GC-MS ANALYSIS OF THE ESSENTIAL OIL FROM *ARTEMISIA aucheri* BOISS. FRUITS

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ABSTRACT

The essential oil content in the fruits of *Artemisia aucheri* growing wild in south of Iran was found to be 2.4% (v/w). The essential oil was analyzed by gas chromatography (GC) and GC–mass spectrometry (GC–MS). Characterization of individual components was performed using a commercial mass spectrometry library, and twenty nine components, representing 89.0% of the fruits essential oil were identified. This analysis showed the presence of three volatile components, including camphor (46.5%) and 1,8-cineol (23.4%) as the main compounds.

Keywords: *Artemisia aucheri*, fruits, Essential oil, GC/MS

INTRODUCTION

The genus *Artemisia* (Asteraceae) is one of the largest and most widely distributed genera comprising a variable number of species, ranging from 200 to over 400 and is predominantly distributed in the northern temperate region of the world [1]. 29 species are reported in Iran of which some are endemic [2,3]. Numerous reports on essential oil compositions of different *Artemisia* species, especially on those used in flavor industry and in medication have been published [4].

Artemisia aucheri is a native plant which is found in some parts of Iran including the south regions. This plant is extensively exploited as a medicinal plant and locally called "Dermaneh Koohi" [5]. The flowering aerial parts and the fruits have been commonly used in Iranian traditional medicine as antiseptic, analgesic and to treat painful menstruation, dyspepsia, arthralgia, fever, headache, common cold and healing wound [1]. Literature survey revealed reports just on the essential oil composition of the aerial parts of *A. aucheri* and there was no attempt to study the essential components of *A. aucheri* fruits up to now. Regarding it and significant pleasant odor of the fruits, we were prompted to investigate the essential oil composition of this part of *A. aucheri* for the first time.

EXPERIMENTAL

Plant material

Fresh fruits of *A. aucheri* were collected in June 2015 Genow protected area, Bandar Abbas, Hormozgan Province, Iran: (27°26′44″N 56°18′18″E, 500 m). Specimens were identified by R. Asadpour and voucher was deposited in the Herbarium of Pharmaceutical Sciences Branch, Islamic Azad University (IAUPS), Tehran under code number 220-PMP/A. Fruits were submitted to hydrodistillation in a Clevenger-type apparatus for 3 hours. At the end of distillation the oil was collected, dried with anhydrous Na_2SO_4, measured, and transferred to clean glass vial and kept at a temperature of −18°C for further analyses.

Analysis of the essential oil

Oil sample analysis was performed on a Hp-6890 gas chromatograph (GC) equipped with a FID and a DB-5 capillary column, 30 m × 0.25 mm, 0.25 µm film thickness, temperature programmed as follows: 60°−240°C at 4°C/min. The carrier gas was N_2 at a flow of 2.0 ml/min; injector port and detector temperature were 250°C and 300°C, respectively. Sample was injected by splitting and the split ratio was 1:10. GC/MS analysis was performed on a Hewlett-packard 6890 /5972 system with a DB-5 capillary column (30 m × 0.25 mm; 0.25 µm film thickness. The operating conditions were the same conditions as described above but the carrier gas was He. Mass spectra were taken at 70 eV. Scan mass range was from 40-400 m/z at a sampling rate of 1.0 scan/s. Quantitative data were obtained from the electronic integration of the FID peak areas. The components of the oil were identified by their retention time, retention indices, relative to C_5-C_{28} n-alkanes, computer matching with the WILEY275.L library and as well as by comparison of their mass spectra with data already available in the literature [6,7]. The percentage of composition of the identified compounds was computed from the GC peaks areas without any correction factors and was calculated relatively. The analysis of the essential oil is the average of three replicates.

