

Date : July 14, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22G08-PTH02

Customer identification : Peppermint - India - P50113R

Type : Essential oil

Source : *Mentha x piperita*

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

Analysis date : July 14, 2022

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4590 ± 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
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.02	Furan
α -Thujene	0.02	Monoterpene
α -Pinene	0.99	Monoterpene
3-Methylcyclohexanone	0.03	Aliphatic ketone
Camphene	0.05	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
<i>cis</i> -para-Menthane	0.01	Monoterpene
Sabinene	0.37	Monoterpene
β -Pinene	1.25	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
<i>cis</i> -Carane	0.01	Monoterpene
Octan-3-one	0.02	Aliphatic ketone
Myrcene	0.11	Monoterpene
Octan-3-ol	0.28	Aliphatic alcohol
Pseudolimonene	0.01	Monoterpene
α -Phellandrene	0.03	Monoterpene
α -Terpinene	0.06	Monoterpene
para-Cymene	0.34	Monoterpene
Limonene	2.77	Monoterpene
1,8-Cineole	5.74	Monoterpenic ether
(<i>Z</i>)- β -Ocimene	0.06	Monoterpene
(<i>E</i>)- β -Ocimene	0.02	Monoterpene
γ -Terpinene	0.30	Monoterpene
<i>cis</i> -Sabinene hydrate	0.11	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.08	Aliphatic alcohol
Terpinolene	0.05	Monoterpene
para-Cymenene	0.01	Monoterpene
<i>trans</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Nonan-3-ol	0.01	Aliphatic alcohol
Linalool	0.13	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.02	Aliphatic ester
Amyl isovalerate	0.01	Aliphatic ester
β -Thujone	0.01	Monoterpenic ketone
Phenylethyl alcohol	0.01	Simple phenolic
<i>cis</i> -para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol
<i>trans</i> -Sabinol	0.02	Monoterpenic alcohol
Isopulegol	0.18	Monoterpenic alcohol
<i>cis</i> - α -Dihydroterpineol	tr	Monoterpenic alcohol
Menthone	25.13	Monoterpenic ketone
Isomenthone	3.54	Monoterpenic ketone

Menthofuran	1.62	Monoterpenic ether
neo-Menthol	3.40	Monoterpenic alcohol
Menthol	42.47	Monoterpenic alcohol
Terpinen-4-ol	0.69	Monoterpenic alcohol
Isomenthol	0.21	Monoterpenic alcohol
α -Terpineol	0.13	Monoterpenic alcohol
neoiso-Menthol	0.16	Monoterpenic alcohol
Methylchavicol	0.03	Phenylpropanoid
Unknown	0.03	Unknown
(3Z)-Hexenyl 2-methylbutyrate	0.01	Aliphatic ester
Pulegone	0.78	Monoterpenic ketone
Carvone	0.06	Monoterpenic ketone
Piperitone	0.13	Monoterpenic ketone
neo-Menthyl acetate	0.12	Monoterpenic ester
Bornyl acetate	0.01	Monoterpenic ester
Dihydroedulan I	0.02	Terpenic ether
Menthyl acetate	5.07	Monoterpenic ester
Dihydroedulan II	0.01	Terpenic ether
Isomenthyl acetate	0.07	Monoterpenic alcohol
Bicycloelemene	0.04	Sesquiterpene
Limonene <i>trans</i> -glycol	0.01	Monoterpenic alcohol
α -Cubebene	0.02	Sesquiterpene
α -Copaene	0.01	Sesquiterpene
β -Bourbonene	0.07	Sesquiterpene
β -Elemene	0.02	Sesquiterpene
Unknown	0.02	Unknown
Isocaryophyllene	0.02	Sesquiterpene
β -Caryophyllene	1.86	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.01	Sesquiterpene
Isogermacrene D	0.01	Sesquiterpene
α -Humulene	0.04	Sesquiterpene
Muurolo-4,11-diene	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.08	Sesquiterpene
γ -Muurolole	0.01	Sesquiterpene
Germacrene D	0.35	Sesquiterpene
Menthylactone	0.02	Monoterpenic lactone
Bicyclogermacrene	tr	Sesquiterpene
Viridiflorene	0.01	Sesquiterpene
α -Muurolole	0.01	Sesquiterpene
ϵ -Amorphene	0.01	Sesquiterpene
γ -Cadinene	0.01	Sesquiterpene
δ -Cadinene	0.03	Sesquiterpene
Caryophyllene oxide	0.07	Sesquiterpenic ether
Viridiflorol	0.05	Sesquiterpenic alcohol
Consolidated total	99.71%	

