

GC/MS BATCH NUMBER: F40105

ESSENTIAL OIL: FRANKINCENSE SERRATA
BOTANICAL NAME: BOSWELLIA SERRATA
ORIGIN: INDIA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF FRANKINCENSE SERRATA OIL	%
α -THUJENE	60.1
α -PINENE	9.4
SABINENE	5.7
α -PHELLANDRENE	3.1
METHYLCHAVICOL	3.0
LIMONENE	2.3
Δ 3-CARENE	2.2

Comments from Robert Tisserand: Rich, green, earthy, pine needle odor quality. Constituents are in expected amounts.

Date : May 17, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18E16-PTH4-1-CC

Customer identification : Frankincense Serrata - India - F4010583R

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 : May 17, 2018

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4618 ± 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	60.25*	Simple phenolic
Unknown	0.01		Unknown
Hashishene	0.08	9.49*	Monoterpene
Tricyclene	0.01	0.01	Monoterpene
α -Thujene	60.12	[60.25]*	Monoterpene
α -Pinene	9.44	[9.49]*	Monoterpene
Unknown	0.24	0.23	Monoterpene
Camphene	0.13*	0.12	Monoterpene
α -Fenchene	[0.13]*	tr	Monoterpene
Thuja-2,4(10)-diene	0.01	5.68*	Monoterpene
meta-Cymene	0.02	0.91*	Monoterpene
Sabinene	6.19*	[5.68]*	Monoterpene
β -Pinene	[6.19]*	0.53	Monoterpene
Pseudolimonene isomer	0.01	0.01*	Monoterpene
Myrcene	0.89	[0.91]*	Monoterpene
α -Phellandrene	3.06*	3.06	Monoterpene
Pseudolimonene	[3.06]*	0.01	Monoterpene
Δ^3 -Carene	2.19	2.19	Monoterpene
α -Terpinene	0.29	0.28	Monoterpene
Carvomenthene	0.06*	[0.01]*	Aliphatic alcohol
ortho-Cymene	[0.06]*	1.53*	Simple phenolic
para-Cymene	1.48	[1.53]*	Monoterpene
Unknown	0.20	0.23*	Unknown
1,8-Cineole	2.92*	0.02	Monoterpenic ether
Limonene	[2.92]*	2.31	Monoterpene
β -Phellandrene	[2.92]*	0.59	Monoterpene
(Z)- β -Ocimene	0.39	0.40	Monoterpene
Unknown	0.09		Unknown
(E)- β -Ocimene	0.21	0.22	Monoterpene
Unknown	0.01		Unknown
γ -Terpinene	0.66	0.66	Monoterpene
cis-Sabinene hydrate	0.09	0.09	Monoterpenic alcohol
Unknown	0.01	0.01	Oxygenated monoterpene
Terpinolene	0.24*	0.22	Monoterpene
para-Cymenene	[0.24]*	0.20*	Monoterpene
trans-Sabinene hydrate	0.09	0.16	Monoterpenic alcohol
Unknown	0.14*	0.02*	Unknown
α -Thujone	[0.14]*	[0.02]*	Monoterpenic ketone
Linalool	[0.14]*	0.11	Monoterpenic alcohol
Unknown	0.24*	[0.20]*	Oxygenated monoterpene
β -Thujone	[0.24]*	[0.23]*	Monoterpenic ketone
Unknown	0.01		Oxygenated monoterpene
cis-para-Menth-2-en-1-ol	0.09*	0.08	Monoterpenic alcohol
Dehydrosabinaketone	[0.09]*	0.01*	Normonoterpenic ketone
α -Campholenal	0.03	0.02	Monoterpenic aldehyde
Unknown	0.01		Unknown
allo-Ocimene	0.02	0.02	Monoterpene
cis-para-Mentha-2,8-dien-1-ol	0.02	0.05	Monoterpenic alcohol

