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Variety of the essential oils composition of wood, needles (leaves), unripe and ripe berries of *Juniperus communis* var. *communis* growing wild in Druskininkai district

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Branches with unripe and ripe berries of *Juniperus communis* var. *communis* were collected from two bushes in Druskininkai district in 2004 and 2006. The essential oils of various juniper parts obtained by hydrodistillation were analysed using GC and GC/MS. The essential oil of the wood was investigated in Lithuania for the first time. The essential oils of the needle (leaf), unripe and ripe berry were of α-pinene (42.4–67.4%) chemotype and their composition from both junipers was similar. The amounts of α-pinene in the wood oils (15.9–31.0%) were lower than those in the above-mentioned oils. The composition of the wood essential oils differed from those of other parts of the plants in the amounts of monoterpenoids (≤60.1% and ≥72.8%) and of the compounds with pinane carbon skeleton (≤40.8% and ≥50.9%). Different quantities of monoterpenoids (24.6 and 60.1%), sesquiterpenoids (63.4 and 23.2%), compounds with pinane (17.8 and 40.8%), cadinane (23.8 and 9.5%) and menthane (3.2 and 11.7%) carbon skeletons were found in the essential oils of the wood under study. The most abundant compounds in one wood oil were nootkatone (18.4%), α-pinene (15.9%) and α-cadinol (3.8%) and in the other oil α-pinene (31.0%), p-mentha-1,5-dien-8-ol (4.5%) and δ-3-carene (4.0%). One hundred and thirty three identified constituents comprised 85.4–97.1% of the essential oils.

Key words: *Juniperus communis*, Cupressaceae, composition of essential oils, wood, needles, unripe berries, ripe berries, α-pinene, myrcene, nootkatone

INTRODUCTION

The wood essential oils of *Juniperus* genus (Cupressaceae) plants (commercial product is named as cederwood oil) are an important natural product for the components directly used in fragrance compounding or as a source of raw components in the production of additional fragrance compounds [1]. These oils exhibit antimicrobial, insecticidal and termicidal properties. Some of the cederwood oils serve as insect repellents [1].

The major constituents of the world's juniper essential oils reviewed by R. P. Adams were sesquiterpenoids [1]. Sesquiterpenoids were also among the most abundant compounds in *Juniperus communis* L. wood essential oils in Sweden [2] and in the South-Western France [3]. The main constituent of these oils was thujopsene (37.0–42.4%) [2, 3].

Monoterpenoids comprised the largest part of the wood essential oils of *J. communis* L. from Corsica [4] and Sardinia [5]. The major constituents of the wood oil from Corsica were limonene (19.0%), α-terpinyl acetate (9.1%), β-phellandrene (8.9%), α-terpineol (8.4%), α-pinene (7.5%), p-cymene (2.4%), terpinen-4-ol (2.4%), α-cadinol (1.9%) and δ-cadinene (1.8%) [4]. The most abundant compounds in the juniper wood essential oil from Sardinia [5] were limonene (23.4%), α-terpineol (9.1%), α-terpinyl acetate (6.8%), p-cymene (6.7%), germacrene D (6.6%), γ-cadinene (5.4%), β-oplopenone (4.7%), β-phellandrene (3.7%), α-pinene (3.3%), α-cadinol (3.3%), α-humulene (2.8%) and α-selinene (2.8%). Besides the aforesaid compounds, *J. communis* L. wood oils included various amounts of β-pinene, myrcene, δ-3-carene, borneol, bornyl acetate, p-cymenol, myrtenol, trans-carveol, β-elemene, γ-muurolene, β-selinene, elemol, spathulenol, caryophyllene oxide, epi-α-cadinol and a lot of other compounds [1–5]. Nearly all compounds of juniper wood essential oils were found in the needle, unripe and ripe berry oils in various countries [1–4, 6–8]. All the investigated needle (n = 10), unripe (n = 6) and ripe (n = 10) berry oils from Lithuania were of α-pinene chemotype. Oxygenated sesquiterpene nootkatone was found only in the root essential oil of *J. communis* L. collected in Corsica [4].

Only one species of *Juniperus genus J. communis* L. var. *communis* grows wild in Lithuania [1, 9, 10].

