NEEDLE ESSENTIAL OIL COMPOSITION OF *Picea omorika* VAR. *vukomanii*

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Serbian spruce, *Picea omorika* (Pancic) Purkyne (Pinaceae), is a relic and endemic tree species with a fragmented natural distribution in Serbia and Bosnia and Herzegovina [1], considered as vulnerable by IUCN [2]. It is geographically isolated, and a very small natural population (up to 30 trees) is a variety named Vukoman's Serbian spruce (*Picea omorika* (Pancic) Purkyne var. *vukomanii* Pavlovic et Matovic) in the Milesevka Kanyon (Serbia), which differs clearly from *P. omorika* var. *omorika* (var. *serbica*) in morphological characteristics of habitus, branches, and needles [3, 4].

Serbian spruce oleoresin and the essential oil composition of twigs or needles have been studied [5-13], but almost all listed researches dealt with a small number of isolated components except [11] (41 identified compounds). Some population studies of *P. omorika* have been published [14-15], but, to the best of our knowledge, this is the first investigation of the variability of the essential oil of *P. omorika* from natural stands on the population level, and the first report of the essential oil composition of *P. omorika* var. *vukomanii.*

The chemical composition of the essential oil of *Picea omorika* var. *vukomanii* is presented in Table. Forty-seven compounds are identified, comprising 99.7% of the oil. The main ones, each with abundance more than 10% [16], are three monoterpenes: bornyl acetate, camphene, and α-pinene. They comprise 74.2% of the essential oil mass. Twelve components have a medium high content (abundance 0.5-10%). Traces comprise only 3.8% of the essential oil. The total amounts of monoterpenes, sesquiterpenes, and diterpenes are 88.5%, 7.1%, and 3.6%, respectively.

The variation of each compound is listed as the value of the standard deviation (SD) (Table). Eight compounds (tricyclene, α-pinene, camphene, β-pinene, myrcene, limonene, borneol, and δ-cadinene) show similarity to the normal distribution (χ^2 = from 7.33 to 16.67, $P>0.05$) but the rest show deviation from such a distribution (χ^2 = from 20.66 to 175, $P<0.05$). This picture has been found in some conifer species in a considerably higher number of samples than ours, suggesting genetic control of the levels of these terpenes [17].

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TABLE 1. Chemical Composition of Needle Essential Oil of *Picea omorika* (Pancic) Purkyne var. *vukomanii* Pavlovic et Matovic

Compound	RI*	%	SD	Compound	RI*	%	SD
trans-2-Hexenal	855	0.59	1.38	Isocaryophyllene	1407	0.31	0.23
Santene	884	2.99	1.92	α-Humulene	1455	0.12	0.14
Tricyclene	918	2.06	1.28	γ-Muurolene	1480	0.04	0.10
α-Pinene	939	10.99	3.77	Germacrene D	1485	1.07	0.92
Camphene	954	20.29	8.10	β-Selinene	1490	0.01	0.04
β-Pinene	979	1.08	0.44	α-Muurolene	1500	0.23	0.22
Myrcene	991	2.32	0.73	γ-Cadinene	1514	0.15	0.17
α-Phellandrene	1003	0.16	0.30	δ-Cadinene	1523	1.47	0.77
δ^3-Carene	1011	0.15	0.23	*trans*-Cadina-1-(2)-4-diene	1535	0.01	0.03
p-Cymene	1026	0.03	0.07	α-Cadinene	1539	0.01	0.04
Limonene	1029	3.99	0.71	T-Cadinol	1640	1.07	0.63
α-Terpinolene	1088	0.05	0.11	α-Cadinol	1653	2.17	1.29
Linalool	1097	0.17	0.20	Cadalene	1674	0.06	0.15
Fenchol	1117	0.05	0.10	Sandaracopimaradiene	1960	0.01	0.03
α-Campholene aldehyde	1125	0.04	0.09	Manoyl oxide	1989	0.17	0.19
Camphene hydrate	1148	0.85	0.44	Abietatriene	2054	0.14	0.52
Citronellal	1153	0.15	0.25	Phytol	2128	0.22	0.84
Borneol	1169	2.38	0.88	Sclareol	2161	0.04	0.09
α-Terpineol	1189	0.06	0.14	Dehydroabietal	2263	0.03	0.08
Verbenone	1205	0.03	0.07	Monoterpene hydrocarbons		41.13	
Fenchyl acetate	1208	0.16	0.16	Monoterpenes oxygenated		47.37	
β-Citronellol	1226	0.19	0.33	Sesquiterpene hydrocarbons		3.80	
Piperitone	1253	0.02	0.05	Sesquiterpenes oxygenated		3.24	
Bornyl acetate	1289	42.89	10.98	Diterpene hydrocarbons		0.15	
α-Terpenyl acetate	1349	0.20	0.24	Diterpenes oxygenated		0.24	
Geranyl acetate	1381	0.18	0.24	Other		3.81	
β-Bourbonene	1388	0.29	0.64	Total		99.74	
β-Elemene	1391	0.02	0.07				

*Retention indices relative to *n*-alkanes on HP-5 column.

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