<i>trans</i> -Pinocarveol	0.01	0.02*	Monoterpenic alcohol
<i>trans</i> -Sabinol	0.08	0.06	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.05*	0.14*	Monoterpenic alcohol
Epoxyterpinolene	[0.05]*	0.03	Monoterpenic ether
para-Menth-3-en-8-ol	0.01	[0.01]*	Monoterpenic alcohol
Unknown	0.01		Oxygenated monoterpene
Unknown	0.02		Oxygenated monoterpene
Borneol	0.05	0.62*	Monoterpenic alcohol
α -Phellandren-8-ol	0.11*	0.01	Monoterpenic alcohol
<i>cis</i> -Sabinol	[0.11]*	0.11*	Monoterpenic alcohol
Umbellulone	0.01	0.01	Monoterpenic ketone
Terpinen-4-ol	0.61	0.62*	Monoterpenic alcohol
meta-Cymen-8-ol	0.03	0.02	Monoterpenic alcohol
Cryptone	0.02	[0.02]*	Normonoterpenic ketone
α -Terpineol	0.08	[0.62]*	Monoterpenic alcohol
Methylchavicol	3.01	3.05	Phenylpropanoid
α -Phellandrene epoxide	0.04	0.06	Monoterpenic ether
Verbenone	0.12*	[0.14]*	Monoterpenic ketone
Unknown	[0.12]*	[0.11]*	Oxygenated monoterpene
<i>trans</i> -Piperitol	0.02	[0.54]*	Monoterpenic alcohol
Unknown	0.02		Unknown
Carvone	0.01	0.01	Monoterpenic ketone
Piperitone	0.04*	0.34*	Monoterpenic ketone
Unknown	[0.04]*	0.02	Unknown
Linalyl acetate	0.03	0.05*	Monoterpenic ester
Unknown	0.04		Oxygenated monoterpene
Bornyl acetate	0.06	0.06	Monoterpenic ester
Thymol	0.02	0.03	Monoterpenic alcohol
Carvacrol	0.02	0.03	Monoterpenic alcohol
α -Terpinyl acetate	0.10	0.08	Monoterpenic ester
α -Copaene	0.16	0.15	Sesquiterpene
β -Bourbonene	0.73	0.74	Sesquiterpene
1,5-diepi- β -Bourbonene	0.04	0.06	Sesquiterpene
β -Elemene	0.08	0.10*	Sesquiterpene
Methyleugenol	0.34	0.36*	Phenylpropanoid
β -Caryophyllene	0.12*	[0.10]*	Sesquiterpene
β -Ylangene	[0.12]*	[0.05]*	Sesquiterpene
β -Copaene	0.10	0.09	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.08	[0.62]*	Sesquiterpene
Isogermacrene D	0.08	0.08	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.02	0.04	Sesquiterpene
γ -Muurolole	0.10	[0.14]*	Sesquiterpene
Germacrene D	0.54	[0.62]*	Sesquiterpene
Unknown	0.29	[0.34]*	Sesquiterpene
α -Muurolole	0.03	0.01	Sesquiterpene
γ -Cadinene	0.07	0.54	Sesquiterpene
Kessane	0.49*	0.01	Sesquiterpenic ether
δ -Cadinene	[0.49]*	[0.54]*	Sesquiterpene
Elemicin	0.08	0.08	Phenylpropanoid
Viridiflorol	0.04	0.04	Sesquiterpenic alcohol
Guaiol	0.02	0.03	Sesquiterpenic alcohol
Unknown	0.03	0.03	Oxygenated sesquiterpene

α -Phellandrene dimer II	0.16	0.15	Diterpene
α -Phellandrene dimer III	0.04	0.04	Diterpene
α -Phellandrene dimer IV	0.02	[0.36]*	Diterpene
(3E)-Cembrene A	0.15	0.15	Diterpene
Verticilla-4(20),7,11-triene	0.09		Diterpene
Cembrenol	0.08	0.08	Diterpenic alcohol
Serratol	0.56	0.54	Diterpenic alcohol
Total identified	97.90%	98.15%	

