

Date : January 19, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21A18-PTH07

Customer identification : Balsam Fir - BN0107205R

Type : Essential oil

Source : *Abies balsamea* ct. Eastern / Low thymol

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : January 19, 2021

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4746 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Isovaleral	tr	Aliphatic aldehyde
Toluene	0.01	Simple phenolic
Hexanal	0.02	Aliphatic aldehyde
Octane	0.01	Alkane
Santene	1.22	Normonoterpene
Unknown	0.01	Normonoterpene
Tricyclene	0.77	Monoterpene
α -Thujene	0.13	Monoterpene
α -Pinene	15.23	Monoterpene
Camphene	5.05	Monoterpene
α -Fenchene	0.12	Monoterpene
Thuja-2,4(10)-diene	0.06	Monoterpene
meta-Cymene	0.03	Monoterpene
β -Pinene	37.66	Monoterpene
Sabinene	0.12	Monoterpene
Unknown	0.02	Monoterpene
Myrcene	1.80	Monoterpene
2-Carene	0.01	Monoterpene
α -Phellandrene	0.12	Monoterpene
Pseudolimonene	0.02	Monoterpene
Δ 3-Carene	7.09	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
α -Terpinene	0.12	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
para-Cymene	0.16	Monoterpene
Limonene	10.69	Monoterpene
β -Phellandrene	5.27	Monoterpene
γ -Terpinene	0.20	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Fenchone	0.20	Monoterpenic ketone
γ -Campholenal	0.03	Aliphatic alcohol
Terpinolene	0.66	Monoterpene
para-Cymenene	0.06	Monoterpene
Linalool	0.09	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	0.08	Monoterpenic alcohol
α -Campholenal	0.03	Monoterpenic aldehyde
<i>trans</i> -Pinocarveol	0.16	Monoterpenic alcohol
Camphor	0.25	Monoterpenic ketone
Camphene hydrate	0.11	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.02	Monoterpenic alcohol
Isoborneol	0.06	Monoterpenic alcohol
Pinocamphone	0.05	Monoterpenic ketone
Pinocarvone	0.02	Monoterpenic ketone
Borneol	0.70	Monoterpenic alcohol

Isopinocampone	0.04	Monoterpenic ketone
α -Phellandren-8-ol	0.06	Monoterpenic alcohol
Terpinen-4-ol	0.21	Monoterpenic alcohol
Cryptone	0.03	Normonoterpenic ketone
para-Cymen-8-ol	0.03	Monoterpenic alcohol
Myrtenal	0.09	Monoterpenic aldehyde
α -Terpineol	0.56	Monoterpenic alcohol
Myrtenol	0.08	Monoterpenic alcohol
Methylchavicol	0.06	Phenylpropanoid
Verbenone	0.06	Monoterpenic ketone
Unknown	0.01	Unknown
endo-Fenchyl acetate	0.07	Monoterpenic ester
Thymol methyl ether	0.10	Monoterpenic ether
Piperitone	0.08	Monoterpenic ketone
Phellandral	0.03	Monoterpenic aldehyde
Isopulegyl acetate	0.03	Monoterpenic ester
Bornyl acetate	6.20	Monoterpenic ester
Isobornyl acetate	0.04	Monoterpenic ester
2-Undecanone	0.04	Aliphatic ketone
<i>trans</i> -Pinocarvyl acetate	0.01	Monoterpenic ester
Thymol	0.04	Monoterpenic alcohol
Isohexyl isocaproate	0.02	Aliphatic ester
Unknown	0.02	Unknown
α -Longipinene	0.08	Sesquiterpene
Citronellyl acetate	0.05	Monoterpenic ester
Longicyclene	0.03	Sesquiterpene
Neryl acetate	0.04	Monoterpenic ester
Geranyl acetate	0.03	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
β -Longipinene	0.03	Sesquiterpene
Longifolene	0.45	Sesquiterpene
Methyleugenol	0.03	Phenylpropanoid
β -Caryophyllene	0.16	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.02	Sesquiterpene
α -Humulene	0.08	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.04	Sesquiterpene
γ -Muurolene	0.01	Sesquiterpene
Germacrene D	0.04	Sesquiterpene
β -Selinene	0.07	Sesquiterpene
α -Selinene	0.05	Sesquiterpene
β -Himachalene	0.03	Sesquiterpene
α -Muurolene	0.03	Sesquiterpene
δ -Amorphene	0.04	Sesquiterpene
β -Bisabolene	0.42	Sesquiterpene
δ -Cadinene	0.07	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.03	Sesquiterpene
α -Calacorene	0.01	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.05	Sesquiterpene
(<i>E</i>)-Nerolidol	0.10	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene
Citronellyl caproate	0.01	Monoterpenic ester

