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STUDIES ON NUTRIENT UPTAKE BY PIGEONPEA AS INFLUENCED BY INTERCROPPING AND P FERTILIZATION

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A study was carried out at the Tamil Nadu Agricultural University, Coimbatore (during *kharif*, 1977) to find out the effect of intercropping and P fertilization on the nutrient depletion pattern in rainfed pigeonpea. Pigeonpea as a base crop was raised in solid stand and with inter crops viz., sorghum, pearlmillet, blackgram and coriander under three levels of P fertilization (0, 25 and 50 kg P_2O_5/ha). Intercropping did not interfere with the total nutrient depletion of pigeonpea per unit area very much. Pigeonpea-pearlmillet intercropping system was found disadvantageous because of mutual competition Uptake of N, P and K by pigeonpea was more when intercropped with blackgram. The available N in the post-harvest soil was also more in this combination.

P fertilization influenced the NPK uptake by pigeonpea. Nutrient uptake was significantly improved by application of 25 kg P_2O_5/ha over no P in all the intercropping systems. This suggests that P application is essential for proper growth and development of pigeonpea in a medium P soil.

There is a possibility of introducing fast growing intercrops of high yield potential and short duration in a crop of longer duration and widely spaced crop like pigeonpea (Giri and De, 1977). Pigeonpea has a very slow growth rate upto 50-60 day after germination. In such a system, there may be a better temporal use of resources and the available interspace. Phosphorus is the major limiting nutrient in realising the production potential of grain legumes. It is essential to assess the nutrient depletion pattern of different intercropping systems in order to develop a sound fertilization programme and to select a compatible system which will help to maintain soil fertility. Dalal (1974) reported that the absorption of nutrients by pigeonpea was significantly lower in mixed stands with maize. At ICRISAT, Hyderabad, it was found that the N content in the leaves of the sole cropped pigeonpea plants was higher than in sorghum intercropped plants An investigation was undertaken to find out the nutrient removal pattern of some of the intercropping systems with pigeonpea (*Cajanus cajan*) under rainfed conditions.

MATERIALS AND METHODS

The experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during *kharif*, 1977 under rainfed conditions in vertisol, which was high in organic carbon (0.74%), available N (303.3 kg/ha), medium in available P (10 kg/ha) and high in available K (389 kg/ha) with a pH of 7.6. A total amount of 669 mm of rainfall was received in 35 rainy days during the cropping period. The treatments were I_0 - pigeonpea in solid stand (Cultivar Co. 3 with 135-140 days duration), I_1 - Pigeonpea intercropped with sorghum (cultivar CSH 6 with 85-90 days), I_2 - pigeonpea + pearlmillet (cultivar Co. 6 with 85-90 days), I_3 - pigeonpea + blackgram (cultivar Co. 2

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with 65-70 days and I_4 - (pigeonpea + coriander (Cultivar local). Solid stand of pigeonpea was planted at a row spacing of 60 cm. In intercropping systems also, the population of pigeonpea was maintained as in solid stand and the intercrops were accommodated by changing the geometry of planting of pigeonpea. Pigeonpea was grown in paired row system with 45 cm between pigeonpea rows leaving 75 cm interspace between pairs of rows. The rows each of pearlmillet, blackgram and coriander and one row of sorghum were planted between pigeonpea rows. The plant spacing adopted was 12 cm, 15 cm and 10 cm for sorghum, pearlmillet and blackgram respectively. Coriander was sown in solid rows. All the crops were harvested at maturity except coriander which was harvested 20 days after sowing as green vegetable. The response of pigeonpea in the presence of intercrops to applied P was studied with P_0 - 0 kg/ha, P_1 - 25kg P_2O_5 / ha and P_2 - 50 kg P_2O_5/ha. These treatments were replicated thrice in a randomized block design. A basal dressing of 10 kg N/ha as urea and entire P as single superphosphate as per treatments was applied just prior to sowing.

N, P, K contents in plant samples were analysed at maturity by standard procedures given by Humphries (1956) and Jackson (1968) and uptake was calculated.

