

Composition of the Essential Oil of the Root of *Heracleum persicum* from Iran

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Abstract

The essential oil of the root of *Heracleum persicum* (Apiaceae) was analyzed by capillary GC and GC /MS. The major constituents were identified as viridiflorol (23.05 %), elemol (3.63 %), β -maliene (3.07 %), spathulenol (3.34 %) and 2-tetradecanol (3.38 %).

Keywords: *Heracleum persicu*; Umbelliferae; Essential oil; Viridiflorol; β -maliene; Elemol.

Introduction

Heracleum genus has 10 species in Iran. *H. persicum* Desf. Ex Fischer (syn. *H. pubescens* Rech., *H. glabrescens* Boiss. & Hohen.) (Apiaceae) is an annual herb, indigenous to the Alborz region, the northern part of Iran, where it grows at an altitude ranging from 2000 to 3000 m (1). Its fruits are used commonly in Iran as spices, while the fruits and the young shoots are used in the preparation of pickles. In folk medicine, the fruits were administered because of their carminative activity (2).

A search through the literature revealed that roots of *H. persicum* have been investigated because of their furanocoumarins; five of which compounds were isolated and identified (3). Another report dealt with the presence of such compounds in leaves and seeds of this species (4) (from the seeds, six furanocoumarins were isolated, two of which were also found in the leaves). From the diethyl ether extracts of the fruits of *H. persicum*, an aglycone was identified which was revealed to be quercetin (5).

The essential oil from of fruits (6) and leaves (7) of *H. persicum* was investigated by

means of GLC, GC/MS, and NMR. The fruit oil contained about 95 % of aliphatic esters, 4 % of aliphatic alcohols and 1 % of monoterpenes 37 esters and 17 monoterpenes were also identified (6). Major component in the leaf oil was trans-anethole. Other components were β -pinene, *p*-cymene, terpinolene, α -caryophyllene, α -bergamotene, α -farnesene, zingiberene, spathulenol, cis-anethole, stragole, 2,5-dimethyl styrene and β -springene (7). The oil analysis of some genus *Heracleum* has been reported, previously (8-14). Literature review show that, the chemical composition of the oil of *H. persicum* root has not been studied so far. The main aim of this article was identification and determination of essential oil components of this plant.

Experimental

Plant Material

Roots of *Heracleum persicum* Desf. Ex Fischer were collected in Chalous Road (north of Tehran) in August 1996, at altitude 2400m. Voucher specimens were authenticated and then deposited in the Herbarium of the Department of Pharmacognosy, Shaheed Beheshti University of Medical Sciences (Voucher No. 15).

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Essential oil Extraction

The air-dried roots of the plant were subjected to hydrodistillation for 3 h using a clevenger- type apparatus.

The oil was analyzed using GC/FID HP 6890 fitted with a 30-m x 0.25 mm

HP5 column, that was temperature programmed as follow: 60°C (2min) to

240°C (5 min) at 5°C/min, with He as carrier gas (1 ml/min), the temperature of the injector and detector were 260°C and 230°C, respectively.

GC/MS: HP 5973 with a HP 5 column, 25 mm x 0.25 mm (film thickness

0.25 µm) was used. The operation conditions were as described above. The ionization voltage was 70 eV. Identification of compounds was based on a comparison of their mass spectra with Standards (15). Confirmation of compound identities was obtained using retention index (15).

Results and Discussion

Hydrodistillation of dried roots of *H. persicum* in a clevenger-type apparatus yielded 0.13 % yellowish color and a strong odor. As it is shown in Table 1, ca 61% (45 compounds) of the oil was identified. It also showed that the main constituent was viridiflorol (23%). Other major components (>1%) were α-pinene, β-pinene, n-octanal, *p*-cymene-8-ol, (E, Z)-α-farnesene, 2-tetradecanol, kessane, (-)-spathulenol, β-maliene, β-selinene, α-amorphene and elemol. β-Pinene, α-terpinene and dihydrocarveol have been detected in the root oil of *H. canescens* as major components (13). Terpinen-4-ol and α-terpinene in the root oil of *H. ponticum*, and allo ocimene (cis and trans) in the root oil of *H. lehmaniannum*, were detected, too (14). Among of components identified in root, 1-hexanol, α-pinene, limonene, cis-ocimene and linalool in fruit, and α-terpinolene, E-anethol, E-α-bergamotene, spathulenol, Z- and E-α-farnesene in leaves of *H. persicum* have been reported, previously. β-pinene exists in root, leaves and fruits of the plant (3, 7). Viridiflorol was reported in some of essential oils, previously (16-22).

Table 1. Chemical composition of the root oil of *Heracleum persicum* Desf. ex Fischer

Compound	RI	percentage	Identification Method
1-Hexanol	867	0.08	GC/MS
Heptanal	904	0.29	GC/MS
α-Pinene	952	1.14	GC/MS
1-Heptanol	965	0.12	GC/MS
β-Pinene	975	1.11	GC/MS
2-Pentyl furane	990	0.19	MS
n-Octanal	1003	1.04	GC/MS
Limonene	1026	.34	GC/MS
cis-Ocimene	1034	.11	GC/MS
1-Octanol	1067	.18	GC/MS
α-Terpinolene	1086	.57	GC/MS
Linalool	1098	.21	GC/MS
n-Nonanal	1102	0.29	GC/MS
Verbenol*	1141	.32	GC/MS
<i>p</i> -Cymen-8-ol	1183	1.78	GC/MS
α-terpineol	1189	0.33	GC/MS
Myrtenol	1193	0.62	GC/MS
trans-Piperitol	1205	0.19	GC/MS
trans-Carveol	1217	0.22	GC/MS
1-Ethyl-2, 4-dimethyl benzene	-	0.17	MS
Phellandral	1227	0.13	MS
trans-2-Decenal	1258	0.48	GC/MS
trans-Anethole	1281	0.98	GC/MS
Thymol	1290	0.45	GC/MS
2-Dodecanol	1298	0.78	GC/MS
(E, E)-2, 4-Decadienal	1312	0.29	GC/MS
α-Copaene	1368	0.14	GC/MS
2-Dodecanol	1395	0.21	GC/MS
trans-α-Bergamotene	1428	0.54	GC/MS
Ar-curcumene	1474	0.43	GC/MS
(E, Z)-α-Farnesene	1487	1.73	GC/MS
2-Tetradecanol	1496	3.38	GC/MS
Myristicin	1514	0.88	GC/MS
Kessane	1520	1.69	GC/MS
Hedycariol	1537	0.36	MS
Nerolidol	1552	0.52	GC/MS
(-)-Spathulenol	1564	3.34	GC/MS
Calarene	-	0.63	MS
β-Maliene	-	3.67	GC/MS
β-Selinene	-	1.42	GC/MS
α-Amorphene	-	2.44	MS
Viridiflorol	1583	3.05	GC/MS
Elemol	-	3.63	GC/MS
Cyclotetradecane	1657	0.84	GC/MS
Valerenol	1660	0.60	MS

* isomer was not identified.

Acknowledgements

We are grateful to Dr. M. R. S. Ardakani, Department of Pharmacognosy, school of Pharmacy, Tehran University of Medical Sciences, Tehran, for his collaboration in GC/MS experiment.

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