

Influence of integrated nutrient management (INM) on growth and yield parameters of elephant foot yam under south Gujarat condition

S.N. SARAVAIYA, P.P. CHAUDHARY, D.A. PATEL, N.B. PATEL, M.P. AHIR AND V.I. PATEL

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See end of the article for authors' affiliations

Correspondence to :

S.N. SARAVAIYA
ASPEE College of
Horticulture and Forestry,
Navsari Agricultural
University, NAVSARI
(GUJARAT) INDIA

ABSTRACT

In order to explore the possibility of improving growth and productivity of elephant foot yam (EFY) by involving integrated nutrient management, an experiment was formulated and conducted during *Kharif* season of 2007-08 and 2008-09 at Rambhas Farm, Krishi Vigyan Kendra of Navsari Agricultural University, Gujarat, India. Nine treatment combinations were evaluated on elephant foot yam variety Gajendra, in randomized block design (RBD) with three replications. Application of 100 % RDF (Through IOS) + *Azospirillum* 5 kg ha⁻¹ + PSB 5 kg ha⁻¹ (T₇) was proved to be beneficial in connection with corm yield (55.33 t ha⁻¹) which was at par with the treatment of T₄ and T₁.

Key words : Elephant foot yam (EFY), Organic fertilizers, Inorganic fertilizers, Bio-fertilizers, Growth and yield

Tuber crops are third most important food crops of humankind after cereals and grain legumes. Among the vegetatively propagated tuber crops, elephant foot yam (EFY) Suran / zimikand / ol (*Amorphophallus paeoniifolius* (Dennst.) Nicolson of Araceae family of order Nudiflorae of monocotyledonae, is basically an important tuber crop of the tropical and sub-tropical countries. Because of its higher yield potential, higher biological efficiency, culinary properties, medicinal utility and therapeutic values it is referred as "King of tuber crops". In India, it is grown in almost all the states but commercially cultivated mainly in Andhra Pradesh, Tamil Nadu, Gujarat, Maharashtra, West-Bengal, North-Eastern states, Kerala, Karnataka, Bihar and Uttar Pradesh. High yielding and non-acrid variety *viz.*, Gajendra has already been developed but this variety is yet to be popularized for commercial cultivation among the farmers' of South Gujarat. In facts, *Amorphophallus* tubers are cheaper and rich source of important nutrients, vitamins and minerals as well as it also improves the delicacy of the food if incorporated. It has several medicinal properties and found to be effective in the treatment of piles, dysentery, asthma, swelling of lungs, vomiting, abdominal disorders in addition to use as blood purifier. The corm yield ranged 40 to 80 t ha⁻¹ and its recommended nutrient requirement is 100-50-150 NPK kg ha⁻¹ (Susan John *et al.*, 2006).

Several factors have found to affect the growth and yield of elephant foot yam. It has been repeatedly confirmed that continuous sole and imbalanced use of chemical fertilizers leads to deteriorate the soil health and ecological balance in conjunction to decrease the nutrient

uptake efficiency of applied plant's nutrients. In this way, it might eventually have manifested either stagnation or plateauing in crop yield and big threats to environmental safety (Virmani, 1994).

The integrated nutrient supply includes the use of chemical fertilizers with organic sources like FYM, crop residues etc. along with bio-fertilizers helps not only in bridging the existing wide gap between the nutrient removal and addition but also in ensuring balanced nutrient proportion, in enhancing nutrient response efficiency, add in maximizing crop productivity of desired quality (Singh and Kalloo, 2000).

Information on the conjoint use of organic sources, chemical fertilizers and their combination with different available and effective bio-fertilizers in this crop under South Gujarat conditions is meager. Looking to the importance, future scope and a heavy demand by all class of consumers as well as to curb the trend of declining yield, there is a great need to find out the most appropriate approach of integrated nutrient management system and thereby increasing the yield of the crop under the question.

Keeping facts in view as high lighted above, the present investigation was taken up with *Amorphophallus*.

MATERIALS AND METHODS

The field experiment was conducted during the *Kharif* season of 2007-08 and 2008-09 at Rambhas Farm, Krishi Vigyan Kendra of Navsari Agricultural University, Gujarat, India. The experiment was laid out in randomized block design with three replications. Total nine treatment combinations namely, T₁ : 100 % recommended dose of

fertilizer RDF (Through IOS : 100-50-150 NPK kg ha⁻¹), T₂ : 100 % recommended dose of nitrogen RDN (Through OS : FYM), T₃ : 50 % RDF (Through IOS) + 50 % RDN (Through OS : FYM), T₄ : 100 % RDF (Through IOS) + *Azospirillum* 5 kg ha⁻¹, T₅ : 100 % RDN (Through OS : FYM) + *Azospirillum* 5 kg ha⁻¹, T₆ : 50 % RDF (Through IOS) + 50 % RDN (Through OS : FYM) + *Azospirillum* 5 kg ha⁻¹, T₇ : 100 % RDF (Through IOS) + *Azospirillum* 5 kg ha⁻¹ + PSB 5 kg ha⁻¹, T₈ : 100 % RDN (Through OS : FYM) + *Azospirillum* 5 kg ha⁻¹ + PSB 5 kg ha⁻¹ and T₉ : 50 % RDF (Through IOS) + 50 % RDN (Through OS : FYM) + *Azospirillum* 5 kg ha⁻¹ + PSB 5 kg ha⁻¹ were evaluated on elephant foot yam cv. Gajendra. Planting of 500 to 1000 g of corm was done in the last week of May at spacing of 75 cm x 75 cm.

