

Studies on optimum spacing and leaf stage of cardamom (*Elettaria cardamomum* Maton) seedlings for transplanting in secondary nursery

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INTRODUCTION

Production of healthy seedlings in secondary nursery for transplanting in main field is most important aspect in cardamom production. Cardamom seeds are sown during August-September in raised nursery beds called as primary nursery (Pattanshetty and Prasad 2, 3; Siddagangaiyah *et al.*, 4). Seeds germinate 30-60 days after sowing. They sprout and start producing leaves afterwards. The seedlings become ready for transplanting in secondary nursery during December-January (Krishnamurthy *et al.*, 1). To produce healthy planting material, seedlings raised in primary nursery should be transplanted at optimum spacing in secondary nursery. Since no scientific information is available on optimum stage of leaves in primary nursery beds for transplanting to secondary nursery beds, an experiment was conducted to study optimum spacing and leaf stage of seedlings.

MATERIAL AND METHODS

The experiment was laid out with 5 different leaf stages following 3 different spacings in split plot with 2 factorial randomized block design. Well-grown and uniform healthy seedlings were selected in primary nursery. Different leaf stage seedlings selected were 2,3,4,5 and 6 leaves. They were

transplanted in 3 different spacings, viz. 15 cm × 15 cm, 22.5 cm × 22.5 cm and 30 cm × 30 cm in secondary nursery beds. The cultural practices and plant-protection measures were carried out as per the schedule. Mortality percentage was recorded 30 days after transplanting in secondary nursery. Seedlings from secondary nursery were uprooted after 120 days to record number of tillers, number of leaves and height of plants.

RESULTS AND DISCUSSION

Mortality percentage recorded significant variation in different leaf stages and it was not significant between different spacings (Table 1). Mean mortality percentage was highest when transplanted at 2nd leaf stage (25.41) and least at 6th leaf stage (1.09). Mortality reduced when transplanting was done with mature seedlings to secondary nursery. Mortality rate was not affected by different spacings.

Plant height recorded significant variation between seedlings with different leaf stages as well as different spacings (Table 2). Plant height increased with increase in leaf number (stage). Maximum plant height was recorded in seedlings transplanted at 6th leaf stage (66.3 cm) at 15 cm × 15 cm spacing. It may be due to lanky growth or mutual shading and competition. The height of

Table 1. Mortality percentage as influenced by different leaf stages and spacings.

Spacing (cm)	Leaf stages				
	2	3	4	5	6
15.0 × 15.0	30.74* (26.20)	20.57 (12.88)	11.79 (4.29)	10.17 (3.25)	5.06 (1.60)
22.5 × 22.5	31.05 (27.07)	21.93 (14.00)	16.39 (8.32)	11.9 (4.43)	6.46 (1.69)
30.0 × 30.0	28.15 (22.48)	22.34 (14.61)	16.24 (8.02)	2.73 (0.90)	0.00 (0.00)
Mean	29.98 (25.41)	21.61 (13.83)	14.81 (6.87)	8.29 (2.86)	3.84 (1.09)
General mean	15.97		SE (leaf stage)		4.36
SE (spacing)	5.58		CV (%)		27.77
CV (%)	35.51		CD (P=0.05) for leaf stage		3.61

Values in parentheses are original values

* Percentage values have been transformed into angular values. Transformation used in Sin⁻¹ square root of P, P is proportion of mortality

Table 2. Plant height (cm) as influenced by different leaf stages and spacings.

Spacing (cm)	Leaf stages				
	2	3	4	5	6
15.0 × 15.0	53.08	46.89	52.30	65.25	66.30
22.5 × 22.5	38.50	37.48	45.95	54.00	57.75
30.0 × 30.0	39.83	33.81	39.60	38.75	45.70
Mean	43.78	39.39	45.95	52.67	56.58
General mean	47.68		CD (P=0.05) for spacing		5.45
SE (spacing)	7.04		CD (P=0.05) for leaf stage		4.14
CV (%)	14.77		CD (P=0.05) for leaf stage for same spacing		7.18
SE (leaf stage)	5.00		CD (P=0.05) for spacing for different leaf stages		8.39
CV (%)	10.49				

seedlings was significantly more in closer spacing which might be due to lanky growth or mutual shading.

Number of tillers recorded significant variation in transplanting seedlings at different leaf stages and spacings in secondary nursery (Table 3). Maximum number of tillers/seedling (10.28) was observed when transplanted at 4th and 5th leaf

stage and at 30 cm × 30 cm spacing (11.92) and least (7.29) was observed in 15 cm × 15 cm spacing. Transplanting seedlings at 4th and 5th leaf stage with a higher spacing would be ideal for proliferation of more number of healthy and vigorous seedlings.

Number of leaves showed significant variation between different leaf stages and spacings

Table 3. Number of tillers as influenced by different leaf stages and spacings.

Spacing (cm)	Leaf stages				
	2	3	4	5	6
15.0 × 15.0	6.00	5.54	9.01	7.59	8.29
22.5 × 22.5	7.28	7.48	9.62	9.55	12.29
30.0 × 30.0	10.08	10.74	12.22	13.45	13.13
Mean	7.78	7.92	10.28	10.19	11.23
General mean	9.48		CV (%)		23.90
SE (spacing)	2.49		CD (P=0.05) for spacing		1.93
CV (%)	26.26		CD (P=0.05) for leaf stage		1.88
SE (leaf stage)	2.27				

Table 4. Number of leaves as influenced by different leaf stages and spacings.

Spacing (cm)	Leaf stages				
	2	3	4	5	6
15.0 × 15.0	31.65	39.48	46.45	54.10	46.58
22.5 × 22.5	34.88	32.58	72.85	66.80	77.82
30.0 × 30.0	43.68	81.33	92.40	101.68	90.25
Mean	36.73	51.13	70.57	74.19	71.55
General mean	60.83		CV (%)		24.85
SE (spacing)	22.31		CD (P=0.05) for spacing		17.27
CV (%)	36.68		CD (P=0.05) for leaf stage		12.53
SE (leaf stage)	15.12				

(Table 4). Mean maximum number of leaves was observed when transplanted at 5th leaf stage (74.19) at a spacing of 30 cm × 30 cm (81.87). Mean number of leaves was on par with each other when planted after 4th leaf stage.

Third leaf stage onwards is ideal for the transplanting cardamom seedlings from primary to secondary nursery at the spacing of 22.5 cm × 22.5 cm. Adequate number of tillers/seedling is an important prerequisite in the early establishment and build-up of the clump when transplanted to the main field.

SUMMARY

An experiment was conducted with 5 leaf stages and 3 different spacings in secondary nursery. Mortality rate was low when cardamom seedlings were transplanted from primary nursery after they attained 3-leaf stage. Plant height, number of tillers/plant and number of leaves/plant were higher when seedlings were transplanted to secondary nursery after 3-leaf stage. Number of tillers and number of leaves increased with increase in spacing at all leaf stages. Narrow spacing led to

lanky growth of seedlings. Optimum spacing in secondary nursery was found to be 22.5 cm × 22.5 cm.

LITERATURE CITED

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