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RESEARCH NOTE

Association of biophysical and morphological traits for pod yield in groundnut (*Arachis hypogaea* L.)

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Thirteen groundnut genotypes were evaluated in randomized block design (RBD) with three replications at College of Agriculture, Raichur during *kharif* season to study the morpho-physiological basis of variations inphotosynthetic productivity in groundnut genotypes. The genotypes were significantly differed for pod yield. The highest pod yield was recorded by the genotypes G2-52, TG-37A and Kadriri-9 due to significant favourable yield contributing characters like pod weight, pod indicated that the dry matter production, photosynthetic rate *etc*., had greater influence on yield and yield contributing characters with total yield.

Key words: Energy, Oil, Yield

Groundnut (*Arachis hypogaea* L.) is the fore most important oil seed crop of India. In terms of area and production, it occupies an third position among the oil seed crops in the world. It has been aptly described as natures masters piece of food values containing 36 to 54 per cent oil with 21 per cent protein and have an energy value of 2,363 KJ^{-1} 100 g. The oil is rich in unsaturated fatty acid (80 %), oleic acid and linoleic acid accounting for 38 to 58 per cent and 16 to 38 per cent, respectively. Yield is a complex trait, governed by many traits and there are ample evidences to show that selections directly based on grain yield in large number of germplasm lines is not easy. Thus, any morphological character that is associated with higher seed yield or which makes a significant contribution to yielding ability would be useful for selection and improvement of the genotype. Hence, the studies on the basis of morpho-physiological traits are needed to overcome the yield based selection within the genotypes.

Generally, there are two physiological approaches to achieve the target of yield potential. One is physio-genetic, based on genetics of physiological traits and another one is the physio-agronomic influenced by the environment and the management practices. It is ultimately the morpho-physiological variations, which are easy to observe and record and important for realizing higher productivity as evident from very high and positive association within traits. Therefore the present study was undertaken with an objectives to evaluate groundnut (*Arachis hypogaea* L.) genotypes for physiological traits and find relation with the productivity.

Field experiment was carried out at Agricultural College Raichur, Karnataka Farm, during *kharif* season 2015-16. The

Table 1. Performance of groundnut genotypes for morpho-physiological traits, yield and yield attributes.

Sl. No.	Genotypes	At 75 DAS						At harvest					
		Plant height (cm)	Number of branches $plant^{-1}$	LAI	LAD	Chlorophyll content (mg g^{-1} fr.wt)	Photosynthetic rate (i mol CO_2 m^{-2} s^{-1})	Transpiration rate (m mol H_2O $m^{-2}s^{-1}$)	No. of mature pods/ plant	Pod weight (g/plant)	100 kernel weight	Pod yield (kg/ha)	Shelling %	Harvest index
1	R-8808	23.50	7.28	2.72	54.24	2.639	27.27	10.67	25	7.80	28.05	2208	65.83	46.57
2	TG-37A	27.97	6.37	2.89	59.81	2.107	30.21	11.32	24	7.08	25.21	2577	67.79	49.82
3	R-2001-2	28.11	6.17	2.51	43.33	1.821	27.40	10.97	16	7.55	17.48	2374	67.42	42.01
4	G2-52	27.83	5.68	3.59	52.76	2.649	31.01	11.92	24	8.53	22.67	2672	71.74	44.56
5	Dharani	33.78	6.00	3.10	43.28	1.704	26.66	11.68	17	5.99	31.34	1966	66.26	47.56
6	TG-51	24.75	6.75	2.27	35.53	2.190	26.70	10.14	20	6.34	22.07	1877	65.73	43.50
7	TPG-41	18.56	7.78	2.81	55.94	2.249	27.86	10.37	21	6.47	28.89	2358	70.23	43.87
8	ICGV-00351	21.89	5.17	2.82	41.05	2.070	28.90	11.28	21	8.34	19.07	2190	66.33	45.92
9	Kadiri-9	25.67	5.00	3.08	57.28	2.330	29.74	11.31	26	7.29	23.90	2574	71.24	44.36
10	TMV-2	31.72	6.10	3.53	58.22	1.704	27.96	11.08	17	7.11	22.08	2078	69.50	41.69
11	GPBD-5	27.78	6.83	3.10	54.48	2.319	28.82	10.68	22	8.44	17.33	2245	66.45	45.62
12	Kadiri Haritandra	22.62	6.18	2.50	51.64	2.081	28.81	11.68	21	6.99	25.97	2156	65.64	47.61
13	R-2001-3	19.67	7.48	3.22	50.85	2.229	30.16	11.45	21	7.04	22.3	2400	67.69	45.85
	Mean	25.67	6.36	2.92	50.65	1.939	28.58	11.03	21.26	7.31	23.57	2282	67.83	45.3
	S.Em±	0.66	0.12	0.21	0.58	0.144	0.2	0.14	2.19	0.11	1.93	125.9	0.17	0.53
	C.D. at 5%	1.92	0.36	0.63	1.71	0.422	0.59	0.42	6.4	0.34	5.65	367.5	0.51	1.54

