



Chemical composition of the Essential oil from Aerial parts of *Achillea filipendulina* Lam. From Iran

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ABSTRACT

The hydrodistillation volatiles separated from flowers, leaves and stems of *Achillea filipendula* Lam, a growing wild plant collected in the Kurdistan province of Iran were investigated. The essential oil of the plant was investigated. The hydrodistillation Volatiles Component Separated From Flowers, Leaves and stems of *Achillea filipendula* Lam. Were analyzed by GC and GC/MS. The main Components in the flower Oil were Alpha-terpineol(11.2%) chrysanthenyl acetate(10.6%) gamma-terpinene(8.6%). The main components in the leaves oil were 1,8 - Cineole (30%) chrysanthenyl acetate (18.7%) and Bornyl acetate(14%). The main constituents in the stem oil were Borneol (18%), 1,8- cineole (14.4%) Chrysanthenyl acetate (12.4%) and Bornyl acetate (11.3%).

1. Introduction

Achillea (Composite) comprises 115 species, which are mainly distributed in Europe, Asia and North Africa and also is introduced plant in the New World[1]. The flora of Iran comprises 19 species of *Achillea* of which 7 are endemic[2,3]. Various parts of different species of the genus *Achillea* are widely used in folk medicine due to numerous pharmacological properties, such as antimicrobial, anti-inflammatory, antiallergic and antioxidant activities[4,5] the essential oils of the *Achillea filipendula* showed high antibacterial activity against seven gram positive and gram negative bacteria[6]. Previous chemical investigation on different species of with Iranian Origin *Achillea* have been shown also the presence of sesquiterpene lactones and essential oils[7-13]. In this investigation the essential oil of *Achillea filipendula* Lam., growing with Iranian Origin obtained and analysis and reported

2. Results and Discussion

The percentage composition of the oils is given in Table I in order of their elution from the DB-5 column. Twenty-nine compounds were identified in stem oil of *Achillea filipendula* representing 93.8% of the oil composition. The main compounds were

borneol(17.9%), α -pinene(14.4%), 1,8-cineole(14.42%) and chrysanthenyl acetate (12.42%). other notable constituents was sphulenol(5.88%).

In the leaf oil, twenty compounds were identified representing 98.27% of the oil Composition. The main compounds were 1, 8-cineole (29.89%), α - pinene (12.0%), chrysanthenyl acetate (16.75%), bornyl acetate(13.7%), α - pinene (8.38%) and Terpinen- 4 - ol (5.74%) were found in large amounts. Twenty-three compounds were identified in the flower oil representing 93.8% of the oil composition. The main compounds were α -terpineol(14.56%), chrysanthenyl acetate(13.44%), γ -terpinene(11.17%), bornyl acetate(10.0%), α - camphenolenal(7.62%) and α - pinene (7.44%).

as can be seen from the above information, the oils from stems, leaves and flowers of *Achillea filipendula* are rich in regard to monoterpenes (80.084%, 97.39% and 84.702%, respectively), While the oils from stems, leaves and flowers of *Achillea filipendula* are poor in regard to sesquiterpene(8.915%, 0.345% and 8.138%, respectively).

the some earlier works have been reported on the essential oils of various *Achillea* species.

The main component of *Achillea cretica* L. essential oil were caryophylladienol-II (13.4%), β -maaliene (6.1%),

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neo-intermedeol (6.0%), carvone (4.9%), spathulenol (4.5%), palmitic acid (3.3%) and selina-3,11-dien-6 α -ol (3.2%)[15].

The main constituents of volatile component, *Achillea millefolium* L. from India were sabinene (17.58%), 1,8-cineole (13.04%), borneol (12.41%), bornyl acetate (7.98%),

α -pinene (6.28%), α -pinene (6.26%), terpinine-4-ol (6.17%) and chamazulene (5.28%)[16].

The major constituents of The essential oil of the aerial parts of *Achillea umbellata* from Greece were beta-thujone (62.8%) and camphor (8.7%)[17].

The main component of the essential oils of *Achillea grandifolia* from different localities in Turkey were piperitone (34.0 %), carvacrol (7.0 %) and p-cymene, (5.0 %) in the oil of *Achillea grandifolia* collected from Izmir and The oil of *Achillea grandifolia* collected from Aydin contained 1,8-cineole (32.0 %), piperitone (18.7 %), and p-cymene, (10.0 %)[18].



Fig. 1 *Achillea filipendulina*

3. Experimental

Plant material: The stems, leaves and flower of *Achillea filipendula* Lam.

which is growing in the Iran, were collected from in the Saqez area Province of kurdistan, Iran, in July 20012.

