Thymus fontanesii Boiss. & Reut. – A Potential Source of Thymol-Rich Essential Oil in North Africa

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The waterdistilled essential oil from dried aerial parts of one of the Algerian thymes, *Thymus fontanesii* Boiss. & Reut. grown in Setif province, Algeria, was analyzed by GC/MS. Fifteen components were characterized representing 99.4% of the total components detected. The major components of the oil were thymol (67.8%), γ-terpinene (15.9%) and *p*-cymene (13.0%).

Key words: Thymus fontanesii, Essential Oil, Thymol

Introduction

Thymus (thyme) is one of the most important genera as regards numbers of species within the Lamiaceae family. *Thymus* belongs to the tribe Mentheae, subfamily Nepetoideae and includes 300–400 species (Evans, 1989; Morales, 1997; Pedersen, 2000). This genus is distributed in the Old World and on the coasts of Greenland, from the Macaronesian Region, Northern Africa and the Sinai Peninsula, through the West and East Asia. However, the central area of this genus surrounds the Mediterranean Sea (Morales, 1997; Pedersen, 2000; Zargari, 1990). Algeria in the western portion of North Africa, together with a considerable extent of the Western Sahara, has some thyme species and one of them is *Thymus fontanesii* Boiss. & Reut. (Quezel and Santa, 1962). *Thymus* species are known to be used for traditional medicine for the treatment of various illnesses and have been found to possess significant pharmacologic activities (Duke, 1989; Zargari, 1990; Newall *et al.*, 1996). In Algerian traditional and folk medicine, *T. fontanesii* is used as antispasmodic, carminative, stomachic, expectorant, antitussive, antiseptic and anthelmintic remedy in some gastrointestinal and cold diseases.

There are several reports on the essential oil analysis of *Thymus* species and the results revealed that thymol and carvacrol represent the most important compounds in the genus, followed by linalool, *p*-cymene, γ-terpinene, borneol, terpinen-4-ol and 1,8-cineole (Guillen and Manzanos, 1998; Miri *et al.*, 2002; Rustaiyan *et al.*, 1999; Sajjadi, 2003; Sajjadi and Khatamsaz, 2003; Stahl-Biskup, 2002). *Thymus* species have always been considered as spice and condiment obtained from several thymes and they are used in savoury formulations and foods (Duke, 1989; Guillen and Manzanos, 1998; Zargari, 1990).

Literature survey revealed that the essential oil of aerial parts of *T. fontanesii* has not been chemically studied to date, therefore the present paper deals with the detailed analysis of the oil by GC/MS. The present study was also undertaken in order to determine the chemical composition of the essential oil of the plant aerial parts for possible use in pharmaceutical preparations, cosmetics and food and beverage products.

Methods and Materials

Plant material

Aerial parts of *T. fontanesii* were collected during the flowering period from wild-growing plants around Setif City, Capital of Setif Province in Northeastern Algeria at an altitude of *ca.* 1000 m in May 2002. The plant identity was confirmed in Faculty of Sciences, Mentouri-Constantine University, Constantine, Algeria. A voucher specimen

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of the plant (ZK ATf 25/05/02) was deposited in LOST in this faculty.

Essential oil isolation

The aerial parts (leaves and flowers, 100 g) of the plant were dried at room temperature, powdered and hydrodistilled for 3 h using a Clevenger-type apparatus (British Pharmacopoeia, 1998). The oil was dried over anhydrous sodium sulfate and stored at 2–4 °C.

Essential oil analysis

The oil was analyzed by GC/MS using a Hewlett Packard 6890 mass selective detector coupled with a Hewlett Packard 6890 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 2 ml/min; column temperature, 60–275 °C at a rate of 4 °C/min; injector temperature, 280 °C; injected volume, 0.1 μl of the oil; split ratio, 1:50.

The MS operating parameters were as follows: ionization potential, 70 eV; ion source temperature, 200 °C; resolution, 1000.

Identification of components in the oil was based on retention indices relative to *n*-alkanes and computer matching with the WILEY275.L library, as well as by comparison of the fragmentation patterns of the mass spectra with those reported in the literature (Adams, 1995; McLafferty and Stauffer, 1991; Sajjadi and Khatamsaz, 2003; Sandra and Bicchi, 1987; Swigar and Silverstein, 1981).

Results and Discussion

This is the first report on the composition of the essential oil of *Thymus fontanesii* Boiss. & Reut. Aerial parts of *T. fontanesii* yielded 1.9% (w/w) of a pale yellowish oil with a pleasant thyme aroma. This plant can be assigned to one of the oil-rich species of the Lamiaceae family. Fifteen components were characterized, representing 99.4% of the total oil components detected. These are listed in Table I with their percentage portion. The major constituents of the oil were thymol (67.8%), γ-terpinene (15.9%), *p*-cymene (13.0%) and carvacrol (1.7%). Other components were present in amounts equal or less than 0.3%. Our results indicate that the composition of the essential oil of *T. fontanesii* is typical for species of the genus *Thymus* and the oil is dominated by a high content of thymol and carvacrol (69.5%). This plant is a rich source not only of flavorings for the food industry but also of compounds with medicinal properties. Thymol, which is the major essential oil component of several thymes, has been tested for antibacterial effects against a wide range of organisms (Ettayebi *et al.*, 2000). This natural compound and some of other *T. fontanesii* oil components are interesting for further investigations as possible pharmacological and biological agents.

Table I. Composition of the essential oil of *Thymus fontanesii.*

Compound	Percentage	Retention index
α-Thujene	0.1	927
α-Pinene	trace	934
1-Octen-3-ol	trace	978
Myrcene	0.2	989
α-Terpinene	0.1	1017
p-Cymene	13.0	1028
Limonene	0.1	1030
γ-Terpinene	15.9	1063
cis-Sabinene hydrate	trace	1070
Linalool	0.3	1101
4-Terpineol	0.1	1179
α-Terpineol	0.1	1199
Thymol methyl ether	trace	1236
Thymol	67.8	1298
Carvacrol	1.7	1328

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