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Statistical Estimation of Relative Changes in P Content with Different Levels of Applied Phosphorus in Groundnut

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ABSTRACT

An experiment with five levels of phosphorus (0, 25, 50, 75 and 100 kg/ha) on summer groundnut crop in latin square design was conducted during 1987 at GAU, Anand with a view to study the effect of various phosphorus levels on the dry matter production at different growth stages and pod yield. The study revealed that summer groundnut crop did not respond to phosphorus for pod yield but responded to cumulative as well as periodic dry matter production.

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INTRODUCTION

Groundnut is a leading oilseed crop in India and has a major role to play in agricultural economics of our country. Although India is a largest groundnut growing country, its yield per hectare is one of the lowest (Kanwar *et al.*, 1983). The need is therefore to boost up the productivity which in turn would result in higher production. One of the ways for improving the productivity of any crop is efficient utilization and application of manures and fertilizers. Generally inconsistent response of nitrogen and phosphorus to the yield of groundnut is observed. The non response of phosphorus is of serious concern, because it has an important role to play in N utilization which ultimately result in higher production. It is, therefore, necessary that quantum of available phosphorus, the concentration and uptake of it at different stages of crop growth alongwith their relationship with dry matter production and pod yield for differnet doses for applied phosphorus be looked into. This may provide an indication of the availability of applied phosphorus and its utilization pattern.

MATERIALS AND METHODS

With a view to study the effect of various phosphorus levels on the dry matter production of different growth stages of summer groundnut and its pod yield, an experiment was planned during summer 1987 at B.A. College of Agriculture, Anand. Groundnut bunch variety GG-2 was selected for the study. Five levels of phosphorus viz., 0. 25, 50, 75 and 100 kg/ha were included in the experiment. At different growth stages, plant and soil samples were collected from each experimental unit. From the periodic plant samples, dry matter yield, phosphorus content and subsequently phosphorus uptake were estimated.

RESULTS AND DISCUSSION

The data on average dry matter production of summer groundnut at different growth stages are presented in Table 1.

The results presented in the table revealed that the dry matter production at the first stage was not significantly influenced due to different levels of phosphorus application in the soil. The average dry matter production at the end of the first stage was 314 kg/ha. Similar results were made at the end of second stage of the crop growth, wherein different levels of phosphorus applied in the soil did not affect the growth of plants significantly. However, it was observed that differences between control i.e. no application of phosphorus and rest i.e. application of phosphorus was significant. The average dry matter production at the end of second stage was 1134 kg/ha.

TABLE 1

Effect of various levels of phosphorus on dry matter production at different growth stages and pod yield of groundnut.

	Dry matter production and pod yield (kg/ha)					
	*Growth Stages**					
Phosphorus (kg/ha)	*First Dry matter production*	*Second Dry matter production*	*Third Dry matter prodution*	*Fourth Dry matter production*	*Pod yield*	*Total*
0	275	1029	1856	4293	725	5018
25	300	1121	2021	4618	764	5382
50	323	1161	2109	4884	847	5731
75	338	1175	2133	5054	904	5958
100	334	1184	2135	5112	899	6011
Average	314	1134	2051	4792	828	5620
S. Em.	19.6	44.7	48.3	69.0	55.2	
CD at 5 %	NS	NS	149	213	NS	
C.V. %	13.93	8.82	5.26	3.22	14.93	
Control V/s Rest						
Control	275	1029	1856	4293	725	
Rest	324	1160	2100	4917	854	
CD at 5 %	48	108	118	168	NS	

*First stage = at the end first month;
Second stage = at the end of second month;
Third stage = at the end of third month;
Fourth stage = at harvest.

At the end of the third stage, however, it was observed that the differences in dry matter production were significant. The dry matter production increased with increase in every level of phosphorus application. However, appreciable increase was observed only upto 50 kg/ha. This was clear from the fact that 50, 75 and 100 kg/ha did not differ significantly.

At the time of harvest, it was observed that different levels of phosphorus application in the soil significantly influenced the dry matter production of the crop. The response trend of phosphorus application was similar to that observed during the first stage, the quantum of response was however comparatively higher. So far as pod yield was concerned, it was observed that the differences were not significant. Thus it could be inferred that summer groundnut crop responds to phosphorus application for dry matter production only and not for pod yield. However, at all the stages, there was increasing trend in dry matter production and pod yield with increase in phosphorus level. In view of this, second order orthogonal polynomials were fitted for dry matter production at different growth stages. The results are presented in Table 2.

TABLE 2

Growth curves of dry matter production at different growth stages and pod yield in relation to various levels of phosphorus application.

