

Response of 'Junagadh 11' Groundnut to Different Levels and Sources of Phosphorus under Rainfed Conditions in Medium Black Soils of Saurashtra

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ABSTRACT

A field experiment was conducted during the *kharif* seasons of the years 1975-76 and 1976-77 at Main Dry Farming Research Station, Targhadia (Rajkot) to study the response of 'Junagadh-11' groundnut to different levels (0, 25 and 50 kg P_2O_5 /ha) and sources of phosphorus (single superphosphate and di-ammonium phosphate) under medium black soils of Saurashtra). Yields of pods and veins were not significantly influenced by the different treatments during both the years. Possible reasons for lack of response are discussed. Further studies are also suggested.

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INTRODUCTION

Groundnut (*Arachis hypogaea* Linn.) is one of the important cash crops of Saurashtra region of Gujarat State. The average yield of this crop in Gujarat State is low (718 kg/ha) as compared to that in Tamilnadu (1212 kg/ha) and Punjab (1080 kg/ha). Low yield level is due to various factors determining the crop yield. The contribution of fertilizer in increasing crop production has been very well demonstrated in India and elsewhere.

Groundnut being a legume crop, it can fix atmospheric nitrogen with the help of root nodule bacteria. It is, however, important that adequate amount of nitrogen be made available in the early stage of growth for young seedlings to get established and help in formation of healthy and effective nodules.

Phosphorus is the key element in process involving conversion of solar energy into food. Study made by Chahal and Virmani (1973) showed that groundnut accumulated more phosphorous in the pods than in the leaves. It is reported (Nair, Ramaswamy and Perumal, 1970) that phosphorus had a very critical role in view of the fact that lack of phosphorous resulted in the greatest reduction in nodulation and nitrogen fixation. Hence, the phosphatic fertilizers can play an important role in achieving higher yield of groundnut crop. Various experiments regarding application of phosphatic fertilizers to groundnut have been conducted at different research stations under rainfed conditions in Gujarat State in the past. In these experiments, mostly the single superphosphate was used as a source of phosphorous. Most of the research

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findings indicated lack of adequate response of phosphorous in groundnut crop (Patel and Sutaria, 1972 and Vaja, 1975). It was, therefore, thought worthwhile to study whether under graded levels, two different sources of phosphorus, namely, single superphosphate and diammonium phosphate had any differential effect on the yield of groundnut under rainfed conditions in medium black soils of Saurashtra.

MATERIALS AND METHODS

The present investigation was conducted at Dry Farming Research Station, Targadia (Rajkot), during the *kharif* seasons of the years 1975 and 1976. The treatments comprised of combinations of three levels of phosphorus (0, 25 and 50 kg P_2O_5 /ha)

and its two sources (single superphosphate and diammonium phosphate). Thus, there were six treatment combinations. The experiment was laid out in randomized block design with four replications. The gross and net plot areas were 38.88 m² and 27.0 m², respectively. Fertilizers were drilled into the soil before sowing as per treatments. Sowing was carried out by three-cultured country seed-drill with a row spacing of 45 cm and seed rate of 85 kg/ha. The bunch variety of groundnut 'Junagadh-11' was used. Yields of pods and veins were obtained from the net plot areas and converted on hectare basis. Studies on the yield attributes were made after selecting at random five plants from each plot. The soil analysis data (Table 1) revealed that the soil

TABLE 1
Soil analysis data of experimental plots.

Year	Depth cm	Soil texture	PH	E.C. mmh/cm	Org. carb. on %	Avail. P_2O_5 kg/ha	Avail. K_2O kg/ha
1975	0-22.5	Clayey	8.2	0.2	0.36	34	540
1976	0-22.5	Clayey	7.7	0.2	0.74	24	560

was clayey, slightly alkaline in reaction, low (1975) to medium (1976) in nitrogen, medium in phosphorous and rich in potash content. The exchangeable calcium in the surface soil was 25 m.e./100 g of soil. Standard week-wise rainfall

data during both the years under study are given in Table 2.

RESULTS AND DISCUSSION

Total rainfall (Table 2) during both the years under study was almost

TABLE 2
Standard week-wise rainfall during the years 1975 and 1976.

