Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Archives of Applied Science Research, 2009, 1 (2) 115-118
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0975-508X

Composition of the essential oil of *Rhanterium adpressum* Coss. and Durieu. from Algeria

Ali Kala[a], Noureddine Gherraf*[b], Djebellah Belkacemi[b], Segni Ladjel[c], Amar Zellagui[b], Hameurelain Samir[c], Soumia Chihi[c], Labed Brahim[c]

[a]Larbi Tebessi University, Tebessa Algeria
[b]Larbi Ben Mhidi University, Chemical Department, OEB Algeria
[c]UKMO University Ouargla, Algeria

Abstract

The water distilled essential oils from the aerial parts of *Rhanterium adpressum* Coss. & Durieu. was analyzed by GC/MS. The oil was characterized by the presence of high amounts of Spathulenol (19.6%), β-Eudesmol (15.2%), Bicyclo[4.4.0]dec-1-ene, 2-isopropyl-5-methyl-9-methylene (12.9%), β-Cadinol (11.3%), α-Cadinol (6.56 %), α-Eudesmol (5.37 %), Myristicin (5.05 %), 2H-Pyran-3-ol, and tetrahydro-2-(1,7-nonadiene-3,5-diynyl) (4.81 %). Nevertheless, some other compounds were only present in minor amounts such as n-Tridec-1-ene (0.54), n-Hexadecan-1-ol (0.52), 1-Butyl 2-(2-ethylhexyl) phthalate (0.59). In total, volatile oil composition of *Rhanterium adpressum* was characterized as a rich source of sesquiterpeniod compounds.

Key words: *essential oils, Rhanterium adpressum, GC-MS Analysis,* Spathulenol, β-Eudesmol

---

Introduction

Rhanterium adpressum Coss. & Durieu. is a member of the Asteraceae family. The genus *Rhanterium* [1] is distributed over western North Africa, the Arabian Peninsula, Iraq and Iran. There have been reported 7 species for this genus: *R. adpressum*, *R. apressum*, *R. epapposum*, *R. eppaposum*, *R. incrassatum*, *R. squarrosum* and *R. suaveolens.* Another accepted species, *R. intermedium* Coss. & Durieu ex Pomel, is considered to be a hybrid between *R. adpressum* and *R. suaveolens* . *Rhanterium adpressum* is native to the desert of Algeria where it is locally known as *Arfaj.* It consists of a complicated network of branches scattered with small thorny leaves and bright yellow flowers [2,3] .

There is no previous study on *the volatile oil composition of Rhanterium adpressum*. However some studies have been reported on the species *Rhanterium epapposum oliv* where

Yaghmai and Kolbadipour investigated its volatile components and identified the major components as α- and β-phellandrenes, linalol, geraniol, bulnesol [4]. Another study has been carried out on the toxicity of the same species on male Wistar rats and proved that depression in growth and hepatonephropathy were severe in rats fed diets containing 100 and 200 g/kg of *R. epapposum* aerial parts [5]. Other studies have focused on the nutrient content of the plant [6].

In the present study we seek to identify the volatile oil components of *Rhanterium adpressum* as a widespread plant in Algerian Sahara.

Materials and Methods

Plant Material

The aerial parts of *Rhanterium adpressum* were collected in April 2007 in the outskirts of Ghardaia (500 km south of Algiers). A voucher specimen was deposited in the herbarium of the VPRS laboratory at Ouargla University. One kg of the plant material was air-dried under shade and subjected to hydrodistillation procedure as described in many references[7] to give 2.5 g (0.25 %) of crude oil.

Analytical Conditions

Gas chromatography/mass spectrometry (GC/MS)

The oil was analyzed by GC/MS using a Agilent 5973EI mass selective detector coupled with an Agilent GC6890A gas chromatograph, equipped with a cross-linked 5% PH ME siloxane HP-5MS capillary column (30 m × 0.25 mm, film thickness 0.25 µm). Operating conditions were as follows: carrier gas, helium with a flow rate of 1mL/min; column temperature 50 °C for 1 min, 50°C to 150°C (3 °C /mn), 150°C to 250°C (5°C/mn) then isothermal for 5 min.

Injector and detector temperatures, 280ºC; split ratio, 1:50.

The MS operating parameters were as follows: ionization potential, 70 eV; ionization current, 2 A; ion source temperature, 200ºC; resolution, 1000.

Identification of components

Identification of oil components was achieved on the basis of their retention indices RI, (determined with reference to a homologous series of normal alkanes), and by comparison of their mass spectral fragmentation patterns with those reported in the literature [8] and stored on the MS library (NIST database). The concentration of the identified compounds was computed from the GC peak total area without any correction factor.

Results and Discussion

The identified compounds represented 97.7 % of the total content of volatile compounds from *Rhanterium adpressum* aerial parts. The oil composition is more or less dominated by the sesquiterpenes 83.33%. Among the sesquiterpenes, less oxygenated compounds constituted the major part of the whole sesquiterpenoid compounds (76.22%).

