



## Therapeutic uses of *Elettaria cardomum*

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### ABSTRACT

Cardamom, popularly known as the “Queen of Spices,” has a checkered history, dating back to the Vedic period (ca. 3000 bc). Mainly used in the dietary habits of millions around the world, Cardamom use ranges from a simple dietary constituent to that of immense pharmacological benefits. Various pharmacological activities contributed to cardomum are sedative, antihypertensive, antibacterial and many more.

### Key Words:

Elaichi, cardamum oil

### INTRODUCTION

Small cardamom, well known as the ‘queen of spices’, belongs to the family Zingiberaceae, order Scitaminae is a rich spice obtained from the seeds of a perennial plant, *Elettaria cardamomum* Maton, locally known as “elaichi”<sup>1</sup>. It is a perennial herb, indigenous to India, Pakistan, Burma and Sri Lanka<sup>2</sup>. In India it is mainly found in evergreen forests of Kerala and Karnataka. It is a shade loving plant cultivated at an altitude of 600 to 1200 m above MSL with an annual rainfall of 1500 to 4000 mm and a temperature range of 10 to 35°C<sup>3</sup>. It is one of the highly prized spices of the world and is the third most expensive spice after saffron and vanilla. Cardamom shared about 60% of the total import value of US\$204 million in 2004. World production of cardamom is estimated at 30,000 MT. Currently, the major producer is Guatemala, recording an average annual production of 18,000–20,000 MT. India is the second largest producer, with an average production of 11,000–12,000 MT. Indian cardamom is considered a superior quality in the international markets<sup>4</sup>.

### HARVESTING

The peak period of harvesting is October–November. The average yield of Cardamom is around 150 kg (dry)/ha; however, record yield of 695 kg/ha (average of 9 crop seasons) was obtained by adopting high production technology directly in farmers’ plantations<sup>5</sup>. Just ripened fruits or physiologically ripened are generally harvested. More splitting of capsules was observed in over-matured capsules<sup>6</sup>. Percentage of dry recovery was highest (29%) in the fully ripened capsules followed by the one harvested at physiological maturity (24%) and in immature stage (14%). Capsules may be washed in water to remove the adhering soil and a treatment with 2% washing soda (alkali) for 10 minutes enables retention of the green colour and prevents growth of mould.

**VARIETIES:**

Cardamom generally exists in two major forms “Green or true cardamom” (*Elettaria cardamom*) and “Black or Brown cardamom” (*Amomum subulatum*). *Amomum* mainly consists of 3% of essential oil which is rich in 1,8 cineol. It also contains traces of limonene, terpinene, terpinyl acetate and Sabinene<sup>7</sup>. Mysore, Malabar, Ceylon, Vazhukka, Manjarabad, Bijapur, Kunnielam, Makaraelam, Thara Guatemala and Nanda are some important cultivated types grown in different parts of Kerala and Karnataka. Among these, Mysore, Malabar and Vazhukka are most popular cultivated which can be identified on the basis of morphological characteristics<sup>8</sup>.

**CHEMICAL COMPOSITION**

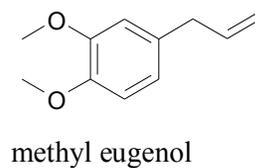
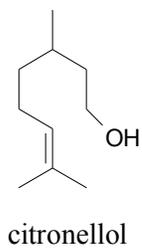
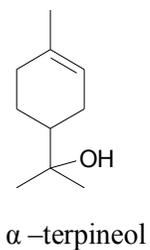
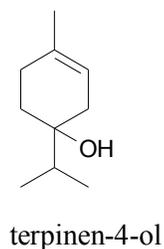
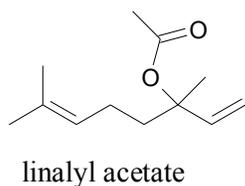
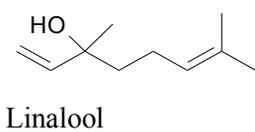
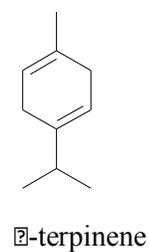
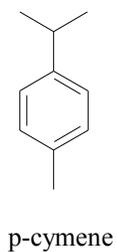
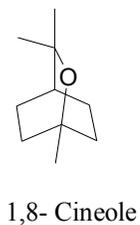
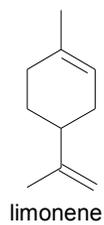
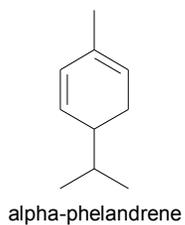
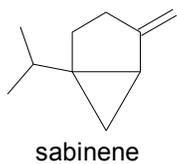
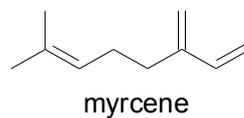
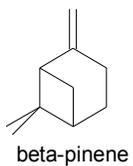
Seeds of *Elettaria cardamom* are rich in volatile oil that mainly includes phenolic and flavonoid components. Starch, protein, waxes and Sterols are other components of the oil.

