VOLATILE CONSTITUENTS OF ELETTARIA CARDAMOMUM MATON SEED

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ABSTRACT: The Essential oil of Elettaria cardamomum was analyzed by GC-MS. The principal components (9 No.) constituting 89.64% of the total were identified. Out of these 1:8 cineole was found as a major component (67.088%) whereas other major components were found to be α- terpineol (7.380 %), camphene (6.752%) and α-pinene (4.302%). Nerolidol (1.93%), β-pinen (0.615), linalool (0.769%), apiol (0.507) and 10-methyl anthracene-9-carboxyaldehyde (0.313%) were minor components of the oil.

Key words: Elettaria cardamomum Maton, Essential oil, MS.

INTRODUCTION

Elettaria cardamomum Maton, one of the world’s most ancient spices, called “Queen of Spices” belongs to the ginger family (Zingiberaceae) and is the third most expensive spice in the world, after saffron and vanilla. It is found commonly in southern India mainly in Kerala, Tamilnadu and Karnataka, on the shady slopes of the Western Ghats. Today, it is also cultivated in Nepal, Sri Lanka, Guatemala, Mexico, Thailand and Central America (Ravindran and Madhusoodanan, 2002, Telja et al, 2006, Narong, 1996 and Susheela, 2007).

It has well established culinary values, and is used in a wide range of sweets and confectionery. It is also an important ingredient of garam masala, a combination spice for many vegetarian and non-vegetarian continental/Arabic dishes. Tea and coffee made with small cardamom are pleasantly aromatic and refreshing (Susheela, 2007).

It has many medicinal properties. It is used as carminative in dyspepsia, flatulence and in gastrointestinal complaints (Hussain et al 1988, Usmanhani et al, 1997, Adegoke et al, 1998, Gurudutt et al, 1996 Nasir and Ali, 1974 and Pieribattesti et al, 1986). In the form of tincture or powder, cardamoms are used, both in Eastern and Western system of medicine, as a frequent adjunct to other stimulant, bitters and purgative. A decoction of cardamom together with their pericarp and jaggery added is a popular home remedy to relieve giddiness caused by biliousness (Nadkarni, 1976). Its oil is used for sciatica, coughs, abdominal pains, spasm, nervous disorders and retention of urine and also for bites of venomous creatures (James et al, 2002). Oil also has antimicrobial, anticarcinogenic, anti-inflammatory and antioxidant activities (Kubo et al., 1991, Vijayan et al., 2002 and Al Tahir et al., 1997).

Oil of Elettaria cardamomum Maton is also extensively used as a fragrance component in soaps, cosmetics and perfumes, especially oriental types (Susheela, 2007).

The aim of present study is to determine the essential oil composition of Elettaria cardamom Maton due to its wide range use as flavouring agent in beverages, syrups, baking products and in ice creams.

MATERIALS AND METHODS

Extraction of oil: The Elettaria cardamomum seeds were collected from the local market. They were cleaned from extraneous matter. The essential oil was extracted through hydrodistillation by reverse Dean Stark assembly (Sattar, 1989). The steam distillate was removed, dried over anhydrous sodium sulphate and stored at low temperature.

GC-MS analysis: The analysis of the essential oil was carried out on GC-MS of Agilent Technologies, Model 6890N. The oil sample (1μL) was injected to a 30 m x 0.25 mm DB-5 capillary column using helium as carrier gas, oven temperature was maintained at 40 °C for five min, programmed at the rate of 40-140°C at 10°C/min and 150°C for one minute hold. Injector temperature was 40°C and MSD temperature was 280°C. The comparison of fragmentation pattern of the individual components of the oil using MS library helped in the identification and
confirmation of the components.

RESULTS AND DISCUSSION

The main constituents of oil and their relative percentages are summarized in Table-1.

Table-1: Mass spectral data of components of essential oil of Elettaria cardamomum Maton seed.

