Date : August 30, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21H17-ORA05
Customer identification : Frankincense - India - 3 years - OIL-SINGLE
Type : Essential oil
Source : *Boswellia serrata*
Customer : Organic Aromas Inc.

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Pamela Lavoie, M.Sc., Chimiste
Analysis date : August 27, 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

Méthode certifiée ISO 17025:2017 Certified method

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4606 ± 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
(*E*)-2-Methyl-1,3-pentadiene	tr	Alkene
Toluene	0.01	Simple phenolic
Unknown	0.01	Unknown
Hashishene	0.10	Monoterpene
Tricyclene	0.05	Monoterpene
α-Thujene	60.94	Monoterpene
α-Pinene	16.58	Monoterpene
Unknown	0.29	Monoterpene
Camphene	0.29	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
meta-Cymene	0.02	Monoterpene
β-Pinene	0.44	Monoterpene
Sabinene	4.76	Monoterpene
Dehydro-1,8-cineole	0.01	Monoterpenic ether
Myrcene	0.84	Monoterpene
α-Phellandrene	1.00	Monoterpene
Δ3-Carene	4.08	Monoterpene
α-Terpinene	0.20	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
ortho-Cymene	0.06	Monoterpene
para-Cymene	1.67	Monoterpene
Unknown	0.40	Unknown
β-Phellandrene	0.15*	Monoterpene
1,8-Cineole	[0.15]*	Monoterpenic ether
Limonene	1.62	Monoterpene
(*Z*)-β-Ocimene	0.50	Monoterpene
Unknown	0.06	Unknown
(*E*)-β-Ocimene	0.24	Monoterpene
Unknown	0.08	Unknown
γ-Terpinene	0.48	Monoterpene
cis-Sabinene hydrate	0.03	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.22	Monoterpene
α-Pinene oxide	0.13	Monoterpenic ether
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.07	Monoterpenic alcohol
α-Thujone	0.03	Monoterpenic ketone
β-Thujone	0.18	Monoterpenic ketone
Unknown	0.02	Oxygenated monoterpene
cis-para-Menth-2-en-1-ol	0.05	Monoterpenic alcohol
α-Campholenal	tr	Monoterpenic aldehyde
Unknown	0.01	Unknown
allo-Ocimene	0.02	Monoterpene
trans-Pinocarveol	0.04	Monoterpenic alcohol

trans-Sabinol	0.05	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
trans-Verbenol	0.11	Monoterpenic alcohol
Epoxyterpinolene	0.01	Monoterpenic ether
Unknown	0.02	Unknown
Unknown	0.01	Oxygenated monoterpene
Borneol	0.02	Monoterpenic alcohol
cis-Sabinol	0.08	Monoterpenic alcohol
Terpinen-4-ol	0.34	Monoterpenic alcohol
meta-Cymen-8-ol	0.01	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	0.04	Monoterpenic alcohol
Methylchavicol	1.06	Phenylpropanoid
cis-α-Phellandrene epoxide (IPP vs Me)	0.05	Monoterpenic ether
Verbenone	0.05	Monoterpenic ketone
Unknown	0.02	Unknown
trans-Carveol	0.01	Monoterpenic alcohol
Cuminal	0.01	Monoterpenic aldehyde
Carvone	0.01	Monoterpenic ketone
Piperitone	0.02	Monoterpenic ketone
Unknown	0.02	Oxygenated monoterpene
Bornyl acetate	0.02	Monoterpenic ester
Perilla alcohol	0.01	Monoterpenic alcohol
Carvacrol	0.01	Monoterpenic alcohol
para-Menth-5-en-1,2-diol isomer III	0.06	Monoterpenic alcohol
Unknown	0.01	Unknown
α-Terpinyl acetate	0.03	Monoterpenic ester
α-Ylangene	0.02	Sesquiterpene
α-Copaene	0.09	Sesquiterpene
β-Bourbonene	0.37	Sesquiterpene
1,5-diepi-β-Bourbonene	0.02	Sesquiterpene
Unknown	0.02	Unknown
Methyleugenol	0.06	Phenylpropanoid
β-Ylangene	0.05	Sesquiterpene
β-Copaene	0.04	Sesquiterpene
trans-α-Bergamotene	0.03	Sesquiterpene
Isogermacrene D	0.03	Sesquiterpene
cis-Muurola-4(15),5-diene	0.02	Sesquiterpene
γ-Muurolene	0.03	Sesquiterpene
Germacrene D	0.07	Sesquiterpene
Unknown	0.08	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.09	Sesquiterpene
Elemicin	0.02	Phenylpropanoid
4,10-diepi-Guaiol	0.01	Sesquiterpenic alcohol
10-epi-γ-Eudesmol	0.03	Sesquiterpenic alcohol
α-Phellandrene dimer II	0.02	Diterpene
Verticilla-4(20),7,11-triene	0.01	Diterpene
Cembrenol	0.01	Diterpenic alcohol

