Date : May 08, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20D24-PTH04
Customer identification : Frereana Organic - Somaliland - FE010492R
Type : Essential oil
Source : *Boswellia frereana*
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 : Fanny Charlier, B. Sc.
Analysis date : April 29, 2020

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.4684 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

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Analysis summary – Consolidated contents

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

Identification	%	Class
3-Methyl-2-butanone	0.03	Aliphatic ketone
Unknown	0.01	Unknown
Toluene	0.06	Simple phenolic
Hexadiene isomer?	0.01	Alkene
Unknown	tr	Alkene
(*Z*)-Salvene	tr	Normonoterpene
Unknown	0.02	Unknown
(*E*)-Salvene	tr	Normonoterpene
Unknown	0.04	Unknown
Unknown	0.01	Monoterpene
Unknown	0.03	Unknown
Hashishene	0.44	Monoterpene
Tricyclene	0.11	Monoterpene
α-Thujene	22.45	Monoterpene
α-Pinene	39.36	Monoterpene
Unknown	1.37	Monoterpene
Camphene	0.81	Monoterpene
Thuja-2,4(10)-diene	0.54	Monoterpene
Sabinene	4.61	Monoterpene
β-Pinene	1.75	Monoterpene
Pseudolimonene isomer	0.02	Monoterpene
6-Methyl-5-hepten-2-one	0.06	Aliphatic ketone
Dehydro-1,8-cineole	0.07	Monoterpenic ether
Myrcene	0.67	Monoterpene
2,7-Dimethyl-2,6-octadiene	0.06	Monoterpene
α-Phellandrene	0.29	Monoterpene
Pseudolimonene	0.01	Monoterpene
Octanal	0.04	Aliphatic aldehyde
Δ3-Carene	0.03	Monoterpene
ortho-Methylanisole	0.03	Simple phenolic
α-Terpinene	0.14	Monoterpene
ortho-Cymene	0.16	Monoterpene
para-Cymene	6.22	Monoterpene
Unknown	0.58	Unknown
Limonene	0.85	Monoterpene
1,8-Cineole	1.29	Monoterpenic ether
β-Phellandrene	0.31	Monoterpene
Unknown	0.04	Unknown
(*Z*)-β-Ocimene	0.03	Monoterpene
Unknown	0.26	Unknown
Unknown	0.02	Unknown
γ-Terpinene	0.23	Monoterpene
cis-Sabinene hydrate	0.10	Monoterpenic alcohol
Unknown	0.05	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol

Unknown	0.08	Oxygenated monoterpene
Isoterpinolene	0.04	Monoterpene
Terpinolene	0.09	Monoterpene
para-Cymenene	0.14	Monoterpene
α-Pinene oxide	0.08	Monoterpenic ether
trans-Sabinene hydrate	0.07	Monoterpenic alcohol
Linalool	0.39	Monoterpenic alcohol
α-Thujone	0.07	Monoterpenic ketone
Unknown	0.02	Monoterpenic alcohol
Unknown	0.53	Oxygenated monoterpene
Verbenol analog?	0.13	Monoterpenic alcohol
β-Thujone	0.12	Monoterpenic ketone
cis-para-Menth-2-en-1-ol	0.13	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.13	Monoterpenic alcohol
α-Campholenal	0.18	Monoterpenic aldehyde
Unknown	0.10	Unknown
Unknown	0.02	Unknown
trans-Pinocarveol	0.67	Monoterpenic alcohol
cis-Verbenol	0.20	Monoterpenic alcohol
trans-Sabinol	0.24	Monoterpenic alcohol
trans-Verbenol	0.94	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.17	Monoterpenic alcohol
Sabinaketone	0.07	Normonoterpenic ketone
Pinocarvone	0.20	Monoterpenic ketone
Unknown	0.08	Oxygenated monoterpene
Borneol	0.12	Monoterpenic alcohol
α-Phellandren-8-ol	0.12	Monoterpenic alcohol
Unknown	0.06	Oxygenated monoterpene
cis-Sabinol	0.18	Monoterpenic alcohol
Umbellulone	0.27	Monoterpenic ketone
Unknown	0.01	Oxygenated monoterpene
Terpinen-4-ol	3.66	Monoterpenic alcohol
Cryptone	0.13	Normonoterpenic ketone
para-Cymen-8-ol	0.44	Monoterpenic alcohol
α-Terpineol	0.62	Monoterpenic alcohol
Myrtenal	0.39	Monoterpenic aldehyde
Myrtenol	0.22	Monoterpenic alcohol
cis-Piperitol	0.03	Monoterpenic alcohol
cis-α-Phellandrene epoxide (IPP vs Me)	0.10	Monoterpenic ether
Verbenone	0.64	Monoterpenic ketone
trans-Piperitol	0.11	Monoterpenic alcohol
trans-Carveol	0.16	Monoterpenic alcohol
cis-Carveol	0.04	Monoterpenic alcohol
Citronellol	0.08	Monoterpenic alcohol
Cuminal	0.01	Monoterpenic aldehyde
Carvone	0.05	Monoterpenic ketone
Carvotanacetone	0.05	Monoterpenic ketone
Unknown	0.04	Unknown
Piperitone	0.02	Monoterpenic ketone
Unknown	0.06	Unknown
Unknown	0.04	Oxygenated monoterpene
Unknown	0.02	Unknown

