QPCRI-2-14/12AC- RE. SH. SANDIP SHIL-DCPH RES. Centre.

Agric. Sci. Digest, **26** (1) : 23 - 26, 2006

RESPONSE OF VARYING LEVELS OF NPK FERTILIZATION ON ELEPHANT FOOT YAM GROWN AS INTERCROP IN ARECANUT PLANTATION

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ABSTRACT

Field experiment was conducted during 2000 and 2001, with five levels of NPK (kg/ha) *viz.*, 75:25:75; 100:50:100; 125:75:125; 150:100:150 and 175: 125:175, to find out their effect on growth and yield of elephant foot yam and also to study the effect of intercrop on the growth of main crop. The soil was gangetic alluvial with sandy loam in texture, nearly neutral pH, good water holding capacity and moderate soil fertility status. The maximum plant length (89.5 cm), girth (19.2 cm), diameter of corm (21.32 cm), average weight of corm (2.21 kg) and yield (57.29 t/ha) were recorded with highest NPK level (175:125:175 kg/ha) but maximum canopy spread (123. 1 cm) and breadth of corm (11.64 cm) were observed with NPK level (150:100:150). The growth rate of different vegetative parameters of arecanut in inter-cropped block was more as compared to monocrop block. The results revealed that fertilizer schedule comprising 175:125:175 NPK (kg/ha) may be recommended for obtaining higher yield of elephant foot yam grown as intercrop in the young arecanut plantation without hampering the growth of main crop.

Arecanut (*Areca catechu* L) is extensively used in India by all sections of the people as a masticatory and is an essential requisite for several religious and social ceremonies. It is mostly grown as monocrop. Orientation and structure of arecanut canopy permits about 40% of active radiation to penetrate down (Balasimha, 1989) and palms spaced at 2.7m x 2.7m could use effectively only 30% of land area. Thus intercropping can more effectively utilize the unused land volume and solar energy. Experimental evidences, in general, indicated that intercropping in arecanut was not harmful to the main crop (Muralidharan and Nayar, 1979).

Elephant foot yam (*Amorphophallus campanulatus* Blume) has now become a very popular crop in northern and eastern India with the introduction of high yielding and non-acrid varieties. Amorphophallus tubers are rich in nutrients and a delicacy as a food. The tubers are also used as medicine in many ayurvedic preparations. It had good response to fertilizer management and fertilizer recommendation for corm production is available for open area but information regarding fertilizer schedule for elephant foot yam grown as intercrop is not available. The present investigation was, therefore, undertaken to find out the effect of NPK fertilization on growth and yield of elephant foot yam as intercrop and also to evaluate the effect of intercrop on the growth of arecanut.

The experiment was carried out in two years old arecanut garden at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, during May, 2000 to November, 2001 in a randomised block design with four replications. Fertilizer combinations of five levels of NPK (kg/ha) *viz.*, 75:25:75; 100:50:100; 125:75:125; 150:100:150 and 175:125:175 were taken. The arecanut palms were spaced at 3m x 3m. Each experimental plot for yam was 1.8m x 1.8m consisted of 3 rows with 4 plants per row. Accordingly 12 plants spaced at 60cm x 45cm apart were accommodated per plot. The plots were prepared 0.6m away from either side of the palms. In both the years planting of corm (cv. Kovvur) of about 500g was done during 1st week of May before the onset of monsoon under irrigated condition. Full dose of

phosphorus, half of nitrogen and potassium along with full dose of well rotten FYM @ 15 tonnes/ha were applied in pits before planting the seed corms. The rest amount of nitrogen and potassium were applied at 70 days after planting (DAP) followed by earthing up and irrigation. The seed corms were harvested at 210 DAP. Removal of side shoots were done as and when necessary, keeping two shoots per plant. The soil of experimental site was gangetic alluvial with sandy loam texture, good water holding capacity, having the available nitrogen 0.05%, available phosphorus 26.50 ppm, available potassium 90.50 ppm, organic carbon 0.60% and soil pH 6.80. Schedule agronomical management practices were followed in arecanut under both monocrop and intercropped block.

Observations on different growth parameters were recorded from five randomly selected plants per replication at 60, 90, 120 and 180 DAP. Rhizome yield was taken on net plot basis at harvest. The projected yield/ha was calculated on the basis of yield per plot, considering the 70% area occupied by intercrops in the present investigation. The growth parameters of arecanut both from monocrop and intercrop plots were measured.

It is evident from the data presented in Table 1 that all vegetative parameters were markedly influenced by different fertilizer levels. Maximum plant height (89.5cm) was exhibited by the plants receiving the highest level of NPK (175:125:175 kg/ha) followed by NPK@ 150:100:150 kg/ha. Like plant height highest level of fertilizer recorded the maximum basal girth (19.2cm) followed by NPK@ 150:100:150 kg/ha (18.6cm). Significant variation in canopy spread was also observed and an increasing trend was recorded with the increase of fertilizer level upto NPK @ 150:100:150 kg/ha. Wide variations at different stages of development in respect of vegetative characters were also observed by Das *et al.* (1995).

