Original Article

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Chemical compositions of two different *Thymus* species essential oils

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Abstract

Thymus is one of the most important members of Lamiaceae family. Aerial parts of the plant have been widely used in medicine. It has been reported that most of these effects are related to phenolic compounds especially thymol and carvacrol in *Thymus* essential oil. In this study, aerial parts of *Thymus daenensis* and *Thymus lancifolius* were collected from Kohgiluyeh and Boyer-Ahmad, Iran. Essential oils of aerial parts of these plants were gained by the hydrodistillation method and the chemical compositions were analyzed by gas chromatography/ Mass spectrometry (GC/MS). The major components of the essential oil of *T. daenensis* were thymol (39.91%), carvacrol (29.93%), linalool (5.55%), caryophyllene (3.5%) and geraniol (3.09%), whereas the major components of the essential oil of *T. lancifolius* were: carvacrol (25.55%), thymol (20.79%), linalool (16.8%), α-terpineol (6.34%), borneol (4.00%), caryophyllene (3.98%), p-cymene (3.38%) and cis-linalool oxide (3.21%). Linalool was reported as another major component in *T. lancifolius.*

Keywords: Carvacrol, Linalool, Thymol, *Thymus daenensis, Thymus lancifolius*.

1.Introduction

Thymus is one of the most important members of Lamiaceae family. Eighteen *Thymus* species has been reported in flora Iranica and 6 of them have been known endemic (1). Aerial parts of the plant have been used a lot in traditional medicine. It has been used for treatment of cold and as an expectorant, antitussive, antibacterial, antifungal, antiviral, antiseptic and antispasmodic agent (2-4). Most of these effects are related to phenolic compounds especially thymol and carvacrol in *Thymus* essential oil (5).

Gas chromatography (GC) is the most popular and common method for analysis of volatile components (6-8). This technique is based on boiling points of components. It is coupled with mass spectroscopy for characterization of components.

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2. Materials and methods

2.1. Plant material

The aerial parts of *T. daenensis* were collected from Kakan (northeastern part of Yasouj in Iran) and *T. lancifolius* were collected from Moorgol Peak (northwestern part of Yasouj in Iran) on July 2013. Plant materials were identified by Dr. A. Jafari and voucher numbers (Hyu30245 for *T. daenensis* and Hyu30231 for *T. lancifolius*) were registered at Herbarium of Faculty of Agriculture, Yasouj University, Yasouj, Iran.

2.2. Isolation of essential oil

The air-dried and powdered aerial parts of the plants (50 g) were used by hydro-distillation

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method for 90 min. For this aim, a Clevenger type apparatus was used. The oils were dried with anhydrous sodium sulfate (Na_2SO_4) to remove moisture. The obtained essential oils were stored in a refrigerator at +4 °C before using.

2.3. Gas chromatography

Using an Agilent technologies 7890A gas chromatograph with a mass detector (Agilent technologies model 5975C), GC/MS analysis was carried out. The gas chromatograph was equipped with a HP-5MS capillary column (phenyl methyl siloxane, 30 m×0.25 mm i.d). Agilent technologies 19091S-433 (60 to 325/350 °C). The oven temperature was programmed from 60 °C (0 min) to 220 °C at the rate of 5 °C/min and then hold for 10 min at 220 °C. Helium was selected as the carrier gas and flow rate was adjusted as 1 ml/min. The mass spectrometer was operating in EI mode at 70 eV. The interface temperature was 280 °C; mass range

Table 1. Compositions of the essential oils of *T. daenensis* and *T. lancifolius*

No	Components*	Components in *T. lancifolius* (%)	Components in *T. daenensis* (%)	KI
1	α-Pinene	-	0.29	939
2	Camphene	-	0.39	955
3	α-Terpinene	0.52	0.40	1021
4	*p*-Cymene	2.25	3.38	1030
5	1,8-Dehydro cineol	0.95	-	1037
6	γ-Terpinene	2.99	2.67	1064
7	cis-Sabinene hydrate	0.47	-	1072
8	cis-Linalool oxide	-	3.21	1078
9	α-Terpinolene	0.52	-	1092
10	trans-Linalool oxide	-	2.94	1093
11	Linalool	5.55	16.18	1108
12	Camphor	-	0.42	1152
13	Borneol	-	4.00	1173
14	Terpin-4-ol	1.67	0.67	1183
15	α-Terpineol	-	6.34	1196
16	Carvacrol methyl ether	1.31	0.91	1247
17	Geraniol	3.09	-	1267
18	Thymol	39.91	20.79	1298
19	Carvacrol	29.93	25.55	1312
20	Thymol acetate	-	0.30	1359
21	Carvacrol acetate	-	0.36	1377
22	β-Caryophyllene	3.5	2.36	1429
23	Bicyclogermacrene	0.64	0.34	1494
24	β-Bisabolene	0.55	-	1513
25	Spathulenol	1.04	1.34	1586
26	Caryophyllene oxide	1.54	3.98	1591
	Monotrpene hydrocarbons	6.28	7.13	
	Monotrpenes with oxygen	84.65	81.67	
	Sesquiterpenehydrocarbons	4.69	2.7	
	Sesquiterpenes with oxygen	2.58	5.32	

*The compounds have been sorted according to retention indices on HP-5 MS capillary column

was 30-600 m/z. Identification of components was based on a comparison of their KI and mass spectra with Willey (7nl) and Adams libraries spectra (9, 10).

3. Results

The chemical compositions of essential oils of *T. daenensis* and *T. lancifolius* are reported in Table 1. The compounds are sorted according to retention indices on HP-5 MS capillary column. *T. daenensis* had thymol (39.91%) and carvacrol (29.93%) as the major components but the major components of *T. lancifolius* were carvacrol (25.55%), thymol (20.79%) and linalool (16.18%). The identified components of *T. daenensis* account for 98.2% and 96.82% for *T. lancifolius*.

4. Discussion

Previously, *T. daenensis* was divided to two subspecies, *T. daenensis* subsp. *daenensis* and *T. daenensis* subsp. *Lancifolius* (11). Recently, both subspecies promote to two species (12). In this study, we found thymol and carvacrol as the main components of these *Thymus* species like most of the other studies on *Thymus* spp. and both samples were rich of monoterpenes. On the other hand, the presence of linalool (16.18%) in *T. lancifolius* was found as a distinguished marker. Nikavar *et al*. (13) reported that the main compounds of *T. daenensis* essential oil from Iran were thymol (74.7%), p-cymene (6.5%), *β*-caryophyllene (3.8%) and methyl carvacrol (3.6%). Sabahi *et al*.(14) reported that the main composition of *T. daenensis* Celak from Sepidan was geraniol and no presence of thymol was reported. Sajadi and Khatamsaz reported that thymol (73.9%), carvacrol (6.7%) and *p*-cymene were the main components of *T. lancifolius* (11). Alavi and coworkers reported that the amount of linalool was 1.9% in *T. daenensis* (15). The amount of linalool in *T. lancifolius* made a difference between this study and others.

Compounds of these two species are almost similar but higher amount of linalool in *T. lancifolius* may be considered as a marker to identify this species.

Conflict of Interest:

None declared.

5. References

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