Voucher specimens have been deposited at the Herbarium of the Research Institute Of Forests and Rangelands(TARI), Tehran, Iran.

Extraction of the oils: The stem, leaves and flowers (150 g, 120g and 80g, respectively) of the plant were subjected to separate hydrodistillation using a Clevenger-type apparatus for 3h. after decanting and drying over anhydrous Sodium sulfate, the corresponding yellowish colored oils were recovered, (in a yield of 0.3%, 0.5% and 0.6% (w/w), respectively).

Analysis: GC analysis were performed on a shimadzu 15 A gas chromatograph equipped with a split /splitless (ratio 1:30), injector (250°C) and a flame ionization detector (250°C). N₂ was used as carrier gas (1 ml/min) and the capillary column used was DB- 5(50 m \times 0.2mm, film thickness 0.32 μ m). the column temperature was kept at 60 °C for 3 min and then heated to 220°C with a 5°C/min rate and kept constant at 220 °C for 5 min. Relative percentage amounts were calculated from peak area using a shimadzu C- R4A chromatopac without the use of correction factors.

GC/MS analysis was performed using a Hewlett - Packard 5973 with a Hp-5MS Column (30 m \times 0.25 mm, film thickness 0.25 μ m). The column temperature was Kept at 60 °c for 3 min and programmed to 220 °c at a rate of 5 °C/min and kept Constant at 220 °C for 5min. The flow rate of He as carrier gas was (1ml/min).

MS were taken at 70eV. Identification of the constituents of each oil was made by Comparison of their mass spectra and retention indices (RI) with those given in the literature and those owthentic sampeles[14].



1,8-Cineole

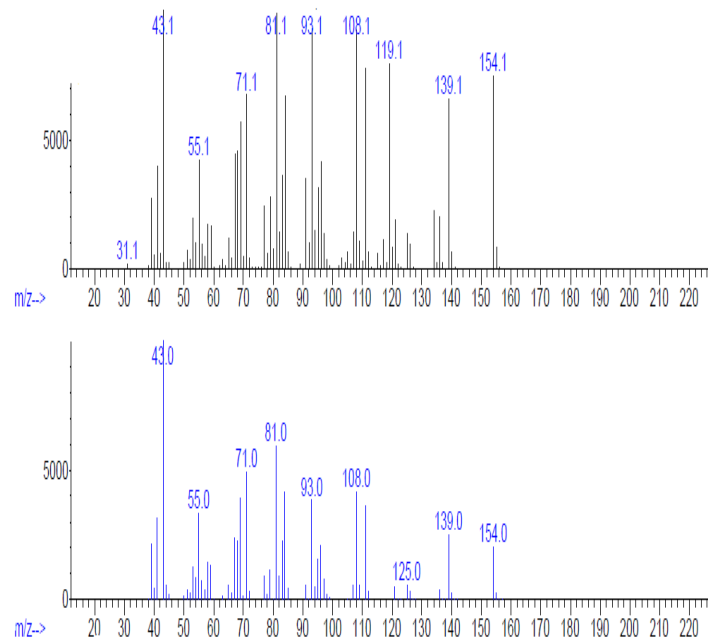
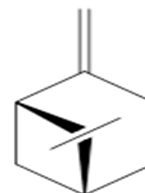


Chart. 1 GC/MS Reference spectrum (up) , GC/MS sample spectrum (down)



Alpha pinen

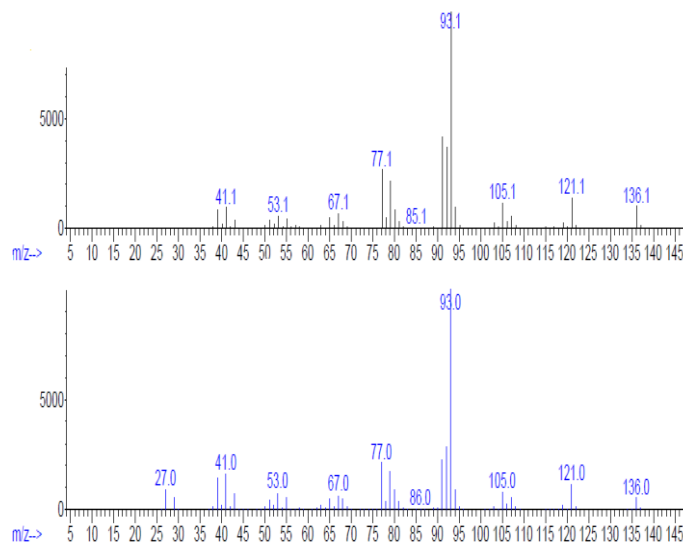
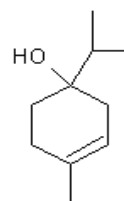


