

Date : December 21, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18L17-PTH10-1-CC

Customer identification : Frankincense Serrata - India - F4010784R

Type : Essential oil

Source : *Boswellia serrata*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - 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 : December 20, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4590 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Toluene	0.01	67.91*	Simple phenolic
Unknown	0.01	0.01	Monoterpene
Unknown	0.03		Unknown
Hashishene	0.13	5.45*	Monoterpene
Tricyclene	tr	0.01	Monoterpene
α -Thujene	67.99	[67.91]*	Monoterpene
α -Pinene	5.34	[5.45]*	Monoterpene
Unknown	0.64	0.64	Monoterpene
Camphene	0.07*	0.07	Monoterpene
α -Fenchene	[0.07]*	0.01	Monoterpene
Thuja-2,4(10)-diene	0.02	5.09*	Monoterpene
meta-Cymene	0.05	0.90*	Monoterpene
Sabinene	5.44*	[5.09]*	Monoterpene
β -Pinene	[5.44]*	0.38	Monoterpene
Dehydro-1,8-cineole	0.02	0.01	Monoterpenic ether
Myrcene	0.86	[0.90]*	Monoterpene
α -Phellandrene	2.09*	2.08	Monoterpene
Pseudolimonene	[2.09]*	tr	Monoterpene
Δ^3 -Carene	3.50	3.50	Monoterpene
α -Terpinene	0.53	0.53	Monoterpene
ortho-Cymene	0.11*	1.94*	Simple phenolic
Carvomenthene	[0.11]*	0.04	Aliphatic alcohol
para-Cymene	1.83	[1.94]*	Monoterpene
Unknown	2.71	0.17	Unknown
Limonene	[2.71]*	2.10	Monoterpene
β -Phellandrene	[2.71]*	0.47*	Monoterpene
1,8-Cineole	[2.71]*	[0.47]*	Monoterpenic ether
(Z)- β -Ocimene	0.42	0.42	Monoterpene
Unknown	0.06		Unknown
(E)- β -Ocimene	0.23	0.23	Monoterpene
Unknown	1.05*	0.01	Unknown
γ -Terpinene	[1.05]*	1.04	Monoterpene
cis-Sabinene hydrate	0.09	0.10*	Monoterpenic alcohol
Unknown	0.01	0.01	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.01	0.01	Monoterpenic alcohol
Isoterpinolene	0.01	0.01	Monoterpene
Terpinolene	0.35*	0.32	Monoterpene
para-Cymenene	[0.35]*	0.26*	Monoterpene
trans-Sabinene hydrate	0.08	0.07	Monoterpenic alcohol
Linalool	0.14*	0.11	Monoterpenic alcohol
α -Thujone	[0.14]*	0.04	Monoterpenic ketone
Unknown	0.27*	[0.26]*	Oxygenated monoterpene
β -Thujone	[0.27]*	[0.26]*	Monoterpenic ketone
cis-para-Menth-2-en-1-ol	0.07	0.06	Monoterpenic alcohol
α -Campholenal	0.01	0.01	Monoterpenic aldehyde
Unknown	0.01		Unknown
allo-Ocimene	0.03	0.02	Monoterpene
cis-para-Mentha-2,8-dien-1-ol	0.02*	0.03*	Monoterpenic alcohol