The present work deals with the composition of the essential oils of wood, needle, unripe and ripe berries from *J. communis* L. var. *communis* plants. The chemical composition of juniper wood essential oils is reported here for the first time in Lithuania.

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MATERIALS AND METHODS

The samples of individual juniper (*J. communis* L. var. *communis*) plants were collected in 2004 and 2006 in Druskininkai district. Voucher specimens have been deposited in the Herbarium of the Institute of Botany (BILAS number 68883). The essential oils were prepared by hydrodistillation (3h) of fresh wood, needles, unripe and ripe berries in an apparatus according to [11]. The ratio of wood, unripe, ripe berries and water was 1:10, needles and water was 1:20. The essential oils were collected in 2 ml of hexane mixture: diethyl ether = 1:1. The results are represented as mean values obtained from at least two hydrodistillations of the plant material. The yields of the oil from wood (~0.22%), needles (~0.37%), unripe berries (~1.2%) and ripe berries (~0.9%) were obtained using 50 g of the plant material and expressed in v/w% on dried weight.

The analyses of the essential oils were carried out by GC and GC/MS. The quantitative analysis was performed on a capillary column HP-FFAP (30m × 0.25mm × 0.25mm) using a chromatograph HP 5890II equipped with an FID. The GC oven temperature was programmed as follows: from 60 °C (isothermal for 3 min) increased to 160 °C at a rate of 5 °C/min (isothermal for 1 min) and to 250 °C at a rate of 10 °C/min and the final temperature was kept for 3 min. The temperature of the injector and the detector was 250 °C. The flow rate of the carrier gas (helium) was 1 ml/min. The analyses by GC/MS were carried out by an HP 5890 gas chromatograph equipped with an HP 5971 mass selective detector and an HP 7673 split/splitless injector on a capillary column DB-5 (50m × 0.32mm × 0.25 mm). The chromatographic conditions were the same. Mass spectra in the electron mode were generated at 70 eV.

The percentage composition of the essential oils was computed from the GC peak areas without correction factors. The qualitative analysis was based on the comparison of the retention indexes and the mass spectra with corresponding data in the literature [12] and the computer mass spectra libraries (Wiley and NBS 54K).

RESULTS AND DISCUSSIONS

The branches with unripe and ripe berries were collected from two *Juniperus communis* var. *communis* wild plants (A – 2006 and B – 2004). The essential oils of needles (leaves) (AL and BL), unripe (AU and BU) and ripe berries (AR and BR) were of α-pinene chemotype (Tables 1 and 2, 42.4–67.4%) as formerly investigated corresponding essential oils [6–8]. The compositions of the ripe berry oils (AR and BR) were nearly the same. The main constituents of the above oils were α-pinene (48.5 and 48.1%), myrcene (13.8 and 12.2%), α-cadinol (3.4 and 5.1%), δ-cadinene (2.0 and 2.1%) and bornyl acetate (2.0 and 2.1%). The composition of the needle oils (AL and BL) also was similar. The amounts of α-pinene (46.9 and 45.7%), spathulenol (2.8 and 2.4%) and α-cadinol (3.3 and 2.2%) in the needle essential oils varied marginally. The quantities of the major constituents of the unripe berry oils (AU and BU) differed more than those of the needle essential oils (Tables 1 and 2, AL and BL).

Table 1. **Chemical composition (%) of the wood, leaf (needle), unripe and ripe berry essential oils of *Juniperus communis* L. var. *communis* growing wild in Druskininkai district**

