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Physiological basis of yield variation in groundnut genotypes in *kharif* season

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ABSTRACT

A study on physiological functions and its relation with yield contributing characters was undertaken and completed at M.P.K.V., Rahuri. From the study, it is revealed that the genotypes J-30 and J-17 performed better during *kharif* season over other eight genotypes studied in respect of per plant number of dry pods, dry pod yield, kernel weight, number of kernels, dry pod yield per hectare, 100 kernel weight, harvest index etc. The study further indicated that the activity and efficiency of dry matter production in physiological growth functions *viz.*, AGR, RGR and NAR had greater influence on yield and yield contributing characters. It was also observed that, there was positive correlation of yield contributing characters with total yield.

Key words : Physiological basis, Groundnut genotypes.

INTRODUCTION

In India groundnut is the king of oilseed crops. India ranks first in area of groundnut cultivation and eighth in productivity in the world. A large variation in growth and yield is seen among the different improved cultivars of groundnut. The growth analysis techniques help in understanding, growth pattern and contribution of various plant parts to economical yield. It also helps in finding out yield contributing characters. Thus, growth analysis forms the basis for manipulation of productivity of the crop. The yield of groundnut is largely influenced by the partitioning of assimilates between reproductive and vegetative parts, the length of pod filling period and the pod setting. In view of these, the present investigation was undertaken.

MATERIALS AND METHODS

A field experiment was conducted during *kharif*, 2002 at the MAP (Medicinal and Aromatic Plant) Project Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment was conducted in a Randomized Block Design with ten genotypes. [*viz.*, J-17 (T_1), I-09 (T_2), T-18 (T_3), I-13 (T_4), J-30 (T_5), I-43 (T_6), ICGS-76 (T_7), I-10 (T_8), T-41 (T_9) and I-23 (T_{10})] of groundnut and replicated three times in rainfed condition. The gross plot size was 3.0 x 2.10 m^2 and net plot size was 2.80 x 1.50 m^2. The sowing was done by dibbling on 22nd July, 2002 with 30 cm x 10 cm spacing. Three randomly selected plants from each plot were tagged and taken as observation plants. The periodic observations were recorded at 30 days interval *viz.*, at 30, 60, 90 DAS and at harvest stage. The observations such as number of per plant mature pods, kernel weight, number of kernel, 100 pod weight, 100 kernel weight, dry pod yield, total dry matter per net plot, shelling percentage, harvest index etc. were recorded at harvest. Similarly, various physiological growth functions *viz.*, AGR, RGR and NAR were worked out during different growth stages as per the standard procedure given by Radford (1967) and Gardner *et al*. (1988). The data was analyzed as per the standard method of analysis of variance (Panse and Sukhatme, 1985).

RESULTS AND DISCUSSION

The data on yield contributing characters are presented in Table 1. It is evident from yield data that the differences due to genotypes were statistically significant indicating genetic variation in yield potential. The performance of different genotypes in respect of dry pod yield q/ha was statistically significant.

The genotype J-30 (24.36 q/ha) recorded significantly highest dry pod yield per hectare, over all genotypes. The genotypes J-17 (20.95 q/ha), I-13 (20.87 q/ha), I-09 (19.92 q/ha), ICGS-76 (19.60 q/ha) and T-18 (19.37 q/ha) were at par in per hectare yield with each other. The genotype I-10 (16.90 q/ha) recorded the significantly lowest dry pod yield per hectare over rest of the genotypes. The higher pod yield of the genotypes, *viz.*, T_5, T_1, T_4, T_2, T_7 and T_3 was mainly due to favorable yield contributing characters like per plant number of kernel, kernel yield, dry pod yield, pod yield per net plot and harvest index. The present investigation had similar trend as seen by Jayalakshmi *et al*. (2000), observed positive correlation of the characters like number of dry pods, dry pod yield, kernel weight and harvest index with yield.

The genotypes as regards to the number of matured pods and number of kernel per plant were statistically significant indicating basic variation in the genetic potential. The genotype J-30 exhibited its superiority in respect of per plant kernel yield and dry pod yield. Harvest index is the best indicator of photosynthetic translocation efficiency

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Table 1: Yield contributing characters in groundnut genotypes

Sr. No.	Genotypes	Number of mature pods/ plants	Kernel number/ Plant	Kernel yield (g)/ plant	100 pod weight (g)	100 kernel weight (g)	Dry pod yield (g)/ plant	Dry pod yield (kg)/ per net plot	Dry pod yield (q)/ha	Shelling percentage (%)	Total dry matter (kg)/ net plot	Total dry matter (q)/ ha	Harvest index (%)
1.	T_1: J-17	14.26	24.29	08.44	80.20	31.24	18.59	0.88	20.95	45.49	2.08	49.60	42.24
2.	T_2: I-09	13.39	21.16	08.37	102.46	39.40	18.43	0.84	19.92	45.28	2.03	48.41	41.17
3.	T_3: T-18	12.98	20.33	08.28	82.02	34.04	18.27	0.81	19.37	45.43	1.91	45.48	42.74
4.	T_4: I-13	14.82	24.32	08.78	101.46	41.76	19.03	0.88	20.87	46.21	2.01	47.86	43.77
5.	T_5: J-30	16.95	29.70	09.24	97.50	30.60	21.50	1.02	24.36	42.97	2.31	54.92	44.54
6.	T_6: I-43	13.66	22.64	08.60	108.52	47.36	18.83	0.76	18.09	45.53	2.19	52.06	35.00
7.	T_7: ICGS-76	10.74	18.26	08.05	102.96	44.24	17.25	0.82	19.60	46.54	1.95	46.51	42.34
8.	T_8: I-10	10.51	15.87	07.74	93.98	41.26	15.88	0.71	16.90	48.57	1.81	43.09	39.22
9.	T_9: T-41	12.20	18.85	08.13	98.78	43.64	18.01	0.80	18.97	45.37	1.61	38.42	49.38
10.	T_{10}: I-23	09.43	15.06	07.48	96.65	38.80	15.40	0.74	17.22	48.70	1.77	42.06	40.94
Mean		12.894	21.048	8.311	96.45	39.234	18.120	0.826	19.627	46.008	1.967	46.841	42147
S.E. $\pm$		0.354	0.601	0.464	1.588	0.967	0.753	0.021	0.544	2.287	0.083	1.979	1.882
C.D. (P=0.05)		1.052	1.785	N.S.	4.715	2.872	2.236	0.063	1.617	N.S.	0.247	5.877	5.590