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

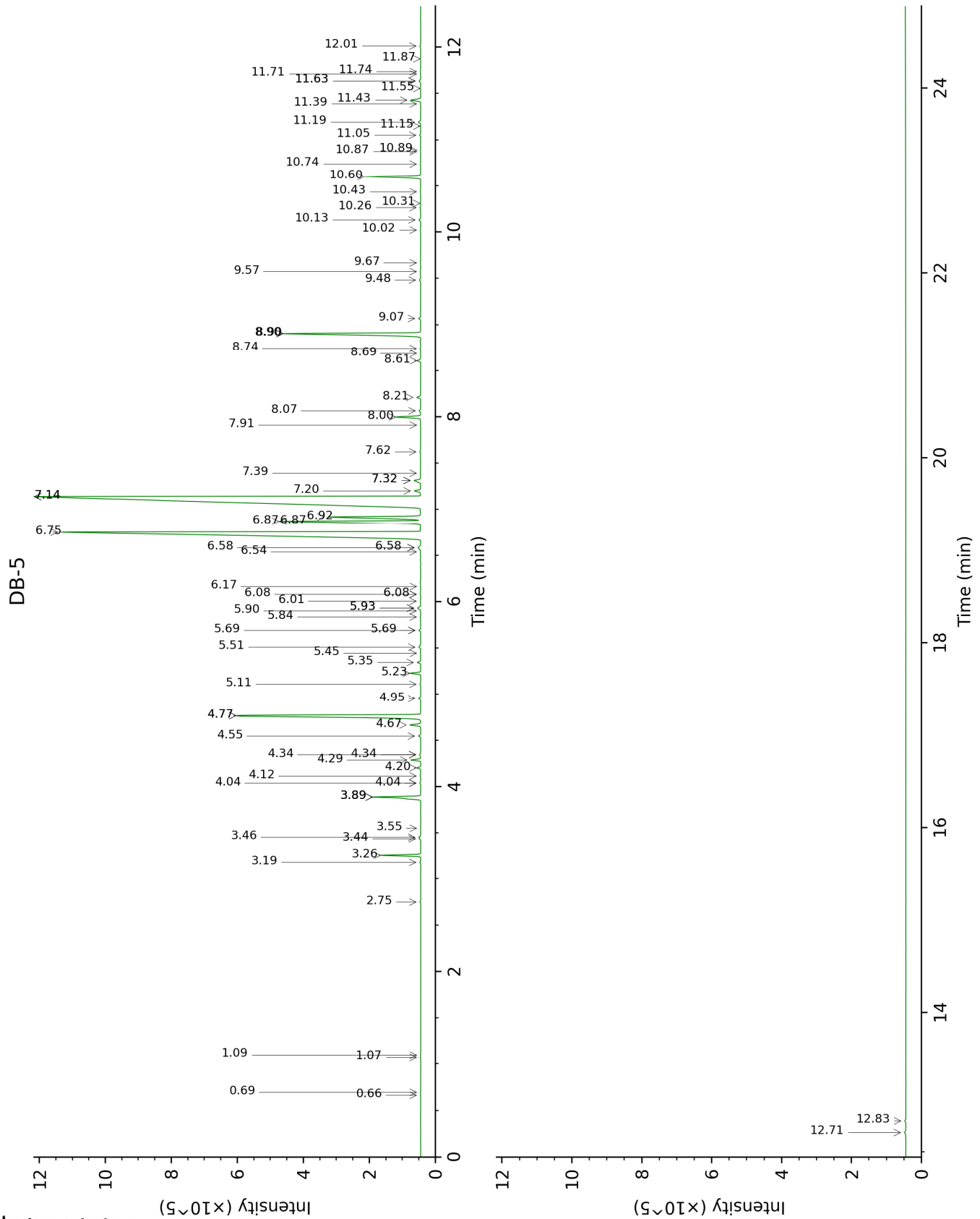
Note: no correction factor was applied

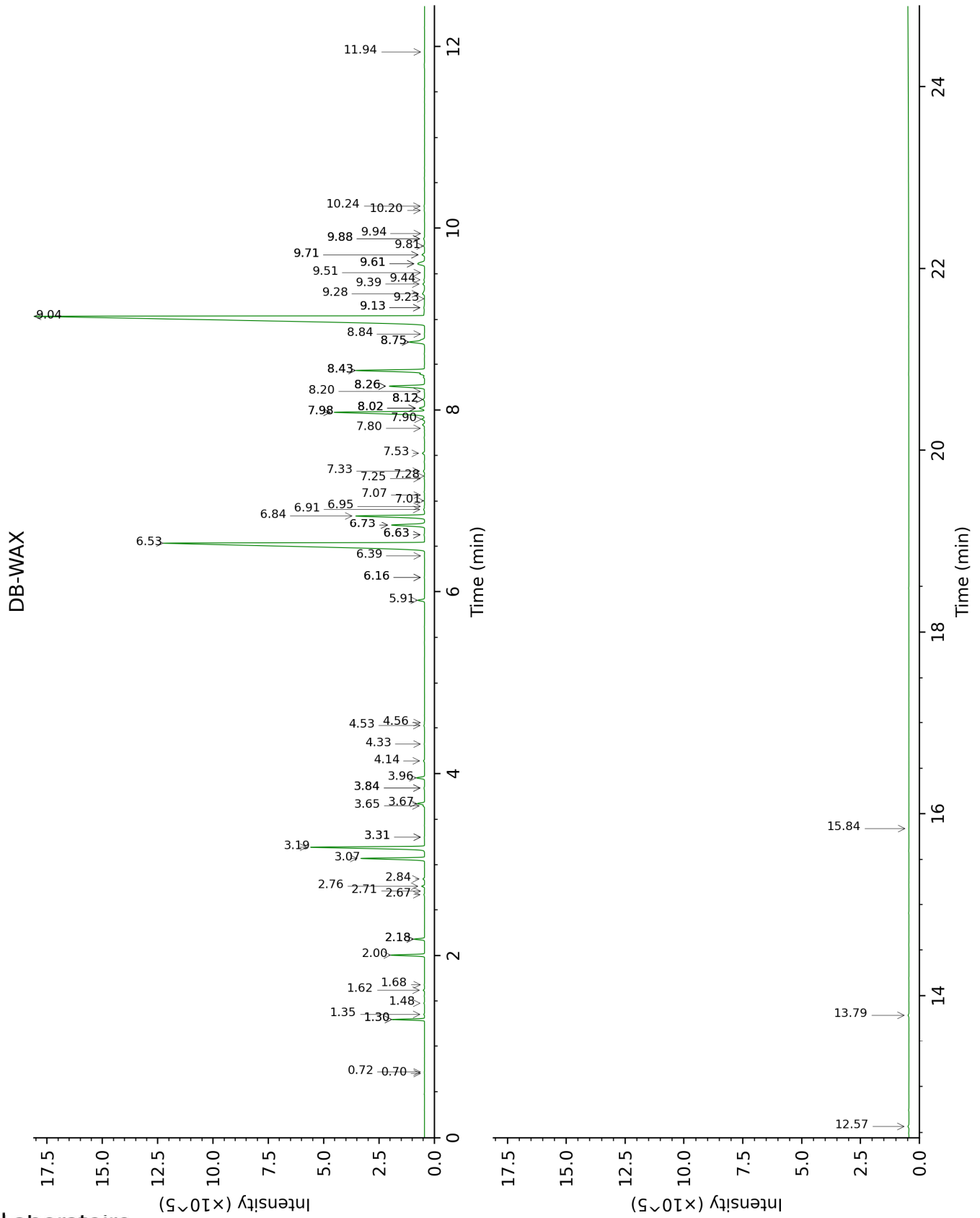
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.66	643	tr	0.72	882	tr
2-Methylbutyral	0.70	653	tr	0.70	877	tr
Isoamyl alcohol	1.07	732	tr	3.30*	1175	0.01
2-Methylbutanol	1.09	735	tr	3.30*	1175	[0.01]
<i>trans</i> -2,5-Diethyltetrahydrofuran	2.75	896	0.02	1.48	1011	0.03
α -Thujene	3.18	926	0.02	1.36	998	0.03
α -Pinene	3.26	931	0.99	1.30*	989	1.01
3-Methylcyclohexanone	3.44	942	0.03	4.53	1267	0.03
Camphene	3.46	943	0.05	1.62	1026	0.05
Thuja-2,4(10)-diene	3.55	950	0.01	2.18*	1082	0.38
<i>cis</i> -para-Menthane	3.89*	972	1.64	1.30*	989	[1.01]
Sabinene	3.89*	972	[1.64]	2.18*	1082	[0.38]
