Chemical Composition of the Essential Oil From the Aerial Parts of *Artemisia Herba*

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Abstract: The aerial parts of the plant *artemisia herba* were collected in the May 2007 from Babaaman (North Khorassan Province of Iran). The plant was isolated by hydro distillation. A total of 61 constituents, representing more than 98% of the oil were identified by gas chromatograph/mass spectrometry (GC/MS). The main compounds, were *alpha*-pinene (3.28%), champhene (4.8%), sabinen (5.18%), *beta*-myrcene (3.04), *cis,beta*-terpineol (11.31%), camphor (6.11%), 8-hydroxylinalool (2.64%), L-4-terpineol (2.5%), *alpha*-therpineol (2.33%), myrtenol (3.27%), bornyl acetate (6.2%), *alpha*-terpinol acetate (3.06%), germacrene (2.06%), davanone (8.49%), *trans*-farnesol (4.27%), *cis*-farnesol (2.07%) and 1,3-dicyclopentyl cyclopentane (2.29%). This herbal medicine traditionally uses as anti-infectious, anti-bacterial, emmenagogue, parasiticide, digestive and stomachic and gastric tonic in Iran.

Keywords: *Artemisia herba*, Essential oil, GC/MS, Hydro distillation, Medicine

Introduction

Artemisia is fairly large genres within the family of the Asteraceae (compositae) with 200 individual species are usually found in dry areas¹⁻⁴. They are invariably found as small fragment shrubs or herbs and most yield essential oils. Some of these oils have found uses in perfumery and medicine⁵⁻⁷. *Artemisia* species are reported to possess anti-diabetic effect and have been used in many countries of middle east and Iran as a herbal medicine for treatment of diabetes, high blood pressure, anti-migraine, anti-fungal activity, digestive, anti-helminic, useful as tonic, antihelminic, azulene source, mycolytic, stomachic, anti-bacterial, lipolytic, anti-septic, good source of chamazulene, vermifuge, and mucolytic⁸⁻¹³. Because of application of *Artemisia* in traditional medicine, many species of this genus have been

surveyed by phytochemists and pharmacologists¹⁴⁻¹⁸. On the other hand, many species in *compositae* family have been found that have effective ingredients in medicinal projects¹⁹⁻²¹. One of the important species is *Artemisia herba* (*A. herba*). In our present work, the chemical compositions of *A. herba* are identified by using aerial part of the dried plant. *Artemisia herba* were collected from Babaaman Mountain, North Khorassan Province of Iran in May 2007. After one week drying the plant in shadow place, the dried plant was used for our experiments.

Experimental

Aerial parts of wild growing *A. herba* were collected in May 2007 from Bojnourd (Northern Khorassan Province of Iran). It was air dried in a shadow place. The dried plant was powdered and the essential of it was isolated by hydrodistillation for 4h. The oil was dried over anhydrous sodium sulfate and stored at 4°C.

Essential Oil Analysis

The essential oil was analyzed by GC/MS. The GC/MS analysis was carried out on a Shimadzu GC/MS model QP 5000. The capillary column was BD-5(30x0.2mm, film thickness 0.32 μ m). The operating conditions were as follows; carrier gas, helium with a flow rate of 1.7 mL/min; column temperature, injector and detector temperatures, was both at 280°C; volume injected 0.1 μ L of the essential oil and ionization potential 70eV. The initial temperature of column was 60°C (held 2 min) and then heated to 200°C with a 3°C/min rate and then heated to 240°C and kept constant for 2 min. The same condition of temperature programming used for *n*-alkenes mixture to calculate the RI. Determination of the oil percent in the plant obtained (1.19 w/w %). Identification of components in the oil was based on the similarity Index (SI), retention index (RI). The relative percentage of the oil constituents was calculated.

Results and Discussion

A. preliminary study on the chemical compositions of essential oils of *A. herba* growing in North Khorassan, Iran, was conducted. The yield of oil is quiet low, only about 1.19 w/w %. The oil is yellow with odor characteristic of plant. The hydrodistillation time for 50 g of dried *A. herba* is 4h. Chromatogram of the analysis is shown in Fig.1. The total ion chromatogram (TIC) retention time is about 45 min. The most compositions of the oil isolates around the first 20min of the analysis procedure and condition. The qualitative and quantitative analytical results are show in Table 1. A total of 61 components were identified by GC/MS, representing 98% of the oil.

