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EFFECT OF APPLIED PHOSPHORUS AND POTASSIUM AND SPACING ON THE AVAILABLE PHOSPHORUS AND POTASSIUM AND TOTAL NITROGEN CONTENT OF SOIL UNDER LAB LAB*

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Legumes play an important role in improving and maintaining soil fertility status The phosphate fertilisation of legumes has been recognised as an efficient method of building up soil fertility (Sen and Bains 1955, Nair *et al* 1957, Sikka and Jain 1958. Lin 1959, Mudaliar 1960, Yawalkar and Agarwal 1962 and Bains 1967).

The present work was undertaken to get an idea on the effect of applied phosphorus and potassium and spacing on the available phosphorus and potassium and total nitrogen content or soil under a legume crop (Co 1 lab lab).

Material and Methods

A red loam soil containing 0.071 percent total nitrogen, 0.041 percent total P_2O_5, 0.081 percent K_2O, 48 ppm available phosphorus and 42 ppm available potash and with a pH of 5·8 was used for the studies.

The variety of lab lab was Co1 [*Ottu mochai*]. The treatments consisted of four level of phosphorus [0, 25, 50 and 75 kg P_2O_5/ha], three levels of potassium [0,15 and 30 kg K_2O/ha] and three spacings [40x15 cm, 40x25 cm and 40x35 cm]. The design was a 4x 3 partially confounded factorial experiment with two replications. Plot size was 4x5. 25 metre. Each plot received cattle manure at the rate of 5600 kg/ha and lime as calcium hydroxide as per the lime requirement of the soil. A uniform dose of 10 kg N/ha was applied as ammonium sulphate. Ammonium sulphate and muriate of potash were applied broadcast, while superphosphate was placed in bands 10 cme deep and 30cm apart. Seeds were dibbled in lines at the rate of one seed per hole Weeding, inter-cultivation and prophylactic spraying against pests and diseases were carried out whenever necessary.

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Analysis of the soil for total nitrogen, available phosphorus and available potassium was done on 50th day of sowing and at the time of final harvest by Kjeldahl's emethod, Bray's method No • 1 (Bray and Kurtz 1945) and Turbidimetric method (Data *et al* 1963) respectively.

Results and Discussion

The results an summarised in Tables 1 to 5. The data presented in Table 1 show a significant increase in the nitrogen content of soil by the incremental doses of applied phophorus, on the 50th day ofplanting. Soil nitrogen increased from the original status (0.071%) in all the treatments except in the control, where a reduction Was noticed, This may be attributed to the stimulatory effect of phosphorus on the nitrogen fixing microorganisms (Raheja 1966).

The slight increase in nitrogen content recorded by the closer spacing might be due to the higher number of plants per unit area. Since some of the unavailable sub-soil phosphorus was made available by the activity of deep rooted legume crop, the lack of significant effect of applied phosphorus on the nitrogen content of soil at the time of final harvest (Table 2} may be because the deep rooted legume was able to make available some of the unavailable sub-soil phosphorus,

The availabe phosphorus content of soil increased significantly with incremental doses of phosphorus application on 50 th day (Table 3).

Table 1

Nitrogen content of soil in percentage on 50th day of sowing at different spacings and doses of P and K

P_2O_5 (kg/ha)	0	25	50	75	Average
Spacing					
40x15 cm	0.0689	0.0720	0.0724	0.0722	0.0714
40x25 cm	0.0683	0.0717	0.0722	0.0722	0.0717
40x35 cm	0.0682	0.0716	0.0722	0.0722	0.0710
K_2O (kg/ha)					
0	0.0674	0.0715	0.0722	0.0721	0.0708
15	0.0686	0.0719	0,0723	0.0724	0.0713
30	0.0695	0.0720	0.0723	0.0724	0.0715
Average	0.0685	0.0718	0.0723	0.0723	

K_2O (kg/ha)	0	15	30	Average
40x15 cm	0.0710	0.0715	0,0718	0.0714
40x25 cm	0.0707	0.0712	0.0714	0.0711
40x35 cm	0,0706	0.0711	0 0714	0.0710
Average	0.0708	0.0713	0.0715	

C. D. (0.05) for levels of P	0.000938
C.D. (0.05) for levels of K or S	0.000816
C. D. (0.05) for combination of P & K or combination of P & S	0.00163
C. D. (0.05; for combination of K & S	0.00141

Table 2

Nitrogen content of soil Cin percentage) at the time of final harvest at different spacings and doses of P & K.

P_2O_5 (kg/ha)	0	25	50	75	Average
Spacing					
49x15 cm	0.0719	0.0720	0.0720	0.0721	0.0720
40x25 cm	0.0720	0.0719	0.0719	0.0720	0.0719
40x35 cm	0.0718	0.0719	0.0719	0.0719	0.0719
K_2O (kg/ha)					
0	0.0718	0.0720	0.0720	0.0720	0 0719
15	00720	0,0720	0.0719	0.0720	0.0719
30	0.0719	0·0720	0 0719	0.0720	0.0719
Average.	0.0719	0.0720	0.0719	0 0720	

K_2O (kg/ha)	0	I5	30	Average
40x15 cm	0.0720	0.0720	0.0720	0·0720
40x25 cm	0.0720	0.0719	0.07i9	0.0719
40x35 cm	0.0718	0·0719	0.0719	0.0719
Average	0,0719	0.0719	0.0719	

G.D. (0.05) for levels of P,	0.0000999
C D. (0.05) for levels of K or S·	0.0000856
C.D· (0.05) for combination of P&K	0.0001733
C.D· (0.05) for combination of R&S	0.0001509

