

Date : May 23, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18E09-FWM3-1-CC

Customer identification : Peppermint - USA

Type : Essential oil

Source : *Mentha x piperita*

Customer : Faith Wellness Ministries

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : May 16, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4598 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Isobutyral	0.01	0.01	Aliphatic aldehyde
Acetic acid	tr	22.56*	Aliphatic acid
Isobutanol	0.01	0.01	Aliphatic alcohol
Isovaleral	0.04	0.04	Aliphatic aldehyde
2-Methylbutyral	0.02	0.02	Aliphatic aldehyde
Isoamyl alcohol	0.03	0.06	Aliphatic alcohol
2-Methylbutanol	0.03	[0.06]	Aliphatic alcohol
Hexanal	tr	tr	Aliphatic aldehyde
(2E)-Hexenal	0.01	0.02	Aliphatic aldehyde
Ethyl isovalerate	tr	tr	Aliphatic ester
(3Z)-Hexenol	0.02	0.03*	Aliphatic alcohol
(2E)-Hexenol	0.01	0.01	Aliphatic alcohol
Hexanol	0.01	0.02	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.02	0.02	Furan
α -Thujene	0.04	0.04	Monoterpene
α -Pinene	0.55	0.56	Monoterpene
Camphene	0.03*	0.01	Monoterpene
3-Methylcyclohexanone	[0.03]*	0.09*	Aliphatic ketone
Thuja-2,4(10)-diene	tr	0.36*	Monoterpene
Benzaldehyde	0.01	0.01	Simple phenolic
β -Pinene	1.15*	0.80	Monoterpene
Sabinene	[1.15]*	[0.36]*	Monoterpene
Octen-3-ol	0.11	0.12	Aliphatic alcohol
Octan-3-one	0.02	0.07*	Aliphatic ketone
Myrcene	0.18	0.18	Monoterpene
Octan-3-ol	0.25	0.25	Aliphatic alcohol
α -Phellandrene	0.03*	0.01	Monoterpene
Pseudolimonene	[0.03]*	0.02	Monoterpene
α -Terpinene	0.16	0.16	Monoterpene
para-Cymene	0.21	0.20	Monoterpene
Limonene	6.45*	1.59	Monoterpene
1,8-Cineole	[6.45]*	4.86	Monoterpenic ether
(Z)- β -Ocimene	0.18	0.18	Monoterpene
(E)- β -Ocimene	0.05	[0.07]*	Monoterpene
γ -Terpinene	0.29	0.30	Monoterpene
<i>cis</i> -Sabinene hydrate	0.63	2.57*	Monoterpenic alcohol
para-Mentha-3,8-diene	0.01	tr	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	0.01	Monoterpenic alcohol
Octanol	0.02	0.02	Aliphatic alcohol
Terpinolene	0.10*	0.09	Monoterpene
para-Cymenene	[0.10]*	0.01	Monoterpene
<i>trans</i> -Sabinene hydrate	0.07	0.06	Monoterpenic alcohol
Linalool	0.22	0.21	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.03	0.03	Aliphatic ester
Amyl isovalerate	0.07	[0.09]*	Aliphatic ester
Octen-3-yl acetate	0.01	[0.03]*	Aliphatic ester
<i>cis</i> -para-Menth-2-en-1-ol	0.05	5.14*	Monoterpenic alcohol
Octan-3-yl acetate	0.03	0.02	Aliphatic ester