<i>trans</i> -Pinocarveol	[0.02]*	0.01	Monoterpenic alcohol
<i>trans</i> -Sabinol	0.07	0.25	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.02*	[0.03]*	Monoterpenic alcohol
Epoxyterpinolene	[0.02]*	0.01	Monoterpenic ether
Unknown	0.01	[0.10]*	Unknown
Unknown	0.01		Oxygenated monoterpene
Unknown	0.03		Oxygenated monoterpene
Borneol	0.03	[0.25]*	Monoterpenic alcohol
α -Phellandren-8-ol	0.02	0.02*	Monoterpenic alcohol
<i>cis</i> -Sabinol	0.08	0.08	Monoterpenic alcohol
Umbellulone	0.02	0.02	Monoterpenic ketone
Terpinen-4-ol	0.78	0.82*	Monoterpenic alcohol
meta-Cymen-8-ol	0.02	0.02	Monoterpenic alcohol
α -Terpineol	0.05	[0.25]*	Monoterpenic alcohol
Methylchavicol	1.90	1.95*	Phenylpropanoid
α -Phellandrene epoxide	0.02	0.03	Monoterpenic ether
Verbenone	0.03	0.05	Monoterpenic ketone
<i>trans</i> -Piperitol	0.02	0.01	Monoterpenic alcohol
<i>trans</i> -Carveol	0.01	0.01	Monoterpenic alcohol
Piperitone	0.03	0.11*	Monoterpenic ketone
Linalyl acetate	0.03	0.05	Monoterpenic ester
Unknown	0.03		Oxygenated monoterpene
Bornyl acetate	0.02	0.02	Monoterpenic ester
Thymol	0.01	0.01	Monoterpenic alcohol
Carvacrol	0.01	0.02	Monoterpenic alcohol
α -Terpinyl acetate	0.04	0.03	Monoterpenic ester
α -Copaene	0.09	0.10	Sesquiterpene
β -Bourbonene	0.46	0.48	Sesquiterpene
1,5-diepi- β -Bourbonene	0.03	0.04	Sesquiterpene
β -Elemene	0.01	0.06*	Sesquiterpene
Sibirene	0.07	0.07	Sesquiterpene
Methyleugenol	0.09	0.09	Phenylpropanoid
β -Caryophyllene	0.07*	[0.06]*	Sesquiterpene
β -Ylangene	[0.07]*	0.01	Sesquiterpene
β -Copaene	0.06	0.06	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.04	[0.82]*	Sesquiterpene
Isogermacrene D	0.04	0.04	Sesquiterpene
α -Humulene	0.01	[1.95]*	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.01	0.02	Sesquiterpene
γ -Muurolole	0.03	0.03	Sesquiterpene
Germacrene D	0.13	[0.25]*	Sesquiterpene
Unknown	0.09	[0.11]*	Sesquiterpene
α -Muurolole	0.01	[0.02]*	Sesquiterpene
γ -Cadinene	0.02	0.11*	Sesquiterpene
Kessane	0.11*	tr	Sesquiterpenic ether
δ -Cadinene	[0.11]*	[0.11]*	Sesquiterpene
Elemicin	0.02	0.02	Phenylpropanoid
Unknown	0.01	0.01	Oxygenated sesquiterpene
Unknown	0.02	0.01	Unknown
α -Phellandrene dimer I	0.01		Diterpene
α -Phellandrene dimer II	0.03	0.03	Diterpene
α -Phellandrene dimer III	0.01	0.01	Diterpene

(3E)-Cembrene A	0.02	0.03	Diterpene
Verticilla-4(20),7,11-triene	0.02		Diterpene
Cembrenol	0.02		Diterpenic alcohol
Serratol	0.08	0.09	Diterpenic alcohol
Total identified	98.04%	98.03%	