Figure 1. The chromatogram of *A. herba* essential oil.

Table 1. Variation of essential oil composition of *Artemisia herba*, collected from North Korassan, Iran and analyzed by GC/MS.

No.	Composition	*RI	**SI%	Percentage in the oil
1 ^a	<i>alpha</i> -Pinene	989	95	3.28
2	Champhene	1005	92	4.8
3	Sabinen	1011	92	5.18
4	<i>beta</i> -Myrecen	1016	92	3.04
5	Cyclohexene-4-methyl- 3-(1-methylethylidene)	1027	91	0.22
6	<i>cis</i> - <i>beta</i> - Terpineol	1056	90	11.31
7	3-Octyn- 2ol	1060	86	0.07
8	Oxime	1063	91	0.15
9	Terpinolene	1095	90	0.71
10	<i>beta</i> -Linalool	1108	85	0.18
11	Camphor	1160	87	6.11
12	<i>beta</i> - Linalool	1170	84	1.08
13	8-Hydroxy linalool	1179	80	2.64
14	L-4-Terpineol	1180	87	2.50
15	<i>alpha</i> - Thujenal	1190	86	0.29
16	<i>alpha</i> - Therpinol	1202	86	2.23
17	Myrtenol	1200	83	3.27
18	(E)-3(10)-Caren-2-ol	1220	85	0.26
19	<i>cis</i> -Carveol	729	80	0.11
20	(E)-3(10)-Caren-4-ol	1242	81	0.35
21	S-Carvone	1248	82	0.22
22	Pinocarvyl acetate	1268	83	1.85
23	Bornyl acetate	1296	92	6.2
24	Neryl acetate	1299	90	0.25
25	2,6-Dimethyl-3,5,7- octatriene-2-ol	1311	82	0.47
26	Terpin diacetate	1320	82	0.98
27	Myrcenyl acetate	1327	88	0.25
28	5-Bromo-1-hexene	1331	86	0.22
29	Gama -Elemene	1337	88	2.43
30	<i>alpha</i> - Therpinol acetate	1356	80	2.43
31	Pivalonate	1359	80	0.48
32	<i>cis</i> -Carvyl acetate	1366	82	0.18
33	Nerol acetate	1371	88	0.44
34	<i>iso</i> Borneol propionate	1376	88	0.11
35	Geranyl acetate	1389	88	0.43
36	Dihydrocarveol acetate	1397	81	0.81
37	<i>beta</i> -Farnesene	1412	89	1.25
38	<i>alpha</i> - Ergamotene	1405	82	0.24
39	Farnesyl alcohol	1454	80	0.16
40	5-Hepten-3-one,2-[5-ethenylterahydro-5-methyl-2- furanyl]-6-methyl	1466	82	0.14
41	Germacrene D	1476	91	2.06

Contd.....

42	<i>alpha</i> -Bisabolene epoxide	1494	83	1.56
43	Davana ether	1515	85	1.28
44	<i>delta</i> -Cadinene	1591	88	0.6
45	Limonen-6-ol, pivalate	1538	83	0.27
46	Hedycaryol	1545	85	0.35
47	Lilac alcohol	1556	80	0.52
48	Davanone	1563	92	8.49
49	Caryophyllene oxide	1571	-	0.72
50	Spiro[2,3]hexane-5-carboxylic acid , 1-methyl,menthyl ether	1621	83	0.8
51	<i>trans</i> -Farnesol	1642	94	4.27
52	2-Octylcyclopropene-1-heptanol	1653	85	1.86
53	Jatamansone	1667	86	0.81
54	<i>Cis</i> - <i>Z</i> - <i>alpha</i> -Bisabolene epoxide	1680	84	0.73
55	<i>cis</i> -Farnesol	1693	84	2.07
56	Lilacaldehyde	1722	83	0.31
57	Ethyl linalool	1730	84	0.1
58	1,3-Dicyclopentylcyclopentane	1746	82	2.29
59	1,6,9, <i>tetra</i> decatriene	1807	84	0.41
60	Cetylic acid	1970	94	0.27
61 ^b	Trans-phytol	2109	91	1.18