Table 1: Results of GC-MS analysis of *Rhanterium adpressum* volatile oil

Compounds	Essential oil	%
Acid 2,2-dimethylbutanoic	fat acid	0.38
n-Hexadecan-1-ol	Oxygenated monoterpenes	0.52
n-Tridec-1-ene	Hydrocarbon monoterpenes	0.54
Myristicin	aromatic monoterpenes	5.05
1-[2-(2-Methoxy-1-methylethoxy)-1-methylethoxy]-2-propanol	Oxygenated monoterpenes	0.47
(-)-Spathulenol	Oxygenated monoterpenes	19.57
Cycloheptane, 4-methylene-1-methyl-2-(2-methyl-1-propen-1-yl)-1-vinyl-	Hydrocarbon sesquiterpenes	2.38
β-Humulene	Hydrocarbon sesquiterpenes	1.48
Apiol	aromatic monoterpenes	2.29
(-)-β-Cadinol	Oxygenated sesquiterpenes	11.34
Cyclohexane, 1,2-dimethyl-3,5-bis(1-methylethenyl)-	Hydrocarbon sesquiterpenes	1.39
Naphthalene, 1,2,3,4,4a,5,6,8a-octahydro-4a,8-dimethyl-2-(1-methylethylidene)-, (4aR-trans)	Hydrocarbon sesquiterpenes	1.62
Bicyclo[4.4.0]dec-1-ene, 2-isopropyl-5-methyl-9-methylene	Hydrocarbon sesquiterpenes	12.94
β-Eudesmol	Oxygenated sesquiterpenes	15.13
α-Eudesmol	Oxygenated sesquiterpenes	5.37
α -Cadinol	Oxygenated sesquiterpenes	6.56
E,Z-5,7-Dodecadien-1-ol acetate	Oxygenated monoterpenes	1.78
α-Limonene diepoxide	Oxygenated monoterpenes	1.80
1,2-Epoxy-5,9-cyclododecadiene	Oxygenated sesquiterpenes	1.32
1-Butyl 2-(2-ethylhexyl) phthalate	aromatic monoterpenes	0.59
2H-Pyran-3-ol, tetrahydro-2-(1,7-nonadiene-3,5-diynyl)	Oxygenated sesquiterpenes	4.81
Cedrylpropylether	Oxygenated sesquiterpenes	0.74
Dibutylphthalate	aromatic monoterpenes	0.87
Butyric, 2-tetradecylester acid	fat acid	0.31

Table 2: main class and subclasses of essential oil components of *Rhanterium adpressum*

Monoterpenes	Monoterpene hydrocarbons (%)	0.54	5.11
	Oxygenated monoterpenes (%)	4.57	
Sesquiterpenes	Sesquiterpene hydrocarbons (%)	19.81	83.33
	Oxygenated sesquiterpenes (%)	63.52	
Others	Aromatic derivatives of monoterpenes (%)	9.26	9.26
Total %			97.70

The monoterpene fraction is represented by a small amount (5.11 %), dominated by oxygenated compounds (4.57 %). The most abundant volatile oil compounds were respectively: (-)-Spathulenol (19.57 %), ß-Eudesmol (15.13 %), Bicyclo[4.4.0]dec-1-ene, 2-isopropyl-5-methyl-9-methylene 12.94 %, (-)-β-Cadinol 11.34 %, α –Cadinol 6.56 %, α-Eudesmol 5.37 %, 2H-Pyran-3-ol, Myristicin 5.05 % and tetrahydro-2-(1,7-nonadiene-3,5-diynyl) 4.81 %. In contrast only small amounts of Cedrylpropylether, n-Tridec-1-ene, n-Hexadecan-1-ol and β-Humulene were contained in the essential oil.

Conclusion

Based on the above study, it may be summarized that the flowering aerial parts of *Rhanterium adpressum* may be utilized for separation of the essential oil and a source of Oxygenated monoterpenes and sesquiterpenes such as Spathulenol (19.6%) and β-Eudesmol (15.2%).

Acknowledgments

We are grateful to Dr. Chahma A. M. university of Ouargla for his help in identifying the plant material as well as Jijel university center for GC-MS analyses.

References

[1] A Wiklund; *Botanical journal of the Linnean Society*, **1986**, 93*(2),* 231-246
[2] Quezel, Paul ; Santa , Nouvelle Flore de l'Algérie et des régions désertiques méridionales, C.N.R.S, Paris, **1963**
[3] Paul Ozenda, Flore du Sahara, 2nd edition, C.N.R.S, Paris, **1983**, pp 432
[4] M. S Yaghmai and S. Kolbadipou; *Flavour and Fragrance Journal*. **1987**, 2*(1),* 29-32
[5] S.I. Younis and S.E.I. Adam; *J. Pharmacology and Toxicology*; **2008**, 3*(2*), 134-140
[6] S.L.R. Al-Rowaily and H.A.S. Al-Hathlool.. *Journal of the Advances in agricultural Research*; **2004**, 9*(3),* 551-561
[7] Satyajit D. Sarker; Zahid Latif ; Alexander I. Gray, Natural Products Isolation, 2nd Ed, Humana Press Inc., Totowa, New Jersey, **2006**, pp. 29-37
[8] R.P. Adams. Identification of Essential Oil Components by Gas Chromatography/Mass Spectrometry, 4th Ed. Allured Publishing Corporation. Carol Stream, Illinois, **2007.**