Asian Journal of Chemistry; Vol. 23, No. 8 (2011), 3765-3766

ASIAN JOURNAL OF CHEMISTRY

www.asianjournalofchemistry.co.in

NOTE

Volatile Constituents of *Calamintha nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball. and *Calamintha nepeta* (L.) Savi subsp. *nepeta* from Mediterranean Region in Turkey

S. YASAR[1,*], H. FAKIR[2], S. ERBAS[2] and B. KARAKUS[1]

[1]Department of Forest Products Engineering, Faculty of Forestry, Suleyman Demirel University, 32260 Isparta, Turkey
[2]Department of Forest Engineering, Faculty of Forestry, Suleyman Demirel University, 32260 Isparta, Turkey

*Corresponding author: Tel: +90 246 2113973; Fax: +90 246 2371810; E-mail: syasar@orman.sdu.edu.tr

(*Received*: 26 October 2010; *Accepted*: 30 April 2011) AJC-9898

The essential oils of aerial parts of *Calamintha nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball. and *Calamintha nepeta* (L.) Savi subsp. *nepeta* (Lamiaceae), growing wild in Mediterranean region of Turkey were obtained by hydrodistillation and were analyzed by GC and GC/MS. Thirty compounds (representing 97.60 % of the oil) and 16 components (representing 99.12 % of the oil) were identified for varieties glandulosa and nepeta, respectively. The major components, belonging to oxygen containing hydrocarbons, were piperitone oxide (33.78 %), piperitenone oxide (15.79 %) and isomenthone (11.17 %) in the variety glandulosa oil and pulegone (48.44 %) and menthone (38.69 %) in the variety nepeta oil.

Key Words: *Calamintha* genus, Essential oil, Piperitone oxide, Piperitenone oxide, Pulegone, Menthone, Isomenthone.

The genus *Calamintha* (Lamiaceae) is represented by 9 species and altogether 12 taxa, in which 4 are endemic in Turkey[1,2]. Some species of *Calamintha* are used as medicinal and aromatic plants. *Calamintha nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball. and *Calamintha nepeta* (L.) Savi subsp. *nepeta* (Lamiaceae) are known as "Nane Çayi and Naneruhu" in different regions of Turkey. In the folk medicine, they are used as herbal tea against cold, flu, diarrhoea and indigestion[3].

In the present study, we investigated the chemical composition of the essential oils from aerial parts of *C. nepeta* subsp. *glandulosa* and *C. nepeta* subsp. *nepeta*, growing in the Mediterranean region of Turkey. *Calamintha* is a perennial plant, has 20-75 cm height, ascending-erect stem, ovate leaves, glandular calyx and mauve to pink corolla. *C. nepeta* subsp. *glandulosa* has lax verticillasters, 6-13 mm peduncles. Also its leaves are 11-30 mm × 7-20 mm and usually serrate-dentate with teeth per side. *C. nepeta* subsp. *nepeta* has dense verticillasters, 0.5-6.0 mm peduncles and leaves of this plant are 8-18 mm × 8-16 mm entire or weakly crenate-dentate with up to teeth per side. These plants prefer sandy and rocky limestone slopes, fields, lake and river banks, ruins and sandy beach[1].

The flowering aerial parts of *C. nepeta* subsp. *glandulosa* and *C. nepeta* subsp. *nepeta* were collected in October 2008 from C3 Çamlik (Isparta), Karacaören Dam lake district in Mediterranean region of Turkey, on lake and river banks and sandy and rocky limestone beach, about 285 m above the sea level. Voucher specimens were deposited in the Herbarium of the Forest Botany Department of Suleyman Demirel University (ISPO) as Fakir 4837 and 4839.

Isolation of the essential oil: The aerial parts were air-dried in the shade prior to distillation of essential oil. 200 g plants material were ground and subjected to hydrodistillation using a Clevenger-type apparatus for 3 h. The oil after preparation was submitted to GC and GC/MS analysis.

GC and GC/MS analysis: GC/MS analysis of the oils was carried out using a Hewlett Packard 6890 series gas chromatograph equipped with a Hewlett Packard 5973 mass selective detector, using a HP-5MS capillary column (30 m × 0.25 mm i.d., film thickness 0.25 μm) which was programmed as follows: 60 ºC for 5 min, rising to 280 ºC at a rate of 4 ºC/min. The carrier gas was helium at a flow rate of 2 mL/min. The conditions of GC equipped with a flame ionization detector (FID) for analysis of the oils were the same as for GC/MS.

Identification of components: The retention indices of the constituents were determined in relation to a homologous series of *n*-alkanes under the same operating conditions. Further identification was made by comparison of their mass spectra with the Wiley library or with data already available in the literature[4-6]. Relative percentage amounts were calculated from the total chromatogram.

The yield of the essential oil obtained by hydrodistillation of dry plant material was 0.2 % for *C. nepeta* subsp. *glandulosa* and 3.1 % for *C. nepeta* subsp. *nepeta*. It was identified 30 and 16 compounds to represent 97.60 % of total oil for glandulosa and 99.12 % for nepeta, respectively. The contents of essential oils of both varieties are given in Table-1.

