

Date : August 08, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22G29-FEP04


Customer identification : Mentha Spicata - China - 51080-04 - Steam Distilled

Type : Essential oil

Source : *Mentha spicata*

Customer : Fern & Petal

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 : Sylvain Mercier, M. Sc., Chimiste 2014-005

Analysis date : August 03, 2022

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4907 ± 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
Methyl 2-methylbutyrate	tr	Aliphatic ester
Ethyl 2-methylbutyrate	tr	Aliphatic ester
(3Z)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.02	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.03	Furan
Hashishene	0.04	Monoterpene
α -Thujene	0.04	Monoterpene
α -Pinene	0.99	Monoterpene
3-Methylcyclohexanone	0.09	Aliphatic ketone
Camphene	0.03	Monoterpene
α -Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	1.30	Monoterpene
Sabinene	0.50	Monoterpene
Octan-3-one	0.04	Aliphatic ketone
Myrcene	0.63	Monoterpene
Octan-3-ol	0.43	Aliphatic alcohol
α -Phellandrene	0.01	Monoterpene
Pseudolimonene	0.04	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Δ^3 -Carene	0.02	Monoterpene
α -Terpinene	0.03	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
para-Cymene	0.29	Monoterpene
Limonene	19.92	Monoterpene
1,8-Cineole	1.73	Monoterpenic ether
2-Ethylhexanol	0.03	Aliphatic alcohol
(Z)- β -Ocimene	0.03	Monoterpene
(E)- β -Ocimene	0.04	Monoterpene
γ -Terpinene	0.06	Monoterpene
<i>cis</i> -Sabinene hydrate	0.08	Monoterpenic alcohol
para-Mentha-3,8-diene	0.01	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
Terpinolene	0.04	Monoterpene
para-Cymenene	0.02	Monoterpene
<i>trans</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
Linalool	0.03	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
2-Methylbutyl 2-methylbutyrate	0.01	Aliphatic ester
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol

Octan-3-yl acetate	0.03	Aliphatic ester
<i>cis</i> -Limonene oxide	0.03	Monoterpenic ether
<i>cis</i> -para-Mentha-2,8-dien-1-ol	0.06	Monoterpenic alcohol
Isopulegol	0.02	Monoterpenic alcohol
Menthone	0.13	Monoterpenic ketone
Isomenthone	0.08	Monoterpenic ketone
Borneol	0.01	Monoterpenic alcohol
neo-Menthol	0.01	Monoterpenic alcohol
Menthofuran	tr	Monoterpenic ether
Menthol	0.49	Monoterpenic alcohol
Terpinen-4-ol	0.22	Monoterpenic alcohol
α -Terpineol	0.04	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
neoiso-Menthol	0.07	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.52	Monoterpenic ketone
<i>cis</i> -Piperitol	0.02	Monoterpenic alcohol
Dihydrocarveol	0.10	Monoterpenic alcohol
neo-Dihydrocarveol	0.14	Monoterpenic alcohol
Methylchavicol	0.15	Phenylpropanoid
<i>trans</i> -Isopiperitenol	tr	Monoterpenic alcohol
Myrtenol	0.01	Monoterpenic alcohol
<i>trans</i> -Dihydrocarvone	0.10	Monoterpenic ketone
iso-Dihydrocarveol ?	0.01	Monoterpenic alcohol
<i>trans</i> -Carveol	0.17	Monoterpenic alcohol
Pulegone	0.02	Monoterpenic ketone
<i>cis</i> -Carveol	0.05	Monoterpenic alcohol
Carvone	67.30	Monoterpenic ketone
Piperitone	0.14	Monoterpenic ketone
<i>trans</i> -Myrtenol	0.03	Monoterpenic alcohol
Isopiperitenone	0.02	Monoterpenic ketone
<i>trans</i> -Carvone oxide	0.04	Monoterpenic ketone
Decanol	0.02	Aliphatic alcohol
Dihydroedulan I	0.01	Terpenic ether
Menthyl acetate	0.06	Monoterpenic ester
Dihydroedulan II	0.01	Terpenic ether
Dihydrocarvyl acetate	0.08	Monoterpenic ester
Bicycloelemene	0.02	Sesquiterpene
<i>trans</i> -Carvyl acetate	0.01	Monoterpenic ester
α -Cubebene	0.01	Sesquiterpene
iso-Dihydrocarvyl acetate	0.01	Monoterpenic ester
<i>cis</i> -Carvyl acetate	0.07	Monoterpenic ester
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.35	Sesquiterpene
1,5-diepi- β -Bourbonene	0.04	Sesquiterpene
β -Elemene	0.04	Sesquiterpene
(<i>Z</i>)-Jasmone	0.06	Jasmonate
Unknown	0.01	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
β -Caryophyllene	1.16	Sesquiterpene
β -Copaene	0.06	Sesquiterpene
Aromadendrene	0.01	Sesquiterpene
Isogermacrene D	0.04	Sesquiterpene

