

Date : 2024-07-30

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24G16-PTH03

Customer Identification : Organic Frankincense Frereana - Somaliland - FE0110R

Type : Essential Oil

Source : *Boswellia frereana*

Customer : Plant Therapy

Checked and approved by:

Alexis St-Gelais, Ph. D., 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

GAS CHROMATOGRAPHIC ANALYSIS

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

***ISO**

Results : See analysis summary (next page)

Analyst : Alexis St-Gelais, Ph. D., Chimiste 2013-174

Date : 2024-07-30

PHYSICOCHEMICAL DATA

Refractive index : 1.4692 ± 0.0003 (20 °C)

Method : PC-MAT-016 - Measure of the refractive index of a liquid.

Analyst : Cindy Caron B. Sc.

Date : 2024-07-17

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
(E)-2-Methyl-1,3-pentadiene	tr	Alkene
3-Methyl-2-butanone	0.01	Aliphatic ketone
Unknown	tr	Unknown
4-Methyl-2-pentanone	tr	Aliphatic ketone
Toluene	0.04	Simple phenolic
Unknown	0.01	Alkene
Unknown	0.03	Alkene
(Z)-Salvene	0.01	Normonoterpene
Unknown	0.01	Unknown
Unknown	0.04	Unknown
Unknown	0.01	Monoterpene
Unknown	0.01	Monoterpene
Hashishene	0.36	Monoterpene
Tricyclene	0.09	Monoterpene
α -Thujene	17.45	Monoterpene
α -Pinene	39.35	Monoterpene
Thujadiene isomer	1.00	Monoterpene
α -Fenchene	tr	Monoterpene
Camphene	0.76	Monoterpene
Thuja-2,4(10)-diene	0.37	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.02	Monoterpene
β -Pinene	2.03	Monoterpene
Sabinene	4.34	Monoterpene
Pseudolimonene isomer	0.02	Monoterpene
6-Methyl-5-hepten-2-one	0.13	Aliphatic ketone
Dehydro-1,8-cineole	0.06	Monoterpenic ether
Myrcene	1.15	Monoterpene
6-Methyl-5-hepten-2-ol	0.02	Aliphatic alcohol
Pseudolimonene	0.02	Monoterpene
Menthatriene isomer I	0.07	Monoterpene
α -Phellandrene	0.99	Monoterpene
<i>ortho</i> -Methylanisole	0.03	Simple phenolic
Δ^3 -Carene	0.07	Monoterpene
Unknown	0.02	Monoterpene
α -Terpinene	0.30	Monoterpene
<i>meta</i> -Cymene	0.08	Monoterpene
<i>para</i> -Cymene	10.74	Monoterpene
Unknown	0.27	Unknown
1,8-Cineole	[2.39]	Monoterpenic ether
β -Phellandrene	[2.39]	Monoterpene

Limonene	2.26	Monoterpene
<i>ortho</i> -Cymene	0.03	Monoterpene
(<i>Z</i>)- β -Ocimene	0.02	Monoterpene
Unknown	0.16	Unknown
γ -Terpinene	0.45	Monoterpene
<i>cis</i> -Sabinene hydrate	0.08	Monoterpenic alcohol
Unknown	0.03	Oxygenated monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Unknown	0.05	Oxygenated monoterpene
Octanol	0.03	Aliphatic alcohol
<i>para</i> -Cymenene	0.12	Monoterpene
Terpinolene	0.12	Monoterpene
α -Pinene oxide	0.03	Monoterpenic ether
<i>trans</i> -Sabinene hydrate	0.05	Monoterpenic alcohol
α -Thujone	0.06	Monoterpenic ketone
Linalool	0.56	Monoterpenic alcohol
Unknown	0.02	Monoterpenic alcohol
Verbenol analog?	0.01	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Unknown	0.14	Oxygenated monoterpene
β -Thujone	0.23	Monoterpenic ketone
Dehydrosabinaketone	0.03	Normonoterpenic ketone
<i>cis-para</i> -Menth-2-en-1-ol	0.09	Monoterpenic alcohol
Myrcenol	0.14	Monoterpenic alcohol
α -Campholenal	0.15	Monoterpenic aldehyde
Unknown	0.14	Unknown
<i>trans</i> -Pinocarveol	0.44	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.04	Monoterpenic alcohol
<i>cis</i> -Verbenol	0.22	Monoterpenic alcohol
<i>trans</i> -Sabinol	0.11	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.63	Monoterpenic alcohol
<i>meta</i> -Mentha-4,6-dien-8-ol	0.15	Monoterpenic alcohol
Sabinaketone	0.06	Normonoterpenic ketone
Unknown	0.05	Oxygenated monoterpene
Pinocarvone	0.20	Monoterpenic ketone
Borneol	0.09	Monoterpenic alcohol
Unknown	0.05	Oxygenated monoterpene
α -Phellandren-8-ol	0.30	Monoterpenic alcohol
<i>cis</i> -Sabinol	0.15	Monoterpenic alcohol
Umbellulone	0.10	Monoterpenic ketone
Terpinen-4-ol	3.19	Monoterpenic alcohol
Thuj-3-en-10-al	0.08	Monoterpenic aldehyde
Cryptone	0.06	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.19	Monoterpenic alcohol
Myrtenal	0.24	Monoterpenic aldehyde

