Annals of West University of Timişoara, ser. Biology, 2017, vol. 20 (2), pp.131-138

CHARACTERIZATION OF GROUNDNUT (*ARACHIS HYPOGAEA* L.) GENOTYPES BASED ON AGRONOMIC AND SEED QUALITY TRAITS

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Received 30 June 2017; accepted 15 December 2017

ABSTRACT
The present investigation was conducted on 11 groundnut genotypes including one check (K_6) to evaluate groundnut genotypes for its yield and yield components. The experiment was conducted at Field Experimentation Center, Department of Genetics and Plant Breeding, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad during Kharif, 2015 in Randomized Block Design with three replications. Analysis of variance showed highly significant differences among 11 groundnut genotypes for 16 agronomic and qualitative characters studied. Genotype ICG 14466 was identified as the best genotype for 100 seed weight, pod yield, kernel yield, pod length and kernel length. Genotypes ICG 4911 was identified as the best genotype for field emergence, plant height and maturity.
KEY WORDS: *Groundnut (Arachis hypogea L.), agronomic, physical characters.*

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the principal economic crops in the world ranked 13th among the food crops (Varnell & Cloud, 1975). Groundnut is the main oilseed crop in India and other developing countries for several decades and will continue to be so in the future. Groundnut (*Arachis hypogaea* L.) also known as peanut and poor men's cashew. It is widely grown in the tropics and subtropics globally. Groundnut belongs to the family Leguminosae. The credit for introduction of groundnut into India belong to the Jesuit Fathers who followed Vasco Dae Gama shortly after his first landing in India.

The oil content in seed of groundnut cultivars for commercial production is generally around 50%, while some germplasm accessions have been found to contain more than 55% oil (Liao & Holbrook, 2005). Its kernel is rich in both oil (45% to 50%) and digestible protein (25% to 30%). In addition, they are a good source of mineral (phosphorus, calcium, magnesium, and potassium) and vitamin (E, K and B group). Groundnuts contains on the average 12-15% carbohydrates, 25-30% protein and 45-50% oil. The nuts may be chewed uncooked, but are usually eaten boiled or roasted. The nuts can also be boiled, fried, ground into groundnut butter, or crushed for oil. Groundnut butter is extensively used in the preparation of soup and as bread spread (Tsigbey *et. al,* 2004).

China leads in production of groundnut with a share of 32.95 percent of overall world production, followed by India (18%) and United States of America (6.8%). The total production

of the groundnut in the world 34.15 million metric tons and cultivable area is 21.14 million hectare. In India, the area, production and productivity of groundnut during 2013-14 is 4.19 mha, 6.68 mt, 1591 kg/ha (Annual report, Directorate of Groundnut Research, 2014) respectively. About 80% of the total groundnut area in the country is under rainfed condition. Because of this, the annual groundnut production, and average groundnut productivity, in the country linked to amount and distribution of rainfall during the crop season in the major groundnut growing states. In India, principal ground nut growing states are Tamil Nadu (14.2%), Rajasthan (10.5%), M.P. (4.9%), Gujarat, Andhra Pradesh, Karnataka, and Maharashtra, which account for more than 84 per cent of the Indian production as well as in area. About 80 percent of total groundnut production in India is crushed for extraction of oil and de-oiled groundnut cakes are utilized as organic fertilizer containing 7 to 8 percent nitrogen, 1 to 5 percent phosphorus and 1 to 2 percent potassium and cattle feed. Industrially, groundnut is used for the manufacture of number of products such as soaps, paints, varnishes, synthetic fibers, lubricating oil, leather dressings and insecticide (Agriculture Statistics at a Glance, 2012).

Pod size and 100-pod weight is the second factor influences the seed yield and quality of the groundnut. Pod size is a function of shelling %, kernels/pod, and 100- kernel weight. The present study was undertaken to evaluate 11 groundnut genotypes for its yield and yield components and seed quality parameters.

