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Effect of plant density on corm yield in Elephant Foot Yam *(Amorphophallus paeoniifolius)* under Island condition

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Abstract

An experiment was conducted with 7 spacing *viz*., (120 x 60 cm, 90 x 90 cm, 90 x 75 cm, 90 x 60 cm, 75 x 75 cm, 75 x 60 cm and 60 x 60 cm) with 3 replication at Horticultural Research Farm, Sipighat, Central Island Agricultural Research Institute, Sri Vijaya Puram to study the influence of plant density on corm yield in Elephant foot yam in Island ecosystem. The yield parameters *viz.,* corm girth (cm), corm weight (kg) and yield/ha were recorded at the time of harvest. The results revealed that, lower corm yield per plant was recorded in planting with high plant densities 60 x 60 cm (1.34 kg plant^{-1}), while individual plant yield was higher in plant density of 90 x 90 cm (2.27 kg plant^{-1}) and 90 x 60 cm (2.20 kg plant^{-1}) respectively. However, the highest corm yield (40.7 t) was resulted with plant density of 90 x 60 cm. The higher yield might be due to higher plant population per ha with closer planting adopted. Higher net income (Rs. 14,72,522) was recorded in 90 x 60 cm which was mainly due to higher yield/ha. However, the highest B: C ratio of 2.92 was recorded in planting at 90 x 60 cm followed by 90 x 90 cm. Further, planting at 60 x 60 cm and 75 x 60 cm resulted in producing total yield comparable with planting at 90 x 60 cm but the B: C ratio was less in planting with high densities (75 x 60 cm and 60 x 60 cm) which may be due to higher seed cost requirement and high cost of production.

Key words: *Plant density, Corm yield, Spacing, Amorphophallus paeoniifolius, Andaman and Nicobar Islands*

Introduction

The Andaman and Nicobar Islands comes under the humid tropics with an average rainfall of about 3000 mm. The climatic conditions of Andaman and Nicobar Islands are well suited for cultivation of tropical tuber crops. Presently, they are grown in an area of 1005.88 ha with a production of 8236.20 MT. Among the tuber crops Elephant foot yam (*Amorphophallus paeoniifolious*) commonly known as *Suran* or *Jimmikand* is an ideal crop for intercropping in existing plantations considering its huge market demand due to the varied range of consumers from Bengal, Kerala and Tamil Nadu.

Elephant foot yam (*A. paeoniifolious*) has now become a very popular crop in certain area of tropical and subtropical regions. It needs a well distributed rainfall with warm weather throughout its growing season. The corm has high carbohydrate content (about 18% starch) and rich in vitamin 'A', minerals and protein. As ayurvedic medicine, it is used against piles, jaundice, diabetes, dyspepsia and appetites. The production potential of this crop is very much dependent on good management practices and both planting material size and spacing being the important factors affecting the corm yield (Sethi *et al*., 2002). Adoption of coconut based multiple cropping system emerges as a viable way for improving the income of coconut farmers. Growing of elephant foot yam as an intercrop increases the profitability without affecting the performance of coconut (Singh *et al*., 1997). The relation between plating material size and corm yield has been reported by Ravi *et al*., (2011). Though few recommendations are available on cultivation of elephant foot yam under open condition but information's are lacking when it is cultivated in different spacing in Island condition. Hence the present study was carried out to standardize the spacing in Elephant foot yam for organic cultivation under Island ecosystem.

Materials and Methods

The experiment was conducted at Horticulture Research Farm, Sipighat, Sri Vijaya Puram during the year 2022 in RBD Design. The treatments included seven spacing *viz*., (120 x 60 cm, 90 x 90 cm, 90 x 75 cm, 90 x 60 cm, 75 x 75 cm, 75 x 60 cm and 60 x 60 cm) with 3 replication at Horticultural Research Farm, Sipighat, Central Island Agricultural Research Institute, Sri Vijaya Puram. There were twenty treatments combinations. The seed corms of Elephant foot yam var Gajendra were treated by dipping in concentrated solution of 25 kg fresh cow dung with 100 litres of water for 30 min. and kept under shade for drying. Corms were planted in the middle of April according to the spacing treatments. Removal of side shoots was done as and when necessary, keeping the two shoots (maximum) per plant. The growth parameters were recorded at 120 days after planting while yield parameters and yield were recorded at the time of harvest.

