

Date : June 03, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20E21-PTH09

Customer identification : Fir Needle - Russia - F2010698R

Type : Essential oil

Source : *Abies sibirica*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : June 01, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4700 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 10869:2011 - OIL OF FIR NEEDLE, SIBERIAN

Compound	Min. %	Max. %	Observed %	Complies?
α-Humulene	0.3	0.9	0.6	Yes
Borneol	1.0	3.0	1.5	Yes
Isobornyl acetate		0.1	0.1	Yes
β-Caryophyllene	0.5	2.0	1.1	Yes
Bornyl acetate	20.0	35.0	30.5	Yes
β-Phellandrene	1.5	5.0	2.7	Yes
Limonene	4.0	10.0	4.5	Yes
Δ3-Carene	9.0	15.0	11.4	Yes
β-Pinene	1.0	3.5	1.8	Yes
Camphene	15.0	26.0	22.6	Yes
α-Pinene	10.0	22.0	12.0	Yes
Tricyclene	1.5	3.5	2.2	Yes
Santene	1.5	3.5	2.5	Yes
Refractive index	1.4680	1.4730	1.4700	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for Siberian fir needle oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Toluene	0.01	Simple phenolic
Santene	2.46	Normonoterpene
Unknown	tr	Normonoterpene
Bornylene	0.01	Monoterpene
Tricyclene	2.23	Monoterpene
α -Thujene	0.07	Monoterpene
α -Pinene	12.04	Monoterpene
Camphene	22.60	Monoterpene
α -Fenchene	0.03	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
meta-Cymene	0.04	Monoterpene
β -Pinene	1.84	Monoterpene
Sabinene	0.01	Monoterpene
Unknown	0.01	Monoterpene
Myrcene	0.62	Monoterpene
2-Carene	0.01	Monoterpene
α -Phellandrene	0.11	Monoterpene
Pseudolimonene	0.01	Monoterpene
Δ^3 -Carene	11.42	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
α -Terpinene	0.06	Monoterpene
Carvomenthene	0.03	Aliphatic alcohol
para-Cymene	0.17	Monoterpene
Limonene	4.50	Monoterpene
β -Phellandrene	2.75	Monoterpene
γ -Terpinene	0.10	Monoterpene
meta-Cymenene	0.01	Monoterpene
γ -Campholenal	0.02	Aliphatic alcohol
Isoterpinolene	0.04	Monoterpene
Terpinolene	0.86	Monoterpene
para-Cymenene	0.03	Monoterpene
α -Pinene oxide	0.01	Monoterpenic ether
α -Thujone	tr	Monoterpenic ketone
Unknown	0.01	Unknown
Linalool	0.04	Monoterpenic alcohol
endo-Fenchol	0.03	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
α -Campholenal	0.02	Monoterpenic aldehyde
Cosmene?	0.01	Monoterpene
Camphor	0.23	Monoterpenic ketone
trans-Pinocarveol	0.05	Monoterpenic alcohol
Camphene hydrate	0.11	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.02	Monoterpenic alcohol
Isoborneol	0.02	Monoterpenic alcohol
Borneol	1.45	Monoterpenic alcohol

Isopinocampnone	0.02	Monoterpenic ketone
Terpinen-4-ol	0.11	Monoterpenic alcohol
meta-Cymen-8-ol	0.02	Monoterpenic alcohol
Cryptone	0.05	Normonoterpenic ketone
para-Cymen-8-ol	0.05	Monoterpenic alcohol
α -Terpineol	0.20	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.02	Monoterpenic alcohol
Verbenone	0.05	Monoterpenic ketone
Unknown	0.03	Oxygenated monoterpene
endo-Fenchyl acetate	0.03	Monoterpenic ester
Citronellol	0.01	Monoterpenic alcohol
Thymol methyl ether	0.06	Monoterpenic ether
Carvone	0.03	Monoterpenic ketone
Piperitone	0.02	Monoterpenic ketone
Geraniol	0.02	Monoterpenic alcohol
Phellandral	0.04	Monoterpenic aldehyde
Bornyl acetate	30.48	Monoterpenic ester
Isobornyl acetate	0.08	Monoterpenic ester
2-Undecanone	0.05	Aliphatic ketone
Isohexyl isocaproate	0.04	Aliphatic ester
Unknown	0.03	Unknown
Unknown	0.10	Unknown
α -Longipinene	0.04	Sesquiterpene
α -Terpinyl acetate	0.01	Monoterpenic ester
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.06	Monoterpenic ester
Unknown	0.11	Unknown
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.22	Monoterpenic ester
Sativene	0.01	Sesquiterpene
β -Longipinene	0.02	Sesquiterpene
Longifolene	0.13	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
Dodecanal	0.15	Aliphatic aldehyde
β -Caryophyllene	1.14	Sesquiterpene
α -Himachalene	0.04	Sesquiterpene
α -Humulene	0.64	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.01	Sesquiterpene
γ -Himachalene	0.04	Sesquiterpene
Unknown	0.09	Sesquiterpene
Unknown	0.04	Unknown
β -Himachalene	0.03	Sesquiterpene
α -Muurolene	0.02	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	0.02	Sesquiterpene
β -Bisabolene	0.16	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.06	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.02	Sesquiterpene
(<i>E</i>)-Nerolidol	0.04	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.05	Sesquiterpenic ether

