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Analysis of the essential oil of *Thymus numidicus* (Poiret) from Algeria

A. Kabouche,[1] Z. Kabouche,[1]* and C. Bruneau[2]

[1] **Laboratoire d'Obtention de Substances Thérapeutiques (LOST), Faculté des Sciences, Université Mentouri–Constantine, Campus Chaabet Ersas, 25000 Constantine, Algeria**
[2] **Université de Rennes 1, UMR 6509, Campus de Beaulieu, 35042 Rennes Cedex, France**

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ABSTRACT: The hydrodistilled essential oil of *Thymus numidicus* (Poiret), grown at Constantine (Algeria), was analysed by GC–MS. The essential oil was largely composed of thymol (68.2%) and carvacrol (16.9%), which are the highest percentages of phenols to be found in an essential oil from a *Thymus* species. Copyright © 2005 John Wiley & Sons, Ltd.

KEY WORDS: *Thymus numidicus*; Lamiaceae; essential oil; thymol; carvacrol

Introduction

Thymus numidicus (Poiret) (Arabic 'Zaatar') is an endemic species to northern Algeria and Tunisia. The genus *Thymus* (Family Lamiaceae, Subfamily Nepetoideae, Tribe Mentheae) is represented by more than 300 species; 12 species are distributed in Algeria,[1] nine of them endemic. *T. numidicus* is characterized by pink flowers and is well known in Algerian folk medicine for its expectorant, antitussive, antiseptic, antispasmodic and anthelmintic properties, as for many other *Thymus* spp.[2,3] The antifungal,[4] antibacterial,[5] antimicrobial and antioxidant[6] activities have also been established for *Thymus* essential oils. Previous investigations on *Thymus* essential oils revealed an abundance of monoterpene hydrocarbons and phenolic monoterpenes.[7–17] The present study deals with the analysis of the essential oil of *T. numidicus* (Poiret), which is reported for the first time.

Experimental

Plant Material

Dried aerial parts of *T. numidicus* were collected in May 2002 from the mountain Djebel El-Ouahch, Constantine (north-eastern Algeria), at an altitude of ca. 800 m on a clayey soil, by Mr Kamel Kabouche (Constantine) and authenticated by Professor Gérard De Belair (University Badji Mokhtar, Annaba, Algeria). A voucher specimen was deposited at the herbarium of the Laboratory of Therapeutic Substances, Faculty of Sciences, Mentouri-Constantine University, Constantine, Algeria (LOST ZKAK Tn 05/02).

The hydrodistillation of the dried aerial parts (100 g) of *T. numidicus* for 3 h in a Clevenger-type apparatus, according to the *European Pharmacopoeia*,[18] yielded 2.1% (w/w) of a yellow-orange good-smelling essential oil, which was dried over anhydrous sodium sulphate and, after filtration, stored at +4 °C until tested and analysed.

GC Analysis

GC analyses were performed using a Perkin-Elmer gas chromatograph equipped with two FIDs, a data-handling system and a vapourizing injector port, into which two columns of different polarities were installed: a DB-1 fused silica column (30 m × 0.25 mm i.d., film thickness 0.25 μm) and a DB-Wax fused silica column (30 m × 0.25 mm i.d., film thickness 0.25 μm). Oven temperature was programmed at 45–175 °C at 3 °C/min, then rising at 15 °C/min to 300 °C, then held isothermal (15 min); carrier gas, He at 1 ml/min.

GC chiral analyses were performed using a Perkin-Elmer gas chromatograph equipped with a FID, a data-handling system and a Cyclodex-B fused-silica column (30 m × 0.25 mm i.d., film thickness 0.25 μm) and a DB-Wax fused silica column (30 m × 0.25 mm i.d., film thickness 0.25 μm). Oven temperature was 75 °C isothermal, injector and detector temperatures, 230 °C and 240 °C, respectively; carrier gas, He at 1 ml/min.

GC–MS Analysis

GC–MS analyses were performed on a Perkin-Elmer apparatus equipped with a DB-1 fused silica column (30 m × 0.25 mm i.d., film thickness 0.25 μm) and interfaced

* Correspondence to: Z. Kabouche, Laboratoire d'Obtention de Substances Thérapeutiques (LOST), Faculté des Sciences, Université Mentouri–Constantine, Campus Chaabet Ersas, 25000 Constantine, Algeria.
E-mail: zkabouche@hotmail.com

with an ion trap detector (ITD; software 4.1). MS operating parameters were as follows: ion trap temperature, 220 °C; split ratio, 1:40; ionization potential, 70 eV; ionization current, 60 μA; scan range, 40–300 u, scan time, 1 s.

Identification of components was assigned by comparison of the retention indices (RI) relative to C_9–C_{17} *n*-alkanes and MS with corresponding database (NIST library) and with mass spectral literature.[19–21] Relative percentage amounts of the identified components were calculated from the total ion chromatograms by a computerized integrator.

Results and Discussion

The GC–MS analysis of the yellow-orange essential oil resulted in the identification of 40 components, representing 99.7% of the essential oil. As shown in Table 1, the major components were thymol (68.2%) followed by carvacrol (16.9%) and linalool (11.5%). The predominance of phenolic compounds was in agreement with previous results reported from *T. vulgaris* essential oil[4] mainly represented with thymol (63.6%), *p*-cymene (23.5%), γ-terpinene (4.3%) and carvacrol (2.2%) and from *T. pectinatus* essential oil,[6] which was characterized by thymol (49.8%) as the major component, followed by *p*-cymene (14.8%), γ-terpinene (16.1%) and carvacrol (3.7%). In contrast with our results, carvacrol (48.7%) instead of thymol (13.8%) was determined as the main component in the *T. serpyllum* essential oil.[5] From our results, the percentages of thymol (68.2%) and carvacrol (16.9%) seem to be the highest amounts of phenols to be found in a *Thymus* species.

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Table 1. Composition of the essential oil of *Thymus numidicus*

Compound	Percentage	Retention index
α-Pinene	t	930
Camphene	—	938
1-Octen-3-ol	0.1	961
β-Pinene	t	963
Myrcene	—	975
3-Octanol	—	993
p-Cymene	1.0	1003
Limonene	t	1009
γ-Terpinene	0.3	1035
trans-Linalyl oxide	t	1085
trans-Sabinene hydrate	0.3	1037
cis-Sabinene hydrate	t	1066
Linalool	11.5	1074
Camphor	t	1095
Borneol	0.1	1134
Isoborneol	t	1136
α-Terpineol	0.3	1159
Dihydrocarveol	t	1170
cis-Carveol	—	1189
Carvone	—	1206
Thymol	68.2	1275
Carvacrol	16.9	1286
Eugenol	t	1327
α-Cubebene	—	1345
α-Copaene	—	1375
β-Bourbonene	—	1379
α-Humulene	0.3	1447
γ-Muurolene	t	1469
Germacrene D	0.1	1474
β-Silene	t	1485
α-Muurolene	0.1	1494
α-Farnesene	t	1508
δ-Cadinene	—	1522
Caryophyllene oxide	0.3	1561
Spathulenol	—	1577
Unknown	t	1585
Cubenol	—	1600
α-Cadinol	0.1	1626
α-Bisabolol	0.1	1656
Myrcenyl acetate	t	1675
Octadecane	—	1800
Nonadecane	—	1900
Identified components (%)	99.7	
One unknown	t	

t, trace, <0.1%.

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