Table 3

Available phosphorous content of soil (P lb acre) on 50th day of sowing at different spacings and doses of P &K

P_2O_5 (kg/ha)	0	25	50	75	Avearge
Spacing					
40x15 cm	64.67	87.33	84.00	92.67	82.17
40x25 cm	51.33	83.33	138.67	116.00	97.33
40x35 cm	80.00	69.33	109.33	147.33	101.50
K_2O (kg/ha)					
0	71.33	73.33	102.67	52.00	74.83
15	44.00	91.33	131.33	138.67	101.33
30	80.67	75.33	98.00	165.33	104.83
Average	65.33	80.00	110·67	118·67	

K_2O (kg/ha)	0	.15	30	Average
40x15 cm	44.00	92.50	110·00	32,17
40x25 cm	103.50	124.00	64.50	97.33
40x35 cm	77.00	87.50	140.00	101.50
Average	74.83	101.33	104.83	

C. D. (0.05)	for levels of P	3,.447
C. D. (0.05)	for levels of K or S.	2.978
G. D. (0.05)	for combination of P & K or combination of P & S	5.977
G. O. (0.05)	for combination of K & S	5,161

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Table 4

Available phosphorus content of soil (Plb/acre) at the time of final harvest at different spacing and doses of P & K

P_2O_5 (kg/ha)	0	25	50	75	Average
Spacing.					
40x15 cm	84.00	106.67	91.33	158.00	110.04
40x25 cm	82.67	79.33	134.00	78.00	93.50
40x35 cm	77.33	108.67	183.33	112.67	120.50
K_2O (kg/ha)					
0	88.67	115.33	162.00	84.67	112.67
15	76.00	1.18.67	122.67	195.33	128.17
30	79.33	60.67	124.00	68.67	83.17
Average	81.33	98.22	136.22	116.22	

K_2O (kg/ha)	0	15	30	Average
40x15 cm	78.00	179.00	73.00	110.00
40x25 cm	135.00	75.50	70.00	93.50
40x35 cm	125.00	130.00	106.50	120.50
Average	112.67	128.17	83.17	

G. D. (0.05) *for* levels of P 7·425

C. D. (0.05) for levels of K or S. 6.446

C. D. (0.05) for combination of P and K or combination of P and S 12.892

C. D. (0.05) for combination of K & S 11.158

Table 5

Available potassium co ,tent o soil (K lb/.cre) on 50th day at diffe·ent spacing : nd doses of P and K

P_2O_5 (kg/ha)	0	25	50	75	Average
Spacing					
40xl5 cm	28.17	28.17	16.33	12.33	21.25
40x25 cm	38.67	8.33	8.38	7.00	15.58
40x35 cm	25.33	24.00	28.00	33.33	27.66
K_2O (kg/ha)					
o	44.00	12.17	8.33	17.50	20.50
15	20.17	13.50	20.17	26.83	20.16
30	28.00	34.83	24.17	8.33	23.83
Average	30.72	20.17	17.55	17.55	

K_2O (kg/ha)	0	15	30	Average
40x15 cm	12.37	22.15	29.25	21.25
40 × 25 cm	22,12	12·37	12.25	15.58
40x35 cm	27.00	26.00	30,00	27.66
Average	20.50	20.16	23.83	

G. D. (0.05; for levels o P 1·656

G. D. (0.05) for levels of K or S. 1.434

C. D. (0·05) for combination of P and K or combination of P and S. 2.870

C. D. (0.05) for combination of K & S. 2.484

The depression in the available phosphorus content of soil observed in the control and at the lowest level of applied phosphorus may be due to the increased uptake by the plants in the early period of growth coupled with bacterial utilization. The high content of available phosphorus observed under wide spacing may be due to less uptake of the nutrients from unit area by the plants.

Data presented in Table 4 substantiate that deep rooted legumes arc capable of converting the unavailable sub soil phosphorus into available form Even the control plot maintained almost the original status in respect of available f hosphorus. According to Raheja[1966] sub soil contains adequate quantities of phosphorus which the deep rooted crops are able to tap and make use of for the growth ofcrops.

Potassium at 15 kg K_2O per hectare significantly icreased the phosphorus contfient of soil. But at higher levels of potassium application, significantreduction in Phosphorus content also was noticed. This reduction may be attributed to higher rate of absorption of phosphorus at higher levels of potassium (Raheja 1966).

Incremental doses of added phosphorus decreased the availability of potassium significantly [Table 5] indicating increased absorption of pot; ssium. Higher levels of added potassium recorded significantly higher content of available potassium in the soil. Among spacings, the widest spacing [40 cm x 35 cm] recorded significantly higher content of available potassium in the soil,

Summary

A field experiment to study the effect of applied phosphorus and potassium on the total nitrogen, available phosphorus and available potassium content of soil under a legume (Go 1 lab lab) planted at different spacings was conducted at the Agricultural College, Vellayani, Kerala State. Increase in the nitrogen content of soil due to application of phosphorus was evident on the 5()th day of planting but not at harvest the soil nitrogen was maximum at the closest spacing of 40 x 15 cm .An increase in the available phosphorus content of the soil due to incremental doses of phosphorus and potassium and Wider spacing was observed on the 50 th day. Potassium at 30 kg K_2O per hectare reduced the available phosphorus content of soil at the time of final harvest. An increase in available potassium content of soil by the application of potassium at 30 kg K_2O per hectare was seen on the 50 th day.

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