



## Effect of Organic Management on the Growth and Yield of Elephant Foot Yam

Elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson) is a subsidiary food in the tropics (Jos et al., 1977; Prakash and Nayar, 2000). It has emerged as a commercial crop in India yielding good economic returns to farmers due its high production and export potential. It is a high energy tuberous vegetable with good taste and medicinal value. Because of the high market demand it is being extensively cultivated in different parts of India. Continued use of organic manures improves soil physico-chemical and biological properties by building up organic matter in soils, improving soil structure, aeration, water holding capacity, friability and drainage. In addition, organic manures are also a source of micronutrients required by the crops. Nowadays organic manures are being used in large quantities in vegetable production. There are sufficient evidences that the judicious use of organic manures have improved plant growth, yield, vitamin and mineral content of fresh vegetables (Parr et al., 1994; Worthington, 2001).

Escalating fertilizer costs is another factor that increases the importance of using locally available organic sources of plant nutrients to maintain the soil productivity. There is ample scope for organic production in tropical tuber crops as they respond well to organic manures (Suja et al., 2009; 2010; 2012). There is a great demand for organically produced tuberous vegetables among affluent Asians and Africans living in Europe, United States of America and Middle East.

The use of inorganic fertilizers in conjunction with organic manures is essential for getting sustainable and profitable yield of elephant foot yam. Since, the application of inorganic fertilizers alone cannot sustain the soil fertility and productivity, especially in cropping systems, the only way to improve and sustain the potential yield of crops is the use of various sources of nutrients in an integrated manner so as to make the system productive and profitable. Though the use of

chemical fertilizers cannot be altogether avoided, their use should be reduced. The major objective of this study was to find out the effect of organic nutrient management on the growth, yield and quality of elephant foot yam under Coimbatore conditions in Tamil Nadu

A field experiment was conducted during July-February in 2011-2012 at the College Orchard, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, to develop an organic nutrient package for elephant foot yam. The soil of the experimental field is reddish brown clay and calcareous. The soil was slightly alkaline with pH of 8.17 and electrical conductivity (EC) of 0.85 dS m<sup>-1</sup> (non saline). The soil was rated as low in organic C (0.42%) and available N (216 kg ha<sup>-1</sup>), medium for P (18 kg ha<sup>-1</sup>) and high for K (1501 kg ha<sup>-1</sup>), respectively. The temperature during the crop growth period varied between 22°C and 31°C, with relative humidity of 68.5% and rainfall of 35 cm.

The experiment was laid out in randomized block design with 10 treatments replicated thrice. The gross plot size was 4.5 m x 4.5 m and the plants were spaced at 90 cm x 90 cm. The following treatments were applied:

- T<sub>1</sub>: Vermicompost @ 5 t ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>
- T<sub>2</sub>: Farmyard manure @ 10 t ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>
- T<sub>3</sub>: Poultry manure @ 5 t ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>
- T<sub>4</sub>: Vermicompost @ 5 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + arbuscular mycorrhizal fungi (AM) @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>
- T<sub>5</sub>: Vermicompost @ 5 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + phosphobacteria @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>
- T<sub>6</sub>: Farmyard manure @ 10 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + AM Fungi @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>
- T<sub>7</sub>: Farmyard manure @ 10 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + phosphobacteria @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>

T<sub>8</sub>: Poultry manure @ 5 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + AM Fungi @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>

T<sub>9</sub>: Poultry manure @ 5 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + phosphobacteria @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup>

T<sub>10</sub>: Recommended package of practices for nutrient management for conventional system (FYM @ 10 t ha<sup>-1</sup> + NPK @ 80: 60 : 100 kg ha<sup>-1</sup> (in the form of Urea, Di Ammonium Phosphate (DAP) and Muriate of Potash) along with chemical pesticides).

Fifty per cent of N and full dose of P and K were applied in the furrows as per treatments and thoroughly mixed in soil. The remaining half of N was top dressed at 60 days after planting. The test variety was “Gajendra”. Observations on growth and quality characters, plant height, pseudostem girth, canopy spread in the East-West (E-W), North-South (N-S) directions, corm yield and oxalic acid were recorded.

The results revealed that all the vegetative, yield and quality traits, plant height (74.44 cm), pseudostem girth (18.66 cm), canopy spread (E-W: 58.24 cm), (N-S: 48.96 cm) and corm yield (63.66 t ha<sup>-1</sup>) were highest with the recommended package of practices for conventional system (T<sub>10</sub>), FYM @ 10 t ha<sup>-1</sup>, NPK @ 80 :60 :100 kg ha<sup>-1</sup> along with chemical pesticides. Among the organic treatments, the highest plant height (72.56 cm), pseudostem girth (18.10 cm), canopy spread (E-W: 56.40 cm), (N-S: 48.00 cm), corm yield (60.84 t ha<sup>-1</sup>) and lowest oxalic acid (93.00 mg100g<sup>-1</sup>) were observed in the treatment combination, FYM @10 t ha<sup>-1</sup> + *Azospirillum* @ 5 kg ha<sup>-1</sup> + ash @ 5 t ha<sup>-1</sup> (Table 1).

