

Date : 2023-07-11

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23G04-PTH01

Customer Identification : Frankincense Frereana ORGANIC - Somaliland - FE0107R

Type : Essential Oil

Source : *Boswellia frereana*

Customer : Plant Therapy

Checked and approved by:

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

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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 : Amélie Simard, Analyste

Date : 2023-07-11

PHYSICOCHEMICAL DATA

Physical aspect : Faintly yellow liquid

Analyst : Cindy Caron B. Sc.

Date : 2023-07-05

Refractive index : 1.4665 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-07-05

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
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
3-Methyl-2-butanone	0.01	Aliphatic ketone
Unknown	tr	Unknown
4-Methyl-2-pentanone	tr	Aliphatic ketone
Toluene	0.03	Simple phenolic
Hexadiene isomer?	0.01	Alkene
Unknown	tr	Alkene
Unknown	0.02	Alkene
(Z)-Salvene	0.01	Normonoterpene
Unknown	0.01	Unknown
Unknown	0.03	Unknown
Unknown	0.01	Monoterpene
Unknown	0.02	Unknown
Hashishene	0.34	Monoterpene
Tricyclene	0.08	Monoterpene
α -Thujene	26.55	Monoterpene
α -Pinene	35.27	Monoterpene
Thujadiene isomer	0.91	Monoterpene
Camphene	0.62	Monoterpene
Thuja-2,4(10)-diene	0.23	Monoterpene
Unknown	0.01	Monoterpene
β -Pinene	1.95	Monoterpene
Sabinene	5.79	Monoterpene
Pseudolimonene isomer	0.03	Monoterpene
<i>cis</i> -Carane	0.06	Monoterpene
Dehydro-1,8-cineole	0.03	Monoterpenic ether
6-Methyl-5-hepten-2-one	0.05	Aliphatic ketone
Myrcene	1.29	Monoterpene
6-Methyl-5-hepten-2-ol	0.04	Aliphatic alcohol
α -Phellandrene	2.58	Monoterpene
Pseudolimonene	0.02	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Δ^3 -Carene	0.01	Monoterpene
Unknown	0.05	Monoterpene
Unknown	0.02	Monoterpene
α -Terpinene	0.30	Monoterpene
Carvomenthene	tr	Aliphatic alcohol
<i>meta</i> -Cymene	0.56	Monoterpene
<i>para</i> -Cymene	5.31	Monoterpene
Unknown	0.41	Unknown

Limonene	1.27	Monoterpene
1,8-Cineole	[2.00]	Monoterpenic ether
β -Phellandrene	[2.00]	Monoterpene
<i>ortho</i> -Cymene	0.03	Monoterpene
(Z)- β -Ocimene	0.05	Monoterpene
Unknown	0.01	Unknown
Unknown	0.18	Unknown
(E)- β -Ocimene	0.04	Monoterpene
Unknown	0.02	Unknown
γ -Terpinene	0.50	Monoterpene
<i>cis</i> -Sabinene hydrate	0.12	Monoterpenic alcohol
Unknown	0.03	Oxygenated monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.06	Oxygenated monoterpene
Isoterpinolene	0.03	Monoterpene
<i>para</i> -Cymenene	0.08	Monoterpene
Terpinolene	0.16	Monoterpene
α -Pinene oxide	0.04	Monoterpenic ether
<i>trans</i> -Sabinene hydrate	0.08	Monoterpenic alcohol
Linalool	0.37	Monoterpenic alcohol
α -Thujone	0.01	Monoterpenic ketone
Unknown	0.02	Monoterpenic alcohol
Verbenol analog?	0.02	Monoterpenic alcohol
Unknown	0.13	Oxygenated monoterpene
β -Thujone	0.21	Monoterpenic ketone
Unknown	0.05	Oxygenated monoterpene
<i>cis-para</i> -Menth-2-en-1-ol	0.09	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.09	Monoterpenic alcohol
α -Campholenal	0.07	Monoterpenic aldehyde
Unknown	0.13	Unknown
Unknown	0.02	Unknown
<i>trans</i> -Pinocarveol	0.30	Monoterpenic alcohol
Camphor	0.03	Monoterpenic ketone
<i>cis</i> -Verbenol	0.26	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.42	Monoterpenic alcohol
<i>meta</i> -Mentha-4,6-dien-8-ol	0.11	Monoterpenic alcohol
Sabinaketone	0.05	Normonoterpenic ketone
Unknown	0.04	Oxygenated monoterpene
Pinocarpone	0.08	Monoterpenic ketone
Unknown	0.09	Oxygenated monoterpene
α -Phellandren-8-ol	0.15	Monoterpenic alcohol
<i>cis</i> -Sabinol	0.06	Monoterpenic alcohol
Umbellulone	0.23	Monoterpenic ketone
Terpinen-4-ol	4.05	Monoterpenic alcohol