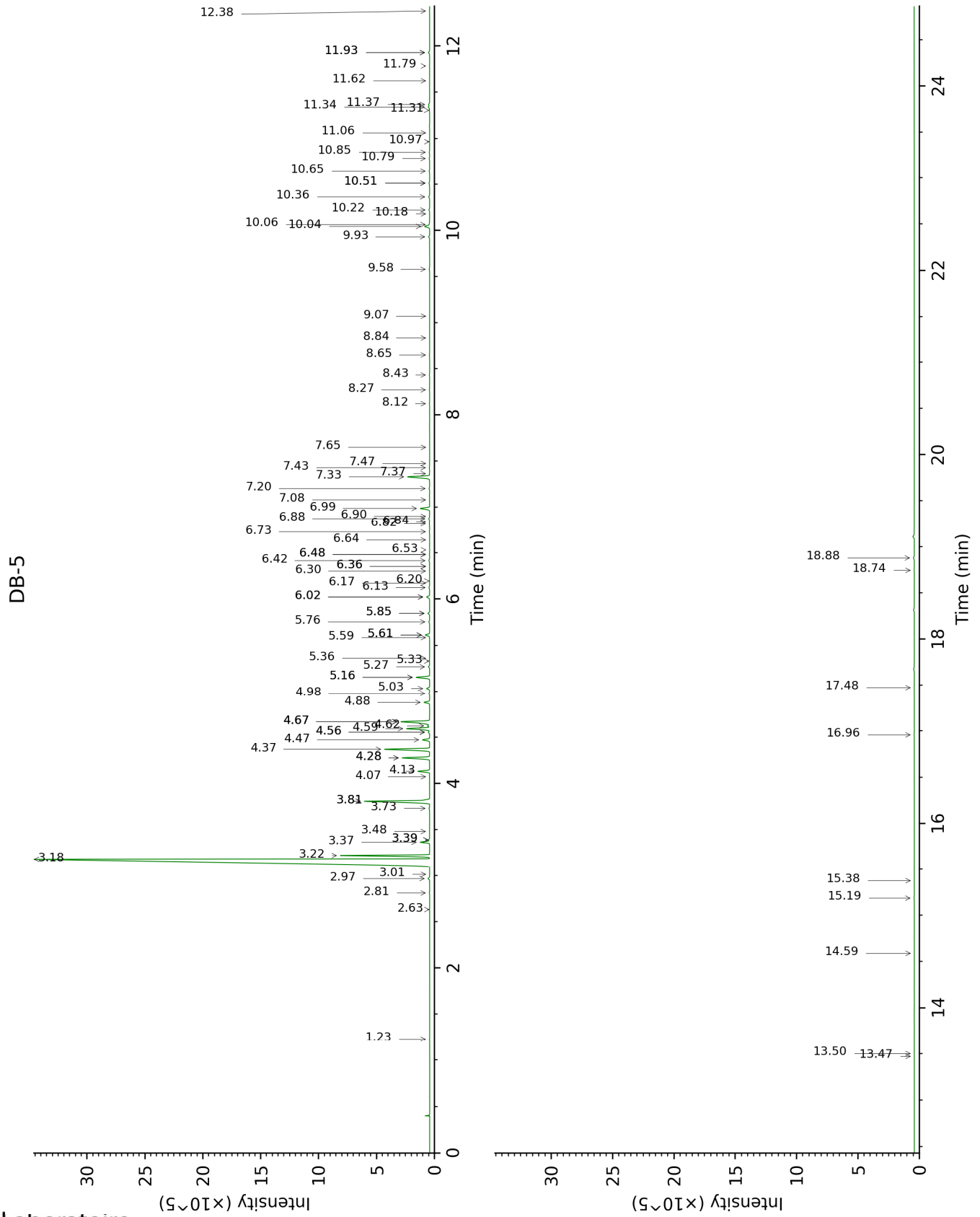
*: Two or more compounds are coeluting on this column

