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VARIATION IN ESSENTIAL OIL CONSTITUENTS IN HIGH YIELDING SELECTIONS OF CARDAMOM

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Cardamom (*Elettaria cardamomum* Maton), the 'queen' of spices is a perennial herbaceous plant belonging to the family Zingiberaceae. Dried capsules along with seeds are used in various culinary preparations as a flavouring agent. It contributes sweet, spicy aroma more compatible with sweet foods such as pastries, cakes, custards and other bakery products and beverages. Volatile oil of the cardamom is a commercially desirable constituent and is used in the food preparations and perfumery (Govindarajan *et al*, 1982). The major chemical constituent which imparts sweet flavour to the oil is α-terpinyl acetate. 1,8 cineole contributes a harsh camphory note to the oil (Lewis *et al*, 1976). In the present investigation, the cardamom clones selected for yield and yield parameters are assessed for volatile constituents to study the variability and to identify superior clones for quality parameters.

Twelve cardamom clones selected for yield and yield parameters (based on their performance in the field from 1982 to 1987, which yielded more than 1.5 kg dry cardamom per clump were selected from an area of 1.5 ha) along with local check were planted in the clonal nursey in randomised block design, with four replications. In each plot there were 12 plants with a spacing of 1.8mx0.6m. The planting and aftercare were followed as per the general package of practices for Malabar types in Karnataka. After recording the dry capsule yield during second year of planting (first maiden crop), the dry capsules were subjected to quality analysis. Replications mean of each entry for given quality parameters have been statistically analysed. Dry capsules of each entry from each replication were assessed for quality parameters separately.

The seed moiety (30g) of the capsules was commutated just prior to distillation and added water (1:4 ratio) and distilled at 90°C using temperature regulated silicon heating mantle up to 4 hours. The liberated oil along with steam was condensed by means of continuous water circulation. The oil, lighter than water, was collected over the latter. At the end of distillation the water oil layer was allowed to stand for thirty minutes and volume of oil was recorded on the Clevenger oil trap used for this purpose (Anon, 1968). Percentage oil yield of dry capsule was calculated on volume/ weight basis.

Essential oil was analysed by gas chromotography with a Hewlett Packard 5730 gas chromatograph interfaced with A Tectron recorder and fitted with FID. The stainless steel column (6"x1/4") with 3 per cent carbowax was used. Flow rate of hydrogen and air was 20 and 220 $ml^{-1}min$, respectively. Flame ionisation detector was attenuated in 1-100 range and peaks were reduced by 8 times for getting optimum resolution of the essential oil components. Individual peaks were identified using authentic samples. Amount of 1,8-cineole and α-terpinyl acetate were calculated as per cent of the total available constituents in 0.5 microlitres of oil.

Table 1. ***Yield and quality evaluation of cardamom selections in clonal nursery***

Clone	Dry capsule yield (kg/ha)	Essential oil (%)	Essential oil Yield (kg/ha)	α-terpinyl acetate(%)	1,8 Cineole (%)	α-terpinyl acetate/ 1,8 cineole ratio
Sel.1	1551	7.0	109	35.0	40.0	0.88
Sel.2	2193	6.4	140	30.0	45.0	0.67
Sel.3	1147	6.3	72	32.0	46.0	0.70
Sel.4	2220	6.2	138	31.6	42.7	0.74
Sel.5	1868	6.2	116	30.7	40.5	0.76
Sel.6	2042	6.8	138	34.0	39.8	0.85
Sel.7	2338	7.3	171	30.0	45.0	0.67
Sel.8	2150	6.3	136	31.6	44.0	0.72
Sel.9	2465	6.7	165	30.7	41.3	0.74
Sel.10	1582	6.2	98	32.1	42.2	0.76
Sel.11	1375	6.3	87	30.7	44.0	0.70
Sel.12	1442	6.0	87	32.9	41.9	0.79
Local check	753	6.5	49	41.2	33.0	1.25
SEm±	115.6	0.188	21.7	1.58	1.68	-
F test	**	*	*	*	*	-
CD at P=0.05	337	0.5	60	4.5	4.8	-

Significant variability (P=0.05) was observed among the clones studied, with the percentage ranging from 6 to 7.3 per cent. Four clones *viz.* Sel.7 (7.3%), Sel.1 (7.0%), Sel.6 (6.8%) and Sel. 9 (6.7%) were significantly superior to local check (6.5%). However, all seven clones *viz.* Sel.7, Sel. 9, Sel. 2, Sel. 4, Sel. 6, Sel. 8 and Sel. 5 were significantly superior to local check for essential oil yield (kg/ha). Variability for essential oil content was observed among the germplasm accessions in the earlier studies (Nambudiri *et al*, 1968; Lewis and Natarajan, 1975). Association of high oil percentage with higher yield is economically desirable.

Alpha terpinyl acetate and 1,8-cineole are the major chemical constituents of essential oil which varied significantly among the clones assessed. Alpha terpinyl acetate, which imparts sweet flavour (Lewis *et al*, 1976) was low in all the high yielding selections as compared to local check. All these clones had higher 1,8-cineole content which is not desirable. The ratio of alpha terpinyl acetate to 1,8-cineole was lower in high yielding clones as compared to local check.

Dry yield of capsules per unit area is economically more important than the recovery of oil. However, the essential oil industry is more interested in the pecentage recovery of oil than the yield of oil per plant. In the present investigation high yielding clones had better oil percentage and they are acceptable for commercial cultivation and also for essential oil industry. With the growing awareness about quality, these clones need to be improved for better α-terpinyl acetate through conventional breeding and/or biotechnological approaches.

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