*Retention Index; **Similarity Index; ^aComposition with the lowest retention time

^bComposition with the highest retention time

cis, *beta*-Terpineol (11.31%) was determined as the first major constituent in the oil, the second was davanone (8.49%) and the third bornyl acetate (6.2%). The other major compositions were camphor (6.11%), sabinen (5.18%), champherne (4.8%), *trans*-farnesol (4.27%), *alpha*-pinene (3.28%), myrtenol (3.27%), *alpha*-terpinol acetate (3.065), *beta*-myrcene (3.04%), 8-hydroxylinalool (2.64%), L-4-terpineol (2.5%), *alpha*-therpineol (2.33%), 1,3,dicyclopentyl cyclopentane (2.29%), *cis*-farnesol (2.07%) and germacrene (2.06%) in the oil, respectively. Fig. 2 shows the compositions with amount more than 2% in the oil.

Figure 2. Variation of main constituents in the essential oil of *A. herba*.

The results show that the second major composition is davanone in the oil. As it is reported in the literature⁴, one of the main compositions in *A. herba* is davanone. The presence of davanone in the plant makes it as anti-infectious, antibacterial, paratocide⁴. This plant traditionally uses for the mentioned properties of it and some other effects like as gastric tonic, digestive and stomachic medicine in Iran.

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References

1. Singh A, Kaul V K, Marlrajan V P, Imsra I N, Thakur and R S, Husain A, *Indian J. Pharm. Sci.* 1986, **5**, 137.
2. Thapa R K, *Indian J. Pharm.* 1968, **30**, 283.
3. Rekka E A, Kouronnakis A P and Kouronnakis P N, *Res. Com. Mol. Parmacel.* 1996, **92**, 361.
4. Yashphe J, *J. Pharm. Sci.* 1979, **68**, 924.
5. Mueller M S, Karhayomba I B, Hirt H M and Wemakor E, *J. Ethnopharmacology*, 2000, **73**, 487.
6. Kim K S, Lee S, Hung S H, Park Y and Shin K H, *J. Ethnopharmacology*, 2003, **85**, 69.
7. Marriif B H and Hassan A K M, *J. Ethnopharmacology*, 1995, **49**, 51.
8. Sheppard Hanger S, *The Aromatherapy Practitioner Reference Manual*, 1995.
9. Gundidza M, *J. Fitoterapia*, 1986, **57**, 111.
10. Thakur R S, Misra, L N, *Essential oils of India artemisia* 11th Int. congress of essential oils fragrances and flavours, New Delhi, 1989.
11. Mabberly D J, *The Plant book*, Cambridge University Press, 1993.
12. Rustaiyan A, Ameri N, Mirjalili B F, Mazloun Ardakani M, Hakimi. Maybody M and Bamoniri, *Am. J. Sci.* 2003, **48**, 1074.
13. Twaij H A and Al-Badr A, *J. Ethnopharmacology*, 1988, **24**, 123.
14. Charlson A J, *J. Ethnopharmacology*, 1980, **2**, 323.
15. Mc Gaw L J, Lager A K and Van Staden J V, *J. Ethnopharmacology*, 2000, **72**, 247.
16. Weenen H, Nkunya M H H, Bray D H, Mwasumloi L B, Kinabo L S and Kilimali V A, *Planta Medica*. 1990, **56**, 368.
17. Graven E, Deans S, Mavi S, Gudidza M G and Svoboda K P, *Flavour and Fraganle*, *J.* 1992, **7**, 121.
18. Salah S M and Jager A K, *J. Ethnopharmacology*, 2005, **99**, 145.
19. Vonwiller P C, Haynes R K, King G and Wang H, *Planta Med. Lett.* 1993, **59**, 546.
20. Mehmet M, Davut M, Hatice G and Fusun B, *J. Cell and Molecular Biology*, 2006, **5**, 19.
21. Mossa J S, *Fitoterapia*, 1985, **56**, 311.