Manoyl oxide	0.02	Diterpenic ether
Juvabione?	0.01	Sesquiterpenic ester
Manool	0.02	Diterpenic alcohol
(Z)-Abienol	0.05	Diterpenic alcohol
Pimaral?	0.02	Diterpenic aldehyde
Consolidated total	98.58%	

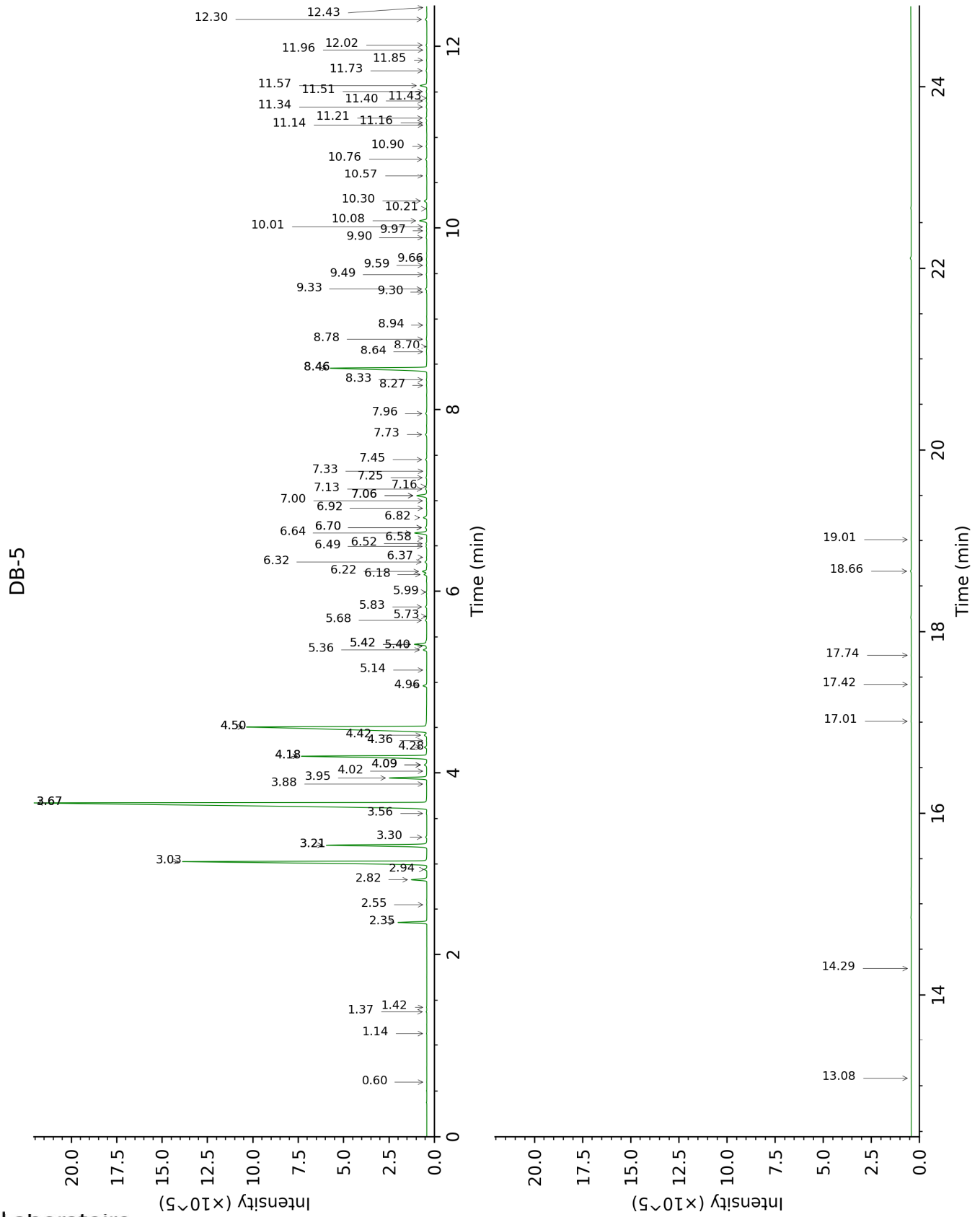
tr: The compound has been detected below 0.005% of total signal.