Serratol	0.05	Diterpenic alcohol
Consolidated total	**99.11%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
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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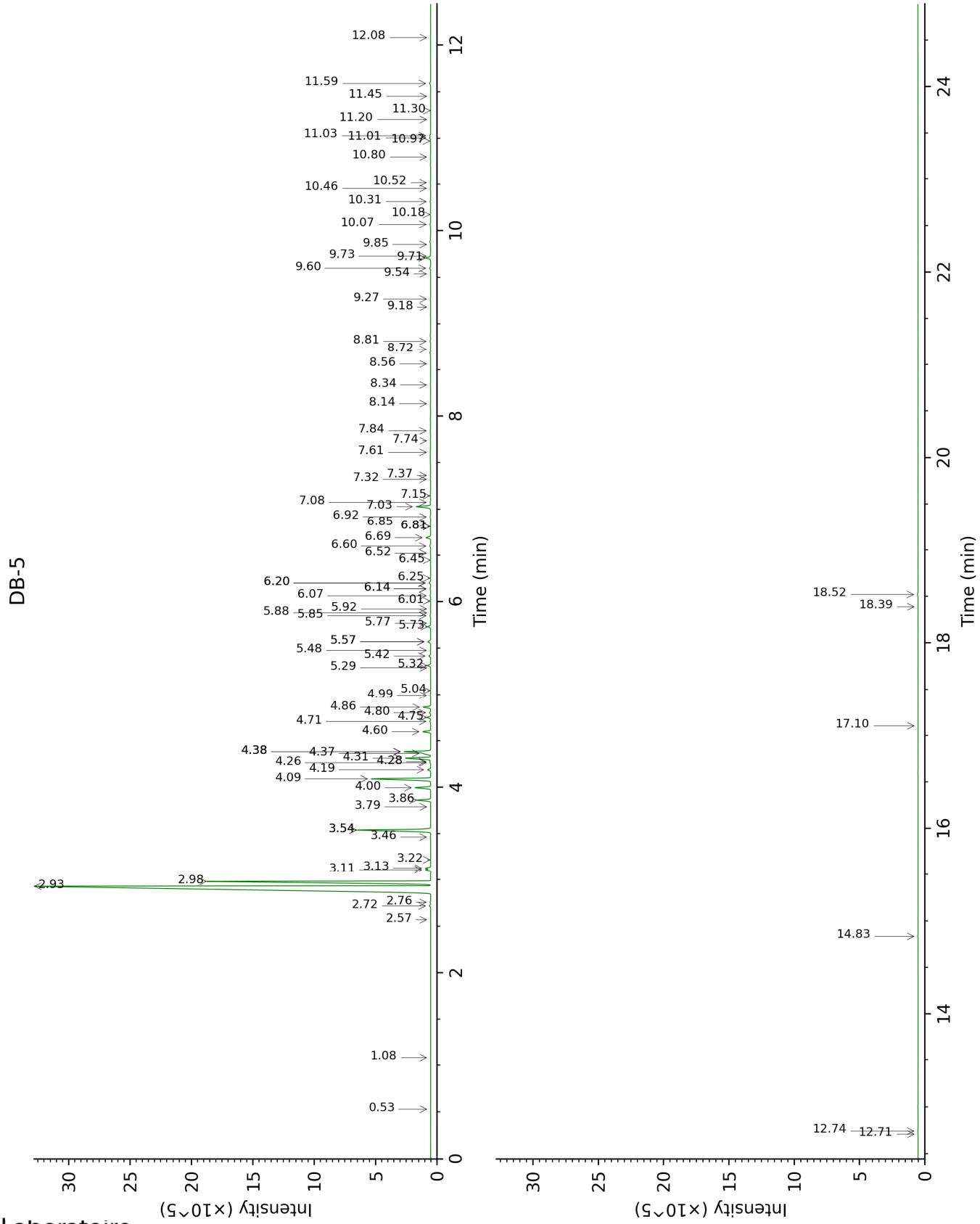
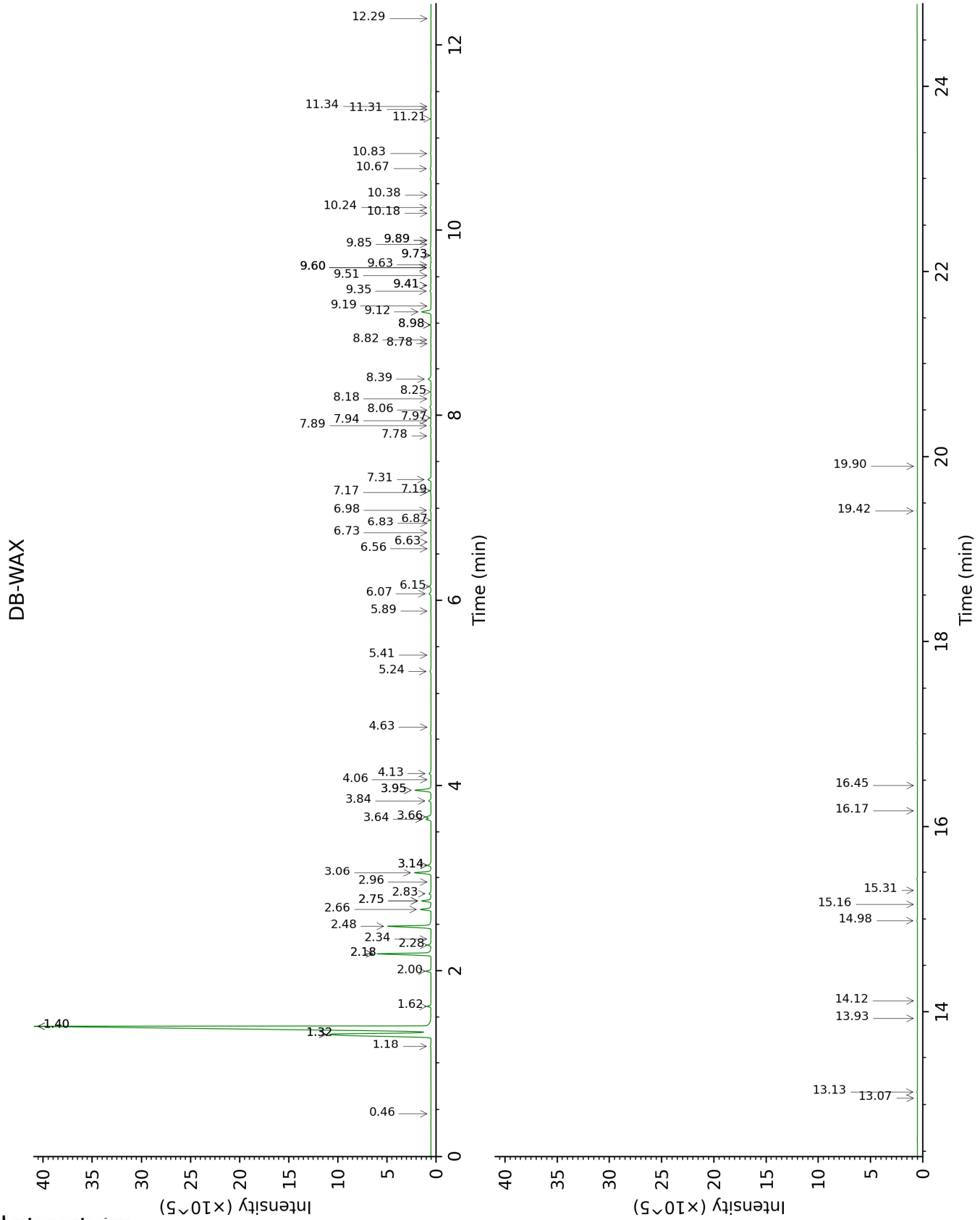