No significant variations in the of corm size and weight were noticed with varying fertilizer levels. The maximum diameter (21.32cm) was observed in NPK@ 175:125:175 kg/ha while maximum breadth was recorded with NPK @ 150:125:175 kg/ha. Plants receiving the NPK @ 175:125:175 produced the corm. of maximum weight (2.21kg) followed by NPK @ 150:100:150 kg/ha (2.05 kg). Sen *et al.* (1996) working with elephant foot yam had also recorded the maximum shoot length and corm weight with the plants under NPK @ 150:75:150 kg/ha treatment.

The maximum yield/plot (26.5kg/3.24 m^2) and projected yield/ha (57.29 tonnes) were recorded with plants under highest level of NPK i.e. 175:125:175 kg/ha. Sen *et al.* (1996) and Pena and Plucknett (1967) also recorded the highest corm yield with higher fertilizer levels in elephant foot yam and taro respectively. They also noticed the minimum vegetative growth and lowest yield with lowest dose of fertilizer. The findings of the present investigation were in good agreement with their observation i.e. lower fertilizer levels leads to minimum vegetative growth and lower yield finally. Combined application of nitrogen and potassium particularly at higher levels on vegetative parameters like plant height, basal girth and canopy spread was very much pronounced, suggesting the effect of potassium nutrition on increased availability of nitrogen to the plants. In fact, application of potassium has been found to reduce the fixation of NH_4^+ and thereby increase the utilization of nitrogen by growing plants. (Sengupta *et al.*, 1971). Potassium able to exchange NH_4^+ ions to make it more available to plants (Krishnamoorthy and Pothiraj, 1974). For this reason, increase in vegetative growth sometimes due to high potassium application, was more pronounced at the high level of nitrogen application.

Table 1. Effect of NPK fertilizer on growth and yield of elephant foot yam grown as intercrop in arecanut plantation

Treatments NPK (kg/ha)	Growth parameters at 180 days after planting			Diameter of corm (cm)	Breadth of corm (cm)	Weight of corm (kg)	Yield/plot (kg/3.24m²)	Projected yield (t/ha)
	Plant height (cm)	Basal girth (cm)	Canopy spread (cm)					
$N_{75}P_{25}K_{75}$	69.54	14.22	89.91	18.53	10.96	1.59	19.08	41.22
$N_{100}P_{25}K_{100}$	72.01	15.91	98.83	19.67	11.34	1.73	20.76	44.85
$N_{125}P_{75}K_{125}$	76.51	18.23	113.83	20.51	11.53	1.84	22.08	47.70
$N_{150}P_{100}K_{150}$	85.34	18.63	123.11	20.96	11.97	2.05	24.60	53.14
$N_{175}P_{125}K_{175}$	89.50	19.22	117.67	21.32	11.64	2.21	26.52	57.29
S.Em (±)	3.49	0.83	2.90	1.39	-1.05	0.006	0.17	0.37
CD (0.05)	10.75	2.55	8.93	N.S.	N.S.	0.018	0.52	1.14

Table 2. Effect of intercrop on growth of young arecanut

	Height (cm)		Leaf number		Girth (cm)	
	Intercrop	Monocrop	Intercrop	Monocrop	Intercrop	Monocrop
May, 2000	164.28	158.62	10.25	9.76	21.54	20.61
November, 2001	307.14	270.85	21.48	17.82	33.98	30.52
Increase during experimentation (cm)	142.86	112.23	11.23	8.06	12.44	9.91
Percentage increase	86.96	70.75	109.56	82.58	57.75	48.08

The beneficial effect of intercrop on growth parameters of arecanut was observed (Table 2). The increase in height, leaf number and girth during the period of experimentation (May, 2000 to November, 2001) against the initial observation were 142.86cm (86.96%), 11.23 (109.56%) and 12.44 cm (57.75%) in intercrop bed block as compared to 112.23cm (70.75%), 8.06 (82.58%) and 9.91 cm (48.08%) in monocrop block.

The results indicate that there was no harmful effect of elephant foot yam on the growth of arecanut. These results are in conformity with the findings of Abraham (1974). They reported that no perceptible deleterious effect on the yield and condition of arecanut palm could be observed due to intercropping with tapioca, elephant foot yam, yam and sweet potato. Similar results were reported by Sadanandan (1974) on intercropping with elephant foot yam and ginger.

Experimental evidences, in general, indicated that intercropping in arecanut was not harmful to the main crop (Muralidharan and Nayar, 1979). The advantage of intercropping in arecanut is the ability to provide substantial yield increase per unit area through better utilisation of resources like land and light, as under monocropping arecanut palms exploit only 30 per cent land volume (Bhat and Leela, 1968) and 32.7-47.8 per cent of incident light rays pass down through the canopy of arecanut garden depending on the time of the day (Muralidharan, 1980). Further a large amount of biomass is being recycled in intercrop situations which will be considerably low in monocrop situation (Reddy *et al.*, 1993). Abdul Khader *et al.* (1990) reported nutrient build up in terms of P_2O_5 and K_2O due to intercropping in arecanut gardens. The other benefits of intercropping in arecanut growth are control of weeds, soil conservation, moisture conservation and regulated temperature.

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