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Effect of vegetable intercropping and source of nutrient on yield-attributing characters and yield of pigeonpea (*Cajanus cajan*)

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ABSTRACT

A field experiment conducted at Coimbatore under irrigated condition during rainy (*kharif*) and *(rabi)* seasons of 1999–2000 revealed that pure stand of pigeonpea [*Cajanus cajan* (L.) Millsp.] recorded higher yield parameters, viz. pods/plant, pod weight/plant, seeds/pod and test weight, and it was on a par with intercropping of amaranth (*Amaranthus* sp.) and coriander (*Coriandrum sativum* L.). Radish (*Raphanus sativus* L.) as an intercrop, significantly reduced the yield-attributing parameters of pigeonpea. Maximum seed yield was recorded under pure stand of pigeonpea in both the seasons. Coriander or amaranth as intercrop did not reduce the pigeonpea seed yield significantly. Combined source of 50% organic and 50% inorganic fertilizer recorded higher yield attributes and seed yield of pigeonpea over their single source.

Key words : Pigeonpea, Coriander, Radish, Amaranth, Intercropping, Rockphosphate, Phosphobacteria, Farmyard manure

India is the second largest country (next only to China) in the production of vegetables contributing to about 12% of the world production. But the production (87 million tonnes) and consumption (145 g/head/day) are rather low and inadequate. Vegetables not being staple food, it is unlikely that more area will be brought under cultivation of vegetables. It is, therefore, imperative to augment vegetable production by including in multiple cropping programme. Inclusion of vegetable in pigeonpea-based cropping system is a feasible proposition and the system would provide early, periodic and high return (Behera *et al.,* 1996). Productivity of the system can be enhanced by judicious selection of vegetables differing in duration and growth rhythms, so as to adjust the demand of the above and underground resources. Present study, therefore, aims at identifying suitable vegetable crops for intercropping with pigeonpea and also to find out the best source of nutrient for the system.

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MATERIALS AND METHODS

The field experiment was conducted at Coimbatore under irrigated condition during the rainy (*khraif*) and winter (*rabi*) seasons (1999–2000) to study the effect of vegetable intercropping and source of nutrient on the yield and yield-attributing parameters of pigeonpea. The soil was sandy clay loam, having 7.8–8.0 pH, 0.37–0.39% organic carbon, 0.46–0.48 dS/m EC. The available nitrogen in the soil was 208–223 kg/ha, phosphorus 10–14 kg/ha and potash 428–446 kg/ha.

Sole crop of 'Co 5' pigeonpea (I_1) with 3 intercrops, viz. 'Co 3' coriander (*Coriandrum sativum* L.) (I_2), 'Co 5' amaranth (I_3) and 'White Long' radish (*Raphanus sativus* L.) (I_4), were raised under 3 sources of nutrient, viz. 100% inorganic (S_1). 50% organic + 50% inorganic (S_2) and 100% organic (S_3) fertilizer to supply the recommended 25, 50 and 0 kg NPK/ha. Urea and single superphosphate (SSP) were used as inorganic source, whereas farmyard manure (FYM) enriched with Mossorie rock phosphate (MRP) and phosphobacteria were used as organic source. The experiment was laid out in factorial randomized block design (FRBD) with 3 replications. A spacing of 45 cm × 20 cm was adopted for pigeonpea with ridges and furrow method of planting. Pigeonpea was sown on one side of the ridge, and vegetables were sown in other side. Solid line sowing was adopted for coriander and amaranth and radish was sown at a plant spacing of 5–7 cm.

RESULTS AND DISCUSSION

Growth attributes of pigeonpea

Pure stand of pigeonpea recorded higher plant height, dry-matter production/ha and primary branches/plant at 90 days after sowing (DAS). Among the intercrops, radish reduced the growth attributes of pigeonpea drastically. Dubey *et al.* (1991) also reported reduction in growth parameters of pigeonpea due to intercropping. Highest dry-matter production was recorded in sole pigeonpea in both the seasons and the lowest recorded when radish was intercropped with pigeonpea in *rabi* season. Combined application of 50% organic and 50% inorganic fertilizer recorded higher value of growth attributes of pigeonpea over their sole application (Table 1).

