

ELEPHANT FOOT YAM (*AMORPHOPHALLUS CAMPANULATUS* ROXB. BLUME) CV. GAJENDRA INTRODUCTION WITH SPICE INTERCROPPING: YIELD EFFICIENCY UNDER SLOPPY FOOT HILLS OF IMPHAL-EAST

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ABSTRACT

During the year 2013 from May to November initial study under sloppy foot hills of Imphal-East, Manipur was conducted on acidity free elephant foot yam (*Amorphophallus campanulatus* Roxb. Blume) cv. Gajendra intercropping with spice crops (ginger and turmeric) for yield efficiency. Elephant foot yam (13.02 t ha⁻¹), turmeric (42.84 t ha⁻¹) and ginger (36.51 t ha⁻¹) were recorded highest yield as sole crops. Among the intercropped treatments maximum land equivalent ratio (1.43) and elephant foot yam equivalent yield (37.91 t ha⁻¹) were recorded in elephant foot yam intercropped with double row of turmeric. The result clearly indicating that non-acridity elephant foot yam cv. Gajendra intercropped with double row of turmeric would be appropriate for providing nutritional security in addition to profitable returns under sloppy foot hills of Imphal-East.

INTRODUCTION

Elephant foot yam (*Amorphophallus campanulatus* Roxb. Blume) is a cheap source of carbohydrates, rich in calcium, phosphorus and vitamins grown for corm (modified-stem) harvested after 6 – 7 months from planting and can be stored for longer period without damage. As intercropping increases crop production per unit area and time, particularly for farmers having marginal and small holdings, interspaces of elephant foot yam (EFY) can be utilized to grow intercrops like turmeric and ginger for profitable returns. Some of the researchers Al-Dalain (2009), Ijohay *et al.* (2012) and Njoku and Muoneke (2008) found that higher productivity per unit area with intercropping system can be harvested compared to sole cropping. Small land holdings of most of the tribal farmers, poor transport and marketing facilities limit the prospect of commercial cultivation in the sloppy foot hills of Imphal-East, Manipur. Tuber crops like cassava, taro, sweet potato and elephant foot yam were consumed very often for sustenance. Of which locally grown elephant foot yam was highly irritative in nature due to high calcium oxalate content. Hence, the present investigation was carried out to study the performance of non-acridity cv. Gajendra, in terms of yield efficiency with locally grown spice intercropping for the food requirements under sloppy foot hills of Imphal-East.

MATERIALS AND METHODS

The present investigation was carried out at horticultural

research farm, department of horticulture, college of agriculture, Central Agricultural University, Imphal, Manipur, India during the year 2013 with elephant foot yam cv. Gajendra. The experimental soil is of Acidic (pH 5.26) and clay soil. The experiment was laid out in a Randomized Block Design with seven treatments and three replications. The treatments comprised of elephant foot yam sole crop (T₁), single row of turmeric planted in the inter-rows elephant foot yam (T₂), double row of turmeric planted in the inter-rows elephant foot yam (T₃), single row of ginger planted in the inter-rows elephant foot yam (T₄), double row of turmeric planted in the inter-rows elephant foot yam (T₅), turmeric sole crop (T₆) and ginger sole crop (T₇). Spacing of 90 x 90 cm row to row and plant to plant was adopted for elephant foot yam constantly. Turmeric/ginger rhizomes planted at a distance of 25 x 25 cm row to row and plant to plant in sole cropping. Where as in single row planting, only one row of ginger/turmeric planted in the inter-rows of elephant foot yam at 25 cm spacing between plant to plant and in double row planting, 2 rows of turmeric/ginger planted in the inter-rows of elephant foot yam at a distance of 25 x 25 cm plant to plant in rows. The number of turmeric or ginger plants present in single row (56), double row (112) and the sole crop (259) will vary accordingly. Elephant foot yam corms weighing 250 g and for turmeric and ginger, primary rhizomes weighing 10-20 g each was used as the planting material. Recommended cultural practices and plant protection measures were carried out regularly.

The harvested corms and rhizomes of turmeric and ginger from each net plot were weighed separately and yield per plot was obtained then converted into tonnes per hectare. Yield efficiency of the system has been studied in terms of land equivalent ratio (LER) and elephant foot yam equivalent yield (EEY). LER was calculated as suggested by Willey and Osiru (1972).

$$LER = \frac{Y_{ab}}{Y_{aa}} + \frac{Y_{ba}}{Y_{bb}}$$

Y_{ab} is yield of species 'a' in association with species 'b' and Y_{ba} is the yield of species 'b' in association with species 'a'. Y_{aa} and Y_{bb} represent the pure stand yield of species 'a' and 'b', respectively.

