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Effect of different integrated nutrient management practices on elephant foot yam (*Amorphophallus paeoniifolius* Dennst.) under eastern Uttar Pradesh conditions

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ABSTRACT : Elephant foot yam is a long duration crop, taking about 7-8 months to realise its full yield potential. This is the reason it requires a nutrient management package which can supply nutrients for longer duration till the maturity of the crop, which is only possible through the incorporation of organic sources of nutrients to the soil. The present experiment, therefore, was conducted at the Main Experiment Station of the Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, UP, during 2006-07 and 2007-08, with the aim to formulate an integrated package of nutrient management involving both inorganic as well as organic sources of nutrients for elephant foot yam under eastern Uttar Pradesh conditions. Ten treatments, using NDA-9 as the experimental material were tested *viz*., T_0 : Absolute control (no fertilizer), T_1 : 100:60:80 kg NPK/ha, T_2 : T_1 + 50 kg N/ha substituted through FYM, T_3 : T_1 + 50 kg N/ha substituted through vermicompost, T_4 : 125:60:100 kg NPK/ha, T_5 : T_4 + 50 kg N/ha substituted through FYM, T_6 : T_4 + 50 kg N/ha substituted through vermicompost, T_7 : 150:60:120 kg NPK/ha, T_8 : T_7 + 50 kg N/ha substituted through FYM and T_9 : T_7 + 50 kg N/ha substituted through vermicompost. On the basis of both the year's data, it was found that the application of 150:60:120 kg NPK/ha + 50 kg N substituted through FYM (T_8) proved to be the best, which resulted in the maximum canopy spread (77.00 cm), maximum corm weight per plant (2.64 kg) as well as total corm yield (44.24 q/ha). It was established that continued crop production potential of soils has a direct relationship to its organic fraction of the soil, and therefore, organic sources of nutrients, in any form, either alone or in combination, may be advocated for use, at least for elephant foot yam.

KEY WORDS : Integrated nutrient management, Vermicompost, Elephant foot yam, Amorphophallus

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Root and tuber crops are the third most important group of food crops, after cereals and grain legumes that constitute either staple or subsidiary food for about a fifth of the world population. The global demand of root and tuber crops is expected to increase further due to declining trend of cereal and pulse production in developing countries due to the effect of global warming.

Elephant foot yam (*Amorphophallus paeoniifolius* Dennst.) is the most popular and widely cultivated member of the edible aroid group of tuber crops. It is fast gaining popularity as a cash crop among the farming community of our country due to its high production potential, capacity to give satisfactory yield in a wide range of soil and agro-climatic conditions and high remuneration. It is a long duration crop, taking about 7-8 months to realise its full yield potential, as well as a heavy feeder. Irrigation water and nutrient are the two important inputs through which farmers manipulate crop growth and yield of cultivated crops. Better management of these two inputs play major role in augmenting productivity and profitability of all crops,

including elephant foot yam. As a matter of fact, continued crop production potential of soils has a direct relationship to its organic matter content, and the productivity is positively correlated to the organic matter content of the soil. Organic matter imparts numerous positive characteristics to the soil. Some relate to soil physical and chemical properties and revolve around the dynamics of organic matter decomposition by soil micro-organisms. Moreover, elephant foot yam, being a long duration crop, needs a nutrient management package which can supply nutrients for a longer duration till the maturity of the crop. This is possible only through the incorporation of organic sources of nutrients to the soil. Therefore, an effort was made to formulate integrated package of nutrient management involving both inorganic as well as organic sources of nutrients for elephant foot yam for eastern Uttar Pradesh conditions.

RESEARCH METHODS

The experiment was conducted at the Main Experiment Station of the Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, U.P., during 2007 and 2008. The trial was laid out in Randomized Block Design with three replications (Randomized Block Design x 3) and ten treatments, using NDA-9 as the experimental material. The ten treatments were:

T_0 : Absolute control (no fertiliser),
T_1 : 100:60:80 kg NPK/ha,
T_2 : T_1 + 50 kg N/ha substituted through FYM,
T_3 : T_1 + 50 kg N/ha substituted through vermicompost,
T_4 : 125:60:100 kg NPK/ha,
T_5 : T_4 + 50 kg N/ha substituted through FYM,
T_6 : T_4 + 50 kg N/ha substituted through vermicompost,
T_7 : 150:60:120 kg NPK/ha,
T_8 : T_7 + 50 kg N/ha substituted through FYM and
T_9 : T_7 + 50 kg N/ha substituted through vermicompost.

The second year experiment was repeated following the first year layout and planting was done on the same plots, in order to access the residual effect of organic manure application to the successive crop and thus sustainability. The crop was planted on 28th and 26th March, maintaining a spacing of 60 x 60 cm and harvested in the last week of October, in both the years of experiment, respectively. Half the dose of inorganic N and full doses of inorganic P and K, and FYM/vermicompost was applied before planting, at the time of field preparation. Rest half inorganic N was applied in two split doses. First, after two months, coinciding with the first hoeing and earthing-up and second, one month thereafter. Irrigation water was applied need based, and other standard cultural practices were followed to raise the crop. Observations on four important horticultural traits were recorded and subjected to statistical analysis. The characters on which observations were recorded were plant height (cm), canopy spread (cm), corm yield per plant (kg) and total corm yield per hectare (q).

