SHORT REPORT

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Chemical Composition of the Essential Oil from *Artemisia arborescens* L. Growing Wild in Algeria

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Abstract: Essential oil extracted from dried aerial part of *Artemisia arborescens* L. collected from Bejaïa (Algeria), was analyzed by gas chromatography-flame ionization detector (GC-FID) and gas chromatography coupled to mass spectrometry (GC-MS). The main constituents of the essential oil were chamazulene (30.2%), β-thujone (27.8%), β-eudesmol (8.1%) and catalponol (5.5%).

Keywords: *Artemisia arborescens* L.; essential oil; GC-FID; GC-MS; chamazulene; β-thujone.

1. Plant Source

Artemisia arborescens L. is a medicinal and aromatic plant from the Asteraceae family. It grows wild in the maritime cliffs and the bushes of littoral hills [1]. The aerial part of *Artemisia arborescens* L. was collected from Bejaïa (Algeria) in April 2008. The specie was identified by the National Park of Gouraya (Bejaïa, Algeria) and a specimen was deposited, under *KBAA 064* number, in Laboratory of Organic Materials, Faculty of Technology, University of Bejaïa (Algeria).

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2. Previous Studies

According to the literature, there are two chemo-types of *Artemisia arborescens* L. essential oil. While the first one is a rich β-thujone and camphor type with more than 50% of these monoterpenic ketones, the proportion of chamazulene varies between 30 to 40% for the second one (rich chamazulene type), depending on the origin of the plant [2-5].

3. Present Study

The aerial part of the plant was dried in a shade and ventilated place, then crushed to obtain a homogeneous powder to increase the efficiency of its essential oil.

The essential oil was obtained by hydrodistillation from the aerial part in a Clevenger-type apparatus in 3 hours [6]. Dichloromethane (Biochem Chemopharma, 99% purity) was used to recover the oil from the extractor apparatus. The organic phase was dried using anhydrous sodium sulphate (Cheminova Internacional, S. A., 99% purity), and then the solvent was evaporated. The essential oil was kept at 4°C before analysis.

The essential oil of *Artemisia arborescens* L. was analyzed on an Agilent gas chromatograph (GC-FID) Model 6890, equipped with a HP-5ms fused silica capillary column having (5%-Phenyl)-methylpolysiloxane stationary phase (30 m length x 0.25 mm internal diameter and 0.25 µm film thickness), programmed from 50°C (5 min) to 250°C at 5°C/min and held for 5 min. Injector and flame ionisation detector temperatures were 280 and 300°C, respectively. The essential oil was diluted in acetone in 3.5% (v/v), and 1 µL was injected in split mode (1/60). Hydrogen was used as a carrier gas (1.0 mL/min). Solution of standard alkanes (C_8-C_{26}) was analyzed under the same conditions to calculate retention indices (RI) with Van Den Dool and Kratz equation [7].

Mass spectrometry was performed on an Agilent gas chromatograph-mass spectrometer (GC-MS) Model 7890/5975, programmed with the same conditions as for GC-FID (as described above). The mass spectrometer (MS) was in electron impact mode at 70 eV and electron multiplier was at 2200 V. Ion source and MS quadrupole temperatures were 230°C and 180°C, respectively. Mass spectral data were acquired in the scan mode in the *m/z* range 33-450. The essential oil constituents were identified by matching their mass spectra and retention indices (RI) with those of reference compounds from libraries such as Adams [8] and Mc Lafferty & Stauffer [9]. The proportions of the identified compounds were calculated by internal normalization.

The color of the essential oil from *Artemisia arborescens* L. aerial part is blue and the yield of hydrodistillation is 0.87% (w/w) in relation to the dry weight of the plant. Twenty one constituents were determined in the *Artemisia arborescens* L. essential oil, representing 90.5% of total content, the chemical composition of which is summarized in Table 1. The main constituents were found to be chamazulene (30.2%), β-thujone (27.8%), β-eudesmol (8.1%) and catalponol (5.5%). The major compound, chamazulene, gives the oil a blue characteristic color, percentage of which, as a constituent, varies depending on the geographical origin of the plant. Lo Presti et al. [4] reported the proportions of chamazulene in the *Artemisia arborescens* L. essential oil from three zones in Southern Italy as Calabria (27.1%), island of Lipari (34.6%) and Sicily (37.6%). Marongiu et al. [3] also indicated chamazulene with 26.64% in the hydrodistillation oil of *Artemisia arborescens* L.

