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Economics of Elephant Foot Yam (*Amorphophalluspaeoniifolius*dennst.) Under The Influence of Different Pre-planting Treatments with Organic and Inorganic Substances

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ABSTRACT: *The pre-planting treatment of minisetts with thiourea at 400 ppm resulted highest corm yield (12.57 t ha^{-1}) and this treatment showed maximum increase in corm yield (31.07 per cent) over control treatment. The economics over the two years showed that among the different pre-planting treatments, the thiourea at 400 ppm stood best treatment which gave maximum net return of Rs. 91851 with a B:C ratio of 2.71 followed by thiourea at 300 ppm (net return Rs. 90651 and B:C ratio 2.69), thiourea at 200 ppm (net return Rs. 88951 and B:C ratio 2.66) and KNO_3 at 250 ppm (net return Rs. 88021 and B:C ratio 2.66).*

INTRODUCTION

Elephant foot yam (*Amorphophalluspaeoniifolius* Dennst.) is one of the important tuber crops widely cultivated in sub-tropical regions for its underground food reserves. The tubers serve as a cheap source of energy especially for weaker sections of the society. Due to its high photosynthetic efficiency and high dry matter production capability per unit area, substantial yields may be obtained even under poor and marginal soils under harsh climatic conditions. The cultivation of this crop has gained momentum in India after the introduction of non-irritant smooth corm type cultivars like Gajendra.

Traditionally, elephant foot yam is propagated through corms and cormels. Whole corm or cut corm pieces weighing about 500 g to 750 g with a part of apical meristem is mainly used as planting material. A great portion (about 25 per cent) of the harvested produce is lost as source of planting material. These limitations could be overcome by adopting minisett technique. Through this technique multiplication ratio could be enhanced from 1:2 to 1:15 (George and Nedunchezhiyan, 2008). In the present study, find out the economics of the different pre-planting treatments with organic and inorganic substances.

MATERIALS AND METHODS

The experiment was conducted at Research and Instructional Farm of Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during *Kharif* season of the years 2010-11 and 2011-12. The experiments were laid out in Randomized Block Design (RBD) with fifteen treatments and three replications.The treatment consisted of different concentrations of organic and inorganic substances which were applied as pre-planting soaking of corms for one hour. Minisetts of weight 100 g were planted vertically in the month of July at spacing of 60 × 60 cm in pits of size 30 × 30 × 30 cm at a depth of 10-15 cm after treating these minisetts with fungicide (Dithane M-45 @ 2.5 g L^{-1}) followed by pre-planting soaking for one hour in different organic and inorganic substances as per treatments. The farm yard manure (FYM) was incorporated in the soil @ 200 q ha^{-1} before planting of minisetts. Recommended dose of nitrogen, phosphorus and potassium were applied @ 100:60:100 kg ha^{-1} in the form of urea, single super phosphate and murate of potash, respectively. The entire quantity of phosphorus and one third dose of nitrogen and potassium were incorporated as basal applications. However, rest of two, one-third doses of each

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Table 1
Economics of elephant foot yam cv. Gajendra as influenced by different pre-planting treatments of minisett corms in one hectare area (2010-11, 2011-12 and average of two years)