Cryptone	0.11	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.15	Monoterpenic alcohol
α -Terpineol	0.91	Monoterpenic alcohol
Myrtenal	0.05	Monoterpenic aldehyde
Myrtenol	0.15	Monoterpenic alcohol
<i>cis</i> -Piperitol	tr	Monoterpenic alcohol
<i>cis</i> - α -Phellandrene epoxide (iPr vs Me)	0.19	Monoterpenic ether
Verbenone	0.24	Monoterpenic ketone
<i>trans</i> -Piperitol	0.08	Monoterpenic alcohol
<i>trans</i> -Carveol	0.10	Monoterpenic alcohol
<i>cis</i> -Carveol	0.03	Monoterpenic alcohol
Citronellol	0.04	Monoterpenic alcohol
Cuminal	0.05	Monoterpenic aldehyde
Carvone	0.03	Monoterpenic ketone
Carvotanacetone	0.05	Monoterpenic ketone
Piperitone	0.01	Monoterpenic ketone
Unknown	0.01	Unknown
Unknown	0.02	Oxygenated monoterpene
Unknown	0.05	Unknown
Unknown	0.04	Unknown
Unknown	0.03	Unknown
Bornyl acetate	0.62	Monoterpenic ester
Cuminol	0.06	Monoterpenic alcohol
<i>cis-para</i> -Mentha-2,8-diene-1-hydroperoxide?	0.02	Monoterpenic peroxide
Thymol	0.05	Monoterpenic alcohol
Carvacrol	0.04	Monoterpenic alcohol
<i>exo</i> -2-Hydroxycineole acetate	0.03	Monoterpenic ester
α -Cubebene	0.02	Sesquiterpene
Citronellyl acetate	0.04	Monoterpenic ester
α -Copaene	0.05	Sesquiterpene
β -Bourbonene	0.10	Sesquiterpene
β -Elemene	0.08	Sesquiterpene
β -Caryophyllene	0.03	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
Isogermacrene D	0.02	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
β -Selinene	0.01	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
Caryophyllene oxide	0.01	Sesquiterpenic ether
Viridiflorol	0.01	Sesquiterpenic alcohol
β -Eudesmol	0.01	Sesquiterpenic alcohol
α -Phellandrene dimer I	0.02	Diterpene
α -Phellandrene dimer II	0.31	Diterpene
α -Phellandrene dimer III	0.05	Diterpene
α -Phellandrene dimer IV	0.05	Diterpene

Consolidated total	98.54
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tr: The compound has been detected below 0.005% of the total signal