In addition to our results above, we report the presence of β-thujone (27.8%) as a common element to several species of *Artemisia*, such as *A. absinthium* (13.7%) [10], *A. umbelliformis* Lam. (18.2%) and *A. petrosa* Baumg (16.8%) [11].

Although our results indicated that chamzulene is the main component, the current study requires to be extended to different locations to classify the essential oil of wild *Artemisia arborescens* L. grown in Bejaïa (Algeria) as a rich chamzulene type.

Table 1. Chemical composition of the essential oil from *Artemisia arborescens* L. growing wild in Algeria.

RI	Compound	% Composition
1102	α-thujone	0.6
1114	β-thujone	27.8
1177	terpinen-4-ol	1.8
1272	aldehyde perrilique	0.6
1294	undecan-2-one	2.0
1295	alcool perrilique	0.5
1377	α-copaene	0.1
1404	methyl eugenol	t
1411*	3,4-dimethyl cinnoline	0.4
1419	β-caryophyllene	0.6
1480	germacrene-D	1.2
1511*	nor β-calamenene	0.4
1581	oxyde de caryophyllene	0.6
1617*	2,2,3-trimethylnaphtalen-1(2H)-one	2.0
1628*	fonenol	0.9
1651	β-eudesmol	8.1
1692*	phenyl hydroquinone	0.9
1732	chamazulene	30.2
1734*	3,3'-dimethyldiphenyl	2.8
2024	catalponol	5.5
2396*	phtalate	3.5
	Total identified	**90.5**

RI: retention indices on DB-5 column (Adams); *: retention indices calculated for the identified compounds from Mc Lafferty & Stauffer library; t: trace (< 0.05%).

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References

[1] P. Quezel, S. Santa (1962-1963). Nouvelle flore de l'Algérie et des régions désertiques méridionales. Ed. du CNRS, Paris.

[2] T. Sacco, C. Frattini, C. Bicchi (1983). Constituents of Essential oil Artemisia arborescens, *Planta Med.* **47**, 49-51.

[3] B. Marongiu, A. Piras, S. Porcedda (2006). Comparative analysis of the oil and supercritical CO_2 extract of *Artemisia arborescens* L. and Helichrysum splendidum (Thunb.) Less., *Nat. Prod. Res.* **20**, 421-428.

[4] M. Lo Presti, M.L. Crupi, B.d'A. Zellner, G. Dugo, L. Mondello (2007). Characterization of Artemisia arborescens L. (Asteraceae) eaf-derived essential oil from Southern Italy, *J. Essent. Oil Res.* **19**, 218-224.

[5] C. Sinico, A. De Logu, F. Lai, D. Valenti, M. Manconi, G. Loy, L. Bonsignore, A.M. Fadda (2005). Liposomal incorporation of *Artemisia arborescens* L. essential oil and in vitro antiviral activity, *Eur. J. Pharm. Biopharm.* **59**, 161-168.

[6] K. Belhamel, A. Abderrahim, R. Ludwig (2008). Chemical composition and antibacterial activity of the essential oil of *Schinus molle* L. grown in Algeria, *Int. J. Essent. Oil Therap.* **2**, 175-177.

[7] J. Tranchant (1982). Manuel pratique de la chromatographie en phase gazeuse. 3e Ed. Masson, Paris.

[8] R.P. Adams (1995). Identification of essential oil components by gas chromatography/mass spectroscopy. Allured Publishing Co. Carol Stream, Illinois.

[9] F.W. Mc Lafferty, D.B. Stauffer (1991). The Wiley/NBS registry of mass spectral data. 5th Edition, J. Wiley and Son, New York.

[10] L.M. Khalilov, E.A. Paramonov, A.Z. Khalilova, V.N. Odinokov, A.A. Muldashev, U.A. Baltaev, U.M. Dzhemilev (2001). Identification and biological activity of volatile organic compounds emitted by plants and insects. IV. Composition of vapor isolated from certain species of Artemisia plants, *Chem. Nat. Comp.* **37**, 339-342.

[11] M. Mucciarelli, R. Caramiello, M. Maffei, F. Chialva (1995). Essential oils from some *Artemisia* species growing spontaneously in north-west Italy, *Flav. Fragr. J.* **10**, 25-32.

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