α -Humulene	0.04	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
(E)- β -Farnesene	0.13	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.01	Sesquiterpene
γ -Muurolene	0.01	Sesquiterpene
Germacrene D	0.11	Sesquiterpene
Viridiflorene	0.02	Sesquiterpene
α -Muurolene	0.01	Sesquiterpene
γ -Cadinene	0.01	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
Caryophyllene oxide	0.10	Sesquiterpenic ether
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
Viridiflorol	0.03	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
Consolidated total	99.33%	

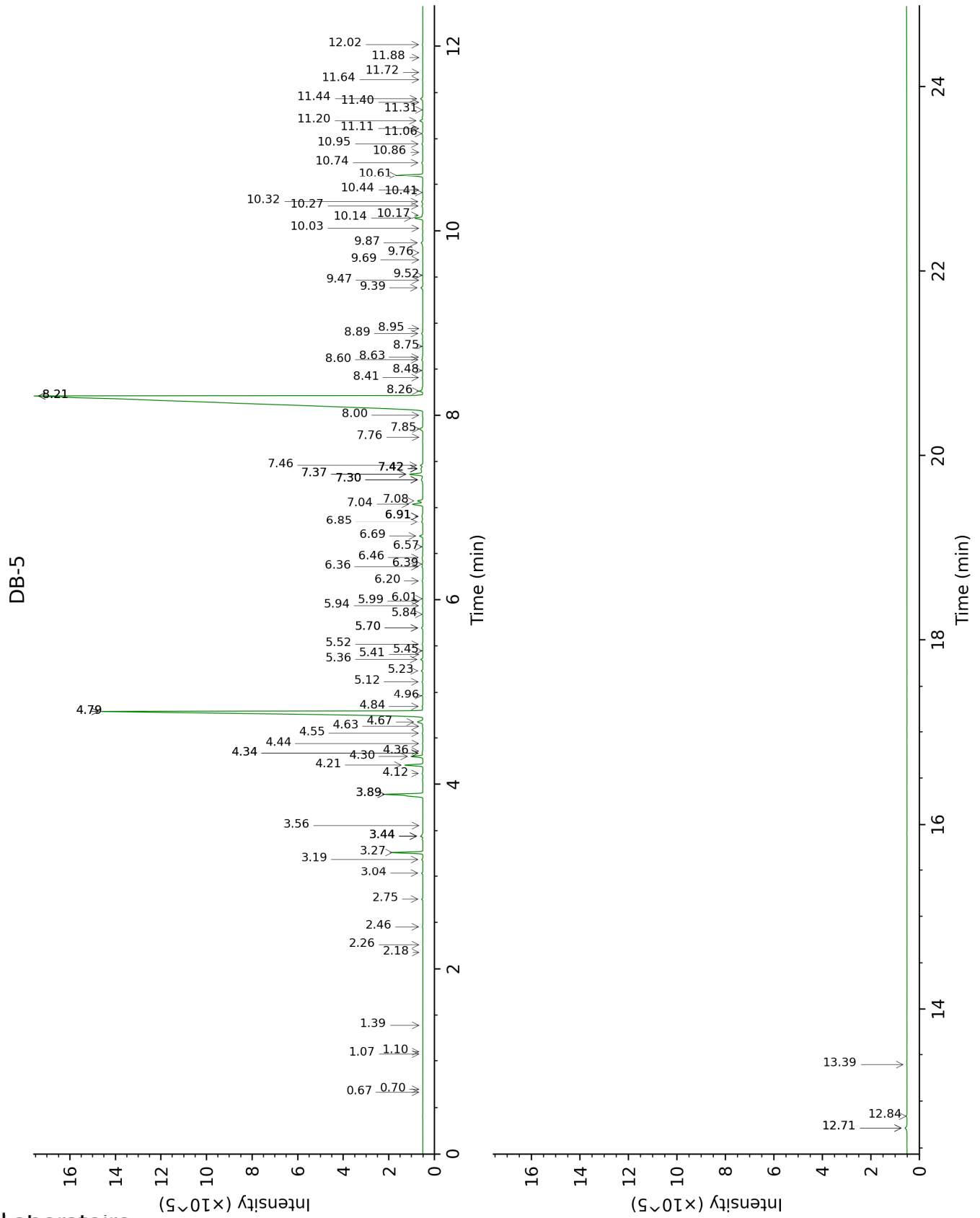
tr: The compound has been detected below 0.005% of total signal.

