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Comparison of essential oil components of *Thymus daenensis* celak. and *T. fedtschenkoi* in flowering stage

Khorshidi jalal* and Rustaiee Ali Reza

Department of Horticulture Science, Faculty of Agricultural Science and Engineering, University of Tehran, Tehran, Iran.

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ABSTRACT

To compare the essential oil composition of two Thyme species *T.daenensis* and *T.fedtschenkoi*, the aerial parts of them were collected at flowering stage. The essential oil was obtained by hydro distillation method for 3 hours and their chemical components of essential oil were identified by GC and GC/MS. The main constituents of *T.daenensis* were thymol (73.86 %), caryophyllene (5.55 %), γ-terpinene (5.03 %), *p*-cymene (3.92 %) and carvacrol (2.92 %). While the main constituents of *T.fedtschenkoi* were linalool (63.77 %), α-terpineol (10.17 %), 1,8-cineole (4.01 %), thymol (3.3 %), sabinene (2.66 %).

Introduction

Thymus is one of the medicinal plants belonged to Labiatae family and native of Mediterranean regions (1). This genus is represented in Iranian flora by 14 species, four of which (Thymus carmanicus, Thymus daenensis subsp. daenensis and T. daenensis subsp. lancifolius, Thymus persicus and Thymus trautvetteri) are endemic (2). *Thymus* has numerous applications in different industries as food and pharmaceutical (3). Recent studies have showed that Thymus species have strong antibacterial, antifungal, antiviral, antiparasitic, spasmolytic and antioxidant activities (4, 5, 6).

Many studies on *Thymus* species indicated that the major constituents of these plants are thymol, carvacrol, linalool, γ – terpineol, geraniol, α- pinen, sabinen and p-cimen (1, 2, 7, 8). The aim of this study was compare the essential oil composition of Thymus daenensis Celak. and Thymus fedtschenkoi from Iran. The composition of essential oil of Thymus daenensis Celak. and Thymus fedtschenkoi is presented here.

Material and Methods

Plant material:

Aerial parts of plants were collected in flowering stage (summer 2009) from Malayer city (Latitude: 34°17´N, Longitude: 48°37´E, Altitude: 1840-1880m, Hamedan province, Iran). Plant materials were dried in shade for 72 hours and then transported to the Laboratory of Medicinal and Aromatic Plants in the department of Horticultural Science, University of Tehran. In order to extract the essential oil, 100 g of plant material were powdered and then essential oil was isolated by hydro distillation method for 3 hours.

The essential oils were separated from the aqueous layer by simply recovering the upper layer, dried over anhydrous sodium sulfate, weighed and essential oil yields and finally samples were stored in the freezer at -4°C at least until analysis.

Analysis of the essential oils:

In order to identify the essential oil components, gas chromatography was carried out using a GC Thermo-UFM with HP5 column (10m, 0.1mm ID, 0.4µm FT). Oven temperature was performed as follow: from 60°C to 285° C at 80°C/min; injector and detector temperatures were held at 280°C; carrier gas was He (0.5ml/min). GC-MS analyses were carried out on a Varian 3400 system with a DB-5 fused silica column (30 m x 0.25 mm i.d.); Oven temperature was 50 to 240°C at a rate of 3°C/min, injector temperature 250°C, transfer line temperature 260°C, carrier gas helium with a linear velocity of 31.5 cm/s, split ratio 1/60, Ionization energy 70 eV; scan time 1 s; mass range 40-300 amu. The components of the oil were identified by comparison of their mass spectra with those of a computer library or with authentic compounds and confirmed by comparison of their retention indices either with those of authentic compounds or with data published in the literature. Mass spectra from the literature were also compared.

Result and Discussion

In total, 14 compounds were identified in essential oil of *Thymus daenensis* Celak. accounting for 98.49% the essential oil. While 15 compounds were identified in essential oil of *Thymus fedtschenkoi* accounting for 97.68% the essential oil. The major components of the essential oil in *T.daenensis* Celak. were thymol (73.86 %), E-caryophyllene (5.55 %), γ-terpinene (5.03 %), p-cymene (3.92 %) and carvacrol (2.92 %). While the main constituents of *T.fedtschenkoi* were linalool (63.77 %), α-terpineol (10.17 %), 1,8-cineole (4.01 %), thymol (3.3 %), sabinene (2.66 %). The highest percentage of *Thymus daenensis* Celak essential oil was related to thymol while the highest percentage of *Thymus fedtschenkoi* essential oil was related to linalool. The minimum percentage of essential oil in *Thymus daenensis* Celak was related to terpinolene while in *Thymus fedtschenkoi* was related to E-caryophyllene (Table 1 and Table 2). In the study on *Thymus daenensis*, 33 compounds were been identified that the major compounds were thymol, para cymene, γ- terpinene and methyl carvacrol (2,9). In another investigation

Tele: 98-914-816-5105

E-mail addresses: jalal_khorshidi2006@yahoo.com

on *Thymus daenensis*, 26 compounds were identified that formed 99.7 % of essential oil and the major compounds were thymol, p-cymene, caryophyllene and methyl carvacrol. In *T. kotschyanus* 31 compounds have been identified that informed 98.7% of essential oil and the major compounds were thymol, carvacrol and γ- Terpinene (2). Thyme is a valuable plant, therefore require that done further studies on essential oil of different spices and compare of essential oil components and reach to best spices.

Conclusion

Differences observed in essential oil components of these species of *Thymus* may be due to the different genetic and environmental factors. Generally, in among of Thyme species, *T.daenensis* and *T.fedtschenkoi* have a high percentage of essential oil in comparison with others species and also we can use from those for inbreeding works.

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Table 1. Composition of essential oil of Thymus daenensis Celak.

Thymus daenensis Celak.				
Number	**Composition**	**RI**	**RT(min)**	**Content (%)**
1	α-Thujene	942	1.40	0.37
2	α-Pinene	954	1.43	0.37
3	Sabinene	985	1.51	1.23
4	α-Terpinene	1044	1.60	0.75
5	p-Cymene	1049	1.61	3.92
6	1,8-Cineole	1063	1.64	0.26
7	γ- Terpinene	1082	1.68	5.03
8	Terpinolene	1095	1.71	0.20
9	Fenchone	1109	1.74	0.54
10	Borneol	1212	1.94	0.81
11	Methyl carvacrol	1268	2.04	2.92
12	Thymol	1316	2.13	73.86
13	Carvacrol	1326	2.15	2.68
14	E-Caryophillene	1483	2.42	5.55

Table 2. Composition of essential oil of Thymol fedtschenkoi

Thymus fedtschenkoi

Number	Composition	RI	RT(min)	Content (%)
1	α- pinene	954	1.42	1.66
2	Camphene	974	1.47	1.06
3	Sabinene	985	1.50	2.66
4	Limonene	1054	1.62	1.11
5	1,8-cineole	1063	1.64	4.01
6	Terpinolene	1091	1.70	1.33
7	Linalool	1109	1.74	63.77
8	Borneol	1176	1.90	1.47
9	Terpinene	1206	1.93	1.88
10	α- Terpineol	1223	1.96	10.17
11	Thymol	1305	2.11	3.31
12	Carvacrol	1316	2.13	1.71
13	E-caryophyllene	1442	2.34	0.33
14	α- humulene	1483	2.41	2.14
15	Caryophyllene oxide	1566	2.56	1.07