The yield of turmeric and ginger was converted into EEY based on the price of corms and calculated as described by Reddy and Reddi (2008)

EEY = Equivalent of elephant foot yam + Equivalent of intercrop

$$\text{Equivalent of elephant foot yam} = \frac{\text{Yield of elephant foot yam} \times \text{Price of elephant foot yam}}{\text{Price of elephant foot yam}}$$

$$\text{Equivalent of intercrop} = \frac{\text{Yield of intercrop} \times \text{Price of intercrop}}{\text{Price of elephant foot yam}}$$

RESULTS AND DISCUSSION

Yield of elephant foot yam was significantly affected with the intercropping of spice crops as mentioned in the Table 2. Elephant foot yam (13.02 t ha⁻¹), turmeric (42.84 t ha⁻¹) and

ginger (36.51 t ha⁻¹) sole crops recorded superior yield. Favourable conditions for growth provided significantly higher yield in sole crops. This result is in agreement with the findings of Singh *et al.* (2013).

In the present study highest LER (1.43) was recorded in elephant foot yam with double row of turmeric (Table 1), indicated that 43 percentage additional productivity per unit area can be achieved by growing two crops (elephant foot yam and two rows of turmeric) together than by growing them separately. Additional yield supplied by the intercrop enhanced the biological efficiency of intercropping system. Whereas all sole crop treatments recorded similar land equivalent ratio (1.00). These findings are in agreement with the results of Amanullah *et al.* (2006), Njoku and Muoneke (2008), Egbe and Idoko (2009), Mayisela *et al.* (2010) and Ijoyah *et al.* (2012). Single row of turmeric planted in the inter-rows elephant foot yam gave the minimum land equivalent ratio (0.89) because of the substandard yield of elephant foot yam was also in line with the findings of Al-Dalain (2009).

The EEY (Table 1) of each treatment was worked out on the basis of yield of elephant foot yam and intercrops (Table 2). Among the intercropped treatments elephant foot yam with double row of turmeric (37.91 t ha⁻¹) recorded highest EEY. In accordance with the findings, raise in the equivalent yield of the system through the provision of intercrop equivalent to the main crop was also reported by Amanullah *et al.* (2006a), Chattopadhyay *et al.* (2008) and Dhandayuthapani *et al.* (2015).

With the help of above results it has been revealed that non-acridity elephant foot yam (*Amorphophallus campanulatus* Roxb. Blume) cv. Gajendra intercropped with double row of turmeric would be the appropriate for providing nutritional security in addition to privileged yield efficiency under sloppy

Table 1: Effect of intercropping on yield advantage of elephant foot yam

Treatments	Land equivalent ratio (LER)			EEY (t/ha)		EEY
	EFY land equivalent	Intercrop land equivalent	LER	Elephant foot yam equivalent	Intercrop equivalent	
T ₁	1.00	-	1.00	13.02	-	-
T ₂	0.55	0.34	0.89	07.17	16.47	23.64
T ₃	0.88	0.55	1.43	11.27	26.64	37.91
T ₄	0.91	0.27	1.17	11.73	09.65	21.38
T ₅	0.56	0.50	1.06	07.20	18.18	25.38
T ₆	-	1.00	1.00	-	48.56	-
T ₇	-	1.00	1.00	-	36.51	-
S.Em (±)			0.05			01.39
C.D.(0.05)			0.16			04.53

Table 2: Yield and price of elephant foot yam and intercrops

Treatments	Corm yield (t ha ⁻¹)	Intercrop yield (t ha ⁻¹)	Price (Rs t ⁻¹)	
			Elephant foot yam	Intercrop
T ₁	13.02	-	15000	-
T ₂	07.17	14.53	15000	17000
T ₃	11.27	23.51	15000	17000
T ₄	11.73	9.65	15000	15000
T ₅	07.20	18.18	15000	15000
T ₆	-	42.84	-	17000
T ₇	-	36.51	-	15000
S.Em (±)	0.55	1.25		
CD (0.05)	1.78	4.08		

foot hills of Imphal-East.

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