-0.57**	-0.69**	-0.53**
	G				1	-0.40**	-0.57**	-0.63**	-0.71**	-0.54**
E	P					1	0.76**	0.43**	0.36**	0.76**
	G					1	0.78**	0.48**	0.38**	0.79**
F	P						1	0.63**	0.48**	0.99**
	G						1	0.66**	0.50**	0.99**
G	P							1	0.44**	0.53**
	G							1	0.55**	0.58**
H	P								1	0.47**
	G								1	0.48**
I	P									1
	G									1

A= Days to 50 % flowering, B=Days to maturity, C=90 days rust, D= 90 days LLS, E=pod yield/plant (g), F=Kernal yield (kg/ha), G= Shelling % H= 100 kernal weight, I=pod yield (kg/ha)

Table 3: Correlation for 9 yield characters in 2012 Kharif season.

		1	0.37**	-0.67**	-0.71**	0.47**	0.52**	-0.47**	-0.52**	0.52**
A	G	1	0.41**	-0.74**	-0.78**	0.56**	0.59**	-0.52**	-0.59**	0.59**
B	P		1	-0.43**	-0.45**	0.30**	0.32**	-0.33**	-0.37**	0.32**
	G		1	-0.45**	-0.46**	0.33**	0.34**	-0.35**	-0.39**	0.34**
C	P			1	0.94**	-0.56**	-0.66**	-0.61**	-0.66**	-0.69**
	G			1	0.94**	-0.69**	-0.70**	-0.63**	-0.68**	-0.66**
D	P				1	-0.58**	-0.68**	-0.64**	-0.70**	-0.62**
	G				1	-0.64**	-0.71**	-0.66**	-0.72**	-0.71**
E	P					1	0.74**	0.54**	0.61**	0.75**
	G					1	0.82**	0.60**	0.66**	083**
F	P						1	0.70**	0.69**	0.99**
	G						1	0.73**	0.71**	0.99**
G	P							1	0.74**	0.63**
	G							1	0.75**	0.66**
H	P								1	0.66**
	G								1	0.69**
I	P									1
	G									1

A= Days to 50 % flowering, B=Days to maturity, C=90 days rust, D= 90 days LLS, E=pod yield/plant (g), F=Kernal yield (kg/ha), G= Shelling % H= 100 kernal weight, I=pod yield (kg/ha)

** Significance at 1%* significance at 5%

positivecorrelationwithallthecharactersexcept late leaf spot and rust. These results were in consonance with those of Shobhakruparani (1999), Nagda*et al.* (2001) for days to 50 per cent flowering, Ramesh Kumar *et al.*(1998), Sangha and Sandhu (1970) for oil yield, AbhayDashora*et al.* (2002), Venkataramana (2001) for kernel yieldLate leaf spot and rust showed the significant andnegativecorrelationwithpod yield per ha. Similar results were reported by John *et al.*, 2005. In the present study late leaf spot and rust were showed negative and significant correlation with all the yield attributing parameters.Days to 50 per cent flowering and days to maturity shown significant positive association with pod yield per hectare,pod yield per plant and significant negative association with both foliar diseases late leaf spot and rust, shelling percentage and kernel weight.Similar results of negative correlation for days to maturity with LLS and rust were reported by Lakshimidevamma and Byregowda(2002) and for 100 kernel weight by Shettar (1974)

4. CONCLUSIONS

The experiment revealed that pod yield per ha, kernelyield per ha, podyield per plant, 100 kernelsweightand shelling percentage weremorevariablecharacters among these genotypes. Correlation analysis showedthatpodyield per haexhibitedhighlysignificantandpositive correlationwithallthecharactersexceptlate leaf spot and rust .Late leaf spot and rust showedsignificant and negative correlation with all parameters. On the other hand shelling percentage and 100 kernels weight showed negative correlation with days to 50 per cent flowering and days to maturity. Therefore, higher shelling percentage, 100 kernel weight, pod yield per plant and kernel yield per hectare are the important characters which could be used in selection for higher yield of groundnut.

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