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Research Article

Essential oil composition of *Helianthemum canum* (L.) Baumg. (Cistaceae) growing in Turkey

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Abstract

This study was performed to determine the chemical composition of essential oils from aerial parts with flower of *Helianthemum canum* (L.) Baumg. Hydrodistilled essential oil from aerial parts of *H. canum* was analysed by Gas Chromatography (GC) and Gas Chromatography-Mass Spectrometry (GC/MS). Fifty-two components were identified representing 94.7% of the oil. Myristicin (29.4%), T-cadinol (6.5%), hexadecanoic acid (5.2%), spathulenol (4.0%) and decanoic acid (3.6%) were the major oil constituents. To best of our knowledge, this is the first report on the essential oils of *H. canum* naturally growing in Turkey.

Keywords: *Helianthemum canum,* Essential oil, GC analysis, GC/MS analysis, Cistaceae

Introduction

Cistaceae family plants are distributed especially in the northern temperate regions, South America and the Mediterranean Region. It is a large family which has striking flowers, and consists of annual or perennial herbaceous and shrub plants (Heywood, 2007). *Helianthemum* Miller taxa belong to Cistaceae known as the centre of diversity in the Mediterranean region are evergreen or semi-evergreen subshrubs (Rubio-Moraga et al., 2013; Davis, 1972). In Turkey, this genus is represented by 19 taxa (Güner, 2012). *Helianthemum* species traditionally used for gastrointestinal disorders, constipation, blood-cutting, anti-inflammatory, antiulcerogenic, antiparasitic, antimicrobial, analgesic, cytotoxic, vasodilator medicines, wound healing and burn treatments since ancient times (Baytop, 1999; Rubio-Moraga et al., 2013). In the literature, main oil components of aerial parts of *Helianthemum kahiricum* (Del.) are described as hexadecanoic acid (36.2%), tetradecanoic acid (7.3%), linoleic acid (6.5%) and dodecanoic acid (4.7%) by gas chromatography (GC) and gas chromatography-mass spectrometry (GC/MS) (Javidnia & Nasiri, 2007). In this present study, we determined the composition of essential oil of *Helianthemum canum* by GC and GC/MS.

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Figure 1: *Helianthemum canum* (L.) Baumg.

Material and Methods

Plant materials

The aerial parts of *H. canum* were collected from the province of Kayseri (Pınarbaşı) during August and September of 2013. An authenticated voucher specimen (AEF 26340) was deposited in the Herbarium of the Faculty of Pharmacy at Ankara University.

Essential oil isolation

In this study, the aerial parts of *H. canum* were hydrodistilled for 3 hrs using a Clevenger apparatus to obtain essential oil (EP, 2005).

Gas chromatography-Mass spectrometry (GC-MS) analysis

The GC-MS analysis was carried out with an Agilent 5975 GC-MSD system. Innowax FSC column (60 m x 0.25 mm, 0.25 µm film thickness) was used with helium as carrier gas (0.8 ml/min). GC oven temperature was kept at 60 °C for 10 min and programmed to 220 °C at a rate of 4 °C / min, and kept constant at 220 °C for 10 min and then programmed to 240 °C at a rate of 1°C / min. Split ratio was adjusted at 40:1. The injector temperature was set at 250 °C. Mass spectra were recorded at 70 eV. Mass range was from m/z 35 to 450.

Gas chromatography (GC) analysis

The GC analysis was carried out using an Agilent 6890N GC system. FID detector temperature was 300°C. To obtain the same elution order with GC-MS, simultaneous auto-injection was done on a

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duplicate of the same column applying the same operational conditions. Relative percentage amounts of the separated compounds were calculated from FID chromatograms.

Qualitative and quantitative analysis

Identification of the essential oil components were carried out by comparison of their relative retention times with those of authentic samples or by comparison of their relative retention index (RRI) to series of n-alkanes. Computer matching against commercial (Wiley GC/MS Library, MassFinder 3 Library) (McLafferty & Stauffer, 1989; Koenig et al., 2004) and in-house "Başer Library of Essential Oil Constituents" built up by genuine compounds and components of known oils, as well as MS literature data (Joulain & Koenig, 1998), was used for the identification (ESO, 2000).

