

Essential oil composition variability in sage (*Salvia officinalis* L.)

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The aerial parts of *Salvia officinalis* were collected in eight gardens in Eastern Lithuania. Essential oils were prepared by the hydrodistillation of air-dried plants and analyzed by GC and GC / MS methods. The dominant constituents were manool (14.4–20.9%, four oils), 1,8-cineole (12.4–17.6%, two samples) and cis-thujone (12.6%, two oils). The second major compound was viridiflorol (11.2–16.5%, four samples), manool (10.3–11.5%, two oils), cis-thujone (11.5%, one oil) and β -caryophyllene (9.0%, one oil). The third position in the sage essential oils was taken by α -humulene (7.3–11.2%, three samples), viridiflorol (10.5%, two oils) and by cis-thujone (9.6%), camphor (9.9%) and manool (8.9%) in other three oils. The *S. officinalis* essential oil richest in manool (20.9%) was found in Lithuania. The amounts of individual constituents in the oils varied from 2 to 25 times, while the quantities of oxygenated terpenes were close. The sage essential oils included larger quantities of the oxygenated terpenes (52.1–65.4%) than terpene hydrocarbons (18.7–34.1%). The seventy nine identified compounds comprised 89.5–99.3% of the oils.

Key words: *Salvia officinalis* L., Lamiaceae, chemical composition of essential oils, 1,8-cineole, cis-thujone, α -humulene, viridiflorol, manool

INTRODUCTION

The extracts and essential oils of *Salvia officinalis* L. are used as spices and for healing of different diseases [1–9]. The plant is appetizing and promotes digestion of food. A dose of 0.1–0.3 g per day of the sage essential oil is proposed as a drug [1] and up to 15 drops a day – as a spice [5]. The essential oils of *S. officinalis* of various chemotypes (cis-thujone, 1,8-cineole, viridiflorol, camphor etc.) exhibit antioxidant, anti-inflammatory, antispasmodic, antimicrobial and stimulant properties [1–8]. Besides, the essential oil of cis-thujone chemotype has antiviral and antifungal properties [7]. Sages are used for wound treatment, bathing, washing, skin and hair care [1]. The essential oil exhibits insecticidal properties [1].

Sages are cultivated in many countries. The plants grow in the wild in some countries on the coast and near the Mediterranean Sea [1]. The chemical composition of *S. officinalis* essential oils varies widely [9–37]. The first dominant constituents in many sage essential oils (Table 1) are cis-thujone ($\leq 65.5\%$), 1,8-cineole ($\leq 59.0\%$), camphor ($\leq 45.7\%$), trans-thujone ($\leq 40.1\%$), α -humulene (33.7%) and linalool ($\leq 35.0\%$). Germacrene D (32.9%) as the first major constituent was found only in one sage oil sample from Cuba [26]. Viridiflorol ($\leq 24.0\%$) dominated in the wild plant essential oils [17, 32]. The latter compound (13.4%) and manool (14.7%) were the major constituents in one sample of the essential oil of *S. officinalis* growing in Cuba [13]. The sage

essential oils rich in viridiflorol and manool were found only in the last decade [9, 13, 17, 32] and the information about the healing power of these oils was not found. Some sage oils were rich in α -pinene ($\leq 24.6\%$), limonene ($\leq 20.3\%$) and borneol ($\leq 15.0\%$) [9–37].

ISO 9909 for medicinal uses regulates the amounts of the following constituents in the sage essential oils: cis-thujone (18.0–43.0%), camphor (4.5–24.5%), 1,8-cineole (5.5–13.0%), trans-thujone (3.0–8.5%), α -humulene ($\leq 12.0\%$), α -pinene (1.0–6.5%), camphene (1.5–7.0%), limonene (0.5–3.0%), bornyl acetate ($\leq 2.5\%$) and linalool + linalyl acetate ($\leq 1.0\%$) [9, 16]. The German Drug Codex requirements differ from the above ISO and are the following: thujones ($\geq 20.0\%$), camphor (14.0–37.0%), 1,8-cineole (6.0–16.0%), borneol ($\leq 5.0\%$) and bornyl acetate ($\leq 5.0\%$) [5]. This Codex regulates the amounts of only five compounds, while ISO 9909 – of eleven constituents. The lower limit of camphor in the German Drug Codex is by ~ 3 times and the upper limit by ~ 1.5 times higher than recommended by ISO 9909. The medicinal properties of the above limited compounds of *S. officinalis* have been properly investigated [1–4, 28, 29]. Monoterpenoids of the sage essential oils exhibit antimicrobial, anti-inflammatory and antioxidant features. Beside the above activities, thujones and 1,8-cineole influence the central nervous system. Low doses of thujone or 1,8-cineole increased human activity in hard living conditions. A chronic intake of thujones can lead to a permanent damage of the central nervous system and cause seizures and dementia [1, 3, 28]. The doses of the sage essential oil were related to the amounts of the

