

Date : August 23, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22H16-PTH04

Customer identification : Frankincense Rivae - Somalia - FP1100R

Type : Essential oil

Source : *Boswellia rivae*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Amélie Simard, Analyste

Analysis date : August 22, 2022

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4767 ± 0.0003 (20 °C; method PC-MAT-016)

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
3-Methyl-2-butanone	0.01	Aliphatic ketone
Unknown	tr	Unknown
4-Methyl-2-pentanone	tr	Aliphatic ketone
Cyclohexadiene isomer?	tr	Alkene
Toluene	0.26	Simple phenolic
Unknown	0.01	Alkene
Unknown	tr	Unknown
Unknown	0.06	Alkene
Unknown	tr	Unknown
Unknown	0.05	Unknown
Unknown	0.02	Unknown
Unknown	0.49	Unknown
Nonane	0.19	Alkane
Hashishene	0.09	Monoterpene
Tricyclene	0.09	Monoterpene
α -Thujene	1.74	Monoterpene
α -Pinene	40.16	Monoterpene
Camphene	0.82	Monoterpene
α -Fenchene	0.13	Monoterpene
Thuja-2,4(10)-diene	0.18	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Unknown	0.01	Unknown
Unknown	0.02	Unknown
3,7,7-Trimethylcyclohepta-1,3,5-triene	1.70	Monoterpene
Sabinene	1.34	Monoterpene
β -Pinene	9.11	Monoterpene
6-Methyl-5-hepten-2-one	0.05	Aliphatic ketone
Dehydro-1,8-cineole	0.05	Monoterpenic ether
Myrcene	0.13	Monoterpene
3-para-Menthen-2-one	0.05	Monoterpene
Octan-3-ol	0.05	Aliphatic alcohol
Pseudolimonene	0.17	Monoterpene
α -Phellandrene	0.07	Monoterpene
Δ^3 -Carene	10.32	Monoterpene
ortho-Methylanisole	0.05	Simple phenolic
α -Terpinene	0.01	Monoterpene
meta-Cymene	0.47	Monoterpene
para-Cymene	3.81	Monoterpene
Unknown	0.19	Unknown
β -Phellandrene	0.57	Monoterpene
Limonene	5.09	Monoterpene
1,8-Cineole	0.06	Monoterpenic ether
Unknown	0.07	Unknown
ortho-Cymene	0.06	Monoterpene
Unknown	0.01	Unknown

(Z)-β-Ocimene	0.12	Monoterpene
Unknown	0.05	Unknown
(E)-β-Ocimene	0.06	Monoterpene
γ-Terpinene	0.05	Monoterpene
cis-Sabinene hydrate	0.13	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Unknown	0.23	Oxygenated monoterpene
meta-Cymenene	0.09	Monoterpene
Terpinolene isomer	0.03	Monoterpene
γ-Campholenal	0.04	Aliphatic alcohol
para-Cymenene	0.12	Monoterpene
Terpinolene	0.03	Monoterpene
α-Pinene oxide	0.04	Monoterpenic ether
trans-Sabinene hydrate	0.24	Monoterpenic alcohol
Unknown	0.13	Unknown
Undecane	0.06	Alkane
Linalool	0.02	Monoterpenic alcohol
α-Thujone	0.03	Monoterpenic ketone
Verbenol analog?	0.04	Monoterpenic alcohol
Unknown	0.29	Unknown
β-Thujone	0.08	Monoterpenic ketone
endo-Fenchol	0.02	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.07	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
α-Campholenal	0.17	Monoterpenic aldehyde
Unknown	0.12	Unknown
cis-Limonene oxide	0.32	Monoterpenic ether
Nopinone	0.18	Normonoterpenic ketone
trans-Pinocarveol	1.58	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.14	Monoterpenic alcohol
cis-Verbenol	0.30	Monoterpenic alcohol
Camphor	0.06	Monoterpenic ketone
trans-Verbenol	2.24	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.09	Monoterpenic alcohol
Sabinaketone	0.02	Normonoterpenic ketone
Pinocamphone	0.05	Monoterpenic ketone
Pinocarvone	0.25	Monoterpenic ketone
Phellandrenol analog I	0.05	Monoterpenic alcohol
Borneol	0.17	Monoterpenic alcohol
α-Phellandren-8-ol	0.03	Monoterpenic alcohol
cis-Sabinol	0.16	Monoterpenic alcohol
Terpinen-4-ol	0.62	Monoterpenic alcohol
4-Methylacetophenone	0.17	Simple phenolic
meta-Cymen-8-ol	0.68	Monoterpenic alcohol
para-Cymen-8-ol	0.46	Monoterpenic alcohol
α-Terpineol	0.36	Monoterpenic alcohol
Myrtenal	0.55	Monoterpenic aldehyde
Myrtenol	0.58	Monoterpenic alcohol
trans-Isopiperitenol	0.10	Monoterpenic alcohol
Verbenone	0.81	Monoterpenic ketone
Unknown	0.04	Unknown

