



Integrated Nutrient Management for Elephant Foot Yam Intercropped in Coconut Gardens

Smallholder coconut farmers in Kerala face the problems of limited landholding, declining productivity and low and unstable price for coconut. In order to enhance productivity per unit land area, maximum use of limited resources without affecting the ecological balance is needed. The ideal approach for small farmers to achieve this would be to increase the cropping intensity, which is possible through two ways, the first being the time concept, where instead of taking only one crop, more crops are cultivated per year and the second being the space concept, where all the available space in between the main crop is used for cultivation of various crops. The mixed or intercropping system in coconut gardens depends very much on the selection of compatible crop combinations, in which each crop will exploit a distinct and different zone of space and soil so that individual competition for moisture, nutrients, space and solar radiation will be the minimum. Various crops such as vegetables, tuber crops, spices, fruit crops etc. can be cultivated as intercrops in coconut gardens. Elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson), which produces starchy corms with high nutritive and medicinal values, is an ideal tuber crop that can be successfully grown in coconut gardens. The objective of the present study was to develop an integrated nutrient management (INM) practice for elephant foot yam intercropped in coconut garden.

A field experiment was undertaken during February to October 2008 at the Regional Station of Central Plantation Crops Research Institute, Kayamkulam, Kerala, India, to develop INM for elephant foot yam intercropped in coconut garden. The experimental site is situated at 9° 8' N latitude and 76° 31' E longitude at an elevation of 3.05 m above MSL. During the study period the experimental area received a total rainfall of 2267 mm, with the maximum temperature ranging between 31.3°C and 33.9°C and the minimum temperature between 18.1°C and 20.4°C. The soil of the experimental field is sandy loam. The soil was acidic (pH: 5.5) with organic C content of 0.25%, total N of

761.6 kg ha⁻¹, available P of 89.6 kg ha⁻¹ and available K of 201.6 kg ha⁻¹. Elephant foot yam var. Gajendra, a local selection from Kovvur, Andhra Pradesh was intercropped in a coconut garden (var. West Coast Tall planted during 1965 (48 years of age)). The experiment with eight treatments was laid out in randomized block design. There were four replications with twenty planting points per replication. The organic manures such as farmyard manure (FYM), neem cake and vermicompost were applied @ 1 kg plant⁻¹, while the biofertilizers (*Azospirillum* and *Phosphobacteria*) were applied @ 5 kg ha⁻¹. The treatments were:

- T₁: Control
- T₂: Full dose of NPK (@ 80:60:110 kg ha⁻¹)
- T₃: 50% NPK + FYM + neem cake (each @1 kg plant⁻¹)
- T₄: 50% NPK + vermicompost + neem cake (each @1 kg plant⁻¹)
- T₅: 50% NPK + biofertilizers + vermicompost (@1 kg plant⁻¹)
- T₆: FYM + neem cake + vermicompost (each @1 kg plant⁻¹) + biofertilizers
- T₇: FYM + biofertilizers + vermicompost (@1 kg plant⁻¹)
- T₈: FYM + neem cake + vermicompost (each @1 kg plant⁻¹)

The planting material of Gajendra variety of elephant foot yam was obtained from Central Tuber Crops Research Institute, Thiruvananthapuram, India. About 500 g sized corms of elephant foot yam were planted in the interspaces of four coconut palms, leaving 2 m radius from the base of palms, in pits taken at a spacing of 90 cm x 90 cm (9000 plants ha⁻¹) during the third week of February 2008. Application of fertilizers, manures and biofertilizers was made during 1st week of April and 2nd week of May 2008. Observations on plant height, pseudostem girth at the base as well as canopy spread (East-West (E-W) and North-South (N-S)) were recorded during June 2008. Harvesting of corms was done during the last week of October and 1st week of

Table 1. Growth characters and yield of elephant foot yam in coconut gardens as influenced by integrated nutrient management practices

Treatments	Plant height (cm)	Pseudostem girth at base (cm)	Plant canopy spread (E-W) (cm)	Plant canopy spread (N-S) (cm)	Yield (kg plant ⁻¹)
T ₁	48.05	10.38	94.63	95.25	1.252
T ₂	70.73	15.98	135.70	138.03	2.333
T ₃	62.08	14.95	109.45	113.98	1.509
T ₄	62.18	14.00	108.13	110.02	1.787
T ₅	69.50	16.23	139.70	140.83	2.508
T ₆	62.55	15.53	112.48	111.40	1.925
T ₇	66.88	15.83	123.58	123.10	2.281
T ₈	61.30	14.90	118.40	116.98	1.894
CD (0.05)	7.64	1.74	15.01	15.71	0.68

November 2008. The mean values were worked out and statistically analysed. The results are presented in Table 1.

There was significant difference in plant growth parameters as well as corm yield among the various treatments. The height of plants ranged from 48.05 cm to 70.73 cm; the tallest plants were observed under full dose of fertilizers, while the plants in the control plot were the shortest. The pseudostem girth at the base ranged from 10.38 cm to 16.23 cm; the highest value was observed in plants treated with 50% NPK + biofertilizers + vermicompost, which was on par with that of full dose of fertilizers. The plant canopy spread in both the directions (E-W and N-S) also differed significantly among the treatments. The canopy spread under the INM treatment, 50% NPK + biofertilizers + vermicompost, was almost similar to that of full dose of fertilizers. The highest yield (2.51 kg per plant) was obtained with 50% NPK + biofertilizers + vermicompost, which was on par with full dose of fertilizers (2.333 kg per plant). Better plant growth and canopy spread in this treatment (50% NPK + biofertilizers + vermicompost) might have contributed to higher corm yield. Integrated application of inorganic fertilizers, organic manures and biofertilizers was found to improve plant growth and yield of elephant foot yam at the Coimbatore and Ranchi Centres of the All India Co-ordinated Research Project on Tuber Crops (Anon., 2007). The beneficial effects of organic nutrient

management practices on plant growth and yield of elephant foot yam have already been reported (Suja et al., 2008; 2010; 2012; Suja and Sundaresan, 2008).

It is concluded that elephant foot yam (var. Gajendra) can be successfully intercropped in coconut gardens with the application of 50% recommended dose of NPK fertilizers along with biofertilizers (*Azospirillum* and phosphobacteria @ 5 kg ha⁻¹) and vermicompost (@ 1 kg plant⁻¹).

References

- Anonymous, 2007. All India Co-ordinated Research Project on Tuber Crops. *Annual Report 2006-2007*. Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala, India, pp.78-79.
- Suja, G., Potty, V. P. and Sundaresan, S. 2008. Organic farming of aroids and yams: A feasible alternative farming strategy. In: *Proceedings of the 20th Kerala Science Congress 2008*. 28-31 January 2008, Thiruvananthapuram, pp. 87-89.
- Suja, G. and Sundaresan, S. 2008. Agronomic, nutritional and economic implications of organic elephant foot yam production. In: *Programme and Abstracts of the National Conference on Organic Farming in Horticultural Crops with Special Reference to Plantation Crops*, 15-18 October 2008, Central Plantation Crops Research Institute, Kasaragod. pp. 33-34.
- Suja, G., Susan John, K., Ravindran, C.S., Prathapan, K. and Sundaresan, S. 2010. On farm validation of organic farming technology in elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]. *J. Root Crops*, **36**(1): 59-64.
- Suja, G., Sundaresan, S., Susan John, K., Sreekumar, J. and Misra, R.S. 2012. Higher yield, profit and soil quality from organic farming of elephant foot yam. *Agron. Sustain. Dev.*, **32**(3): 755-764.