Results

Air-dried parts with flower of *H. canum* were *hydrodistilled* using Clevenger-type apparatus to produce with 0.01% yield. The analysis results are given in Table 1. RRI Relative retention indices calculated against *n*-alkanes; % calculated from FID data tr: Trace (< 0.1 %)

Discussion

Javidnia and Nasiri (2007) reported that the main components of oil of *H. kahiricum* Del. were determined as hexadecanoic acid (36.2%), tetradecanoic acid (7.3%), linoleic acid (6.5%), and dodecanoic acid (4.7%). Our results have similar to results of this study in terms of main components, both of which are hexadecanoic acid and decanoic acid. Moreover, while spathulenol was main component in essential oil of *H. canum* in our study, it was found to be as minor compound in the essential oil of *H. kahiricum* (Javidnia & Nasiri, 2007). In previous studies on Cistaceae plants, spathulenol and T-cadinol were identified as main components of oil (Öğütveren & Tetik, 2004; Paolini et al., 2008). These components have some biological activities, such as insecticidal (Srivastava et al., 2001); hepapatoprotective (Morita et. al, 2003); antiviral (Parang et al., 1997); antimite (Chang et al., 2001); antifungal (Cheng et al., 2006); antiiflammatory (Tung et al., 2008); larvicidal (Rahuman et al., 2000) and immunomodulatory effect (Ziaei et al., 2011).

Conclusion

This study is the first report on the essential oil of *H. canum* naturally growing in Turkey. The main constituents of *H. canum* oil were myristicin (29.4%), T-cadinol (6.5%), hexadecanoic acid (5.2%), spathulenol (4.0%), and decanoic acid (3.6%).

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Table 1. Chemical composition of the essential oil of *H. canum*

RRI	Compound	%
1032	α-Pinene	0.5
1076	Camphene	0.3
1118	β-Pinene	tr
1174	Myrcene	0.4
1203	Limonene	0.2
1213	1,8-Cineole	0.4
1246	(*Z*)-β-Ocimene	0.2
1255	γ-Terpinene	0.1
1266	(*E*)-β-Ocimene	2.8
1400	Nonanal	0.3
1532	Camphor	0.9
1591	Bornyl acetate	0.8
1612	β-Caryophyllene	2.2
1668	(*Z*)-β-Farnesene	2.0
1687	α-Humulene	0.5
1704	γ-Muurolene	0.1
1706	α-Terpineol	0.1
1719	Borneol	0.1
1726	Germacrene D	2.9
1741	β-Bisabolene	1.1
1742	β-Selinene	0.2
1755	Bicyclogermacrene	1.1
1765	Geranyl acetate	tr
1773	δ-Cadinene	0.9
1776	γ-Cadinene	1.8
1815	2-Tridecanone	0.4
1849	Calamenene	0.3
1868	(*E*)-Geranyl acetone	0.6
1958	(*E*)-β-Ionone	0.6
2008	Caryophyllene oxide	2.6
2050	(*E*)-Nerolidol	0.6
2080	1,10-*diepi*-Cubenol	1.6
2122	Hedycaryol	0.9
2200	α-Guaiol	0.6
2131	Hexahydrofarnesyl acetone	0.4
2144	Spathulenol	**4.0**
2192	Nonanoic acid	2.7
2187	T-Cadinol	**6.5**
2226	Methyl hexadecanoate	0.6
2250	α-Eudesmol	0.8
2257	β-Eudesmol	1.9
2296	Myristicine	**29.4**
2298	Decanoic acid	3.6
2392	Caryophylla-2(12),6-dien-5β -ol (=*Caryophyllenol II*)	1.1
2503	Dodecanoic acid	2.3
2509	Methyl linoleate	0.7
2583	Methyl linolenate	1.2
2622	Phytol	0.7
2600	Hexacosane	1.1
2670	Tetradecanoic acid	1.6
2900	Nonacosane	2.8
2931	Hexadecanoic acid	**5.2**
	Total	94.7

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Declaration of Conflict of Interest

No conflict of interest associated with this work.

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