α -Terpineol	0.82	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.03	Monoterpenic alcohol
Myrtenol	0.15	Monoterpenic alcohol
<i>cis</i> - α -Phellandrene epoxide (iPr vs Me)	0.28	Monoterpenic ether
Verbenone	0.37	Monoterpenic ketone
<i>trans</i> -Piperitol	0.10	Monoterpenic alcohol
<i>trans</i> -Carveol	0.14	Monoterpenic alcohol
<i>cis</i> -Carveol	0.04	Monoterpenic alcohol
Citronellol	0.10	Monoterpenic alcohol
Cuminal	0.03	Monoterpenic aldehyde
Carvone	0.13	Monoterpenic ketone
Carvotanacetone	0.06	Monoterpenic ketone
Unknown	0.04	Oxygenated monoterpene
Piperitone	0.09	Monoterpenic ketone
Unknown	0.03	Unknown
3,5-Dimethoxytoluene	0.03	Simple phenolic
Bornyl acetate	0.96	Monoterpenic ester
<i>para</i> -Cymen-7-ol	0.08	Monoterpenic alcohol
Thymol	0.05	Monoterpenic alcohol
<i>para</i> -Menth-5-en-1,2-diol isomer II	0.03	Monoterpenic alcohol
Carvacrol	0.09	Monoterpenic alcohol
<i>exo</i> -2-Hydroxycineole acetate	0.02	Monoterpenic ester
Citronellyl acetate	0.05	Monoterpenic ester
Eugenol	0.02	Phenylpropanoid
Unknown	0.03	Unknown
α -Copaene	0.07	Sesquiterpene
β -Bourbonene	0.19	Sesquiterpene
1,5-diepi- β -Bourbonene	0.02	Sesquiterpene
β -Elemene	0.13	Sesquiterpene
β -Ylangene	0.02	Sesquiterpene
β -Caryophyllene	0.03	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
Isogermacrene D	0.02	Sesquiterpene
α -Humulene	0.02	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
γ -Cadinene	0.02	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.02	Sesquiterpene
Caryophyllene oxide	0.02	Sesquiterpenic ether
α -Phellandrene dimer I	0.04	Diterpene
α -Phellandrene dimer II	0.86	Diterpene
α -Phellandrene dimer III	0.09	Diterpene
α -Phellandrene dimer IV	0.11	Diterpene
Consolidated total	99.16	

