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Effect of Spacing and Size of Planting Material on Elephant Foot Yam Grown as Intercrop in Coconut Garden

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Abstract

Field experiment was conducted at AICRP on Palms at Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur (Bastar), IGKV, Raipur, Chhattisgarh to standardize the spacing and size of planting material of elephant foot yam grown as intercrop in coconut plantation. Among the five different spacing (40 x 40 cm, 50 x 50 cm, 60 x 60 cm, 70 x 70 cm and 80 x 80 cm) and two corm sizes (300 and 500 g), the plants under closest spacing (40 x 40 cm) had maximum pseudostem length but pseudostem girth and canopy were maximum in plants spacing (80 x 80 cm). Greater growth and yield were associated with 500 g size of planting material. From yield maximization point of view, 40 x 40 cm spacing with 500 g planting material size was the best for elephant foot yam grown as intercrop under coconut garden. Greater nut yield/palm/year of 8.71 was observed from intercropped block as compared to nut yield of 5.58 from the monocrop.

Key words: Coconut, corm size, elephant foot yam, intercrop, spacing, yield.

Introduction

Elephant foot yam (*Amorphophallus companulatus* Blume,) 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). In the recent past, economy of coconut farming was affected due to fluctuation in the price of coconut, copra and coconut oil. 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). The present investigation was undertaken to study the effect of spacing and size of planting material on the yield of elephant foot yam grown as intercrop in coconut garden and to evaluate the effect of intercrop on the yield of coconut.

Materials and Methods

The field experiment was conducted during the period of *Kharif* season of 2009-10 in a 20 year old plantation of AICRP on Palms at Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur (Bastar), Chhattisgarh. Soil of the experimental site is silty-loam to clay-loam, rich in silicon, prone to excessive cementing nature with low contents of organic matter, zinc, nitrogen, phosphorus, potash and boron and pH ranging from 5.5 to 6.1. The experiment was laid out in

a split plot design with three replications assigning spacing to the main plots and size of planting material (corm) to the sub plots. The treatment included five spacings (40 x 40 cm, 50 x 50 cm, 60 x 60 cm, 70 x 70 cm and 80 x 80 cm) with two corm sizes (300 and 500 g). There were ten treatments with all possible combinations. Four rows of coconut consisting of six palms in each row, i.e. 24 palms, covering an area of 1350 m^2 was taken for conducting the experiment. The seed corms were treated by dipping in concentrated solution of 20 kg fresh cow dung with 100 liters of water for 30 minutes. Corms were planted in the middle of March during both the years. 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. Scheduled agronomical management practices with fertilizer dose @ 400:200:750 g NPK/Palm/year as urea, P_2O_5 and K_2O was followed in coconut under both intercropped and monocropped plots. 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 considering 75% area occupied by intercrop. 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

Spacing and corm size had significant effect on almost all vegetative and yield parameters but their interactions had significant effect on girth of pseudostem, canopy and yield of elephant foot yam (Table1-2). The plants under closest spacing (40 cm x 40 cm) had maximum pseudostem length but pseudostem girth and canopy spread were maximum in plant was widest spacing. The plant raised from bigger corm size (500 g) had maximum length, girth of pseudostem and canopy spread.

The combination of spacing and size of planting material (Table 2) at P_1S_2 (40 x 40 cm, 500 g i.e. closest spacing with bigger corm size) resulted in maximum pseudostem length and corm yield per plot. Maximum girth, canopy spread, diameter of corm and weight of corm were observed in plants under P_5S_2 (80 x 80 cm, 500 g) treatment. Increasing trends in both corm diameter and corm weight was observed with the increase in spacing and also with bigger (500 g) planting material but the corm yield was the maximum in plants were closest spacing

Table1. Effect of planting material size on growth and yield parameters of elephant foot yam

Treatments	Pseudo stem length (cm)		Girth (cm)		Canopy spread (cm)		Diameter of corm (cm)		Weight of corm (Kg)		Corm yield (Kg10m^{-2})		Corm yield (tha^{-1})	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Spacing (cm x cm)														
P_1 (40 x 40)	103.88	94.16	16.90	15.13	91.28	86.25	13.15	12.93	1.03	0.95	61.84	57.05	41.87	38.62
P_2 (50 x 50)	98.36	91.50	17.33	16.40	98.16	91.16	14.76	13.96	1.15	1.17	40.71	41.27	27.56	27.94
P_3 (60 x 60)	91.85	91.56	18.63	16.83	98.81	94.35	16.88	16.43	1.56	1.31	36.94	29.93	25.01	20.26
P_4 (70 x 70)	91.33	80.38	19.60	17.70	103.75	98.00	18.18	17.43	1.55	1.71	30.14	34.16	20.40	23.13
P_5 (80 x 80)	92.96	80.51	20.60	18.60	103.78	104.26	18.60	18.71	1.83	1.72	22.89	19.13	15.50	12.94
CD (p=0.05)	11.12	10.24	2.06	1.036	NS	11.13	1.55	0.62	0.25	0.14	6.96	5.06	2.26	3.43
Corm size (g)														
S_1 (300)	87.56	80.37	18.14	16.14	93.28	88.24	15.96	15.64	1.23	1.21	32.03	31.78	21.69	21.52
S_2 (500)	103.80	94.88	19.08	17.72	105.04	101.37	16.67	16.15	1.61	1.53	44.98	40.83	30.45	27.63
CD (p=0.05)	8.09	3.55	NS	0.39	6.66	2.83	0.54	0.50	0.15	0.14	1.76	1.62	1.65	1.93

Table 2. Effect of size of planting material on growth and yield parameters of elephant foot yam.