Bornyl acetate	0.89	Monoterpenic ester
Cuminol	0.05	Monoterpenic alcohol
Thymol	0.08	Monoterpenic alcohol
Carvacrol	0.13	Monoterpenic alcohol
exo-2-Hydroxycineole acetate	0.02	Monoterpenic ester
Eugenol	0.10	Phenylpropanoid
β-Bourbonene	0.21	Sesquiterpene
β-Elemene	0.11	Sesquiterpene
β-Caryophyllene	0.05	Sesquiterpene
β-Copaene	0.04	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
β-Selinene	0.02	Sesquiterpene
α-Muurolene	0.04	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
Caryophyllene oxide	0.02	Sesquiterpenic ether
Viridiflorol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.02	Sesquiterpenic alcohol
α-Phellandrene dimer I	0.05	Diterpene
α-Phellandrene dimer II	0.21	Diterpene
α-Phellandrene dimer III	0.02	Diterpene
α-Phellandrene dimer IV	0.04	Diterpene
Consolidated total	**97.95%**	

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.

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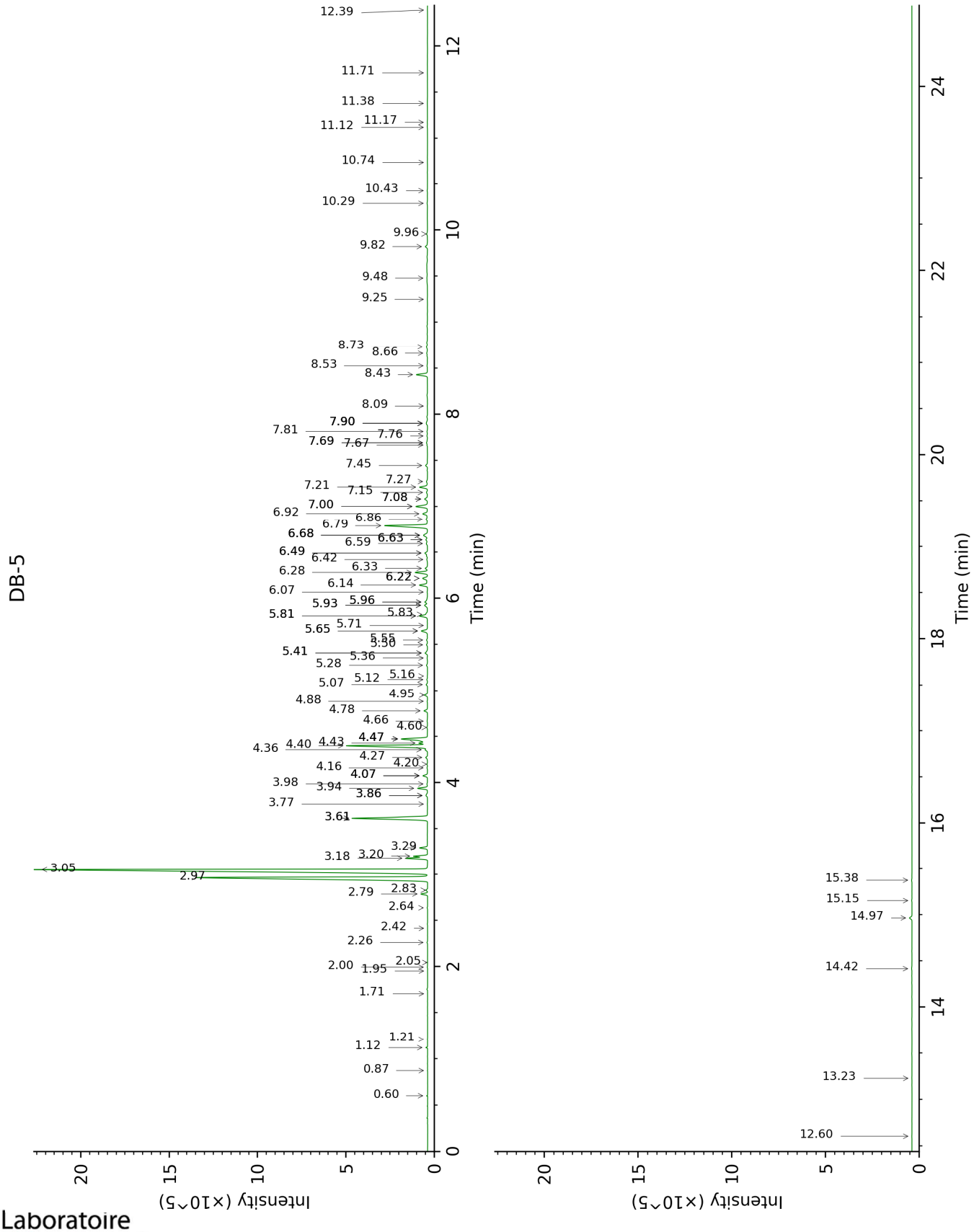
DB-5
Time (min)
Intensity (×10^5)
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11.71
11.38
11.12
11.17
10.74
10.43
10.29
9.96
9.82
9.48
9.25
8.73
8.66
8.53
8.43
8.09
7.90
7.81
7.76
7.69
7.67
7.45
7.27
7.21
7.15
7.08
7.00
6.92
6.86
6.79
6.68
6.63
6.59
6.49
6.42
6.33
6.28
6.22
6.14
6.07
5.96
5.93
5.83
5.81
5.71
5.65
5.55
5.50
5.41
5.36
5.28
5.16
5.12
5.07
4.95
4.88
4.78
4.66
4.60
4.47
4.43
4.40
4.36
4.27
4.20
4.16
4.07
3.98
3.94
3.86
3.77
3.61
3.29
3.20
3.18
3.05
2.97
2.83
2.79
2.64
2.42
2.26
2.05
2.00
1.95
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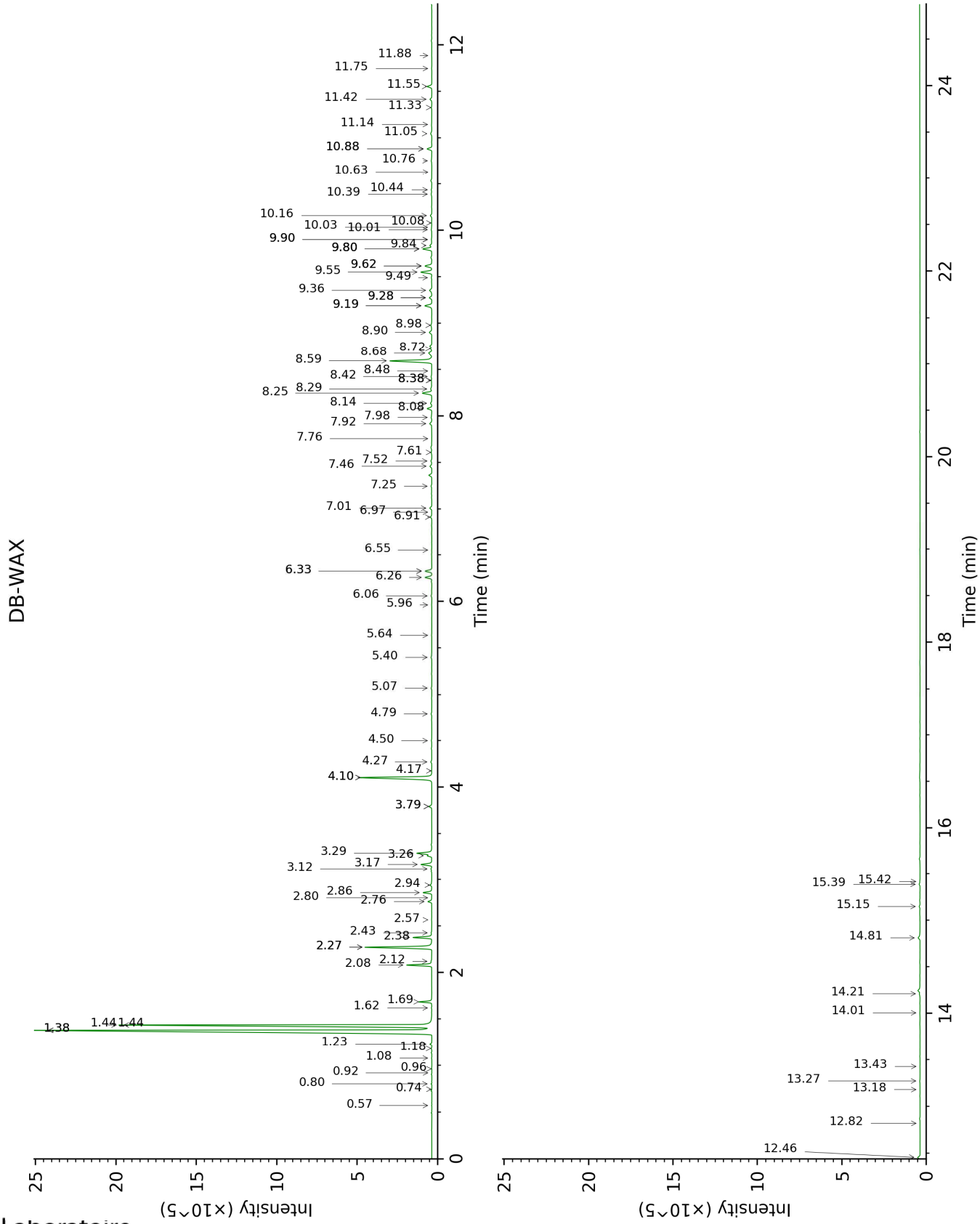
15.15
14.97
14.42
13.23
12.60