TABLE-1
COMPOSITION OF THE ESSENTIAL OILS OF *C. nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball. AND *C. nepeta* (L.) Savi subsp. *nepeta*

Components	RI	*C. nepeta* subsp. *glandulosa* (%)	*C. nepeta* subsp. *nepeta* (%)
Hydrocarbons			
α-Pinene	934	0.66	1.31
Camphene	951	0.21	0.06
Sabinene	973	0.16	0.43
β-Pinene	980	0.44	1.05
β-Myrcene	991	1.01	0.72
Limonene	1026	4.84	0.64
γ-Terpinene	1062	1.83	1.11
α-Terpinolene	1088	0.04	–
β-Bourbonene	1382	1.62	–
β-Elemene	1388	0.17	–
β-Caryophyllene	1418	4.07	–
α-Humulene	1455	0.69	–
Germacrene-D	1480	1.51	0.49
γ-Cadinene	1515	0.52	–
δ-Cadinene	1526	1.43	–
Oxygen containing components			
3-Octanol	993	1.53	0.34
1,8-Cineole	1031	0.38	–
cis-Sabinene hydrate	1068	0.10	–
trans-Sabinene hydrate	1097	0.19	–
Nonanal	1105	1.57	–
Menthone	1154	–	38.69
Isomenthone	1164	11.17	0.68
α-Terpineol	1189	–	0.20
Pulegone	1237	2.92	48.44
Piperitone	1253	4.70	1.03
Piperitone oxide	1259	33.78	2.24
Isopiperitenone	1272	1.55	–
Thymol	1293	1.74	–
Carvacrol	1298	1.01	–
Piperitenone	1343	1.47	–
Eugenol	1353	0.50	1.69
Piperitenone oxide	1369	15.79	–

RI: Retention indices on HP-5MS capillary column, %: Percentages calculated from FID data.

Fifteen (19.20 %) and eight (5.81 %) hydrocarbon constituents were determined for two varieties; glandulosa and nepeta, respectively. The hydrocarbons were α-pinene, camphene, sabinene, β-pinene, β-myrcene, limonene, γ-terpinene, α-terpinolene, β-bourbonene, β-elemene, β-caryophyllene, α-humulene, germacrene-D, γ-cadinene and δ-cadinene in the glandulosa and α-pinene, camphene, sabinene, β-pinene, β-myrcene, limonene, γ-terpinene and germacrene-D in the nepeta, respectively (Table-1).

Fifteen (78.40 %) and eight (93.31 %) oxygen containing components were detected for glandulosa and nepeta, respectively. The oxygen containing components were 3-octanol, 1,8-cineole, *cis*-sabinene hydrate, *trans*-sabinene hydrate, nonanal, isomenthone, pulegone, piperitone, piperitone oxide, isopiperitenone, thymol, carvacrol, piperitenone, eugenol and piperitenone oxide in the glandulosa and 3-octanol, menthone, isomenthone, α-terpineol, pulegone, piperitone, piperitone oxide and eugenol in the *nepeta*, respectively (Table-1).

Three types of oil were distinguished for *Calamintha* genus by Baldovini *et al.*[7]. In the first type, pulegone is the dominant constituent, associated with different components such as menthone and/or isomenthone, menthol and its isomers, piperitenone, piperitone and piperitenone oxides. The second type is characterized by the predominant components piperitone oxide and/or piperitenone oxide. Last type is distinguished by the presence of carvone and 1,8-cineole as major constituents.

Although, piperitone oxide (33.78 %), piperitenone oxide (15.79 %) and isomenthone (11.17 %) were the major constituents in essential oil of *C. nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball., pulegone (48.44 %) and menthone (38.69 %) were the predominant components in essential oil of *C. nepeta* (L.) Savi subsp. *nepeta*.

Conclusion

Data obtained from two varieties growing wild in Mediterranean region of Turkey allow us to ascribe the oil of *C. nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball. to a type piperitone oxide/piperitenone oxide oil and the oil of *C. nepeta* (L.) Savi subsp. *nepeta* to a type pulegone/menthone oil, respectively.

REFERENCES

1. P.H. Davis, R. Mill and T. Kit, Flora of Turkey and East Aegean Islands, Edinburgh University Press, Edinburgh, Vol. 7 (1982).
2. K.H.C. Baser, *Pure Appl. Chem.*, **74**, 527 (2002).
3. T. Baytop, Turkiye'de Bitkilerle Tedavi, I.U. Eczacilik Fakultesi Yayin No: 3255/40, Istanbul (1984).
4. R.P. Adams, Identification of Essential Oil Components by Gas Chromatography and Mass Spectroscopy, Allured Publishing Co., Carol Stream, IL (1995).
5. H. van den Dool and P.D. Kratz, *J. Chromatogr.*, **11**, 463 (1963).
6. A. Bisio, G. Ciarallo, G. Romussi, N. Fontana, N. Mascolo, R. Capasso and D. Biscardi, *Phytother. Res.*, **12**, 117 (1998).
7. N. Baldovini, D. Ristorcelli, F. Tomi and J. Casanova, *Fragr. J.*, **15**, 50 (2000).