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constituents especially with quantities of thujones. 1,8-Cineole is the most effective terpenoid for increasing the penetration of the anticancer drug 5-fluorouracil (a 95-fold increase) through the human skin [3].

The variability of the composition of the investigated *S. officinalis* essential oils was determined.

MATERIALS AND METHODS

The aerial parts of *Salvia officinalis* L. were collected in eight localities of Eastern Lithuania: A – Žalieji ežerai, B – Šeškinė, C – Bukčiai, D – Nemenčinė, E – Dvarčionys, F – Balsiai, G – Rastinėnai and H – Pagiriai. The aerial parts of the plants were air dried at room temperature (20–25 °C). The essential oils (0.7–1.4%) were prepared by the hydrodistillation (2 h) of 10–25 g of the air-dried samples.

The analyses of the essential oils were carried out by GC and GC / MS. An HP 5890 II chromatograph equipped with an FID and a capillary column HP-FFAP (30 m × 0.25 mm × film thickness 0.3 μm) was used for the quantitative analysis. The GC oven temperature was set at 70 °C for 10 min and then reprogrammed from 70 °C to 210 °C at a rate of 3 °C/min using He as a carrier gas (0.7 ml/min). The analyses by GC / MS were carried out by an HP 5890 (Hewlett Packard) gas chromatograph equipped with an HP 5971 mass selective detector and an HP 7673 split/splitless injector. The temperatures of the injector and detector were set to 200 °C and 250 °C, respectively. The separation was performed on a silica capillary column CP-Sil 8CB (50 m × 0.32 mm; the film thickness 0.25 μm). The GC oven temperature was programmed as follows: from 60 °C (isothermal for 1 min) increased to 160 °C at a rate of 5 °C/min and to 250 °C at a rate of 10 °C/min, and the final temperature was kept for 5 min. The temperatures of the injector and the detector were 250 °C and 280 °C, respectively. The flow rate of the carrier gas (He) was 1 ml/min. Mass spectra in the electron mode were generated at 70 eV.

The percentage composition of the essential oils was computed from GC peak areas without correction factors. The qualitative analysis was based on the comparison of retention indexes on both columns and mass spectra with corresponding data in literature [38, 39] and the computer mass spectra libraries (Wiley and NBS 54K).

RESULTS AND DISCUSSION

The first major constituent in six of the eight *S. officinalis* essential oils (Tables 1 and 2) from Eastern Lithuania differed from that of the previously investigated five oils from Vilnius district [9] in which the dominant compound was cis-thujone (14.8–18.0%). Two oils under study also contained cis-thujone (12.6%), four samples contained manool (14.4–20.9%) and other sage oils contained 1,8-cineole (12.4–17.6%) as the first main constituent. The essential oils with dominant cis-thujone (Table 1, G, H) included viridiflorol (9.0–10.5%), manool (10.3–11.5%) and α-humulene (9.2–9.8%) among the main constituents as earlier [9] investigated sage oils. Samples A and B rich in 1,8-cineole (12.4–17.6%) contained viridiflorol (13.8%) and β-caryophyllene (9.0%) as the second major constituents and α-humulene (11.2%) and manool (8.9%) as the third ones. Sage essential oils C, E, F rich in manool contained the same viridiflorol (10.5–12.0%), cis-thujone (9.1–11.5%), α-humulene (8.7–9.2%) and borneol (5.1–8.1%). Manool is the predominant compound in oil D like in samples C, E, F, but in this oil α-humulene epoxide II was detected among the main constituents. The sage essential oils with the dominant manool (C–F) and cis-thujone (G and H) differed from the samples rich in 1,8-cineole (A and B) by lower amounts of the last compound (Table 2, 0.7–4.3% and 5.4–6.1%, respectively).