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

Note: no correction factor was applied

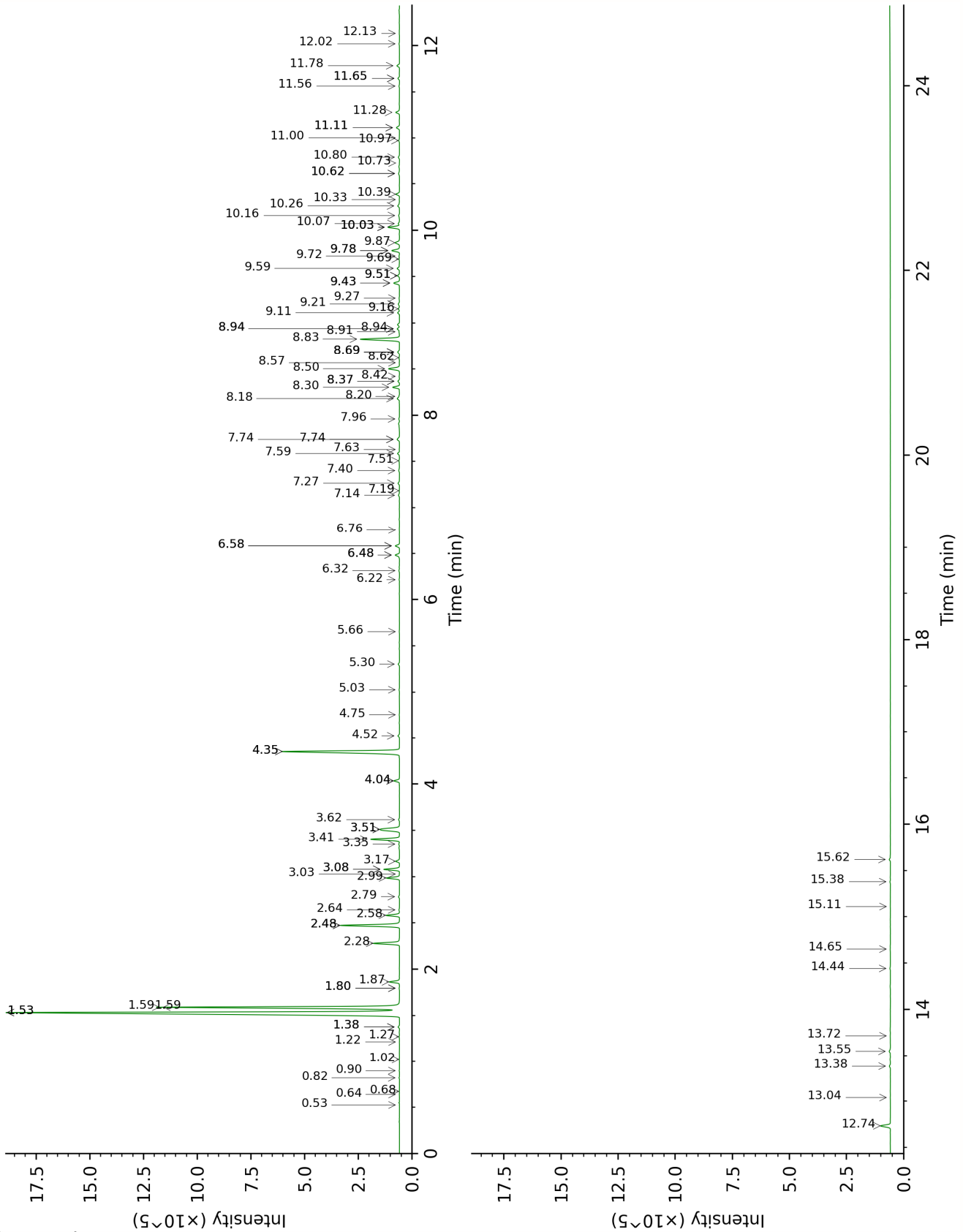
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