RESULTS AND DISCUSSION

The hydrodistillation of *A. aucheri* fruits gave pale yellow oil with pleasant odor and yield of 2.4% (v/w) based on the fresh weight. Figure 1 shows the gas chromatogram of *A. aucheri* fruits essential oil. Table 1 demonstrates the list of compounds whose GC/MS concentration is not less than 0.1% of total peak concentration. According to the Table 1, twenty nine components were identified in the fruits essential oil which presented about 89.0% of the total composition. The major constituents of *A. aucheri* fruits oil were characterized as camphor (46.5%) and 1,8-cineol (23.4%). The studied essential oil comprised one hydrocarbon (0.1%), twenty one monoterpenoids (85.0%), three sesquiterpenoids (1.7%) and three phenylpropanoid (1.5%).

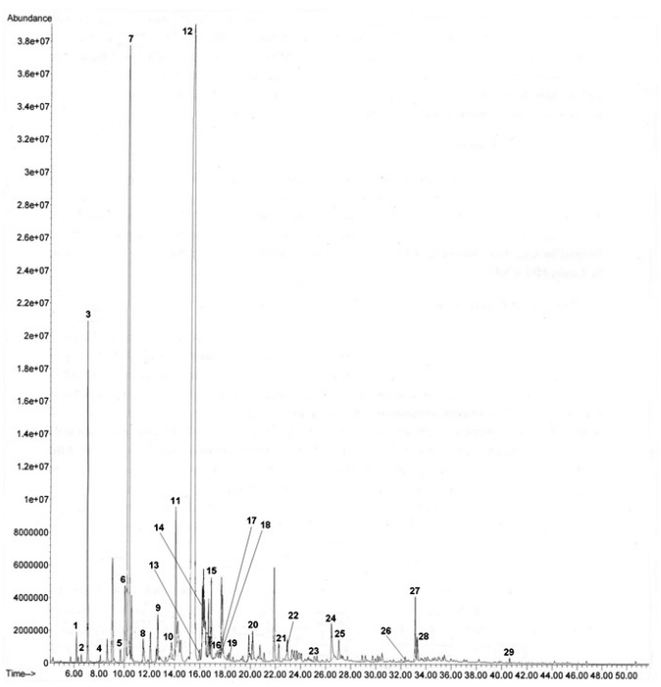

Figure 1. Gas chromatogram of *A. aucheri* fruits essential oil.

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Camphor as the major component of the studied oil is a monoterpenoid ketone and is familiar to many people as a principal ingredient in topical home remedies for a wide range of symptoms, and its use is well consolidated among the population of the whole world, having a long tradition of use as antiseptic, antipruritic, rubefacient, abortifacient, aphrodisiac, contraceptive and lactation suppressant [8]. Presence of high amount of camphor in *A. aucheri* fruits oil is considerable and demonstrates that the studied essential oil could be a good source of this compound and could possess the related biological properties including insecticide, antibacterial, analgesic and antiinflammatory activities. 1,8-cineol is the other main component of *A. aucheri* fruits oil and is characterized as a monoterpenoid ether and has a fresh camphor-like smell and a spicy, cooling taste. Because of its pleasant spicy aroma and taste, eucalyptol is used in flavorings, fragrances, and cosmetics.

Four reports on the analysis of *Artemisia* species fruits oils have been published [9,10]. Table 2 shows the main compounds of *A. aucheri* fruits oil and those of four other species. Presence of camphor as the main component of the studied oil in the fruits oil of *A. annua* from Iran and absence of it in other fruits oils is characteristic. 1,8-cineol as the other major compound of *A. aucheri* fruits oil has been reported in the fruits oil of *A. absinthium* and *A. annua* which were collected from Iran. The fruit oils of *A. tschernieviana* and *A. annua* (from China) are completely different from that of *A. aucheri* and the absence of both major components in *A. aucheri* in their fruits oils is noticeable.

Table 1. GC-MS analysis of *A. aucheri* fruits essential oil.