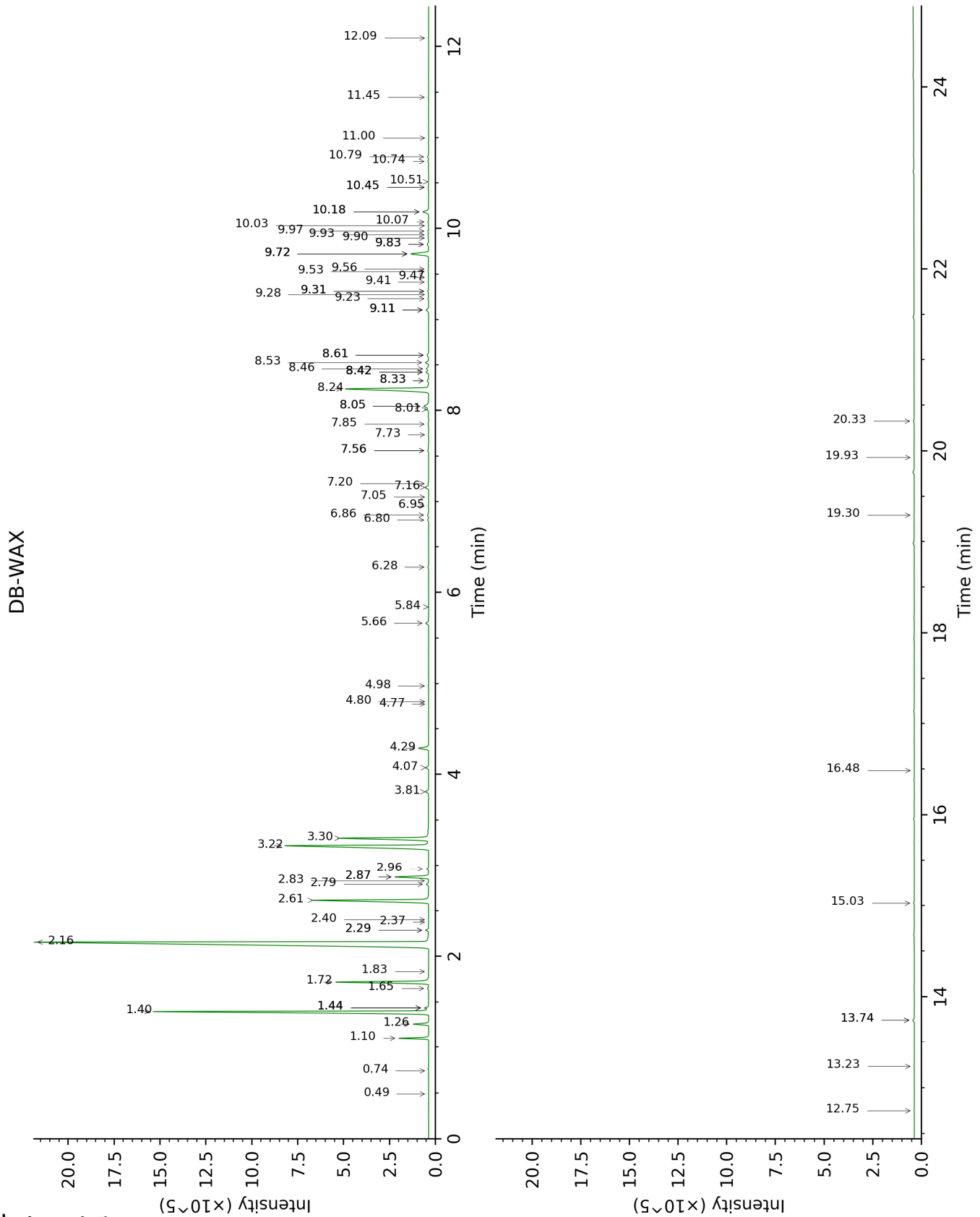
Note: no correction factor was applied

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	%
Isovaleral	0.60	640	tr	0.74	887	tr
Toluene	1.14	763	0.01	1.44*†	1003	[15.37]
Hexanal	1.37	797	0.02	1.83	1042	0.02
Octane	1.42	804	0.01	0.49	785	tr
Santene	2.35	882	1.22	1.10	952	1.23
Unknown [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.55	898	0.01	1.44*†	1003	[15.37]
Tricyclene	2.82	917	0.77	1.26	977	0.76
α-Thujene	2.94	925	0.13	1.44*†	1003	[15.37]
α-Pinene	3.03	931	15.23	1.40†	999	15.37
Camphene	3.21*	943	5.17	1.72	1031	5.05
α-Fenchene	3.21*	943	[5.17]	1.65†	1024	[15.37]
Thuja-2,4(10)- diene	3.30	949	0.06	2.29*	1087	0.18
meta-Cymene	3.56	966	0.03	2.87*	1135	1.83
β-Pinene	3.67*	974	38.01	2.16	1074	37.66
Sabinene	3.67*	974	[38.01]	2.29*	1087	[0.18]
Unknown [m/z 91, 119 (65), 109 (51), 134 (47)]	3.88	987	0.02			
Myrcene	3.95	992	1.80	2.87*	1135	[1.83]
