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Short Communication

Composition of the essential Oil of *Teucrium chamaedrys* L. (Lamiaceae) from Turkey

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The essential oil obtained by hydrodistillation from *Teucrium chamaedrys* L. (Lamiaceae) from Turkey was analyzed by (GC) and (GC/MS). Thirty six components in aerial parts of *T. chamaedrys* were identified representing (90.8%) of the oils. Main constituents of the oil were found as germacrene D (32.1%), β-caryophyllene (14.2%), δ-cadinene (13.1%), bicyclogermacrene (6.7%) and β-farnesene (4.3%). The results were discussed with the genus pattern in means of medicinal purpose and natural products.

Key words: *Teucrium chamaedrys*, germacrene D, Lamiaceae, essential oil, Turkey.

INTRODUCTION

Teucrium chamaedrys L. (Lamiaceae) is a cosmopolitan genus that differs from other related genera in that its corolla is formed of one lip. It comprises more than 300 species; almost 50 are known in Europe and are distributed mainly in the Mediterranean basin (Tutin et al., 1976). The genus *Teucrium* is one of the richest sources of diterpenes, with a neoclerodane skeleton: more than 220 diterpenes have been described up to now, and many of these are particularly interesting because of their ecological role as antifeedants against different species of insects and for their role in the medicinal properties of the plants (Piozzi et al., 2005).

Teucrium species have been used as medicinal plants for more than 2000 years and some of them are still used in folk medicine as antispasmodic, tonic, antipyretic and antiseptic (Hassan et al., 1979; Velasco et al., 1989). Many *Teucrium* species are known for their medicinal utilisation and exhibit interesting biological properties such as hypoglycaemic, hypolipidemic, hepatoprotective, antipyretic, anti-inflammatory, antiulcer, antitumor, antibacterial and insect antifeedant activities (Roman-Ramos et al., 1991; Rasheed et al., 1995; Galati et al., 2000; Couladis et al., 2003; Bruno et al., 2003). The importance of this genus and family patterrns in food industries lies also on the fact that many species show antimicrobial, antioxidant and antifungal activities, rendering them useful as natural preservative ingredients (Ulubelen et al., 2000; Bagci and Baser, 2005; Saroglou, et al., 2007; Ozkan et al., 2007).

The Mediterranean flowering plant known as *T. chamaedrys* L. (Germander) is useful in herbal medicine for its anti-inflammatory, anti-rheumatic, digestive and diuretic effects. *T.chamaedrys* L. was used as antimalarial, antispasmodic, appetizing, diabetes, for hemorrhoids, gastric pain, heart diseases, intestinal colic, kidney diseases, chapped, fissure on finger tips (Pieroni and Quave, 2005; Genc and Ozhatay, 2006; Cansaran et al., 2007; Cornara et al., 2009; Fakir et al., 2009; Sarper et al., 2009; Cakilcioglu et al., 2010; Tuzlaci and Dogan, 2010). *T. chamaedrys*, which is one of the most common and highly investigated species in the *Teucrium* genus, is marketed for use in weight control, although there have been some concerns over hepatotoxicity (Larrey et al., 1992; Dao et al., 1993).

It is aimed to evaluate the composition of the essential oils obtained from the aerial parts of *T. chamaedrys* growing wild in Turkey in means of medicinal purpose, natural products and renewable resources with the genus patterns.

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Table 1. Essentail oil constituents of *T. chamaedrys* L.

No	Compounds	RRI	Percentage
1	α-pinene	1021	0.2
2	β-pinene	1055	0.1
3	Bicycloelemene	1324	0.2
4	β-bourbonene	1366	2.4
5	β-cubebene	1369	0.2
6	Cyclohexane, 1-ethenyl- 1 methyl	1370	0.2
7	α-gurjunene	1383	0.3
8	*β*-caryophyllene	1393	14.2
9	*β*-copaene	1400	0.6
10	*β*- Farnesene	1415	4.3
11	α Humulene	1418	1.8
12	Aromadendrene	1421	0.6
13	β-Ionone	1431	0.3
14	Germacrene D	1436	32.1
15	α-cis-Bergamotene	1440	0.9
16	Bicyclogermacrene	1445	6.7
17	α-Farnesene	1449	0.4
18	γ-cadinene	1456	0.2
19	δ-cadinene	1459	13.1
20	3-Hexen, 1-ol	1490	0.5
21	α-amorphene	1495	1.1
22	Caryophyllene oxide	1498	1.2
23	Azulene	1511	0.3
24	Cis- Z- α Bisabolene epoxide	1514	0.3
25	Bicyclo [4.4.0] dec-1-ene	1532	0.5
27	Valencene	1544	0.4
28	Isoledene	1560	0.2
29	Hexadecanal	1569	0.1
30	Mintsülfide	1583	0.2
31	α-Benzyl benzoate	1596	0.2
32	β-9H-Fluorene, 9 methylene	1603	0.1
33	2-Pentadecanone	1631	0.5
34	Neophytadiene	1794	4.1
35	Tricosane	1902	0.8
36	Tetracosane	1949	0.2
	Total		90.8

MATERIALS AND METHODS

Plant material

T. chamaedrys specimens were collected from natural habitats in Baskil / Elazig- Turkey in 2009. Voucher specimens are kept at the Firat University Herbarium (FUH).