Note: no correction factor was applied

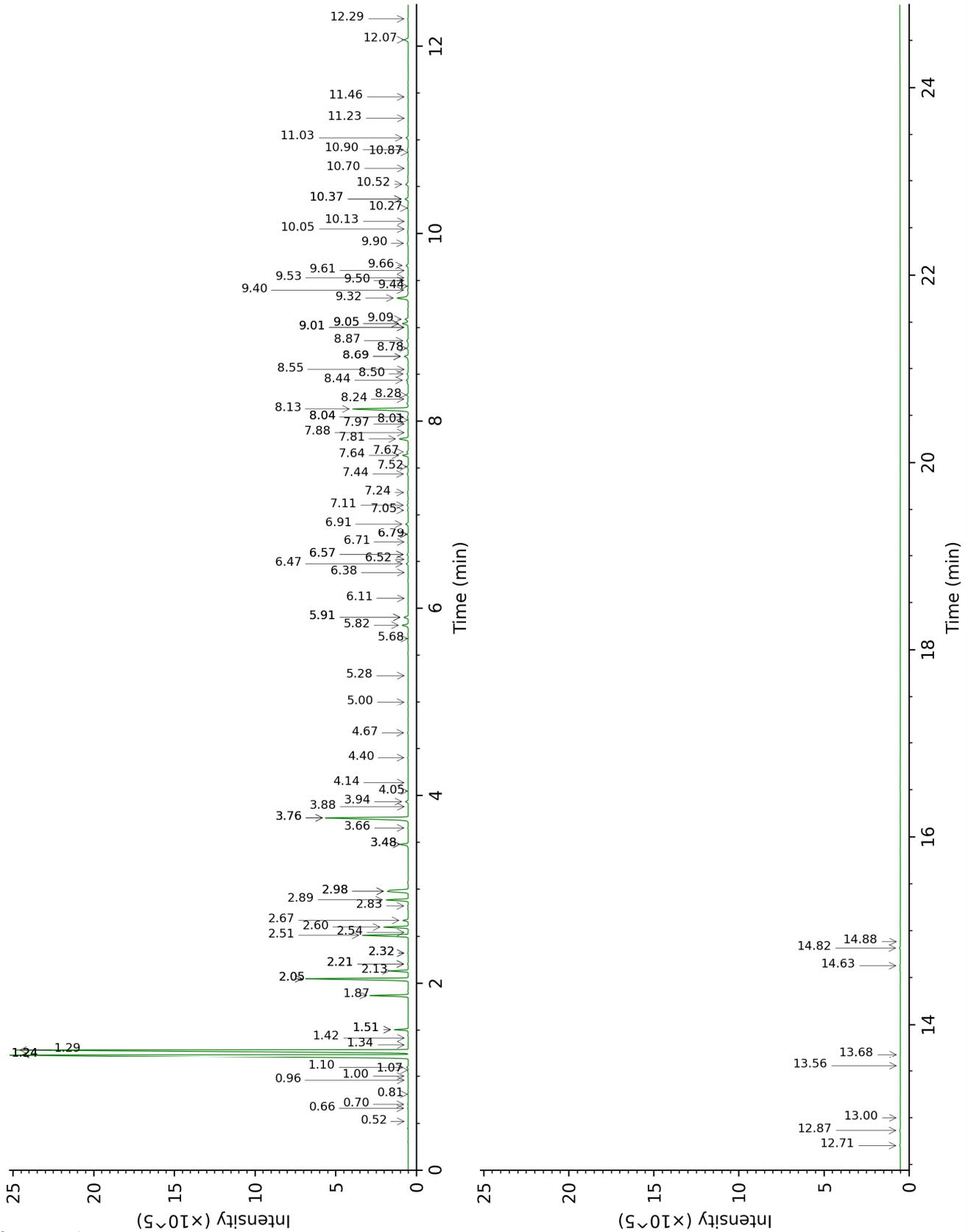
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