Entire quantity of farm yard manure (FYM) as organic source, bio-fertilizers (as *Azospirillum* and PSB : Phosphate solubilizing bacteria) and P₂O₅ (as single super phosphate) as well as half dose of N (as urea) and K (as muriate of potash) was applied as basal dose. Rest of N and K, in two equal splits were top dressed after 35 and 75 days at the time of weeding and earthing up. Observations were recorded on plant height, girth of pseudostem, canopy spread and corm yield. The data recorded on various character during the period of investigation were statistically analyzed by appropriate procedure to Randomized Block Design as describe by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

A perusal of pooled mean of two years indicated

that effect of INM treatments on all growth parameters found non-significant while yield of corm was found significant (Table 1).

The corm yield of *Amorphophallus* (cv. GAJENDRA) was significantly influenced by the various treatments. The highest mean corm yield (55.33 t ha⁻¹) of two years (Table 1) was recorded with the treatment T₇ (100 % RDF (Through IOS) + *Azospirillum* 5 kg ha⁻¹ + PSB 5 kg ha⁻¹) which was at par with the treatment of T₄ and T₁ followed by the application of 50 % RDF (Through IOS) + 50 % RDN (Through OS : FYM) + *Azospirillum* 5 kg ha⁻¹ + PSB 5 kg ha⁻¹ (47.33 t ha⁻¹).

From this results it could be concluded that the 50 % nutrients requirement could be substituted through organic source as FYM without yield loss. The reason being that the application of FYM might have enhanced soil micro flora activity, besides supplementing nutrients. The combined application of *Azospirillum* and phosphate solubilizing bacteria (PSB) increased the availability of soil nitrogen and phosphorus.

The treatment consisting of FYM alone, which recorded lowest corm yield of elephant foot yam, indicating that the use of organic source alone for fulfilling the requirement of total nutrition was insufficient.

This study proves the significance of integrated nutrient management in *Amorphophallus* cultivation with bio-fertilizers and organic manures.

The results of the present investigation are in agreement with those reported by Scagel (2004), Yadav *et al.* (2005), Jawahar and Suresh (2007), Sengupta *et al.* (2008) and Saraswathi *et al.* (2008).

Table 1: Influence of INM on growth and yield parameters of elephant foot yam cv. "GAJENDRA" under south Gujarat conditions

Treatments	Plant height (cm)	Girth of pseudo stem (cm)	Canopy spread (cm)		Corm yield (t ha ⁻¹)
			E – W	N – S	
T ₁ – 100% RDF (Through IOS)	72.40	13.26	59.33	62.38	48.33
T ₂ – 100% RDN (Through OS : FYM)	54.20	10.46	46.43	46.96	29.89
T ₃ – 50% RDF (Through IOS) + 50% RDN (Through OS : FYM)	63.80	11.46	60.71	54.16	36.98
T ₄ – 100% RDF (Through IOS) + <i>Azospirillum</i> 5 kg ha ⁻¹	68.66	11.58	56.27	59.57	52.86
T ₅ – 100% RDN (Through OS : FYM) + <i>Azospirillum</i> 5 kg ha ⁻¹	54.52	10.60	44.69	46.77	34.66
T ₆ – 50% RDF (Through IOS) + 50% RDN (Through OS : FYM) + <i>Azospirillum</i> 5 kg ha ⁻¹	57.53	11.13	58.15	56.66	42.77
T ₇ – 100% RDF (Through IOS) + <i>Azospirillum</i> 5 kg ha ⁻¹ + PSB 5 kg ha ⁻¹	54.80	10.86	58.33	60.63	55.33
T ₈ – 100% RDN (Through OS : FYM) + <i>Azospirillum</i> 5 kg ha ⁻¹ + PSB 5 kg ha ⁻¹	56.13	10.53	48.64	45.91	37.66
T ₉ – 50% RDF (Through IOS) + 50% RDN (Through OS : FYM) + <i>Azospirillum</i> 5 kg ha ⁻¹ + PSB 5 kg ha ⁻¹	70.73	12.60	57.64	59.89	47.33
C.D. (P=0.05)	NS	NS	NS	NS	16.47

NS = Non significant, RDF = Recommended dose of fertilizer (100-50-150 NPK kg ha⁻¹)

RDN = Recommended dose of nitrogen, IOS = Inorganic source, OS = Organic source

Authors' affiliations

P.P. CHAUDHARY, Hill Millet Research Station, Krishi Vigyan Kendra, Navsari Agricultural University, Waghai, DANGS (GUJARAT) INDIA

D.A. PATEL, AICRP (Castor), Pulse Research Station, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA

N.B. PATEL, AICRP (Tuber Crops), ASPEE College of Horticulture and Forestry, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA

M.P. AHIR AND V.I. PATEL, Krishi Vigyan Kendra, Waghai, DANGS (GUJARAT) INDIA

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