Treatments	Pseudo stem length (cm)		Girth (cm)		Canopy spread(cm)		Diameter of corm (cm)		Weight of corm (Kg)		Corm yield ($Kg10m^{-2}$)		Corm yield (tha^{-1})	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
P1S1	96.30	87.33	17.26	14.13	87.33	79.16	12.60	13.10	0.84	0.78	49.16	45.72	33.28	30.95
P1S2	111.16	101.00	16.53	16.13	95.23	93.33	13.70	12.76	1.22	1.12	74.52	68.37	50.46	46.29
P2S1	92.33	83.20	17.26	15.26	91.83	86.16	14.66	13.36	0.98	1.03	32.77	37.25	22.19	25.22
P2S2	104.40	99.80	17.40	17.53	104.50	96.16	14.86	14.56	1.33	1.314	48.65	45.29	32.94	30.66
P3S1	79.56	86.33	18.00	16.33	92.16	86.53	16.70	16.13	1.38	1.15	30.52	26.20	20.66	17.73
P3S2	104.13	96.83	19.26	17.33	105.56	102.16	17.06	16.73	1.75	1.47	43.37	33.67	29.36	22.79
P4S1	82.00	69.76	18.86	17.14	96.67	93.66	16.90	17.66	1.34	1.56	27.44	32.46	18.57	21.97
P4S2	100.66	91.00	20.33	18.26	110.83	102.33	19.46	17.29	1.75	1.85	32.84	35.86	22.23	24.28
P5S1	87.60	75.23	19.33	17.86	98.16	112.86	18.93	17.93	1.64	1.53	20.26	17.29	13.72	11.71
P5S2	98.33	85.80	21.86	19.33	109.16	112.86	18.26	19.50	2.02	1.92	25.52	20.97	17.28	14.17
CD (p=0.05)	NS	NS	NS	1.32	14.91	6.34	1.21	NS	0.31	NS	3.92	3.61	3.68	4.30

due to greater plant density. Maximum corm yield was recorded in plants were 40 cm x 40 cm followed by plants were 50 x 50 cm spacing. Growth of the elephant foot yam plant and corm yield was proportionate with the size of planting material. From yield maximization point of view, 40 cm x 40 cm plant spacing with 500 g planting material was the best for elephant foot yam, grown as intercrop in coconut garden. Wider plant spacing (80 cm x 80 cm) along with larger corm size (500 g) resulted in the maximum vegetative growth and greater corm size but maximum yield was associated with the closest plant spacing (40 cm x 40 cm) with greater corm size (500 g). The pseudostem girth, canopy spread, corm size and corm diameter increased with increase in plant spacing and size of seed corm, whereas pseudostem length decreased. Maximum corm yield was recorded with the closest plant spacing and greater corm size. This is in good agreement with the findings of Mohan Kumar et al. (1973) and (Mandal and Sen, 2004).

At closer plant spacing (40 cm x 40 cm), the plant height was maximum as compared to widest plant spacing. Stiff competition for light and space could have made these plants to grow taller than those in wider spacing (80 cm x 80 cm). In the case of corm size, the larger corm produced the taller plant and the remit it in agreement (Ashokan et al. 1984). Greater plant competition and mutual shading might have resulted in reduction in basal girth, canopy spread and yield attributes under higher planting density.

Greater corm size might be attributing to better crop growth in terms of plant height, basal growth and canopy spread which intercepted more light and resulted in greater corm yield. The greater corm yield was presumably due to early sprouting and better root ramification (Sen et al., 1996). The present study recommends the use of greater size corm as planting material. Plants grown from large size corm are vigorous in the early stage and further in the growing season resulting in better productivity.

Influence of elephant foot yam on yield of coconut

Intercropping elephant foot yam under coconut with normal package of practices affect the nut yield of coconut. The pre-experimental (2008) nut yield from monocrop and intercrop plot was 60.65 and 58.72 nuts/palm/year respectively. The average nut yield after the experimentation (2010) was 66.23 and 67.23 nuts/palm/year respectively from monocrop and intercrop plot that shows the beneficial effect of intercrop on the yield of coconut. An increase in nut yield of 5.58 (8.42%) and 8.71 (12.91%) per palm per year respectively were observed

over initial. The findings of present investigation are in agreement with Chowdhury and Deka (1997); Maheswarappa et al., (1998); Marimutha et al. (2001) and Nath (2002).

Conclusion

For yield maximization 40 x 40 cm spacing with 500 g planting material size was the best for elephant foot yam grown as intercrop under coconut garden. Greater nut yield/palm/year of 8.71 was observed from intercropped block as compared to nut yield of 5.58 from the monocrop.

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