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Essential Oil Composition of *Nepeta cilicia* Boiss. Apud Bentham and *Phlomis viscosa* Poiret from Turkey

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Abstract: The chemical composition of the essential oils from flowering parts of *Nepeta cilicia* Boiss. apud Bentham and *Phlomis viscosa* Poiret from Turkey was determined by GC/MS. The main constituents of the essential oils were obtained as limonene (44.75%) in *P. viscosa* and β-caryophyllene (24.4%).

Key words: *Nepeta cilicia, Phlomis viscosa*, essential oils, limonene, β-caryophyllene

INTRODUCTION

Turkey is regarded as an important gene-center for Labiatae (Lamiaceae). The family is represented in Turkey by 45 genera, 546 species and a total of 731 taxa. The rate of endemism in the family is 44.2%. In terms of endemism, Labiatae family is the third richest family in Turkey (Başer, 1993). Plants of the genus *Nepeta* (Lamiaceae), commonly known as catmints, are distributed in Europe, Asia and a few areas of Africa. The genus *Nepeta* is represented in Turkey by 33 species, 17 of which are endemic. Some species of the genus have been used in folk medicine and some of their constituents, posses biological activities (Kökdil *et al*., 1997). Some *Nepeta* sp. are used as exciting and in stomach diseases in Turkey (Baytop, 1984).

The published result reveal that major volatile constituents obtained from *Nepeta* species nepetalactones (Regnier *et al*., 1967; Tzakou *et al*., 2000; Dabiri and Sefidkan, 2003; Sefidkon and Akbarinia, 2003). However some differences in essential oil composition of *Nepeta* species revealed that other terpenic compounds (e.g., 1,8-cineole, citronellol, linalool, linoleic acid and spathulenol) are the main components (Regnier *et al*., 1967; Domokos *et al*., 1994; Kalpoutzakis *et al*., 2001; Senatore and Özcan, 2003; Mehrabani *et al*., 2004).

N. cilicia Boiss. apud Bentham is spreaded to South Anatolia in Turkey and grows cliffs, rocks, gullies, limestone and soil slopes, coniferous and deciduous woods and at an altitude of 900-2700 m (Davis, 1982).

The genus *Phlomis*, consists of about more than 100 species; Africa, Asia, Europe. Some *Phlomis* species are used as tonics and stimulants in Anatolian folk medicine (Baytop, 1984). *P. viscosa* Poiret is spreaded to mainly S. Anatolia, Syria, Lebanon, Palestine. 34 of them are found among the flora of Turkey of which 21 are endemic *P. viscosa* grows Quercus scrub, rocky slopes, schitose hillsides and at an altitude of 300-1440 m (Davis, 1982).

Essential oil of *N. cilicia* collected from different area of Turkey were studied by Kökdil *et al.* (1997). Contrary to *N. cilicia,* there was no study concerning the essential oil composition of *P. viscosa,* as far as we know. Essential oil composition and glycosides from *Turkish Phlomis* spp. were studied some authors (Çalis and Kırmızıpekmez, 2004; Ismailoglu *et al*., 2002; Demirci *et al*., 2003). The composition of the essential oil plants can be very different from one location to another and these components correspond very different activities and organoleptic properties (Guillen and Manzanos, 1998). For this reason, it is very important to determine the real composition of the wild plants. In this study we report the essential oil composition of *N. cilicia* and *P. viscosa* growing wild in Southestern of Turkey.

MATERIALS AND METHODS

Plant materials: *N. cilicia* was collected from Başkonuş Mountain in June (altitude 1450 m) and *P. viscosa* from Çimendağı in K. Maras in July (altitude 1900 m). Voucher specimens are kept at the herbarium of the Science and Letter Faculty, University of KSU in K. Maraş, Turkey.

Isolation of the essential oils: The air dried flowering parts and leaves of the plants were hydrodistilled

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for 3 h using a Clevenger type apparatus according to the standard procedure described in the Sainte-Ruffine (1975).

Chemical analysis of the essential oils: The chemical composition of the essential oils was determined with a G 1800 B GCD system with an electron iozination detector (Hewlett-Packard Co, Polo All, CA) for high-resolution gas chromotography-mass spectrometry (GC-MS) analysis. Essential oils were injected into HP-5 fused silica capillary column (30 m×0.25 mm) was used with helium as the carrier gas (1 mL min^{-1}). The temperature programme was 80 °C for 2 min and 80-200 °C at 4°C min^{-1} . MS were taken at 70 eV. The scanning range was 45-450 m/z.

