Chemistry of Natural Compounds, Vol. 44, No. 6, 2008

COMPOSITION OF THE FRUIT ESSENTIAL OIL OF *Bupleurum fruticosum* GROWN IN SOUTHERN FRANCE

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UDC 547.913

Bupleurum fruticosum L. (Apiaceae) is a shrub with entire, oblong leaves and yellowish flower umbels growing on rocky places in garrigues in the mediterranean region [1]. From this species various chemical constituents have been studied, including triterpene saponins [2–4], phenylpropanoids [5, 6], and coumarins [3]. The essential oils of various parts from plants of different origin have been analyzed [7–10]. Recently Testai et al. [11] found a vasorelaxant effect of root chloroformic extracts, but they did not identify the active principle.

The present work reports the essential oil composition of fruits of *Bupleurum fruticosum* collected in the wild in Southern France.

The plants were collected in August 2000 near Villeneuve les Corbieres (Dep. Aude) along the road D613 between Villeneuve and Col d'Extreme. The plants were growing on a smooth montain side in an open maquis on a schiste underground (N 42°56.85′- E 2′45.50′). A voucher specimen was deposited in the Herbarium of the University of Vienna (WU-Generale, http:\\herbarium.univie.ac.at).

The hydrodistillation of the dried fruits gave an essential oil yield of 2.5% (v/w). As shown in Table 1, the main components of the present *B. fruticosum* fruit oil are α- and β-pinene, representing nearly 75% of the essential oil. β-Phellandrene, α-thujene, and myrcene together make up another 11.6 % of the oil.

The composition of the essential oil appeared to be dependent on the plant part analyzed. α-pinene and β-pinene as the main compounds of *B. fruticosum* were reported by Peyron and Roubard [10], presumably from flowering branches of plants of French origin. The fruits of Spanish origin analyzed by Lorente et al. [9] had also α-pinene and β-pinene as the main compounds in the essential oil. The blooming parts of plants collected in Lybia displayed β-phellandrene (49%) as the major compound followed by α-pinene (15%) and β-pinene (9%) [7]. α-Pinene and β-pinene were the main monoterpenes in *B. fruticosum* leaves and were emitted mainly during July [12]. Sabinene and β-phellandrene were the main componentes in the leaf oil, and γ-terpinene is predominant in the oil from stems of plants of Italian origin [8]. In both field-grown and micropropagated plants the leaves had β-phellandrene and sabinene, and the stems γ-terpinene and α-phellandrene as the main components of their essential oils [13].

Limonene, 1,8-cineole, and carvacrol, which were present in a fruit oil from Southern Spain [9], could not be detected in the present oil.

Limonene, which is largely emitted by *B. fruticosum* in the winter [12], was not present in the fruits collected in August. In July, the limonene emissions were very slight [12].

Decanal, which is among the volatile organic compounds emitted by *B. fruticosum* during summer [14], was present as a minor compound in the fruits.

Cinnamyl isovalerate has also been found in the leaves and stems [8].

In conclusion, the fruit essential oils reported here are α-pinene and β-pinene, which are the same main components as the fruit oils of other origin; however there were considerable differences in the minor components.

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 0009-3130/08/4406-0792

TABLE 1. Composition of the Fruit Essential Oil of *Bupleurum fruticosum*

Compound	RI	%	Compound	RI	%
Tricyclene	914	0.1	Pinocarvone	1160	0.1
α-Thujene	921	2.3	*cis*-Pinocamphone	1172	0.1
α-Pinene	934	35.4	Terpinen-4-ol	1175	0.6
Camphene	944	1.0	Cryptone	1185	<0.05
Verbenene	950	0.1	α-Terpineol	1189	0.2
β-Pinene	977	39.1	Myrtenal	1193	0.1
Myrcene	987	1.9	Methyl chavicol	1195	0.1
α-Phellandrene	997	0.2	Decanal	1200	0.1
α-Terpinene	1010	0.2	Hexyl isovalerate	1237	0.1
p-Cymene	1021	0.9	Carvacrol methylether	1241	0.1
β-Phellandrene	1026	7.4	Bornyl acetate	1281	0.2
E-β-Ocimene	1035	0.2	*trans*-Pinocarvyl acetate	1295	0.1
Z-β-Ocimene	1046	0.3	α-Copaene	1371	<0.05
γ-Terpinene	1056	0.6	Benzyl valerate	1383	0.1
cis-Sabinene hydrate	1065	0.0	β-Elemene	1387	0.3
Terpinolene	1083	0.1	Benzyl isovalerate	1391	0.1
Isoamyl-2-methylbutyrate	1094	0.6	β-Caryophyllene	1414	0.2
2-Methylbutyl-2-methylbutyrate	1098	0.4	α-Humulene	1450	0.1
Isoamyl valerate	1100	2.3	Germacrene D	1477	<0.05
Amyl isovalerate	1102	1.1	β-Bisabolene	1502	0.5
cis-para-Menth-2-en-1-ol	1118	0.1	Spathulenol	1577	0.1
α-Campholenal	1123	0.1	Caryophyllene oxide	1581	0.1
trans-Pinocarveol	1136	0.2	Cinnamyl isovalerate	1681	0.4

RI: retention index on an apolar column.

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