



Essential Oil Composition of Thyme (*Thymus zygoides* Griseb. var. *lycaonicus* (Celak.) Ronniger) Wild Growing in Turkey

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ARTICLE INFO	ABSTRACT
<p>Research Article</p> <p>Received : 22/05/2019 Accepted : 29/11/2019</p> <p>Keywords: <i>Thymus zygoides</i> Labiatae Essential oil composition Limonene Cis-linalool oxide</p>	<p>The chemical composition of essential oil, which is isolated by hydrodistillation of aerial parts of <i>Thymus zygoides</i> growing wild in Turkey, have been determined by GC and GC/MS. Essential oil yield on a dry weight basis of aerial parts from <i>T. zygoides</i> was 0.45%. A total of twenty two constituents were identified by GC-MS analyses, the main components representing 92.3% the oil was identified as limonene (24.11%), cis-linalool oxide (22.91%), eucalyptol (8.65%), 3-octonol (7.04%), nerol (4.47%) geranyl acetate (3.19%), carvacrol (2.74%), linalyl propanoate (2.95%) and sabinene (2.23%). The essential oil of <i>T. zygoides</i> was characterized by its high content of limonene (24.11%).</p>

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Introduction

Thyme (*Thymus zygoides*) is aromatic plants of middle Anatolia basin belonging to the Labiatae family (Davis, 1992). It is a hardy perennial and herbaceous plant which grows wild in its naturel areas. The family labiatae (Lamiaceae) is represented in Turkey by 556 species and 741 taxa (Başer, 1995; Tümen et al., 1998). It is Turkish endemic species commonly used in cooking as spices and condiments, in the preparation of herbal tea and also employed, since antiquity, in folk medicine (Biavati et al., 2004). The volatile aromatic compounds are employed in the food industry as a flavoring agent. The oil is used in perfumery for its spicy herbaceous notes. The plant of genus *Thymus* and their essential oils are used for their bioactivity (Reddy et al., 1998; Tzakou et al., 1998; Kulevanova et al., 1998; Tikhonov et al., 1998). The plants and the essential oils have antimicrobial, antifungal,

antioxidant, antihelminthic, antitoxic, diuretic and stimulant properties. It is known as tonic and carminative (Baytop, 1984). *T. zygoides*, named as “yayla kekik”, is used as condiment in Konya province. Recently, the essential oils obtained through steam distillation on *Thymus pulegioides*, *T. vulgaris*, *T. transcaspicus*, *T. shimperi*, *T. serrulatus*, and *T. serpylloides* ssp *gadorensis* were studied, (Hubaid et al., 2002; Asfaw et al., 2000; Saez, 2001; Miri et al., 2002; Mockute and Berrotiene, 2003). Miri et al. (2002) reported that the most abundant components between 47 compounds were thymol, γ -terpinene, carvacrol, *p*-cymene and thymol methyl ether. This oil has not previously been investigated. In the present study, the chemical composition of essential oil of the air-dried parts of the wild plant *T. zygoides* growing was characterized via GC and GC-MS.

Material and Method

Plant Material

Fresh aerial parts of *Thymus zygoides* were collected from plants growing wild in Konya (Doğanhisar) provinces of Middle Anatolia (Turkey) and identified at the Department of Biology, Selçuk University, Konya, Turkey (Voucher specimen No: 3553). The aerial parts were dried in the shade at room temperature.

Isolation of the Essential Oil

Dried aerial parts of the plants (about 100 g) were ground and submitted to hydrodistillation for 4 h using a Clevenger-type apparatus. The oil isolated was dried over anhydrous sodium sulfate. The oil yield of *Thymus zygoides* on dry weight basis were 0.45%.

Identification of Components

GC: The analysis was carried out using a DANI 6500 gas chromatograph equipped with FID and a DB-5 capillary column (30 m × 0.22 mm, film thickness 0.25 µm). Analytical conditions were: injector and detector temperature 200°C and 220°C respectively; oven temperature programmed from 50°C to 180°C at 4°C/min. The carrier gas flow was 1 ml N₂/min. Relative concentrations were calculated using peak areas as given by Shimadzu model CR3A integrator, without correction for response factors. Retention indices were obtained by injection of the homologous hydrocarbon series C₈ – C₁₈ under the same conditions.