Chart. 2 GC/MS Reference spectrum (up) , GC/MS Sample spectrum (down)



4-Terpineol

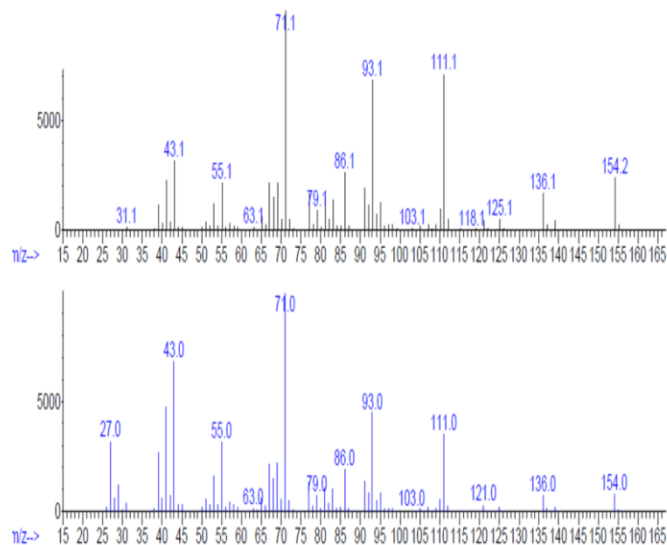


Chart. 2 GC/MS Reference spectrum (up) , GC/MS Sample spectrum (down)

Table I. Chemical composition (%) of essential oil from stems, flowers and leaves of *Achillea filipendula*

Number of compound	KI	Flower (%)	Leaf (%)	Stem (%)
n-octane	800	0/299	--	2/17
ALPHA-PINENE*	939	7/738	8/382	0/302
Camphene*	954	--	5/408	--
sabinene	975	--	0/337	--
Trans-pinocarveol	1139	--	1/733	--
Alpha-terpinene	1017	1/439	1/211	0/541
Beta-Eudesmol	1651	0/456	--	--
1,8-cineole*	1031	--	29/888	14/423
Isopentyl 2-methyl butanoate	1100	1/534	--	--
Geranylacetat	1381	1/43	--	--
Gamma-terpinene*	1060	11/170	2/003	1/611
Gis-sabinene hydrate	1070	1/43	0/365	--
Terpinolene*	1089	4/689	--	0/253
Terpineol	1126	0/247	--	--
Tricyclene	927	0/338	--	--
Camphor	1146	--	0/918	0/658
Borneol*	1169	--	2/116	17/910
Alpha-terpineol*	1189	14/56	1/229	0/582
Delta-cadinene	1523	0/217	--	--
Chrysanthenylacetate*	1265	13/741	16/749	12/420
Bornyl acetate*	1289	10/017	13/969	11/288
Cis-pinocamphone	1175	--	0/515	--
Alpha-Amorphene	1485	0/52	--	--
BETA-ELEMENE	1391	1/366	--	--
Caryophyllene(E)	1419	--	--	0/503
Alpha-humulene	1455	--	--	0/261
Germacrene-D	1485	0/984	0/345	--
Bicyclogermacrene	1500	--	--	0/365
Trans-carveol	1217	1/43	--	--
Spathulenol*	1578	1/274	--	5/876
6,6-Dimethyl Bicyclo[3,1,1]hept-2-ene-2ethanol	1218	0/59	--	--
Alpha-campholenal*	1134	7/618	0/775	--
(7),4,8-o-menthatriene*	1332	2/6	--	--
Beta-pinene*	979	3/611	2/040	0/575
n-decane	1000	--	--	0/557
p-cymene*	1025	--	4/030	0/241
4-Terpineole*	1177	--	5/735	3/987
Pinocarvone	1165	1/89	--	--
Eugenol	1359	0/601	--	--
Tuj-3-en-10-al	1184	--	0/522	--
Myrtenol	1409	--	--	0/32
Nerol	1230	--	--	1/934
1,5-epoxysalvin-4(14)ene	1571	0/169	--	0/42
Nerolidol	1563	0/291	--	--
valerianol	1658	1/664	--	--
Trans-sabinene hydrate	1098	--	--	0/924
Beta-Himachalene	1638	--	--	0/27
Trans-pinocarveol	1139	--	--	1/195
n-Tetradecane	1400	--	--	0/197
Salvia-4(14)-en-1-one	1595	0/455	--	--
Geranylpropionate*	1368	--	--	10/54
carvacrol	1299	--	--	0/38
13,14,15,16,17-pentanorlabda-7,2(11)diene	1378	--	--	1/64
Beta-Elemene	1391	1/366	--	--
Total (%)		94/384	98/27	94/188

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