Compounds	RI	AW	AL	AU	AR	BW	BL	BU	BR
2-Hexenal	855	-	0.1	-	-	-	-	-	-
α-Thujene	930	-	-	-	0.3	-	0.2	-	-
α-Pinene	939	15.9	46.9	67.4	48.5	31.0	45.7	42.4	48.1
Camphene	954	0.4	1.0	0.3	0.1	0.1	0.3	0.1	0.2
Verbenene	968	-	0.1	-	0.3	0.2	0.5	0.6	-
Hexanoic acid	973	0.3	-	-	-	-	-	-	-
Sabinene	975	0.1	0.4	0.2	1.7	0.4	0.3	0.1	0.8
β-Pinene	979	0.9	3.9	2.2	2.1	0.3	2.2	1.6	1.3
Myrcene	991	0.4	4.4	3.9	13.8	0.1	1.8	0.1	12.2
α-Phellandrene	1003	t	t	t	t	0.1	0.9	t	t
δ-3-Carene	1011	0.7	0.1	t	t	4.0	0.4	0.1	t
α-Terpinene	1017	t	0.1	t	0.1	0.1	t	0.1	t
p-Cymene	1025	0.1	0.1	0.1	t	0.5	0.5	0.1	t
Limonene	1029	0.3	2.1	1.4	1.6	1.2	2.0	1.2	2.5
β-Phellandrene	1030	0.2	1.1	0.2	0.9	0.3	0.6	0.5	0.5
(E)-β-Ocimene	1050	-	0.5	-	-	t	t	-	-
Isoamyl butyrate	1056	0.1	0.5	-	-	0.3	0.3	-	-
γ-Terpinene	1060	t	0.1	0.1	0.2	t	0.1	0.1	0.1
Terpinolene	1089	0.5	1.3	0.6	1.4	0.3	1.1	0.5	0.5
Linalool	1097	-	-	0.1	0.6	-	0.2	0.1	0.2
trans-Sabinene hydrate	1098	-	-	-	-	-	0.2	-	t
Isoamyl-2-methylbutyrate	1100	0.2	0.9	-	-	0.3	-	-	-
α-Thujone	1102	-	-	-	-	-	t	-	-
3-Methyl-3-butenyl isovalerate	1115	t	0.4	-	-	-	0.1	-	-
α-Campholenal	1126	0.2	0.5	0.1	0.2	1.7	1.9	1.6	0.3
trans-Pinocarveol	1139	0.3	0.6	t	0.2	3.8	3.6	4.3	0.4

