Annals of Plant and Soil Research 16(1):41-44 (2014)

EVALUATION OF GROUNDNUT GENOTYPES FOR YIELD AND QUALITY TRAITS

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Received: July, 2013, Revised accepted: November, 2013

ABSTRACT

Thirty groundnut genotypes were evaluated for yield and quality traits at Allahabad during kharif 2012 results 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 primary branches/plant at 40 DAS, pod yield, kernel yield, oil yield and oleic acid. Heritability in broad sense was higher in most of the characters like oil yield, oleic acid, kernel yield, plant height, pod yield (q/ha), hundred kernel weight, sound mature kernel %, oil content, days to maturity, field emergence, plant height at 60 DAS, kernel uniformity, pod yield/plant, shelling %, primary branches/plant 40 DAS, primary branches/plant 60 DAS and days to 50 % flowering. High heritability coupled with high genetic advance was observed for oil yield. Pod yield was positively correlated with kernel yield, pod yield per plant, hundred kernel weight and shelling percent, kernel uniformity %.

Keywords: Groundnut, GCV, PCV, heritability, genetic advance, genetic quantitative and qualitative characters

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an important oil seed crop and food grain legume. Groundnut is the largest oilseed crop in India in terms of production. Groundnut is one of the most important cash crops of our country. Groundnut is the also known as "The king of oilseeds". It is also consumed directly because of its high food value which is again due to higher content of oil 46.70%, protein 22.0%, carbohydrate 10.0% and minerals 3.0% (Patra *et al*. 2011). India is largest grower and second producer after china, the average productivity of groundnut is about 0.98 tones/ ha, which is very much lower than the world average of 1.62 t ha^{-1} (Anon, 2012). The yield is a complex character, which is highly influenced by environmental variations. Information on nature and magnitude of variability present in the population due to genetic and non genetic cause is an important prerequisite for a systemic breeding programme. Genetic variability is essential for initiating an effective and successful breeding programme and it become imperative to study the level of genetic variability available in the existing genotype. The study of genetic advance with heritability estimates further clarify the nature of character which can be improved through selection. Therefore, the present investigation was undertaken to study variability, heritability and genetic advance in three independent populations of groundnut (Savaliya *et al*. 2009). The objectives of the present study are to evaluate groundnut genotypes for yield and quality traits and to assess genetic parameters among Groundnut genotypes.

MATERIAL AND METHODS

The experiment for the present study using of 30 genotypes of groundnut was laid out in randomized block design (RBD) with three replications at Experimentation Centre of Department of Genetics and Plant Breeding, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, (U.P.) during *kharif*, 2012. Standard agronomic practices and plant protection measures were adopted as per schedule. Observations were recorded on five randomly selected plants per replication for field mergence, plant height, primary branches/plant, pod yield/plant, pod yield, sound mature kernel, hundred kernel weight, shelling, kernel yield, kernel uniformity and observations on days to 50% flowering and days to maturity were recorded on plot basis and 4 qualitative characters oil yield, oleic acid, protein content and oil content. The data were subjected to Burton statistics to measure the phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV). Heritability (h^2) was worked out by using formula suggested by Lush (1949) and Burton and Devane (1953). The genetic advance i.e. the expected genetic gains was worked out by using the formula suggested by (Johnson *et al.* 1955).

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RESULTS AND DISCUSSION

Analysis of variance showed significant differences for 12 quantitative and 4 qualitative characters studied suggesting the existence of high genetic variability among the genotypes. The presence of large amount of variability might be due to diverse source of materials as well as environmental influence affecting the phenotypes. The Genotypic Coefficient of Variation provides a measure to compare of genetic variability present in 12 quantitative and 4 qualitative characters (Table 1 & 2).