Isopulegol	0.13*	[5.14]*	Monoterpenic alcohol
neo-Isopulegol	[0.13]*	[5.14]*	Monoterpenic alcohol
Menthone	22.54	[22.56]*	Monoterpenic ketone
Isomenthone	5.14*	3.23	Monoterpenic ketone
Menthofuran	[5.14]*	[2.57]*	Monoterpenic ether
Borneol	3.28*	1.42*	Monoterpenic alcohol
δ-Terpineol	[3.28]*	0.12	Monoterpenic alcohol
neo-Menthol	[3.28]*	3.13	Monoterpenic alcohol
Menthol	43.67*	42.73	Monoterpenic alcohol
Terpinen-4-ol	[43.67]*	0.83	Monoterpenic alcohol
Isomenthol	0.53	1.43*	Monoterpenic alcohol
α-Terpineol	0.39	[1.42]*	Monoterpenic alcohol
Myrtenal	[0.39]*	0.01	Monoterpenic aldehyde
neoiso-Menthol	[0.39]*	0.19	Monoterpenic alcohol
cis-Piperitol	0.04	0.03	Monoterpenic alcohol
Unknown	0.01		Unknown
trans-Piperitol	0.02	[0.12]*	Monoterpenic alcohol
Unknown	0.04		Unknown
Citronellol	0.02	0.06*	Monoterpenic alcohol
Pulegone	0.88	[1.43]*	Monoterpenic ketone
Carvone	0.10	0.08	Monoterpenic ketone
Piperitone	0.50	0.50	Monoterpenic ketone
neo-Menthyl acetate	0.21*	0.15	Monoterpenic ester
Decanol	[0.21]*	[0.06]*	Aliphatic alcohol
2-Ethylmenthone?	0.04		Aliphatic ketone
Dihydroedulan I	0.05	0.05	Terpenic ether
Menthyl acetate	5.02	[5.14]*	Monoterpenic ester
Dihydroedulan II	tr	0.01	Terpenic ether
Isomenthyl acetate	0.14	0.17	Monoterpenic alcohol
Bicycloelemene	0.03	0.03	Sesquiterpene
Piperitenone	0.03	0.03	Monoterpenic ketone
α-Cubebene	0.01	0.02	Sesquiterpene
Evodone	0.02	0.02	Monoterpenic ketone
Menthofuroolactone	0.02	0.03	Aliphatic alcohol
α-Copaene	0.04	0.04	Sesquiterpene
β-Bourbonene	0.26	0.25	Sesquiterpene
1,5-diepi-β-Bourbonene	0.02	0.02	Sesquiterpene
β-Elemene	0.10	1.97*	Sesquiterpene
Unknown	0.04		Unknown
Unknown	0.03		Sesquiterpene
β-Caryophyllene	1.97	[1.97]*	Sesquiterpene
β-Copaene	0.05	0.04	Sesquiterpene
trans-α-Bergamotene	0.02	[1.97]*	Sesquiterpene
Isogermacrene D	0.03	[1.43]*	Sesquiterpene
α-Humulene	0.08	[42.73]	Sesquiterpene
(E)-β-Farnesene	0.25	0.24	Sesquiterpene
γ-Murolene	1.23*	0.05	Sesquiterpene
Germacrene D	[1.23]*	[1.42]*	Sesquiterpene
Bicyclogermacrene	0.24*	0.23*	Sesquiterpene
Viridiflorene	[0.24]*	0.02	Sesquiterpene
Menthylactone	[0.24]*	0.02	Monoterpenic lactone
5-Methyl-2,4-diisopropylphenol	0.01	0.01	Terpene derivative

α-Muurolene	0.03	[0.23]*	Sesquiterpene
γ-Cadinene	0.02	0.12	Sesquiterpene
δ-Cadinene	0.08	[0.12]*	Sesquiterpene
(E)-Nerolidol	0.01	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.08*	0.06	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.08]*	0.02	Sesquiterpenic ether
Viridiflorol	0.14	0.14	Sesquiterpenic alcohol
Isospathulenol	0.02	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.01	0.01	Sesquiterpenic alcohol
α-Cadinol	0.01	0.01	Sesquiterpenic alcohol
Mint sulfide?	0.01		Sesquiterpenic sulfide
Total identified	98.70%	98.36%	