Humulene epoxide II	0.03	Sesquiterpenic ether
Selin-6-en-4 α -ol isomer	0.03	Sesquiterpenic alcohol
α -Bisabolol analog	0.02	Sesquiterpenic alcohol
epi- α -Bisabolol	0.07	Sesquiterpenic alcohol
α -Bisabolol	0.20	Sesquiterpenic alcohol
Manoyl oxide	0.04	Diterpenic ether
13-epi-Manoyl oxide	0.02	Diterpenic ether
Manool	0.04	Diterpenic alcohol
Consolidated total	99.37%	

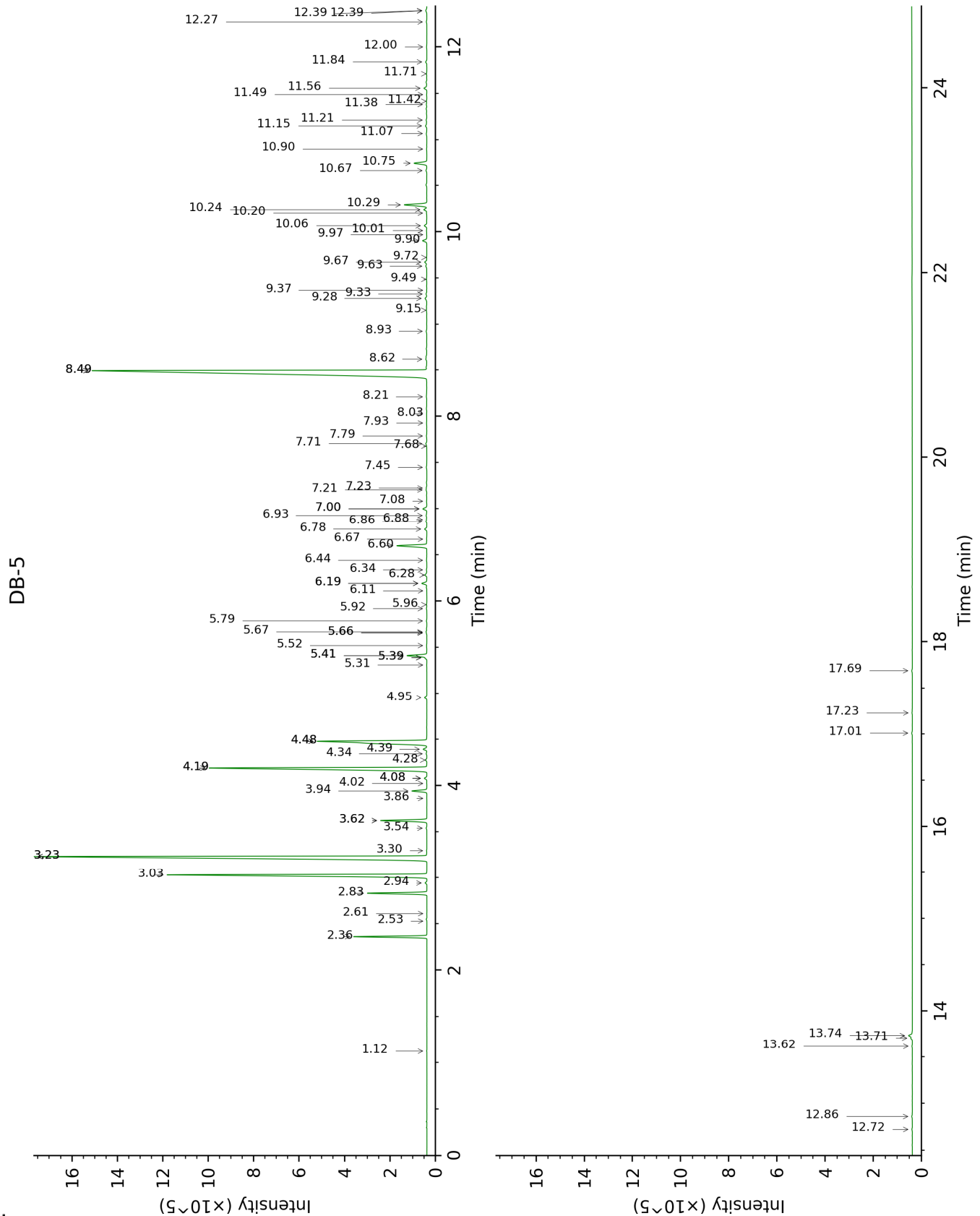
tr: The compound has been detected below 0.005% of total signal.