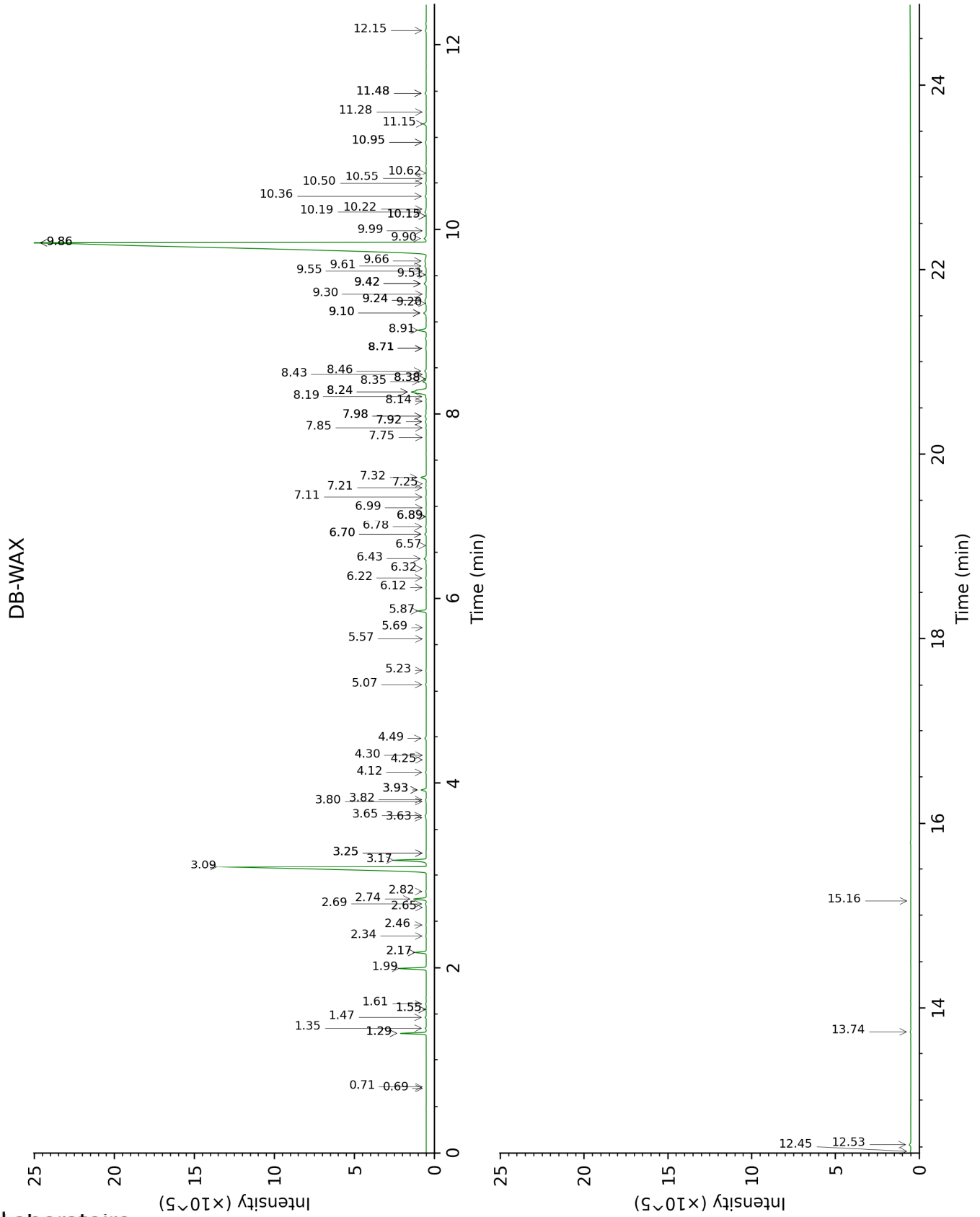
Note: no correction factor was applied

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.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.66	642	tr	0.71	886	tr
2-Methylbutyral	0.70	653	tr	0.70	880	tr
Isoamyl alcohol	1.07	733	tr	3.25*	1174	0.02
2-Methylbutanol	1.10	736	tr	3.25*	1174	[0.02]
Methyl 2-methylbutyrate	1.39	775	tr			
Ethyl 2-methylbutyrate	2.18	850	tr	1.55*	1023	0.01
(3Z)-Hexenol	2.26	857	0.01	5.57	1343	0.01
Hexanol	2.46	873	0.02	5.23	1318	0.02
<i>trans</i> -2,5-Diethyltetrahydrofuran	2.75	897	0.03	1.47	1015	0.04
Hashishene	3.04	916	0.04	1.29*	993	1.04
α -Thujene	3.19	927	0.04	1.35	1002	0.04
α -Pinene	3.26	932	0.99	1.29*	993	[1.04]
3-Methylcyclohexanone	3.44*†	943	0.13	4.48	1268	0.09
Camphene	3.44*†	943	[0.13]	1.61	1029	0.03
α -Fenchene	3.44*†	943	[0.13]	1.55*	1023	[0.01]
Thuja-2,4(10)-diene	3.56	950	0.01	2.17*	1084	0.51
β -Pinene	3.89*	973	1.82	1.99	1067	1.30
Sabinene	3.89*	973	[1.82]	2.17*	1084	[0.51]
Octan-3-one	4.12	987	0.04	3.82	1219	0.03
Myrcene	4.21	993	0.63	2.74	1134	0.63