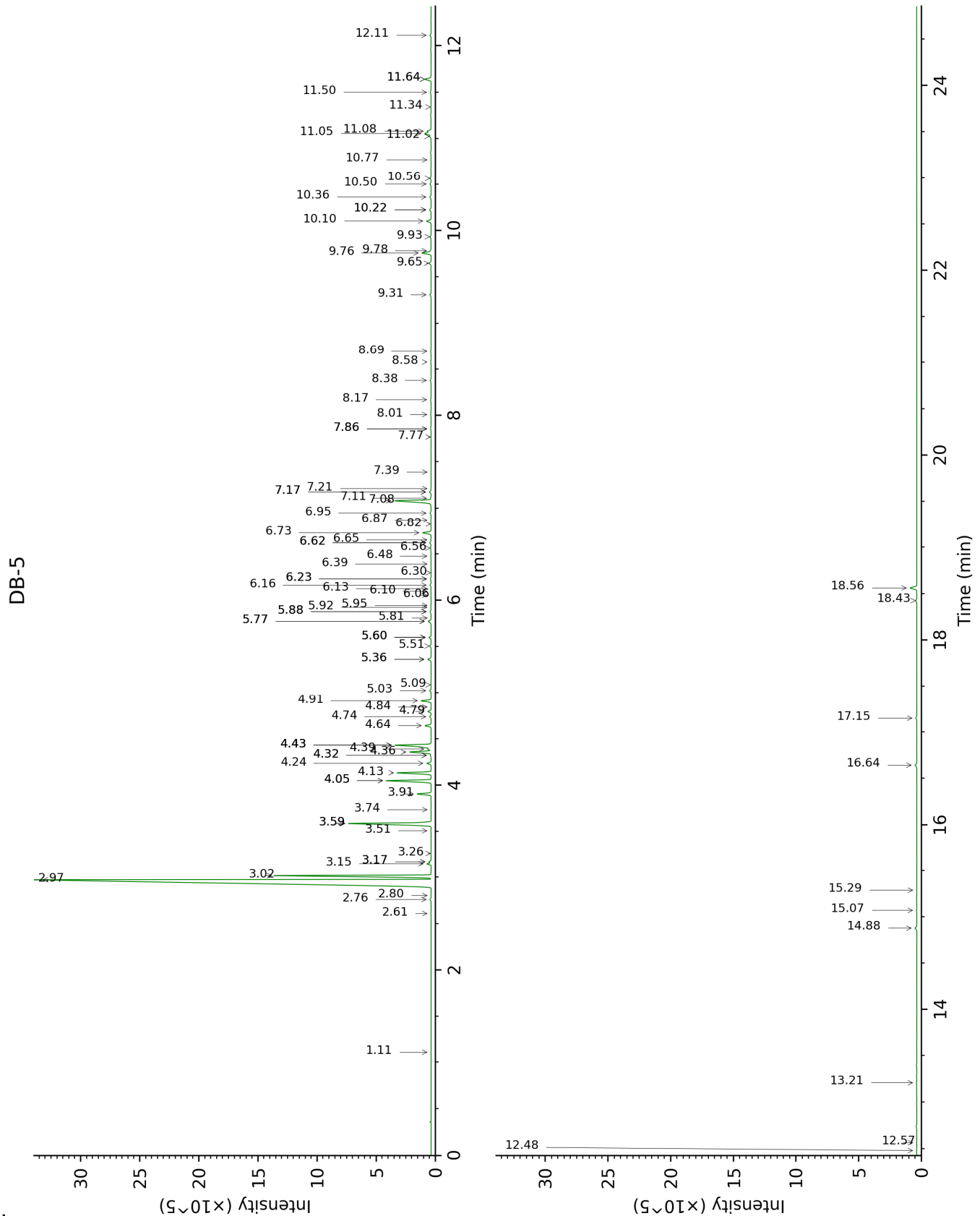
*: Two or more compounds are coeluting on this column