Table 1 continued

trans-Verbenol	1145	-	0.4	t	0.1	1.7	2.3	5.1	0.6
Camphor	1146	0.5	0.1	-	-	-	-	-	-
Camphene hydrate	1152	t	-	-	t	-	-	-	-
p-Menth-1(7),2-en-8-ol	1156	0.2	-	-	-	0.9	0.8	0.8	-
Pinocarvone	1163	-	-	-	-	-	0.8	-	-
Borneol	1169	0.5	-	0.1	0.6	0.3	0.5	0.4	0.9
p-Mentha-1,5-dien-8-ol	1170	0.3	1.2	-	-	4.5	2.6	2.9	-
Terpinen-4-ol	1177	0.3	0.6	0.4	0.9	0.8	0.5	0.6	1.5
p-Cymen-8-ol	1183	0.1	0.1	t	0.1	0.6	0.4	0.5	0.2
Cryptone	1188	-	-	-	-	-	0.2	-	-
α-Terpineol	1189	1.0	1.4	0.4	1.2	0.9	0.8	0.6	0.8
Myrtenol	1196	0.3	0.5	t	0.2	1.5	1.6	2.4	0.3
cis-Piperitol	1197	-	-	-	-	0.1	-	-	-
trans-dihydro Carvone	1201	0.3	-	-	-	-	0.3	-	-
Verbenone	1205	0.3	0.3	0.1	0.2	1.9	1.6	1.7	0.2
trans-Piperitol	1208	-	-	-	-	0.1	1.2	-	-
trans-Carveol	1217	0.1	0.2	t	0.1	1.2	0.1	0.8	0.1
Citronellol	1226	t	0.1		t	t	-	0.2	0.5
Methyl thymol	1235	-	t	-	-	-	0.1	-	-
trans-Chrysanthenyl acetate	1238	t	0.4		t	t	0.1	-	-
Carvone	1243	-	-	-	-	-	0.3	0.1	-
Piperitone	1253	-	-	-	-	-	0.4	0.1	-
Methyl citronellate	1261	0.1	0.4	0.4	0.9	t	0.1	0.1	0.1
trans-Myrtanol	1262	0.1	0.1		t	-	-	-	-
Bornyl acetate	1289	0.4	2.0	1.1	2.0	1.0	1.3	2.3	1.6
Thymol	1290	-	-	-	t	0.1	-	-	-
(2E,4Z)-Decadienal	1293	0.1	0.2	-	-	0.6	-	-	-
trans-Pinocarvyl acetate	1298	-	-	-	-	0.4	0.2	t	-
Carvacrol	1299	0.1	-	-	-	-	-	-	-
Tridecane	1300	t	-	t	-	-	-	-	-
Myrtenyl acetate	1327	0.1	1.0	0.1	-	-	0.5	-	-
δ-Elemene	1338	0.1	0.2	0.1	t	-	t	-	0.1
trans-Carvyl acetate	1342	-	-	-	-	-	0.2	-	-
α-Terpinyl acetate	1349	0.1	0.5	0.1	0.1	-	0.4	0.3	0.1
α-Cubebene	1351	1.0	-	-	-	0.2	-	-	-
Thymol acetate	1352	-	-	-	-	-	-	0.2	t
Citronellyl acetate	1353	t	0.1	t	0.1	-	-	0.1	0.1
α-Copaene	1377	0.1	t	t	t	0.1	0.1	t	t
trans-Myrtanol acetate	1387	t	0.6	t	t	t	0.1	0.1	t
β-Bourbonene	1388	0.2	-	-	t	-	-	-	-
β-Elemene	1391	1.3	0.8	0.5	0.5	0.4	0.2	0.2	0.3
Longifolene	1408	0.1	t	-	t	-	-	-	-
β-Caryophyllene	1418	0.9	0.3	t	0.2	0.3	0.1	t	t
β-Ylangene	1421	-	0.1	-	0.1	-	0.1	-	-
(E)-α-Ionone	1430	-	-	0.1	-	-	t	-	-
β-Gurjunene	1434	-	-	-	t	-	-	-	-
γ-Elemene	1437	0.4	0.7	0.2	0.2	0.9	0.3	t	0.1
(Z)-β-Farnesene	1443	-	0.1	t	0.1	t	0.1	-	t
cis-Muurola-3,5-diene	1450	0.1	t	-	t	0.1	t	-	-
trans-Muurola-3,5-diene	1454	0.4	t	-	0.1	t	t	-	t
α-Humulene	1455	0.9	0.3	0.2	0.3	0.4	0.1	0.1	0.2
cis-Muurola-4(14),5-diene	1467	t	0.3	t	t	-	t	t	t
trans-Cadina-1(6),4-diene	1477	0.8	t	0.1	t	0.4	0.1	t	t
γ-Muurolene	1480	0.1	0.1	0.6	0.1	0.9	0.1	t	0.1
Germacrene D	1485	1.1	0.8	0.6	0.4	t	0.1	0.4	0.2
(E)-β-Ionone	1489	-	0.1	-	t	-	0.1	0.1	0.3