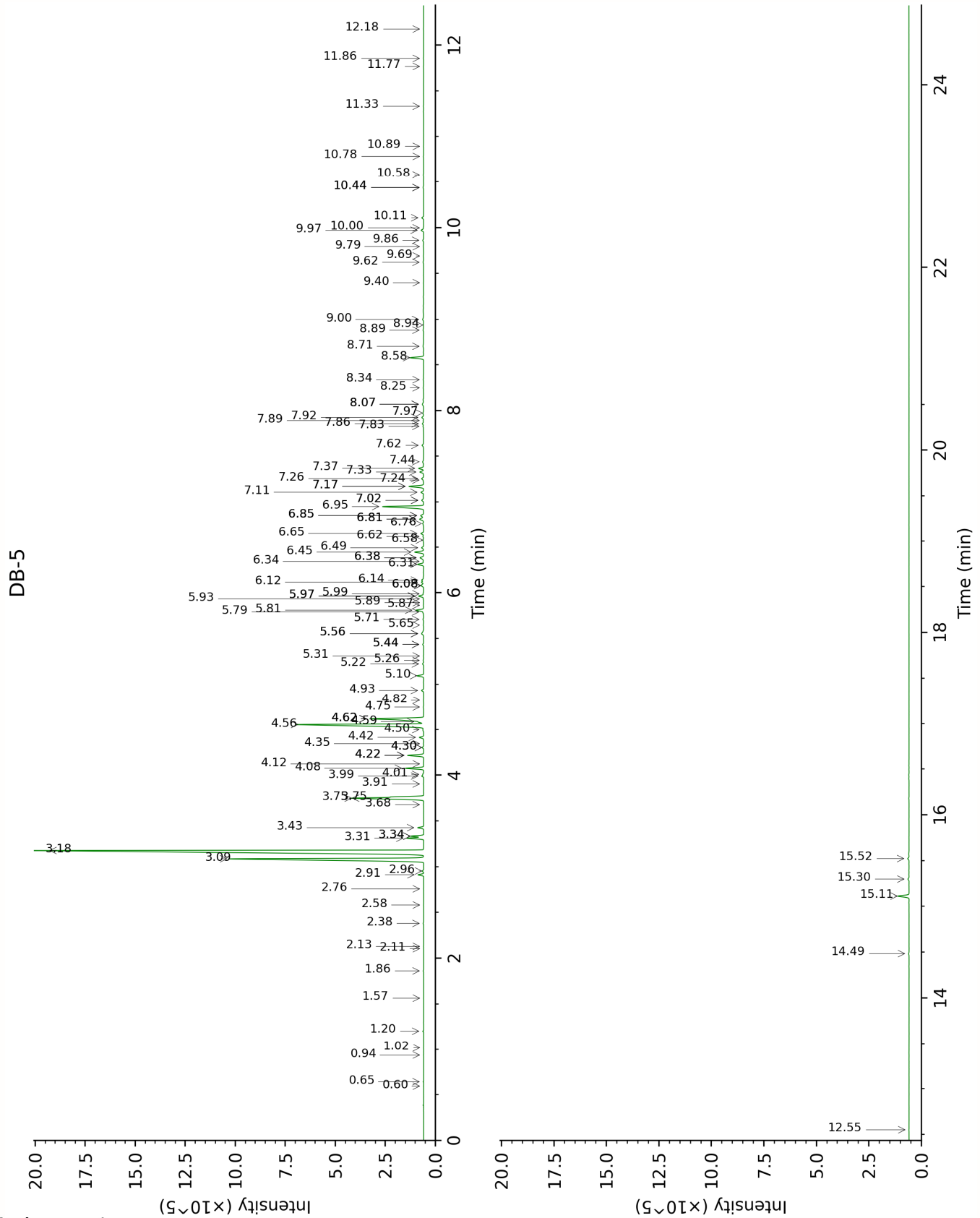
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

This page was intentionally left blank. The following pages present the complete data of the analysis.

DB-WAX





FULL ANALYSIS DATA

(E)-2-Methyl-1,3-pentadiene	Column DB-WAX			Column DB-5		
	0.53	760.5	tr	0.60	629.5	tr
3-Methyl-2-butanone	0.90	899.8	0.02	0.64	646.2	0.01
Unknown BODA I [m/z 93, 91 (70), 77 (48), 108 (42)]	0.64	818.5	tr	0.94	721.6	tr
4-Methyl-2-pentanone	1.38*	973.1	[0.10]	1.02	732.8	tr
Toluene	1.59*	1001.7	[17.69]	1.20	759.0	0.04
Unknown BODA II [m/z 109, 67 (33), 41 (16), 81 (13)... 124 (8)]	0.68	829.8	tr	1.57	807.2	0.01
Unknown BOCA I [m/z 109, 67 (32), 81 (14), 41 (12), 124 (10)]	0.82	879.5	0.02	1.86	831.9	0.03
(Z)-Salvene	1.02	918.4	0.01	2.11	852.0	0.01
Unknown PRME II [m/z 109, 43 (28), 124 (28), 41 (14), 55 (11), 79 (9), 81 (8)...]	1.80*	1021.2	[0.02]	2.13	854.1	0.01
Unknown BOCA II [m/z 79, 78 (45), 91 (28), 77 (28), 41 (13), 80 (12), 107 (11)... 122 (1)]	1.27	957.0	0.03	2.38	874.8	0.04
Unknown BOFR I [m/z 93, 91 (75), 121 (61), 77 (58), 79 (38), 92 (26), 43 (24), 41 (23), 105 (22), 107 (19), 136 (16)]	1.22	948.4	tr	2.58	891.4	0.01
Unknown BOFR II [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20), 107 (20), 41 (18), 136 (17), 92 (17)]				2.76	905.5	0.01
Hashishene	1.53*	996.2	[39.27]	2.91	915.7	0.36
Tricyclene	1.38*	973.1	[0.10]	2.96	918.4	0.09
α -Thujene	1.59*	1001.7	[17.69]	3.09	927.2	17.45
α -Pinene	1.53*	996.2	[39.27]	3.18	933.2	39.35
Thujadiene isomer	2.58	1095.9	0.98	3.31	942.1	1.00
α -Fenchene	1.80*	1021.2	[0.02]	3.34*	943.5	[0.76]
Camphene	1.87	1027.7	0.76	3.34*	943.5	[0.76]