Isolation of the essential oils

Air-dried aerial parts of the plant materials (100 g) were subjected to hydrodistillation using a Clevenger-type apparatus for 3 h to yield.

Gas Chromatographic (GC) Analysis

The essential oil was analyzed using HP 6890 GC equipped with and FID detector and an HP- 5 MS column (30 m × 0.25 mm i.d., film tickness 0.25 µm) capillary column was used. The column and analysis conditions were the same as in GC-MS. The percentage composition of the essential oils was computed from GC – FID peak areas without correction factors.

Gas Chromatography / Mass Spectrometry (GC-MS) Analysis

The oils were analyzed by GC-MS, using a Hewlett Packard System. HP- Agilent 5973 N GC-MS system with 6890 GC in Plant Products and Biotechnology Research Laboratory (BUBAL) in Firat University. HP-5 MS column (30 m × 0.25 mm i.d.,film tickness 0.25 µm) was used with Helium as the carrier gas. Injector temperature was 250°C split flow was 1 ml / min. The GC oven temperature was kept at 70°Cfor 2 min. and programmed to 150°C at a rate of 10°C/min and then kept constant at 150°C for 15 min to 240°C at a rate of 5°C/ min. Alkanes were used as reference points in the calculation of Relative Retention Indices (RRI). MS were taken at 70 eV and a mass range of 35 to 425. Component identification was carried out using spectrometric electronic libraries (WILEY, NIST). The identified constituents of the essential oils are listed in Table 1.

RESULTS AND DISCUSSION

The hydrodistillation of the aerial parts of *T.chamaedrys* yielded 0.3% (v/w). GC and GC–MS analysis enabled the identification of a total of 36 constituents, representing 90.8% of the oil. The relative concentrations of the volatile components identified are presented in Table 1, according to their retention indices on a HB-5 column. The main components found as germacrene D (32.1%), β-caryophyllene (14.2), δ-cadinene (13.1%) bicyclogermacrene (6.7%) and β-farnesene (4.3%). Predominantly the oil were rich in sesquiterpenenoids.

The essential oils of *Teucrium* species were characterized by a higher content of sesquiterpenes, in accordance with the results reported by previous studies (Cavalerio et al., 2002; Kucuk et al., 2006; Hachicha et al., 2007; Saroglou et al., 2007). So the predominance of sesquiterpenes in this *Teucrium* species is not surprising.

In the essential oil analysis of the *T. chamaedrys* in here showed some similarities with the Morteza-Semnani et al. (2005) study; they reported that, the major constituents of this plant oil (total 49 compounds) were as germacrene D (16.5%), (Z) β-farnesene (12.2%), β-caryophyllene (10.5%), α-pinene (9.1%) and δ-cadinene (7.4%) like in our samples with different quantity. But α-pinene (0.2%) was detected as trace amount in our study. Kovacevic and Lakusic (2001), found 32 compounds in the leaves of *T. chamaedrys* collected from Serbia and Montenegro. They also determined that β-caryophyllene (26.9%) and germacrene D (22.8%) to be the main components in this species. When we compared the essential oil composition of *T. chamaedrys* sample from Turkey; there was a contrast in the quantity

of these two components as (germacrene D - 32.1% and β–caryophyllene 14.2%) (Table 1). The analysis of the essential oil of six *Teucrium* sp. were characterized by a higher content of germacrene D (Velasco- Negueruela and Perez-Alonso, 1990). This oil also has some differences with the other *Teucrium* species from Turkey; particularly in view of main compound. While in *Teucrium multicaule*, caryophyllene oxide (32.1%) and thymol (14.6%) were the major, β-caryophyllene (19.6%) and germacrene D (12.3%) were in *Teucrium parviflorum* Schreb. (Bagci et al., 2010); β pinene (6.74%), trans-caryophyllene (21.84%), germacrene D (13.49%) and bicyclogermacrene (6.88%) were in *Teucrium polium* L. (Doğan, 2008) essential oil. It is possible to say that the differences in the quality or quantity of the composition of volatile oils may be due to genetical, differing chemo-types, drying conditions, mode of distillation and/or extraction and geographic or climatic factors.

Conclusıon

From the research, it can be said that the essential oil of *T. chamaedrys* has germacrene D / β̃-caryophyllene type essential oil. These findings have also ecological and economic significance for utilization of the species in the medicinal, cosmetic and chemical industries.

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