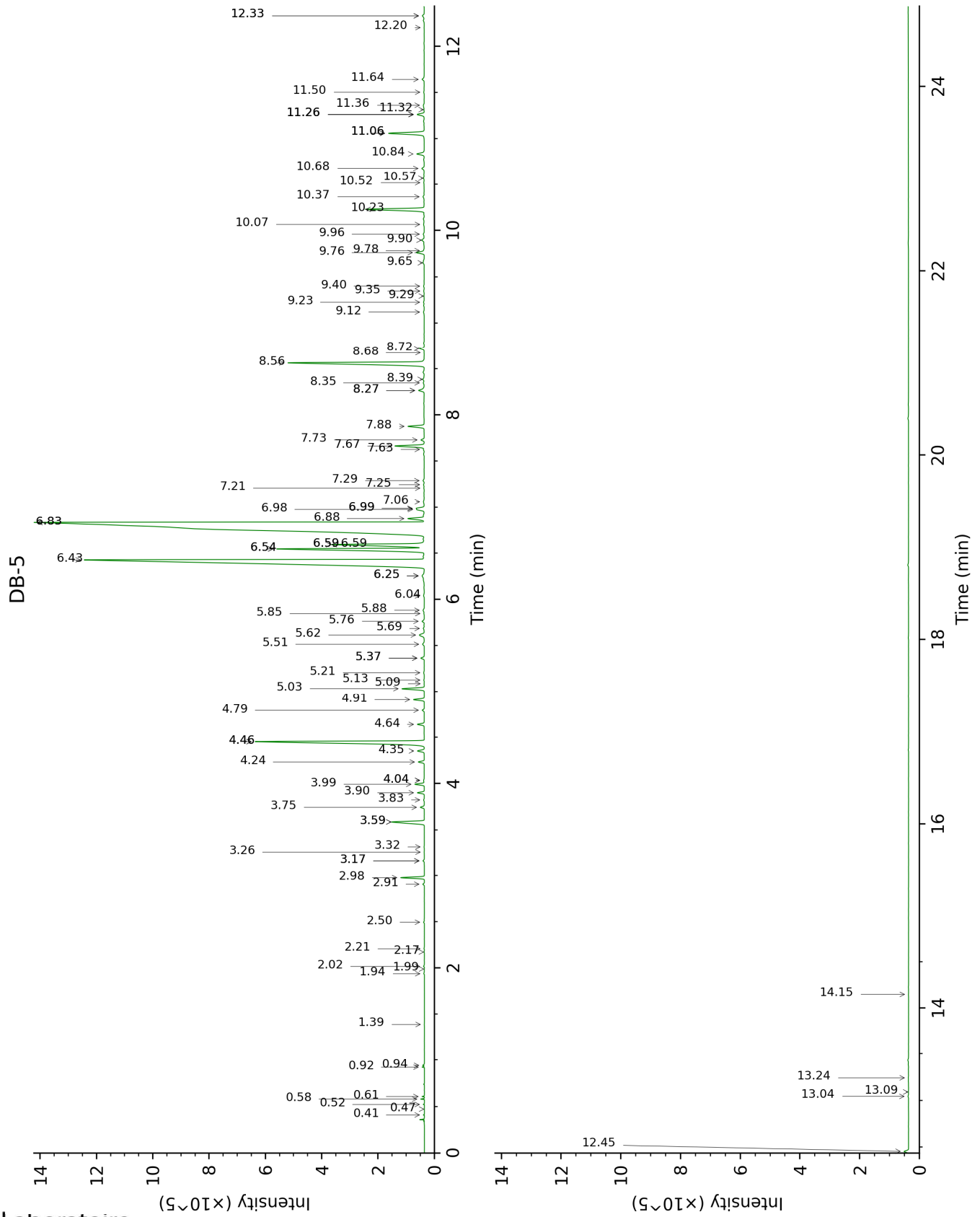
*: Two or more compounds are coeluting on this column