Thuja-2,4(10)-diene	2.48*	1085.8	[4.66]	3.43	949.7	0.37
3,7,7-Trimethylcyclohepta-1,3,5-triene	3.08*	1133.9	[1.15]	3.68	966.3	0.02
β -Pinene	2.28	1067.4	2.03	3.75*	970.9	[6.36]
Sabinene	2.48*	1085.8	[4.66]	3.75*	970.9	[6.36]
Pseudolimonene isomer	2.64	1100.4	0.05	3.91	981.2	0.02
6-Methyl-5-hepten-2-one	5.30	1296.7	0.11	3.99	986.9	0.13
Dehydro-1,8-cineole	3.35	1154.6	0.06	4.01	988.1	0.06
Myrcene	3.08*	1133.9	[1.15]	4.08	992.5	1.15
6-Methyl-5-hepten-2-ol	7.19	1431.9	0.01	4.12	995.6	0.02
Pseudolimonene	3.03	1129.9	0.02	4.22*	1001.8	[1.07]
Menthatriene isomer I	3.62	1174.8	0.07	4.22*	1001.8	[1.07]
α -Phellandrene	2.99	1126.7	0.99	4.22*	1001.8	[1.07]
<i>ortho</i> -Methylanisole	6.22	1361.6	0.03	4.30*	1007.2	[0.10]
Δ 3-Carene	2.79	1111.3	0.07	4.30*	1007.2	[0.10]
Unknown BOSA III [m/z 117, 132 (88), 115 (68), 91 (55), 77 (20)]				4.35	1009.8	0.02
α -Terpinene	3.17	1140.5	0.30	4.42	1014.2	0.30
<i>meta</i> -Cymene	4.35*	1228.7	[10.75]	4.50	1019.5	0.08
<i>para</i> -Cymene	4.35*	1228.7	[10.75]	4.56	1023.0	10.74
Unknown BODA IV [m/z 109, 43 (58), 95 (26)... 137 (15)...]	6.48*	1380.6	[0.38]	4.59	1024.9	0.27
1,8-Cineole	3.51*	1166.8	[2.39]	4.62*	1026.9	[4.71]
β -Phellandrene	3.51*	1166.8	[2.39]	4.62*	1026.9	[4.71]
Limonene	3.41	1158.7	2.26	4.62*	1026.9	[4.71]
<i>ortho</i> -Cymene	4.75	1257.0	0.02	4.75	1034.9	0.03
(<i>Z</i>)- β -Ocimene	4.04*	1206.0	[0.45]	4.82	1039.7	0.02
Unknown BOFR III [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	7.59	1461.6	0.17	4.93	1046.6	0.16
γ -Terpinene	4.04*	1206.0	[0.45]	5.10	1056.7	0.45
<i>cis</i> -Sabinene hydrate	7.14	1428.3	0.09	5.22	1064.8	0.08
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.03	1276.8	0.04	5.26	1067.2	0.03