Octan-3-ol	4.30	999	0.43	5.87	1365	0.43
α -Phellandrene	4.34*†	1002	0.05	2.65	1127	0.01
Pseudolimonene	4.34*†	1002	[0.05]	2.69	1130	0.04
Octanal	4.36†	1003	[0.05]	4.25	1251	0.01
Δ^3 -Carene	4.44	1008	0.02	2.46	1112	0.02
α -Terpinene	4.55	1015	0.03	2.82	1141	0.03
Carvomenthene	4.63	1020	0.02	2.34	1102	0.03
para-Cymene	4.67	1023	0.29	3.93*	1227	0.28
Limonene	4.79*	1030	21.70	3.09	1162	19.92
1,8-Cineole	4.79*	1030	[21.70]	3.17	1168	1.73
2-Ethylhexanol	4.84	1033	0.03	7.10	1458	0.03
(Z)- β -Ocimene	4.96	1040	0.03	3.63	1204	0.03
(E)- β -Ocimene	5.12	1050	0.04	3.80	1218	0.02
γ -Terpinene	5.23	1058	0.06	3.65	1206	0.07
<i>cis</i> -Sabinene hydrate	5.36	1065	0.08	6.70*	1427	0.09
para-Mentha-3,8-diene	5.41	1069	0.01	3.93*	1227	[0.28]
<i>cis</i> -Linalool oxide (fur.)	5.45	1071	0.01	6.32	1399	0.01
Octanol	5.52	1076	0.03	7.98*	1525	0.09
Terpinolene	5.70*	1086	0.06	4.12	1241	0.04
para-Cymenene	5.70*	1086	[0.06]	6.12	1384	0.02
<i>trans</i> -Sabinene hydrate	5.84	1096	0.01	7.75	1506	0.02
Linalool	5.94	1101	0.03	7.85	1515	0.02
Nonanal	5.99	1104	0.01	5.69	1352	0.01