Compound[a]	KI[b]	KI[c]	Percentage
1. Tricyclene	931	927	0.4
2. α-Pinene	942	939	0.1
3. Camphene	950	954	4.8
4. β-Pinene	976	979	0.1
5. α-Terpinene	1011	1017	0.2
6. ρ-Cymene	1028	1026	2.1
7. 1,8-Cineol	1036	1033	23.4
8. γ-Terpinene	1060	1062	0.1
9. Artemisia alcohol	1080	1084	0.8
10. Hotrienol	1100	1101	0.4
11. β-Thujone	1119	1114	2.6
12. Camphor	1143	1146	46.5
13. Sabina ketone	1162	1159	0.2
14. Borneol	1166	1169	0.4
15. Terpinene-4-ol	1179	1177	1.3
16. ρ-Cymene-8-ol	1188	1183	0.1
17. Myrtenal	1194	1193	0.3
18. Myrtenol	1198	1196	0.2
19. Piperitol	1204	1198	0.2
20. Carvone	1241	1243	0.7
21. Bornyl acetate	1286	1289	0.3
22. Carvacrol	1300	1298	0.3
23. Hydrocinnamic acid, ethyl ester	1331	1335	0.2
24. Cinnamic acid, methyl ester	1366	1370	1.0
25. Jasmone	1399	1394	0.5
26. α-Calacorene	1552	1548	0.1
27. Spathulenol	1581	1577	1.1
28. Caryophyllene oxide	1587	1583	0.5
29. 6,10,14-trimethyl-2-pentadecanone	1844	1840	0.1
Total			89.0

[a]Compounds listed in order of elution.

[b]KI (Kovats index) measured relative to *n*-alkanes (C_9-C_{28}) on the non-polar DB-5 column under condition listed in the Materials and Methods section.

[c]KI, (Kovats index) from literature.

Table 2. Essential oil main components of the fruits of five *Artemisia* species (>5%).

Compounds	*A. aucheri*	*A. absinthium*	*A. tschernieviana*	*A. annua*[a]	*A. annua*[b]
Camphor					
1,8-Cineol					
β-Thujone					
Sabinene					
β-Pinene			13.7		
cis-Chrysanthenol					
Limonene			7.7		
o-Cymene			5.8		
Bornyl acetate			5.6		
Nerolidol			10.4		
Spathulenol			10.0		
Cubenol			15.4		
Artemisia ketone				9.8	
Pinocarveol				9.7	
Caryophyllene oxide				7.2	9.0
(E)-β-farnesene					8.2
Caryophyllene					6.9

[a] *A. annua* fruits collected from Iran.

[b] *A. annua* fruits collected from China.

This paper presents the essential oil composition of *A. aucheri* fruits for the first time. Regarding to the essential oil major components, further biological studies are suggested to investigate the pharmacologic and therapeutic properties of the fruits.

ACKNOWLEDGMENTS

Supports from the Pharmaceutical Sciences Branch, Islamic Azad University are gratefully acknowledged.

REFERENCES

1. Tan, R. X.; Zheng, W. F.; Tang, H. Q. *Planta Med*. **1998**, *64*, 295-302.
2. Rechinger, K. H., in: Flora Iranica. Akademische Druck-u. Verlagsanstalt. Graz, **1986**.
3. Mozafarian, V., in: Study and Recognition of Iranian Artemisia spp. Tehran University of Sciences Press, Tehran, **1988**.
4. Gilemeister, E,; Hoffmann, F. in: Die Aetherischen Ole. 4th ed. vol VII. Academic Verlag. Berlin, **1961**.
5. Mozaffarian, V., in: *A Dictionary of Iranian Plant Names*, Farhang Moaser Press, Tehran, **2006**.
6. Swigar, A. A.; Silverstein, R. M., in: *Monoterpenes*. WI: Aldrich Chemical Company Publ., Milwaukee, **1981**.
7. Adams, R. P., in: *Identification of essential oil components by gas chromatography/mass spectroscopy*. Allured publishing Co. Carol Stream, Illinois, **1995**.
8. Zuccarini, P. *J. Appl. Sci. Environ. Manage*. **2009**, *13*(2), 69-74.
9. Pasha Zanousi, M. B.; Aberoomand Azar, P.; Raeesi, M. *J. Med Plants Res*. **2012**, *6*(42), 5489-5494.
10. Wang, R. L. D.; Liao, H. *Zhongnan Yaoxue*. **2007**, *5*, 230–232.