β -Pinene	3.89*	972	[1.64]	2.00	1064	1.25
Octen-3-ol	4.04*	982	0.03	6.63*	1417	0.03
<i>cis</i> -Carane	4.04*	982	[0.03]	1.68	1032	0.01
Octan-3-one	4.12	987	0.02	3.84*	1216	0.03
Myrcene	4.20	993	0.11	2.76	1132	0.11
Octan-3-ol	4.29	998	0.28	5.91	1365	0.29
Pseudolimonene	4.34*	1002	0.05	2.71	1127	0.01
α -Phellandrene	4.34*	1002	[0.05]	2.67	1124	0.03
α -Terpinene	4.55	1015	0.06	2.84	1138	0.06
para-Cymene	4.67	1022	0.34	3.96	1225	0.34
Limonene	4.77*	1028	8.51	3.07	1156	2.77
1,8-Cineole	4.77*	1028	[8.51]	3.20	1166	5.74
(<i>Z</i>)- β -Ocimene	4.95	1040	0.06	3.65	1202	0.05
(<i>E</i>)- β -Ocimene	5.11	1050	0.02	3.84*	1216	[0.03]
γ -Terpinene	5.23	1058	0.30	3.67	1204	0.31
<i>cis</i> -Sabinene hydrate	5.35	1065	0.11	6.73*	1425	1.73