2-Methylbutyl 2-methylbutyrate	6.01	1106	0.01	4.30	1255	0.01
<i>trans</i> -para-Mentha-2,8-dien-1-ol	6.20	1118	0.03	8.71*	1582	0.05
Octan-3-yl acetate	6.36	1128	0.03	5.07	1307	0.04
<i>cis</i> -Limonene oxide	6.39	1130	0.03	6.22	1391	0.04
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.46	1134	0.06	9.24*	1625	0.13
Isopulegol	6.57	1142	0.02	7.92*	1520	0.06
Menthone	6.69	1149	0.13	6.43	1407	0.14
Isomenthone	6.85	1159	0.08	6.78	1433	0.04
Borneol	6.91*	1163	0.07	9.55	1651	0.01
neo-Menthol	6.91*	1163	[0.07]	8.38*	1556	0.02
Menthofuran	6.91*	1163	[0.07]	6.70*	1427	[0.09]
Menthol	7.04	1172	0.49	8.91	1598	0.51
Terpinen-4-ol	7.08	1174	0.22	8.35	1554	0.21
α -Terpineol	7.30*	1188	0.12	9.51	1647	0.04
Myrtenal	7.30*	1188	[0.12]	8.43	1560	0.01
neoiso-Menthol	7.30*	1188	[0.12]	9.24*	1625	[0.13]
<i>cis</i> -Dihydrocarvone	7.36*	1192	0.60	8.24*	1545	1.68
<i>cis</i> -Piperitol	7.36*	1192	[0.60]	9.30	1630	0.02
Dihydrocarveol	7.42*	1196	0.15	10.19	1703	0.10
neo-Dihydrocarveol	7.42*	1196	[0.15]	9.90	1680	0.14
Methylchavicol	7.42*	1196	[0.15]	9.10*	1613	0.20
<i>trans</i> -Isopiperitenol	7.42*	1196	[0.15]	10.15*	1700	0.01
Myrtenol	7.42*	1196	[0.15]	10.62	1740	0.01
<i>trans</i> -Dihydrocarvone	7.46	1198	0.10	8.46	1563	0.10
iso-Dihydrocarveol ?	7.76	1218	0.01	10.55	1734	0.01
<i>trans</i> -Carveol	7.85	1224	0.17	11.15	1786	0.17
Pulegone	8.00	1234	0.02	8.71*	1582	[0.05]
<i>cis</i> -Carveol	8.21*	1248	67.60	11.48*	1814	0.08
Carvone	8.21*	1248	[67.60]	9.86*	1676	67.31
Piperitone	8.26	1252	0.14	9.66	1660	0.19
<i>trans</i> -Myrtanol	8.41	1261	0.03	11.48*	1814	[0.08]
Isopiperitenone	8.48	1266	0.02	10.95*	1768	0.06
<i>trans</i> -Carvone oxide	8.60	1274	0.04	10.95*	1768	[0.06]
Decanol	8.63	1276	0.02	10.50	1730	0.05
Dihydroedulan I	8.75	1284	0.01	6.89*	1442	0.02
Menthyl acetate	8.89	1294	0.06	7.92*	1520	[0.06]
Dihydroedulan II	8.95	1297	0.01	7.25	1469	0.02
Dihydrocarvyl acetate	9.39	1328	0.08	9.20	1622	0.04
Bicycloelemene	9.47	1334	0.02	6.89*	1442	[0.02]
<i>trans</i> -Carvyl acetate	9.52	1337	0.01	9.99	1687	0.01
α -Cubebene	9.69	1349	0.01	6.57	1418	0.02
iso-Dihydrocarvyl acetate	9.76	1354	0.01			
<i>cis</i> -Caryyl acetate	9.87	1362	0.07	10.36	1718	0.07
α -Copaene	10.03	1373	0.02	6.99	1449	0.02
β -Bourbonene	10.14	1381	0.35	7.32	1474	0.34
1,5-diepi- β -Bourbonene	10.17	1383	0.04	7.21	1465	0.04
β -Elemene	10.27	1390	0.04	8.19	1541	0.04

(Z)-Jasmone	10.32	1393	0.06	12.16	1875	0.05
Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	10.41	1400	0.01	11.28	1797	0.02
Isocaryophyllene	10.44	1402	0.01	7.98*	1525	[0.09]
β-Caryophyllene	10.61	1414	1.16	8.24*	1545	[1.68]
β-Copaene	10.74	1424	0.06	8.14	1537	0.02
Aromadendrene	10.86	1433	0.01	8.38*	1556	[0.02]
Isogermacrene D	10.95	1440	0.04	8.71*	1582	[0.05]
α-Humulene	11.06	1448	0.04	9.10*	1613	[0.20]
allo-Aromadendrene	11.11	1452	0.01	8.71*	1582	[0.05]
(E)-β-Farnesene	11.20	1458	0.13	9.42*	1640	0.15
trans-Cadina-1(6),4-diene	11.31	1467	0.01	9.10*	1613	[0.20]
γ-Murolene	11.40	1473	0.01	9.42*	1640	[0.15]
Germacrene D	11.44	1476	0.11	9.61	1655	0.11
Viridiflorene	11.64	1491	0.02	9.42*	1640	[0.15]
α-Murolene	11.72	1497	0.01	9.86*	1676	[67.31]
γ-Cadinene	11.88	1509	0.01	10.15*	1700	[0.01]
δ-Cadinene	12.02	1520	0.02	10.22	1706	0.02
Caryophyllene oxide	12.72*	1575	0.12	12.53	1909	0.10
Caryophyllene oxide isomer	12.72*	1575	[0.12]	12.45	1902	0.03
Viridiflorol	12.84	1585	0.03	13.74	2023	0.03
Isospathulenol	13.40	1629	0.01	15.16	2162	0.01
Total identified		99.52%			99.28%	
Total reported		99.53%			99.30%	

*: 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