GC/MS: Analyses were done using an HP 5870 Series II gas chromatograph equipped with a OV-101 capillary column (25 m x 0.18 mm; film thickness 0.25 µm) and an HP 5772A mass selective detector. Analytical conditions as follows injector and detector temperatures 200°C and 220°C, respectively; oven temperature programmed from 60°C to 220°C at 4°C/min. The carrier gas flow was 1.2 ml He/min, and the ionization source was set at 70 eV.

The essential oil constituents were identified by the combination of retention index data and mass spectra data using NBS library and other literature data.

Results and Discussion

The volatile oil components of *Thymus zygoides* collected from different populations in the same locality was determined by GC and GC-MS. The results of analysis are given in Table 1. The oil was subjected to GC and GC/MS analysis, and the components greater than 0.01% were identified by chromatograph with GC Kovats indices and MS data.

The findings in Table 1 show that the oil contained mainly monoterpenes and oxygenated monoterpenoids. In this study, the most prominent components were cis-linalool oxide (22.91%), limonene (24.11%) eucalyptol (8.65%), 3-octanol (7.04%), nerol (4.47%), geranyl acetate (3.19%), carvacrol (2.74%), linalyl propanoate (2.95%) and sabinene (2.23%). They formed about 78% of total essential oil. Investigation of the essential oil of *Thymus* has shown that the volatile aroma composition is typical to origin of the plant (Akgül et al., 1999; Tümen et al., 1998). Tümen et al. (1998) reported the *Thymus aznavourii* oil was rich in germacrene D (22.8%), (E)-β-farnesene

(16.1%) and α-pinene (11.1%). *Thymus cilicicus* is very rich in α-terpineol (16.4%), camphor (9.7%), α-pinene (6.9%), 1,8-cineole (7.8%) and trans-sabinene hydrate (5.2%) (Akgül et al., 1999).

Table 1 Chemical composition of high plateau (*Thymus zygoides*) oil (%)

RI	Constituents	Percentage
934	α-pinene	0.55
950	Camphene	1.23
971	Sabinene	2.23
975	1-octen-3-ol	0.46
982	β-myrcene	0.44
993	3-octanol	7.04
1018	α-terpinene	1.40
1023	o-cymene	0.55
1031	Limonene	24.11
1035	Eucalyptol	8.65
1056	γ-terpinene	1.07
1070	Cis-linalool oxide	22.91
1161	Borneol	1.2
1173	4-terpineol	1.86
1314	Linalyl propanoate	2.95
1228	Nerol	4.47
1241	neral	1.08
1256	Geraniol	0.76
1207	Fenchyl acetate	1.91
1290	Thymol	1.50
1298	Carvacrol	2.74
1384	Geranyl acetate	3.19
Total		92.30

The major constituents of *Thymus daenensis* oil were thymol (49.7%), carvacrol (15.2%), p-cymene (6.4%), γ-terpinene (5.4%) and 1,8-cineole + limonene (3.2%) (Askari and Setidkon, 2003). p-Cymene (37.44%), carvacrol (32.22%), borneol (5.98%), γ-terpinene (5.40%) and 1,8-cineole (1.84%) were found to be the major components in the *T. sintenisii* subsp. *isaurica* oil (Biavati et al., 2004). The α-terpinene (3-8%), γ-terpinene (17-30%), thymol (2-18%), p-cymene (15-20%), and α-thujene (2-4%) were the main components in *Thymus striatus* (D'Auria et al. 2005). The presence of high quantities of β-caryophyllene and (E)-nerolidol in the essential oils was found at least in two species (*T. pulegioides* L. and *T. albanus*) of genus *Thymus* (Kulevanova et al., 1998).

A review of the literature reveals that the volatile compounds of this plant have been the subject of previous studies in other geographical areas. The chemical composition of this oil has been known to differ enormously due to different geographical origins. The observed differences may be probably due to different environmental factors, different chemotypes and the nutritional status of the plants as well as other factors that can influence the oil composition. Also, it is well known that environmental conditions and the stage of development can affect the relative amounts of essential oil components (Milos et al., 2001). As a result, our findings indicated that essential oil of *T. zygoides* from Turkey belonged to limonene and Cis-linalool oxide rich type.

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