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**CHARACTERIZATION OF
ACCESSIONS AND
REPRODUCTIVE BIOLOGY
OF *Elettaria cardamomum* L. Maton
IN SRI LANKA**

A THESIS PRESENTED
BY
A.L. SARATHCHANDRA DHARMAPARAKRAMA

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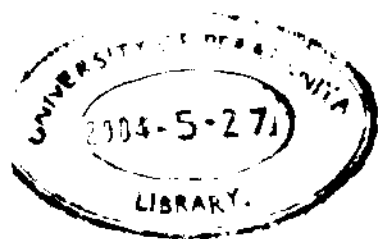
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ABSTRACT

CHARACTERIZATION OF ACCESSIONS AND REPRODUCTIVE BIOLOGY OF *Elettaria cardamomum* L. Maton IN SRI LANKA

A.L.S. DHARMAPARAKRAMA

Plant Science Board of Study
Degree of Master of Philosophy

Cardamom [*Elettaria cardamomum* L. Maton, family *Zingiberaceae*] belonging to Malabar, Vashukka, and Mysore types were studied under different agro-ecological conditions viz., wet zone, low country 1 (WL1) (>2500 mm rainfall, <150 m elevation, 30 °C under a rubber canopy), intermediate zone, up country 1 (IU1) (>2000 mm rainfall, >1000 m elevation, 24 °C under a forest canopy) and intermediate zone, mid country 3 (IM3) (1000-2000 mm rainfall, 350 m elevation, 28 °C under 50 % shade polythene net).

Results revealed that the capsule size and shape, panicle angle and internodal length and texture of leaflet are the inherited characters. Number of capsules harvested per year per clump in the Mysore and Vashukka types in the IU1 region was 2071, 1016, 1183, 1051, 1061 from Ec 201, Ec 300, Ec 301, Ec 401 and Ec 700, whereas it was 534, 572 and 593 from the Malabar type accessions Ec 100, Ec 101 and Ec 102 and 641 from Ec 400 of the Vashukka type, which performed best in the WL1 region.

Well-distributed rainfall was the best condition for clump development. Four suckers and four panicles were produced alternatively on opposite sides of a pseudostem. Early sucker development was observed at WL1. The first sucker developed after 5 – 6 months age; the 2nd, 3rd and 4th suckers on a pseudostem were activated after 9 - 10, 10 - 12 and 18 - 19 months age. A maximum of 6 generations of daughter suckers were observed in a matured clump at a time.

Early maturity (15 months) and early death (36 months) of pseudostems were recorded at WL1 whereas that at IU1 was 40 months. At WL1, the first panicle on pseudostems was observed after 15 – 25 months. The 2nd, 3rd and 4th panicles on pseudostems were observed after 5-7 months, 14-16 months and 18-20 months respectively after the first panicle emerged irrespective of the type of cardamom. Considering the age of the individual pseudostems of a matured clump, the first panicle emerged at 8 months, while 2nd, 3rd and 4th panicles emerged respectively at 12-14, 16-18, 24-26 months ages in the Malabar type accession at WL1. Late first panicle initiation (9 months) was observed at IU1 and IM3 regions. Capsules were taken 90 –100 days for its maturity at WL1 and 95 – 105 days at IM3 and IU1 regions.

The optimum shade for cardamom is 50 %. Under more than 70 % shade, the clumps were tall and big but with few pseudostems (< 10) per clump, the leaflets

were dark green, the panicles were fewer and the yield was low. Under less than 50 % shade, the clumps were short and thin but with many pseudostems, curved or dried and yellowish leaflets, few, short and thin panicles with low yield.

Differences in flower morphology may have some effect on yield in different eco-regions. Anthesis commenced before 4.00 am and peaked at 5.00-5.30 am. Anthers dehiscence peaked between 6.00-8.00 am and was completed before 11.00 am. Stigma receptivity commenced before 6.00 am, was best between 7.00 and 9.00 am and decreased after 12 noon to a nil at 6.00 pm. Pollen grains were of two different sizes ($35.31 \mu\text{m} \pm 9.2$, and $44.93 \mu\text{m} \pm 9.8$). The Malabar type had smaller pollen grains. They were highly stainable ($> 75 \%$) and had a high percent of germination under a wide range of sugar concentrations (16 -18%). Self-pollinated flowers expressed the lowest ($<5.8 \%$) fruit set. Pollination within a clump or accession was 10.7 to 15.4 % fruit set and within a type 21.3 - 26.2 %. The best cropping system is a mixture of accessions at least from the same type of cardamom.

Key words: Cardamom, *Elettaria cardamomum*, rubber, characterization, flushing, flowering, fruit set, floral morphology, floral biology, pollination, breeding systems, environments.