Yield-attributing characters of pigeonpea

Pure crop of pigeonpea recorded significantly higher number of pods/plant, pod weight/plant and test weight (100-seed weight) over intercropping with radish. Yield-attributing parameters with coriander and amaranth intercropping were comparable with sole pigeonpea. This indicates the lower competition from amaranth and coriander for resources. However, radish was found to be a potent competitor for resources, especially nutrient. Ahlawat (1998), also reported reduction in yield-attributing parameters of frenchbean due to intercropping with vegetables.

Among the different sources of nutrient, application of 50% organic + 50% inorganic fertilizer recorded significantly higher yield-attributing characters, compared to the application of 100% organic fertilizers. Application of 100% inorganic fertilizer recorded yield-attributing parameters at par

with the application of combined source of nutrients. Better performance of combined source of nutrients on yield attributes might be owing to improved growth parameters and higher nutrient uptake compared to other source. The results confirm the findings of Sarkar *et al.* (1997).

Yield of pigeonpea and vegetables

Pigeonpea as pure crop registered higher seed yield (883 kg/ha) which was comparable with pigeonpea intercropped with coriander and amaranth (Table 2). Radish as an intercrop significantly reduced the grain yield of pigeonpea (633 kg/ha). This might be due to vigorous growth of radish which might have created severe competition for resources and deprived the pigeonpea of essential nutrients, thus resulting in reduced growth and yield parameters and finally yield. Besides, smothering effect of radish on pigeonpea would have also reduced the yield. This finding is in line with the finding of Reddy *et al.* (1993). On the other hand, coriander and amaranth did not reduce the pigeonpea yield significantly. The non-significant effect of intercropping of vegetables on pigeonpea yield was reported by Behera *et al.* (1996).

Combined source of nutrient application recorded higher pigeonpea yield than 100% organic manure application and resulted in comparable yield with 100% inorganic fertilizer application (Table 2). Increased nutrient availability from combined source of nutrient which supplied the nutrient up to the maturity would have resulted in better nutrient uptake, growth and yield parameters and finally reflected in yield (Muthuvel *et al.*, 1985). Poor release of nutrients in the initial stage from 100%

Table 1. Effect of vegetable intercropping and source of nutrient on growth parameters of pigeonpea (90 days after sowing)

Treatment	Rainy season			Winter season		
	Plant height (cm)	Primary branches/ plant	DMP (kg/ha)	Plant height (cm)	Primary branches/ plant	DMP (kg/ha)
Intercropping						
Sole pigeonpea	117.8	6.00	5,634	98.3	5.68	4,747
Pigeonpea + coriander	114.8	5.42	5,368	96.4	5.47	4,364
Pigeonpea + amaranth	111.6	5.50	5,405	95.2	5.07	4,161
Pigeonpea + radish	88.2	4.92	4,879	86.3	4.46	3,732
CD (P=0.05)	4.1	0.61	322	3.9	0.29	352
Source of nutrient						
100% inorganic	114.3	7.27	5,457	95.8	5.41	4,490
50% organic + 50% inorganic	117.7	7.95	6,104	101.6	5.64	4,939
100% organic	97.6	5.52	4,613	86.5	4.44	3,493
CD (P=0.05)	3.2	0.48	249	3.1	0.23	273

DMP, Dry matter production

Table 2. Effect of vegetable intercropping and source of nutrient on yield attributes and seed yield of pigeonpea