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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
3-Methyl-2-butanone	0.60	646	0.03	0.80	902	0.02
Unknown [m/z 93, 91 (70), 77 (48), 108 (42)]	0.87	728	0.01	0.57	822	0.01
Toluene	1.12	762	0.06	1.44*	1002	22.79
Hexadiene isomer?	1.21	775	0.01			
Unknown [m/z 109, 67 (32), 81 (14), 41 (12), 124 (10)]	1.71	829	tr	0.74	885	tr
(*Z*)-Salvene	1.95	849	tr	0.92	921	tr
Unknown [m/z 109, 43 (28), 124 (28), 41 (14), 55 (11), 79 (9), 81 (8)...]	2.00	853	0.02	1.62	1020	0.03
(*E*)-Salvene	2.05	857	tr	0.96	928	tr
Unknown [m/z 79, 78 (45), 91 (28), 77 (28), 41 (13), 80 (12), 107 (11)... 122 (1)]	2.26	875	0.04	1.18	963	0.04
Unknown [m/z 93, 91 (75), 121 (61), 77 (58), 79 (38), 92 (26), 43 (24), 41 (23), 105 (22),107 (19), 136 (16)]	2.42	887	0.01	1.08	946	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)]	2.64	906	0.03			
Hashishene	2.79	915	0.44	1.38*	996	39.06
Tricyclene	2.83	918	0.11	1.23	972	0.11
α-Thujene	2.97	927	22.45	1.44*	1002	[22.79]
α-Pinene	3.05	933	39.36	1.38*	996	[39.06]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.18	941	1.37	2.38	1095	1.32
Camphene	3.20	943	0.81	1.69	1026	0.82
Thuja-2,4(10)-diene	3.29	949	0.54	2.27*	1085	5.15