Table 1 continued

Compounds	RI	AW	AL	AU	AR	BW	BL	BU	BR
β-Selinene	1490	0.3	0.1	-	0.1	0.5	0.1	0.2	0.1
δ-Selinene	1492	-	-	-	-	0.7	-	0.1	-
trans-Muurola-4(14),5-diene	1494	3.5	-	-	0.4	t	0.1	0.3	0.1
α-Muurolene	1500	0.5	0.6	0.6	0.9	0.2	0.2	0.2	0.5
β-Bisabolene	1506	t	0.1	-	-	-	-	-	-
γ-Cadinene	1514	0.1	0.5	0.3	0.4	0.6	0.2	0.1	0.4
Cubebol	1515	2.7	-	-	-	-	-	-	-
endo-1-Bourbonalol	1520	-	0.1	t	t	-	t	t	0.2
δ-Cadinene	1523	3.6	2.3	1.5	2.0	1.0	0.7	0.5	2.1
Zonarene	1530	0.6	-	-	-	0.2	-	0.1	-
Citronellyl butyrate	1532	t	0.4	0.4	t	-	0.2	0.2	0.5
trans-Cadina-1(2),4-diene	1535	0.5	t	t	t	t	t	0.1	0.2
α-Cadinene	1539	0.2	0.3	0.1	0.2	0.2	0.2	t	0.1
α-Calacorene	1546	0.1	-	-	-	0.1	t	-	-
Elemol	1550	0.6	0.6	0.4	0.4	0.4	0.3	0.2	0.5
Germacrene B	1561	-	0.3	-	0.2	0.4	0.3	0.3	-
(Z)-3-Hexenyl benzoate	1567	-	0.1	-	-	-	0.1	-	-
Germacrene D-4-ol	1576	0.2	0.3	0.1	0.1	t	0.4	0.1	0.8
Spathulenol	1578	3.0	2.8	1.4	1.3	3.5	2.4	5.6	3.1
Caryophyllene oxide	1583	0.8	0.3	0.1	0.2	0.6	0.5	0.9	0.4
Viridoflorol	1593	-	-	2.0	-	-	-	-	-
Salvial-4(14)-en-1-one	1595	0.2	0.1	t	0.1	0.2	0.2	0.2	0.1
β-Oplopenone	1607	-	-	-	-	0.6	0.6	0.4	0.3
Humulene epoxide II	1608	-	0.3	0.1	-	0.6	0.3	1.3	0.4
1,10-di-epi-Cubenol	1619	t	0.1	t	0.1	-	t	0.1	0.2
1-epi-Cubenol	1629	1.9	0.1	0.2	0.2	0.4	0.2	0.1	0.3
γ-Eudesmol	1632	0.1	t	t	0.1	0.3	t	t	0.2
epi-α-Cadinol	1640	2.4	0.9	0.7	1.1	0.6	0.3	0.3	1.2
epi-α-Muurolol	1642	0.3	0.6	0.3	0.9	0.4	0.6	0.3	0.9
α-Muurolol	1646	0.5	0.4	0.2	0.3	0.5	0.5	0.3	1.0
α-Cadinol	1654	3.8	3.3	1.5	3.4	2.9	2.2	1.1	5.1
Selin-11-en-4-α-ol	1660	0.6	-	0.4	0.1	-	-	0.9	-
14-hydroxy-9-epi-β-Caryophyllene	1670	3.1	0.6	0.3	0.3	0.9	0.4	1.5	0.7
Khusinol	1680	1.1	-	-	-	-	-	-	-
Eudesma-4(15),7-dien-1-β-ol	1688	0.1	0.2	-	-	-	0.5	0.6	0.5
(6Z,2Z)-Farnesol	1697	0.1	0.2	t	t	-	-	-	-
Eudesm-7(11)-en-4-ol	1700	0.1	0.1	0.1	0.3	1.1	0.2	0.4	0.3
14-hydroxy-α-Humulene	1714	2.7	-	-	0.2	0.9	0.4	0.2	0.5
Nootkatol	1715	-	0.4	0.2	0.2	0.5	0.1	1.0	0.4
Oplopanone	1740	-	-	0.2	0.1	-	0.1	0.6	0.3
Cyclocolorenone	1760	-	-	-	0.2	-	-	-	-
14-oxy-α-Muurolene	1768	1.8	t	-	t	0.3	-	-	-
14-hydroxy-α-Muurolene	1780	1.6	0.2	0.1	0.2	0.6	0.2	t	0.2
17-hydroxy-δ-Cadinene	1803	0.9	0.3	-	0.1	0.1	-	-	-
Nootkatone	1806	18.4	-	-	0.1	0.2	-	-	t
Cyclopentadecanolide	1834	t	t	t	t	-	0.2	t	0.1
Manoyl oxide	1998	0.4	0.1	-	t	0.2	t	-	-
Abietatriene	2057	0.2	0.1	t	0.1	-	t	0.1	t
Octadecanol	2078	0.2	-	-	t	0.7	-	-	-
Abietadiene	2088	0.2	0.1	t	t	-	t	0.1	t
Sandaracopimaral	2185	-	t	-	-	-	t	-	-
Total		**90.1**	**95.9**	**92.7**	**94.5**	**85.4**	**94.4**	**92.0**	**97.1**
Monoterpene hydrocarbons		19.5	62.0	76.3	70.9	38.6	56.6	47.5	66.2
Oxygenated monoterpenes		5.1	11.0	3.0	7.4	21.5	23.3	25.3	7.9
Sesquiterpene hydrocarbons		16.5	8.0	4.9	6.1	7.6	3.2	2.6	4.6