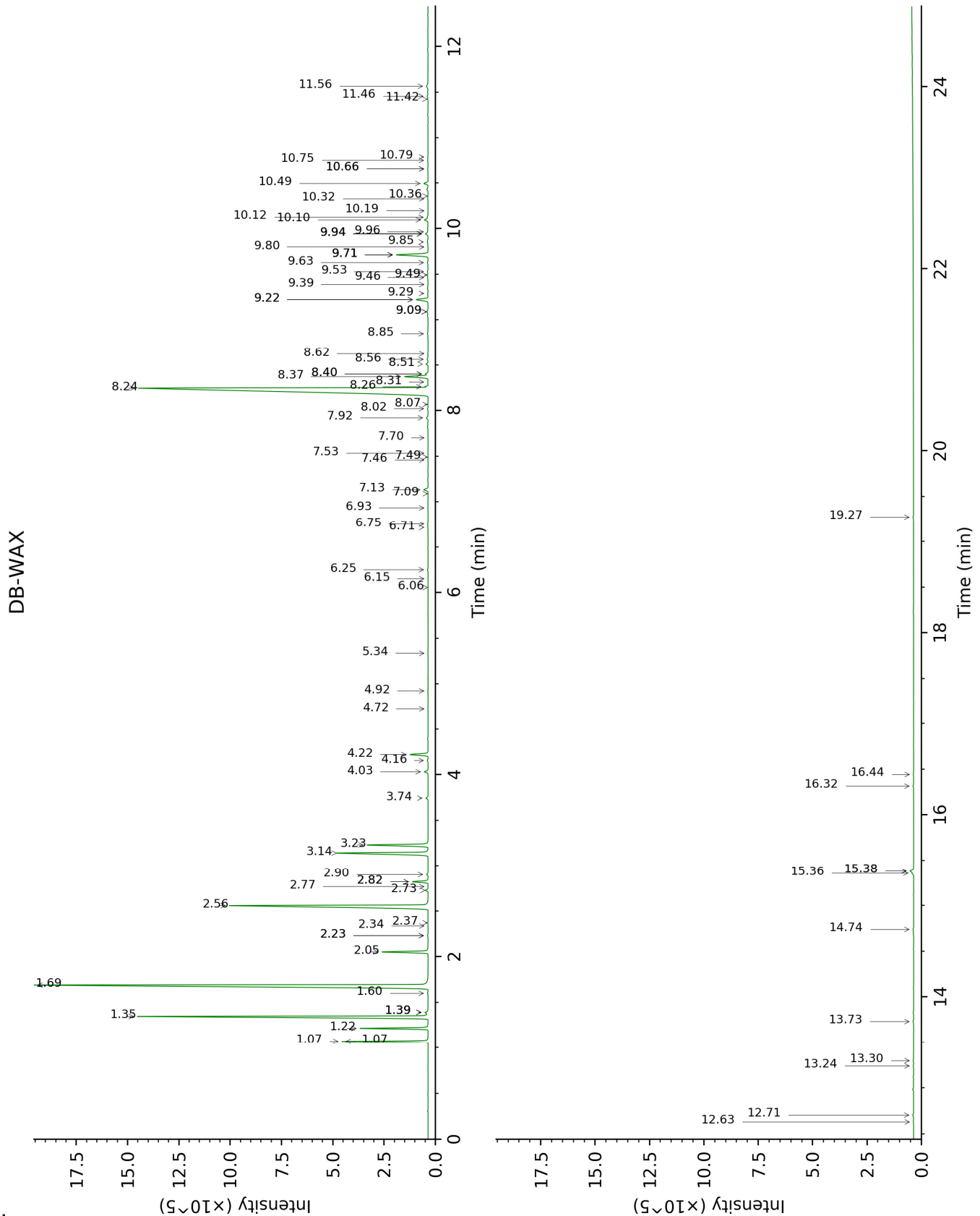
Note: no correction factor was applied

About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.12	763	0.01	1.39*†	1001	[12.11]
Santene	2.36	883	2.46	1.07*	950	2.45
Unknown [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.53	897	tr	1.39*†	1001	[12.11]
Bornylene	2.61	904	0.01	1.07*	950	[2.45]
Tricyclene	2.83	918	2.23	1.22	973	2.23
α-Thujene	2.94	926	0.07	1.39*†	1001	[12.11]
α-Pinene	3.03	931	12.04	1.35†	995	12.11
Camphene	3.23*	945	22.65	1.69	1031	22.60
α-Fenchene	3.23*	945	[22.65]	1.60	1022	0.03
Thuja-2,4(10)- diene	3.30	949	0.02	2.23*	1084	0.03
meta-Cymene	3.54	965	0.04	2.82*	1134	0.66
β-Pinene	3.62*	970	1.86	2.05	1067	1.84
Sabinene	3.62*	970	[1.86]	2.23*	1084	[0.03]
Unknown [m/z 91, 119 (65), 109 (51), 134 (47)]	3.86	986	0.01			
Myrcene	3.94	991	0.62	2.82*	1134	[0.66]
2-Carene	4.02	997	0.01	2.34	1095	0.01
α-Phellandrene	4.08*	1000	0.12	2.73	1127	0.11