MATERIALS AND METHODS

The field experiment was conducted during *kharif* 2015 at Field Experimentation Centre of Department of Genetics and Plant Breeding, SHIATS, Allahabad. The experimental material comprised of 11 genotypes of Groundnut which was provided by International Crop Research Institute of Semi Arid Tropics (ICRISAT) Hyderabad, A.P, India. The site of experiment is located at 25.57°N latitude, 81.51°E and 98 m above the sea level. The soil of the experimental field was sandy loamy in texture, medium, inorganic carbon (0.50%) and available nitrogen (245.5 kg/ha), low in phosphorous (21 kg/ha) and medium in potassium. The list of genotypes was ICG-397, ICG-434, ICG-1427, ICG-4911, ICG-6057, ICG-6201, ICG-6402, ICG-13941, ICG-13982, ICG-14466 and K-6 cultivar as check. The 11 groundnut genotypes were grown in randomized block design with three replications, with row to row distance 35 cm and plant to plant distance 10 cm and the crop was sown on July 29st and harvested on 25th November 2015. Irrigation, weeding and earthing up were followed as per package of practices of groundnut. Observations were recorded on five randomly selected plants from each replication. Reading from five plants was average replication-wise and the mean data were used for statistical analysis for the 16 characters viz., field emergence (%), days to 50% flowering, plant height (cm), primary branches/plant, days to maturity, pods per plant, pod yield per plant (g), shelling (%), kernel yield per plant (g), hundred kernel weight (g), sound matured kernel (%), kernel uniformity(%), pod length (mm), pod width (mm), kernel length (mm), kernel width (mm). Analysis of variance to test the significance difference among accessions for each character was carried out as per methodology suggested by *Panse and Sukhatme* (1962).

RESULTS AND DISCUSSIONS

The analysis of variance for 16 characters revealed that significant differences were observed for all different agronomic and seed quality characters studied among the genotypes. (table 1). The growth, yield and quality of seed were governed by soil and weather condition besides management practices. Crop performance under given environmental conditions is also depends on methods of cultivation and genotypes used in vogue. Therefore there is a need for study the variations for growth, yield and quality traits. The results were obtained from the experiment conducted during Kharif 2015 to study the yield performance and quality parameters among the groundnut genotypes. The variation in growth parameters among the genotypes can be attributed due to the response of different genotypes to environment and genetic makeup of the genotype.

Based on the mean performance among 11 genotypes, the present study concluded that Genotype ICG 4911(73.20) demonstrated the highest field emergence %, 10 DAS and lowest field emergence % is for ICG 434 (65.63). In earlier days Genotype ICG 4911 (25.67) had shown 50% flowering while ICG 13982 (30.00) had shown highest flowering. Highest and lowest plant height were observed in ICG 4911 (40.67) and ICG 6201 (35.33) respectively. Genotype ICG 6402 (5.87) had highest Primary branches per plant while lowest Primary branches/plant were observed in ICG 434 (3.73). Similar performance was reported by Patidar *et al.* (2014) in genotype ICG 4911 and ICG 6402 (116.67) from earliest days to maturity while from late days to maturity in genotype ICG 14466 (122.33).

Genotype ICG 14466 (10.67) had highest Pods/plant while lowest pods/plant were observed in ICG 6402 (7.67). Similar performance was reported by Karikari *et al*. (1997) and Sah *et al.* (2000). Genotype ICG 14466 (30.00) had highest Pod yield/plant (gm.) while lowest pod yield/plant (gm.) was observed in ICG 6201 (25.40). Similar performance was reported by Borate *et al.* (1993) and Karikari *et al*. (1997). Genotypes ICG 14466 (21.79) and ICG 434 (21.16) have highest Seed yield/plant (gm.) while lowest Seed yield/plant (gm.) was observed in ICG 6201 (18.39). Similar performance was reported by Abhay *et al.* (2002). Genotype ICG 14466 (45.50) had highest Hundred kernel weight (gm.) while lowest hundred kernel weight was observed in ICG 397 (29.00). Similar performance was reported by Yadav *et al.* (1998), Kathmale *et al*. (2000) and Parmar *et al.* (2000)**.** Genotype ICG 397 (80.33) had highest Sound mature kernel % while lowest sound mature kernel % was observed in ICG 6057 (68.00). Similar performance was reported by Kathmale *et al*. (2000) and Rajgopal *et al*. (2000). Genotype ICG 6201 (77.33) had highest Kernel uniformity % and lowest kernel uniformity % was observed in ICG 6057 (68.33). Similar performance was reported by Shukla *et al*. (2014). Genotype ICG 397 (76.60) had highest shelling % and lowest shelling % was observed in ICG 6402 (68.00). Similar performance was reported by Kathmale *et al*. (2000) and Parmar *et al.* (2000).