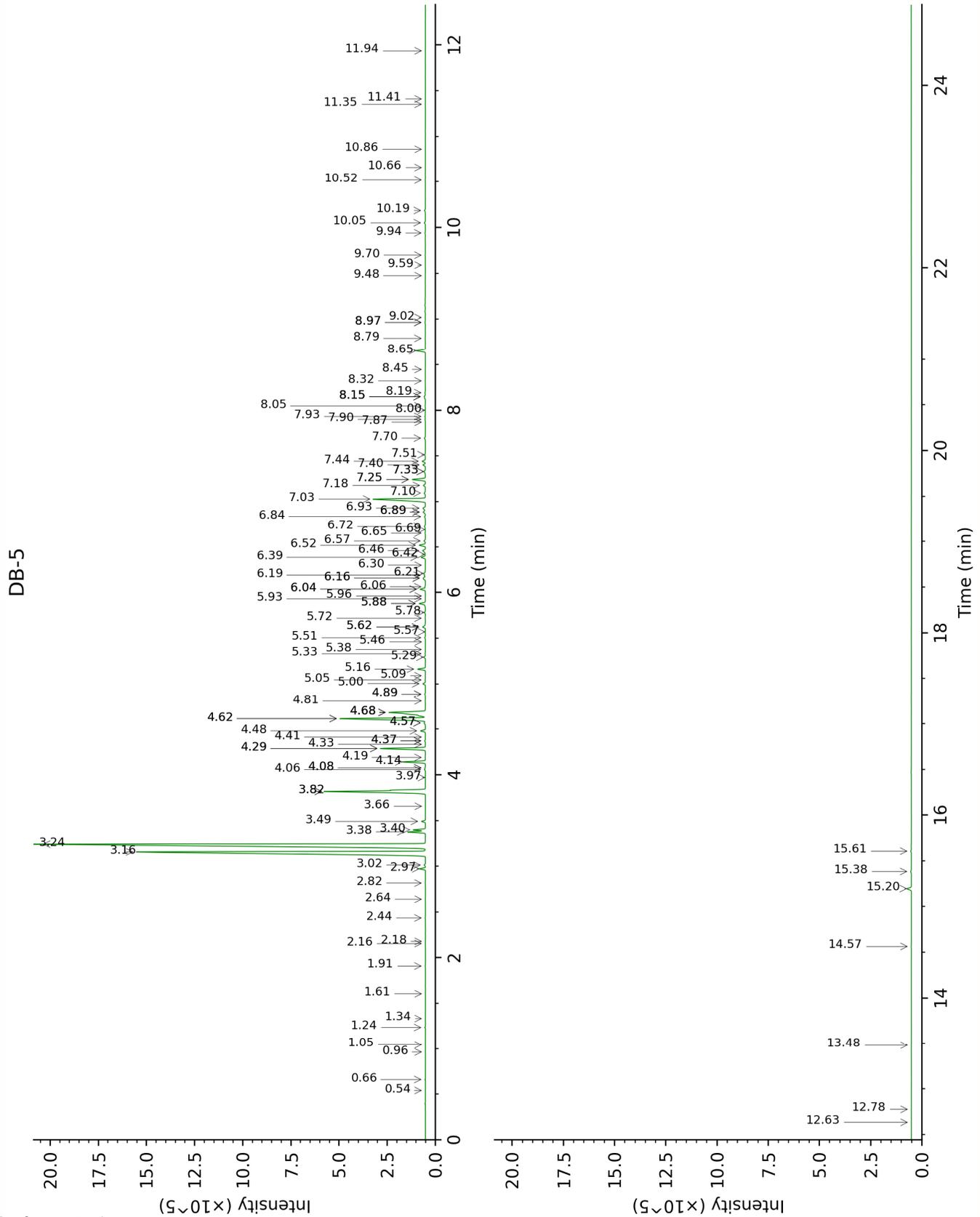
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

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

2-Methyl-3-buten-2-ol	Column DB-WAX			Column DB-5		
	1.34	1011.5	0.01	0.54	605.7	tr
3-Methyl-2-butanone	0.70	899.0	0.02	0.66	645.5	0.01
Unknown BODA I [m/z 93, 91 (70), 77 (48), 108 (42)]				0.96	721.5	tr
4-Methyl-2-pentanone	1.07	967.5	0.01	1.05	732.6	tr
Toluene	1.24*	996.6	[35.72]	1.24	758.7	0.03
Hexadiene isomer?				1.34	772.0	0.01
Unknown BODA II [m/z 109, 67 (33), 41 (16), 81 (13)... 124 (8)]	0.52	828.6	tr	1.61	807.2	tr
Unknown BOCA I [m/z 109, 67 (32), 81 (14), 41 (12), 124 (10)]	0.66	882.7	0.02	1.91	832.0	0.02
(Z)-Salvene	0.81	923.2	0.01	2.16	852.1	0.01
Unknown PRME II [m/z 109, 43 (28), 124 (28), 41 (14), 55 (11), 79 (9), 81 (8)...]	1.42	1019.0	tr	2.18	854.1	0.01
Unknown BOCA II [m/z 79, 78 (45), 91 (28), 77 (28), 41 (13), 80 (12), 107 (11)... 122 (1)]	1.00	956.3	0.02	2.44	875.0	0.03
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)]	0.96	948.8	0.01	2.64	891.7	0.01
Unknown BOFR II [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20), 107				2.82	905.8	0.02