NS - Non significant

of the genotype. The genotype T-41 followed by J-30 was observed to be superior in respect of harvest index. Jadhav and Sengupta (1991) in the field experiment also reported that pod yield was significantly correlated with per plant number of pods, number of kernel, 100 kernel and pod weight, dry pod yield per hectare, harvest index.

The data pertaining to the various physiological growth functions (Table 2) revealed that the value of these growth functions increase up to the stage 60-90 days after sowing (DAS) and declined between 90 DAS till harvesting. The generalized trend for mean absolute growth rate (AGR) indicated increased up to 60-90 DAS of growth and declined thereafter. Some genotypes showed increment in relative growth rate (RGR) up to 30-60 DAS and others showed decline from 60-90 DAS and 90 DAS till harvesting. The genotypic differences in respect of net assimilation rate (NAR) value were statistically significant at all the growth stages except 90 DAS to harvest stage. The above findings are in agreement with the results of Murty *et al.* (1983) and Chhonkar and Arvindkumar (1987).

The correlation studies (Table 3) indicated positive correlation of number of matured pods and kernel yield per plant with dry pod yield per plant, dry pod yield per hectare, harvest index. However, there was highly significant negative correlation between shelling

Table 2: Physiological growth functions as influenced by groundnut genotypes

Sr. No.	Genotypes	Days after sowing								
		30-60			60-90			90- harvest		
		AGR	RGR	NAR	AGR	RGR	NAR	AGR	RGR	NAR
1.	T_1: J-17	0.420	0.049	0.066	0.724	0.028	0.047	0.362	0.009	0.019
2.	T_2: I-09	0.370	0.046	0.077	0.766	0.031	0.055	0.459	0.011	0.024
3.	T_3: T-18	0.383	0.043	0.060	0.800	0.031	0.055	0.265	0.006	0.016
4.	T_4: I-13	0.449	0.043	0.080	0.644	0.024	0.045	0.392	0.006	0.024
5.	T_5: J-30	0.407	0.047	0.059	0.769	0.030	0.051	0.706	0.016	0.042
6.	T_6: I-43	0.377	0.043	0.074	0.667	0.027	0.052	0.528	0.014	0.033
7.	T_7: ICGS-76	0.404	0.050	0.041	0.628	0.026	0.041	0.398	0.011	0.022
8.	T_8: I-10	0.376	0.047	0.065	0.648	0.028	0.048	0.311	0.009	0.021
9.	T_9: T-41	0.366	0.049	0.051	0.633	0.028	0.041	0.259	0.007	0.015
10.	T_{10} :I-23	0.313	0.044	0.044	0.586	0.029	0.036	0.434	0.013	0.023
Mean		0.386	0.046	0.062	0.686	0.028	0.047	0.411	0.010	0.024
S.E.$\pm$		0.029	0.005	0.080	0.039	0.002	0.003	0.148	0.004	0.009
C.D. (P=0.05)		N.S.	N.S.	0.024	0.117	N.S.	0.008	N.S.	N.S.	N.S.

N.S. – Non- significant, AGR- g/day, RGR- g/g/day, NAR-g/dm^2/day

Table 3: Correlation of yield contributes with pod yield (g) per plant

Sr. No.	Characters	Correlation of mean pod yield (g) per plant
1.	Number of mature pod per plant	0.575
2.	Number of kernel per plant	0.532
3.	Kernel yield (g) per plant	0.509
4.	Dry pod yield (g) per plant	0.611
5.	Dry pod yield (q) per ha.	0.476
6.	Shelling percentage (%)	-0.743*
7.	Harvest index	0.117

* and ** indicates significance of values at P=0.05 is r = 0.632 and P=0.01 is r = 0.765, respectively

percentage and mean pod yield. Similar correlations were reported by Kataria *et al*. (1982).

From the present study it is revealed that the highest pod yield was recorded by genotype T_5 (J-30) followed by T_1 (J-17). These genotypes were found to be superior in respect of per plant number of dry pods, kernel weight, 100 kernel weight, harvest index.

Further, it was observed that the differences in physiological growth functions *viz.*, AGR, RGR and NAR could influence the major yield contributing characters and thus, formed the physiological basis for yield variation in *kharif* groundnut genotypes.

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