<i>cis</i> -Linalool oxide (fur.)	6.76	1400.3	0.01	5.31	1070.2	0.02
Unknown BODA VI [m/z 43, 94 (63), 109 (61), 59 (55), 79 (51)...152 (2)]	7.51	1455.7	0.05	5.44*	1078.1	[0.07]
Octanol	8.42	1524.2	0.03	5.44*	1078.1	[0.07]
<i>para</i> -Cymenene	6.58*	1387.7	[0.35]	5.56*	1085.5	[0.24]
Terpinolene	4.52	1240.7	0.12	5.56*	1085.5	[0.24]
α -Pinene oxide	5.66	1321.7	0.03	5.65	1091.4	0.03
<i>trans</i> -Sabinene hydrate	8.20	1507.5	0.03	5.71	1095.2	0.05
α -Thujone	6.32	1368.6	0.05	5.79	1100.3	0.06
Linalool	8.30	1515.2	0.52	5.81	1101.5	0.56
Unknown ORMA I [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	8.69*	1545.0	[0.17]	5.87	1104.9	0.02
Verbenol analog?	8.57	1535.6	0.02	5.89	1106.8	0.01
Unknown BOSE I [m/z 109, 81 (54), 91 (32), 79 (22)...]	6.48*	1380.6	[0.38]	5.94	1109.4	0.02
Unknown BOSE II [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)...154 (1)]				5.97*	1111.4	[0.37]
β -Thujone	6.58*	1387.7	[0.35]	5.97*	1111.4	[0.37]
Dehydrosabinaketone	8.91	1561.8	0.04	5.99	1112.9	0.03
<i>cis-para</i> -Menth-2-en-1-ol	8.37*	1520.2	[0.12]	6.08*	1118.6	[0.24]
Myrcenol	9.11	1577.5	0.14	6.08*	1118.6	[0.24]
α -Campholenal	7.27	1437.9	0.12	6.12	1121.0	0.15
Unknown BOSE III [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...]				6.14	1122.5	0.14
<i>trans</i> -Pinocarveol	9.43*	1602.6	[0.50]	6.31	1133.4	0.44
<i>trans-para</i> -Menth-2-en-1-ol	9.27	1589.6	0.04	6.34	1135.5	0.04
<i>cis</i> -Verbenol	9.51*	1608.9	[0.16]	6.38*	1138.0	[0.33]
<i>trans</i> -Sabinol	10.07	1654.0	0.11	6.38*	1138.0	[0.33]
<i>trans</i> -Verbenol	9.78*	1630.6	[0.67]	6.45	1142.0	0.63
<i>meta</i> -Mentha-4,6-dien-8-ol	9.59	1615.2	0.21	6.49	1145.0	0.15

Sabinaketon	8.94*	1564.2	[0.20]	6.58	1150.3	0.06
Unknown BOCA III [m/z 97, 81 (96), 109 (80), 43 (53), 53 (40), 41 (36), 56 (29), 95 (25)... 152 (1)]	7.74*	1472.7	[0.24]	6.62	1152.9	0.05
Pinocarvone	8.18	1505.7	0.21	6.65	1154.9	0.20
Borneol	10.03*	1650.8	[0.93]	6.76	1162.1	0.09
Unknown CALU III [m/z 95, 110 (43), 81 (28), 41 (15)... 152 (8)]	7.96	1489.0	0.05	6.81*	1165.4	[0.37]
α -Phellandren-8-ol	10.39	1679.4	0.30	6.81*	1165.4	[0.37]
<i>cis</i> -Sabinol	11.11*	1740.0	[0.28]	6.85*	1167.9	[0.25]
Umbellulone	9.16	1580.7	0.10	6.85*	1167.9	[0.25]
Terpinen-4-ol	8.83	1555.7	3.28	6.95	1174.2	3.19
Thuj-3-en-10-al	8.94*	1564.2	[0.20]	7.02*	1178.5	[0.14]
Cryptone	9.43*	1602.6	[0.50]	7.02*	1178.5	[0.14]
<i>para</i> -Cymen-8-ol	11.78	1796.6	0.21	7.11	1184.2	0.19
Myrtenal	8.94*	1564.2	[0.20]	7.17*	1188.2	[1.06]
α -Terpineol	10.03*	1650.8	[0.93]	7.17*	1188.2	[1.06]
<i>cis</i> -Piperitol	9.78*	1630.6	[0.67]	7.24	1192.6	0.03
Myrtenol	11.11*	1740.0	[0.28]	7.26	1193.6	0.15
<i>cis</i> - α -Phellandrene epoxide (iPr vs Me)	11.28	1753.9	0.32	7.33	1198.2	0.28
Verbenone	9.87	1637.5	0.42	7.37	1200.8	0.37
<i>trans</i> -Piperitol	10.62*	1698.3	[0.11]	7.44	1205.5	0.10
<i>trans</i> -Carveol	11.65*	1784.8	[0.13]	7.62	1217.5	0.14
<i>cis</i> -Carveol	12.02	1817.4	0.04	7.83	1231.4	0.04
Citronellol	10.98	1728.2	0.06	7.86	1233.3	0.10
Cuminal	10.80	1713.2	0.10	7.89	1235.6	0.03
Carvone	10.26	1669.3	0.18	7.92	1237.8	0.13
Carvotanacetone	9.72	1625.9	0.04	7.97	1241.0	0.06
Unknown BODA V [m/z 109, 119 (84), 91 (81), 134 (55)... 137 (27)...]	11.56	1777.8	0.04	8.07*	1247.4	[0.13]
Piperitone	10.16	1660.9	0.09	8.07*	1247.4	[0.13]
Unknown CIGL III [m/z 43, 97 (78), 41 (45), 55 (35), 69 (28), 107 (24), 83 (23)...]	13.72	1970.0	0.01	8.25	1259.5	0.03
3,5- Dimethoxytoluene	11.65*	1784.8	[0.13]	8.34	1265.4	0.03
Bornyl acetate	8.50	1530.6	0.98	8.58	1281.4	0.96
<i>para</i> -Cymen-7-ol	14.44	2038.9	0.05	8.71	1290.2	0.08