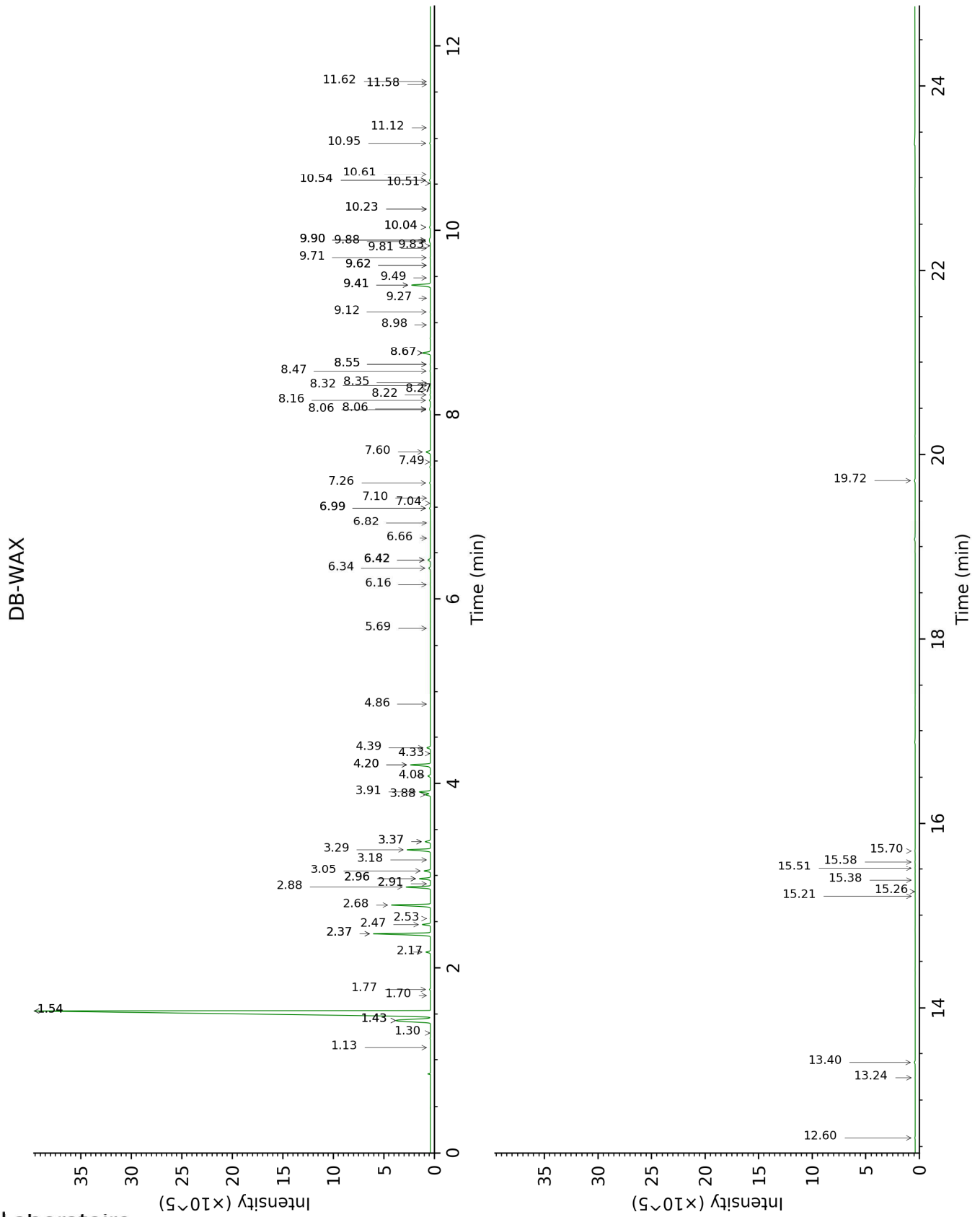
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.23	756	0.01	1.54*	1005	67.91
Unknown [m/z 93, 91 (75), 121 (61), 77 (58), 79 (38), 92 (26), 43 (24), 41 (23), 105 (22), 107 (19), 136 (16)]	2.63	890	0.01	1.13	949	0.01
Unknown [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20), 107 (20), 41 (18), 136 (17), 92 (17)]	2.81	904	0.03			
Hashishene	2.97	914	0.13	1.43*	993	5.45
Tricyclene	3.01	917	tr	1.30	973	0.01
α -Thujene	3.18	928	67.99	1.54*	1005	[67.91]
α -Pinene	3.22	931	5.34	1.43*	993	[5.45]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.37	941	0.64	2.47	1094	0.64
Camphene	3.39*	942	0.07	1.77	1027	0.07
α -Fenchene	3.39*	942	[0.07]	1.70	1021	0.01
Thuja-2,4(10)-diene	3.48	948	0.02	2.37*	1084	5.09
meta-Cymene	3.73	965	0.05	2.96*	1132	0.90
Sabinene	3.81*	970	5.44	2.37*	1084	[5.09]
β -Pinene	3.81*	970	[5.44]	2.17	1065	0.38
Dehydro-1,8-cineole	4.07	987	0.02	3.18	1149	0.01
Myrcene	4.13	991	0.86	2.96*	1132	[0.90]
α -Phellandrene	4.28*	1001	2.09	2.88	1126	2.08
Pseudolimonene	4.28*	1001	[2.09]	2.91	1128	tr
Δ 3-Carene	4.37	1007	3.50	2.68	1110	3.50
α -Terpinene	4.47	1013	0.53	3.05	1139	0.53
ortho-Cymene	4.56*	1018	0.11	4.20*	1228	1.94
Carvomenthene	4.56*	1018	[0.11]	2.53	1099	0.04
para-Cymene	4.59	1021	1.83	4.20*	1228	[1.94]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.62†	1022	2.71	6.34	1379	0.17
Limonene	4.67*†	1025	[2.71]	3.28	1158	2.10
β -Phellandrene	4.67*†	1025	[2.71]	3.37*	1164	0.47
1,8-Cineole	4.67*†	1025	[2.71]	3.37*	1164	[0.47]
(Z)- β -Ocimene	4.88	1038	0.42	3.88	1204	0.42
Unknown [m/z 109, 43 (57), 91	4.98	1045	0.06			