DB-5
12.08
11.59
11.45
11.30
11.20
11.03
11.01
10.97
10.80
10.52
10.46
10.31
10.18
10.07
9.85
9.73
9.71
9.60
9.54
9.27
9.18
8.81
8.72
8.56
8.34
8.14
7.84
7.74
7.61
7.37
7.32
7.15
7.08
7.03
6.92
6.85
6.81
6.69
6.60
6.52
6.45
6.25
6.20
6.14
6.07
6.01
5.92
5.88
5.85
5.77
5.73
5.57
5.48
5.42
5.32
5.29
5.04
4.99
4.86
4.80
4.75
4.71
4.60
4.38
4.37
4.31
4.28
4.26
4.19
4.09
4.00
3.86
3.79
3.54
3.46
3.22
3.13
3.11
2.98
2.93
2.76
2.72
2.57
1.08
0.53
Time (min)
Intensity (×10^5)
18.52
18.39
17.10
14.83
12.74
12.71
Time (min)
Intensity (×10^5)


DB-WAX
Time (min)
Intensity (×10^5)
12.29
11.34
11.31
11.21
10.83
10.67
10.38
10.24
10.18
9.85
9.89
9.73
9.60
9.63
9.51
9.41
9.35
9.19
9.12
8.98
8.82
8.78
8.39
8.25
8.18
8.06
7.89
7.94
7.97
7.78
7.31
7.17
7.19
6.98
6.83
6.87
6.73
6.63
6.56
6.15
6.07
5.89
5.41
5.24
4.63
4.13
4.06
3.95
3.84
3.64
3.66
3.14
3.06
2.96
2.83
2.75
2.66
2.48
2.34
2.28
2.18
2.00
1.62
1.40
1.32
1.18
0.46
19.90
19.42
16.45
16.17
15.31
15.16
14.98
14.12
13.93
13.13
13.07

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
(*E*)-2-Methyl-1,3-pentadiene	0.53	629	tr	0.46	766	tr
Toluene	1.08	758	0.01	1.40*†	1005	[77.39]
Unknown [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20),107 (20), 41 (18), 136 (17), 92 (17)]	2.57	906	0.01			
Hashishene	2.72	916	0.10	1.32*†	995	77.39
Tricyclene	2.76	919	0.05	1.18	972	0.05
α-Thujene	2.93	930	60.94	1.40*†	1005	[77.39]
α-Pinene	2.98	934	16.58	1.32*†	995	[77.39]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.11	942	0.29	2.28	1094	0.28
Camphene	3.13	944	0.29	1.62	1027	0.30
Thuja-2,4(10)-diene	3.22	950	0.01	2.18*	1084	4.78
meta-Cymene	3.46	966	0.02	2.75*	1133	0.85
β-Pinene	3.54*	972	5.25	2.00	1065	0.44
Sabinene	3.54*	972	[5.25]	2.18*	1084	[4.78]
Dehydro-1,8-cineole	3.79	988	0.01	2.96	1150	0.01
Myrcene	3.86	993	0.84	2.75*	1133	[0.85]
α-Phellandrene	4.00	1002	1.00	2.66	1126	0.99
Δ3-Carene	4.09	1008	4.08	2.48	1111	4.06
α-Terpinene	4.19	1014	0.20	2.83	1139	0.20
Carvomenthene	4.26	1019	0.02	2.34	1100	0.03
ortho-Cymene	4.28	1020	0.06	3.95*	1228	1.75
para-Cymene	4.31	1022	1.67	3.95*	1228	[1.75]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.36	1026	0.40	6.07	1379	0.21
β-Phellandrene	4.38*	1027	1.77	3.14*	1165	0.35
1,8-Cineole	4.38*	1027	[1.77]	3.14*	1165	[0.35]
Limonene	4.38*	1027	[1.77]	3.06	1158	1.62
(*Z*)-β-Ocimene	4.60	1040	0.50	3.64	1204	0.45
Unknown [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	4.71	1047	0.06	7.17	1460	0.06
(*E*)-β-Ocimene	4.75	1050	0.24	3.84	1219	0.24
Unknown [m/z 109 , 45 (67), 41 (40), 67 (39), 81 (33), 79	4.80	1053	0.08			

(27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...]						
γ-Terpinene	4.86	1057	0.48	3.66	1206	0.53
cis-Sabinene hydrate	4.99	1066	0.03	6.73	1427	0.03
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.04	1069	0.01	4.63	1279	0.01
Isoterpinolene	5.29	1084	0.01	4.06	1236	0.02
Terpinolene	5.32	1086	0.22	4.13	1241	0.22
α-Pinene oxide	5.42	1092	0.13	5.24	1318	0.13
trans-Sabinene hydrate	5.48	1096	0.03	7.78	1506	0.07
Linalool	5.57*	1102	0.22	7.89	1515	0.07
α-Thujone	5.57*	1102	[0.22]	5.89	1365	0.03
β-Thujone	5.73	1112	0.18	6.15	1384	0.16
Unknown [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)... 154 (1)]	5.77	1115	0.02			
cis-para-Menth-2-en-1-ol	5.85	1120	0.05	7.94	1519	0.03
α-Campholenal	5.88	1122	tr	6.83	1435	0.01
Unknown [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...]	5.92	1125	0.01			
allo-Ocimene	6.01	1130	0.02	5.41	1331	0.02
trans-Pinocarveol	6.06	1134	0.04	8.98*	1600	0.05
trans-Sabinol	6.14*	1138	0.05	9.63	1652	0.05
trans-para-Menth-2-en-1-ol	6.14*	1138	[0.05]	8.78	1584	0.02
trans-Verbenol	6.20*	1142	0.11	9.34	1629	0.11
Epoxyterpinolene	6.20*	1142	[0.11]	6.56	1414	0.01
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.25	1146	0.02	6.63	1420	0.02
Unknown [m/z 109, 43 (75), 137 (46), 67 (31), 93 (25)... 152 (4)]	6.45	1158	0.01			
Borneol	6.52	1163	0.02	9.60*	1650	0.11
cis-Sabinol	6.60	1168	0.08	10.67	1739	0.08
Terpinen-4-ol	6.69	1174	0.34	8.39	1554	0.34
meta-Cymen-8-ol	6.81*	1182	0.02	11.31	1793	0.01
Cryptone	6.81*	1182	[0.02]	8.98*	1600	[0.05]
para-Cymen-8-ol	6.85	1184	0.03	11.34	1796	0.03
α-Terpineol	6.92	1188	0.04	9.60*	1650	[0.11]