<table>
<thead>
<tr>
<th>S. #</th>
<th>Components</th>
<th>% age</th>
<th>M/Z Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>α-pinene</td>
<td>4.30</td>
<td>M+ (136,16),(121,21),(105,20),(93,100) (72,33),(73,53)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(65,85),(65,15)</td>
</tr>
<tr>
<td>2</td>
<td>Camphene</td>
<td>6.72</td>
<td>M+ (136,14),(121,18),(107,64),(93,100),(79,24) (69,28),(35,5)</td>
</tr>
<tr>
<td>3</td>
<td>β-pinene</td>
<td>0.61</td>
<td>M+ (136,10),(121,11),(107,77),(93,100),(79,20) (65,85),(55,15)</td>
</tr>
<tr>
<td>4</td>
<td>1:8 Cineol</td>
<td>6.08</td>
<td>M+ (154,72),(139,59),(126,11),(121,15),(108,88) (93,71),(81,100),(71,55),(65,65),(65,90,2)</td>
</tr>
<tr>
<td>5</td>
<td>Linalool</td>
<td>0.76</td>
<td>M+ (154,13),(136,17),(121,32),(93,37),(81,62) (67,17),(65,100),(55,15)</td>
</tr>
<tr>
<td>6</td>
<td>α-terpineol</td>
<td>7.30</td>
<td>M+ (154,54),(136,64),(121,54),(107,81) (67,29),(59,100)</td>
</tr>
<tr>
<td>7</td>
<td>Nerolidol</td>
<td>1.93</td>
<td>M+ (204,2),(189,7),(161,29),(136,30),(121,22) (107,55),(93,87),(61,33),(69,100)</td>
</tr>
<tr>
<td>8</td>
<td>Apiole</td>
<td>0.507</td>
<td>M+ (222,2),(208,8),(204,24),(191,17),(177,100) (181,40),(147,14),(121,34),(105,39)</td>
</tr>
<tr>
<td>9</td>
<td>10-methyl-anthracene-9-</td>
<td>0.313</td>
<td>M+ (220,2),(205,42),(191,100),(177,24) (195,31),(149,22),(135,42),(121,55,65)</td>
</tr>
<tr>
<td></td>
<td>carboxy aldehyde</td>
<td></td>
<td>(79,31),(69,25),(55,23)</td>
</tr>
</tbody>
</table>

GS-MS analysis of essential oil of Elettaria cardamomum revealed the presence of 24 compounds, out of which 9 principal components constituting 89.64 % of the total were identified from their fragmentation pattern by mass spectrometry (Table-1). These compounds were further classified in two fractions; hydrocarbon fraction (13.009%) constituted α-pinene, camphene and β-pinene while 1:8 cineol, linalool, α-terpineol, nerolidol, apiole and 10-methyl anthracene-9-carboxyaldehyde were found as oxygenated fraction (86.990%) of the oil. It was recorded that oxygenated monoterpene 1:8 cineol (eucalyptol) was the major component (67.088%) and it is also reported as major component of cardamom oil in previous studies (Hussain et al. 1988, Pieribattesti et al. 1986 and Marongiu et al. 2004). α-terpineol (7.380 %), camphene (6.752%) and α-pinene (4.302%) were present in considerable quantity. Nerolidol (1.93%), β-pinene (0.615), linalool (0.769%), apiole (0.507) and 10-methyl anthracene-9-carboxyaldehyde (0.313%) were identified as minor components. The α-pinene, nerolidol and linalool have also been reported in the cardamom oil in previous study (Okugawa et al., 1988). 10-methyl anthracene-9-carboxyaldehyde is a newly reported compound in the cardamom oil.

1:8 cineol is a major component of oil. Because of its pleasant spicy aroma and taste, is used in flavorings, fragrances, and cosmetics (Anonymous, 2002). It is also an ingredient in many brands of mouthwash and cough suppressant. Eucalyptol has been demonstrated to be capable of reducing inflammation and pain. It has also been found to be able to kill leukemic cells (Anonymous, 2002). Therefore it is concluded that cardamom is a rich source of cineol and can be isolated and used for different purposes.

REFERENCES


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