Treatments	*Yield (t)*			*Gross return (Rs)*			*Cost of cultivation (Rs)*			*Net return (Rs)*			*B:C ratio*		
	2010-11	*2011-12*	*Average*	*2010-11*	*2011-12*	*Average*	*2010-11*	*2011-12*	*Average*	*2010-11*	*2011-12*	*Average*	*2010-11*	*2011-12*	*Average*
Cow dung slurry (50%) + water 50%)	11.21	11.03	11.12	112100	110300	111200	32328	34170	33249	79772	76130	77951	2.47	2.23	2.34
Cow urine (50%) + Water (50%)	11.43	11.77	11.60	114300	117700	116000	32628	34470	33549	81672	83230	82451	2.50	2.41	2.46
Cow dung (25%) + Cow urine (25%) + Water (50%)	11.70	11.80	11.75	117000	118000	117500	32478	34320	33399	84522	83680	84101	2.60	2.44	2.52
Cow dung (37.5%) + Cow urine (37.5%) + Water (25%)	11.17	10.68	10.92	111700	106800	109200	32653	34495	33574	79047	72305	75626	2.42	2.10	2.25
Cow dung (50%) + Cow urine (50%)	11.69	11.65	11.67	116900	116500	116700	32828	34670	33749	84072	81830	82951	2.56	2.36	2.46
Thiourea at 200 ppm	12.43	12.04	12.24	124300	120400	122400	32528	34370	33449	91772	86030	88951	2.82	2.50	2.66
Thiourea at 300 ppm	12.49	12.37	12.43	124900	123700	124300	32728	34570	33649	92172	89130	90651	2.82	2.58	2.69
Thiourea at 400 ppm	12.75	12.39	12.57	127500	123900	125700	32928	34770	33849	94572	89130	91851	2.87	2.56	2.71
KNO_3 at 250 ppm	12.31	11.92	12.11	123100	119200	121100	32158	34000	33079	90942	85200	88021	2.83	2.51	2.66
KNO_3 at 500 ppm	12.01	11.86	11.93	120100	118600	119300	32188	34030	33109	87912	84570	86191	2.73	2.49	2.60
KNO_3 at 750 ppm	11.71	11.78	11.74	117100	117800	117400	32218	34060	33139	84882	83740	84261	2.63	2.46	2.54
GA_3 at 100 ppm	10.54	10.60	10.57	105400	106000	105700	36128	37970	37049	69272	68030	68651	1.92	1.79	1.85
GA_3 at 200 ppm	10.61	10.47	10.54	106100	104700	105400	40128	41970	41049	65972	62730	64351	1.64	1.49	1.57
GA_3 at 300 ppm	10.53	10.46	10.49	105300	104600	104900	44128	45970	45049	61172	58630	59851	1.39	1.28	1.33
Water (Control)	9.61	9.57	9.59	96100	95700	95900	32128	33970	33049	63972	61730	62851	1.99	1.82	1.90

Market rate of elephant foot yam @ 10 kg^{-1}

nitrogen and potassium were applied in two equal splits at 60 and 90 days after planting (DAP).The crop was harvested in the month of February when leaves turn yellow and start drying. The corm yield per plot was recorded at the time of harvesting in kilograms and average yield per hectare was computed and expressed in tonnes. The first year (2010-11), second year (2011-12) and pooled data were analysed for economics. Total cost of cultivation and gross returns were calculated from the average input cost and average market price of the produce during the period of investigations. Based on these the net income and benefit: cost (B: C) ratio was computed as follows:

$$\text{Net return (Rs ha}^{-1}) = \text{Gross return (Rs ha}^{-1}) - \text{cost of cultivation (Rs ha}^{-1})$$

$$\text{B: C ratio} = \frac{\text{Net return (Rs ha}^{-1})}{\text{Cost of cultivation (Rs ha}^{-1})}$$

RESULTS AND DISCUSSION

The data on corm yield (t ha^{-1}) are presented in Table 1 and revealed that the pre-planting treatments of corm setts of elephant foot yam with different organic and inorganic substances registered an increased in average corm yield from 9.41 to 31.07 per cent over control treatment (soaking of minisetts in water) and the highest corm yield (12.24 to 12.57 t ha^{-1}, pooled data) was obtained with thiourea at all the concentrations (200, 300 and 400 ppm)which were found to be statistically equal in increasing the corm yield. These were closely followed by KNO_3 at 250 ppm (12.11 t ha^{-1}, pooled data). In general, all the cow dung based pre-planting treatments (T_1 to T_5) gave better response to productivity due to enhanced sprouting but were found comparatively less superior to rest of the treatments except GA_3.

Mondal *et al.* (2005) obtained the highest corm yield of elephant foot yam with cow dung slurry treatment because of improvement in sprouting and vegetative growth of the crop plant. In the present study the corm yield did not show much improvement under cow dung based treatment in comparison to rest of treatments which might probably be due to comparatively low percentage of sprouting.