Octyl acetate	0.05	Aliphatic ester
<i>trans</i> -Carveol	0.35	Monoterpenic alcohol
Unknown	0.11	Unknown
<i>cis</i> -Carveol	0.06	Monoterpenic alcohol
Cuminal	0.12	Monoterpenic aldehyde
Myrtenyl formate?	0.06	Monoterpenic ester
Carvone	0.21	Monoterpenic ketone
Carvotanacetone	0.08	Monoterpenic ketone
Car-3-en-2-one	0.16	Monoterpenic ketone
Unknown	0.02	Unknown
Phellandral	0.10	Monoterpenic aldehyde
Bornyl acetate	0.13	Monoterpenic ester
Cuminol	0.07	Monoterpenic alcohol
Thymol	0.03	Monoterpenic alcohol
Car-3-en-5-one	0.20	Monoterpenic ketone
Carvacrol	0.17	Monoterpenic alcohol
3-Carene-2,5-dione	0.13	Monoterpenic ketone
δ -Elemene	0.05	Sesquiterpene
α -Longipinene	0.14	Sesquiterpene
α -Terpinyl acetate	0.05	Monoterpenic ester
Longicyclene	0.22	Sesquiterpene
α -Copaene	0.09	Sesquiterpene
β -Bourbonene	0.03	Sesquiterpene
β -Elemene	0.22	Sesquiterpene
Cyperene	0.07	Sesquiterpene
Longifolene	0.08	Sesquiterpene
α -Gurjunene	0.01	Sesquiterpene
β -Caryophyllene	0.04	Sesquiterpene
β -Barbatene	0.03	Sesquiterpene
α -Himachalene	0.04	Sesquiterpene
α -Humulene	0.08	Sesquiterpene
allo-Aromadendrene	0.10	Sesquiterpene
(1S,2S,4S)-para-Menthane-1,2,4-triol	0.02	Monoterpenic alcohol
β -Selinene	0.05	Sesquiterpene
Unknown	0.17	Sesquiterpenic ether
α -Selinene	0.08	Sesquiterpene
β -Himachalene	0.04	Sesquiterpene
γ -Cadinene	0.71	Sesquiterpene
<i>trans</i> -Calamenene	0.05	Sesquiterpene
ar-Himachalene	0.02	Sesquiterpene
Caryophyllene oxide	0.08	Sesquiterpenic ether
β -Himachalene oxide	0.18	Sesquiterpenic ether
10-epi-Cubenol	0.16	Sesquiterpenic alcohol
τ -Cadinol	0.84	Sesquiterpenic alcohol
α -Phellandrene dimer I	0.04	Diterpene
α -Phellandrene dimer II	0.11	Diterpene
α -Phellandrene dimer IV	0.02	Diterpene
Consolidated total	95.99%	

