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Response of Summer Groundnut (*Arachis hypogea* L.) to Dates of Sowing, Planting Geometry and Levels of Phosphorus under South Gujarat Conditions

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ABSTRACT

An experiment was conducted at the College Farm, Gujarat Agricultural University, Navsari on groundnut (Var. GAUG-1) in summer seasons of 1982 to 1984 on clayey soil. Three dates of sowing (1st and 15th February and 2nd March) as main plots were tried with there levels of phosphorus (25, 50 and 75 kg P_2O_5/ha) and two spacings (30 and 45 cm between rows) as sub plot treatments in a split plot design. Significant reduction in pod yield was recorded by delay in sowing from 1st February to 2nd March. Highest fodder yield was obtained with sowing on 15th February. Effect of different levels of phosphorus and spacing was not significant indicating that 25 kg P_2O_5/ha is sufficient for summer groundnut on vertisol with 30 x 10 cm or 45 x 7.5 cm as planting geometry.

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INTRODUCTION

Practice of raising summer groundnut crop in command area of Ukai-Kakarapar irrigation project is a newly adoptation and hence adequate information is not available regarding agronomic practices. The groundnut crop being insensitive to photoperiod, the major weather parameter that influences the growth and yield, is the temperature. The influence of air temperature on the yield of groundnut was striking during pegging and pod development stages of the crop (Ono and Ozaki, 1974). Plant geometry is also an important factor influencing photosynthetic activity of the plant and ultimately the yield. Besides maintaining optimum plant population, changing the geometry of planting can influence moisture and nutrition extraction pattern from the soil (Raddy *et al.*, 1978). In contrast to most of the other crops, the groundnut crop can use soil phosphorus at lower test level (Scarsbrook and Cope, 1956). Martin (1964) in a world-wide review on fertilization to peanuts pointed out that in most areas pea-nuts depended on residual phosphorus applied to previous crop. Considering these views, the experiment was conducted to findout the adequate requirement of P, best period of sowing and spacing between two rows for South Gujarat conditions.

MATERIALS AND METHODS

The experiment was conducted at the College Farm, GAU, Navsari during the

summer seasons of 1982 to 1984 on vertisols having pH 7.8, Ec 0.11 mmhos/cm, low in N, medium in available phosphorus (24 kg P_2O_5/ha) and rich in potash. Total eighteen treatment combinations involving three dates of sowing (1st and 15th Feb. and 2nd March) in main plots and combinations of two planting geometry i. e. (30 x 10 and 45 x 7.5 cm) and three levels of phosphorus (25, 50 and 75 kg P_2O_5/ha) in sub plots were employed under split plot design with four replications. The seed rate was 100 kg kernels/ha. The erect type groundnut variety GAUG-1 was employed. A common dose of N @ 25 kg/ha in the form of urea along with single superphosphate as per treatment was band placed before sowing and in same line the crop was sown as per spacing. No potash was applied. The irrigations were given just after sowing and then at about 10 days interval till maturity. The crop was harvested in the beginning of June every year. The yields of pod as well as dry fodder were recorded plotwise. The fodder was spoiled during 1983 due to premonsoon rain, hence not recorded.

RESULTS AND DISCUSSION

The mean yield data of pod as well as dry fodder as affected by different treatments are presented in Table-1.

Effect of dates of sowing

The data given in table-1 revealed that the pod yield was significantly affected by dates of sowing in all the years and also in data pooled. Significantly the highest pod yield was recorded with sowing on 1st Feb. followed by 15th Feb. and 2nd March. The reduction in pod yield was to the tune of 78, 70, 51 and 63 per cent during 1982, 1983, 1984 and in pooled, respectively, when crop sown on 2nd March. Patel (1982) also obtained the highest pod yield from sowing of 3rd Feb. Which was at par with 18th Feb. and significantly superior over 18th Jan. The same period was also found significantly superior over late sowing at Junagadh (Annual Progress Report 1979) and by Patel (1981). They have suggested that maximum pod yield from the crop sown during this period might be due to favourable climatic condition that existed during the crop growth period. Joshi *et al.* (1975) also recorded higher number of undeveloped pods per plant in late sown crop. Here reduction in yield might also be due to less period available for maturity as it was essential to harvest the crop before second week of June as it is a probable period for start of monsoon in this region.

From the two years data (table-1) it was observed that though the effect of dates of sowing was found to be significant in respect of fodder yield during both the years, was not significant on data pooled. During both the years and also in pooled analysis, the second data (15th Feb.) showed maximum fodder yield. Similar observations were also recorded by Patel (1982). He observed that the maximum fodder yield was obtained from the crop sown on 18th Feb. which was statistically at par with the sowing of 3rd Feb. The better development of growth parameters from sowing of first fortnight of February was observed by several scientists viz., Patel, 1982; and Joshi *et al.*, 1975 in respect of plant height and Patel (1981) and Patel (1982) in respect of number of branches per plant and Patel (1981) in respect of plant spread per plant.

The effect of temperature on growth of groundnut, studied by Joshi *et al.* (1975)

Effec' of various treatments on pod and dry fodder yield of groundnut.

