

## COMPOSITION OF THE FRUIT ESSENTIAL OILS OF FOUR *Heptaptera* SPECIES GROWING IN TURKEY\*

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UDC 547.913

The genus *Heptaptera* Marg. & Reuter (Umbelliferae) includes 11 species worldwide; among them, *H. cilicica* (Boiss. & Bal.) Tutin, *H. anisoptera* (D.C.) Tutin, *H. anatolica* (Boiss.) Tutin, and *H. triquetra* (Vent.) Tutin are growing in Turkey [1]. *H. cilicica* (Boiss. & Bal.), which grows only in Icel, South Anatolia, is an endemic species to Turkey. *H. anisoptera* (D.C.) Tutin is a species that has a wide distribution in Turkey, W. Iran, N. Iraq, W. Syria, and Palestine, while *H. anatolica* (Boiss.) Tutin is distributed in Turkey and Yugoslavia. *H. triquetra* (Vent.) Tutin is a species that has a limited distribution in Turkey and Bulgaria [2]. In Turkey *H. anisoptera* (D.C.) Tutin has a wider distribution than *H. anatolica* (Boiss.) Tutin and *H. triquetra* (Vent.) Tutin.

*Heptaptera* genus, which shows the general Umbelliferae characteristics, is very similar to the genus *Prangos*. It only differs from the latter with respect to its fruit, which is strongly compressed dorsally and asymmetrical, and with its stylopodium as wide as the fruit.

Although *Prangos* genus has ethnobotanical applications in Turkey and in the world, *Heptaptera* genus is not used for any purpose.

The present work reports on the essential oil composition of four *Heptaptera* species from Turkey: *H. cilicica*, *H. anisoptera*, *H. triquetra*, and *H. anatolica*. The essential oils were analyzed by gas chromatography (GC) and gas chromatography-mass spectrometry (GC/MS) systems, to the best of our knowledge, for the first time. The detected components of the essential oils of *Heptaptera* species and their relative percentages are given in Table 1 according their relative retention indices (RRI). Sixty-three components were characterized, representing 90.7% of the *H. cilicica* oil, with nonacosane (38.7%), heptacosane (11.0%), pentacosane (6.2%), hexahydrofarnesyl acetone (4.8%), and (*E*)-geranyl acetone (3.5%) as the main constituents. A total of twenty-eight compounds were characterized in *H. anisoptera* essential oil, representing 97.6% of the total oil. This oil was characterized by a relatively high content of nonacosane (69.0%). Heptacosane (9.5%), hexadecanoic acid (6.9%), pentacosane (2.3%), and octacosane (1.6%) were the other main components. The main components of the essential oil of *H. triquetra* were nonacosane (42.0%), heptacosane (25.6%), hexadecanoic acid (5.5%), octacosane (3.3%), hexahydrofarnesyl acetone (2.6%), and (*E*)-geranyl acetone (1.2%). Forty-seven components were characterized in *H. triquetra* essential oil, representing 96.4% of the total oil. Analysis of the *H. anatolica* oil revealed thirty-five components, representing 83.8% of the total oil. This oil was characterized by nonacosane (24.1%) and heptacosane (23.3%). To the best of our knowledge, according to a literature survey there is no report on the essential oil constituents of *Heptaptera* species.

*Heptaptera cilicica*, *H. anisoptera*, *H. triquetra*, and *H. anatolica* were collected in different localities of Turkey (Table 2). Voucher specimens are kept at the Herbarium of Ankara University, Faculty of Pharmacy, Ankara, Turkey (AEF).

\*This work was presented in the 7<sup>th</sup> Plant Life of Southwest Asia Symposium (7<sup>th</sup> PLoSWA) held between June 25–29, 2007 at Anadolu University, Eskisehir, Turkey.

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TABLE 1. The Composition of the Essential Oils of Fruits of *Heptaptera* ssp., %