Table 1 continued

Oxygenated sesquiterpenes	46.9	12.0	8.2	10.0	15.6	10.4	16.1	17.6
Aliphatic monoterpenoids	0.5	5.9	4.7	15.4	0.1	2.3	0.8	13.6
Pinane skeleton	17.8	54.4	69.8	51.5	40.8	59.1	58.2	50.9
Cadinane skeleton	23.8	10.0	6.1	10.4	9.5	5.6	3.5	12.4
Menthane skeleton	3.2	8.7	3.3	6.4	11.7	12.1	9.0	6.3
Sabinane skeleton	0.1	0.4	0.2	2.0	0.4	0.7	0.1	0.8

Notes: RI – retention indexes on nonpolar column; t – traces; A, B – indicated localities; W – wood; L – leaves (needles); U – unripe berries; R – ripe berries.

Table 2. **Major constituents (%) of *Juniperus communis* L. var. *communis* essential oils of various plant parts**

Compounds	Wood		Needles (leaves)		Unripe berries		Ripe berries	
	AW	BW	AL	BL	AU	BU	AR	BR
α-Pinene	15.9 (II)	31.0 (I)	46.9 (I)	45.7 (I)	67.4 (I)	42.4 (I)	48.5 (I)	48.1 (I)
β-Pinene	0.9	0.3	3.9 (III)	2.2 (V/VI)	2.2 (III)	1.6	2.1 (IV)	1.3
Myrcene	0.4	0.1	4.4 (II)	1.8	3.9 (II)	0.1	13.8 (II)	12.2 (II)
δ-3-Carene	0.7	4.0 (III)	0.1	0.4	t	0.1	t	t
Limonene	0.6	1.2	2.1	2.0	1.4	1.2	1.6	2.5 (V)
trans-Pinocarveol	0.3	3.8 (IV)	0.6	3.6 (II)	t	4.3 (IV)	0.2	0.4
trans-Verbenol	-	1.7	0.4	2.3	t	5.1 (III)	0.1	0.6
p-Mentha-1,5-dien8-ol	0.6	4.2 (II)	1.2	2.6 (III)	-	2.9 (V)	-	-
Myrtenol	0.3	1.5	0.5	1.6	t	2.4 (VI)	0.2	0.3
Bornyl acetate	0.4	1.0	2.0	1.3	1.1	2.3	2.0 (V/VI)	2.1 (VI)
trans-Muurola-4(14),5-diene	3.5 (V)	t	-	0.1	-	0.3	0.4	0.1
δ-Cadinene	3.6 (IV)	1.0	2.3 (VI)	0.7	1.5 (V/VI)	0.5	2.0 (V/VI)	2.1 (VI)
Spathulenol	3.0 (VI)	3.5 (V)	2.8 (V)	2.4 (IV)	1.4	5.6 (II)	1.3	3.1 (IV)
Viridoflorol	-	-	-	-	2.0 (IV)	-	-	-
α-Cadinol	3.8 (III)	2.9 (VI)	3.3 (IV)	2.2 (V/VI)	1.5 (V/VI)	1.1	3.4 (III)	5.1 (III)
Nootkatone	18.4 (I)	0.2	-	-	-	-	0.1	t
Monoterpenoids	24.6	60.1	73.0	79.9	79.3	72.8	78.3	74.1
Sesquiterpenoids	63.4	23.2	19.0	13.6	7.9	18.7	13.5	22.2
Pinane skeleton	17.8	40.8	54.5	59.1	69.8	58.2	51.5	50.9
Cadinane skeleton	23.8	9.5	10.0	5.6	6.1	3.5	10.4	12.4
Menthane skeleton	3.2	11.7	8.7	12.1	3.3	9.0	6.4	6.3
2,6-Dimethyloctane skeleton	0.5	0.1	5.9	2.3	4.7	0.8	15.4	13.6

Notes: notation is the same as in Table 1; numbers in parentheses indicate the position of the major terpenoids.