(28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...						
(E)-β-Ocimene	5.03	1048	0.23	4.08	1219	0.23
Unknown [m/z 109, 45 (67), 41 (40), 67 (39), 81 (33), 79 (27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...	5.16*	1056	1.05	7.04	1431	0.01
γ-Terpinene	5.16*	1056	[1.05]	3.91	1206	1.04
cis-Sabinene hydrate	5.27	1063	0.09	6.99*	1427	0.10
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.33	1067	0.01	4.86	1278	0.01
cis-Linalool oxide (fur.)	5.36	1069	0.01	6.66	1403	0.01
Isoterpinolene	5.59	1083	0.01	4.32	1238	0.01
Terpinolene	5.61*	1085	0.35	4.39	1242	0.32
para-Cymenene	5.61*	1085	[0.35]	6.42*	1386	0.26
trans-Sabinene hydrate	5.76	1094	0.08	8.06	1506	0.07
Linalool	5.85*	1100	0.14	8.16	1514	0.11
α-Thujone	5.85*	1100	[0.14]	6.16	1366	0.04
Unknown [m/z 109, 81 (54), 91 (32), 79 (22)...	6.02*	1111	0.27	6.42*	1386	[0.26]
β-Thujone	6.02*	1111	[0.27]	6.42*	1386	[0.26]
cis-para-Menth-2- en-1-ol	6.13	1118	0.07	8.22	1519	0.06
α-Campholenal	6.18	1121	0.01	7.10	1435	0.01
Unknown [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...	6.20	1122	0.01			
allo-Ocimene	6.30	1129	0.03	5.69	1333	0.02
cis-para-Mentha- 2,8-dien-1-ol	6.36*	1132	0.02	9.62*	1629	0.03
trans-Pinocarveol	6.36*	1132	[0.02]	9.27	1600	0.01
trans-Sabinol	6.42	1136	0.07	9.88†	1649	0.25
trans-Verbenol	6.48*	1141	0.02	9.62*	1629	[0.03]
Epoxyterpinolene	6.48*	1141	[0.02]	6.82	1415	0.01
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...	6.53	1144	0.01	6.99*	1427	[0.10]
Unknown [m/z	6.64	1151	0.01			