Growth Stage	*Character*	*Constant a*	*Partial regression*		*R square*		*Remarks*
			b1	*b2*	*Linear*	*Quad.*	
First	Dry matter	234.2	43.9	– 4.7	87.7	98.9	Quad.
Second	Dry matter	928.9	118.6	–13.7	82.3	98.6	Quad.
Third	Dry matter	1655.0	234.2	–27.9	80.1	99.4	Quad.
Fourth	Dry matter	3854.8	477.4	–45.0	93.8	99.9	Quad.
	pod yield	624.4	97.6	– 8.1	92.0	95.6	Linear

The results presented in Table 2 revealed that for all the growth stages, the quadratic form of curve fitted well. The only exception was that for pod yield, where the quadratic term did not account for significant contribution of variability in pod yield. Which for dry matter, quadratic form for all the stages, gave high degree of fit (R square ✣ 99 per cent). This clearly indicated that the relationship between the phosphorus application and dry matter production was quadratic in nature and the dry matter increased at decreasing rate with increase in levels of phosphorus.

With a view to get estimates of dry matter production during particular period, the differences between two consecutive growth stages were calculated and analysed. The results of such differences are presented in Table 3.

The results presented in the Table 3 indicated similar trend of phosphorus response as obseved in the cumulative growth study. However, it was very clear from an average increase in the growth during different periods that in the fourth period, the dry matter

production increased about three times as compared to the increase in the third period.

No response of phosphorus application for pod and fodder yield was observed by Parmar and Buhecha (1980) in medium black soil of Targhadia in Gujarat. Similar observation for pod yield in groundnut were made by Agrawal (1968), Cheema *et al.* (1977), Kolar *et al.* (1976), Patel and Sutaria (1972), Dhingra *et al.* (1984) and Anonymous (1986).

TABLE 3

Effect of various levels of phosphorus on dry matter production during different periods and pod yield of groundnut.

Phosphorus (kg/ha)	*Dry matter production and pod yield(kg/ha)*					
	Period					
	*First** *Dry matter production*	*Second** *Dry matter production*	*Third** *Dry matter production*	*Fourth** *Dry matter procution*	*Pod yield*	*Total*
0	275	754	827	2437	725	3162
25	300	821	900	2597	764	3361
50	323	838	948	2775	847	3622
75	338	837	958	2921	904	3825
100	334	850	951	2977	899	3876
Average	314	820	917	2741	828	3569
S. Em.	19.6	36.8	43.6	72.9	55.2	
CD at 5 %	NS	NS	NS	225	NS	
C.V. %	13.9	10.00	10.60	6.0	14.9	

* First stage = at the end of first month

Second stage = at the end of second month.

Third stage = at the end of third month and

Fourth stage = at harvest.

The inconsistency in the phosphorus response on pod yield as evident from the research reported could be attributed to the differneces in soil fertility, past manuring history, availability of applied sand soil phosphorus (Varma and Bajpai, 1964).

From the results discussed above it can be concluded that (i) various levels of phosphorus influenced the cumulative dry matter production at 90 days crop and at harvest. The quantam of response was however higher at harvest. Periodic dry matter

production followed more or less similar trend as observed in cumulative growth of dry matter production. Non significant differences in pod yield were observed for various levels of phosphorus. This indicated that summer groundnut crop responded to phosphorus application for dry matter production and not to pod yield.

(ii) The quadratic response curves of dry matter production on phosphorus levels fitted well at all the stages but not for pod yield, the quadratic term did not contribute appreciably for improving the predictability. This indicated that dry matter production increased at decreasing rate with the increase in levels of phosphorus.

REFERENCES

Agrawal, S. C. (1965). Nutrient uptake by groundnut at two different stages of crop growth as influenced by different fertilization. M.Sc. Thesis submitted to P.A.U., Ludhiana.

Anonymous (1986). A research report. Presented in 23rd meeting of the Agronomy and Soil Science Sub Committee of Agricultural Research Council, Dept. of Agril. Chemistry and Soil Science, GAU, Junagadh.

Cheema, S. S., Minhar, K. S., Tripathi, H. P. and Kadra, H. C. (1977). The effect of applying phosphorus and nitrogen to groundnut under different regimes of soil moisture *J. Res. PAU*, **14** (1) : 9-14.

Kolar, J. S., Tiwona, M. S. and Gill, G. S. (1976). Note on fertilizers studies with groundnut. *Indian J. Agric. Res.*, **10** (4) : 265-268.

Parmar, M. T. and Buhecha, K. V. (1980). Response of "Junagadh-11" groundnut to different levels and source of phosphorus under rainfed condition in medium black soils of Saurashtra. *GAU Res. J.* **6** (1) : 8-12.

Patel, A. S. and Sutaria, N. H. (1972). A summary of agronomic studies in Gujarat State on bajra and groundnut. *N. M. College of Agriculture Magazine, Navsari* **6** (1) : 89-93.

Verma, J. K. and Bajpai, M. R. (1964). A brief review of mineral nutrition of groundnut in relation to its growth, yield and quality. *Indian Oilseeds J.*, **8** (3) : 222-227.