(20), 41 (18), 136 (17), 92 (17)]						
Hashishene	1.24*	996.6	[35.72]	2.97	916.1	0.34
Tricyclene	1.10	972.6	0.08	3.02	918.8	0.08
α -Thujene	1.29	1005.9	26.78	3.16	928.2	26.55
α -Pinene	1.24*	996.6	[35.72]	3.24	933.8	35.27
Thujadiene isomer	2.13	1092.6	0.91	3.38*†	942.6	[0.91]
Camphene	1.51*	1028.0	[0.62]	3.40*†	944.1	[0.62]
Thuja-2,4(10)- diene	2.05*	1083.9	[6.03]	3.49	950.2	0.23
Unknown ZIOF V [m/z 91, 119 (60), 77 (36), 92 (31), 93 (31)... 134 (23)]	2.32*	1110.9	[0.02]	3.66	961.0	0.01
β -Pinene	1.87	1065.4	1.95	3.82*	971.7	[7.73]
Sabinene	2.05*	1083.9	[6.03]	3.82*	971.7	[7.73]
Pseudolimonene isomer	2.21*	1100.3	[0.04]	3.97	981.6	0.03
<i>cis</i> -Carane	1.51*	1028.0	[0.62]	4.06	987.3	0.06
Dehydro-1,8- cineole	2.82	1151.7	0.03	4.08*	988.6	[0.04]
6-Methyl-5- hepten-2-one	4.67	1297.5	0.05	4.08*	988.6	[0.04]
Myrcene	2.60	1133.4	1.29	4.14	992.9	1.29
6-Methyl-5- hepten-2-ol	6.52	1428.7	0.02	4.19	996.0	0.04
α -Phellandrene	2.51	1126.2	2.58	4.29*	1002.5	[2.61]
Pseudolimonene	2.54	1128.7	0.02	4.29*	1002.5	[2.61]
Octanal	4.05	1249.4	0.02	4.33	1005.4	0.01
Δ 3-Carene	2.32*	1110.9	[0.02]	4.37*	1007.8	[0.06]
Unknown BOFR V [m/z 119, 91 (86), 41 (24), 79 (19), 77 (19), 134 (16)]				4.37*	1007.8	[0.06]
Unknown BOSA III [m/z 117, 132 (88), 115 (68), 91 (55), 77 (20)]				4.41	1010.4	0.02
α -Terpinene	2.67	1139.1	0.30	4.48	1014.6	0.30
Carvomenthene	2.21*	1100.3	[0.04]	4.57*	1020.1	[0.11]
<i>meta</i> -Cymene	3.76*	1227.5	[5.87]	4.57*	1020.1	[0.11]
<i>para</i> -Cymene	3.76*	1227.5	[5.87]	4.62*	1023.0	[5.72]

Unknown BODA IV [m/z 109, 43 (58), 95 (26)... 137 (15)...]	5.82	1376.9	0.41	4.62*	1023.0	[5.72]
Limonene	2.89	1157.0	1.27	4.68*	1027.3	[3.66]
1,8-Cineole	2.98*	1164.5	[2.00]	4.68*	1027.3	[3.66]
β-Phellandrene	2.98*	1164.5	[2.00]	4.68*	1027.3	[3.66]
ortho-Cymene	4.14	1256.3	0.02	4.81	1035.2	0.03
(Z)-β-Ocimene	3.48*	1205.8	[0.52]	4.89*	1040.1	[0.06]
Unknown ARAN I [m/z 43, 55 (65), 41 (34), 67 (32), 107 (30), 122 (26)... 125 (10)]	5.28	1337.7	0.01	4.89*	1040.1	[0.06]
Unknown BOFR III [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	6.90	1457.4	0.17	5.00	1047.3	0.18
(E)-β-Ocimene	3.66	1219.3	0.03	5.05	1049.9	0.04
Unknown BOFR IV [m/z 109, 45 (67), 41 (40), 67 (39), 81 (33), 79 (27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...]	6.57*	1432.5	[0.08]	5.09	1052.8	0.02
γ-Terpinene	3.48*	1205.8	[0.52]	5.16	1057.3	0.50
cis-Sabinene hydrate	6.48	1425.1	0.13	5.30	1065.5	0.12
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	4.40	1276.9	0.04	5.33	1067.9	0.03
cis-Linalool oxide (fur.)	6.11	1397.7	0.01	5.38	1070.7	0.03
Unknown BOFR VI [m/z 85, 43 (48), 57 (45), 70 (29), 41 (28), 103 (23), 60 (19)...]				5.46	1075.9	0.01
Unknown BODA	6.79*	1448.7	[0.06]	5.51	1078.8	0.06

