Composition of the Essential Oils of *Thymus deanensis* Celak Var. *deanensis* from Different Regions of Iran

Abousaber M (Ph.D.)¹, Khanavi M (Ph.D.)¹*, Khoshchehreh M (M.D.)², Hadjiakhoondi A (Ph.D.)¹, Shams Ardekani MR (Ph.D.)¹, Shafiee A (Ph.D.)³

¹- Department of Pharmacognosy and Medicinal Plants Research Center, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
²- Evidence Based Medicine Group, the Endocrine and Metabolism Research Center, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran
³- Department of Medicinal Chemistry, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding author: Department of Pharmacognosy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
Tel & Fax: +98 – 21 - 66954706
Email: khanavim@tums.ac.ir

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Abstract

**Background:** *Thymus deanensis* is a known aromatic plant which grows widely in Iran and many mediterranean regions. In previous studies composition of essential oils of many species of *Thymus* genus reported which they were rich of phenols like Thymol and Carvacrol.

**Methods:** Water distilled essential oils from aerial parts of *Thymus deanensis* var. *deanensis* from three different localities in Iran were analyzed by GC and GC/MS.

**Results:** 20 compounds representing 87.8% of the region of Azerbaijan Mountains (A) oil were identified with thymol (70.8%), carvacrol (6.3%) as main constituents.

13 compounds representing 98.6 % of Damavand, Mosha (B) oil were identified with thymol (53.6%), carvacrol (23.8%) and p-cymene (11.0 %) and then thymol (72.1%) and p-cymene (5.3%) were the major constituents of the latter oil Chaharmahal Bakhtiari (C) among the 16 compounds characterized which represented 99.6% of the oil.

**Conclusions:** The composition of three samples of *Th. deanensis* oils in our research was similar to the composition of other phenol–rich Iranian species. Although the content of thymol in *Th. deanensis* is higher than many reported cultivated *Thymus vulgaris*.

**Keywords:** *Thymus deanensis* var. *deanensis*, Oil composition, Thymol, Carvacrol, *P*-cymene
Introduction

The Thymus genus comprises over 300 species of which, 14 are found in Iran [1], which grow wildly in many regions and four of them are endemic [2]. Thymus is a well-known medicinal plant which is native to Southern Europe which its essential oil is manufactured commercially for use in cough drops, mouthwashes, liniments, toothpastes, detergents and perfumes. The herb is approved by Commission E in the treatment of bronchitis, whooping cough and upper respiratory inflammation.

Thyme in its crude herb form is carminative, antibiotic, anthelmintic, astringent, expectorant and antitussive. It has been used in traditional medicine to treat heat burn, gastritis, asthma, laryngitis, pertussis and bronchitis. Extracts demonstrate in vitro anti-inflammatory effects on guinea pig tracheal smooth muscle tissue and the volatile oil in the herb most likely exerts spasmylytic effects on bronchial tissues in humans [3].

They are hot, energizing oils that can be used for local, respiratory and systematic infections and mental stimulants in aromatherapy [4]. In folk medicine, Thymus spp. are used as an anthelmintic, antispasmodic, carminative, sedative, diaphoretic usually in form of an infusion, or externally in bath to cure rheumatic and skin disease [5]. Thyme oil is also carminative, expectorant and possesses antimicrobial and anthelmintic properties due to concentrated thymol and carvacrol content but it is extremely toxic. Thymus essential oil and extract is a source of aromatic terpenes and terpenoids, flavonoids and phenolic acids [6].

Thymol, which is the main components of many Thymus species is known as an antiseptic agent and is approved for diverse effects like hookworm treatment [7, 8]. Also thymol and their salts used about 0.1 - 1% in formulation of many lotions, creams and ointments. In external used about 0.1 - 1% in formulation of many lotions, creams and ointments. In external use, thymol is known as a strong antiseptic agent in toothplaste, gargle and mouthwashes [9]. The other major component of Thymus spp. oil is carvacrol which is used nowadays on a large scale in the food, cosmetic and mouthwashes industries. In addition, it has been shown several activities like antimicrobial, analgesic and antioxidant activities but it is toxic in high concentration [10].

There are many reports of the essential oil composition and biological activity of different Thymus species especially common Thyme (Thymus vulgaris) and wild Thyme (Thymus serpyllum). Hence of the use of Thymus species or their essential oils in the food and traditional medicine of Iran, we were interested in studying on the essential oil contents and chemical composition of all Iranian endemic species.

