

INVESTIGATION OF THE VOLATILE OIL OF *HERTIA ANGUSTIFOLIA* (DC.) O. KUNTZE

SULEIMAN AFSHARYPUOR*, MARYAM MOSAFFA JAHROMY* and MOHAMMAD REZA RAHIMINEZHAD**

*Faculty of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran
** Faculty of Sciences, Department of Botany, University of Isfahan, Isfahan, Iran

ABSTRACT

The composition of the volatile oil of the aerial parts of *Hertia angustifolia* (Compositae) was determined by GC/MS and retention index. The main constituents of the monoterpene fraction of the oil were: β -pinene (51.5%), β -phellandrene (16.5%), α -pinene (13.9%) and α -thujene (2.7%). Percentage of the detected sesquiterpene components was relatively low.

Key words: *Hertia angustifolia* (DC.), *O. kuntze*, Compositae, Volatile oil, β -Pinene, β -Phellandrene, α -Pinene

INTRODUCTION

In Iran, the genus *Hertia* Lees. (Compositae) has only two species which are mostly distributed in the desert areas (1). As part of our screening program in searching the new sources of aromatic plants from different parts of Iran, we investigated the oil of *Hertia angustifolia* (DC.) Kuntze. It is a very much branched shrub that reaches a height of about 20-40 cm. The branches are white when they are young and become grayish on aging. The leaves are fleshy, narrowly linear form and somewhat obtuse. The flowers are golden yellow and the fruit is an achene, 6 mm long, grayish, having many ridges and covered with fairly coarse and stiff long erect or ascending straight hairs (2). *Hertia angustifolia* grows wild in Tehran, Isfahan, Kerman and Yazd provinces of Iran (2). So far nothing is known about the constituents of the volatile oil of this plant. However, there are reports indicating the presence of some sesquiterpenoids namely cremophilenolides and furoeremophilanes in the aerial parts of *Hertia pallens* (3) and *Hertia cheirifolia* (4). This is the first report on the essential oil constituents of *Hertia angustifolia* growing wild in Isfahan (Iran).

MATERIALS AND METHODS

Plant Material: Aerial parts of *Hertia angustifolia* (DC.) O. Kuntze were collected in June 1998 from a wild population growing in Isfahan (Iran) at an altitude of 1710 m. The plant was identified in the Botany Department of the Faculty of Sciences at the University of Isfahan (Iran), and a voucher specimen (No. 2151) was deposited in the Herbarium of

Pharmacognosy Department, Faculty of Pharmacy & Pharmaceutical Sciences at the Isfahan University of Medical Sciences (Iran).

Oil Preparation: The air-dried powdered plant material was steam-distilled for 4h. A pale greenish yellow essential oil was obtained which exhibited the following physical properties: η^{25} : 1.4760; d^{25} : 0.961.

GC/MS Analysis: Analysis of 0.1 μ l of the oil was performed on a Hewlett Packard 6890 GC/MS instrument under the following conditions: HP-5 MS capillary column (30 mX 0.25 mm i.d., coating thickness 0.25 μ m); carrier gas: He, flow rate: 2 ml/min, injector temperature: 250°C, temperature program: 60-275°C at 4°C/min; mass spectra: electronic impact, ionization potential 70 eV, ion source temperature: 250°C, ionization current: 1000 μ A, resolution: 1000, and mass range 30-300.

Identification of the constituents was based on computer matching against the library spectra (Library Database Wiley 275), their retention indices with reference to an n-alkane series in a temperature programmed run and by comparing their mass spectra with the literature data (5).