All the cultural practices and plant protection measures were done as per need of crop. Fertilizers were applied @ 100:80:100 kg NPK/ha as urea, P_2O_5 and K_2O. Entire phosphorus with FYM @ 20 t/ha was given as basal application. Nitrogen and potassium were applied in to splits 30 days after planting (DAP) and 60 DAP followed by earthing up and irrigation. The observation on different growth parameters were recorded from five randomly selected plants per plot. Yield was taken on net plot basis at harvest. The yield per ha was calculated on the basis of yield per plot. The data collected from different characters were processed and were analyzed by the method of analysis of variance given by Gomez and Gomez (1984).

Results and Discussion

The experiment conducted on High density of planting in elephant foot yam revealed that, spacing had significant effect on almost all yield parameters (Table1). lower corm yield per plant was recorded in T_7 (60 x 60 cm) at 7, 8 and 9 months (1.34 kg) of planting followed by T_6 (75 x 60 cm) respectively, while individual plant yield was higher in T_2 with plant density of 90 x 90 cm (2.27 kg) and T4- 90 x 60 cm (2.20 kg) respectively. However, the highest corm yield (40.7 t) was resulted with plant density of 90 x 60 cm (T_4) followed by T_7 and T_6 which was on par with each other. The greater corm yield was presumably due to early sprouting and better root ramification (Sen *et al*., 1996). The higher yield might be due to higher plant population per ha with closer planting adopted. Maximum corm yield was recorded with the closest plant spacing and greater corm size. This is in good agreement with the findings of Mandal and Sen, 2004 and Salam *et al*., 2016).

The different management practices expressed variations in the net returns and B: C ratio. Higher net income (14, 72,522) was recorded in T_4 (90 x 60 cm) followed by T_6 which was mainly due to higher yield/ha. However, the highest B: C ratio of 2.92 was recorded in planting at 90 x 60 cm followed by 90 x 90 cm and 75 x 75 cm. Further planting at 60 x 60 cm and 75 x 60 cm resulted in producing total yield comparable with planting at 90 x 60 cm but the B: C ratio was less in planting with high densities (T_6 and T_7) which may be due to higher seed cost requirement and high cost of production (Table 2). The findings of present investigation are in agreement with Chowdhury and Deka (1997); Maheswarappa *et al*., (1998); Marimutha *et al*., (2001) and Nath (2002).

Figure 1. EFY plants under different spacing

Table 1: Corm and seed yield

Treatment	Corm yield per plant (Kg)			Corm yield/ha (t/ha)		Seed corm yield/ ha (t/ha)
	7m	8 m	9m	7m	8 m	
T_1 (120 x 60 cm)	1.26	1.61	1.79	17.54	22.36	24.62
T_2 (90 x 90 cm)	1.74	1.95	2.27	21.48	24.07	28.02
T_3 (90 x 75 cm)	1.31	1.54	1.78	19.41	22.76	24.86
T_4 (90 x 60 cm)	1.55	1.82	2.20	28.64	33.70	40.74
T_5 (75 x 75 cm)	1.08	1.43	1.78	19.20	25.48	31.71
T_6 (75 x 60 cm)	1.12	1.39	1.62	24.82	30.88	35.93
T_7 (60 x 60 cm)	0.86	1.11	1.34	23.98	30.92	37.13
SEm+	0.10	0.11	0.15	2.13	2.00	2.30
CD (0.05)	0.32	0.34	0.47	6.65	6.25	7.17
CV	13.88	12.33	14.23	16.68	12.79	12.51

Table 2: Economics of High density planting in Elephant foot yam

Treatments	Cost of cultivation (Rs)	Gross return/ha (Rs)	Net return/ha (Rs)	B:C ratio
T_1 (120 x 60 cm)	396674	1194077	797404	2.01
T_2 (90 x 90 cm)	364390	1359123	994732	2.73
T_3 (90 x 75 cm)	416787	1205687	788900	1.89
T_4 (90 x 60 cm)	503349	1975871	1472522	2.92
T_5 (75 x 75 cm)	482839	1537649	1054810	2.18
T_6 (75 x 60 cm)	584201	1742390	1158189	1.98
T_7 (60 x 60 cm)	703395	1800737	1097342	1.56

Conclusion

For yield maximization 90 x 60 cm spacing was the best for elephant foot yam cultivation under Island condition.

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