The juniper wood essential oils were investigated for the first time in Lithuania. The wood oils included lower amounts of monoterpenoids (AW – 24.6 and BW – 60.1%) and compounds with pinane carbon skeleton (AW – 17.8 and BW – 40.8%) than the essential oils from the other juniper plant parts (Tables 1and 2, 72.8–79.9 and 50.9–69.8%, respectively). The composition of the wood oil AW markedly differed from that of the wood oil BW. The wood essential oil AW was rich in sesquiterpenoids (63.4%), while in the wood oil BW monoterpenoids prevailed (60.1%). The most abundant constituents of the wood oil AW were nootkatone (18.4%), α-pinene (15.9%), α-cadinol (3.8%), δ-cadinene (3.6%), trans-muurola-4(14),5-diene (3.5%) and spathulenol (3.0%). The major compounds of the wood oil BW were α-pinene (31.0%), p-mentha-1,5-dien-8-ol (4.2%), δ-3-carene (4.0%), trans-pinocarveol 3.8%), spathulenol (3.5%) and α-cadinol (2.9%). The amounts of the compounds with pinane (17.8 and 40.8%), cadinane (23.8 and 9.5%), menthane (3.2 and 11.7%) and 2,6-dimethyloctane (0.5 and 0.1%) carbon skeletons differed more than twice as comapared to wood oil AW from the sample BW. The variations of the above compound groups in both ripe berry essential oils were insignificant (Tables 1 and 2). The proportion of the compounds with cadinane and menthane carbon skeletons in the needle and unripe berry oils from A and B plants remained nearly the same as in the wood oils. The variability of the wood oil compositions was larger than that in the essential oils of other juniper plant parts. The compositions of both investigated wood essential oils (Tables 1 and 2) differed from formerly investigated corresponding oils in other countries [1–5].

One hundred and thirty three identified constituents comprised 85.4–97.1% of the essential oils.

CONCLUSIONS

The wood essential oils from two investigated junipers differed markedly in the amounts of monoterpenoids (24.6 and 60.1%), sesquiterpenoids (63.4 and 23.2%) and the compounds with various carbon skeletons. The needles, unripe and ripe berries from both plants biosynthesize essential oils containing nearly the same constituents. The amounts of monoterpenoids (72.8–79.9%) and constituents with pinane carbon skeleton (50.9–69.8%) in the needle, unripe and ripe berry oils of the same junipers exceeded those in the wood essential oils.

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DRUSKININKŲ RAJONE AUGANČIO *JUNIPERUS COMMUNIS* L. VAR. *COMMUNIS* MEDIENOS, LAPŲ (SPYGLIŲ), NEPRINOKUSIŲ IR PRINOKUSIŲ UOGŲ ETERINIŲ ALIEJŲ ĮVAIROVĖ

S a n t r a u k a

2004 ir 2006 m. Druskininkų rajone nuo dviejų augalų *Juniperus communis* var. *communis* surinktos šakos su neprinokusiomis ir prinokusiomis uogomis. Iš atskirų augalo dalių hidrodistiliacijos būdu gauti eteriniai aliejai buvo analizuoti dujų chromatografijos ir dujų chromatografijos / masių spektrometrijos metodais. Pirmą kartą Lietuvoje tirtas kadagio medienos eterinis aliejus. Abiejų kadagių lapų (spyglių), neprinokusių ir prinokusių uogų eterinių aliejų sudėtis buvo α-pineno (42,4–67,4%) chemotipo. α-Pineno (15,9–31,0%) medienos aliejuose aptikta mažiau, nei kitų to paties augalo dalių aliejuose. Medienos aliejai nuo kitų augalo aliejų skiriasi monoterpenoidų (≤60,1 ir ≥72,8%) ir junginių su pinano skeletu (≤40,8 ir ≥50,9%) kiekiu. Abiejuose tirtuose medienos aliejuose nustatyti skirtingi monoterpenoidų (24,6 ir 60,1%), seskviterpenoidų (63,4 ir 23,2%) bei junginių su pinano (17,8 ir 40,8%), kadinano (23,8 ir 9,5%) ir mentano (3,2 ir 11,7%) skeletais kiekiai. Pagrindiniai junginiai viename medienos aliejuje buvo notkatonas (18,4%), α-pinenas (15,9%) ir α-kadinolis (3,8%), o kitame α-pinenas (31,0%), p-menta-1,5-dien-8-olis (4,5%) ir δ-3-karenas (4,0%). Identifikuoti šimtas tridešimt trys junginiai sudaro 85,4–97,1% aliejų.