ABSTRACT
Essential oil obtained from hydrodistillation of the fruits of *Carum copticum* Benth. and Hook., (Apiaceae) collected from Delhi region contained a monoterpene hydrocarbon, γ-terpinene (55.75%) as major constituent followed by thymol (15.56 %), p-cymene (12.30%), α-pinene (2.29%), β-pinene (8.12%), β-myrcene (1.67%) and α-terpinene (1.32%).

Key words: *Carum copticum*, Apiaceae, Ajwain fruits, volatile oil analysis, γ-terpinene, thymol.

INTRODUCTION
*Carum copticum* Benth. and Hook., syn. *Trachyspermum ammi* (L.) Sprague commonly known as ajwain or Bishop’s weeds is an erect, aromatic, annual herb with striate stem, white flowers and small brownish fruits. It is an indigenous to Egypt and the middle east; cultivated in northern India, Pakistan and Iran. The most utilized part of ajwain is the small caraway like fruit which is popular in Indian savory recipients, pastries, breads and snacks. The fruits possess characteristic aromatic odour and pungent taste, are used as antispasmodic, stimulant, tonic and carminative and to treat flatulence, diarrhoea and pile. The seeds are utilized as spice, flavouring agent in foods and preservatives in medical formulations. Ajwain fruits contained an essential oil mainly composed of thymol (50%), eelemol, α-cadinol, δ-cadinene, β-caryophyllene and carvacrol. The oil is strong germicide, antispasmodic and fungicide. Thymol is used in toothpaste and perfumery. It inhibited the bacterial resistant microbial pathogens and is useful as a plant based fourth generation herbal antibiotic formulation. The present paper describes the isolation and analysis of the volatile oil of the fruits of *C. copticum*.

MATERIAL AND METHODS

Plant material

The fruits of *C. copticum* were collected from the local market of Khari Baoli, Delhi and identified by Prof. M. P. Sharma Department of Botany, Jamia Hamdard, New Delhi. Plant material was deposited in the herbarium of the Phytochemistry Reasearch Laboratory, Faculty of Pharmacy, Jamia Hamdard, New Delhi with a voucher specimen number PRL/ JH / 11/ 03.

Isolation of volatile oil

Dried fruits of *C. copticum* (30 g) were hydrodistilled using Clavenger’s apparatus according to the method recommended. Light yellow coloured oil (Yield 2.6%) was obtained having characteristic odour and taste. It was dried over anhydrous sodium sulphate to remove moisture and stored in refrigerator in dark at 4°C for further analysis.

GC Analysis

The GC analysis was performed using SPL2 system, using Omega SPTm capillary column (30 m x 0.25 mm i.d.) with film thickness of 0.25 μm. Sample injected was 2μL at a time and injector temperature 270 °C, Carrier gas used was N2 at 101.2 kPa flow pressure, temperature programmed from 100 °C to 280 °C, detector used FID, detector temperature 280 °C [Detector channel: sampling Rate: 40 msec, Stop Time: 60.33 min, delay time: 0.00 min and, subtract detector: none, makeup flow: 30.0 mL/min, H2 flow: 40.0 mL/min, air flow: 400.0 mL/min].

RESULT AND DISCUSSION

Most constituents were identified by GC by comparing their Kovat’s indices with those of authentic standards available in the author’s laboratory or with Kovat’s indices in the close agreement with reference. Further identification has been done by GC-MS. The fragmentation patterns of mass spectra were compared WILEY 8-built libraries, spectrometer database and with those published in the literature.