experiment was conducted with 13 groundnut genotypes selected from different geographical regions with three replications with spacing of 30 cm x 10 cm. Recommended package of practices were followed to raise a good groundnut. Observations on five selected plants were recorded for plant height, number of branches, leaf area index, leaf area duration, chlorophyll content, photosynthetic rate, transpiration rate at 75 DAS and number of mature pods per plant, pod weight, 100 kernel weight, pod yield, shelling percentage, harvest index at harvest stage. The experiment data was analyzed as per the standard method of analysis of variance (Panse and Sukhatme, 1985).

Variability for different morphological and biophysical parameters is as essential component for the genetic improvements of a crop. The significant differences in mean sum of squares were observed between genotypes for all the characters studied are presented in (Table 1). The maximum plant height was observed in the Dharani and whereas, the genotype TPG-41 recorded the lowest plant height at 75 DAS. Channappagoudar *et al.* (2010) reported that the highest plant height was recorded in TMV-2 closely followed by JL-24 and the lowest plant height in Dh-86. The number of branches per plant ranged from 3.2 to 7.5 and the genotypes TPG-41 and R-2001-3 maintained higher number of branches per plant over all other genotypes. Chaitanya *et al.* (2015) reported on the basis of mean performance, genotype ICG 14127 revealed the better performance in primary branches per plant.

The genotypes G2-52 recorded higher LAI whereas, significantly lower LAI was recorded in TG-51 genotype. Channappagoudar *et al.* (2010) indicated the importance of leaf area index in yield determination. The genotypes TG-37A recorded significantly higher LAD, whereas, significantly lower LAD was recorded in TG-51 genotype. The chlorophyll content was relatively higher in G2-52 where as significantly lower in TMV-2 genotype. Singh and Joshi (1993) also indicated that the higher chlorophyll content was associated with higher yield in groundnut.

The maximum transpiration rate was recorded in G2-52 genotype and significantly lower transpiration rate was recorded in TG-51 genotype. There is report in the literature supported this finding (Borkar and Dharanguttikar, 2014). The genotypes G2-52, TG-37A and Kadiri-9 recorded higher photosynthetic rate. However, significantly lower photosynthetic rate was recorded in Dharani and TG-51. Nautiyal *et al.* (2012) and Kuldeepsingh *et al.* (2015) opined that the physiological processes *viz.,* photosynthesis were found at higher rate in some genotypes which resulted in high yielding.

The genotypes differed significantly with respect to yield and yield attributes. In the present investigation, it is observed that Kadiri-9 recorded higher number of mature pods, Where as the genotype R-2001-2 recorded significantly lower value. The maximum pod weight was recorded in G2-52 and lower in TG-51 genotype. The higher 100 kernel weight recorded in Dharani and lowest in GPBD-5. There are reports in the literature supported this finding (Borkar and Dharanguttikar, 2014, Ayub khan *et al.* (2012).

The Pod yield found to be significantly higher in the genotypes G2-52, TG-37A, and Kadiri-9, where as, the genotypes TG-51 and Dharani recorded significantly lower pod yield. Among the genotypes, the highest shelling percent was recorded in G2-52 (71.74 %) and lowest in Kadiri Haritandra (65.64 %). The harvest index was significantly higher in TG-37A whereas, TMV-2 recorded significantly lower harvest index. These results are similar to those of Mukhtar *et al.* (2013), Madiha *et al.* (2013), Ashutosh and Prashant (2014) concluded that, pod yield was positively correlated with kernel yield, pod yield per plant, hundred kernel weight, shelling percent and Harvest index.

Genotypic variability was observed for morphological, biophysical and yield contributing characters. The traits like photosynthesis, transpiration rate, pod weight, shelling percent were found at highest rate in G2-52 genotype which resulted in highest yielding. Among the genotypes G2-52, TG-37A and Kadiri-9 recorded significantly higher yield as compared to others due to improved morpho-physiological traits, growth parameters and also other associated traits related to productivity. Therefore, these genotypes may be used in breeding programmes or can be recommended for cultivation in Karnataka.. These traits could be considered for further breeding programme from the high pod yield per plant point of views.

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