The results in relation to thiourea and KNO_3 in increasing the corm yield are in conformity of Das *et al.* (1995) who reported outstanding performance of these substances in increasing the corm yield.

The economics of the crop under experimentations were worked out as per the treatment of the experiment during both the years (2010-11 and

Appendix (a)

Cost of cultivation of elephant foot yam cv. Gajendra in one hectare area during year 2010-11

S. No.	Operations	Rate (Rs)	Quantity	Cost (Rs)													
				T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15}
A.	Fixed cost																	
1.	*Field preparation* tractor																	
	Ploughing	350 hr^{-1}	2 hr	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700
	Harrowing	350 hr^{-1}	3 hr	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
2.	*Seed Treatment*																	
	Dithane M-45	210 kg^{-1}	2.5 kg per 1000 litre	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525
3.	*Manure and fertilizer*																	
	FYM	30 q^{-1}	200 q	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	Urea	5.05 kg^{-1}	217.39 kg	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098
	SSP	3.36 kg^{-1}	375 kg	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260
	MOP	6.30 kg^{-1}	166.67 kg	1050	1050	1050	1050.	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
4.	Manure and fertilizer	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
5.	Planting Material	800 q^{-1}	15.50 q	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400
6.	Planting Cost	125 man^{-1}	15	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875
7.	Intercultural practices including Earthing up and weeding	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
8.	Irrigation	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
9.	*Plant protection*																	
	(a) Rogor	190 L^{-1}	2 litre	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380
	(b) Dithane M-45	210 kg^{-1}	2 kg	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
10.	Harvesting	125 man^{-1}	15	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875
11.	Grading	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
12.	Miscellaneous	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Total fixed cost			32128	32128	32128	32128	32128	32128	32128	32128	32128	32128	32128	32128	32128	32128	32128
A.	*Variable cost*																	

1.	Pre-planting treatments	200	500	350	525	700	400	600	800	30	60	90	4000	8000	12000	–
	Total cost (A+B)	32328	32628	32478	32653	32828	32528	32728	32928	32158	32188	32218	36128	40128	44128	32128

Note: cost of thiourea Rs 2 g^{-1}, KNO_3 Rs 120 kg^{-1} and GA_3 Rs 40 g^{-1}

T_1 : Cow dung slurry (50%) + Water (50%) T_2 : Cow urine (50%) + Water (50%) T_3 : Cow dung (25%) + Cow urine (25%) + Water (50%)

T_4 : Cow dung (37.5%) + Cow urine (37.5%) + Water (25%) T_5 : Cow dung (50%) + Cow urine (50%) T_6 : Thiourea at 200 ppm T_7 : Thiourea at 300 ppm

T_8 : Thiourea at 400 ppm T_9 : KNO_3 at 250 ppm T_{10}: KNO_3 at 500 ppm T_{11} : KNO_3 at 750 ppm

T_{12} : GA_3 at 100 ppm T_{13}: GA_3 at 200 ppm T_{14}: GA_3 at 300 ppm T_{15} : Water (Control)

Appendix (b)

Cost of cultivation of elephant foot yam cv. Gajendra in one hectare area during year 2011-12

S. No.	*Operations*	*Rate (Rs)*	*Quantity*	*Cost (Rs)*													
				T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15}
A.	*Fixed cost*																	
01	Field preparation tractor																	
	Ploughing	350 hr^{-1}	2 hr	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700
	Harrowing	350 hr^{-1}	3 hr	1050	1050	1050	105	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
2.	Seed Treatment																	
	Dithane M-45	210 kg^{-1}	2.5 kg per 1000 litre	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525
3.	*Manure and fertilizer*																	
	FYM	30 q^{-1}	200 q	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	Urea	5.63 kg^{-1}	217.39 kg	1224	1224	1224	1224	1224	1224	1224	1224	1224	1224	1224	1224	1224	1224	1224
	SSP	5.45 kg^{-1}	375 kg	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044
	MOP	11.87 kg^{-1}	166.67 kg	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977
4.	Manure and fertilizer application	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
5.	Planting Material	800 q^{-1}	15.50 q	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400
6.	Planting Cost	125 man^{-1}	15	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875
7.	Intercultural practices including Earthing up and weeding	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
8.	Irrigation	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
9.	Plant protection																	