Standard week	1975		1976	
	Rainfall mm	Rainy days	Rainfall mm	Rainy days
22	Nil	Nil	14.00	2
23	11.25	1	52.00	3
24	Nil	Nil	Nil	Nil

1	2	3	4	5
25	112.75	3	25.00	2
26	73.50	2	Nil	Nil
27	11.00	1	2.00	Nil
28	103.00	3	58.50	2
29	17.50	1	299.00	5
30	00.50	Nil	10.00	1
31	15.00	2	18.00	1
32	191.75	5	Nil	Nil
33	25.50	3	21.50	2
34	3.50	Nil	3.50	Nil
35	6.00	Nil	239.25	4
36	37.75	2	64.50	3
37	44.00	3	36.25	2
38	8.00	1	Nil	Nil
39	13.00	1	Nil	Nil
40	169.50	3	Nil	Nil
41	12.00	1	2.00	Nil
42	1.00	Nil	Nil	Nil
43	20.00	1	Nil	Nil
Total	876.50	33	845.50	27

equal and more than average (594 mm) of the research station. The rainfall distribution, however, greatly differed in both the years. Favourable and even distribution of rainfall during the year

1975 resulted into very high yields of the crop. Erratic distribution of the rainfall during the year 1976 resulted into low and sub-marginal yields.

Data given in Table 3 revealed that

TABLE 3

Yields of pods and veins (Q/ha) of groundnut has influenced by different levels and sources of phosphorus.

Treatment	1975		1976		Mean	
	Pods	Veins	Pods	Veins	Pods	Veins
Levels of P_2O_5, kg/ha						
0	30.09	21.30	5.03	29.20	17.56	25.25
25	28.09	22.00	4.89	26.65	16.49	24.32
50	31.56	22.20	4.18	26.95	17.87	24.57
S.E.m.±	1.78	2.71	0.52	2.30		
C.D. 5%	N.S.	N.S.	N.S.	N.S.		
Sources of P_2O_5						
Single super-phosphate	29.59	22.63	4.46	26.96	17.02	24.79
Diammonium phosphate	30.23	21.03	4.93	28.23	17.58	24.63
S.E.m.±	1.44	2.19	0.41	1.77		
C.D. 5%	N.S.	N.S.	N.S.	N.S.		
Levels x Sources interaction	N.S.	N.S.	N.S.	N.S.		

N.S. = Not significant

TABLE 4
Yield attributes as influenced by different levels and sources of phosphorus.

Treatment	Pods/Plant		Pods/Plant		Wt. of pods/plant		Plants/ha 600		Shelling %		100-kernel wt., g	
	1975	1976	1975	1976	1975	1976	1975	1976	1975	1976	1975	1976
Levels of P_2O_5, kg/ha												
0	35.00	8.35	28.50	6.50	23.50	4.10	151	257	75.50	74.00	38.00	26.00
25	33.35	9.25	27.35	7.95	22.00	5.00	150	257	75.00	74.50	37.50	27.50
50	32.10	11.00	27.10	8.25	21.50	5.45	160	259	76.50	74.00	38.50	25.00
Sources of P_2O_5,												
Single superphosphate	29.73	9.63	24.57	8.06	19.66	5.03	150	254	75.33	74.00	38.00	25.66
Diammonium phosphate	37.23	9.43	30.73	7.06	25.00	4.66	158	262	76.00	74.33	38.00	24.66

different levels and sources of phosphorus had no significant influence on the yield of pods and veins during both the years. These results are in agreement with those reported by Patel (1969), Patel and Sutaria (1972) and Vaja (1975).

Data given on the yield attributes as influenced by different levels and sources of phosphorus (Table 4) indicated that increasing levels of phosphorus had differential effect on the various yield attributes during the two years. In general, the diammonium phosphate appeared to be better than single superphosphate as it tended to have favourable effect on majority of the yield attributes.

Lack of significant and favourable response of groundnut to phosphate application in the experimental fields deserves special investigations in view of the facts that groundnut growing farmers of Saurashtra region spend major portion of their cash input towards phosphatic fertilization. According to the accepted national standards, the soil during both the years under the current study had medium status of available phosphorus. Lack of response of groundnut to phosphatic fertilization to the soils with medium status of available phosphates emphasized the need for re-examination of these standards so as to make them location-specific taking into consideration different factors such as the crop variety, type of soil and the climatic parameters. It is interesting to note here that in contrast to most of the other crops, the groundnut crop can use soil phosphorus at a lower test-level (Scarsbrook and Cope, 1956). Moreover, the studies made in other countries have shown that the uptake of phosphorus by groundnut crop is low, varying from 7 to 11 kg of P_2O_5 per hectare (Collins and Morris, 1941 and Anonymous, 1970). The experimental plots

of the current studies, however, contained 34 and 24 kg of P_2O_5 per hectare during the years 1975 and 1976, respectively. The results also point out the need for conducting studies on nutrient uptake by this crop and studies pertaining to soil-test crop-response correlations under Saurashtra conditions as these studies are not done. Such studies will greatly help in arriving at recommendations for economic application of phosphatic fertilizers to the groundnut crop under different soil-climatic conditions of Saurashtra region.

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