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ESSENTIAL OIL COMPOSITION OF TWO *PIMPINELLA* L. SPECIES FROM TURKEY

TÜRKİYE'DE YETİŞEN İKİ *PIMPINELLA* L. TÜRÜNÜN UÇUCU YAĞ KOMPOZİSYONU

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ÖZET

Bingöl'de yetişen Pimpinella kotschyana Boiss. ve Pimpinella corymbosa Boiss. türlerinin toprak üstü kısımlarından elde edilen yağlar GC-MS tekniği ile analiz edildi ve bu türlerden sırasıyla %94.4 ve %95.9'luk toplam yağ miktarından 24 ve 25 bileşen tespit edildi. P. Kotschyana'nın ana bileşenleri b-karyofillen (%26.8), a-humulen (%18.6) ve germakren D (%12.8) olarak belirlendi; P. corymbosa'da ise b-farnesen (%28.6), b-bisabolen (%22.7) ve (E)-anethole (%13.9) ana bileşenler olarak bulundu. P. Kotschyana'nın kemotipi b-karyofillen; P. corymbosa'nın kemotipi b-farnesen olarak belirlendi. Sonuçta bu çalışma ile P. kotschyana ve P. corymbosa türlerinin uçucu yağ içerikleri bakımından zengin olduğu bulunmuş ve uçucu yağlarının içerikleri yönünden önemli sonuçlar ortaya konulmuştur.

Anahtar Kelimeler: *Anason, GC-MS, Pimpinella, Uçucu yağ.*

ABSTRACT

The essential oils of aerial parts of Pimpinella kotschyana Boiss. and Pimpinella corymbosa Boiss. species growing in Bingöl were analyzed by GC-MS technique and 24 and 25 compounds were identified representing 94.4% and 95.9% of the oil respectively. The main constituents of P. kotschyana were b-caryophyllene (26.8%), a-humulene (18.6%) and germacrene D (12.8%); whereas b-farnesene (28.6%), b-bisabolene (22.7%) and (E)-anethole (13.9%) were the major constituents of P. corymbosa. The chemotypes of P. kotschyana and P. corymbosa were determined b-caryophyllene and b-farnesene, respectively. Eventually with this study, essential oil contents of P. kotschyana and P. corymbosa were found to be rich and important results presented in respect to essential oil composition of these species.

Key words: *Anise, GC-MS, Pimpinella, Essential oil*

1. INTRODUCTION

The Apiaceae or Umbelliferae family comprises 300-455 genera and about 3000-3750 species distributed in the world [1]. Members of this family include economically important plants, and they have particularly flavors and odor which are largely in traditional medicine many parts of world [2].

Pimpinella L. is represented about 150 species in the world [3] and 30 taxa in the Flora of Turkey [4,5].

Pimpinella have annual, biennial or perennial members; leaves entire or 1-3 pinnate; inflorescence a compound umbel; sepals usually minute; petals white, yellow or pink [4].

Some members of *Pimpinella* were cultivated by Egyptians, Greeks and Romans for their aromatic seeds used in medicine and as a condiment; they have also been used as popular aromatic herbs and spices since antiquity, and have been cultivated throughout Europe [3]. In addition the fruits of *Pimpinella* have been used for medicine, perfumery and in cooking [6,7].

In Turkish folk medicine, some species of *Pimpinella* seeds have been used as appetizers, tranquillizers, diuretic drugs and in liquor production [8].

The most widely known and cultivated *Pimpinella* species is *P. anisum* L. *P. anisum* (Anis) fruits (Aniseed) have been used in Turkish folk medicine as carminative, appetizers, sedative, agents to increase milk secretion and an important agricultural crop of Turkey [9].

Leaves of *P. anisetum* Boiss.& Bal. are used in salads and its seeds are used in pickling in Central Turkey; *P. isaurica* Matthews, *P. aurea* DC., *P. corymbosa* are used in animal feeds to increase milk production in eastern and southeastern parts of Turkey [10]. *P. saxifraga* L. roots are used as demulcent, stomachic, expectorant and tonic in Turkey [11].

The objective of the present study was to examine the chemical composition of the essential oil of *P. kotschyana* and *P. corymbosa*, growing wild in the eastern part of Turkey.

2. MATERIALS AND METHODS

2.1. Plant Source

P. kotschyana was collected from Şaban village vicinity, steppe and stony areas, Bingol/ Turkey, on 30.06.2013, at an altitude of 1550-1600 m., by O. Kilic, collect no: 5053. *P. corymbosa* was collected from south of Dikme village, steppe and stony areas, Bingol/Turkey, on 15.07.2013, at an altitude of 1600-1650 m., by O. Kilic, collect no: 5266. Voucher specimens of plant samples kept at the Bingol University Herbarium (BIN) with 2925 and 2926 herbarium numbers, respectively.

2.2. Gas Chromatography/Mass Spectrometry (GC-MS)

100 gram air-dried aerial parts of *Pimpinella* species were subjected to hydrodistillation using a Clevenger-type apparatus for 2-3 h. 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 thickness 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 [12].