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

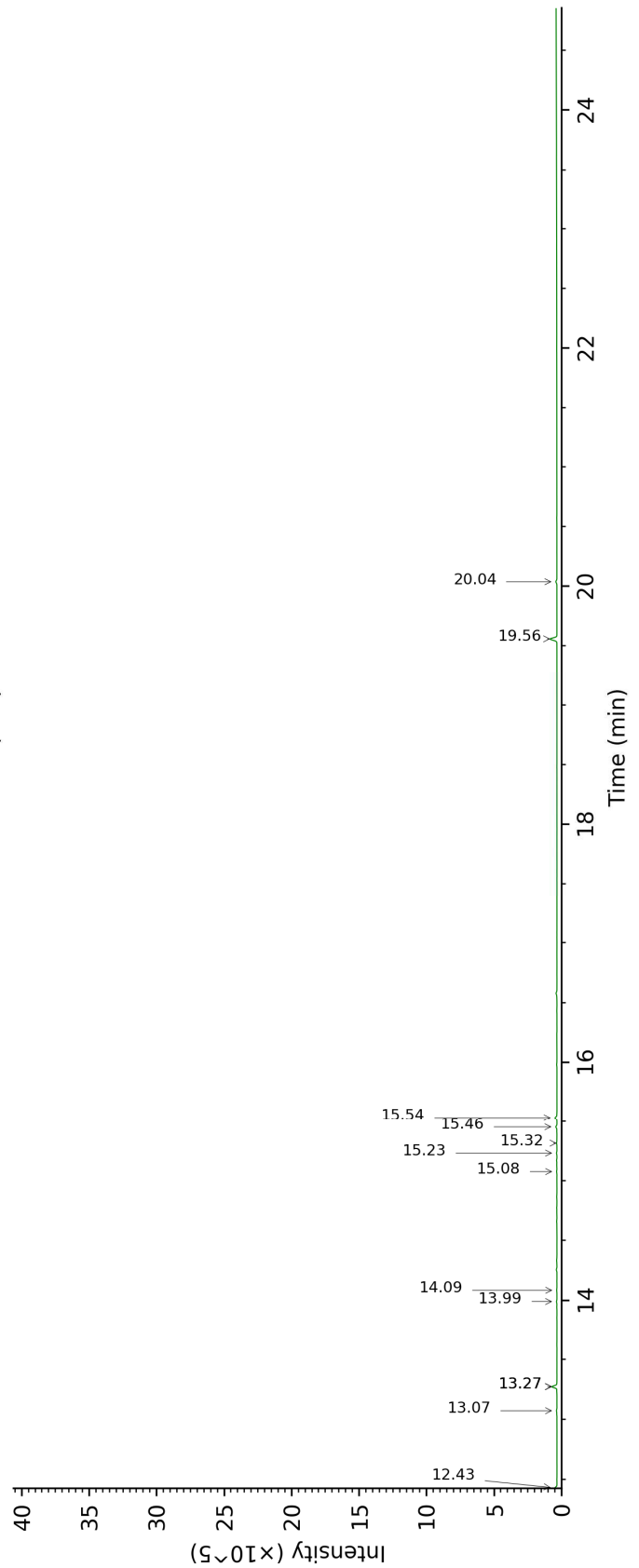
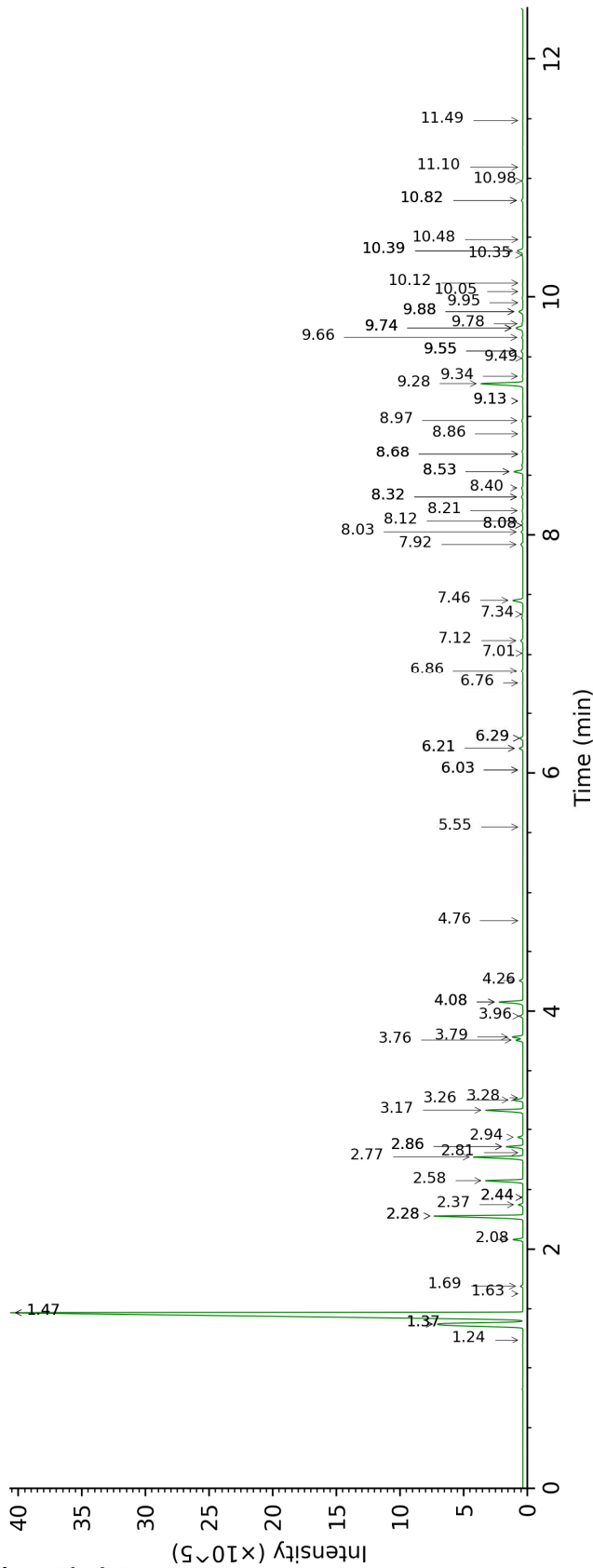
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.11	752	0.01	1.47*	1005	60.25
Unknown [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20), 107 (20), 41 (18), 136 (17), 92 (17)]	2.61	901	0.01			
Hashishene	2.76	912	0.08	1.37*	993	9.49
Tricyclene	2.80	914	0.01	1.24	971	0.01
α -Thujene	2.97	926	60.12	1.47*	1005	[60.25]
α -Pinene	3.02	929	9.44	1.37*	993	[9.49]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.15	938	0.24	2.37	1095	0.23
Camphene	3.17*	940	0.13	1.69	1027	0.12
α -Fenchene	3.17*	940	[0.13]	1.63	1021	tr
Thuja-2,4(10)-diene	3.26	946	0.01	2.28*	1085	5.68
meta-Cymene	3.51	962	0.02	2.86*	1133	0.91
Sabinene	3.59*†	967	6.19	2.28*	1085	[5.68]
β -Pinene	3.59*†	967	[6.19]	2.08	1066	0.53
Pseudolimonene isomer	3.74	977	0.01	2.44*	1100	0.01
Myrcene	3.91	989	0.89	2.86*	1133	[0.91]