RESEARCH FINDINGS AND DISCUSSION

The data recorded for different traits was analysed statistically and the compiled data are presented in Table 1. A perusal of the data clearly implies that elephant foot yam responds well to nutrient supply. It is also indicated from the data there was a significant increment in the *per se* performance of each trait studied and for all the treatments,

Table 1 : Effect of different integrated nutrient management on important horticultural traits of elephant foot yam

Treatment combinations	Plant height (cm)			Canopy spread (cm)			Corm yield per plant (g)			Corm yield per hectare (q)		
	2007	2008	Mean	2007	2008	Mean	2007	2008	Mean	2007	2008	Mean
T_0 : Absolute control (no fertilizer)	88.43	80.74	84.58	53.41	52.86	53.13	0.88	0.83	0.86	24.58	24.08	24.33
T_1 : 100:60:80 kg NPK/ha	94.00	88.80	91.40	65.42*	60.03*	62.72	1.18	1.10	1.14	32.72*	31.86*	32.29
T_2 : T_1 + 50 kg N/ha substituted through FYM	99.62*	99.70*	99.66	67.42*	69.51*	68.46	1.89*	2.05*	1.97	38.63*	40.13*	39.38
T_3 : T_1 + 50 kg N/ha substituted through vermicompost	99.84*	99.87*	99.85	68.41*	71.15*	69.78	2.08*	2.26*	2.17	36.42*	39.13*	37.78
T_4 : 125:60:100 kg NPK/ha	97.43*	97.94*	97.69	70.39*	70.02*	70.20	1.80*	1.95*	1.88	35.18*	35.04*	35.11
T_5 : T_4 + 50 kg N/ha substituted through FYM	105.43*	104.34*	104.88	72.65*	74.05*	73.35	2.39*	2.45*	2.42	40.46*	44.26*	42.26
T_6 : T_4 + 50 kg N/ha substituted through vermicompost	104.61*	103.29*	103.95	70.88*	72.67*	71.77	2.35*	2.42*	2.39	42.71*	42.77*	42.74
T_7 : 150:60:120 kg NPK/ha	100.34*	99.87*	100.10	71.13*	69.66*	70.70	2.08*	2.17*	2.13	38.70*	38.11*	38.41
T_8 : T_7 + 50 kg N/ha substituted through FYM	100.61*	101.69*	101.15	75.45*	78.53*	77.00	2.55*	2.73*	2.64	44.83*	43.64*	44.24
T_9 : T_7 + 50 kg N/ha substituted through vermicompost	101.60*	101.55*	101.11	74.32*	77.84*	76.08	2.40*	2.67*	2.53	43.86*	43.17*	43.52
C.D. (P=0.05)	7.14	8.36		5.23	4.97		0.42	0.55		5.87	6.33	

* indicates significance of value at P= 0.05

over the absolute control.

Due to the application of different treatments, the tallest plants (105.43 and 104.34 cm) were recorded for T_5 (125:60:100 kg NPK/ha + 50 kg N substituted through FYM) in both the years. Maximum canopy spread (75.45 and 78.53 cm) was observed for T_8 (150:60:120 kg NPK/ha + 50 kg N substituted through FYM). Although, the increase in plant height and canopy spread with the increase in fertilizer dose was statistically insignificant. Nitrogen has always been known to promote vegetative growth by increasing both the photosynthetic activity as well as the photosynthetic area. The photosynthetic activity is improved by increasing the concentration of chlorophyll in the cell, whereas, the increase in photosynthetic area is brought about by increasing the plant height and more leaf area and number. The higher plant height and more canopy spread associated with comparatively higher doses of fertilizers (both inorganic and organic) may be thus explained by the above fact.

The effect of various integrated nutrient management practices on yield was more pronounced, as compared to vegetative characters. The mean value of the two years data show that the maximum corm weight per plant (2.64 kg) as well as total corm yield (44.24 q/ha) were obtained by the application of 150:60:120 kg NPK/ha + 50 kg N substituted through FYM (T_8), while the lowest values for these traits were recorded for absolute control. Saraswathi *et al.* (2008) and Narsimha Murthy *et al.* (2008) have also reported significant yield improvement in elephant foot yam with 25-50 % substitution of inorganic fertilisers with organic sources. What was important to note that the yield increased significantly when 50 kg N was applied through organic sources, alongwith the chemical fertilizers as compared to the chemical fertilizers alone. This clearly signifies the importance of application of organic sources of nutrients alongwith the inorganic fertilizers at least in case of tuber crops. This result may be based on the fact that organic sources also improves the physico-chemical properties of the soil alongwith supplying nutrients in smaller amounts for a longer duration, which is specifically desired for tuber crops, being long duration crops. Another reason may be attributed to the fact that organic matter thus supplied in the form of FYM or vermicompost improves the bulk density, porosity and makes the soil light and friable, which favours enlargement or bulking of the underground tubers.

From the data in Table 1, it may also be observed that in the successive year crop, there was a little increase in the individual corm size as well as total corm weight in the treatments receiving additional organic sources of nutrients. Whereas, the yield from the treatments with chemical fertilizers alone, declined a little in the next year. It is to be mentioned again that the previous year layout was repeated in the successive year also, means the same plots receiving the same treatments again in the next year. Katyal *et al.* (2000), Senapati *et al.* (2001) also noted yield decline in field crops and Behera *et al.* (2006) in tuber crops, due to the application of chemical fertilizers alone year after year. From the above result it was realised that addition of N through organic sources of nutrients, in any form, either alone or in combination, improves as well as sustains the total yield, and thus, may be advocated for use, at least for elephant foot yam.

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