INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com ISSN 2230 – 8407
Research Article

COMPOSITION OF VOLATILE OIL OF *CARUM COPTICUM* BENTH. AND HOOK FRUITS

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Article Received on: 18/04/12 Revised on: 20/05/12 Approved for publication: 16/06/12

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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 [1]. The most utilized part of ajwain is the small caraway like fruit which is popular in Indian savory recipies, pastries, breads and snacks [2]. The fruits possess characterstic aromatic odour and pungent taste, are used as antispasmodic, stimulant, tonic and carminative and to treat flatulence, diarrhoea and pile [3, 4]. The seeds are utilized as spice, flavouring agent in foods and preservative in medical formulations. Ajwain fruits contained an essential oil mainly composed of thymol (50%), elemol, α-cadinol, δ-cadinene, β-caryophyllene and carvacrol [5, 6]. The oil is strong germicide, antispasmodic and fungicide. Thymol is used in toothpaste and perfumery [4]. It inhibited the bacterial resistant microbial pathogens and is useful as a plant based fourth generation herbal antibiotic formulation [7]. 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 characterstic odour and taste. It was dried over anhydrous sodium sulphate to remove moisture and stored in refrigerator in dark at 4^0 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 ^{0}C, Carrier gas used was N_2 at 101.2 kPa flow pressure, temperature programmed from 100 ^{0}C to 280 ^{0}C, detector used FID, detector temperature 280 ^{0}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, H_2 flow : 40.0 mL/min, air flow : 400.0 mL/min] .

GC-MS Analysis

GC-MS analysis was carried on GCMS –QP2010 PLUS of SHIMADZU company Omega SPTm using capillary column (30 m x 0.25 mm i.d.) with film thickness of 0.25 µm [Ion source temp : 250 °C, interface temp : 280 °C, solvent cut time : 2 min, detector gain mode : relative, detector gain : 0.00 kV, threshold : 1000]. [GC-2010 : column oven temp: 80 °C, injection temp : 270 °C, injection mode : split, flow control mode : linear velocity, pressure : 86.6 kPa, total flow : 100.9 mL/min, column flow : 1.21 mL/min, linear velocity : 40.5 cm/sec, purge flow : 3.0 mL/min, split ratio : 80.0, high pressure injection : off, carrier gas saver : off, splitter hold : off] [MS: start time: 2 min, end time: 60.32 min ACQ mode: scan, event time : 0.50 sec, scan speed : 1666, start m/z :40.00, end m/z : 750.00] sample inlet unit: GC. Mass spectra were recorded at 70 ev.

Identification of components

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 [8, 9].

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 monoterpenes mainly hydrocarbon (83.16%) and alcohol (16.84%). Terpinene are biosynthesized from geranyl phosphate and hydroxylation 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-terpineol (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-terpineol, 4-terpineol and α-

terpineol. 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 γ-terpinene (2.6%) [9]. The essential oil of *C. copticum* procured from Shiraz (Iran) contained mainly thymol (54.5%), γ-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 γ-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, γ- terpinene and p-cymene [10]. In two other reports major components of the oil were identified as thymol (35.4% and 49.0%) and γ-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%), γ-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%) [14]. 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 γ-terpinene chemotypes. These chemical constituents possess different bioactivites. 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 *Carum copticum*

S. no	Components	Percentage (%)	KI value
1.	α-Pinene	2.29	928
2.	β-Pinene	8.12	960
3.	Sabinene	0.29	967
4.	β-Myrcene	1.67	974
5.	α-Terpinene	1.32	1015
6.	Limonene	0.44	1022
7.	β-Phellandrene	0.97	1030
8.	γ-Terpinene	55.75	1062
9.	p- Cymene	12.30	1088
10.	Cis-β-terpineol	0.42	1096
11.	4-Terpineol	0.65	1178
12.	α-Terpineol	0.21	1197
13.	Thymol	15.56	1296

ACKNOWLEDGMENT

The authors are thankfull to AIRF, Jawaharlal Nehru University, New Delhi for analysis of the volatile oil.

CONCLUSION

The essential oil components of *C.copticum* may be responsible for the medical importance of the drug.

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Source of support: Nil, Conflict of interest: None Declared