

Evaluation of high yielding accessions of small cardamom (*Elettaria cardamomum* Maton) for suitability in the high ranges of Idukki District

S Backiyarani, P Sainamole Kurian, A Josephraj Kumar & M Murugan

Cardamom Research Station
Kerala Agricultural University
Pampadumpara – 685 556, Kerala, India.

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Abstract

Ten high yielding small cardamom accessions were collected from RRS, Mudigere; ICRI, Saklespur and CRS, Pampadumpara and evaluated for their suitability in Idukki District, Kerala. M-1 and PV-1 were found to be high yielding varieties since both of them recorded the highest yield consistently for four consecutive years. M-1 was relatively tolerant to thrips infestation. The biometrical traits such as plant height, tiller number, panicle number, panicle length and seed number showed high positive correlation with yield. These characters are likely to be the ideal selection criteria in small cardamom.

Key words: correlation, *Elettaria cardamomum*, crop yield.

Introduction

Small cardamom (*Elettaria cardamomum* Maton) is a highly remunerative spice crop grown extensively in the cardamom hill reserve of Idukki District, owing to its unique environmental conditions. With limited scope existed on expanding the area under cultivation, the latest trend was to concentrate on productivity rather than production so as to get high returns per unit area. To achieve this goal, a holistic approach towards manipulation of different factors that may differ from region to region and place to place, is essential. Cardamom is a highly location specific crop influenced by microclimatic conditions and bee foraging activity (Koshy John & Venkatesan 1999). Hence identification of an appropriate variety suitable for a specific region is an important factor to increase the cardamom productivity (Hegde & Korikanthimath 1999). For evolving high yielding varieties of any

crop, knowledge on the relationship between yield contributing characters and yield is mandatory. Therefore, the present study was conducted to evaluate the released varieties and promising selections at an elevation of 1100 m MSL to identify the location specific high yielding accessions with desirable attributes and also to obtain information on character association.

Materials and methods

The experiment was carried out at Cardamom Research Station, Pampadumpara during 1994 to 2000. Clones of ten high yielding accessions were collected from RRS, Mudigere; ICRI, Saklespur and CRS, Pampadumpara and planted in a randomized block design (RBD) with four replications at a spacing of 2.5 m x 2.5 m. Normal agronomical practices were followed as per the package of practices of Kerala Agricultural University. Observations were

recorded on various yield components such as plant height, tiller number, panicle number, panicle length, 100 capsule weight, seed number, recovery percentage, wet yield and infestation by thrips and capsule borer for five cropping seasons. The pooled data for five years (1996 to 2000) were subjected to statistical analysis. The simple phenotypic correlation co-efficient was estimated using the formula suggested by Al-jibouri *et al.* (1958). Reaction to thrips and capsule borer was statistically arrived by Duncan's Multiple Range Test (Gomez & Gomez 1984).

Results and discussion

Among the ten entries tested, significant differences were observed for the yield (dry) per plant during all the years under the study, except 1996 and 1998 (Table 1). All the accessions recorded low yield during 1998, which is attributed to severe drought coinciding the critical panicle initiation stage. M-1 registered the highest yield consistently for four consecutive years (1997 to 2000) followed by PV-1 for three years in succession (1998-2000). The highest pooled yield (dry) of 373.98 kg ha⁻¹ was recorded in M-1 followed by PV-1 (321.78 kg ha⁻¹).

Out of the ten characters investigated, tiller number, panicle number, panicle length, 100 capsule weight, thrips and borer incidence and wet yield differed significantly among the accessions. Sel. 262 was the tallest and

SKP-14 was the shortest among the ten accessions (Table 2). Number of tillers per clump was significantly higher in PV-1 (57.0), followed by M-1 (56.8), whereas M-1 and Sel. 262 recorded higher number of panicles (28.7 and 26.7, respectively) and lengthy panicle (41.8 cm and 43.8 cm, respectively). The accessions, Sel. 262 and Cl. 679 recorded highest 100 capsule weight (70.0 g and 67.5 g, respectively) and higher number of seeds per capsule (18.3). Wet weight per clump was highest in the accession M-1 (1253.49 g plant⁻¹) followed by PV-1 (1011.88 g plant⁻¹), while high recovery was observed in PV-1 (21.2%) followed by Cl. 683 (20.8%). Thrips infestation on the capsule was lowest in M-1 (6.58%) followed by Sel. 800 (8.33%) and PV-1 (10.05%). Among the ten accessions tested, SKP-51 (1.40%) and Sel. 112 (2.76%) were found to be relatively tolerant to capsule borer infestation. M-1 was tolerant to infestation by thrips but it was susceptible to capsule borer. Even though the accession Cl. 683 had high recovery (20.8%), the yield was low may be due to less number of capsules and less number of panicles per clump (11) and shorter panicle length (26 cm).

In correlation studies, all the traits showed significant positive correlation with yield clump⁻¹ except for 100 capsule weight (Table 3). Avadhani *et al.* (1993) and Patil *et al.* (1998) established a highly significant and positive correlation between yield and number of panicles, panicle length as well as seed number.

