



ORIGINAL ARTICLE

Essential oil of the seeds of *Cuminum cyminum* L. (Apiaceae)

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ABSTRACT

The essential oil of Cuminum cyminum L. collected from Kurdistan Mountain, Iran, was obtained by hydro-distillation. The oil was analyzed by chromatography/mass spectrophotometry (GC/MS). Thymol (40.68%) and γ -terpinene (24.51%) were the major components of the essential oil from C. cyminum L.

Keywords: Seeds, *Cuminum cyminum*, Thymol, γ -Terpinene.

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INTRODUCTION

Natural products with their diverse biological and pharmacological activities represent a gold mine for scientists searching for lead compounds for the treatment of health disorders and infections [1,2]. In the search for sources of natural products, in the last years some medicinal plants have been extensively studied for their biological properties [3-5]. Aromatic plants are frequently used in traditional medicine and essential oils and volatile constituents extracted from them are widely used as antioxidants and antidiabetic agents and for the prevention and treatment of different human diseases, such as cancer, cardiovascular diseases, including atherosclerosis and thrombosis, bacterial and viral infections [6]. Among the different groups of plant products, essential oils are especially considered as one of the most promising groups of natural products for the formulation of safer antifungal agents [7]. Cumin (*Cuminum cyminum* L.) is aromatic plant included in the Apiaceae family and is used to flavor foods, added to fragrances, and for medical preparation. Cumin seeds have been found to possess significant biological activities, such as antibacterial, antifungal, anti-carcinogenic and antioxidant properties [8,9]. Rehman *et al.*, [10] reported that 1,8-cineole (72.7%), Cinnamaldehyde (79.8%), linalool (78.1%), Cuminaldehyde (37.18%), 8-cineole (30.7%), Terpinen-4-ol (20.0% and 31.3%) respectively as the main constituents analyzed by GC/MS. The main objective of this study was to determine the chemical composition of *C. cyminum* hydro-distilled essential oil by GC/MS.

MATERIALS AND METHODS

Plant material and oil isolation

The plant materials were collected from Kurdistan Mountain, Iran in 2013-2014. The *C. cyminum* seeds were ground and the resulting powder was subjected to hydrodistillation for 3 hours in an all glass Clevenger-type apparatus according to the method recommended by the European Pharmacopoeia [11]. The obtained essential oils were dried over anhydrous sodium sulphate and after filtration, stored at +4 °C until tested and analysed.

Essential oil analysis

Essential oil analysis

The GC/MS analyses were executed on a Hewlett–Packard 5973N gas chromatograph equipped with a column HP-5MS (30 m length \times 0.25 mm i.d., film thickness 0.25 μ m) coupled with a Hewlett–Packard 5973N mass spectrometer. The column temperature was programmed at 50 °C as an initial temperature, holding for 6 min, with 3 °C increases per minute to the temperature of 240 °C, followed by a temperature enhancement of 15 °C per minute up to 300 °C, holding at the mentioned temperature for 3 min. Injector port temperature was 290 °C and helium used as carrier gas at a flow rate 1.5 ml/min. Ionization voltage of mass spectrometer in the EI-mode was equal to 70 eV and ionization source temperature was 250 °C. Linear retention indices for all components were determined by coinjection of the samples with a solution

containing homologous series of C8-C22 *n*-alkanes and comparing them and their mass spectra with those of authentic samples or with available library data of the GC/MS system (WILEY 2001 data software) and Adams libraries spectra [12].

RESULTS AND DISCUSSIONS

The chemical compositions of *C. cyminum* essential oil are shown in Table 1. Fourteen compounds representing 86.75 % of *C. cyminum* essential oil were identified. The organic compounds detected in the seeds oils, were thymol (40.65%), γ -terpinene (24.51%), *b*-pinene (5.38%), *a*-pinene (3.47%), camphene (2.31%), terpinene- 4 - ol (2.00%), cuminaldehyde (1.79%), *a*-thujene (1.45%), *a*-terpinolene (1.17%), myrcene (1.07%), limonene (1.04%), α -phyllanderene (0.94%), acetoxylinalool (0.57%) and sabinene (0.37%). Cumin, the second most popular spice in the world after black pepper, is cultivated mainly in India, China, Arabia and in the countries adjoining the Mediterranean Sea [13]. The medicinal applications of cumin include use as a stimulant, carminative, an astringent, against indigestion, flatulence and diarrhea [14]. Sawi *et al.*, reported that in the herb and seed oils, 21 constituents were identified, representing 90.2% and 95.6% of the total amounts, respectively [15]. Borges *et al.*, reported chemical composition of the oil was determined by chromatography spectrometric methods and physicochemical indexes [16]. Some major components of Chinese cumin oil (*c*-terpinene, *q*-cymene and *b*-pinene) were previously found in cumin oils obtained from Turkey [17], Pakistan [18] and Iran [19]. It is well known that cuminal and cuminic alcohol show very strong antimicrobial and antioxidative activities. In another study performed by Derakhshan *et al.*, [20], the main constituents of *C. cyminum* essential oil were found to be cumin aldehyde, *r*-mentha-1,3-dien-7-al, *r*-mentha-1,4-dien-7-al, γ -terpinene, *p*-cymene and *b*-pinene. In fact, the composition of the essential oil of *C. cyminum* depends on many factors, such as plant part, harvest-time, extraction- method, type of cultivar, geographic origin and storage conditions. In general, cumin aldehyde, menthane derivatives, *c*-terpinene, *p*-cymene and *b*-pinene are major components of many essential cumin oils and are mainly responsible for the aroma and biological effects [21].

Table 1. Chemical compositions of *Cuminum cyminum* essential oil.

	Components	%	Retention Index ^a	Identification Methods
1	<i>a</i> -Thujene	1.45	930	MS, RI
2	<i>a</i> -Pinene	3.47	938	MS, RI, Col
3	Camphene	2.31	974	MS, RI, Col
4	Sabinene	0.37	981	MS, RI, Col
5	<i>b</i> -Pinene	5.38	987	MS, RI
6	Myrcene	1.07	995	MS, RI
7	α -Phyllanderene	0.94	1000	MS, RI
8	Limonene	1.04	1031	MS, RI, Col
9	γ -Terpinene	24.51	1072	MS, RI
10	Terpinene- 4 - ol	2.00	1177	MS, RI
11	Acetoxylinalool	0.57	1184	MS, RI
12	<i>a</i> -Terpinolene	1.17	1196	MS, RI
13	Cuminaldehyde	1.79	1251	MS, RI, Col
14	Thymol	40.68	1294	MS, RI, Col
	Total	86.75		

^aThe retention Kovats indices were determined on HP-5 capillary column. MS= Mass Spectroscopy, RI= Retention Index, Col= Co injection with authentic compounds

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