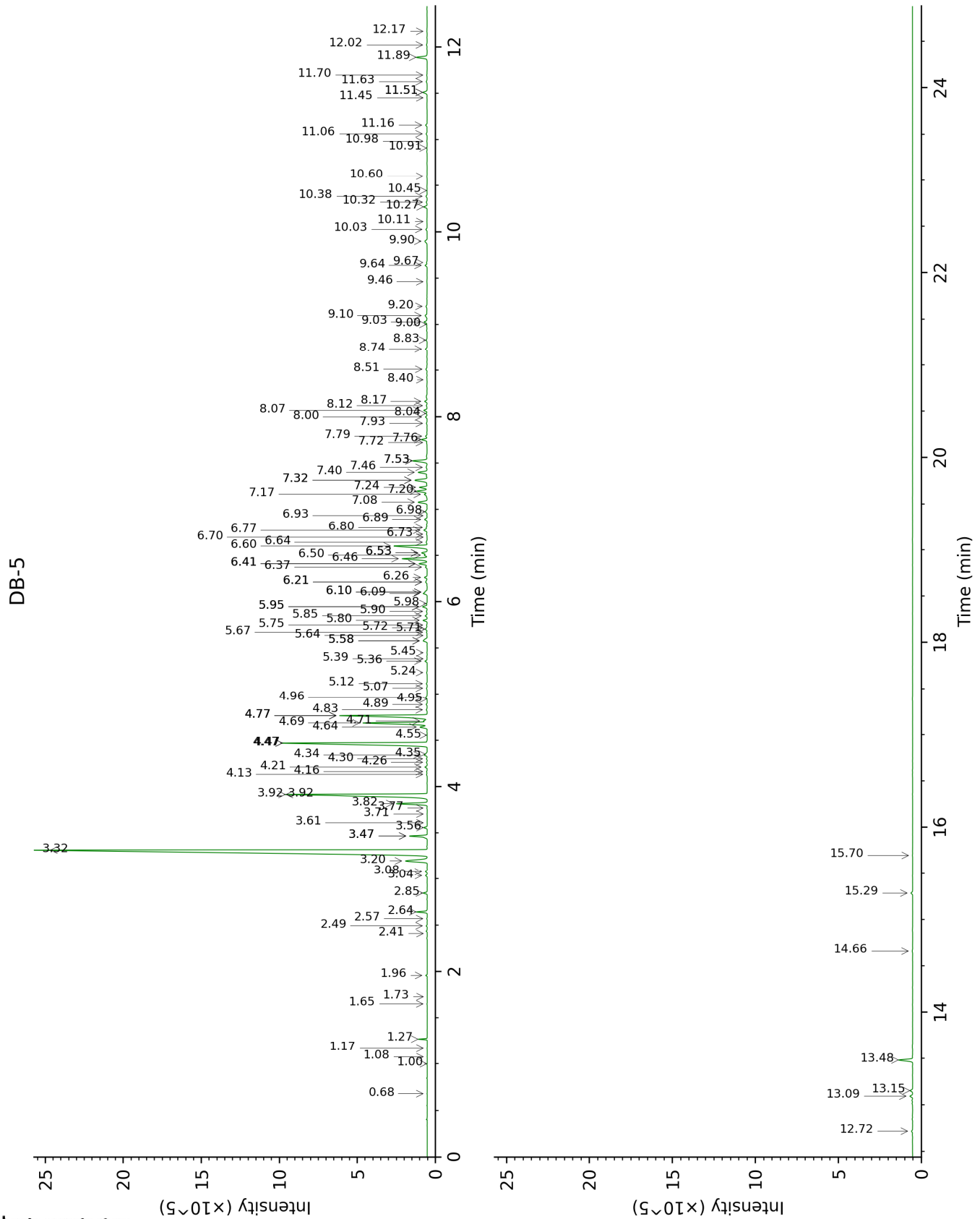
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