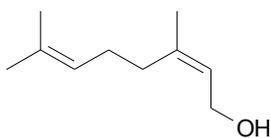
- volatile oil** is the major component of all the varieties of *Elettaria cardamom*. In the study, volatile oil for the major varieties (Mysore, Malabar, Vazhukka and Guatemala) have been reported as 7.9, 8.79, 7.9, 8.6 respectively. Table 2.1 shows the major constituents of volatile oil of cardamom seed<sup>9</sup>.

Table 2.1: Main components of volatile oil present in different varieties of cardamom.

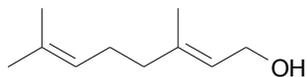
Component	Mysore	Malabar	Vazhukka	Guatemala
$\alpha$ -Pinene	0.36	0.07	0.14	0.11
Sabinene	1.32	0.31	0.41	0.55
$\beta$ -Myrcene	0.85	0.37	0.25	0.53
Limonene	2.23	1.82	1.57	1.92
1,8 cineole	11.76	7.55	7.23	9.29
$\gamma$ -Terpinene	0.23	0.03	-	0.11
Terpinolene	0.31	0.09	-	0.18
Linalool	0.94	4.53	0.86	5.96
Linalyl acetate	0.33	1.92	0.42	1.63
Terpinen-4-ol	1.51	1.18	1.34	1.53
$\alpha$ -Terpineol	5.51	3.69	2.91	4.92
$\beta$ -Terpineol	0.64	0.2	0.21	0.22
$\alpha$ -Terpinyl acetate	64.45	63.32	68.19	61.65
Octyl Acetate	0.06	0.07	0.11	0.11
Nerly Acetate	2.11	1.61	1.75	1.58
Nerolidol	0.88	3.75	1.71	2.17
Geraniol	1.66	2.5	1.52	2.47
Geranial	0.49	0.51	0.54	0.65
B-caryophyllene	0.12	0.23	0.4	0.14
Cis, trans Farnesol	0.16	0.84	0.14	0.38
Cis, Cis Farnesol	0.17	0.36	0.19	0.21

Chemical Structures of major constituents of cardamom





Nerol



geraniol

2. **Waxes and Sterols:**  $^1\text{H}$  NMR and MS studies revealed that the nonsaponifiable lipid fraction of cardamom consisted mainly of waxes and sterols. The waxes identified were n-alkanes ( $\text{C}_{21}$ ,  $\text{C}_{23}$ ,  $\text{C}_{25}$ ,  $\text{C}_{27}$ ,  $\text{C}_{29}$ ,  $\text{C}_{31}$ , and  $\text{C}_{33}$ ) and n-alkenes ( $\text{C}_{21}$ ,  $\text{C}_{23}$ ,  $\text{C}_{25}$ ,  $\text{C}_{27}$ ,  $\text{C}_{29}$ ,  $\text{C}_{31}$ , and  $\text{C}_{33}$ ). In the sterol fraction  $\beta$ -sitostenone and  $\gamma$ -sitosterol are newly reported. Phytol and traces of eugenyl acetate were also identified in cardamom for the first time<sup>10</sup>.

## USES

Cardamom is an ancient spice and has the longest influence in India, its birthplace. The ancient Greeks and Romans also use it in food, medicines and perfumes<sup>1</sup>.

### Traditional use:

**Matsya Purana** : a constituent of an antivenom drug.

**Ayurveda:** seeds are used as abortifacient, alexiteric, aromatic, acrid, sweet, cooling, carminative, cardiac tonic, digestive, diuretic, expectorant, stimulant, and tonic, beneficial in asthma, bronchitis, strangury, haemorrhoids, renal and vesical calculi, halitosis, anorexia, dyspepsia, gastropathy and burning sensation.

**Siddha** : dried fruit, seed and stem-bark are used to prepare drugs cell 'Elam', 'Elarici'.

**Unani:** preparations used as antidote to poison, astringent, exhilarant and in nausea.

## Pharmacological uses

**Antibacterial Activity:** Ethanolic extract of *E. cardamomum* possess antibacterial effect at the dose of  $512\mu\text{g/mL}$ <sup>11</sup>. Toxicity of the extract was observed at  $0.3\text{ mg/g}$ , which showed inflammation in brain, oxidative stress and cells necrosis in heart. The use of *E. cardamomum* as spice should not exceed the  $0.003\text{ mg/g}$  since at this amount no negative effects were observed<sup>12</sup>.

**Gastroprotective Activity:** Gastroprotective activity of *E. cardamomum* was best found in the petroleum ether soluble extract which inhibited lesions by nearly 100% at  $12.5\text{ mg/kg}$  in the aspirin-induced gastric ulcer. Methanolic extract also possess gastroprotective effect<sup>13</sup>.