109, 81 (39), 41 (38), 95 (24)... 152 (1)]						
Unknown [m/z 109, 43 (75), 137 (46), 67 (31), 93 (25)... 152 (4)]	6.73	1157	0.03			
Borneol	6.82	1162	0.03	9.90*†	1651	[0.25]
α-Phellandren-8-ol	6.84	1164	0.02	10.23*	1678	0.02
cis-Sabinol	6.88	1166	0.08	10.95	1738	0.08
Umbellulone	6.90	1168	0.02	8.98	1578	0.02
Terpinen-4-ol	6.99	1173	0.78	8.67*	1554	0.82
meta-Cymen-8-ol	7.08	1180	0.02	11.62	1794	0.02
α-Terpineol	7.20	1188	0.05	9.90*†	1651	[0.25]
Methylchavicol	7.33	1196	1.90	9.41*	1611	1.95
α-Phellandrene epoxide	7.36	1198	0.02	11.12	1752	0.03
Verbenone	7.43	1202	0.03	9.71	1635	0.05
trans-Piperitol	7.47	1205	0.02	10.51	1700	0.01
trans-Carveol	7.65	1217	0.01	11.58	1791	0.01
Piperitone	8.12	1249	0.03	10.04*	1662	0.11
Linalyl acetate	8.27	1260	0.03	8.27	1523	0.05
Unknown [m/z 109, 41 (22), 81 (14), 43 (11)... 152 (4)]	8.43	1271	0.03			
Bornyl acetate	8.65	1286	0.02	8.35	1529	0.02
Thymol	8.84	1299	0.01	15.26	2132	0.01
Carvacrol	9.07	1309	0.01	15.51	2157	0.02
α-Terpinyl acetate	9.58	1345	0.04	9.83	1646	0.03
α-Copaene	9.93	1370	0.09	7.26	1447	0.10
β-Bourbonene	10.04	1378	0.46	7.60	1472	0.48
1,5-diepi-β-Bourbonene	10.06	1380	0.03	7.49	1464	0.04
β-Elemene	10.18	1388	0.01	8.55*	1544	0.06
Sibirene	10.22	1391	0.07	8.06	1507	0.07
Methyleugenol	10.36	1401	0.09	13.40	1954	0.09
β-Caryophyllene	10.51*	1412	0.07	8.55*	1544	[0.06]
β-Ylangene	10.51*	1412	[0.07]	8.32	1526	0.01
β-Copaene	10.65	1422	0.06	8.47	1538	0.06
trans-α-Bergamotene	10.79	1432	0.04	8.67*	1554	[0.82]
Isogermacrene D	10.85	1438	0.04	9.12	1588	0.04
α-Humulene	10.97	1446	0.01	9.41*	1611	[1.95]
cis-Muurolo-4(15),5-diene	11.06	1453	0.01	9.49	1618	0.02
γ-Muurolole	11.31	1472	0.03	9.81	1643	0.03
Germacrene D	11.34	1474	0.13	9.90*†	1651	[0.25]
Unknown [m/z 91, 93 (92), 105	11.37	1476	0.09	10.04*	1662	[0.11]

(71), 77 (69), 79 (68), 133 (63)... 204 (32)]						
α-Murololene	11.62	1496	0.01	10.23*	1678	[0.02]
γ-Cadinene	11.79	1508	0.02	10.54*	1703	0.11
Kessane	11.93*	1519	0.11	10.61	1709	tr
δ-Cadinene	11.93*	1519	[0.11]	10.54*	1703	[0.11]
Elemicin	12.38	1555	0.02	15.58	2164	0.02
Unknown [m/z 204, 161 (97), 59 (87), 189 (78), 105 (45)...]	13.47	1643	0.01	15.38	2144	0.01
Unknown [m/z 214, 161 (86), 173 (82), 172 (79), 199 (75), 189 (75), 204 (70)...]	13.50	1646	0.02	15.21	2127	0.01
α-Phellandrene dimer I	14.59	1738	0.01			
α-Phellandrene dimer II	15.19	1790	0.03	12.60	1880	0.03
α-Phellandrene dimer III	15.38	1806	0.01	13.24	1939	0.01
(3E)-Cembrene A	16.96	1953	0.02	15.70	2176	0.03
Verticilla- 4(20),7,11-triene	17.48	2002	0.02			
Cembrenol	18.74	2129	0.02			
Serratol	18.88	2143	0.08	19.72	2617	0.09
Total identified		98.04%			98.03%	
Total reported		99.15%			98.89%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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