The first eight (manool, cis-thujone, 1,8-cineole, viridiflorol, α-humulene, borneol, camphor and β-caryophyllene) constituents in sage essential oils under study were the same as in the oils of wild growing plants in Central Hercegovina [32] and

Table 1. The major constituents (%) of the essential oil of *Salvia officinalis* from A–H localities in comparison with literature data

[1, 9–36]	ISO 9909 [9, 16]	Hercegovina [32]	Vilnius district [9]
cis-Thujone t–65.5 Camphor 0.4–45.7 1,8-Cineole t–59.0 trans-Thujone 1.0–40.1 α-Humulene 0.1–33.7	cis-Thujone 8.0–43.0 Camphor 4.5–24.5 1,8-Cineole 5.5–13.0 trans-Thujone 3.0–8.5 α-Humulene 0–12.0	Viridiflorol 18.5–24.0 cis-Thujone 9.3–15.6 α-Humulene 10.2–13.6 Manool 10.0–13.3 1,8-Cineole 9.2–10.9	cis-Thujone 14.8–18.0 Manool 10.0–13.3 α-Humulene 7.6–8.7 Viridiflorol 7.7–8.2 1,8-Cineole 6.6–8.2
A	B	C	D
1,8-Cineole 17.6 Viridiflorol 13.8 α-Humulene 11.2 β-Caryophyllene 10.2 Manool 7.9	1,8-Cineole 12.4 β-Caryophyllene 9.0 Manool 8.9 cis-Thujone 8.3 Borneol 7.5	Manool 14.4 cis-Thujone 11.5 Viridiflorol 10.5 α-Humulene 8.7 Borneol 5.9	Manool 20.9 Viridiflorol 16.5 α-Humulene 7.2 Humulene epoxide II 3.7 Borneol 3.5
E	F	G	H
Manool 15.5 Viridiflorol 11.2 cis-Thujone 9.6 α-Humulene 8.7 Borneol 8.1	Manool 15.7 Viridiflorol 12.0 α-Humulene 9.2 cis-Thujone 9.1 Borneol 5.1	cis-Thujone 12.6 Manool 11.5 Viridiflorol 10.5 α-Humulene 9.8 Borneol 7.1	cis-Thujone 12.6 Manool 10.3 Camphor 9.9 α-Humulene 9.2 Viridiflorol 9.0

Note: the essential oils of plants collected in gardens: A – Žalieji ežerai, B – Šeškinė, C – Bukčiai, D – Nemenčinė, E – Dvarčionys, F – Balsiai, G – Rastinėnai, H – Pagiriai; t – traces.

Table 2. Chemical composition (%) of the essential oils of *Salvia officinalis* growing in Eastern Lithuania

