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Response of high density planting on growth, yield and economics of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]

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Abstract

A trial on high density planting in elephant foot yam was conducted during 2021-22 and 2022-23 on sandy loam soil in randomized block design at Agricultural Research Farm, Dholi of Tirhut College of Agriculture under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar) to find out the effect of high density planting on growth, tuber/corm yield and economics. It was found that plant height after four months planting under high planting density either in single row or paired row was significantly higher than normal planting and the increase was to the tune of 19.8-29.9%. Corm yield, net return and B:C ratio under high density planting were also found significantly superior than normal planting and the increase were recorded to the tune of 74.7-96.7, 66.6-105.4 and 4.3-5.8%, respectively. Plant height, corm yield, net return and B:C ratio in all the treatments green manured with greengram (*Vigna radiata*) or dhaincha (*Sesbania rostrata*) or without green manuring either single row planting or paired row planting under high density planting were found at par among themselves.

Keywords: Elephant foot yam, high density planting, corm yield, net return

Introduction

Elephant Foot Yam [*Amorphophallus paeoniifolios* (Dennst.) Nicolson] is one of the most important tuber crops of India as well as other parts of the tropical and subtropical world. It is also an important tuber crop grown in Bihar particularly in the districts of northern Bihar. In the present situation of changing climate scenario, it has assumed more importance than before due to some unparalleled edges over other crops like- its capacity to produce even in adverse climatic conditions without affecting much on its productivity and its high yield potential (George James and Sunitha, S., 2018) [33]. Its farming is also eco-friendly because of less use of agro-chemicals (Singh *et al.*, 2019). It has both nutritional and medicinal value and is usually consumed as cooked vegetable. Elephant foot yam is rich in minerals, protein, vitamins-A. (Mukherjee *et al.*, 2020) [4]. It has high dry matter production capability per unit area than most of the other vegetables. Elephant foot yam is a remunerative and profitable stem tuber crop. The crop is gaining popularity due to its shade tolerance, easiness in cultivation, high productivity, less incidence of pests and diseases, steady demand and reasonably good price. Tubers are mainly used as vegetable after thorough cooking (Thangam *et al.*, 2013).

There is steady decline in land holding size, farmers income, plateauing in productivity and increasing cost of production of elephant foot yam in spite of increasing demand for various uses of its corm. It was felt as high time to increase its production, productivity, farmers income and contributing in strengthening national economy as well. Keeping these facts in view, an experiment was conducted to find out the effect of high density planting on growth, yield and economics of elephant foot yam.

Materials and Methods

The experiment was conducted at Agricultural Research Farm, Dholi of Tirhut College of Agriculture under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar) during the period of 2020-21 to 2022-23. The soil of the experimental plot was sandy loam with pH value of 8.2. Initial soil analysis value of experimental field was: available nitrogen (204.3 kg/ha), phosphorus (16.2 kg/ha), and potassium (131.5 kg/ha). There were nine treatments i.e., T₁-Normal planting at 90x90 cm, T₂- Normal planting at 90x90 cm + green gram sowing in

interrow spaces and its incorporation, T₃- Normal planting at 90x90 cm + dhaincha sowing in interrow spaces and its incorporation, T₄-High density planting at 75x45, T₅- High density planting at 75x45 + green gram sowing in interrow spaces and its incorporation, T₆- High density planting at 75x45 + dhaincha sowing in interrow spaces and its incorporation, T₇-Paired row planting at 45x55/77 cm, T₈- Paired row planting at 45x55/77 cm + green gram sowing in interrow spaces and its incorporation and T₉- Paired row planting at 45x55/77 cm + dhaincha sowing in interrow spaces and its incorporation. ‘Gajendra’ was taken as test variety and the tuber size was of 900- 1100 g. Recommended dose of manures and fertilizers i.e., 15.0 t/ha of FYM with 60: 80: 60 kg N: P₂O₅: K₂O /ha was for normal planting density (T₁ - T₃) and 30.0 t/ha of FYM with 150: 75: 175 kg N: P₂O₅: K₂O /ha (T₄ - T₉) applied uniformly. Immediately after planting of elephant foot yam, green gram and dhaincha were sown in interrow spaces of respective treatment plots. Green gram and dhaincha at about 50 days after sowing were incorporated in the soil. Plant height of five tagged plants was recorded treatment wise at four months after planting and was averaged. Corm weight of five plants was taken randomly treatment wise after harvesting and cleaning of corms and then were calculated on hectare basis (t/ha). All other standard package of practices were followed and analysis was done following standard statistical procedures.

Results and Discussion

Different treatments of planting density green manured either with/without green gram or dhaincha produced significant effect on plant height, tuber/corm yield, net return and B: C ratio of elephant foot yam (Table 1 & fig.1,2). It was found that plant height after four months planting under high planting density either in single row or paired row planting was significantly higher than normal planting and the increase was to the tune of 19.8-29.9%.