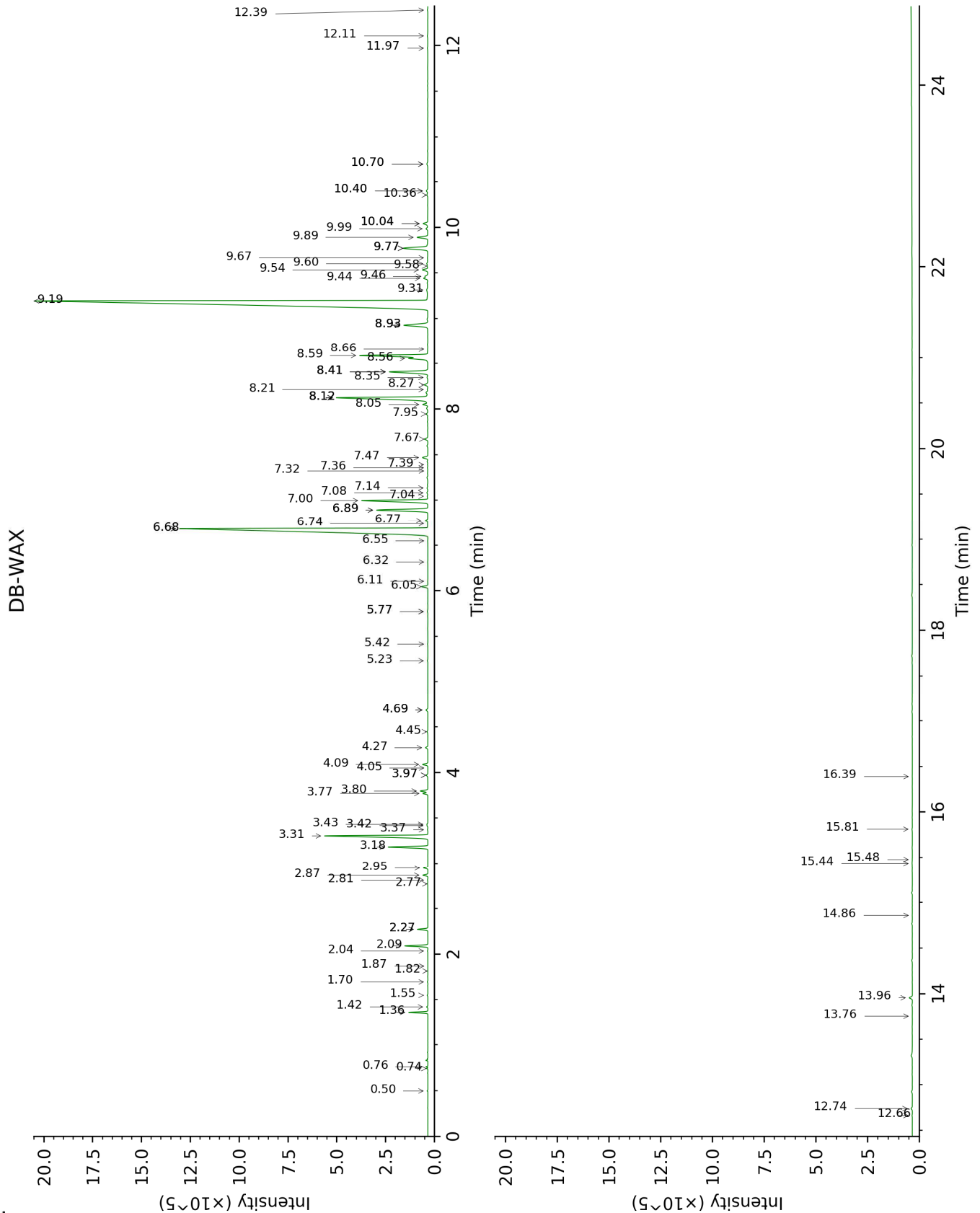
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutylal	0.41	538	0.01	0.50	771	0.01
Acetic acid	0.47	597	tr	6.68*	1412	22.56
Isobutanol	0.52	617	0.01	2.04	1061	0.01
Isovaleral	0.58	637	0.04	0.76	884	0.04
2-Methylbutylal	0.61	647	0.02	0.74	877	0.02
Isoamyl alcohol	0.92	725	0.03	3.42†	1176	0.06
2-Methylbutanol	0.94	728	0.03	3.43†	1178	[0.06]
Hexanal	1.39	794	tr	1.87	1045	tr
(2E)-Hexenal	1.94	844	0.01	3.37	1173	0.02
Ethyl isovalerate	1.99	848	tr	1.82	1040	tr
(3Z)-Hexenol	2.02	851	0.02	5.77*	1347	0.03
(2E)-Hexenol	2.17	864	0.01	6.10	1370	0.01
Hexanol	2.21	867	0.01	5.42	1321	0.02
<i>trans</i> -2,5-Diethyltetrahydrofuran	2.50	892	0.02	1.55	1013	0.02
α-Thujene	2.91	922	0.04	1.42	1000	0.04
α-Pinene	2.98	926	0.55	1.36	991	0.56
Camphene	3.17*	939	0.03	1.70	1028	0.01
3-Methylcyclohexanone	3.17*	939	[0.03]	4.69*	1268	0.09
Thuja-2,4(10)-diene	3.26	945	tr	2.27*	1085	0.36
Benzaldehyde	3.32	949	0.01	7.32	1460	0.01
β-Pinene	3.59*	967	1.15	2.09	1067	0.80
Sabinene	3.59*	967	[1.15]	2.27*	1085	[0.36]
Octen-3-ol	3.74	978	0.11	6.77	1419	0.12
Octan-3-one	3.82	983	0.02	3.97*	1217	0.07
Myrcene	3.90	989	0.18	2.87	1134	0.18
Octan-3-ol	3.99	995	0.25	6.05	1366	0.25
α-Phellandrene	4.04*	998	0.03	2.77	1127	0.01
Pseudolimonene	4.04*	998	[0.03]	2.81	1130	0.02
α-Terpinene	4.24	1010	0.16	2.95	1140	0.16
para-Cymene	4.35	1018	0.21	4.09	1226	0.20
Limonene	4.46*	1024	6.45	3.18	1158	1.59
1,8-Cineole	4.46*	1024	[6.45]	3.30	1168	4.86
(Z)-β-Ocimene	4.64	1036	0.18	3.77	1203	0.18
(E)-β-Ocimene	4.80	1046	0.05	3.97*	1217	[0.07]
γ-Terpinene	4.91	1053	0.29	3.80	1205	0.30
<i>cis</i> -Sabinene hydrate	5.03	1061	0.63	6.89*	1428	2.57
para-Mentha-3,8-diene	5.09	1064	0.01	4.05	1223	tr
<i>cis</i> -Linalool oxide (fur.)	5.13	1067	0.02	6.55	1402	0.01
Octanol	5.21	1072	0.02	8.22	1527	0.02
Terpinolene	5.36*	1082	0.10	4.27	1239	0.09
para-Cymenene	5.36*	1082	[0.10]	6.32	1386	0.01
<i>trans</i> -Sabinene hydrate	5.52	1092	0.07	7.95	1506	0.06
Linalool	5.62	1098	0.22	8.05	1515	0.21
2-Methylbutyl 2-methylbutyrate	5.69	1102	0.03	4.45	1251	0.03