Pseudolimonene	4.08*	1000	[0.12]	2.77	1130	0.01
Δ3-Carene	4.19*	1008	11.42	2.56	1113	11.42
(3Z)-Hexenyl acetate	4.19*	1008	[11.42]	4.72	1279	0.01
α-Terpinene	4.28	1013	0.06	2.90	1140	0.07
Carvomenthene	4.34	1017	0.03	2.37	1098	0.02
para-Cymene	4.39	1020	0.17	4.03	1228	0.18
Limonene	4.48*	1026	7.22	3.14	1159	4.50
β-Phellandrene	4.48*	1026	[7.22]	3.23	1166	2.75
γ-Terpinene	4.95	1055	0.10	3.74	1207	0.10
meta-Cymenene	5.31	1078	0.01	6.15	1378	0.01
γ-Campholenal	5.39*	1083	0.06	4.92	1294	0.02
Isoterpinolene	5.39*	1083	[0.06]	4.16	1237	0.04
Terpinolene	5.41*	1084	0.90	4.22	1242	0.86
para-Cymenene	5.41*	1084	[0.90]	6.25	1385	0.03
α-Pinene oxide	5.52	1091	0.01	5.34	1319	0.01
α-Thujone	5.66*	1100	0.02	6.06	1371	tr
Unknown [m/z 79, 94 (87), 77 (25), 91 (21), 93 (16), 95 (12), 138 (8)]	5.66*	1100	[0.02]			
Linalool	5.67	1101	0.04	8.02	1518	0.04
endo-Fenchol	5.78	1108	0.03	8.31	1541	0.03
cis-para-Menth-2-	5.92	1117	0.03	8.07	1522	0.02