<i>cis</i> -Linalool oxide (fur.)	5.45	1071	0.01	6.40	1400	0.01
Octanol	5.51	1075	0.08	8.02*	1523	0.27
Terpinolene	5.69*	1087	0.06	4.14	1238	0.05
para-Cymenene	5.69*	1087	[0.06]	6.16*	1383	0.01
<i>trans</i> -Sabinene hydrate	5.84	1096	0.02	7.80	1505	0.02
Nonan-3-ol	5.90	1100	0.01	7.25	1464	0.02
Linalool	5.93*	1102	0.14	7.90	1513	0.13
2-Methylbutyl 2-methylbutyrate	5.93*	1102	[0.14]	4.32	1252	0.02
Amyl isovalerate	6.01	1107	0.01	4.56	1269	0.01
β -Thujone	6.08*	1111	0.02	6.16*	1383	[0.01]
Phenylethyl alcohol	6.08*	1111	[0.02]	11.94	1847	0.01
<i>cis</i> -para-Menth-2-en-1-ol	6.16	1117	0.01	7.98*	1519	5.21
<i>trans</i> -Sabinol	6.54	1141	0.02	9.71*	1657	0.13
Isopulegol	6.58*	1144	0.15	8.02*	1523	[0.27]
<i>cis</i> - α -Dihydroterpineol	6.58*	1144	[0.15]	8.12*	1530	0.07