Treatment	Pod yield kg/ha				Dry fodder yield kg/ha		
	1982	1983	1984	Pooled	1982	1984	Pooled
(A) Dates of sowing							
D_1 (1st Feb.)	2927	3569	2347	2948	6782	5971	6377
D_2 (15th Feb.)	1582	3410	1513	2168	8363	6373	7368
D_3 (2nd March)	636	1076	1023	913	5293	6117	5705
S. Em. ±	134	101	155	132	393	56	754
C. D. 5%	463	348	536	391	1359	194	N.S.
(B) Levels of phosphorus							
P_1 (25 kg P_2O_5/ha)	1673	2680	1728	2027	6977	6258	6617
P_2 (50 kg P_2O_5/ha)	1657	2747	1558	1987	6466	6031	6248
P_3 (75 kg P_2O_5/ha)	1818	2629	1597	2015	7196	6173	6684
S. Em. ±	54	61	62	55	254	85	134
C. D. 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
(C) Spacing between two rows :							
S_1 (30 cm)	1666	2682	1584	1975	6784	6055	6419
S_2 (45 cm)	1772	2689	1672	2041	6975	6253	6614
S. Em. ±	44	50	51	28	207	69	109
C. D. 5%	N.S.	N.S.	N.S.	N.S.	N.S.	198	N.S.

indicated that cooler temperature resulted in delay in germination and slow growth of groundnut. In South Gujarat, the low temperature during 1st Feb. might have resulted in slow growth and had affected final fodder yield.

In late sowing the period available for growth is not sufficient and because of early onset of monsoon the harvesting is affected. Secondly high temperature of summer affected the peg formation and pod development might have affected the yield adversely (Joshi *et al.* 1975).

Effect of levels of phosphorus

The effect of different levels of phosphorus did not show significant effect on pod yield in all the years separately as well as in pooled data. The application of higher (75 kg P_2O_5/ha) level of phosphorus also failed to increase the pod yield. The results were in agreement with those of Aulakh *et al.* (1980), Shelke and Khuspe (1980) and Dubey and Shinde (1986). They observed that the application of various levels increased the yield significantly but the significant difference were only between control (no application) and lower levels ranging from 15 to 22.5 kg P_2O_5/ha. While other higher levels were at par. Similar results were also obtained at Navsari (A Research Report, 1985), in summer. Adams and Pearson (1970) opined that the phosphorus requirement of peanut crop is very low and therefore little or no response is expectable. Fox (1978) also observed much less requirement of external phosphorus. The contribution of surface soil for phosphorus fertility and association of microorganisms in the rhizospheric environment might also be playing a definite role for the poor response of the crop (Patel and Kanzaria, 1985). Almost similar trend was recorded for dry fodder yield.

Effect of planting geometry

The effect of planting geometry did not reach to the level of significance in respect to pod yield in all the years and data pooled. Similar results were also reported by Reddy *et al.* (1978). On the other hand, Bhan and Misra (1971), and Gopalswami *et al.* (1979), recorded higher yield with narrow spacings whereas Joshi and Joshi (1964) recorded higher pod yield with wider inter row spacings and closer plant to plant spacings.

In present study, the formation of pods mainly on main shoot of non spreading variety GAUG-1 might be the probable reason for the poor effect of plant geometry on the pod yield. However, wider row spacing (45 cm) resulted in increase in fodder yield only during 1981. Non significant response of spacing to fodder yield was reported by Patel (1982). In contrast to this Bhan and Misra (1971), Reddy (1979) and Ramarao (1980) recorded higher fodder yield with narrow spacings. Interaction effects on pod yield.

Dates of sowing x levels of phosphorus

The interaction effect of date of sowing and level of phosphorus (table-2) was significant (pooled data). Within the date of sowing, phosphorus levels did not show significant effect except last date (2nd March). It is clear that the reduction in yield by delayed sowing was lessend with increase in P level. However, the yield obtained at higher level was so small that it seems to be uneconomical. Interaction effects on fodder yield :

TABLE 2

Interaction effect of dates of sowing and levels of phosphorus on pod yield (kg/ha) (Pooled data)

Date of sowing	*Levels of phosphorus kg P_2O_5/ha*		
	P_1 (25)	P_2 (50)	P_3 (75)
D_1 (1st Feb.)	3014	2975	2855
D_2 (15th Feb.)	2188	2192	2125
D_3 (2nd March)	879	795	1064
S. Em. ±	C. D. 5%	164	

Dates x planting geometry :

The interaction effect of date of sowing into planting geometry (table-3) was also found to be significant (pooled data). The highest yield (7636 kg/ha) was obtained from the sowing of 15th Feb. at 45 x 7.5 cm distance and was at par with the sowing of same date at 30 x 10 cm. Significantly the lowest yield (5410 kg/ha) was recorded with sowing on 2nd March at 30 x 10 cm planting geometry.

From the study it is concluded that farmers of South Gujarat should sow the groundnut variety GAUG-1 in first week of February along with 25 kg P_2O_5/ha. keeping the plant geometry 30 x 10 cm or 45 x 7.5 cm.

TABLE 3

Interaction effect of date of sowing and spacing on fodder yield (kg/ha). (Pooled data)

Date of sowing	*Spacings*	
	S_1 (30 cm)	S_2 (45 cm)
D_1 (1st Feb.)	6546	6207
D_2 (15th Feb.)	7301	7636
D_3 (2nd March)	5410	6000
S. Em. ± 189	C. D. 5% 533	

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