Right proportion of inorganic fertilizers and organic manures is required to meet the nutrient demand throughout the crop growth. This type of integration of organic

Table 1. Effect of organic management on the growth, yield and quality of elephant foot yam

Notation	Treatments	Plant height (cm)	Pseudostem girth (cm)	Canopy spread		Corm yield (t ha <sup>-1</sup> )	Oxalic acid (mg100g <sup>-1</sup> )
				(E-W)(cm)	(N-S)(cm)		
T <sub>1</sub>	Vermicompost @ 5 t ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	65.63	14.36	52.66	42.88	54.20	94.8
T <sub>2</sub>	Farmyard manure @ 10 t ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	60.56	10.22	50.50	41.96	48.94	99.6
T <sub>3</sub>	Poultry manure @ 5 t ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	64.88	13.10	53.96	42.10	51.55	96.2
T <sub>4</sub>	Vermicompost @ 5 t ha <sup>-1</sup> + <i>Azospirillum</i> @ 5 kg ha <sup>-1</sup> + AM Fungi @ 5 kg ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	69.86	15.55	56.00	43.20	54.88	94.6
T <sub>5</sub>	Vermicompost @ 5 t ha <sup>-1</sup> + <i>Azospirillum</i> @ 5 kg ha <sup>-1</sup> + phosphobacteria @ 5 kg ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	67.22	15.11	55.33	47.66	58.33	96.8
T <sub>6</sub>	Farmyard manure @ 10 t ha <sup>-1</sup> + <i>Azospirillum</i> @ 5 kg ha <sup>-1</sup> + AM Fungi @ 5 kg ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	70.58	16.96	54.88	45.21	55.20	95.6
T <sub>7</sub>	Farmyard manure @ 10 t ha <sup>-1</sup> + <i>Azospirillum</i> @ 5 kg ha <sup>-1</sup> + phosphobacteria @ 5 kg ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	72.56	18.10	56.40	48.00	60.84	93.0
T <sub>8</sub>	Poultry manure @ 5 t ha <sup>-1</sup> + <i>Azospirillum</i> @ 5 kg ha <sup>-1</sup> + AM Fungi @ 5 kg ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	56.44	9.96	47.64	38.60	44.23	99.2
T <sub>9</sub>	Poultry manure @ 5 t ha <sup>-1</sup> + <i>Azospirillum</i> @ 5 kg ha <sup>-1</sup> + phosphobacteria @ 5 kg ha <sup>-1</sup> + ash @ 5 t ha <sup>-1</sup>	58.66	10.12	49.22	39.56	51.90	97.4
T <sub>10</sub>	Recommended package of practices for conventional system (FYM: 10 t ha <sup>-1</sup> , NPK @ 80 : 60 : 100 kg ha <sup>-1</sup> and using chemical pesticides)	74.44	18.66	58.24	48.96	63.66	102.4
	CD (0.05)	9.28	4.72	10.49	9.75	10.22	7.3

and inorganic sources helps in balanced nutrition and availability of nutrients readily to the crop. This equal proportion also favors mineralization of organic manures at a rate desirable enough to maintain nutrient supply to elephant foot yam.

The significant improvement in plant growth and yield with the use of organic manures, particularly farmyard manure, is due to the fact that organic manures, might have also supplied trace elements, besides major nutrients, in an available form over a long period of time as per the requirement of the crop, in addition to improving the soil structure, aeration and water holding capacity. Thus, the combined application of organic manures, *Azospirillum*, phosphobacteria, farmyard manure and AM fungi produced yield on par with the present recommended dose of NPK.

## References

- Jos, J.S., Rajendran, P.G. and Hishi, N. 1977. Polymitosis in the microspores of elephant foot yam. *Curr. Sci.*, **46**: 829-830.
- Parr, J.F., Hornick, S.B. and Kaufman, D.D. 1994. Use of microbial inoculants and organic fertilizers in agricultural production. *In. Proceedings of the International Seminar on Use of Microbial and Organic Fertilizers in Agricultural Production*. Food and Fertilizer Technology Center, Taipei, Taiwan.
- Prakash, P.S. and Nayar, N.M. 2000. Thermogenesis in elephant foot yam *Amorphophallus paeoniifolius* (Dennst.) Nicolson (Araceae). *J. Root Crops*, **26**: 10-14.
- 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**: 755-764 (doi 10. 1007/S 13593-011-0058-5)
- 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**: 59-64.
- Suja, G., Susan John, K. and Sundaresan, S. 2009. Potential of tannia (*Xanthosoma sagittifolium* L.) for organic production. *J. Root Crops*, **35**: 36-40.
- Worthington, M. 2001. Nutritional quality of organic versus conventional fruits, vegetables and grains. *J. Attern. Compl. Med.*, **7**: 161-173.

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