Compounds	RI	A	B	C	D	E	F	G	H
α -Pinene	939	2.4	1.6	0.5	0.2	0.7	0.4	1.5	0.5
Camphene	953	0.8	1.8	0.2	0.1	0.5	0.2	1.3	0.3
β -Pinene	980	2.6	1.6	0.2	0.2	0.4	0.3	1.2	0.1
Myrcene	991	0.7	0.4	0.1	0.1	0.1	0.1	0.2	0.1
α -Phellandrene	1005	t	t	t	t	t	t	–	t
α -Terpinene	1018	t	t	t	t	t	0.1	0.1	t
p-Cymene	1026	0.2	0.1	0.1	t	0.2	0.1	0.1	0.2
1,8-Cineole	1033	17.6	12.4	3.7	0.7	4.3	3.7	5.4	6.1
γ -Terpinene	1062	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Terpinolene	1088	0.1	0.1	t	t	t	t	t	t
cis-Thujone	1102	4.8	8.3	11.5	3.0	9.6	9.1	12.6	12.6
trans-Thujone	1114	3.2	2.2	2.9	0.8	1.9	1.7	2.3	2.9
Camphor	1143	2.0	6.2	4.6	1.3	2.7	2.0	4.6	9.9
trans-Pinocamphone	1160	–	–	t	t	t	0.1	0.1	t
Borneol	1165	1.7	7.5	5.9	3.5	8.1	5.1	7.1	7.5
Terpinen-4-ol	1177	0.2	0.3	0.2	0.2	0.3	0.3	0.3	t
p-Cymen-8-ol	1183	t	t	t	t	t	t	0.1	0.3
α -Terpineol	1189	0.2	0.4	0.1	0.1	0.2	0.1	t	t
Myrtenol	1194	–	0.1	0.1	0.1	0.2	0.2	–	0.3
trans-Carveol	1217	0.1	t	t	t	0.1	0.1	–	t
Dihydrolinalyl acetate	1275	–	0.1	t	–	–	t	–	0.1
Bornyl acetate	1285	0.1	2.3	1.5	0.1	0.1	0.1	t	1.3
p-Cymen-7-ol	1287	t	t	t	t	0.1	0.1	–	t
Thymol	1290	t	t	t	t	t	t	t	t
trans-Sabinyl acetate	1291	–	0.2	0.1	t	–	–	0.1	0.1
Carvacrol	1298	t	–	0.1	t	0.1	0.1	–	0.1
α -Cubebene	1351	t	0.2	0.1	t	t	0.1	0.1	0.1
Eugenol	1356	t	0.2	t	t	–	0.1	–	t
α -Ylangene	1372	–	0.3	0.1	t	0.1	0.2	0.1	t
α -Copaene	1376	0.5	0.7	0.2	0.1	0.4	0.6	0.5	0.3
β -Bourbonene	1384	t	0.3	t	t	0.1	0.2	0.1	0.1
γ -Caryophyllene	1404	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
α -Gurjunene	1409	–	t	t	0.1	t	t	0.1	t
β -Caryophyllene	1418	10.8	9.0	5.7	2.4	3.5	4.3	6.5	6.0
β -Gurjunene	1432	–	0.3	t	t	t	0.3	0.3	t
α -Guaiene	1438	–	t	–	0.1	t	0.1	0.1	t
Aromadendrene	1439	0.6	1.3	0.8	0.8	1.0	1.4	1.1	1.0
α -Humulene	1454	11.2	5.2	8.7	7.2	8.7	9.2	9.8	9.2
allo-Aromadendrene	1461	0.3	0.3	0.4	0.5	0.5	0.5	0.6	0.4
γ -Gurjunene	1473	–	–	t	t	–	–	0.1	t
γ -Murolene	1477	0.5	1.2	0.6	0.6	0.8	1.1	0.7	0.6
Germacrene D	1480	t	0.1	0.1	0.1	0.1	0.1	0.1	0.1
β -Selinene	1485	t	0.1	0.1	t	t	0.1	0.1	t
cis- β -Guaiene	1490	t	0.1	0.3	0.3	0.2	0.4	0.3	0.2
Viridiflorene	1493	1.5	1.2	1.5	1.5	1.3	1.4	1.3	1.5
α -Murolene	1499	t	0.3	0.1	0.2	0.2	0.4	0.2	0.1
γ -Cadinene	1513	0.2	0.5	0.3	0.3	0.4	0.6	0.3	0.3
cis-Calamenene	1521	–	t	t	t	t	0.1	0.1	t
δ -Cadinene	1524	0.5	1.7	0.9	1.1	1.2	2.0	1.0	0.8
Cadina-1,4-diene	1532	0.1	0.1	0.1	t	0.1	0.2	0.1	0.1
α -Cadinene	1538	t	0.1	0.2	0.1	0.1	0.2	0.1	0.1
α -Calacorene	1542	t	0.2	t	0.1	0.2	0.3	t	t
cis-Sesquisabinene hydrate	1545	t	0.1	t	t	0.1	0.1	0.1	t
Spathulenol	1576	t	t	0.2	0.6	0.5	0.6	0.1	0.4
Caryophyllene oxide	1581	0.9	1.5	0.9	1.4	1.0	1.1	0.9	0.9

Table 2 (continued)

