



Effect of spacing and size of planting material on growth and yield of turmeric grown in coconut plantation

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Turmeric (*Curcuma longa* L.) is one of the most important spice crops grown in India since ancient times and India enjoys monopoly in the production of turmeric. Growing turmeric in coconut plantation proves profitable without hampering the performance of the main crop (Sharma *et al.*, 1996; Sairam *et al.*, 1997; Nath, 2002). The size of planting material and spacing are the major factors influencing growth and yield of turmeric although not much work on standardisation of these factors has so far been done in West Bengal, particularly when grown as intercrop in coconut garden. Turmeric in West Bengal is generally planted in 22-35 cm apart in each direction. For sowing, the fingers are cut into pieces each of 4-5 cm long. The present investigation was undertaken with the objectives to determine optimum spacing and size of planting material for turmeric when grown as intercrop with coconut.

The experiment was carried out in a 18 years old coconut (cv. E C T) plantation at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia during 1999-2000. The soil of the experimental site was gangetic alluvial with sandy loam texture having medium NPK and soil pH 6. The coconut palms were spaced at 7.5 x 7.5 m. The experiment was laid out in split plot design with five spacings *i.e.*, P₁ (20 x 15 cm), P₂ (20 x 20 cm), P₃ (25 x 20 cm), P₄ (25 x 25 cm) and P₅ (30 x 25 cm) as main plot and two size of planting materials (primary finger) *i.e.* S₁ (20-25 g) and S₂ (30-35 g) as subplot treatments, with three replications. There were ten treatments with all possible combinations. Indofil-M 45 (0.3%) treated rhizomes of required size (cv Suguna) were planted in the middle of April during both the years according to the spacing treatments. Fertilizers were applied @ 125 : 100 : 100 kg NPK / ha. Entire P with ½ K and 1/3 N along with FYM @ 20 t / ha were given as basal application. 1/3N at 45 days after planting (DAP) and 1/3N & 1/2 K were applied at 90 DAP

followed by earthing up and mulching. The rhizome was harvested at 210 DAP. Scheduled agronomical management practices with fertilizer dose @ 500: 250 : 750 g NPK / palm /year were followed in coconut under both intercropped and monocrop plots. Irrigation was given after planting of turmeric. Further need based irrigation was given for intercrops and main crop. Plant protection measures were taken as and when required. The observation on different growth parameters were recorded (180 DAP) from five randomly selected plants per replication. Yield was taken on net plot basis at harvest.

Different growth parameters like plant height and tiller number recorded at 180 DAP in both the years showed variation with the treatments. A decreasing trend in plant height was observed with the increase in spacing. The maximum plant height of 139.45 cm and 141.86 cm were observed in the closest spacing (20 x 15 cm) in the year 1999 and 2000 respectively while the minimum plant height of 127.08 cm and 124.36 cm were recorded in the plants raised under widest spacing (30 x 25 cm) in the respective years. Plant height decreased from 140.66 cm to 125.72 cm (pooled data) with the increase in spacing from 20 x 15 cm to 30 x 25 cm (Table 1). Ponnuswamy and Muthuswami (1981) recorded similar results. At closer spacing the intra row mutual shading takes place, hence competition for light may be the reason for increased plant height. This conforms with the earlier findings of Singh *et al.* (2000). The bigger seed rhizome (30-35g) significantly increased the plant height upto 143.51 cm, as compared to 121.96 cm recorded in smaller seed rhizome (20-25 g) which is in agreement with the findings of Singh and Kar (1991) and Singh *et al.* (2000). Maximum height (151.05 cm) was observed in the plants raised from bigger seed rhizome (30-35 g) under closest spacing (20 x 15 cm) followed by combination of same seed size under 20 x 20 cm spacing (149.21 cm) and

Table 1. Effect of spacing and rhizome size on growth parameters of turmeric

Treatment	Plant height (cm)		
	1999	2000	Pooled
Spacing			
P ₁ (20 x 15cm)	139.45	141.86	140.66
P ₂ (20 x 20cm)	140.60	133.60	137.10
P ₃ (25 x 20cm)	135.50	128.40	131.95
P ₄ (25 x 25cm)	132.33	124.18	128.25
P ₅ (30 x 25cm)	127.08	124.36	125.72
S.E.m.(±)	8.814	6.906	4.028
CD (P=0.05)	NS	NS	NS
Rhizome size			
S ₁ (20-25 g)	121.37	122.56	121.96
S ₂ (30-35 g)	148.61	138.40	143.51
S.E.m. (±)	2.712	1.990	1.196
CD (P=0.05)	8.542	6.268	3.767

NS = Not significant

minimum height (117.33 cm) was recorded in the plants under widest spacing (30 x 25 cm) with smaller seed rhizome (20 - 25 g) (Table 2).