α -Phellandrene	4.05*	998	3.06	2.77	1127	3.06
Pseudolimonene	4.05*	998	[3.06]	2.81	1130	0.01
Δ^3 -Carene	4.13	1004	2.19	2.58	1111	2.19
α -Terpinene	4.24	1010	0.29	2.94	1140	0.28
Carvomenthene	4.32*	1016	0.06	2.44*	1100	[0.01]
ortho-Cymene	4.32*	1016	[0.06]	4.08*	1225	1.53
para-Cymene	4.36	1018	1.48	4.08*	1225	[1.53]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.39	1020	0.20	6.21*	1378	0.23
1,8-Cineole	4.43*	1023	2.92	3.28	1166	0.02
Limonene	4.43*	1023	[2.92]	3.17	1158	2.31
β -Phellandrene	4.43*	1023	[2.92]	3.26	1164	0.59
(Z)- β -Ocimene	4.64	1036	0.39	3.76	1202	0.40
Unknown (m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	4.74	1042	0.09			
(E)- β -Ocimene	4.80	1046	0.21	3.96	1217	0.22
Unknown [m/z 109, 45 (67), 41 (40), 67 (39), 81 (33), 79 (27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...]	4.84	1049	0.01			
γ -Terpinene	4.91	1053	0.66	3.79	1204	0.66
cis-Sabinene hydrate	5.03	1061	0.09	6.86	1426	0.09

Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.09	1064	0.01	4.76	1273	0.01
Terpinolene	5.36*	1082	0.24	4.26	1238	0.22
para-Cymenene	5.36*	1082	[0.24]	6.29*	1384	0.20
trans-Sabinene hydrate	5.51	1091	0.09	7.92	1505	0.16
Unknown [m/z 109, 43 (65), 95 (54), 119 (50), 91 (47)... 149 (8)...]	5.60*	1097	0.14	6.03*	1365	0.02
α-Thujone	5.60*	1097	[0.14]	6.03*	1365	[0.02]
Linalool	5.60*	1097	[0.14]	8.03	1513	0.11
Unknown [m/z 109, 81 (54), 91 (32), 79 (22)...]	5.77*	1108	0.24	6.29*	1384	[0.20]
β-Thujone	5.77*	1108	[0.24]	6.21*	1378	[0.23]
Unknown [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)... 154 (1)]	5.81	1110	0.01			
cis-para-Menth-2-en-1-ol	5.88*	1115	0.09	8.12	1520	0.08
Dehydrosabinaketone	5.88*	1115	[0.09]	8.68*	1563	0.01
α-Campholenal	5.92	1118	0.03	7.01	1437	0.02
Unknown [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...]	5.94	1119	0.01			
allo-Ocimene	6.06	1126	0.02	5.55	1331	0.02
cis-para-Mentha-2,8-dien-1-ol	6.10	1129	0.02	9.49	1627	0.05
trans-Pinocarveol	6.13	1131	0.01	9.13*	1598	0.02
trans-Sabinol	6.16	1133	0.08	9.78	1651	0.06
trans-Verbenol	6.23*	1137	0.05	9.55*	1632	0.14
Epoxyterpinolene	6.23*	1137	[0.05]	6.76	1418	0.03
para-Menth-3-en-8-ol	6.30	1142	0.01	8.68*	1563	[0.01]
Unknown [m/z 109, 81 (39), 41 (38), 95 (24)... 152 (1)]	6.39	1148	0.01			
Unknown [m/z 109, 43 (75), 137 (46), 67 (31), 93 (25)... 152 (4)]	6.48	1153	0.02			
Borneol	6.56	1159	0.05	9.74*	1648	0.62
α-Phellandren-8-ol	6.62*	1162	0.11	10.12	1678	0.01
cis-Sabinol	6.62*	1162	[0.11]	10.82*	1737	0.11
Umbellulone	6.65	1165	0.01	8.86	1577	0.01
Terpinen-4-ol	6.73	1170	0.61	8.53*	1552	0.62
meta-Cymen-8-ol	6.82	1176	0.03	11.49	1794	0.02
Cryptone	6.87	1179	0.02	9.13*	1598	[0.02]
α-Terpineol	6.95	1184	0.08	9.74*	1648	[0.62]
Methylchavicol	7.08	1192	3.01	9.28	1610	3.05
α-Phellandrene	7.11	1194	0.04	10.98	1751	0.06

