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Evaluation of Groundnut Genotypes for Agronomic and Seed Quality Traits

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript

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ABSTRACT

An experiment was oversaw to assess agronomic and seed quality traits in 11 Groundnut genotypes along with one check (K 6) at Department of Genetics and Plant Breeding, Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHIATS), Allahabad, Uttar Pradesh during kharif season (2015). The genotypes were sown at field experimentation center in three replications adopting randomized block design to evaluate agronomic and seed quality traits. The analysis of variance for 17 parameters revealed that significant differences were observed for all the characters except pod width among the genotypes On the basis of mean performance, genotype ICG 15309 revealed best performance in primary branches/ plant, pods per plant, pod yield/plant, seed yield/plant while ICG 4598 recorded highest 100 kernel weight (47.15 gm).The genotype ICG 1399 (117.5) and ICG 14008 (117.67) were earliest in days to maturity.

Keywords: Arachis hypogaea; traits; evaluation; yield; promising genotypes.

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1. INTRODUCTION

Groundnut (*Arachis hypogaea) is* one of remarkable crop among oilseeds. It belongs to the family Leguminosae (Fabaceae) It is highly self-pollinated crop and has cleistogamous flowers. The popular types of groundnuts are Spanish, Runner, Virginia and Valencia. Groundnut is reported to have originated in South America and spread to Brazil [1]. It was introduced by Portuguese from Brazil to West Africa and then to South Western India in the 16th Century. Today, the groundnut is grown in almost all the tropical and subtropical countries of the world. Light, sandy loam soil is preferred for the production of groundnut. Temperature of 30℃ is considered to be the optimum for rapid germination and development of pods [2]. Groundnut is considered as the important and powerful food source for people throughout the world [3]. It is called as wonder nut, earth nut, monkey nut, goobers, pinder, panda, manila nut and poor men's cashew nut [4]. Groundnut is also known as "The king of oilseeds" as it is the most important oilseed crop in India in terms of production and highly nutritious. Groundnut contains on the average of 10-20% carbohydrates, 20-50% protein and 43-55% oil respectively [5]. The area, production and productivity of groundnut in India during 2013-2014 were 5.53 m ha, 9.67 m t and 1.75 ton/ha respectively. It accounts for 45% of the area and 55% of the production of total oilseeds in the country. It also accounts for 43% of total oil production in the country [6]. The yield is a complex character and various agronomic and seed quality characters determine the productivity of the groundnut genotypes. The evaluation of groundnut genotypes for yield and quality attributes result in better prediction of performance and improved production. Hence in this present study, 11 groundnut genotypes were evaluated for their performance with regard to agronomic and seed quality traits.

2. MATERIALS AND METHODS

The experiment layout included 11 groundnut genotypes, which were provided by International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) during *Kharif* season (2015) at field experimentation centre, Department of Genetics and Plant Breeding, SHIATS, Allahabad. The genotypes used were ICG-15042, ICG-15419, ICG-1399, ICG-4598, ICG-14008, ICG-14523, ICG-14482, ICG-503, ICG-15309 and ICG-12625 with K-6 cultivar as check variety. The 11 groundnut genotypes were grown in randomized block design with three replications. The spacing used was 35 cm between rows and 10 cm between plants. The crop was sown on 1st August and harvested on 25th November, 2015. Irrigation, weeding and earthing up were followed as per package of practices of groundnut. The estimations were recorded on five randomly selected plants from each entry and replication and their mean values were used for statistical analysis for the 17 parameters viz., field emergence (%), days to 50% flowering, plant height (cm), primary branches/plant, days to maturity, pods per plant, pod yield per plant (g), pod yield (q/ha), shelling (%), kernel yield (q/ha), hundred kernel weight (g), sound matured kernel (%), kernel uniformity (%), pod length (mm), pod width (mm), kernel length (mm) and kernel width (mm). The Analysis of variance was estimated according to procedure proposed by [7].

3. RESULTS AND DISCUSSION

The results were obtained from the experiment conducted during *Kharif* season (2015) to study the yield performance and quality parameters among the groundnut genotypes. The analysis of variance for 17 parameters revealed that significant differences were observed for all the characters except pod width among the genotypes tested (Table 1), which implies the presence of a high degree of variability.

The mean performance of groundnut genotypes for different traits are presented in (Table 2a and 2b). Based on the mean performance among 11 genotypes studied it was concluded that the genotype ICG 15309 was the best for primary branches per plant (5.31), pods per plant (14.46), pod yield (31.81 q/ha), kernel yield (23.40 q/ha) of all genotypes tested.Genotype ICG 503 was the best genotype for plant height (48.28 cm).Genotype ICG 4598 recorded the highest 100 kernel weight (47.15 gm). Genotype ICG 1399 was the best genotype for days to 50% flowering (25.00 days), days to maturity (117.5 days) and kernel uniformity (80.37%). The highest shelling % (73.46) was recorded in genotype ICG 15309 and the highest sound matured kernel (76.64%) was recorded in genotype ICG 4598. In case of pod and seed characters, ICG 14008 (31.22 mm) was the best genotype for pod length, ICG 12625 (13.87 mm) was the best genotype for kernel length and ICG 15309 (8.33 mm) was the best genotype for kernel width.