The oils of studied samples 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 thickness (0.25 μm) was used with helium as the carrier gas. Injector temperature was 250 ºC split flow was 1 mL/min. The GC oven temperature was kept at 70 ºC for 2 min. and programmed to 150 ºC at a rate of 10 ºC/min and then kept constant at 150 ºC for 15 min to 240 ºC at a rate of 5 ºC / min. Alkans were used as reference points in the calculation of relative retention indices (RRI). MS were taken at 70 eV and a mass range of 35-425. Component identification was carried out using spectrometric electronic libraries (Wiley, Nist) [12]. The identified constituents of *Pimpinella* species are listed in Table 1.

Table 1. The identified constituents of *Pimpinella* species (%).

Constituents	RRI*	*P. kotschyana*	*P. corymbosa*
-pinene	1030	-	1.2
Camphene	1055	1.8	0.6
-pinene	1100	2.6	-
Sabinene	1125	4.5	3.7
Myrcene	1165	0.2	0.5
-phellandrene	1128	-	1.6
cineole	1153	0.3	-
Limonene	1203	4.5	3.2
-phellandrene	1218	-	0.1
-ocimene	1242	0.2	-
-Terpinene	1253	0.1	-
p-cymene	1275	-	2.3
Terpinolene	1288	-	0.4
Longipinene	1455	0.3	-
trans-sabinene hydrate	1476	0.1	0.2
Bicycloelemene	1489	-	0.4
-copaene	1493	0.3	-
-cubebene	1539	0.7	-
Linalool	1550	-	0.6
Bornyl acetate	1592	1.2	0.5
-caryophyllene	1610	26.8	3.6
-farnesene	1665	4.8	28.6
-humulene	1672	18.6	3.9
Germacrene D	1715	12.8	4.9
-bisabolene	1745	4.3	22.7
(E)-anethole	1842	5.8	13.9
-calacorene	1935	-	0.2
Caryophyllene oxide	2005	2.5	-
Elemol	2092	0.2	0.1
Spathulenol	2140	-	0.3
-bisabolol	2230	1.2	0.5
Carvacrol	2245	-	1.3
-cadinol	2262	0.2	0.6
Octadecanal	2351	0.4	-
***RRI:** Relative Retention Index	**Total**	**94.4**	**95.9**

3. RESULTS AND DISCUSSION

In this study, the main constituents of *P. kotschyana* were b-caryophyllene (26.8%), a-humulene (18.6%) and germacrene D (12.8%). b-farnesen (28.6%), b-bisabolen (22.7%) and (E)-anethole (13.9%) were the major constituents of *P. corymbosa* (Table 1). Arslan *et al.,* (2004) also recorded that trans-anethole was the main compound of anise essential oil [13]. b-caryophyllene (26.8%) was found to be the main compound of *P. kotschyana* (Table 1); similarly, b-caryophyllene was detected the main compound different part of *P. kotschyana* from Iran [14]; fruits-stem and leaves of *P. corymbosa* from Turkey [15]. Whereas b-caryophyllene was not reported among the main constituents of *P. anisetum* and *P. flabellifolia* (Boiss.) Benth. & Hook. ex Drude from Turkey [16].

The major constituents stem/leaves (SL) and flowers (F) of *P. aurea* DC. (Askari et al., 2005) were b-pinene (SL: 13.0%; F: 1.6%), limonene, (SL: 21.0%; F: 9.0%), viridiflorol (SL: 13.0%; F: 33.0%) and b-bisabolene (SL: 4.0%; F: 30.0%). Viridiflorol, was not found *P. kotschyana* and *P. corymbosa* oil; in addition, b-pinene, limonene and 1,8-cineole was not or found low amounts in this research (Table 1). The aerial parts of *P. anisetum* Boiss. & Ball. and *P. flabellifolia* (Boiss.) Benth. ex Drude were analysed by GC and GC/MS and the main compounds of *P. anisetum* were (E)-anethole (82.8%) and methyl chavicol (14.5%), whereas limonene (47.0%), (E)-anethole (37.9%) and b-pinene (6.0%) were the major constituents of *P. flabellifolia*. In our research, the main constituents of *P. kotschyana* were b-caryophyllene (26.8%), a-humulene (18.6%) and germacrene D (12.8%). b-farnesen (28.6%), b-bisabolen (22.7%) and (E)-anethole (13.9%) were the major constituents of *P. corymbosa* (Table 1).Chavicol (91.96%), (E)-anethole (7.22%) and α-pinene (0.12%) were characterized the oil of *P. aromatica* Bieb. growing in Turkey [17]. In our study methyl chavicol wasn't detected in two *Pimpinella* species and (E)-anethole (13.9%) was the main compounds only in *P. corymbosa* (Table 1).

b-caryophyllene is the main sesquiterpene of *Humulus lupulus* L. (hops) and are being used as cosmetic additives in soaps and fragrances [18]. In herbal medicine, the mild sedative properties of hops are due to the presence of b-caryophyllene [19]. Furthermore, b by *in vitro* studies it was demonstrated the cytotoxic activity of the b-caryophyllene against breast cancer cells [20]. In our study b-caryophyllene was determined high amount from *P. kotschyana* (26.8%) and *P. corymbosa* (3.6%); so these results demonstrating their applicability for medicinal, cosmetic and pharmaceutical purposes.

In conclusion, b-caryophyllene / a-humulene in *P. kotschyana*; b-farnesene/b-bisabolene were found to be the chemotypes of *P. corymbosa*. According to these results, studied *Pimpinella* species were found to be rich in respect to essential oils and to enlarge usable of these species important results presented with this study.

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