RESULTS AND DISCUSSION

The air-dried aerial parts of *Hertia angustifolia* yielded 1.09% (v/w) volatile oil. Thirty-eight constituents representing about 95% of the total oil were identified (Table 1). The oil was consisted of two fractions, namely monoterpene and sesquiterpene fractions. The most abundant constituents of the monoterpene fraction which amounted 89.3% were

Table 1. Composition of the volatile oil of *Hertia angustifolia* (DC) O. Kuntze. Growing wild in Isfahan (Iran)

Components	Retention Indices	Frequency	Components	Retention Indices	Frequency
α -thujene	931	2.7	Terpin-4-ol	1177	<0.1
α -pinene	939	13.9	Cryptone	1186	<0.1
Camphene	951	<0.1	α -terpineol	1190	<0.1
2,4[10]-thujadiene	957	<0.1	Myrtenol	1195	0.7
Sabinene	975	<0.1	β -bourbonene	1384	0.5
β -pinene	986	51.5	β -elemene	1392	0.9
Myrcene	991	1.6	Trans caryophyllene	1419	0.4
α -phellandrene	1005	0.2	β -gurjunene	1429	<0.1
α -terpinene	1018	0.3	Aromadendrene	1442	<0.1
ρ -cymene	1026	0.6	α -humulene	1455	0.2
β -phellandrene	1033	16.5	Dehydro-aromadendrene	1457	<0.1
Trans - β -ocimene	1049	0.2	Cis muurola-4(14),5-diene	1464	<0.1
γ -terpinene	1060	0.3	Drima-7,9(11)diene	1470	<0.1
Terpinolene	1088	<0.1	γ -himachalene	1476	<0.1
Methyl benzoate	1091	<0.1	Germacrene-D	1481	2.2
Trans thujone	1117	<0.1	β -selinene	1485	0.9
α -campholenal	1127	<0.1	α -selinene	1494	<0.1
Trans pinocarveol	1140	0.5	δ -cadinene	1524	<0.1
Pinocarvone	1164	0.3	Cis arteannuic alcohol	1588	0.3

β -pinene, 51.5%; β -phellandrene, 16.5%; α -pinene, 13.9%; and β -thujene, 2.7% were the most abundant constituents. β -Pinene is found in turpentine and most essential oils, which contain α -pinene (6). It is a flavouring ingredient and is an important intermediate in manufacturing of synthetic aroma compounds (7). β -Phellandrene that is one of the other major constituents of the examined oil is an important flavour ingredient and has been found widely distributed in essential oils of *Angelica*, *Eucalyptus*, *Lavandula*, *Mentha*, and *Pinus* species (7). The third major constituent of the oil, namely α -Pinene, is a

valuable monoterpene hydrocarbon used in the manufacture of camphor, insecticides, solvents, plasticizers, perfume bases and synthetic pine oil (6). The sesquiterpene fraction consisted of fifteen components. Germacrene-D, 2.2% was the most abundant constituent of this fraction. The aerial parts of *Hertia pallens* were reported to contain Germacrene-D (3). From the results of this investigation it appears that the examined volatile oil can be used at least as a good source of β -pinene, β -phellandrene and α -pinene.

REFERENCES

1. Mozaffarian, V. (ed.) (1996) A Dictionary of Iranian Plant Names, Farhang Mo'aser, Tehran, p. 273.
2. Rechinger, K.H. (ed.) (1989) Flora Iranica, No. 164: Compositae VII, Akademische Druck-u. Verlagsanstalt, Graz, Austria, p. 96.
3. Jakupovic, J., Bohlmann, F., Grenz, M. (1989) Furoeremophilanes from *Hertia pallens*. *Phytochemistry*, 28:3231-3232.
4. Massiot, G., Nuzillard, J.M., MenOliver, L.L., Aclinou, P., Benkouider, A., Khelifa, A. (1990) Eremophilenolides from *Hertia cheirifolia*. *Phytochemistry* 29:2207-2210.
5. Adams, R.P. (1995) Identification of essential oils by gas chromatography/ mass spectroscopy, Allured Publishing Corporation, Carol Stream, Illinois.
6. Budavari, S. (1996) The Merck Index, 12th edn, Published by Merck Research Laboratories, Division of Merck & Co., Inc., New Jersey, p. 1281.
7. Buckingham, J. (ed.) (1994) Dictionary of Natural Products, Vols. 4 and 5, 1st edn, Chapman & Hall, London, PP. 3820, 5625 and 5917.