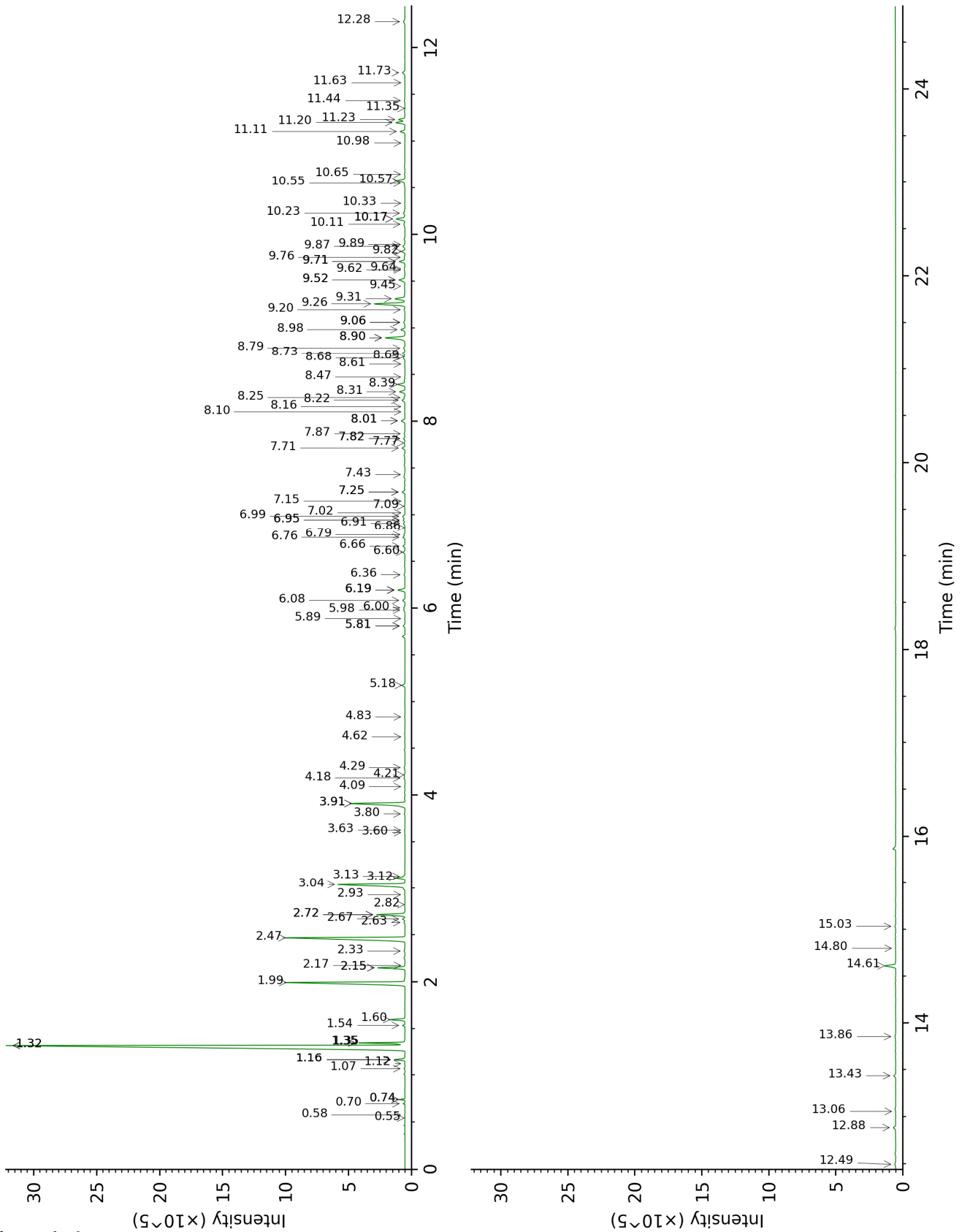
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