	(c) Rogor (d) Dithane M-45	190 L^{-1} 210 kg^{-1}	2 litre 2 kg	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420	380 420
10.	Harvesting	125 man^{-1}	15	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875
11.	Grading	125 man^{-1}	5	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
12.	Miscellaneous Total fixed cost			1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970	1000 33970
A. 01	Variable cost Pre-planting treatments			200	500	350	525	700	400	600	800	30	60	90	4000	8000	12000	-
	Total cost (A+B)			34170	34470	34320	34495	34670	34370	34570	34770	34000	34030	34060	37970	41970	45970	33970

Note: cost of thiourea Rs 2 g^{-1}, KNO_3 Rs 120 kg^{-1} and GA_3 Rs 40 g^{-1}

T_1 : Cow dung slurry (50%) + Water (50%) T_2 : Cow urine (50%) + Water (50%) T_3 : Cow dung (25%) + Cow urine (25%) + Water (50%)
T_4 : Cow dung (37.5%) + Cow urine (37.5%) + Water (25%) T_5 : Cow dung (50%) + Cow urine (50%)
T_6 : Thiourea at 200 ppm T_7 : Thiourea at 300 ppm
T_8 : Thiourea at 400 ppm T_9 : KNO_3 at 250 ppm T_{10} : KNO_3 at 500 ppm T_{11} : KNO_3 at 750 ppm
T_{12} : GA_3 at 100 ppm T_{13} : GA_3 at 200 ppm T_{14} : GA_3 at 300 ppm T_{15} : Water (Control)

2011-12) as well as in pooled data which is presented in Table 1. The economics over the two years showed that among the different pre-planting treatments, the T_8 (thiourea at 400 ppm) stood best treatment which gave maximum net return of Rs. 91851 with a B:C ratio of 2.71 followed by T_7 *i.e.* thiourea at 300 ppm (net return Rs. 90651 and B:C ratio 2.69), T_6 *i.e.* thiourea at 200 ppm (net return Rs. 88951 and B:C ratio 2.66) and T_9 *i.e.* KNO_3 at 250 ppm (net return Rs. 88021 and B:C ratio 2.66). However, minimum net return of Rs. 59851 with a B:C ratio of 1.33 was obtained under the T_{14} (GA_3 at 300 ppm) followed by T_{15} *i.e.*control (net return Rs. 62851 and B:C ratio 1.90), T_{13} *i.e.* GA_3 at 200 ppm (net return Rs. 64351 and B:C ratio 1.57) and T_{12} *i.e.* GA_3 at 100 ppm (net return Rs. 68651 and B:C ratio 1.85) in case of pooled data. [Appendix II (a) and (b)]

CONCLUSION

Among the different pre-planting treatments, maximum values of corm yield (t ha^{-1}) being under thiourea at 400 ppm and there was also increase in per cent corm yield under this treatment over control treatment and these treatment (thiourea at 400 ppm) stood best treatment in crop economy which gave maximum net return of Rs. 91851 with a B:C ratio of 2.71.

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REFERENCES

Das, P. K., Sen, H., Banerjee, N. C. and Panda, P. K. (1995), Sprouting, growth and whole seed corm production of elephant foot yam as affected by soaking of bottom corm setts in chemicals. *Indian Agriculturist*, **39**(3): 179-185.

George, James and Nedunchezhiyan, M. (2008), Rapid propagation techniques in tuber crops. In: Nedunchezhiyan, M. (eds.). Advance techniques in quality planting material production and commercial cultivation of tropical tuber crops. Regional Centre, Central Tuber Crops Research Institute, ICAR, Bhubaneshwar, Orissa. p.75.

Mondal, Soumik, Sen, H., Tarafdar, J. and Chattopadhyay, A. 2005. Whole seed corm production of elephant foot yam through mini bottom corm setts soaked with growth substances and cow dung slurry. *The Hort. J.*, **18**(2): 102-105.

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