VI [m/z 43, 94 (63), 109 (61), 59 (55), 79 (51)...152 (2)]						
Isoterpinolene	3.88	1236.6	0.01	5.57	1082.7	0.03
<i>para</i> -Cymenene	5.90*	1383.0	[0.29]	5.62*	1086.1	[0.24]
Terpinolene	3.94	1240.8	0.16	5.62*	1086.1	[0.24]
α -Pinene oxide	5.00	1317.0	0.04	5.72	1092.1	0.04
<i>trans</i> -Sabinene hydrate	7.52	1503.4	0.07	5.78	1096.0	0.08
Linalool	7.64	1512.7	0.37	5.88*	1102.1	[0.46]
α -Thujone	5.68	1366.5	0.01	5.88*	1102.1	[0.46]
Unknown ORMA I [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	8.01	1542.3	0.02	5.93	1105.4	0.02
Verbenol analog?	7.88	1531.8	0.02	5.96	1107.3	0.02
Unknown BOSE I [m/z 109, 81 (54), 91 (32), 79 (22)...]				6.04*	1112.1	[0.35]
β -Thujone	5.90*	1383.0	[0.29]	6.04*	1112.1	[0.35]
Unknown BOSE II [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)... 154 (1)]				6.06	1113.7	0.05
<i>cis-para</i> -Menth-2-en-1-ol	7.67	1515.6	0.09	6.16*	1119.7	[0.23]
<i>trans-para</i> -Mentha-2,8-dien-1-ol	8.50	1580.8	0.09	6.16*	1119.7	[0.23]
α -Campholenal	6.57*	1432.5	[0.08]	6.19	1121.7	0.07
Unknown BOSE III [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...]				6.21	1123.0	0.13
Unknown BONE I [m/z 95, 43 (41), 110 (36), 41 (19), 67 (18)... 150 (tr)]				6.30	1128.7	0.02
<i>trans</i> -	8.69*	1595.6	[0.29]	6.39	1134.3	0.30

Pinocarveol						
Camphor	6.79*	1448.7	[0.06]	6.42	1136.3	0.03
<i>cis</i> -Verbenol	8.78	1602.9	0.10	6.46	1138.9	0.26
<i>trans</i> -Verbenol	9.05*	1624.2	[0.42]	6.52	1142.7	0.42
<i>meta</i> -Mentha-4,6-dien-8-ol	8.86	1609.3	0.13	6.57	1145.7	0.11
Sabinaketone	8.28	1563.3	0.12	6.65	1151.2	0.05
Unknown BOCA III [m/z 97, 81 (96), 109 (80), 43 (53), 53 (40), 41 (36), 56 (29), 95 (25)... 152 (1)]	7.05	1468.5	0.05	6.69	1153.6	0.04
Pinocarvone	7.44	1497.6	0.09	6.72	1155.7	0.08
Unknown CALU II [m/z 95, 110 (38), 81 (21), 79 (16)... 152 (7)]	7.24	1482.7	0.07	6.84	1163.0	0.09
α -Phellandren-8-ol	9.66	1675.0	0.15	6.89*	1166.2	[0.21]
<i>cis</i> -Sabinol	10.37*	1734.2	[0.23]	6.89*	1166.2	[0.21]
Umbellulone	8.44	1575.6	0.14	6.93	1168.9	0.23
Terpinen-4-ol	8.13	1551.6	4.17	7.03	1175.2	4.05
Cryptone	8.69*	1595.6	[0.29]	7.10	1179.4	0.11
<i>para</i> -Cymen-8-ol	11.03	1791.0	0.16	7.18	1184.8	0.15
α -Terpineol	9.32	1646.6	0.91	7.24*	1188.9	[0.86]
Myrtenal	8.24	1559.8	0.05	7.24*	1188.9	[0.86]
Myrtenol	10.37*	1734.2	[0.23]	7.33*	1194.4	[0.16]
<i>cis</i> -Piperitol	9.05*	1624.2	[0.42]	7.33*	1194.4	[0.16]
<i>cis</i> - α -Phellandrene epoxide (iPr vs Me)	10.52	1747.6	0.20	7.40	1199.0	0.19
Verbenone	9.09	1628.0	0.25	7.44	1201.6	0.24
<i>trans</i> -Piperitol	9.90	1694.4	0.09	7.52	1206.1	0.08
<i>trans</i> -Carveol	10.90	1780.0	0.08	7.70	1218.3	0.10
<i>cis</i> -Carveol	11.23	1808.9	0.01	7.87	1229.9	0.03
Citronellol	10.27	1725.9	0.06	7.90	1231.9	0.04
Cuminal	10.13	1713.8	0.02	7.93	1234.1	0.05
Carvone	9.53	1664.2	0.03	8.00	1238.6	0.03
Carvotanacetone	9.01*	1620.9	[0.04]	8.05	1241.8	0.05
Piperitone	9.44	1656.9	0.01	8.15*	1248.5	[0.15]
Unknown CALU IV [m/z 43, 97 (69), 107 (46), 41	10.70	1762.9	0.01	8.15*	1248.5	[0.15]