**Blood Pressure Lowering Activity:** powdered *E. Cardamomum* posses antihypertensive activity. At a dose of  $3\text{g}$ , it significantly decreases diastolic pressure. It enhances fibrinolysis and improves antioxidant status, without significantly altering blood lipids and fibrinogen level in hypertensive patients<sup>14</sup>. exhibits gut excitatory and inhibitory effects. These effects are mediated through cholinergic and  $\text{Ca}^{++}$  antagonist mechanisms respectively and lowers BP via combination of both pathways<sup>15</sup>.

**Anti-inflammatory, Analgesic & Antispasmodic Activity:** Seeds of *E. cardamomum* possess anti-inflammatory, analgesic and antispasmodic. In Carrageenan-induced rat paw oedema the oil extract of *Elettaria cardamomum* seeds, in doses of 175 and 280 microliters/kg were found to reduce the inflammation. Analgesic activity was evaluated by p-benzoquinone-induced writhing method but antispasmodic activity was evaluated in-vitro<sup>16</sup>. Studies reveal that antispasmodic action is produced through muscarinic receptor blockage.

**Antioxidant activity:** Cardamom oil is effective as an antioxidant and can increase levels of glutathione<sup>9</sup>, a natural antioxidant in body. The effect is increased by increasing the content of the oil from 100 to 5000 ppm<sup>17</sup>.

**Insecticidal Activity:** The volatile oil from cardamom acts as a potential grain protectant by killing various life stages of the stored product insects attacking wheat, e.g. *Tribolium castaneum* and *Sitophilus zeamais*, via contact and fumigant action<sup>18</sup>.

**Haematological and Lipid Peroxidation activities:** Aqueous extract of cardamom have lipid peroxidation as well as activity against platelet aggregation. The inhibitory activity of cardamom extract was studied on human platelets. Platelet aggregation and lipid peroxidation were evaluated with platelet rich plasma (PRP) and platelet membranes, respectively, obtained from blood of healthy volunteers. The inhibitory effect was dose dependent with concentrations varying between 0.14 and 0.70 mg and time dependent at IC50<sup>19</sup>.

Lipid peroxidation induced by iron – ascorbic acid system in platelet membranes was analysed with malondialdehyde (MDA) as an index. An increase in concentration of cardamom has decreased the MDA formation significantly.

**Skin Disorders :** Group of 27 plants including cardamom is used in promoting skin complexion, destroying itching and pustules<sup>1</sup>.

**Sedative and anticonvulsant Activity:** Unmadnashak Ghrita, an ayurvedic formulation which contains *Elettaria cardamomum* as one of the component possess CNS depressant as well anticonvulsant activity. Unmadnashak Ghrita' (UG) is a ayurvedic formulation containing *Ferula narthex* (6 g), *Gardenia gummifera* (6 g), *Elettaria cardamom* (6 g), *Bacopa monneri* (6 g), and cow's ghee (clarified butter fat-76 g)<sup>20</sup>.

**Cigarette De addiction:** It can also be used to ease cigarette addiction. Eating a few seeds of cardamom can safely be recommended to initially minimize the number of cigarettes being smoked and slowly the smoker may give up the chronic addiction to chain smoking<sup>21</sup>.

## **Toxicology Studies:**

Not all, but some of the components of cardamom possess mutagenicity and carcinogenicity.

The following compounds were found to be **non-mutagenic** in the biological model for 3 strains: TA98, TA100, and TA1535 :

1-decanol, 1-heptanol, 1-hexanol, 1-octanol,  $\alpha$ -ylangene,  $\beta$ -guriunene, cedrol, citronellal, decanal, decyl acetate, dodecyl acetate, eicosanoic acid, farnesol, farnesyl acetone, geranyl acetone, humulene, octyl acetate, trans-2-cis-6-dodecadialenal, trans-farnesol and undecan-2- one.

The following compounds are found to be **non-carcinogenic** in the computational model for Rodent carcinogenicity prediction:

1-heptanol, 1-hexanol, 2methyl-3-buten-2-ol, 2-methylbutanal, 3-methylbutanal,  $\alpha$ , $\beta$ -dimethylstyrene,  $\alpha$ -terpinyl acetate, carvone oxide, decanal, delta-terpineol, ethyl 2-hydroxyhexanoate, hexanal, nonanal, oct-1-en-3-ol, octanal, p-dimethylstyrene, phenol, pmenth-8-en-2-ol, terpinyl acetate, tetrahydrolinalool, thymol, trans-2-butenal, trans-dec-2-enal, trans-nerolidol and trans-oct-2-enal

Only three compounds were found to be **non-mutagenic and non-carcinogenic**.

These include: 1-heptanol, 1-hexanol, Decanal, Nerolidol <sup>22</sup>.

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