2-Carene	4.02	997	0.01	2.37	1096	tr
α-Phellandrene	4.09*	1001	0.15	2.79	1129	0.12
Pseudolimonene	4.09*	1001	[0.15]	2.83	1132	0.02
Δ3-Carene	4.18*	1007	7.15	2.61	1115	7.09
(3Z)-Hexenyl acetate	4.18*	1007	[7.15]	4.80	1283	0.01
α-Terpinene	4.28	1014	0.12	2.96	1142	0.12
Carvomenthene	4.36	1018	0.01	2.40	1098	0.01
para-Cymene	4.42	1022	0.16	4.07	1228	0.17
Limonene	4.50*	1028	16.12	3.22	1163	10.69
β-Phellandrene	4.50*	1028	[16.12]	3.30	1169	5.27
γ-Terpinene	4.96	1057	0.20	3.81	1209	0.22
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.14	1068	0.01	4.77	1280	0.01
Fenchone	5.36	1082	0.20	5.66	1342	0.20
γ-Campholenal	5.40	1084	0.03	4.98	1296	0.03
Terpinolene	5.42*†	1086	0.74	4.29	1244	0.66
para-Cymenene	5.42*†	1086	[0.74]	6.28	1386	0.06
Linalool	5.68	1103	0.09	8.01	1515	0.10
Nonanal	5.73	1106	0.01	5.84	1355	0.01
endo-Fenchol	5.83	1112	0.08	8.33*	1540	0.12
α-Campholenal	5.99	1123	0.03	6.95	1436	0.04