Thymol	15.38	2130.2	0.04	8.89	1302.0	0.05
<i>para</i> -Menth-5-en-1,2-diol isomer II	14.65	2059.0	0.03	8.94	1305.9	0.03
Carvacrol	15.62	2154.1	0.10	9.00	1310.1	0.09
<i>exo</i> -2-Hydroxycineole acetate	10.33	1674.8	0.02	9.40	1338.3	0.02
Citronellyl acetate	9.69	1623.3	0.04	9.62	1353.9	0.05
Eugenol	15.11	2103.6	0.02	9.69	1358.8	0.02
Unknown CAO V XXIX [m/z 109, 43 (79), 123 (62), 95 (46), 67 (37), 55 (25)...]				9.80	1366.0	0.03
α -Copaene	7.40	1447.9	0.08	9.86	1370.8	0.07
β -Bourbonene	7.74*	1472.7	[0.24]	9.97	1378.5	0.19
1,5-diepi- β -Bourbonene	7.63	1464.7	0.02	10.00	1380.3	0.02
β -Elemene	8.69*	1545.0	[0.17]	10.11	1388.0	0.13
β -Ylangene	8.37*	1520.2	[0.12]	10.44*	1411.7	[0.05]
β -Caryophyllene	8.69*	1545.0	[0.17]	10.44*	1411.7	[0.05]
β -Copaene	8.62	1539.7	0.05	10.58	1422.4	0.03
Isogermacrene D	9.21	1584.8	0.11	10.78	1437.5	0.02
α -Humulene	9.51*	1608.9	[0.16]	10.89	1445.6	0.02
Germacrene D	10.03*	1650.8	[0.93]	11.33	1478.2	0.02
γ -Cadinene	10.62*	1698.3	[0.11]	11.77	1511.0	0.02
δ -Cadinene	10.73	1707.8	0.01	11.86	1517.9	0.02
(<i>E</i>)- α -Bisabolene	11.00	1730.6	0.01	12.18	1543.0	0.02
Caryophyllene oxide	13.04	1908.1	0.01	12.55	1572.5	0.02
α -Phellandrene dimer I	12.13	1827.3	0.02	14.49	1731.8	0.04
α -Phellandrene dimer II	12.74	1880.4	0.86	15.11	1786.2	0.86
α -Phellandrene dimer III	13.38	1939.3	0.09	15.30	1802.4	0.09
α -Phellandrene dimer IV	13.55	1954.6	0.12	15.52	1822.7	0.11
Total reported		98.53%			99.22%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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