Identification of components

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RESULT AND DISCUSSION

The components of the volatile oil, the percentage of each constituent and their RI values are summarized in Table. 1. The components were arranged in order of GC elution on SPTm capillary column. The oil was characterized by a large amount of monoterpene main hydrocarbon (83.16%) and alcohol (16.84%). Terpinene are biosynthesized from geranyl phosphate and hydroxylatation of these terpinenes followed by dehydration can lead to the synthesis of monoterpene phenol, thymol. It is suggested that at that time of plant cultivation terpinenes are not converted naturally to thymol. The predominant constituent was γ-terpinene (55.75%) followed by thymol (15.56%), p-cymene (12.30%) and β-pinene (8.12%). The components occurring in small amounts included α-pinene, β-myrcene and α-terpinene. Four volatile oil constituents present in trace amount were characterized as limonene, β-phellandrene, cis-β-terpinene, 4-terpineol and α-
terpinene. The volatile oil was devoid of any aliphatic, aromatic and sesquiterpenic constituents. The volatile oil of ajwain collected from Gorakhpur (Northern India) was consisted of predominantly thymol (39.1%), oleic acid (10.4%), linoleic acid (9.6%) and \( \gamma \)-terpinene (2.6%) 9. The essential oil of \( C. \) copticum procured from Shiraz (Iran) contained mainly thymol (54.5%), \( \gamma \)-terpinene (22.9%) and p-cymene (19.3%); it was devoid of aromatic, aliphatic and sesquiterpene constituents 8. A report from Cairo (Egypt) indicated the presence of \( \gamma \)-terpinene (24.0%), p-cymene (24.0%), thymol (42.0%) and carvacrol (4.7%) 5. An earlier report showed the major components of \( C. \) copticum fruit essential oil as thymol, \( \gamma \)-terpinene and p-cymene 10. In two other reports major components of the oil were identified as thymol (35.4% and 49.0%) and \( \gamma \)-terpinene (28.6% and 30.8%) with no carvacrol 11, 12. The essential oil of \( C. \) copticum from Sanliurta (Turkey) possessed mainly p-cymene (33.1%), \( \gamma \)-terpinene (28.6%) and thymol (24.1%) 13. However, in other report the major compounds were characterized as p-cymene (41.9%), carvacrol (45.2%) and thymol (0.48%) 12. The significant variation of the chemical constituents of the ajwain oil from different regions may be regarded as chemotypes as thymol, p-cymene, carvacrol and as \( \gamma \)-terpinene chemotypes. These chemical constituents possess different bioactivities. Therefore, ajwain seeds collected from different region may be used for particular nutritional and medicinal uses.

**Table 1. Chemical composition of volatile oil of from the fruits of \( C. \) copticum**

<table>
<thead>
<tr>
<th>S. no</th>
<th>Components</th>
<th>Percentage (%)</th>
<th>KI value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>( \alpha )-Pinene</td>
<td>2.29</td>
<td>928</td>
</tr>
<tr>
<td>2.</td>
<td>( \beta )-Pinene</td>
<td>8.12</td>
<td>960</td>
</tr>
<tr>
<td>3.</td>
<td>Sabinene</td>
<td>0.29</td>
<td>967</td>
</tr>
<tr>
<td>4.</td>
<td>( \beta )-Myrcene</td>
<td>1.67</td>
<td>974</td>
</tr>
<tr>
<td>5.</td>
<td>( \alpha )-Terpinene</td>
<td>1.32</td>
<td>1015</td>
</tr>
<tr>
<td>6.</td>
<td>Limonene</td>
<td>0.44</td>
<td>1022</td>
</tr>
<tr>
<td>7.</td>
<td>( \beta )-Phellandrene</td>
<td>0.97</td>
<td>1030</td>
</tr>
<tr>
<td>8.</td>
<td>( \gamma )-Terpinene</td>
<td>55.75</td>
<td>1062</td>
</tr>
<tr>
<td>9.</td>
<td>p-Cymene</td>
<td>12.30</td>
<td>1088</td>
</tr>
<tr>
<td>10.</td>
<td>Cis-( \beta )-terpineol</td>
<td>0.42</td>
<td>1096</td>
</tr>
<tr>
<td>11.</td>
<td>( \delta )-Terpineol</td>
<td>0.65</td>
<td>1178</td>
</tr>
<tr>
<td>12.</td>
<td>( \alpha )-Terpineol</td>
<td>0.21</td>
<td>1197</td>
</tr>
<tr>
<td>13.</td>
<td>Thymol</td>
<td>15.56</td>
<td>1296</td>
</tr>
</tbody>
</table>

**ACKNOWLEDGMENT**
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**CONCLUSION**
The essential oil components of \( C. \) copticum may be responsible for the medical importance of the drug.

**REFERENCES**

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