<i>trans</i> -Pinocarveol	6.18	1136	0.16	9.11*	1600	0.21
Camphor	6.22	1138	0.25	7.16	1451	0.26
Camphene hydrate	6.32	1145	0.11	8.42*†	1547	0.37
meta-Mentha-4,6-dien-8-ol	6.37	1148	0.02	9.28	1614	0.02
Isoborneol	6.49	1155	0.06	9.31*	1617	0.08
Pinocamphone	6.52	1157	0.05	7.20	1454	0.05
Pinocarvone	6.58	1161	0.02	7.85	1503	0.05
Borneol	6.64	1164	0.70	9.72*	1650	1.35
Isopinocampheol	6.70*	1168	0.10	7.56*	1481	0.06
α-Phellandren-8-ol	6.70*	1168	[0.10]	10.07	1678	0.06
Terpinen-4-ol	6.82	1176	0.21	8.52	1555	0.21
Cryptone	6.92	1182	0.03	9.11*	1600	[0.21]
para-Cymen-8-ol	7.00	1187	0.03	11.44	1794	0.03
Myrtenal	7.06*	1191	0.66	8.61*	1561	0.13
α-Terpineol	7.06*	1191	[0.66]	9.72*	1650	[1.35]
Myrtenol	7.13	1195	0.08	10.79	1739	0.08
Methylchavicol	7.16	1197	0.06	9.23	1610	0.05
Verbenone	7.26	1203	0.06	9.56	1637	0.06
Unknown [m/z 93, 121 (98), 79 (64), 91 (41), 77 (35), 124 (24)...]	7.33	1208	0.01	11.00	1756	0.01
endo-Fenchyl acetate	7.45	1216	0.07	6.86	1429	0.09
Thymol methyl ether	7.73	1234	0.10	8.42*†	1547	[0.37]
Piperitone	7.96	1250	0.08	9.83*	1659	0.12
Phellandral	8.27	1270	0.03	9.90	1664	0.04
Isopulegyl acetate	8.33	1274	0.03	8.05*	1518	0.45
Bornyl acetate	8.46*	1282	6.31	8.24	1533	6.20
Isobornyl acetate	8.46*	1282	[6.31]	8.33*	1540	[0.12]
2-Undecanone	8.64	1294	0.04	8.61*	1561	[0.13]
<i>trans</i> -Pinocarvyl acetate	8.70	1298	0.01	9.11*	1600	[0.21]
Thymol	8.78	1304	0.04	15.02	2130	0.04
Isohexyl isocaproate	8.94	1315	0.02	7.56*	1481	[0.06]
Unknown [m/z 121, 93 (84), 43 (81), 79 (48), 117 (40), 56 (37)...]	9.30	1340	0.02			
α-Longipinene	9.33	1342	0.08	6.80	1425	0.07
Citronellyl acetate	9.49	1353	0.05	9.41	1625	0.05
Longicyclene	9.59	1360	0.03	7.05	1443	0.01
Neryl acetate	9.66	1365	0.04	10.18*	1687	0.45
Geranyl acetate	9.90	1382	0.03	10.51	1715	0.05
β-Elemene	9.97	1387	0.02	8.42*†	1547	[0.37]
β-Longipinene	10.01	1390	0.03	7.73	1494	0.02

Longifolene	10.08	1395	0.45	8.05*	1518	[0.45]
Methyleugenol	10.21	1404	0.03	13.23	1956	0.02
β -Caryophyllene	10.30	1410	0.16	8.46†	1550	[0.37]
<i>trans</i> - α -Bergamotene	10.57	1431	0.02	8.42*†	1547	[0.37]
α -Humulene	10.76	1445	0.08	9.31*	1617	[0.08]
(<i>E</i>)- β -Farnesene	10.90	1455	0.04	9.47	1629	0.03
γ -Murolene	11.14	1473	0.01	9.53	1634	0.05
Germacrene D	11.16	1475	0.04	9.72*	1650	[1.35]
β -Selinene	11.22	1478	0.07	9.83*	1659	[0.12]
α -Selinene	11.34	1488	0.05	9.93	1667	0.05
β -Himachalene	11.40	1492	0.03	9.72*	1650	[1.35]
α -Murolene	11.43	1495	0.03	10.03	1675	0.03
δ -Amorphene	11.51	1500	0.04	9.97	1670	0.06
β -Bisabolene	11.57	1505	0.42	10.18*	1687	[0.45]
δ -Cadinene	11.73	1518	0.07	10.45*	1710	0.07
(<i>E</i>)- γ -Bisabolene	11.85	1527	0.03	10.45*	1710	[0.07]
α -Calacorene	11.96	1536	0.01	12.09	1852	0.02
(<i>E</i>)- α -Bisabolene	12.02	1540	0.05	10.74	1735	0.06
(<i>E</i>)-Nerolidol	12.30	1562	0.10	13.74*	2004	0.10
Caryophyllene oxide	12.43	1573	0.02	12.75	1911	0.02
Unknown [m/z 41, 91 (78), 67 (76), 119 (70), 55 (61)... 220 (7)]	13.08	1625	0.01	13.74*	2004	[0.10]
Citronellyl caproate	14.29	1727	0.01			
Manoyl oxide	17.01	1978	0.02	16.48	2281	0.01
Juvabione?	17.42	2019	0.01	19.93	2677	0.02
Manool	17.74	2051	0.02	19.30	2600	0.02
(<i>Z</i>)-Abienol	18.66	2147	0.05	20.33	2726	0.05
Pimaral?	19.01	2184	0.02			
Total identified		99.05%			98.31%	
Total reported		99.13%			98.33%	

*: 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