Table 1. Analysis of variance for 13 agronomic and 4 seed quality characters in 11 groundnut genotypes (including check) during *Kharif*-2015

Sr.no	Characters	Mean sum of squares		
		Replication (d.f. = 02)	Treatment (d.f = 10)	Error (d.f. =20)
1	Field emergence	10.79	19.11*	5.88
2	Days to 50% flowering	0.27	14.23**	1.14
3	Plant height	25.6	20.39*	8.2
4	Number of primary branches/plant	0.3	**0.55***	0.22
5	Days to maturity	1.2	6.58*	2.71
6	Pods per plant	6.19	4.74**	1.4
7	Pod yield per plant	150.44	43.57*	13.36
8	Pod yield (q/ha)	**49.12**	14.23*	4.36
9	Shelling percentage	1.18	8.92*	3.49
10	Kernel Yield	24.59	10.41**	2.39
11	Sound matured Kernels	46.47	12.21*	4.98
12	Kernel Uniformity	45.6	**43.49***	**21.01**
13	Hundred kernel weight	0.46	19.19**	4.34
14	Pod length	4.3	9.70*	3.71
15	Pod width	3.48	0.81	3.91
16	Kernel length	**0.25**	3.87*	1.37
17	Kernel width	0.49	1.16**	**0.11**

** ** Significant at 5% and 1% Level of significance respectively*

The significant differences observed in this study indicate that agronomic variation exists across the 11 groundnut genotypes. This could be due to differences in the genetic composition of these genotypes. This finding is very useful for selecting agronomically favourable genotypes for breeding programmes.

The genotype ICG 503 (48.28 cm) was found to be tallest whereas ICG 14008 was dwarf genotype. Plant height is an important trait for utilizing the whole plant in feeding farm animals. As the direct effect of plant height had negative association with yield, genotype ICG 503 is found to be not suitable for good yield, similar findings reported by [8].

In the present investigation, the genotype ICG 1399 (25 days) required minimum number of days for initiation of first flower, whereas, the genotype 12625 requiring more number of days for appearance of flowering. The wide range indicates the presence of sufficient variability and a better scope for improvement in terms of this character,- similar findings reported by [9,10].

The highest number of primary branches was recorded in ICG 15309 (5.31) and found to be significantly superior among all the genotypes, which help in bear more number of pods / plant. Hence ICG 15309 is the best genotype for pod yield. [11-13] recorded significant correlation between number of branches / plant with pod yield.

The minimum number of days for physiological maturity was recorded in genotype ICG 1399 (1117.5).As earliness in maturity had positive association with 100 kernel weight, genotype with earliest maturity is the best for seed index. Similar findings were reported by [14].

Genotype ICG 15309 was found to be the highest in number of pods per plant (14.46), pod yield per plant (55.67 g) and pod yield per hectare (31.81 q/ha). Among the yield components, number of pods per plant and pod yield per plant (gm) was more closely associated with pod yield per hectare. More pod yield / plant leads to the high pod yield / hectare. The pod yield of genotypes were mainly due to favourable yield contributing characters like number of pods / plant, number of kernels and harvest index. These findings are on the similar lines to those reported by [15].

The highest kernel yield was recorded in genotype ICG 15309 (23.40 q/ha). The shelling percent was significantly highest in genotype ICG 15309 (73.46%). The sound matured kernel was significantly highest in genotype ICG 4598 (76.64%). The kernel uniformity was significantly highest in genotype ICG 1399 (80.37%). Higher kernel yield was mainly attributed to greater shelling percent, kernel yield per plant, seeds per pod, 100 kernel weight, sound matured kernel and kernel uniformity in different genotypes. The similar results were reported by [16].

Table 2 (a). Mean performance of agronomic traits and seed quality traits of groundnut genotypes during *Kharif*- 2015

