

GC MS analysis of essential oil of export grade Indian, Guatemalan and Sri Lankan cardamoms

ELIZABETH THOMAS, JALEEL KIZHAKKAYIL, T. JOHN ZACHARIAH, S. SYAMKUMAR AND B. SASIKUMAR*

Indian Institute of Spices Research, Marikunnu P O, Calicut, Kerala, India.

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ABSTRACT

The essential oil of export grade Indian, Guatemalan and Sri Lankan cardamoms has been extracted by steam distillation and analyzed by GC MS. A total of 25 compounds have been identified, 22 compounds in Indian, 23 in Guatemalan and 24 in Sri Lankan cardamoms, and 22 of them were common to the three produces. The quantitative result of Indian cardamom indicates the high yield of 1, 8-cineole (27.59%) and α -terpinyl acetate (41.65%) compared to (25.75 & 39.68%) in Guatemalan and (25.16 & 37.64) in Sri Lankan cardamoms.

Key words: *Elettaria cardamomum*, India, Guatemala, Sri Lanka.

INTRODUCTION

Cardamom (*Elettaria cardamomum* Maton.), known as the 'Queen of spices', is grown extensively in the hilly regions of south India, Sri Lanka, New Guinea, Tanzania & Guatemala.

Cardamom is mainly used in curry, sausages, fruit cups, green peas soups, curry-flavoured soups, spice dishes, Danish pastry, buns, breads, rolls, cookies, jellies, baked apple coffee, honey pickles, pickled herring, canned fish and to a small extent in flavouring cigarette and tobacco [11]. It is used in food perfumery, liquor and pharmaceutical industries as a flavour and a carminative [4]. Recently the essential oils from *E. cardamomum* have been shown to possess antimicrobial and antioxidant activities [2, 7]. The quality of cardamom is mainly due to its essential oil profile which is subjected to variation due to climatic conditions, processing methods and genotypes [3, 5, 12].

The basic aroma is produced by a combination of two major components, terpinyl acetate and 1, 8-cineole [6]. Traditionally it has been believed that Indian cardamom is having high intrinsic quality, and hence an edge over cardamoms produced by the other countries. In the present context of liberalization of trade, quality of a commodity needs

to be defined scientifically to sustain the export market. Thomas *et al.* [10] studied physical, biochemical and molecular profiling of export grade cardamom from India, Guatemala and Sri Lanka and found that the Indian cardamom is superior based on physical quality parameters such as weight of 100 capsules, seed to husk ratio, bulk density, circumference, and length, and the biochemical parameter like starch. GC profiling of different cardamoms also indicates that Indian produce is rich in 1, 8-cineole and α -terpinyl acetate.

The present work is the comparative analysis of essential oil obtained from Indian, Guatemalan and Sri Lankan cardamoms.

MATERIALS AND METHODS

Plant material and isolation of the essential oils

Export grade capsules of Indian, Guatemalan and Sri Lankan cardamoms were procured through Spices Board, India. The essential oils were obtained from the dried powdered seeds (25g) by hydro distillation using Clevenger-type apparatus for 4 hrs. The volatile distillate was separately collected and refrigerated prior to analysis.

Analysis of the essential oils

The GC MS analysis was performed on a (Shimadzu GC-2010) gas chromatograph equipped with flame ionization detector using a Rtx-5 (dimethyl poly siloxane) column (30m x 0.25mm x 0.25 μ m film thickness); carrier gas Helium, flow rate 1ml/min and with split mode. The column temperature was programmed to 60°C for 5min and then heated to 110°C at the rate of 5°C/min⁻¹; 110°C- 200°C at 3°C⁻¹; 200°C- 220°C at 5°C/min and kept constant for 5min. The injection temperature was 250°C. The mass spectra corresponding to GC peaks were scanned at 70ev.

The retention indices for all the components were determined using n-alkanes as standards. The compounds were identified by comparison with those reported in the literature [1] and with mass spectral correlations using Wiley 275 and NBS 75 databases.

*Author for correspondence: E mail: bhaskaransasikumar@yahoo.com

RESULTS AND DISCUSSION

The essential oil yield of Indian, Guatemalan, Sri Lankan cardamom was found to be 10%, 5% and 14% respectively. GC MS profile of the oil is given in Table 1.

A total of twenty three compounds were identified in these oils. Indian produce had 20 compounds, while in Guatemalan 21 and in Sri Lankan cardamom 22 compounds were identified comprising 95.85%, 94.56% and 98.34% of the total oils. The essential oil was dominated by monoterpenes. The main monoterpenes were α -pinene, sabinene, β -myrcene, linalool, 4-terpineol, α -terpineol, 1, 8-cineole and α -terpinyl acetate in all the three essential oils. The sesquiterpenes identified were β -selinene and nerolidol. The quantitative result of Indian cardamom indicated high yield of 1, 8-cineole (28.25%) and α -terpinyl acetate (46.60%) compared to the other produces. Based on GC MS study of oil, Menon [8] also reported high content of 1, 8-cineole and α -terpinyl acetate in commercial grade cardamom from India. The ratio of 1, 8 cineole

to α -terpinyl acetate is a fairly good index of the purity and authenticity of cardamom volatile oil [9].

Guatemala and Sri Lankan produces have comparatively higher quantity of linalool 7.28% & 6.78% as compared to Indian produce. Linalool gives pleasant taste to the cardamom oil only at low level [13]. Linalyl acetate (6.88%) was present only in Sri Lankan cardamom. This compound imparts sweet and fruity odour to the essential oil.

Thus GC-MS study further reinforces the legendary intrinsic quality of Indian cardamom and supports the age old preference for Indian produce.

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Table 1. GC MS profile of essential oils of Indian, Guatemalan and Sri Lankan cardamoms

Peak No.	Compound	RI	Indian	Guatemalan	Sri Lankan
1	α -Thujene	928	0.11	0.21	0.26
2	α -pinene	935	1.97	1.82	2.11
3	Sabinene	977	5.13	4.50	5.0
4	β -pinene	979	0.29	0.38	0.35
5	β -Myrcene	994	2.60	2.79	2.71
6	Octanal	1006	-	0.20	0.14
7	α -terpinene	1020	-	0.23	-
8	1,8.cineole	1038	28.25	25.75	25.16
9	Trans ocimene	1052	0.03	0.11	0.14
10	γ -terpinene	1063	0.44	0.58	0.37
11	Trans sabinene hydrate	1071	0.31	0.17	0.17
12	α -terpinolene	1092	0.23	0.30	0.26
13	Linalool	1110	1.28	7.28	6.78
14	4-terpineol	1185	2.72	2.39	2.44
15	α -terpineol	1201	2.64	4.70	3.79
16	Z-citral	1246	0.24	0.53	0.25
17	Linalyl acetate	1261	-	-	6.88
18	citral	1277	0.41	0.94	0.46
19	α -terpinyl acetate	1365	46.60	39.68	37.64
20	Neryl acetate	1372	0.04	0.15	0.28
21	Geranyl acetate	1390	0.67	0.53	1.25
22	β -selinene	1496	0.86	-	0.61
23	Nerolidol	1570	0.99	1.32	1.29

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