Table 1: Analysis of variance for 12 quantitative Characters in 30 Groundnut Genotypes during *Kharif* 2012

S. No	Characters	Mean Sum of Square		
		Replication (df=2)	Treatment (df=9)	Error (df=18)
1.	Oil yield	19.60	133748.74	10.71
2.	Oil content	3.60	59.76	1.82
3.	Oleic acid	2.50	637.13	1.17
4.	Protein content	2.64	6.59	1.22

*** Significant at 5% level of significant respectively*

High genotypic coefficient of variation was recorded for oleic acid (38.46) followed by oil yield (27.23), kernel yield (23.04) and low estimates of genotypic coefficient of variation values were observed for shelling % (3.83), kernel uniformity (2.96) and days to maturity (1.51). These results are in accordance with findings of Khote *et al*. (2009) and John *et al*. (2007) for kernel yield per plant is high GCV. Nath and Alam (2002) also resulted low genotypic co-efficient of variation for days to maturity. Phenotypic Coefficient of Variation which measure total relative variation were high for oleic acid (38.57) followed by oil yield (27.24), kernel yield (23.49), while low for shelling % (4.30) , kernel uniformity (3.20) and days to maturity (1.60) . These results are in accordance with the findings of Khote *et al*. (2009) and John *et al*. (2007) for kernel yield per plant is high PCV.

Heritability is a measure of extent of phenotypic variation caused by the action of genes. For making effective improvement in the characters for which selection is practiced, heritability has been adopted by genetic variability, which is transmitted from parent to offspring is reflected by heritability. In the present study high heritability was observed for 12 quantitative and 4 qualitative characters oil yield (99.98%), oleic acid (99.45%), kernel yield (96%), whereas protein content (59.57%) and plant height 20 DAS (52%) lowest heritability. Johnson (1955) reported that high heritability should be accompanied by high genetic advance to arrive at more reliable conclusion. The High heritability for kernel yield (96%) was also reported by Katiyar *et al.* (1974). and John *et al*. (2006) similar finding has been also reported by high heritability for hundred kernel weight. Therefore, genetic advance was also computed. So heritability coupled with genetic advance would be more useful than heritability alone. On examining the estimate of genetic advance expressed as percent of mean if different characters (Table 3and 4), it was observed that oil yield (413.25) exhibited highest estimates of genetic advance followed by oleic acid (28.57).

Table 2: Analysis of variance for 4 qualitative characters in 10 groundnut genotypes during Kharif 2012

S. No.	Characters		Mean Sum of Square		
			Replication (df =2)	Treatment (df=29)	Error df=58
1	Field Emergence		3.33	35.88**	1.63
2	Days to 50% flowering		6.63	14.35**	1.77
3	Plant height	20 DAS	0.12	0.68**	0.16
		40 DAS	0.63	25.56**	0.41
		60 DAS	0.81	20.74**	1.14
4	Primary Branches/ Plant	20 DAS	0.0053	0.33**	0.04
		40 DAS	0.0034	0.73**	0.07
		60 DAS	0.10	0.43**	0.05
5	Days to maturity		0.01	10.16**	0.40
6	Pod yield /plant		0.27	24.00**	1.42
7	Pod yield		0.75	39.72**	0.86
8	Sound mature kernel		3.04	45.64**	1.19
9	Hundred kernel weight		0.26	74.41**	1.56
10	Shelling Percentage		0.92	17.76**	1.40
11	Kernel yield		1.62	38.95**	0.50
12	Kernel uniformity		0.21	15.20**	0.82

*** Significant at 5% level of significant respectively*

Table 3: Estimation of range, mean, PCV, GCV, heritability, genetic advance and genetic advance as % of mean of 4 qualitative characters in groundnut genotypes

S. No.	Character	Range	Mean	GCV %	PCV %	h^2 (Broad sense) %	GA	GA as percent of mean
1.	Oil yield	520.33-1124.36	775.25	27.23	27.24	99.98	413.25	53.31
2.	Oil content	40.30-53.19	46.59	9.43	9.87	91.38	9.00	19.31
3.	Oleic acid	20.04-63.55	37.85	38.46	38.57	99.45	28.57	75.48
4.	Protein content	18.25-23.10	20.86	6.41	8.31	59.57	3.39	16.26

h^2 = Heritability, GCV = Genotypic coefficient of variation, PCV = Phenotypic coefficient of variation, GA = Genetic advance