epoxide						
Verbenone	7.18*	1198	0.12	9.55*	1632	[0.14]
Unknown [m/z 109, 91 (100), 81 (88), 94 (75), 119 (74), 96 (73), 41 (63)... 150 (2)]	7.18*	1198	[0.12]	10.82*	1737	[0.11]
<i>trans</i> -Piperitol	7.21	1201	0.02	10.39*†	1700	[0.54]
Unknown [m/z 43, 93 (73), 91 (40), 109 (31), 77 (28)...]	7.39	1212	0.02			
Carvone	7.77	1238	0.01	9.95	1665	0.01
Piperitone	7.86*	1244	0.04	9.88*	1659	0.34
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	7.86*	1244	[0.04]	11.10	1760	0.02
Linalyl acetate	8.01	1254	0.03	8.08*	1517	0.05
Unknown [m/z 109, 41 (22), 81 (14), 43 (11)... 152 (4)]	8.17	1265	0.04			
Bornyl acetate	8.38	1279	0.06	8.20	1526	0.06
Thymol	8.58	1292	0.02	15.08	2128	0.03
Carvacrol	8.69	1300	0.02	15.32	2152	0.03
α -Terpinyl acetate	9.31	1344	0.10	9.66	1642	0.08
α -Copaene	9.65	1368	0.16	7.12	1445	0.15
β -Bourbonene	9.76	1376	0.73	7.46	1470	0.74
1,5-diepi- β -Bourbonene	9.78	1377	0.04	7.34	1461	0.06
β -Elemene	9.93	1388	0.08	8.32*	1535	0.10
Methyleugenol	10.10	1400	0.34	13.27*	1954	0.36
β -Caryophyllene	10.22*	1409	0.12	8.32*	1535	[0.10]
β -Ylangene	10.22*	1409	[0.12]	8.08*	1517	[0.05]
β -Copaene	10.36	1419	0.10	8.40	1541	0.09
<i>trans</i> - α -Bergamotene	10.50	1430	0.08	8.53*	1552	[0.62]
Isogermacrene D	10.56	1434	0.08	8.97	1586	0.08
<i>cis</i> -Muurolo-4(15),5-diene	10.77	1450	0.02	9.34	1615	0.04
γ -Muurolole	11.02	1469	0.10	9.55*	1632	[0.14]
Germacrene D	11.06	1471	0.54	9.74*	1648	[0.62]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.08	1473	0.29	9.88*	1659	[0.34]
α -Muurolole	11.34	1492	0.03	10.05	1673	0.01
γ -Cadinene	11.50	1504	0.07	10.35†	1697	0.54
Kessane	11.64*	1516	0.49	10.48	1708	0.01
δ -Cadinene	11.64*	1516	[0.49]	10.39*†	1700	[0.54]
Elemicin	12.11	1553	0.08	15.46	2166	0.08
Viridiflorol	12.48	1582	0.04	13.99	2022	0.04
Guaiol	12.57	1588	0.02	14.09	2031	0.03
Unknown [m/z 204, 161 (97), 59 (87), 189 (78), 105 (45)...]	13.21	1641	0.03	15.23	2143	0.03

α-Phellandrene dimer II	14.88	1784	0.16	12.43	1877	0.15
α-Phellandrene dimer III	15.07	1800	0.04	13.07	1936	0.04
α-Phellandrene dimer IV	15.29	1820	0.02	13.27*	1954	[0.36]
(3E)-Cembrene A	16.64	1945	0.15	15.54	2174	0.15
Verticilla-4(20),7,11-triene	17.15	1994	0.09			
Cembrenol	18.42	2121	0.08	20.04	2674	0.08
Serratol	18.56	2136	0.56	19.56	2616	0.54
Total identified		97.90%			98.15%	
Total reported		98.90%			98.45%	

*: 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