RESULTS AND DISCUSSION

The general chemical profiles of the tested oils, the percentage content of the components are summarized in Table 1 in order of elution from silica capillary column.

In the oil of *N. cilicia* 13 components were identified, which represented 97.55% of the total detected constituents. The major constituents of the oil were limonene (44.75%), β-pinene (13.6%), β-caryophyllene (11.2%) and caryophyllene oxide (9%). Other components were present in amount less than 9%. The earlier literatures results about Turkish *Nepeta* species showed different oil composition Kökdil *et al.* (1998) reported that *N. italica* and *N. sulfuriflora* includes 1,8-cineole as main component. The major components being linalool (40.5%), 1,8-cineole (20.8%) in *N. betonicifolia* oil (Senatore and Özcan, 2003) Başer and Özek (1994) reported that 4aα, 7α, 7a β- nepetalactone was found to be the major component in the *N. caeserea* oil. The major constituents found were nerolidol (31.7%) in the *N. nuda* ssp. albiflora pils (Sarer and Konuklugil, 1996).

In regard to the previously report essential oil content of *N. cilicia* had high caryophyllene oxide (40.7%) and β-caryophyllene (15.7%) (Kökdil *et al*., 1997). Present results have some differences than Kökdil *et al.* (1997) results. These chemical differences can be most probably explained differences of collecting area. Because the collecting area of Kökdil *et al.* (1997) was near Anamur in Southern Turkey that so far from our area.

In the oil of *P. viscosa* 15 compound constituting 80. 85% of the oil were identified. β-caryophyllene (24.4%) was major component in the oil. Followed by alloaromadendrene (11%), α-humulene (6.1%) and germacrene-D (4.7%). Our result confirmed by Demirci *et al.* (2003). They report that essential oil of Turkish *P. linearis* was indicate β-caryophyllene, germacrene-D and caryophyllene oxide as main component. The results of the present investigation indicate differences to the composition of the oils of *Phlomis* species reported earlier. α-pinene, limonene and trans-caryophyllene were found as its main components in *P. lanata* (Couladis *et al*., 2000). Essential oils of *P. persica* and *P. chorassanica* were rich in sesquiterpenes (81.3 and 90.1%, respectively) and germacrene-D (32.5 and 515%, respectively) as the major component (Sarkhail *et al*., 2004). Morteza-Semnani *et al.* (2003) reported that the major constituents of the *P. herba-venti* leaf essential oil were germacrene-D (33.9%), hexadecanoic acid (12.9%) and α-pinene (9.4%) and the major constituents of the flower essential oil were hexadecanoic acid (33.1%), 6, 10, 14-trimethylpentadecan-2-one (16.2%), 3-methyltetradecane (6.7%) and germacrene D (6.7%).

Table 1: Percentage composition of the oils of *N. cilicia* and *P. viscosa*

Compound	*Nepeta cilicia*	*Phlomis viscosa*
α-thujone	2.00	-
α-pinene	3.50	-
sabinene	2.40	-
β-pinene	13.60	-
limonene	44.75	1.10
linalool	-	0.80
α-campholene aldehyde	0.30	-
terpinene-4-ol	1.50	-
α-terpineol	2.30	-
β-caryophyllene	11.20	24.40
aroma dendrene	-	0.90
α-humulene	0.80	6.10
alloaromadendrene	-	11.00
germacrene D	5.20	4.70
α-longipinene	-	2.70
β-bisabolene	-	1.00
D-cadinene	1.00	1.30
elemol	-	1.40
caryophyllene oxide	9.00	2.60
α-monocyclofarnesylacetone	-	16.44
β-selinene	-	0.81
5, 7-Dimethoxy-1-naphthol	-	5.60
Total	97.55	80.85

Published studies have indicated a high degree of variability in quantity and composition of the volatile oils from different populations and clones (Skoula *et al*., 2000). Altough the chemical characters are generally inherited plants are capable of adapting themselves to changing climatic and edaphic conditions. Such changes may in the long run lead to the evolution of new taxa (Başer, 2002). Also the highly heterogenous soil and climatic conditions of the Mediterranean area have resulted in an increased diversity of medicinal plants (Nicolaidis, 1993).

As a conclusion oil of *N. cilicia* are rich in limonene and *P. viscosa* are rich in β-caryophyllene and due to these high content, they can be considered as substitues for these plants for medical purposes and cosmetics.

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