Sabinene	3.61*	970	6.51	2.27*	1085	[5.15]
β-Pinene	3.61*	970	[6.51]	2.08	1066	1.75
Pseudolimonene isomer	3.77	980	0.02	2.43	1099	0.06
6-Methyl-5-hepten-2-one	3.86*	986	0.17	5.07	1296	0.06
Dehydro-1,8-cineole	3.86*	986	[0.17]	3.12	1154	0.07
Myrcene	3.94	991	0.67	2.86	1133	0.65
2,7-Dimethyl-2,6-octadiene	3.98	994	0.06	2.12	1070	0.07
α-Phellandrene	4.07*	1000	0.35	2.76	1125	0.29
Pseudolimonene	4.07*	1000	[0.35]	2.80	1128	0.01
Octanal	4.07*	1000	[0.35]	4.50	1257	0.04
Δ3-Carene	4.16	1006	0.03	2.57	1110	0.02
ortho-Methylanisole	4.20	1008	0.03	5.96	1360	0.02
α-Terpinene	4.27	1013	0.14	2.94	1139	0.14
ortho-Cymene	4.36	1018	0.16	4.10*	1228	6.38
para-Cymene	4.40	1021	6.22	4.10*	1228	[6.38]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.43†	1023	3.03	6.26†	1381	1.17
Limonene	4.47*†	1025	[3.03]	3.17	1157	0.85
1,8-Cineole	4.47*†	1025	[3.03]	3.29	1167	1.29
β-Phellandrene	4.47*†	1025	[3.03]	3.26	1165	0.31
Unknown [m/z 43, 55 (65), 41 (34), 67 (32), 107 (30), 122 (26)... 125 (10)]	4.60	1033	0.04	5.64	1337	0.02
(*Z*)-β-Ocimene	4.66	1038	0.03	3.79*	1206	0.25
Unknown [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	4.78	1044	0.26			
Unknown [m/z 109 , 45 (67), 41 (40), 67 (39), 81 (33), 79 (27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...]	4.88	1051	0.02	6.97	1434	0.02
γ-Terpinene	4.95	1055	0.23	3.79*	1206	[0.25]
cis-Sabinene hydrate	5.07	1063	0.10	6.91	1430	0.12
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91	5.12	1066	0.05	4.79	1278	0.06

(20), 152 (18)]						
cis-Linalool oxide (fur.)	5.16	1069	0.01	6.55	1403	0.01
Unknown [m/z 43, 94 (63), 109 (61), 59 (55), 79 (51)...152 (2)]	5.28	1076	0.08	7.25	1454	0.07
Isoterpinolene	5.36	1081	0.04	4.18	1234	0.02
Terpinolene	5.41*	1084	0.23	4.27	1240	0.09
para-Cymenene	5.41*	1084	[0.23]	6.33*†	1386	[1.17]
α-Pinene oxide	5.50	1090	0.08	5.40	1320	0.09
trans-Sabinene hydrate	5.55	1094	0.07	7.98	1510	0.09
Linalool	5.65*	1100	0.53	8.08	1517	0.39
α-Thujone	5.65*	1100	[0.53]	6.06	1367	0.07
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	5.71	1104	0.02	8.48	1548	0.02
Unknown [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)... 154 (1)]	5.81*	1110	0.65			
Verbenol analog?	5.81*	1110	[0.65]	8.29	1534	0.13
β-Thujone	5.83	1111	0.12	6.33*†	1386	[1.17]
cis-para-Menth-2-en-1-ol	5.93*	1118	0.28	8.14	1522	0.13
trans-para-Mentha-2,8-dien-1-ol	5.93*	1118	[0.28]	8.98	1587	0.13
α-Campholenal	5.96*	1120	0.28	7.01	1437	0.18
Unknown [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...]	5.96*	1120	[0.28]			
Unknown [m/z 95, 43 (41), 110 (36), 41 (19), 67 (18)... 150 (tr)]	6.07	1127	0.02			
trans-Pinocarveol	6.14	1132	0.67	9.19*	1604	0.67
cis-Verbenol	6.22*	1136	0.43	9.28*	1611	0.21
trans-Sabinol	6.22*	1136	[0.43]	9.84†	1656	[0.99]
trans-Verbenol	6.28	1141	0.94	9.55	1633	0.98
meta-Mentha-4,6-dien-8-ol	6.32	1144	0.17	9.36	1617	0.24
Sabinaketone	6.42	1150	0.07	8.72	1567	0.11
Pinocarvone	6.49*	1154	0.22	7.92	1505	0.20
Unknown [m/z	6.49*	1154	[0.22]	7.52	1474	0.08