Methylchavicol	7.03	1196	1.06	9.12	1611	1.06
cis-α-Phellandrene epoxide (IPP vs Me)	7.08	1199	0.05	10.83	1753	0.05
Verbenone	7.15	1203	0.05	9.41*	1634	0.06
Unknown [m/z 43, 93 (73), 91 (40), 109 (31), 77 (28)...]	7.32	1215	0.02			
trans-Carveol	7.36	1218	0.01	11.21	1784	0.01
Cuminal	7.61	1234	0.01	10.38	1714	0.01
Carvone	7.74	1243	0.01	9.85	1670	0.03
Piperitone	7.84	1250	0.02	9.73*	1660	0.10
Unknown [m/z 109, 41 (22), 81 (14), 43 (11)... 152 (4)]	8.14	1270	0.02			
Bornyl acetate	8.34	1283	0.02	8.06	1528	0.01
Perilla alcohol	8.56	1298	0.01	13.07	1951	0.03
Carvacrol	8.72	1309	0.01	15.16	2153	0.01
para-Menth-5-en-1,2-diol isomer III	8.81	1316	0.06	14.98	2135	0.06
Unknown [m/z 133, 105 (45), 91 (38), 119 (36)... 150 (3)]	9.18	1342	0.01			
α-Terpinyl acetate	9.27	1348	0.03	9.51	1643	0.03
α-Ylangene	9.54	1367	0.02	6.87	1438	0.01
α-Copaene	9.60	1371	0.09	6.98	1446	0.08
β-Bourbonene	9.71	1379	0.37	7.31	1471	0.36
1,5-diepi-β-Bourbonene	9.73	1380	0.02	7.19	1462	0.03
Unknown [m/z 71, 109 (99), 85 (66), 111 (65), 100 (63), 43 (59)...]	9.85	1389	0.02	16.44	2285	0.02
Methyleugenol	10.07	1404	0.06	13.13	1957	0.06
β-Ylangene	10.18	1412	0.05	7.97	1521	0.03
β-Copaene	10.31	1423	0.04	8.18	1537	0.04
trans-α-Bergamotene	10.46	1433	0.03	8.25	1543	0.04
Isogermacrene D	10.52	1438	0.03	8.82	1587	0.04
cis-Muurola-4(15),5-diene	10.80	1459	0.02	9.18	1616	0.02
γ-Muurolene	10.97	1472	0.03	9.41*	1634	[0.06]
Germacrene D	11.00	1474	0.07	9.60*	1650	[0.11]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.03	1476	0.08	9.73*	1660	[0.10]
Bicyclogermacrene	11.20	1489	0.01	9.89*	1674	0.03
α-Muurolene	11.30	1496	0.01	9.89*	1674	[0.03]
γ-Cadinene	11.45	1508	0.02	10.18	1697	0.01

δ-Cadinene	11.59	1519	0.09	10.24	1703	0.09
Elemicin	12.08	1558	0.02	15.31	2168	0.01
4,10-diepi-Guaiol	12.71	1607	0.01	14.12	2051	0.01
10-epi-γ-Eudesmol	12.74	1610	0.03	13.93	2032	0.02
α-Phellandrene dimer II	14.83	1787	0.02	12.29	1880	0.02
Verticilla-4(20),7,11-triene	17.10	1997	0.01	16.17	2257	0.02
Cembrenol	18.39	2125	0.01	19.90	2675	0.01
Serratol	18.52	2139	0.05	19.42	2617	0.05
Total identified		**98.21%**			**98.07%**	
Total reported		**99.26%**			**98.66%**	

*: 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