Compound	RRI*	<i>H. cilicica</i>	<i>H. anisoptera</i>	<i>H. triquetra</i>	<i>H. anatolica</i>
Decane	1000	0.4	0.5	0.4	–
Hexanal	1093	–	–	–	0.4
Undecane	1100	Tr.	0.3	0.2	–
Dodecane	1200	0.2	0.2	0.3	–
2-Pentyl furan	1244	0.1	–	0.1	0.2
6-Methyl-5-hepten-2-one	1348	0.2	–	–	–
2-Butoxy ethanol	1395	0.7	0.4	0.2	–
Nonanal	1400	0.2	–	0.1	0.2
Tetradecane	1400	–	Tr.	0.1	0.1
4,8-Dimethyl-1,3,7-nonatriene	1417	1.0	–	0.3	–
$\alpha$ -Copaene	1497	0.2	–	–	–
Pentadecane	1500	–	–	0.2	–
Decanal	1506	0.4	–	–	0.2
$\alpha$ -Gurjunene	1544	0.2	–	–	–
( <i>E</i> )-2-Nonenal	1548	0.2	–	–	–
1-Tetradecene	1549	0.1	–	–	–
Linalool	1553	–	–	–	0.5
Octanol	1562	0.2	–	–	–
Hexadecane	1600	0.3	0.2	0.3	Tr.
$\beta$ -Caryophyllene	1612	0.5	–	–	–
1-Hexadecene	1654	0.4	0.2	0.3	–
( <i>E</i> )-2-Decenal	1655	–	–	–	0.3
( <i>Z</i> )- $\beta$ -Farnesene	1668	0.4	–	0.2	Tr.
Heptadecane	1700	0.2	–	0.1	Tr.
$\gamma$ -Muurolene	1704	0.3	–	–	–
$\alpha$ -Terpineol	1706	–	–	–	0.2
Germacrene D	1726	0.5	–	–	–
( <i>Z,E</i> )- $\alpha$ -Farnesene	1737	0.4	–	0.1	0.3
$\alpha$ -Muurolene	1740	0.4	–	0.1	0.3
Geranial	1742	0.4	–	–	–
Bicyclogermacrene	1755	1.0	–	–	–
Naphthalene	1763	1.2	–	3.4	–
( <i>E</i> )-2-Undecenal	1764	0.2	–	0.2	0.4
$\delta$ -Cadinene	1773	1.2	–	0.3	–
$\gamma$ -Cadinene	1776	0.4	–	0.1	–
Octadecane	1800	0.2	0.3	0.2	0.7
( <i>E,E</i> )-2,4-Decadienal	1827	0.5	–	0.1	0.3
1-Octadecene	1852	0.2	–	0.1	–
Germacrene B	1854	0.2	–	–	–
( <i>E</i> )-Geranyl acetone	1868	3.5	0.2	1.2	1.5
Nonadecane	1900	0.3	0.2	0.2	0.3
Eicosane	2000	0.4	0.3	0.2	0.3
2-Pentadecanone	2036	–	–	–	0.1
( <i>E</i> )-Nerolidol	2050	0.3	0.2	0.2	0.8
Germacrene D-4 $\beta$ -ol	2069	Tr.	–	0.1	–
Elemol	2096	1.2	–	–	–
Heneicosane	2100	0.7	0.4	0.7	0.7
Viridiflorol	2104	0.3	–	–	–
Hexahydrofarnesyl acetone	2131	4.8	0.9	2.6	7.0
3,4-Dimethyl-5-pentylidene-2(5H)-furanone	2179	0.6	–	0.1	0.4
$\gamma$ -Eudesmol	2185	0.7	–	–	–
T-Cadinol	2187	0.3	–	–	–
Thymol	2198	–	–	–	0.2
Docosane	2200	Tr.	0.4	0.1	0.4
T-Muurolol	2209	0.3	–	0.3	–
Carvacrol	2239	–	0.2	0.3	0.6

TABLE 1 (Continued)

Compound	RRI	<i>H. cilicica</i>	<i>H. anisoptera</i>	<i>H. triquetra</i>	<i>H. anatolica</i>
(2Z,6E)-Farnesal	2246	Tr.	–	0.1	–
$\alpha$ -Eudesmol	2250	0.9	–	–	–
$\alpha$ -Cadinol	2255	–	–	0.2	–
$\beta$ -Eudesmol	2257	1.9	–	–	–
(2E,6E)-Farnesal	2278	0.7	–	0.4	1.4
Tricosane	2300	0.7	1.2	0.7	1.5
(2E,6E)-Farnesol	2369	0.4	0.5	0.3	–
Farnesyl acetone	2384	Tr.	Tr.	–	–
Tetracosane	2400	Tr.	Tr.	0.2	–
Pentacosane	2500	6.2	2.3	2.6	8.5
Hexacosane	2600	0.4	0.5	1.1	0.8
1-Octadecanol	2607	–	0.4	0.3	–
Phytol	2622	0.9	0.8	0.7	–
Heptacosane	2700	11.0	9.5	25.6	23.3
Octacosane	2800	2.5	1.6	3.3	1.7
Nonacosane	2900	38.7	69.0	42.0	24.1
Hexadecanoic acid	2931	Tr.	6.9	5.5	6.1
Identified compound		63	28	47	35

\*RRI: relative retention indices calculated against *n*-alkanes.

Tr.: trace (< 0.1%).

TABLE 2. Information on the Plant Materials

<i>Heptaptera</i> spp.	Collecton site	Altitude, m	Collection period	Oil yield, %*
<i>H. cilicica</i>	Icel, between Tarsus and Camliyayla, Beylice village, rocky slopes	540	04.07.2006	Tr.
<i>H. anisoptera</i>	Erzincan, road from Tercan to Erzurum, after Yaylacik village, rocky places	1550	24.07.2006	Tr.
<i>H. triquetra</i>	Saray, Gungormez village, around and in cemetery, under oak trees	234	22.07.2006	Tr.
<i>H. anatolica</i>	Mugla-Milas road, from Yatagan 7 km, road side and in cemetery	530	07.07.2007	Tr.

\*Essential oil yields are given on moisture free basis (v/w).

Tr.: trace (<0.1%).

## REFERENCES

1. <http://www.ipni.org/index.html>.
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