The low estimates of genetic advance were observed for plant height 20 DAS (0.63), primary branches/plant60 DAS (0.62) and primary branches/plant 20 DAS (0.52). On examining the estimate of genetic advance expressed as percent of mean if different characters (Table 3&4), it was observed that oleic acid (75.48) had highest genetic advance as percent of mean followed by oil yield (53.31), kernel yield (46.54%) pod yield (26.03%). The moderate estimate of genetic advance were noticed for hundred kernel weight (20.00%) followed by oil content (19.31), protein content (16.26), pod yield/plant (15.86%) days to 50% flowering (12.29%), sound mature kernel % (11.48%) and primary branches/plant (10.19%) while low genetic advance as % of Mean was recorded for plant height (9.10%), field emergence % (8.96%), shelling % (7.03%), kernel uniformity % (5.63%) and days to maturity (2.93%). moderate genetic advance as percent of mean values for hundred kernel weight similar finding has been also reported by Savaliya *et al.* (2009).

Table 4: Estimation of range, mean, PCV, GCV, heritability, genetic advance and genetic advance as % of mean of 12 quantitative characters in groundnut genotypes

S. No.	Characters		Range	Mean	PCV%	GCV%	Heritability%	GA	GA % of mean
1	Field Emergence		68.00-80.66	72.66	4.97	4.65	87	6.51	8.96
2	Days to 50% flowering		25.00-32.66	28.80	8.48	7.11	70	3.54	12.29
3	Plant Height	20	9.72-11.51	10.81	5.37	3.88	52	0.63	5.79
		40	29.01-37.62	32.62	9.26	9.05	95	5.94	18.22
		60	50.66-60.93	53.38	5.19	4.79	85	4.86	9.10
4	Primary branches /Plant	20	3.00-4.20	3.40	11.13	9.07	66	0.52	15.23
		40	4.13-5.83	4.74	11.51	9.85	73	0.82	17.36
		60	5.60-6.80	6.09	6.94	5.86	71	0.62	10.19
5	Days to maturity		116-122	119.55	1.60	1.51	89	3.51	2.93
6	Pod yield /plant		29.66-40.14	32.68	9.15	8.39	84	5.18	15.86
7	Pod yield		24.31-35.67	27.58	13.48	13.05	94	7.18	26.03
8	Sound mature kernel		61.46-74.77	66.43	6.02	5.79	93	7.63	11.48
9	Hundred kernel weight		45.66-61.94	49.19	10.33	10.02	94	9.84	20.00
10	Shelling%		58.18-67.56	60.96	4.30	3.83	79	4.29	7.03
11	Kernel yield		12.31-22.76	15.53	23.49	23.04	96	7.23	46.54
12	Kernel uniformity		67-78	73.98	3.20	2.96	85	4.17	5.63

High heritability coupled with high genetic advance as percent of mean for pod yield per plant, kernel yield per plant, test weight and shelling percentage. The present findings are in conformation with findings of John *et al*. (2007) and Khote *et al*. (2009).

Coefficient of variation revealed that PCV values were higher than GCV values for all characters. High GCV and PCV values were recorded for characters like oleic acid while lowest GCV and PCV was recorded for character days to maturity. High heritability was recorded for oil yield, oleic acid, kernel yield and pod yield. The maximum genetic advance was recorded for oil yield followed by oleic acid. The maximum value of genetic advance as percent of mean was recorded for oleic acid followed by oil yield, kernel yield and pod yield.

Acknowledgement: Authors are thankful to International Crop Research Institute for Semi Arid Tropics Region (ICRISAT) for providing seed of groundnut Also special thanks to Dr. Shailesh Marker, Associate Professor and Head, Department of Genetics and Plant Breeding, SHIATS, Allahabad, for providing necessary facilities.

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