Genotypes that have highest and lowest pod length were ICG 14466 (31.37 mm) and ICG 4911 (21.93 mm) respectively. Similar performance was reported by Kumar *et al*. (2014). Genotypes that have highest pod width were ICG 397 and ICG 1427 (14.47 mm) while lowest pod width was observed in genotype ICG 4911 (11.07 mm). Similar findings were reported by Kumar *et al*. (2014). Genotypes that have highest and lowest seed length were ICG 14466 (12.27 mm) and ICG 6201 (8.00 mm) respectively. Genotypes that have highest and lowest seed width were ICG 1427 (10.53 mm) and ICG 6201 (7.20 mm) respectively.

The highest field emergence was recorded in ICG-4911 (73.20%) and found to be significantly superior among all the genotypes, which help in bear more number of plant / ha. The similar findings were reported by Patidar *et al.* (2014).

Days to 50% flowering was found in ICG 4911 (25.67 days). The wide range indicates the percent of sufficient variability and a better scope for improvement in terms of this character. Same genotype is better for oil yield because of 50% flowering has positive and significant correlation with the harvest index and oil content. Babariya *et al*. (2012) reported positive association of days to 50% flowering with oil content as well as harvest index.

TABLE 1. Analysis of variance for 12 Agronomic and 4 seed qualitative characters in 11 Groundnut genotypes during *Kharif* 2015

S. No.	Characters	Mean sum of squares		
		Replications (d.f. =02)	Treatment (d.f =10)	Error =20
1.	Field emergence	22.15	15.08**	2.55
2.	Days to 50% flowering	7.48	5.35**	1.55
3.	Plant height	1.64	6.75**	0.57
4.	Number of primary branches/plant	1.05	1.35**	0.19
5.	Days to maturity	2.93	11.42**	0.80
6.	Pods per plant	3.84	1.56*	0.54
7.	Pod yield per plant	1.49	11.02**	0.99
8.	Sound matured Kernels	0.29	26.39**	1.61
9.	Kernel Uniformity	7.20	30.14*	3.15
10.	Shelling percentage	43.26	18.36*	7.57
11.	Kernel Yield	0.18	8.57**	0.38
12.	Hundred kernel weight	20.43	22.33*	7.93
13.	Pod length	2.85	8.96**	0.74
14.	Pod width	1.63	4.90**	0.32
15.	Kernel length	0.22	2.02**	0.11
16.	Kernel width	0.26	3.65**	0.04

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

TABLE 2. Mean performance of 11 groundnut genotypes for 5 agronomic characters

S. No.	Genotype	Field Emergence	Plant Height (cm)	Days to 50% Flowering	Primary Branches/Plant	Days to Maturity
1	ICG-397	71.18	36.80	28.00	4.00	118.33
2	ICG-434	65.63	38.43	26.67	3.73	118.67
3	ICG-1427	69.94	38.37	29.33	4.47	119.00
4	ICG-4911	73.20	40.67	25.67	5.83	116.67
5	ICG-6057	68.45	38.00	27.33	5.20	122.33
6	ICG-6201	72.15	35.33	28.00	4.40	120.67
7	ICG-6402	71.67	39.60	26.33	5.87	116.67
8	ICG-13941	71.90	39.53	28.67	4.87	119.33
9	ICG-13982	68.73	37.73	28.33	5.00	119.00
10	ICG-14466	72.67	38.67	30.00	4.87	122.33
11	Kadiri-6	69.82	36.80	29.00	5.07	117.67
Mean		**70.49**	**38.18**	**27.94**	**4.85**	**119.15**
C.V.		2.27	1.99	4.48	9.11	0.75
S.E.		1.30	0.62	1.02	0.36	0.73
C.D.5%		2.72	1.29	2.12	0.75	1.53
Range	Lowest	65.63	35.33	25.67	3.73	116.67
	Highest	73.20	40.67	30.00	5.87	122.33