Viridiflorol	1590	13.8	5.0	10.5	16.5	11.2	12.0	10.5	9.0
Humulene epoxide II	1606	1.4	0.9	1.5	3.7	3.0	2.9	2.0	1.8
β -Oplophenone	1607	0.1	t	0.1	0.2	0.1	0.3	0.1	0.1
1,10-di-epi-Cubenol	1614	t	0.1	0.2	0.4	0.3	0.5	0.2	0.2
Selina-3,11-dien-6- α -ol	1640	1.0	0.5	1.1	2.6	2.1	2.3	1.5	1.3
Caryophylla-4,8-dien-5-ol ***	1641	0.3	0.3	0.2	0.4	0.3	0.3	0.3	0.2
epi- α -Muurolol	1642	t	0.1	0.1	0.2	0.1	0.5	t	0.1
α -Muurolol	1645	t	t	t	0.1	t	0.1	t	0.1
α -Cadinol	1653	0.1	0.2	0.1	0.4	0.3	0.4	0.1	0.1
14-hydroxy-9-epi-(E)-Caryophyllene	1664	0.6	0.7	0.5	0.9	0.6	0.7	0.6	0.6
β -Bisabolol	1671	0.1	0.7	0.3	0.8	0.6	0.7	0.4	0.4
Cadalene	1674	t	t	t	t	t	t	0.1	t
α -Bisabolol	1683	0.1	t	0.1	0.3	0.2	0.2	0.1	0.1
α -trans-Bergamotol	1693	0.4	t	0.1	0.3	0.3	0.3	0.2	0.2
14-hydroxy- α -Muurolene	1712	0.2	0.1	0.1	–	–	–	–	–
α -trans-Bergamotyl acetate	1798	0.8	0.2	0.3	0.6	0.4	0.4	0.4	0.3
epi-Laurene	1891	0.2	0.3	0.3	0.6	0.5	0.5	0.3	0.3
Rimuene	1894	0.5	0.6	1.0	1.1	1.1	0.8	0.7	0.9
m/z 149 (Phthalate)	1900	4.5	6.0	11.9	8.8	6.8	5.0	4.0	7.4
Pimaradiene	1941	0.1	0.1	0.2	0.3	0.5	0.3	0.1	0.2
epi-13-Manool	1961	0.1	0.1	0.3	0.4	0.2	0.2	0.1	0.2
Manoyl oxide	1989	0.3	0.4	0.7	0.7	0.8	0.6	0.5	0.7
Manool	2056	7.9	8.9	14.4	20.9	15.5	15.7	11.5	10.3
cis-Ferruginol	2362	0.2	0.1	0.3	0.8	0.7	0.9	0.3	0.2
Total		97.2	97.2	97.7	89.5	95.3	95.7	95.6	99.3
Monoterpene hydrocarbons		7.0	5.7	4.6	1.3	5.9	4.7	9.4	6.9
Oxygenated monoterpenes		29.9	32.5	33.4	9.8	23.6	19.4	27.5	35.6
Monoterpenoids (C10)		36.9	38.2	38.0	11.1	29.5	24.1	36.9	42.5
Sesquiterpene hydrocarbons		26.3	23.3	20.3	15.4	18.7	24.1	23.6	20.9
Oxygenated sesquiterpenes		19.8	10.4	16.3	29.4	21.0	23.5	17.6	15.7
Sesquiterpenoids		46.1	33.7	36.6	44.8	39.7	47.6	41.2	36.6
Diterpene hydrocarbons		0.8	1.0	1.5	2.0	2.1	1.6	1.1	1.4
Oxygenated diterpenes		8.5	9.5	15.7	22.8	17.2	17.4	12.4	11.4
Diterpenoids (C20)		9.3	10.5	17.2	24.8	19.3	19.0	13.5	12.8
Terpene hydrocarbons		34.1	30.0	26.4	18.7	26.7	30.4	34.1	29.2
Oxygenated terpenes		58.2	52.1	65.4	62.0	61.8	60.3	57.5	62.7
C10 + C20		46.2	48.7	55.8	33.9	48.8	43.1	50.4	55.3

Note: RI – retention indexes on nonpolar column; t – traces; A–H – indicated localities. *** – correct isomer not identified