Increase in plant height under high planting density was may be due to more competition for sun light among plants than the plants under normal planting density. Similar findings were also reported by James and Nair, 2004 in elephant foot yam and Shweta *et al*, 2020 in cotton.

Similar trend was also obtained for corm yield where high

planting density produced significantly higher corm yield (86.79 - 97.68 t/ha) than normal planting (44.15 – 49.67 t/ha) and the yield increase was to the tune of 74.7 – 96.7%. Yield increase was obviously due to higher plant population under high density planting than normal planting. This result was in conformity with the findings of Patel, *et al.*, 2013 and Sen *et al.*, 1984 [5]. Green manuring either with green gram or sesbania contributed in corm yield realization to the tune of 9.2 -11.8%.

Table 1: Effect of planting density on plant height, corm yield net return and B:C ratio of elephant foot yam

Treatments	Plant height (cm)	Corm yield (t/ha)	Net return (Rs./ha)	B:C ratio
T1	117.9	44.15	409948	1.87
T2	125.5	48.36	483698	2.00
T3	127.3	49.67	508848	2.05
T4	139.6	87.36	859163	1.97
T5	147.6	95.37	1008913	2.12
T6	150.4	97.68	1045063	2.17
T7	141.3	86.79	847763	1.95
T8	149.1	93.75	976513	2.09
T9	153.1	95.16	1003663	2.12
S.Em+	2.93	0.98	10036	0.03
CD (p=0.05)	8.87	2.96	30347	0.10

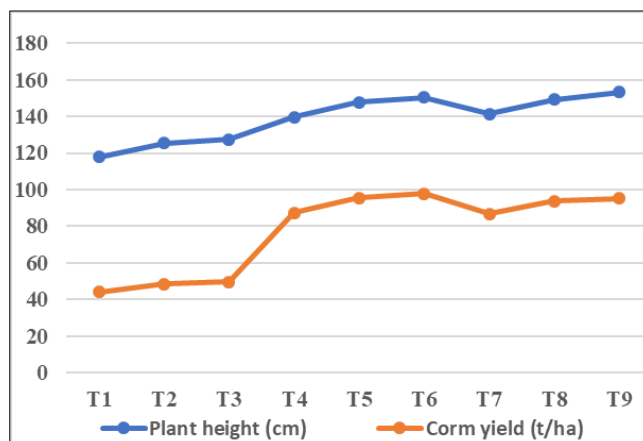


Fig 1: Effect of planting density on plant height and corm yield of elephant foot yam

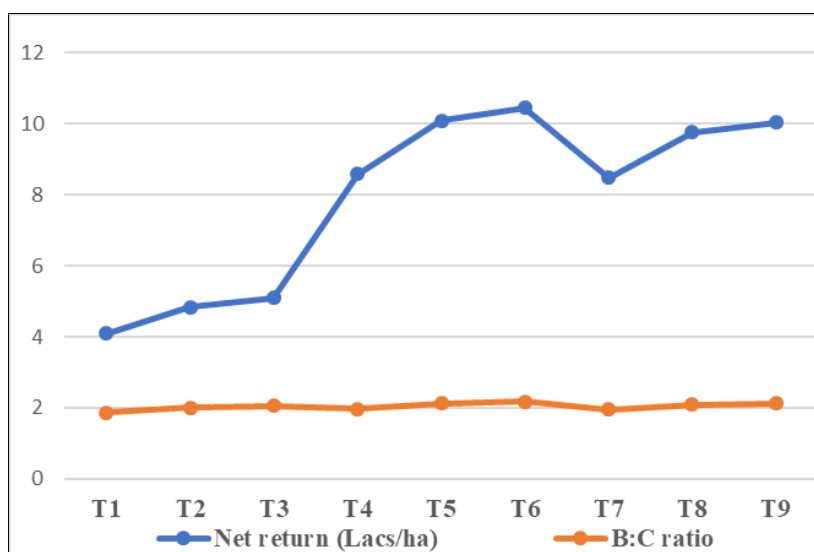


Fig 2: Effect of planting density on net return and B:C ratio of elephant foot yam

Net return was also significantly influenced by different planting densities in elephant foot yam. Significantly highest net return (Rs. 1045063/ha) was recorded by T6 than all the three treatments (T1 – T3) of normal planting density and the increase in net return was calculated to the tune of 66.6 – 105.4% but was found at par with the treatments under high density planting. Significantly lowest net return (Rs. 409948 - 508848/ha) was recorded in treatments under normal planting density than the net return of all other treatments under high planting density which may be due to realization of lowest corm yield because of lowest plant population.

Different planting densities influenced B:C ratio significantly. Significant higher B:C ratio (2.17) was recorded under T6 than all other treatments under normal planting density may be due to realization of highest corm yield and net return but was found at par with the treatments under high planting density green manured either with green gram or dhaincha.

Conclusion

Based on the findings of this experiment it can be concluded that high density planting in elephant foot yam can be suggested for higher corm yield and net return to the farmers.

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