Chemistry of Natural Compounds, Vol. 48, No. 2, May, 2012 [Russian original No. 2, March–April, 2012]

COMPOSITION AND EXTRACTION OF ESSENTIAL OIL FROM *Rumex chalepensis* USING HYDRODISTILLATION

Hooshang Vahedi,* Jalil Lari, Maliha Nasrabadi, and Majid Halimi

UDC 547.913

The genus *Rumex* (Polygonaceae) comprises several species, whose leaves and roots have been used in traditional medicine for inflammation, blood purification, and constipation [1–3]. Because of their high oxalic acid content, they have been implicated in oxalic intoxication, mainly in children [2, 3]. The growing interest in many *Rumex* species has led to the study of their biological activities. Traditionally, *Rumex* plants are used as bactericidal [4], anti-inflammatory [5], antitumor, astringent antidermatitis [6], diuretic, cholagogue, tonic, and laxative agents [7].

A literature survey revealed that no chemical studies had been performed on the essential oil of *Rumex chalepensis* Miller.

The aim of our study was to evaluate the chemical composition of *Rumex chalepensis* essential oil.

From the aerial parts of *Rumex chalepensis* at the flowering stage, a yellowish oil was obtained at a yield of 0.03% (w/w). Thirty-three components were identified, accounting for 66.3% of the total oil. *p*-Menth-2-en-ol (18.8%) was determined as the major constituent in the extract. The other major components in the oil of *Rumex chalepensis* were identified as dibutyl phthalate (6.5%), fleximel (4.3%), and dodecane (3.4%). It was also confirmed that the oxygenated and non-oxygenated terpenes made up 20.5% and 1.2% of the extract, respectively. The percentage composition of the various oil components is listed in Table 1.

Plant Material. Arial parts of *Rumex chalepensis* were collected at the flowering stage from Southern Khorasan, Birjand, Iran, in June 2010, and identified at the Research Center for Plant Sciences, Ferdowsi University of Mashhad, Iran. A voucher specimen has been deposited in the Herbarium of Research Center for Plant Sciences.

Isolation of the Essential Oil. Arial parts of *Rumex chalepensis* were air-dried for 5 days before isolation of essential oil. The plant material (100 g) was cut into small pieces and the essential oil obtained by hydrodistillation with a Clevenger-type apparatus until there was no significant increase in the volume of the oil collected (6 h). The yield of the yellow oil was 0.03% (w/w) based on the dry weight of the plant.

GC and GC-MS Analysis. GC analysis of the oil from the aerial parts of the plant was performed using a Shimadzu GC-MS-QP (2010) gas chromatograph equipped with flame ionization detector (FID) and an RTx-5MS column (95% diphenyl–5% dimethylpolysiloxane, 15 m × 0.25 mm.i.d., film thickness 0.25 μm). The oven temperature was programmed to 35–280°C at a rate of 5°C/min; the carrier gas was helium with a flow rate of 1 mL/min, and the sample was injected using the split sampling technique 1:10. The percentage composition of the oil was calculated automatically from peak areas without any correction. Retention indices (RI) were determined by comparing with the retention times of a series of *n*-alkanes with linear interpolation. Identification of each component was confirmed by comparison of its retention index either with those of authentic compounds or with data in the literature [8–10].

Chemistry Department, Payame Noor University, 19395-4697 Tehran, I. R. of Iran, fax: +98 511 8683001, e-mail: h_vahedi@pnu.ac.ir; hooshangvahedi@yahoo.co.uk. Published in *Khimiya Prirodnykh Soedinenii*, No. 2, March–April, 2012, pp. 293–294. Original article submitted January 6, 2011.

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TABLE 1. Percentage Composition of the Essential Oil Isolated from Aerial Parts of *Rumex chalepensis*

Compound	RI	%	Compound	RI	%
Ethylbenzene	868	0.7	Tetratetracontane*	1898	0.4
p-Xylene	883	3.0	*E,E*-Farnesyl acetone	1919	0.8
2-Nonanol	7098	0.5	Methyl palmitate	1928	0.4
2,6-Dimethyloctane	933	0.5	Dibutylphthalate	1965	6.5
Nonanal	1107	0.8	Eicosane	1911	0.9
Dodecane	1095	3.4	D-Neoisomenthol	2069	0.3
Tetradecane	1399	1.9	Nonadecane	2098	0.8
1-Bromonaphthalene*	1463	2.8	Phytol	2115	0.6
Pentadecane	1499	0.5	Docosane	2198	0.7
2,6-Bis(1,1-dimethylethyl)-4-methylphenol	1511	1.7	Tricosane	2298	1.0
α-Copaene	1520	0.6	Tetracosane	2398	1.3
1-Bromo-2-methylbutane*	1596	0.5	Fleximel*	2553	4.3
Hexadecane	1598	1.1	Hexacosane	2597	1.8
trans-β-Farnesene	1684	0.6	Octadecane	2698	1.6
p-Menth-2-en-1-ol	1693	18.8	*E*-15-Heptadecane	2797	1.2
Octadecane	1798	0.7	Total		66.3
Pentadecanone	1847	3.1			
1,2-Benzene dicarboxylic acid, *bis* (2-methylpropyl) ester	1870	2.5			

RI: retention indices on RTx-5MS. Method of identification – MS-GC; *method of identification – MS.

ACKNOWLEDGMENT

We are grateful to Mr. M. R. Joharchi from Ferdowsi University of Mashhad Herbarium (FUMH), Mashhad for the collection and identification of plant materials. The authors are grateful to Payame Noor University (PNU) for financial support.

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