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



DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
3-Methyl-2-butanone	0.68	647	0.01	0.74*	898	0.20
Unknown [m/z 93, 91 (70), 77 (48), 108 (42)]	1.00	723	tr	0.55	826	0.01
4-Methyl-2-pentanone	1.08	733	tr	1.16*	971	0.58
Cyclohexadiene isomer?	1.17	746	tr			
Toluene	1.27	759	0.26	1.35*†	1002	2.03
Unknown [m/z 109, 67 (33), 41 (16), 81 (13)... 124 (8)]	1.65	808	0.01	0.58	837	0.01
Unknown [m/z 109, 67 (39), 81 (14), 41 (14), 55 (10), 110 (9)... 124 (6)]	1.73	814	tr			
Unknown [m/z 109, 67 (32), 81 (14), 41 (12), 124 (10)]	1.96	832	0.06	0.70	881	0.06
Unknown [m/z 119, 91 (27), 77 (112), 79 (11), 120 (10), 117 (9)...134 (2)]	2.41	869	tr			
Unknown [m/z 79, 78 (45), 91 (28), 77 (28), 41 (13), 80 (12), 107 (11)... 122 (1)]	2.49	876	0.05	1.07	956	0.05
Unknown [m/z 119, 91 (28), 77 (11), 120 (10), 117 (9)...134 (2)]	2.57	882	0.02	1.12	964	0.02
Unknown [m/z 119, 91 (35), 79 (17), 77 (13), 120 (11), 117 (9)...134 (1)]	2.64	888	0.49	1.16*	971	[0.58]
Nonane	2.85	904	0.19	0.74*	898	[0.20]
Hashishene	3.04	917	0.09	1.32*	998	40.66
Tricyclene	3.08	919	0.09	1.16*	971	[0.58]
α-Thujene	3.20	927	1.74	1.35*†	1002	[2.03]
α-Pinene	3.32	935	40.16	1.32*	998	[40.66]
Camphene	3.47*	945	0.95	1.60	1028	0.82
α-Fenchene	3.47*	945	[0.95]	1.54	1022	0.13
Thuja-2,4(10)-diene	3.56	951	0.18	2.15*	1083	1.60
Benzaldehyde	3.61	954	0.01	7.15	1461	0.01
Unknown [m/z 55, 43 (89), 111 (78), 93 (75), 41 (56), 83 (53), 91 (42), 108 (38), 67 (36), 126 (35)...]	3.70	960	0.01			

Unknown [m/z 55, 125 (78), 43 (71), 41 (67), 69 (41), 97 (35)... 138 (1)]	3.77	964	0.02			
3,7,7-Trimethylcyclohepta-1,3,5-triene	3.82	968	1.70	2.72*	1132	1.84
Sabinene	3.92*†	974	10.46	2.15*	1083	[1.60]
β-Pinene	3.92*†	974	[10.46]	1.99	1067	9.11
6-Methyl-5-hepten-2-one	4.13	988	0.05	4.83	1294	0.02
Dehydro-1,8-cineole	4.16	990	0.05	2.93	1149	0.03
Myrcene	4.21	993	0.13	2.72*	1132	[1.84]
3-para-Menthene?	4.26	997	0.05	2.18	1085	0.02
Octan-3-ol	4.30	999	0.05	5.81*	1361	0.14
Pseudolimonene	4.34†	1002	0.24	2.67	1129	0.17
α-Phellandrene	4.35†	1003	[0.24]	2.63	1126	0.07
Δ3-Carene	4.47*	1010	10.37	2.47	1113	10.32
ortho-Methylanisole	4.47*	1010	[10.37]	5.81*	1361	[0.14]
α-Terpinene	4.56	1015	0.01	2.82	1141	0.02
meta-Cymene	4.64	1021	0.47	3.91*	1226	4.27
para-Cymene	4.69	1024	3.81	3.91*	1226	[4.27]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.71	1025	0.19	6.08	1381	0.17
β-Phellandrene	4.77*	1028	5.60	3.12	1164	0.57
Limonene	4.77*	1028	[5.60]	3.04	1158	5.09
1,8-Cineole	4.77*	1028	[5.60]	3.13	1165	0.06
Unknown [m/z 91, 107 (75), 43 (55), 135 (54), 79 (49), 77 (38), 105 (36)...]	4.83	1032	0.07			
ortho-Cymene	4.89	1036	0.06	4.29	1254	0.06
Unknown [m/z 119, 91 (26), 134 (25), 77 (11), 117 (11), 120 (10), 115 (7)...]	4.95	1040	0.01	4.22	1248	0.06
(Z)-β-Ocimene	4.96	1041	0.12	3.60	1202	0.02
Unknown [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	5.07	1047	0.05	7.09	1457	0.05
(E)-β-Ocimene	5.12	1050	0.06	3.80	1217	0.05
γ-Terpinene	5.24	1058	0.05	3.63	1204	0.03
cis-Sabinene hydrate	5.36	1065	0.13	6.66	1424	0.14
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.39	1067	0.02	4.62	1278	0.01
cis-Linalool oxide (fur.)	5.45	1071	0.03	6.36	1401	0.08