Table 1. Yield of high yielding small cardamom accessions for five years

Accession	Yield (dry) (g plant ⁻¹)					Mean
	1996	1997	1998	1999	2000	
Cl. 679	286.00	104.80	36.20	90.70	355.20	174.58
Sel. 800	311.60	146.20	33.50	117.90	390.80	200.05
M-1	244.40	175.60	60.00	189.60	578.00	249.32
Sel. 112	72.00	52.40	30.40	76.30	279.10	102.04
Sel. 262	231.60	90.50	42.90	124.00	292.20	156.24
Cl. 276	162.40	53.10	43.20	98.60	338.80	139.22
Cl. 683	87.50	20.20	22.90	75.20	232.50	87.66
SKP-51	116.50	36.30	15.08	37.60	285.60	98.20
SKP-14	280.70	155.70	25.80	94.60	222.00	155.76
PV-1	257.50	116.80	43.80	164.20	490.30	214.52
CD (P=5%)	NS	96.2	NS	90.23	30.18	48.70

Table 2. Performance of high yielding accessions of small cardamom at high ranges of Idukki District

Accession	Plant height (cm)	No. of tillers clump ⁻¹	No. of panicles clump ⁻¹	Length of panicle (cm)	Weight of 100 capsules (g)	No. of seeds capsule ⁻¹	Pest incidence (%)		Recovery (%) (g plant ⁻¹)	Capsule yield	
							Thrips*	Borer**		Wet (kg ha ⁻¹)	Dry
Cl. 679	221.9	39.8	22.5	29.5	67.5	18.3	16.31 (23.75) ^{bcd}	4.06 (2.01) ^{ab}	19.60	890.71	261.87
Sel. 800	247.9	40.1	21.7	39.4	6.8	17.3	8.33 (16.71) ^{ab}	5.30 (2.30) ^b	20.60	971.12	300.08
M-1	258.7	56.8	28.7	41.8	60.0	16.3	6.58 (14.85) ^a	5.62 (2.37) ^b	19.90	1253.49	373.98
Sel. 112	209.1	37.8	12.0	27.8	62.5	11.8	12.42 (18.46) ^{abc}	2.76 (1.66) ^a	19.20	531.46	153.06
Sel. 262	277.3	51.6	26.7	43.8	70.0	18.3	16.15 (23.36) ^{bcd}	4.09 (2.02) ^{ab}	19.70	793.01	234.36
Cl. 276	219.2	42.3	25.5	32.8	55.0	15.0	12.83 (21.09) ^{abc}	5.74 (2.39) ^b	18.90	736.61	208.83
Cl. 683	225.5	45.4	11.0	26.0	65.0	15.8	18.98 (25.39) ^{cd}	4.25 (2.06) ^{ab}	20.80	421.44	131.49
SKP-51	198.6	53.5	18.0	42.9	40.2	15.0	24.54 (29.68) ^d	1.40 (1.18) ^a	19.45	504.88	147.30
SKP-14	196.0	39.6	17.0	34.5	62.5	15.5	18.06 (25.05) ^{cd}	3.67 (1.92) ^{ab}	20.03	767.29	233.64
PV-1	254.8	57.0	23.5	38.8	52.5	16.8	10.05 (18.42) ^{abc}	4.92 (2.22) ^b	21.20	1011.88	321.78
CD (P=5%)	NS	16.0	4.1	9.7	19.5	NS	-	-	NS	83.20	

Figures followed by a common letter are not significantly different at 5% level in DMRT.

*, ** Figures in parentheses are arc sine and square root transformation values, respectively.

Table 3. Correlation of yield and yield related characters in high yielding accessions of small cardamom

Character	Plant height	No. of tillers	No. of panicles	Length of panicle	Weight of 100 capsules	No. of seeds	Recovery (%)	Dry weight
Plant height	1.0000	0.5259**	0.6541**	0.5011**	0.3928*	0.2747	0.3789*	0.6240**
Tiller number		1.0000	0.4783*	0.6838**	-0.4655*	0.2747	0.3090	0.3798*
Panicle number			1.0000	0.6584**	0.0204	0.5982**	-0.1032	0.7614**
Panicle length				1.0000	-0.3129	0.3981*	0.0734	0.4862*
100 capsule weight					1.0000	0.3649*	0.1318	0.1774
Seed number						1.0000	0.3833*	0.5289**
Recovery (%)							1.0000	-0.2661
Dry weight								1.0000

*, ** Significant at 5% and 1 % level, respectively.

A significant positive interrelationship between plant height and tiller number, panicle number as well as panicle length brought out the possibility of selecting tall stature plants coupled with more number of panicles and tillers. This may be due to the accumulation of more photosynthates in the development of plants that finally lead to the increased production. Similar result was also observed by Backiyarani *et al.* (2000). Panicle length had positive and significant association with number of seeds per capsule. The result was in confirmation with earlier findings of Gopal *et al.* (1992). Weight of 100 capsules had positive but non-significant relationship with recovery percentage and this is mainly due to the high moisture content as well as rind thickness of the capsules. It is therefore suggested that adequate emphasis need be given to dry recovery rather than selecting plants having bold capsules alone. Bold capsule coupled with high recovery percentage is an ideal character for selection. Since tiller number was negatively associated with 100 capsule weight, it would be therefore difficult to exercise simultaneous selection of these characters in developing a variety (Newell & Eberhart 1961). Therefore selection programme based on tiller number, panicle length, plant height, panicle number and recovery percentage would lead to significant improvement in yield of cardamom. In the present study, M-1 and PV-1 are found to be the suitable varieties for Idukki District. These varieties can be utilized for further breeding programme

in order to develop high yielding varieties suitable for cardamom hill reserve.

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