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Studies on crossability between elite types of cardamom (*Elettaria cardamomum* Maton)

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Abstract

A 8 x 8 set of crosses including reciprocals were made between elite Malabar selections of cardamom (*Elettaria cardamomum*) namely, CCS-1 and RR-1 and six cardamom mosaic disease (*katte*) resistant lines (NKE-12, NKE-27, NKE-34, NK3-9, NKE-3 and NKE-19) to incorporate desirable characters in the hybrids. All the elite selections were compatible with each other; however, the degree of compatibility varied with the parents selected for hybridisation. The crossability was highest and significant in the cross NKE-19 x NKE-34 (92%) followed by NKE-12 x NKE-19 (77%) and NKE-12 x RR-1 (69%). The crossability in CCS-1 x RR-1, NKE-27 x CCS-1, NKE-12 x RR-1, NKE-9 x RR-1 and NKE-3 x RR-1 was high (>50%) indicating the scope for combining yield and disease resistance in these crosses.

Key words : cardamom, crossability, *Elettaria cardamomum*, resistance, yield.

One of the limiting factors in production of cardamom (*Elettaria cardamomum* Maton) in India is the susceptibility of the crop to diseases such as cardamom mosaic disease (*katte*) and rhizome rot. Cardamom mosaic disease which is caused by a virus causes severe yield losses (up to 68%) to cardamom (Venugopal 1995). Although a few improved high yielding varieties of cardamom have been evolved, yield and cardamom mosaic disease resistance have not been incorporated together. In India, as *Elettaria* is a monotypic species, interspecific hybridisation is ruled out and intergeneric hybridisation was also not successful (Krishnamurthy *et al.* 1989) as there was no seed set. Patel *et al.* (1998) opined that in order to combine desirable characters like earliness, high yield, quality characters and resistance in hybrids, a large number of crossess should be attempted to get more number of F1 plants and selection in the subsequent generation would produce the expression of desired characters. As the success of any hybridisation programme primarily depends on the crossability of the genotypes involved, the present study was undertaken to explore the possibilities of hybrid production by working out the

crossability between elite types of cardamom.

A 8 x 8 set of crosses involving Malabar type selections of IISR namely, RRI (rhizome rot tolerant type), CCS-1 (high yielding type) and cardamom mosaic disease resistant lines NKE-12, NKE-27, NKE-34, NKE-9, NKE-3 and NKE-19 were made. Reciprocal crosses were also attempted. Hybridisation was carried out during peak flowering time (June to September). Well developed unopened flower buds which would open the next day were emasculated during the previous day evening. As stigma receptivity and pollen viability are maximum during morning hours, pollination was done the next day morning using pollen from male parents. The emasculated and pollinated flowers were tagged and covered with polythene bags to prevent pollination by bees. Two days after pollination the bags were removed and crossability (per cent fruitset) was worked out and the data statistically analysed.

$$\text{Crossability} = \frac{\text{Number of flowers pollinated}}{\text{Number of capsules set}} \times 100$$

All the 56 crosses set capsules and seeds indicating that all the crosses were compatible with each other. However, the degree of crossability varied depending on the parents selected for hybridisation (Table 1). In general, the crossability was significant when RR-1 was used as male parent and NKE-27 as female parent indicating the possibility of combining rhizome rot tolerance and cardamom mosaic disease resistance in the hybrids. Out of the 56 crosses studied, the crossability in 22 crosses was significant. Crossability exceeding 50% was recorded in 11 crosses namely, CCS-1 x RR-1 (56%), NKE-12 x RR-1 (69%), NKE-9 x RR-1 (56%), NKE-3 x RR-1 (59%), NKE-27 x CCS-1 (66%), NKE 27 x NKE-34 (53%), NKE-9 x NKE-34 (55%), NKE-19 x NKE-34 (92%), NKE-27 x NKE-9 (56%), NKE-34 x NKE-9 (67%) and NKE-12 x NKE-19 (77%).

The crosses CCS-1 x RR-1 and NKE-27 x CCS-1 could be utilised for incorporating rhizome rot tolerance and cardamom mosaic disease resistance, respectively. Crossability was highest between

Table 1. Crossability (% capsules set) between elite types of cardamom

Elite type	RR-1	CCS-1	NKE-12	NKE-27	NKE-34	NKE-9	NKE-3	NKE-19
RR-1	-	32	31	19	41	36	28	37
CCS-1	56*	-	49*	33	28	24	24	45*
NKE-12	69*	22	-	24	27	10	45*	77*
NKE-27	49*	66*	20	-	53*	56*	50*	45*
NKE-34	21	27	38	17	-	67*	27	32
NKE-9	56*	44*	38	31	55*	-	33	22
NKE-3	59*	46*	47*	36	18	15	-	39
NKE-19	36	48*	40	43*	92*	36	20	-
	Mean = 39.24			SE-2.221				

SE = Standard error
* Significant at P = 0.05 level

NKE types in the cross NKE-19 x NKE-34 (92%) followed by NKE-12 x NKE-19 (77%) and NKE-9 (67%). Selection could be made in these hybrids and further crossing with types with combined characters namely, high yield and rhizome rot tolerance would help to combine desirable characters. The crossability was poor (10%) in the cross NKE-12 x NKE-9.

The characters, cardamom mosaic disease resistance and rhizome rot tolerance could be combined in NKE-12 x RR-1 (69%), NKE-9 x RR-1 (56%), NKE-3 x RR-1 (59%) as fairly higher crossability occurred in these hybrids.

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