97, 81 (96), 109 (80), 43 (53), 53 (40), 41 (36), 56 (29), 95 (25)... 152 (1)]						
Borneol	6.59	1161	0.12	9.80*†	1653	0.99
α-Phellandren-8-ol	6.64*	1164	0.15	10.16	1682	0.12
Unknown [m/z 95, 110 (38), 81 (21), 79 (16)... 152 (7)]	6.64*	1164	[0.15]	7.61	1481	0.06
cis-Sabinol	6.68*	1167	0.46	10.88*	1743	0.40
Umbellulone	6.68*	1167	[0.46]	8.90	1581	0.27
Unknown [m/z 95, 110 (43), 81 (28), 41 (15)... 152 (8)]	6.68*	1167	[0.46]	7.76	1492	0.01
Terpinen-4-ol	6.79	1174	3.66	8.59	1557	3.79
Cryptone	6.86	1178	0.13	9.19*	1604	[0.67]
para-Cymen-8-ol	6.92	1182	0.44	11.55	1799	0.42
α-Terpineol	7.00*	1188	1.01	9.80*†	1653	[0.99]
Myrtenal	7.00*	1188	[1.01]	8.68	1563	0.39
Myrtenol	7.08*	1193	0.27	10.88*	1743	[0.40]
cis-Piperitol	7.08*	1193	[0.27]	9.62*	1638	0.67
cis-α-Phellandrene epoxide (IPP vs Me)	7.15	1198	0.10	11.05	1756	0.13
Verbenone	7.21	1202	0.64	9.62*	1638	[0.67]
trans-Piperitol	7.27	1206	0.11	10.39	1701	0.07
trans-Carveol	7.45	1217	0.16	11.42	1788	0.17
cis-Carveol	7.67	1233	0.04	11.75	1816	0.02
Citronellol	7.69*	1234	0.12	10.76	1732	0.08
Cuminal	7.69*	1234	[0.12]	10.63	1721	0.01
Carvone	7.76	1239	0.05	10.01	1670	0.05
Carvotanacetone	7.81	1243	0.05	9.49	1628	0.04
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	7.90*	1249	0.16	11.14	1765	0.04
Piperitone	7.90*	1249	[0.16]	9.90*	1661	0.05
Unknown [m/z 43, 82 (79), 109 (69), 110 (65), 95 (38), 41 (36)...]	7.90*	1249	[0.16]			
Unknown [m/z 109, 119 (84), 91 (81), 134 (55)... 137 (27)...]	7.90*	1249	[0.16]	11.33	1780	0.04
Unknown [m/z 43, 97 (78), 41	8.09	1262	0.02	13.43	1968	0.01

(45), 55 (35), 69 (28), 107 (24), 83 (23)...]						
Bornyl acetate	8.43	1285	0.89	8.25	1530	0.88
Cuminol	8.52	1292	0.05	14.21	2042	0.07
Thymol	8.66	1302	0.08	15.15	2133	0.07
Carvacrol	8.73	1306	0.13	15.39	2157	0.07
exo-2-Hydroxycineole acetate	9.25	1338	0.02	10.08	1676	0.02
Eugenol	9.48	1354	0.10	14.81	2100	0.18
β-Bourbonene	9.82	1378	0.21	7.46	1470	0.18
β-Elemene	9.96	1388	0.11	8.42†	1544	[0.13]
β-Caryophyllene	10.29	1412	0.05	8.38*†	1541	0.13
β-Copaene	10.43	1422	0.04	8.38*†	1541	[0.13]
α-Humulene	10.74	1445	0.02	9.28*	1611	[0.21]
Germacrene D	11.12	1473	0.02	9.80*†	1653	[0.99]
β-Selinene	11.17	1478	0.02	9.90*	1661	[0.05]
α-Muurolene	11.38	1493	0.04	10.03	1672	0.02
δ-Cadinene	11.71	1518	0.02	10.44	1705	0.05
Caryophyllene oxide	12.39	1572	0.02	12.82	1912	0.01
Viridiflorol	12.60	1588	0.02	14.01	2022	0.03
β-Eudesmol	13.23	1639	0.02	15.42	2160	0.02
α-Phellandrene dimer I	14.42	1739	0.05	11.88	1829	0.01
α-Phellandrene dimer II	14.97	1787	0.21	12.46	1879	0.22
α-Phellandrene dimer III	15.15	1804	0.02	13.18	1945	0.02
α-Phellandrene dimer IV	15.38	1824	0.04	13.27	1953	0.04
Total identified		**93.17%**			**93.80%**	
Total reported		**98.20%**			**96.82%**	

*: 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