(28), 55 (21), 109 (20)...						
Unknown BODA V [m/z 109, 119 (84), 91 (81), 134 (55)... 137 (27)...	10.87	1777.6	0.02	8.15*	1248.5	[0.15]
Unknown PLOR IV [m/z 43, 82 (79), 109 (69), 110 (65), 95 (38), 41 (36)...				8.19	1251.4	0.05
Unknown CIGL III [m/z 43, 97 (78), 41 (45), 55 (35), 69 (28), 107 (24), 83 (23)...	13.00	1971.0	0.03	8.32	1260.1	0.04
Unknown PECR X [m/z 109, 43 (83), 95 (70), 110 (70), 99 (53), 119 (48)...				8.45	1268.4	0.03
Bornyl acetate	7.81	1526.5	0.63	8.66	1282.3	0.62
Cuminol	13.68	2036.3	0.01	8.79	1291.5	0.06
<i>cis-para</i> -Mentha-2,8-diene-1-hydroperoxide?				8.97*	1303.1	[0.06]
Thymol	14.63	2130.2	0.05	8.97*	1303.1	[0.06]
Carvacrol	14.82	2149.6	0.07	9.02	1306.8	0.04
exo-2-Hydroxycineole acetate	9.61	1670.5	0.02	9.48	1338.9	0.03
α -Cubebene	6.38	1418.1	0.01	9.59	1347.0	0.02
Citronellyl acetate	9.01*	1620.9	[0.04]	9.70	1354.6	0.04
α -Copaene	6.71	1442.6	0.03	9.94	1371.7	0.05
β -Bourbonene	7.11	1472.6	0.08	10.05	1379.5	0.10
β -Elemene	8.04*	1544.7	[0.08]	10.19	1388.9	0.08
β -Caryophyllene	8.04*	1544.7	[0.08]	10.52	1412.8	0.03
β -Copaene	7.97	1539.0	0.01	10.66	1423.3	0.02
Isogermacrene D	8.55	1584.6	0.01	10.86	1438.3	0.02
Germacrene D	9.40	1653.5	0.06	11.35	1474.8	0.02
β -Selinene	9.50	1661.9	0.03	11.41	1479.2	0.01
δ -Cadinene	10.05	1706.8	0.02	11.94	1519.1	0.02
Caryophyllene oxide	12.29	1904.4	0.04	12.63	1573.7	0.01

Viridiflorol	13.56	2024.0	0.02	12.78	1584.9	0.01
β -Eudesmol	14.88	2156.5	0.01	13.48	1642.1	0.01
α -Phellandrene dimer I	11.46	1829.4	0.02	14.57	1732.8	0.02
α -Phellandrene dimer II	12.07	1884.3	0.31	15.20	1787.5	0.31
α -Phellandrene dimer III	12.70	1943.1	0.06	15.38	1803.8	0.05
α -Phellandrene dimer IV	12.87	1958.3	0.06	15.61	1823.9	0.05
Total reported		97.88%			98.59%	

*: 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