In this study, we reported the essential oil composition of Thymus deanensis Var. deanensis from three different regions of north, northwest and west of Iran.

Materials and Methods

Three samples of T. deanensis Var. deanensis were collected during the flowering stage in June and July 2008 from different localities in northwest, west and north of Iran, respectively.
Voucher specimens have been deposited at the Herbarium of Research Institute of forests and rangelands, Tehran, Iran.

Preparation of oil
The aerial part of T. deanensis (100 g) was subjected to hydrodistillation using a Clevenger-type apparatus for 4h. The oils were dried over anhydrous sodium sulfate and obtained oils kept in refrigerator until doing analysis.

GC & GC-MS Analysis
Analytical gas chromatography was carried out using a Termoquest 2000 GC with capillary column DB-1 (30 m, 0.25 mm i.d., 0.25 μm film Thickness); carrier gas, He; split ratio, 1:25; and using a flame ionization detector. The column temperature was programmed at 50°C for 1 min. and then heated to 265°C at a rate of 2.5°C/min. and then kept constant at 265°C for 20 min.

GC-MS was performed on a Thermoquest 2000 with a quadruple detector, on capillary column DB-1 (GC); carrier gas, He; flow rate, 1.5 ml/min. the column was held at 50°C for 1 min. and programmed up to 265°C at rate of 2.5°C/min, then kept constant at 256°C for 20 min. The MS operated at 70 eV ionization energy. Retention indices were calculated by using retention times of n-alkanes that were injected after the oil at the same chromatographic conditions. Quantitative data were obtained from the electronic integration of the FID peak areas.

The components of the oils were identified by comparison of their mass spectra and retention indicates with Wiley library and those published in the literature [11 - 13].

Results
Yields of essential oils were 1% for A, 1.1% for B and 1.8% for C with yellow color and a distinct sharp odor. The chemical composition of the oils of three sample of T. deanensis Var. deanensis oil is presented in Table 1.

In sample A, 24 components were identified representing 88.6% and the main constituents of A were thymol (70.8%) and carvacrol (6.3%). In sample B, 13 components were identified representing 98.6% and the main constituents were thymol (53.6%), carvacrol (23.8%) and p-cymene (11.0%) while in sample C, 16 components representing 99.6 % and the main constituents of C were thymol (72.1%), p-cymene (5.3%), γ-terpinene (4.9%) and α-pinene (4.0%).

Table 1- Chemical composition of essential oil of aerial parts of Thymus daenensis

<table>
<thead>
<tr>
<th>Components</th>
<th>RI</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>α–Pinene</td>
<td>929</td>
<td>0.2</td>
<td>4.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Camphene</td>
<td>950</td>
<td>-</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>β-Pinene</td>
<td>980</td>
<td>0.1</td>
<td>0.7</td>
<td>0.2</td>
</tr>
<tr>
<td>Myrcene</td>
<td>987</td>
<td>0.1</td>
<td>-</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Discussion

The oil composition of three samples were similar in containing large amounts of thymol and carvacrol together with present of p-cymene, α-pinene, γ-terpinene, β-pinene, β-bisabolene and β-caryophyllene. Linalool oxide and terpinen-4-ol were found only in sample A (1.65%, 0.66 %) respectively. Also α-terpinene and α-phellandrene were found only in sample C (1.0%, 2.0%). The oil of *T. deanensis* var. *deanensis* contained monoterpene hydrocarbons (2.5% in A, 19.7% in B and 18.3% in C samples), oxygenated monoterpenes (83.8% in A, 78% in B and 75% in C samples), sesquiterpen hydrocarbons (1.5% in A, 0.7% in B and 3.5% in C samples)
and oxygenated sesquiterpenes (0.2% in B and 1.8% in C samples). Hence, total amount of oxygenated monoterpenes were considered as the highest fractions of the oils. In conclusion, it is evident that there are qualitative similarities between the major compound group and constituents present in these three oils. However, minor constituents are qualitatively and quantitatively different.

The composition of three sample of *T. deanensis* oils in our research was similar to the composition of other phenol–rich Iranian *Thymus* species [14-18], it is noticeable that content of thymol in *T. deanensis* is higher than many reported cultivated *Thymus vulgaris* [18].

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**References**

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