Amyl isovalerate	5.76	1107	0.07	4.69*	1268	[0.09]
Octen-3-yl acetate	5.85	1113	0.01	5.77*	1347	[0.03]
<i>cis</i> -para-Menth-2-en-1-ol	5.88	1115	0.05	8.12*	1520	5.14
Octan-3-yl acetate	6.04	1125	0.03	5.23	1308	0.02
Isopulegol	6.25*	1139	0.13	8.12*	1520	[5.14]
neo-Isopulegol	6.25*	1139	[0.13]	8.12*	1520	[5.14]
Menthone	6.43	1150	22.54	6.68*	1412	[22.56]
Isomenthone	6.54*	1158	5.14	7.00	1436	3.23
Menthofuran	6.54*	1158	[5.14]	6.89*	1428	[2.57]
Borneol	6.59*†	1161	3.28	9.77*	1650	1.42
δ-Terpineol	6.59*†	1161	[3.28]	9.46	1625	0.12
neo-Menthol	6.59*†	1161	[3.28]	8.59	1556	3.13
Menthol	6.83*	1176	43.67	9.19†	1604	42.73
Terpinen-4-ol	6.83*	1176	[43.67]	8.56	1554	0.83
Isomenthol	6.88	1179	0.53	8.93*	1582	1.43
α-Terpineol	6.98†	1186	0.39	9.77*	1650	[1.42]
Myrtenal	6.99*†	1186	[0.39]	8.66	1562	0.01
neoiso-Menthol	6.99*†	1186	[0.39]	9.44	1624	0.19
<i>cis</i> -Piperitol	7.06	1191	0.04	9.58	1634	0.03
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.21	1200	0.01			
<i>trans</i> -Piperitol	7.25	1203	0.02	10.40*†	1701	[0.12]
Unknown [m/z 146, 145 (94), 43 (72), 99 (41), 81 (29), 115 (25), 86 (24)...]	7.29	1206	0.04			
Citronellol	7.63	1228	0.02	10.70*	1727	0.06
Pulegone	7.67	1231	0.88	8.93*	1582	[1.43]
Carvone	7.73	1235	0.10	9.99	1668	0.08
Piperitone	7.88	1245	0.50	9.89	1660	0.50
neo-Menthyl acetate	8.26*	1271	0.21	7.67	1486	0.15
Decanol	8.26*	1271	[0.21]	10.70*	1727	[0.06]
2-Ethylmenthone?	8.35	1277	0.04			
Dihydroedulan I	8.39	1280	0.05	7.08	1442	0.05
Menthyl acetate	8.56	1292	5.02	8.12*	1520	[5.14]
Dihydroedulan II	8.68	1299	tr	7.39	1465	0.01
Isomenthyl acetate	8.72	1302	0.14	8.27	1531	0.17
Bicycloelemene	9.12	1330	0.03	7.04	1439	0.03
Piperitenone	9.23	1338	0.03	12.11	1849	0.03
α-Cubebene	9.29	1343	0.01	6.74	1417	0.02
Evodone	9.35	1346	0.02	12.39	1874	0.02
Menthofuroolactone	9.40	1350	0.02	11.97	1837	0.03
α-Copaene	9.65	1368	0.04	7.14	1446	0.04
β-Bourbonene	9.76	1376	0.26	7.47	1471	0.25
1,5-diepi-β-Bourbonene	9.78	1377	0.02	7.36	1462	0.02
β-Elemene	9.90	1385	0.10	8.41*	1542	1.97
Unknown [m/z 107, 121 (79), 119 (66), 91	9.96	1390	0.04			