Table 2. Interaction effect of spacing and rhizome size on growth parameters of turmeric

Treatment	Plant height (cm)		
	1999	2000	Pooled
P ₁ S ₁	129.24	131.30	130.27
P ₁ S ₂	149.66	152.43	151.05
P ₂ S ₁	123.83	126.13	124.98
P ₂ S ₂	157.36	141.06	149.21
P ₃ S ₁	120.66	116.93	118.80
P ₃ S ₂	150.33	139.86	145.10
P ₄ S ₁	115.33	121.56	118.45
P ₄ S ₂	149.33	126.80	138.06
P ₅ S ₁	117.80	116.86	117.33
P ₅ S ₂	136.36	131.86	134.11
P x S			
S.E.m.(±)	6.043	4.451	2.676
CD (P=0.05)	NS	NS	NS

NS = Not significant

Table 3. Effect of spacing and rhizome size on yield of turmeric

Treatment	Yield per plant (g)			Yield per plot (kg/3 m ²)			Yield per hectare (t)		
	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled
Spacing									
P ₁ (20 x 15cm)	194.28	191.53	192.90	16.42	16.49	16.46	13.18	13.21	13.19
P ₂ (20 x 20cm)	254.78	250.13	252.45	17.39	17.07	17.23	14.08	13.48	13.78
P ₃ (25 x 20cm)	284.88	278.80	281.84	16.05	15.60	15.83	12.83	12.48	12.66
P ₄ (25 x 25cm)	308.23	304.98	306.60	14.30	13.98	14.14	11.65	10.97	11.31
P ₅ (30 x 25cm)	335.98	326.41	331.20	13.50	13.02	13.27	11.30	9.92	10.61
S.E.m.(±)	6.083	8.178	5.646	0.695	0.966	0.760	0.823	0.699	0.452
CD (P=0.05)	19.836	26.668	18.411	2.266	NS	2.478	NS	2.281	1.468
Rhizome size									
S ₁ (20-25 g)	259.86	257.60	258.73	14.57	14.39	14.48	12.00	11.15	11.58
S ₂ (30-35 g)	291.40	283.14	287.27	16.50	16.08	16.29	13.21	12.86	13.04
S.E.m. (±)	3.715	4.080	2.635	0.382	0.241	0.258	0.538	0.634	0.546
CD (P=0.05)	11.702	12.85	8.300	1.203	0.759	0.812	NS	NS	NS

NS = Not significant

The interaction effect also showed that maximum tiller number (3.36) was produced in the plants raised from bigger seed rhizome (30-35 g) under 25 x 25 cm spacing as compared to minimum tiller number (2.45) with smaller seed rhizome (20-25 g) in combination with closest spacing (20 x 15 cm).

Increasing trend in clump weight or yield per plant was observed with increase in spacing. The clump weight increased from 192.90 to 331.20 g with the increase in spacing from 20 x 15 cm to 30 cm x 25 cm (Table 3). The plants raised from the bigger seed rhizome (30-35 g) produced bigger clump of 287.27 g as compared to 258.73 g with smaller seed rhizome (20-25 g). Among the interactions, maximum clump weight (350.58 g) was recorded in plants raised under widest spacing (30 x 25 cm) coupled with bigger (30-35 g) rhizome (P₅S₂) but minimum clump weight (186.78 g) was recorded in the P₁S₁ (20 x 15 cm, 20-25 g) treatment combination. Interaction of spacing and rhizome size P₂S₂ (20 x 20 cm, 30-35g) treatment combination recorded maximum yield of 17.26 kg/3m² as compared to minimum plot yield of 12.34 kg/3m² with P₅S₁ (30 x 25 cm, 20-25 g) combination in the respective years. P₂S₂ treatment combination recorded maximum projected yield per hectare of 14.71 t as compared to minimum yield of 9.87 t with P₅S₁ combination (Table 4).

Closer spacing might effect the growth and development of plants due to competition among them for nutrients and other resources available per unit area but under spacing above the optimum, the utilization of the land may be less and thereby the yield might have been reduced Rajput *et al.* (1982), Philip (1985), Singh and Kar (1991). The plants resulting from large size rhizome are vigorous in take off stage and further in the growing season with better productivity as compared to the smaller rhizome (Singh *et al.*, 2000).

Table 4. Interaction effect of spacing and rhizome size on yield of turmeric

Treatment	Yield per plant (g)			Yield per plot (kg/3 m ²)			Yield per hectare (t)		
	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled
P ₁ S ₁	186.26	187.30	186.78	15.62	15.69	15.65	12.49	12.58	12.53
P ₁ S ₂	202.30	195.76	199.03	17.23	17.30	17.26	13.87	13.84	13.85
P ₂ S ₁	236.33	233.90	235.11	16.07	16.07	16.07	13.20	12.50	12.85
P ₂ S ₂	273.23	266.36	269.80	18.71	18.08	18.39	14.96	14.46	14.71
P ₃ S ₁	274.13	269.46	271.80	15.36	14.76	15.06	12.28	11.80	12.04
P ₃ S ₂	295.63	288.13	291.88	16.74	16.45	16.60	13.39	13.16	13.28
P ₄ S ₁	288.23	288.03	288.13	13.28	13.28	13.28	11.05	10.19	10.62
P ₄ S ₂	328.23	321.93	325.08	15.32	14.69	15.00	12.25	11.75	12.00
P ₅ S ₁	314.33	309.30	311.81	12.52	12.15	12.34	11.01	8.72	9.87
P ₅ S ₂	357.63	343.53	350.58	14.49	13.90	14.20	11.59	11.12	11.35
P x S									
S.Em. (±)	8.308	9.123	5.898	0.856	0.540	0.578	1.204	1.419	1.220
C.D. (P=0.05)	26.170	28.737	NS	NS	1.701	NS	3.794	4.469	3.843

NS = Not significant

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