Unknown [m/z 43, 94 (63), 109 (61), 59 (55), 79 (51)...152 (2)]	5.58*	1079	0.38	6.99	1449	0.23
meta-Cymenene	5.58*	1079	[0.38]	6.00	1375	0.09
Terpinolene isomer	5.64	1083	0.03	4.18	1246	0.07
γ-Campholenal	5.67	1085	0.04			
para-Cymenene	5.70†	1087	0.15	6.19*	1389	0.52
Terpinolene	5.72†	1088	[0.15]	4.09	1239	0.03
α-Pinene oxide	5.75	1090	0.04	5.18	1315	0.22
trans-Sabinene hydrate	5.80	1093	0.24	7.77	1508	0.07
Unknown [m/z 109, 43 (65), 95 (54), 119 (50), 91 (47)... 149 (8)...]	5.85	1096	0.13	5.98	1373	0.10
Undecane	5.90	1099	0.06	2.33	1101	0.06
Linalool	5.95*	1102	0.30	7.82*	1512	0.10
α-Thujone	5.95*	1102	[0.30]	5.89	1367	0.03
Verbenol analog?	5.98	1104	0.04	8.10	1534	0.02
Unknown [m/z 94, 59 (83), 43 (81), 95 (56), 109 (50), 79 (50), 91 (40)...]	6.09†	1111	0.39			
β-Thujone	6.10*†	1112	[0.39]	6.19*	1389	[0.52]
endo-Fenchol	6.10*†	1112	[0.39]	8.16	1539	0.02
cis-para-Menth-2-en-1-ol	6.21*	1119	0.15	7.87	1516	0.07
trans-para-Mentha-2,8-dien-1-ol	6.21*	1119	[0.15]	8.69	1581	0.03
α-Campholenal	6.26	1122	0.17	6.78	1433	0.08
Unknown [m/z 95, 43 (41), 110 (36), 41 (19), 67 (18)... 150 (tr)]	6.37	1129	0.12			
cis-Limonene oxide	6.41*	1131	0.50	6.19*	1389	[0.52]
Nopinone	6.41*	1131	[0.50]	8.01*	1527	0.31
trans-Pinocarveol	6.46	1135	1.58	8.90*	1597	1.65
trans-para-Menth-2-en-1-ol	6.50†	1137	0.51	8.68	1580	0.14
cis-Verbenol	6.53*†	1139	[0.51]	8.98	1604	0.30
Camphor	6.53*†	1139	[0.51]	6.95*	1446	0.15
trans-Verbenol	6.60	1144	2.24	9.26	1627	2.39
meta-Mentha-4,6-dien-8-ol	6.64	1146	0.09	9.06*	1610	0.12
Sabinaketone	6.70	1150	0.02	8.47	1564	0.02
Pinocamphone	6.73	1152	0.05	7.02	1452	0.01
Pinocarvone	6.77	1154	0.25	7.72	1504	0.22
Phellandrenol analog I	6.80	1156	0.05	9.82	1673	0.26
Borneol	6.89	1162	0.17	9.52*	1648	0.53
α-Phellandren-8-ol	6.94	1165	0.03	9.89	1679	0.02
cis-Sabinol	6.98	1168	0.16	10.55†	1734	0.64
Terpinen-4-ol	7.08	1174	0.62	8.32	1551	0.41