en-1-ol						
α-Campholenal	5.96	1120	0.02	6.93	1436	0.02
Cosmene?	6.11	1129	0.01			
Camphor	6.19*†	1135	0.28	7.13	1451	0.23
<i>trans</i> -Pinocarveol	6.19*†	1135	[0.28]	9.09*	1601	0.09
Camphene hydrate	6.28	1140	0.11	8.40*	1547	0.13
meta-Mentha-4,6-dien-8-ol	6.34	1144	0.02	9.22*	1612	0.68
Isoborneol	6.44	1151	0.02	9.29	1618	0.03
Borneol	6.60	1161	1.45	9.71*	1652	1.69
Isopinocampone	6.67	1166	0.02	7.53	1481	0.01
Terpinen-4-ol	6.78	1173	0.11	8.51	1556	0.10
meta-Cymen-8-ol	6.86†	1178	0.07	11.42	1795	0.02
Cryptone	6.88†	1180	[0.07]	9.09*	1601	[0.09]
para-Cymen-8-ol	6.93	1183	0.05	11.46	1798	0.05
α-Terpineol	7.00*	1188	0.21	9.71*	1652	[1.69]
Myrtenal	7.00*	1188	[0.21]	8.62	1565	0.01
Myrtenol	7.08	1193	0.02	10.79	1742	0.02
Verbenone	7.21	1201	0.05	9.53	1637	0.04
Unknown [m/z 109, 91 (100), 81 (88), 94 (75), 119 (74), 96 (73), 41 (63)... 150 (2)]	7.23	1202	0.03	10.75	1738	0.03
endo-Fenchyl acetate	7.45	1218	0.03	6.75	1422	0.04
Citronellol	7.68	1233	0.01	10.66*	1730	0.03
Thymol methyl ether	7.70	1235	0.06	8.40*	1547	[0.13]
Carvone	7.79	1241	0.03	9.96	1672	0.02
Piperitone	7.93	1251	0.02	9.80	1659	0.02
Geraniol	8.03	1257	0.02	11.56	1808	0.12
Phellandral	8.21	1270	0.04	9.94*	1671	0.15
Bornyl acetate	8.49*	1290	30.46	8.24	1535	30.48
Isobornyl acetate	8.49*	1290	[30.46]	8.26	1536	0.08
2-Undecanone	8.62	1298	0.05	8.56	1560	0.05
Isohexyl isocaproate	8.93	1316	0.04	7.46	1475	0.01
Unknown [m/z 135, 91 (76), 43 (59), 77 (39), 93 (33)...]	9.15	1332	0.03			
Unknown [m/z 121, 93 (84), 43 (81), 79 (48), 117 (40), 56 (37)...]	9.28	1341	0.10			
α-Longipinene	9.33	1344	0.04	6.72	1420	0.02
α-Terpinyl acetate	9.37	1347	0.01	9.63	1645	0.04
Citronellyl acetate	9.49	1355	0.02	9.39	1626	0.01
Neryl acetate	9.63	1365	0.06	10.12	1685	0.04
Unknown [m/z	9.67	1368	0.11			

93, 91 (99), 119 (63), 41 (59), 43 (57), 109 (55)...						
α -Copaene	9.72	1372	0.01	7.09	1448	tr
Geranyl acetate	9.90	1384	0.22	10.49	1716	0.21
Sativene	9.97	1389	0.01	7.49	1478	tr
β -Longipinene	10.01	1392	0.02	7.70	1493	0.01
Longifolene	10.06	1396	0.13	7.92	1510	0.11
Methyleugenol	10.20	1406	0.02	13.24	1959	0.02
Dodecanal	10.24	1408	0.15	9.94*	1671	[0.15]
β -Caryophyllene	10.29	1412	1.14	8.37	1545	1.14
α -Himachalene	10.67	1440	0.04	8.85	1582	0.04
α -Humulene	10.75	1446	0.64	9.22*	1612	[0.68]
(<i>E</i>)- β -Farnesene	10.90	1458	0.01	9.49	1634	0.03
γ -Himachalene	11.07	1470	0.04	9.46	1632	0.03
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.15	1476	0.09	9.85	1663	0.07
Unknown [m/z 43, 58 (75), 57 (58), 71 (55), 41 (41), 59 (31)...	11.21	1481	0.04			
β -Himachalene	11.38	1494	0.03	9.71*	1652	[1.69]
α -Muurolene	11.42	1496	0.02	9.94*	1671	[0.15]
(<i>Z</i>)- α -Bisabolene	11.49	1501	0.02	10.19	1691	0.01
β -Bisabolene	11.56	1507	0.16	10.10	1683	0.20
δ -Cadinene	11.71	1519	0.02	10.36	1704	0.02
(<i>E</i>)- γ -Bisabolene	11.84	1529	0.06	10.32	1702	0.03
(<i>E</i>)- α -Bisabolene	12.00	1542	0.02	10.66*	1730	[0.03]
(<i>E</i>)-Nerolidol	12.27	1563	0.04	13.73	2004	0.04
Caryophyllene oxide isomer	12.40*	1572	0.08	12.63	1902	0.02
Caryophyllene oxide	12.40*	1572	[0.08]	12.71	1909	0.05
Humulene epoxide II	12.72	1598	0.03	13.30	1964	0.02
Selin-6-en-4 α -ol isomer	12.86	1609	0.03	14.74	2102	0.04
α -Bisabolol analog	13.62	1672	0.02	15.38*	2166	0.21
epi- α -Bisabolol	13.71	1679	0.07	15.36	2164	0.06
α -Bisabolol	13.74	1682	0.20	15.38*	2166	[0.21]
Manoyl oxide	17.01	1976	0.04	16.44	2275	0.02
13-epi-Manoyl oxide	17.23	1997	0.02	16.32	2262	0.04
Manool	17.69	2043	0.04	19.27	2590	0.03
Total identified		98.86%			98.82%	
Total reported		99.27%			98.92%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index