RESULTS AND DISCUSSION

Data on nutrient uptake by pigeonpea are presented in Table 1. Pi-

Table 1 Nutrient uptake (kg/ha) by pigeonpea at harvest

Intercropping system / P levels	N				P				K				Grain yield (kg/ha
	P_0	P_1	P_2	Mean	P_0	P_1	P_2	Mean	P_0	P_1	P_2	Mean	
I_0	94.60	128.07	124.46	115.71	7.10	8.99	8.75	8.28	67.18	77.09	80.84	75.04	9580
I_1	82.63	100.82	95.30	92.92	3.81	3.74	3.48	3.68	53.82	55.30	58.24	55.28	7570
I_2	69.21	77.35	87.89	78.15	2.76	3.20	4.50	3.49	42.15	53.65	54 87	50.22	6940
I_3	114.59	133.97	138.29	128.95	7.28	8.10	8.42	7.93	84.07	96.34	97.50	92.64	9280
I_4	93.93	107.57	110.06	103.85	6.96	8.52	7.94	7.81	77.03	71.03	69.33	72.47	9050
Mean	90.99	109.55	111.20	—	5.58	6.51	6.62	—	64 85	70.68	72.15	—	—

	C.D.5%	C.D.5%	C.D.5%	C.D.5%
I	3.41	0.37	2.91	1120
P	2.64	0.29	2.26	—
IP	5.90	0.64	5.05	—

geonpea intercropped with blackgram recorded the maximum N uptake. Blackgram might have made available some of the N fixed in root nodules to pigeonpea in the early stages of its growth by accretion. The lowest N uptake was noticed in pearlmillet intercropped treatment. This is due to competitive effect of pearlmillet which reduced the the dry matter production of pigeonpea. P application increased the N uptake by pigeonpea, but the difference bet ween P_1 and P_2 levels was not significant.

The uptake of P was maximum in solid pigeonpea which was on a par with blackgram intercropped treatment. Sorghum and pearlmillet reduced P uptake at all levels of P. Generally, P uptake was increased over no P in intercropping due to P application.

Pearlmillet decreased the K uptake by pigeonpea due to its vigous growth and more competitive nature. There was increase in K uptake due to P application but the difference between the two levels applied was not significant.

The data on nutrient uptake by intercrops are presented in Table 2.

Table 2 Nutrient uptake (kg/ha) by intercrops as influenced by P.

Intercrops	Sorghum	Pearlmillet	Blackgram	Coriander
Nitrogen				
P_0	83.11	116.00	24.78	15.55
P_1	94.96	130.13	25.36	17.93
P_2	97.70	129.05	25.26	18.00
Mean	91.59	125.06	25.13	17.16
C.D.5%	7.65	3 63	N.S.	0.67
Phosphorus				
P_0	4.23	2.50	2.77	2.04
P_1	4.63	2.98	3 64	2.73
P_2	4.49	2.64	4.45	2.57
Mean	4.45	2.71	3,62	2.45
C.D. 5%	N.S	0.13	0.30	0.25
Potassium				
P_0	180.41	211.46	14.88	29.64
P_1	198.01	235.26	16.16	32.99
P_2	203.53	236.70	18.47	33.95
Mean	193.98	227.70	16.50	32.19
C.D.5%	NS	NS	1.77	1.99

Among the intercrops, pearlmillet recorded greater N uptake followed by others. P application significanily increased the uptake of N except in blackgram. In contrast to N uptake, sorghum registered maximum P uptake which showed that the requirement of pearlmillet for P is not high and so this crop might not have competed much with pigeonpea for P. P response was higher only in blackgram. Pearlmillet recorded maximum uptake of K. Application of 25 kg P_2O_5/ha seemed to be adequate for blackgram and coriander as response to P could be seen in these crops.

The post-harvest soil analysis (Table 3) indicated that available-N status of the soil was higher where blackgram and coriander were grown as intercrops. Comparatively, smaller quantity of removal of N by coriander and addition of some N through the root nodules by blackgram might be attributed as possible causes. Substantial additions to soil N reserves due to cultivation of pulses either as a pure or as mixed crops were reported by Jaganathan (1972). Least quantity of available N was noticed in sorghum and pearlmillet inter-cropped treatments Application of P resulted in lower soil available N. This is due to greater removal of N from these treatments, consequently depleting the soil.

Teble 3. Post harvest fertility status of soil

	Available N (kg/ha)				Available P_2O_5 (kg/ha)			
	P_0	P_1	P_2	Mean	P_0	P_1	P_2	Mean
I_0	101.16	100.73	107.56	106.15	12.90	15.17	18.37	15.48
I_1	95.73	89.72	86.73	90.73	11.61	14.75	18 00	74.79
I_2	94.19	89.76	91.33	91.76	12.13	16 78	17 30	15.40
I_3	111 37	110.66	106 47	109.47	13.33	14.79	19.35	15.02
I_4	116.56	112.90	115.19	113.88	12.07	16.14	18.32	15.51
Mean	105.60	100.76	100.84	—	12.41	15 53	18 27	—
		C.D. 5%				C D 5%		
I		3.64				NS		
P		2.82				1.37		
IP		NS				NS		

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