4-Methylacetophenone	7.16	1180	0.17	10.23	1706	0.12
meta-Cymen-8-ol	7.20	1182	0.68	11.20	1790	0.66
para-Cymen-8-ol	7.24	1184	0.46	11.23	1793	0.45
α-Terpineol	7.32*	1189	0.99	9.52*	1648	[0.53]
Myrtenal	7.32*	1189	[0.99]	8.39	1558	0.55
Myrtenol	7.40	1195	0.58	10.57†	1736	[0.64]
trans-Isopiperitenol	7.46	1198	0.10	10.11	1697	0.13
Verbenone	7.53*	1202	0.99	9.32	1631	0.81
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.53*	1202	[0.99]	10.65	1743	0.04
Octyl acetate	7.72	1216	0.05	6.86	1440	0.01
trans-Carveol	7.76	1218	0.35	11.11	1782	0.35
Unknown [m/z 119, 93 (40), 91 (37), 43 (25), 41 (24), 109 (19)...]	7.79	1220	0.11			
cis-Carveol	7.93	1229	0.06	11.44	1810	0.06
Cuminal	8.00	1234	0.12	10.33	1715	0.02
Myrtenyl formate?	8.04	1236	0.06	8.61	1575	0.02
Carvone	8.07	1239	0.21	9.71*	1664	0.45
Carvotanacetone	8.12	1242	0.08	9.20	1622	0.07
Car-3-en-2-one	8.17	1245	0.16	10.17*	1701	0.72
Unknown [m/z 149, 93 (50), 121 (45), 91 (39), 77 (38), 136 (32), 67 (31)...]	8.40	1261	0.02			
Phellandral	8.51	1268	0.10	9.71*	1664	[0.45]
Bornyl acetate	8.74	1283	0.13	8.01*	1527	[0.31]
Cuminol	8.83	1290	0.07	13.86	2034	0.07
Thymol	9.00	1301	0.03	14.80	2126	0.03
Car-3-en-5-one	9.03	1303	0.20	11.73	1837	0.23
Carvacrol	9.10	1308	0.17	15.03	2150	0.07
3-Carene-2,5-dione	9.20	1315	0.13			
δ-Elemene	9.46	1333	0.05	6.76	1431	0.16
α-Longipinene	9.64	1346	0.14	6.60	1419	0.13
α-Terpinyl acetate	9.67	1348	0.05	9.45	1642	0.04
Longicyclene	9.90	1364	0.22	6.91	1443	0.13
α-Copaene	10.03	1373	0.09	6.95*	1446	[0.15]
β-Bourbonene	10.11	1379	0.03	7.25*	1468	0.21
β-Elemene	10.27	1390	0.22	8.22	1544	0.25
Cyperene	10.32	1394	0.07	7.25*	1468	[0.21]
Longifolene	10.38	1398	0.08	7.82*	1512	[0.10]
α-Gurjunene	10.45	1402	0.01	7.43	1482	0.04
β-Caryophyllene	10.60	1414	0.04	8.25	1546	0.08
β-Barbatene	10.91	1437	0.03	8.90*	1597	[1.65]
α-Himachalene	10.98	1442	0.04	8.73	1584	0.20
α-Humulene	11.06	1448	0.08	9.06*	1610	[0.12]
allo-Aromadendrene	11.16	1455	0.10	8.79	1588	0.11

(1S,2S,4S)-para-Menthane-1,2,4-triol	11.45	1477	0.02			
β-Selinene	11.51*	1482	0.30	9.64	1658	0.05
Unknown [m/z 137, 43 (84), 138 (63), 109 (53), 95 (51), 93 (50), 207 (46)... 222 (21)]	11.51*	1482	[0.30]	9.87	1677	0.17
α-Selinene	11.63	1490	0.08	9.76	1668	0.07
β-Himachalene	11.70	1495	0.04	9.62	1656	0.03
γ-Cadinene	11.89	1510	0.71	10.17*	1701	[0.72]
<i>trans</i> -Calamenene	12.02	1520	0.05	10.98	1771	0.01
α-Himachalene	12.17	1532	0.02	11.35	1803	0.01
Caryophyllene oxide	12.72	1575	0.08	12.49	1906	0.11
β-Himachalene oxide	13.09	1604	0.18	12.88	1942	0.21
10-epi-Cubenol	13.15	1609	0.16	13.43	1994	0.15
τ-Cadinol	13.48	1636	0.84	14.61	2107	0.82
α-Phellandrene dimer I	14.66	1735	0.04	11.63	1828	0.02
α-Phellandrene dimer II	15.29	1789	0.11	12.28	1886	0.15
α-Phellandrene dimer IV	15.70	1826	0.02	13.06	1958	0.02
Total identified		94.75%			94.51%	
Total reported		96.53%			95.49%	

*: 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