(58), 136 (55), 105 (49)... 194 (1) Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	10.07	1397	0.03			
β-Caryophyllene	10.23	1409	1.97	8.41*	1542	[1.97]
β-Copaene	10.37	1420	0.05	8.35	1538	0.04
<i>trans</i> -α-Bergamotene	10.52	1431	0.02	8.41*	1542	[1.97]
Isogermacrene D	10.57	1435	0.03	8.93*	1582	[1.43]
α-Humulene	10.68	1443	0.08	9.31†	1613	[42.73]
(<i>E</i>)-β-Farnesene	10.84	1455	0.25	9.54	1631	0.24
γ-Murolene	11.06*	1471	1.23	9.60	1637	0.05
Germacrene D	11.06*	1471	[1.23]	9.77*	1650	[1.42]
Bicyclogermacrene	11.26*	1487	0.24	10.04*	1672	0.23
Viridiflorene	11.26*	1487	[0.24]	9.67	1642	0.02
Menthylactone	11.26*	1487	[0.24]	15.81	2202	0.02
5-Methyl-2,4-diisopropylphenol	11.32	1491	0.01	16.39	2262	0.01
α-Murolene	11.36	1494	0.03	10.04*	1672	[0.23]
γ-Cadinene	11.50	1505	0.02	10.36†	1698	0.12
δ-Cadinene	11.64	1516	0.08	10.40*†	1701	[0.12]
(<i>E</i>)-Nerolidol	12.20	1560	0.01	13.76	1999	0.01
Caryophyllene oxide	12.33*	1570	0.08	12.74	1905	0.06
Caryophyllene oxide isomer	12.33*	1570	[0.08]	12.66	1898	0.02
Viridiflorol	12.45	1580	0.14	13.96	2018	0.14
Isospathulenol	13.04	1628	0.02	15.44	2164	0.02
τ-Cadinol	13.09	1631	0.01	14.86	2106	0.01
α-Cadinol	13.24	1644	0.01	15.48	2168	0.01
Mint sulfide?	14.15	1720	0.01			
Total identified		98.70%			98.36%	
Total reported		98.82%			98.36%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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