Cuba [13]. The amounts of the above compounds markedly varied in the sage oils (Tables 1 and 2): cis-thujone – from 3.0 to 12.6%, manool – from 7.9 to 20.9%, 1,8-cineole – from 0.7 to 17.6%, viridiflorol – from 5.0 to 16.5%, α -humulene – from 5.2 to 11.2%, β -caryophyllene – from 2.4 to 10.8%, borneol – from 1.7 to 8.1%, camphor – from 1.3 to 9.9% and 1,8-cineole – from 0.7 to 17.6%. The amounts of camphor in oils A, D, E and F were 1.3–2.7%, in samples B, C and G they were 4.6–6.2% and only oil H contained 9.9% of this compound. The wild sage oils from Central Hercegovina contained larger amounts of viridiflorol (18.5–24.0%) and α -humulene (10.2–13.6%) [32] than those from Lithuania (Tables 1 and 2). The oil of the Cuban *S. officinalis* differed in larger amounts of camphor (10.4%) and trans-thujone (10.9%). The essential oils under study contained only 0.9–3.5% of trans-thujone. The variations in the amounts of the constituents might be caused by different quantities of buds, flowers and leaves in the collected plant samples [17, 32]. The

above plant parts biosynthesized various amounts of the essential oil constituents.

The chemical composition of the *S. officinalis* essential oils under study did not match the requirements of ISO 9909 and the German Drug Codex (Introduction). The sage oils from the plants of Eastern Lithuania contained significantly lower amounts of cis-thujone and camphor and higher amounts of borneol than required by the mentioned acts.

The differences between the smallest and the largest concentrations of separate constituents were about 2–25 times. The amounts of terpenoid groups varied several times: monoterpenoids – from 11.1 to 42.5%, sesquiterpenoids – from 33.7 to 47.6% and diterpenoids – from 9.3 to 24.8%. Monoterpenoids and diterpenoids are biosynthesized in the plastids (chloroplasts, chromoplasts, leucoplasts etc.) of the cells, while sesquiterpenoids in cytosol [40]. The minimal changes were observed in the amounts of the oxygenated terpenes (Table 2). Sage essential

oils G and H with dominant α -thujone contained 57.5–62.7% of the oxygenated terpenes. Oils A and B with dominant 1,8-cineole contained the smallest amounts of the above compounds (52.1–58.2%). The oxygenated terpenes in the essential oils with the first major constituent manool comprised 60.3–65.4%. Terpene hydrocarbons made up only 18.7–34.1% in all the sage oils.

Only one sample of the essential oil of *S. officinalis* in Cuba [13] out of hundreds of the previously investigated oils [9–12, 14–37] contained manool (14.7%) as the first main constituent. Sage essential oils D, E and F contained larger amounts of the main constituent manool (Tables 1 and 2, 15.5–20.9%) than other investigated oils with the latter compound [9, 13, 17, 32].

The presence of phthalate (Table 2) in the sage essential oils might be caused by polluted soils. The seventy nine identified constituents comprised 89.5–99.3% of the sage essential oils.

CONCLUSIONS

The chemical compositions of the sage essential oils varied markedly and were close to that of the plants which grow wild in Hercegovina. The essential oil of *S. officinalis* contained the largest amount of manool (20.9%) in comparison with previously investigated corresponding oils in different countries. The composition of the sage oils under study did not match the requirements of ISO 9909 and the German Drug Codex.

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**VAISTINIO ŠALAVIJO (*SALVIA OFFICINALIS* L.)
ETERINIŲ ALIEJŲ SUDĖTIES ĮVAIROVĖ**

S a n t r a u k a

Vaistinio šalavijo (*Salvia officinalis* L.) antžeminė dalis surinkta aštuoniuose soduose Rytų Lietuvoje. Eteriniai aliejai, gauti hidrodistiliacijos būdu, analizuoti dujų chromatografijos ir dujų chromatografijos / masių spektrometrijos metodais. Keturiuose aliejuose vyraujantis

komponentas buvo manoolis (14,4–20,9%), dviejuose – 1,8-cineolis (12,4–17,6%), o likusiuose – cis-tujonas (12,6%). Be minėtų junginių, eteriniuose aliejuose buvo nustatyta viridiflorolio (10,5–16,5%), α -humuleno (7,3–11,2%), kamparo (9,9%) ir β -kariofileno (9,0%). Lietuvoje aptikto šalavijo eteriniuose aliejuose, palyginti su Hercegovinoje ir Kuboje aptikto šalavijo eteriniais aliejais, buvo daugiau manoolio. Šalavijo aliejuose rasta daugiau deguoninių terpenų (52,1–65,4%), nei terpeninių angliavandenilių (18,7–34,1%). Identifikuoti septyniasdešimt devyni junginiai sudaro 89,5–99,3% aliejų.