Genotypes	Field emergence (%)	50 % flowering	Plant ht (cm)	Primary branches/ plant	Days to maturity	No. of Pods/plant	Pod yield/plant (g)	Pod yield (q/ha)
ICG-15042	66.00c	30.33b	40.75e	4.07b	119.83cd	10.47de	42.42h	24.24g
ICG 15414	67.67a	27.33d	41.02e	4.29b	120.40c	11.63cd	50.98d	29.13d
ICG 1399	64.93d	25.00f	44.76c	5.04a	117.50ef	10.77d	50.65d	28.94d
ICG 4598	66.93b	25.33f	43.33d	5.23a	120.15c	12.45bc	51.55cd	29.46cd
ICG 14008	63.43e	27.33d	39.97f	4.79a	117.67e	12.17c	45.00g	25.72f
ICG 14523	61.21f	27.00d	42.97d	4.80a	120.50bc	11.33d	50.76d	29.00d
ICG 14482	65.35d	26.00e	46.86b	5.21a	118.83d	13.68b	52.35c	29.91c
ICG 503	59.77g	28.67c	48.28a	4.31b	118.67d	12.35c	54.28b	31.02b
ICG 15309	65.26d	26.00e	41.55ed	5.31a	118.60d	14.46a	55.67a	31.81a
ICG 12625	65.03d	32.00a	43.42d	4.47ab	122.25a	10.67d	48.34f	27.62e
K 6	61.34f	29.00c	44.99c	4.53ab	121.17b	11.42b	50.09e	28.62de
Grand mean	**64.27**	**27.64**	**43.45**	**4.73**	**119.6**	**11.95**	**50.19**	**28.68**
Range Min	59.77	25	39.97	4.07	117.5	10.47	42.42	24.24
Max	67.67	32	48.28	5.31	122.25	14.46	55.67	31.81
SE(d)	1.98	0.87	2.34	0.38	1.34	0.97	2.98	1.71
CV (%)	3.77	3.86	6.59	9.85	1.38	9.92	7.28	7.28
CD (5%)	4.13	1.82	4.88	0.79	2.8	2.02	6.23	3.56

Same letters in the each column indicate no significant difference between them

Table 2 (b). Mean performance of agronomic and seed traits of groundnut genotypes during *Kharif*- 2015

Genotypes	Shelling percentage (%)	kernel yield q/ha	100 kernel wt (gm)	Sound matured kernel (%)	Kernel uniformity (%)	Pod length (mm)	Pod width (mm)	Kernel length (mm)	Kernel width (mm)
ICG-15042	67.67f	16.44g	37.00f	69.99f	68.99g	28.22b	13.38a	12.65b	8.33a
ICG 15414	71.07c	20.70c	43.11c	71.68d	79.16b	26.32d	11.84b	10.21d	7.36b
ICG 1399	72.28b	20.91c	43.42c	71.89d	80.37a	28.32b	12.62ab	12.46b	8.19a
ICG 4598	70.21d	20.65c	47.15a	76.64a	74.29d	26.49cd	11.99b	11.77c	7.00b
ICG 14008	71.45bc	18.41f	43.72bc	73.65c	67.99h	31.22a	12.23b	12.06c	7.96a
ICG 14523	70.37d	20.39d	41.80d	70.68e	74.76c	26.98c	11.53b	11.45c	6.65bc
ICG 14482	72.99ab	21.82b	43.53bc	70.97e	71.62e	24.12e	11.88b	9.75d	7.10b
ICG 503	70.09d	21.74b	40.50e	74.29c	70.99f	28.26b	12.14b	11.88c	7.38b
ICG 15309	73.46a	23.40a	43.01c	73.85c	70.66f	26.07d	11.79b	11.86c	6.31c
ICG 12625	69.23e	19.09e	44.02b	74.68b	78.34c	27.58b	12.44b	13.87a	7.11b
K 6	72.34b	20.73c	44.14b	73.66c	71.00f	26.47cd	11.73b	12.54b	7.27b
Grand mean	**71.01**	**20.39**	**42.85**	**72.91**	**73.46**	**27.28**	**12.14**	**11.86**	**7.33**
Range Min	67.67	16.44	37	69.99	67.99	24.12	11.53	9.75	6.31
Max	73.46	23.4	47.15	76.64	80.37	31.22	13.38	13.87	8.33
SE(d)	1.53	1.26	1.7	1.82	3.74	1.57	1.63	0.95	0.27
CV (%)	2.63	7.58	4.86	3.06	6.24	7.06	16.45	9.86	4.44
CD (5%)	3.18	2.63	3.55	3.8	7.81	3.28	3.4	1.99	0.56

Same letters in the each column indicate no significant difference between them

The highest 100 kernel weight was reported in genotype ICG 4598. [17] reported that, hundred kernel weight and number of mature pods were the most important traits contributing to pod yield, hence the genotype ICG 4598 is good for pod yield.

In pod and seed characters, genotype ICG 14008 (31.22 mm) was the best genotype for pod length, ICG 12625 (13.87 mm) was the best genotype for kernel length and ICG 15042 (8.33 mm) was the best genotype for kernel width, [18, 19] reported that low number of pods per plant, had the highest pod width, pod length, seed width and seed length. As bigger size is one of the grading parameter for exporting, genotype ICG 14008, ICG 12625 and ICG 15042 can be used for export purposes.

4. CONCLUSION

On the basis of mean performance of all the genotypes taken, genotype ICG 15309 identified as best for primary branches/plant, pods per plant, pod yield, kernel yield, shelling %, kernel length and kernel width amongst all. Genotype ICG 4598 recorded the highest 100 kernel weight. Genotype ICG 1399 identified as best genotype for days to 50% flowering and days to maturity. The evaluation of groundnut genotypes during *Kharif* season (2015) enabled to identify promising groundnut genotypes based on agronomic and seed quality traits. Hence, the genotypes (ICG-15309, ICG-4598 and ICG-1399) can be used as parents for future groundnut improvement programme.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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