Menthone	6.75	1155	25.13	6.53	1410	25.10
Isomenthone	6.87*	1163	5.16	6.84	1433	3.54
Menthofuran	6.87*	1163	[5.16]	6.73*	1425	[1.73]
neo-Menthol	6.92	1166	3.40	8.43*	1555	3.36
Menthol	7.14*	1180	43.16	9.04	1602	42.47
Terpinen-4-ol	7.14*	1180	[43.16]	8.43*	1555	[3.36]
Isomenthol	7.20	1184	0.21	8.75*	1580	0.98
α -Terpineol	7.32*	1191	0.29	9.61*	1649	0.54
neoiso-Menthol	7.32*	1191	[0.29]	9.28	1622	0.16
Methylchavicol	7.39	1196	0.03	9.23	1618	0.02
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.62	1212	0.03			
(3Z)-Hexenyl 2-methylbutyrate	7.91	1231	0.01	6.94	1441	0.01
Pulegone	8.00	1237	0.78	8.75*	1580	[0.98]
Carvone	8.07	1242	0.06	9.88*	1671	0.06
Piperitone	8.21	1252	0.13	9.71*	1657	[0.13]
neo-Menthyl acetate	8.61	1279	0.12	7.53	1485	0.11
Bornyl acetate	8.69	1284	0.01	8.12*	1530	[0.07]
Dihydroedulan I	8.74	1288	0.02	7.01	1446	0.02
Menthyl acetate	8.90*	1299	5.09	7.98*	1519	[5.21]
Dihydroedulan II	8.90*	1299	[5.09]	7.28	1466	0.01
Isomenthyl acetate	9.07	1306	0.07	8.12*	1530	[0.07]
Bicycloelemene	9.48	1335	0.04	6.91	1439	0.05
Limonene <i>trans</i> -glycol	9.57	1341	0.01	15.84	2221	0.01
α -Cubebene	9.67	1348	0.02	6.63*	1417	[0.03]
α -Copaene	10.02	1373	0.01	7.07	1451	0.01
β -Bourbonene	10.13	1381	0.07	7.33	1470	0.06
β -Elemene	10.26	1390	0.02	8.26*	1542	1.88
Unknown [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]	10.31	1393	0.02			
Isocaryophyllene	10.43	1402	0.02	8.02*	1523	[0.27]
β -Caryophyllene	10.60	1414	1.86	8.26*	1542	[1.88]
β -Copaene	10.74	1425	0.02	8.20	1537	0.01
<i>trans</i> - α -Bergamotene	10.87	1435	0.01	8.26*	1542	[1.88]
Isogermacrene D	10.89	1436	0.01	8.84	1587	0.01
α -Humulene	11.05	1448	0.04	9.13*	1610	0.07
Muurolo-4,11-diene	11.15	1455	0.01	9.13*	1610	[0.07]
(<i>E</i>)- β -Farnesene	11.19	1458	0.08	9.39	1631	0.09
γ -Muurolole	11.39	1473	0.01	9.44	1634	0.04
Germacrene D	11.43	1476	0.35	9.61*	1649	[0.54]
Menthylactone	11.56	1486	0.02			
Bicyclogermacrene	11.64*	1492	0.06	9.88*	1671	[0.06]
Viridiflorene	11.64*	1492	[0.06]	9.51	1641	0.01
α -Muurolole	11.71	1497	0.01	9.94	1676	0.01
ϵ -Amorphene	11.74	1499	0.01	9.81	1665	0.04
γ -Cadinene	11.87	1510	0.01	10.20	1696	0.03
δ -Cadinene	12.01	1521	0.03	10.24	1700	0.03

Caryophyllene oxide	12.71	1575	0.07	12.57	1903	0.05
Viridiflorol	12.83	1585	0.05	13.79	2017	0.04
Total identified		99.70%			99.10%	
Total reported		99.74%			99.10%	

*: Two or more compounds are coeluting on this column

[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

R.T.: Retention time (minutes)

R.I.: Retention index