TABLE 3. Mean performance of 11 groundnut genotypes for 7 agronomic characters

Sr. No	Genotype	Pods / Plant	Pod Yield /Plant	Kernel Yield/Plant	Shelling (%)	100 Kernel Weight	S. M. K.	K. U.%
1	ICG-397	10.00	26.80	20.52	76.60	29.00	80.33	74.89
2	ICG-434	10.33	28.43	21.16	74.40	36.67	72.78	71.00
3	ICG-1427	9.07	28.37	21.11	74.87	44.33	70.67	69.22
4	ICG-4911	8.80	27.73	20.01	71.20	34.43	71.78	71.33
5	ICG-6057	9.27	28.00	19.56	68.67	38.13	68.00	68.33
6	ICG-6201	9.73	25.40	18.39	73.73	39.73	73.67	77.33
7	ICG-6402	7.67	27.93	20.04	68.00	31.17	74.45	71.00
8	ICG-13941	10.13	29.53	21.21	72.67	36.53	69.67	75.00
9	ICG-13982	10.27	27.73	20.91	75.40	39.36	72.33	76.00
10	ICG-14466	10.67	30.00	21.79	68.40	45.50	78.67	69.11
11	Kadiri-6	8.87	26.80	19.10	72.53	37.47	71.33	74.33
Mean		**9.53**	**27.88**	**20.35**	**72.41**	**37.48**	**73.06**	**72.50**
C.V.		8.34	3.47	4.65	3.89	5.34	1.39	2.14
S.E.		0.65	0.79	0.77	2.30	1.63	0.83	1.27
C.D.5%		1.35	1.65	1.61	4.80	3.41	1.73	2.65
Range	Lowest	7.67	25.40	18.39	68.00	29.00	68.00	68.33
	Highest	10.67	30.00	21.79	76.60	45.50	80.33	77.33

TABLE 4. Mean performance of 11 groundnut genotypes for 4 seed quality characters

Sr. No	Genotype	Pod width mm)	Pod Length (mm)	Kernel Length (mm)	Kernel Width (mm)
1	ICG-397	14.47	28.87	11.53	10.00
2	ICG-434	12.87	26.67	11.20	8.60
3	ICG-1427	14.47	26.33	12.07	10.53
4	ICG-4911	11.07	21.93	8.53	7.73
5	ICG-6057	12.73	27.53	10.80	8.93
6	ICG-6201	11.13	22.90	8.00	7.20
7	ICG-6402	14.07	30.33	12.00	10.33
8	ICG-13941	11.87	29.13	9.93	9.27
9	ICG-13982	11.47	23.40	9.20	8.40
10	ICG-14466	12.80	31.37	12.27	10.27
11	Kadiri-6	13.93	26.93	10.40	8.40
Mean		**12.81**	**26.85**	**10.54**	**9.06**
C.V.		4.24	2.79	2.85	2.68
S.E.		0.44	0.61	0.25	0.20
C.D.5%		0.93	1.28	0.51	0.41
Range	Lowest	11.07	21.93	8.00	7.20
	Highest	14.47	31.37	12.27	10.53

The highest pod per plant was observed in ICG-14466 (10.67). The pod yield per plant was significantly higher in ICG-14466 (30.00 gm). Among the yield components, number of pods per plant and pod yield per plant were more closely associated with pod yield per ha. Higher the pod yield / plant lead to the high pod yield / hectare. The pod yield of genotypes was mainly due to favorable 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 Borate *et al.* (1993) and Karikari *et al*. (1997).

The highest kernel yield was recorded in ICG 14466 (21.79 gm/plant). The shelling percent is significantly highest in ICG 397 (76.60%). The sound matured kernel was significantly higher in ICG 397 (80.33%). The kernel uniformity was significantly higher in ICG 6201 (77.33%). 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 findings were reported by Kathmale *et al*. (2000), Parmar *et al.* (2000), Kumar *et al*. (2014) and Shukla & Rai (2014).

The highest 100 kernel weight was reported in ICG-14466 (45.50 gm.). Yadav *et al.* (1998), Kathmale *et al*. (2000) and Parmar *et al.* (2000) reported that hundred kernel weight and number of mature pods were the most important traits contributing to pod yield and oil content, hence genotype ICG 14466 is good for pod yield**.**

In pod and seed characters, ICG 14466 (31.37 mm) identified as best genotype for pod length, ICG 14466 (12.27 mm) identified as best genotype for kernel length and ICG 1427 (10.53 mm) identified as best genotype for kernel width. Kumar *et al*. (2014) 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, ICG 14466 and ICG 1427 can be use for export purposes.

The characteristics that refer to pod and seeds of peanut are related to industrial uses based on the consumer's preferences. Large-seeded (with large pods) varieties are better preferred for consumed directly by humans. Seed taste interests those that grow the cultivars for direct consumption, to have the best organoleptic quality (Kotzamanidis, 1994).

CONCLUSIONS

Present study concluded that the genotype ICG-14466 was identified as best genotype for pod per plant (10.67), kernel yield per plant (21.79), pod yield per plant (30.00), 100 kernel weight (45.50gm), pod length (31.37), kernel length (12.27). The genotype ICG 4911 recorded highest field emergence (73.20), plant height (40.67 cm) and 50% flowering (25.67). Significant differences were observed for all the different agronomic and seed quality characters studied among the genotypes.

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