

Research Paper :

Chemical composition of Indian Ajowan (*Carum copticum* L.) seed oil in Kanpur region of North India

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ABSTRACT

The hydro-distilled oil obtained from Ajowan seeds (*Carum copticum* L.) of local market of Kanpur was analysed by GC and GC-MS, which led to the identification of 13 compounds representing 93.4% of the total oil. Thymol, the main constituent was found in the range of 39.9 % followed by p-cymene 23.5 %, γ -terpinene 19.7 % and β -pinene 6.6 %. The oil yield was 4.8 % (v/w).

Key words : Carum copticum, Seed oil, Chemical composition, p-cymene, β -pinene, γ -terpinene

Ajowan, botanically known as *Carum copticum* L. *syn Trachyspermum ammi* (Linn.) Sprague (Family Apiaceae) yields an essential oil which is a major source of thymol in India. The plant is a native of Egypt. It is cultivated around the Mediterranean Sea and in South-west Asia extending from Iran to India. In India, it is grown in Madhya Pradesh, Gujarat, Maharashtra, Uttar Pradesh, Rajasthan, Bihar and West Bengal. It is also found growing wild in certain parts of India. Seeds are employed either alone or in mixture with other spices and condiments. It is used in pickles, biscuits, confectionery and beverages. An important use of seeds in medicine as a remedy for indigestion. Externally, a paste of the crushed fruit is applied for relieving colic pains. It is also used in the preparation of lotions and ointment.¹

There have been numerous studies available on the chemical composition of the Ajowan seed oil. The oils from CIMAP Research Farm, Lucknow and local market of Lucknow and Chennai were analyzed by GC and GC-MS. The major constituent of this oil were thymol (36.5-41.1), p-cymene (20.9-27.2) and γ -terpinene (25.9-35.7%).² The seed oils obtained from Pakistan contained the following range of constituent: α -pinene (0.33-0.63%), camphene (0.56-0.63%), β -pinene (1.24-1.56%), δ -3-carene (0.42-0.80%), limonene (0.25-2.25%), γ -terpinene (18.70-20.35%), p-cymene (20.80-23.78%), thymol (45.20-48.50%), and carvacrol (4.50-6.80%).³ Kumar *et al.* (2008) analyzed the hydro-distilled oils obtained from ajowan seed (*Carum copticum*) commercially available in local market of Delhi, Uttarakhand, Bihar and Uttar Pradesh by GC and twelve components were identified

using reference standard by comparing the retention times representing 99.1, 98.0, 98.7 and 99.6%, respectively. Thymol was in the range of 48.9-68.6 followed by p-cymene 13.8-26.8 and γ -terpinene 13.2-19.6%. The thymol percentage from Uttarakhand was higher amongst others which have almost similar type of climate. The oil yield from Uttarakhand was highest (5.36% v/w).⁴ Practically, no work has been done on the chemical composition of seed oil from Kanpur region of northern India which was required to be carried out from commercial point of view. Keeping the above facts under consideration, the present investigation was undertaken.

MATERIALS AND METHODS

The Ajowan seeds were identified by Taxonomy Division of Dayanand Girls, P.G. College, Kanpur. The semi-crushed seeds were hydrodistilled in a Clevenger type apparatus for 6 hrs yielding oil in 4.8 % (v/w). The oils were dried over anhydrous sodium sulphate and stored in a sealed glass vials in refrigerator.

GC and GC-MS analysis:

Quantitative analysis of the essential oil of *Coriandrum sativum* was carried out using a Shimadzu GC-2010. Nitrogen was used as carrier gas at 6 psi inlet pressure with FID and AB inno-wax column (60 m x 0.25 mm id, film thickness (0.25 μ m). Injector and detector temperatures were 260⁰ and 280⁰C, respectively. Column temperature programmed from 50⁰ to 180⁰C at 3⁰C/min with hold time of 2 min and from 180⁰ to 250⁰C at 5⁰C/min with hold time 20 min, respectively. The flow rate of

Table 1 : Comparison of chemical composition (per cent content) of *Carum copticum* oil of Kanpur region of north India with the oil of Gorakhpur, CIMAP, Lucknow and Chennai.

Sr. No.	Compounds	Kanpur (Present report)	Gorakhpur ⁵	CIMAP, Lucknow ²	Chennai ²
1.	α -pinene	1.3	0.2	0.4	0.6
2.	camphene	0.1	-	0.2	0.3
3.	β -pinene	6.6	1.7	2.7	4.6
4.	myrcene	0.9	0.4	-	-
5.	α -terpinene	0.4	0.2	0.1	0.5
6.	limonene	0.2	-	0.1	0.1
7.	γ -terpinene	19.7	23.2	35.7	25.9
8.	p-cymene	23.5	30.8	21.8	27.2
9.	1,8-Cineole	0.1	-	0.3	0.3
10.	terpinene-4-ol	0.2	-	-	-
11.	α -terpineol	0.1	0.1	0.2	0.2
12.	thymol	39.9	39.1	36.5	37.6
13.	carvacrol	0.4	0.3	0.2	0.1

carrier gas was 1.2 ml/min and split ratio was 80:1. The data were processed on GC solutions software for oil composition. GC-MS analysis was obtained on a Shimadzu mass spectrometer-2010 series system using same column and conditions as GC. Helium was used as carrier gas. EI source and mass range were 70 eV and 40-600 amu, respectively. Compounds were identified by using Willey, NIST and Perfumery libraries.

RESULTS AND DISCUSSION

The hydro-distilled oil obtained from Ajowan seeds of Kanpur local market were subjected to GC and GC-MS analysis which resulted in the identification and quantification of 13 compounds which are listed in order of elution on AB-Inno-wax Column (Table 1).

The major constituents identified from Kanpur oil were thymol (39.9), p-cymene (23.5), γ -terpinene (19.7) and β -pinene (6.6 %). Kanpur oil was compared with oils of Gorakhpur, CIMAP and Chennai in respect of per cent content of its major compounds. γ -terpinene (23.2 %) and p-cymene (30.8 %) contents were higher in Gorakhpur oil while all other components were lesser in quantity. Similarly, Chennai oil was higher in γ -terpinene (25.9 %) and p-cymene (27.2 %) contents while rest of the components were more or less in the range. γ -terpinene (35.7 %) content was higher in CIMAP oil while remaining compounds were either lower in quantity or in the range.

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