Treatment	Pods/ plant	Pod weight (g/plant)	Seeds/ pod	1,00-seed weight (g)	Seed yield (kg/ha)
Rainy season intercropping					
Sole pigeonpea	94.0	37.1	3.99	7.92	883
pigeonpea + corriander	89.0	34.0	3.96	7.87	869
Pigeonpea + amaranth	93.9	33.8	3.96	7.81	853
Pigeonpea + radish	67.0	29.5	3.70	7.71	689
CD (P=0.05)	8.9	5.49	NS	0.08	67
Sources of nutrient					
100% inorganic	91.1	35.20	3.98	7.92	855
50% organic + 50 % inorganic	95.1	37.14	4.07	9.97	904
100% organic	77.5	30.40	3.74	7.69	756
CD (P=0.05)	6.9	4.14	0.19	0.06	52
Winter season intercropping					
Sole pigeonpea	76.1	34.70	3.94	7.84	819
Pigeonpea + corriander	69.8	32.10	3.84	7.77	760
Pigeonpea + amaranth	64.7	30.33	3.73	7.72	743
Pigeonpea + radish	55.1	28.50	3.53	7.57	633
CD (P=0.05)	7.6	2.75	0.18	0.07	75
Sources of nutrient					
100% inorganic	69.2	32.86	3.81	7.78	771
50% organic + 50 % inorganic	75.5	33.30	3.90	7.85	825
100% organic	56.5	28.90	3.61	7.56	649
CD (P=0.05)	5.9	2.13	0.14	0.06	58

organic fertilizer would have resulted in poor growth and yield of pigeonpea.

The yield of vegetables was higher in the winter season compared to rainy season. Maximum coriander green yield of 3,458 kg, amaranth yield of 7,291 kg and radish (root) yield of 12,291 kg/ha were recorded from intercropping with pigeonpea with combined source of nutrient during the winter season. However, the intercrop yields were higher when they were raised as pure crop (Table 3). Das *et al.* (1985), reported favourable effect of low temperature on coriander growth.

It could be inferred that coriander and amaranth are the best vegetables for intercropping with the pigeonpea and combined application of 50% organic and 50% inorganic fertilizer is the best source of nutrient to get higher yield in vegetablebased pigeonpea intercropping system.

Table 3. Effect of vegetable intercropping and source of nutrient on the vegetable (intercrop) yield (kg/ha)

Treatment	Rainy season	Winter season
I_2S_1	2,324	3,145
I_2S_2	2,622	3,458
I_2S_3	1,956	2,583
I_3S_1	3,200	6,145
I_3S_2	3,555	7,291
I_3S_3	2,488	5,000
I_4S_1	7,467	11,041
I_4S_2	8,000	12,291
I_4S_3	6,000	9,271
$*I_2$	4,088	4,938
$*I_3$	4,800	10,625
$*I_4$	11,556	15,625

I_2, I_3 and I_4 indicates the sole crop yield of coriander, amaranth and radish respectively

REFERENCES

Ahlawat, I.P.S. 1998. Production potential of frenchbean (*Phaseolus vulgaris)* based intercropping system in northern plains. *Indian Journal of Agronomy* **43** (1) : 45–49.

Behera, B.D., Mishra, D.D., Singh, G.S., Mohapatra, P.K., Alim, A. and Senapati, P.C. 1996. Prospects of vegetable crops in pigeonpea based intercropping systems in rainfed lateritic soils of Orissa: *Indian Journal of Dryland Agricultural Research and Development* **11** (2) : 65–68.

Das, A.K., Sodha, M.K., Sona, M.G. and Bose, T.K. 1985. Effect of time of sowing on growth and yield of coriander. *Indian Journal of Horticulture* **42** : 265–270.

Dubey, O.P., Garg, D.C., Dixit, J.P. and Tiwari, K.P. 1991. Intercropping in short duration pigeonpea. *Indian Journal of Agronomy* **36**(2) : 253–254.

Muthuvel, P., Subramanian, V. and Sivasamy, R. 1985. Effect of organic, inorganic and biofertilizers on rainfed redgram (*Cajanus cajan*). *Madras Agricultural Journal* **72** (3) : 176–177.

Reddy, A.P.K., Selvam, V.S., Rao, G.N.S. and Rajan, M.S.S. 1993. Intercropping in late rainy season pigeonpea (*Cajanus cajan*) under rainfed condition. *Indian Journal of Agronomy* **38** (2) : 232–235.

Sarkar, R.K., Shit, D. and Chakraborty, A. 1997. Effect of levels and sources of phosphorus with and without farmyard manure on pigeonpea (*Cajanus cajan*) under rainfed condition. *Indian Journal of Agronomy* **42** (1) : 120–123.