

Date : 2024-02-27

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24B13-PTH01

Customer Identification : Western U.S. Peppermint - US - PF0110R

Type : Essential Oil

Source : *Mentha x piperita*

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

Date : 2024-02-21

PHYSICOCHEMICAL DATA

Refractive index : 1.4612 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2024-02-15

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	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
(3Z)-Hexenol	tr	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.01	Furan
Heptanal	0.01	Aliphatic aldehyde
α -Thujene	0.02	Monoterpene
α -Pinene	0.39	Monoterpene
Camphene	0.01	Monoterpene
3-Methylcyclohexanone	0.03	Aliphatic ketone
Sabinene	0.26	Monoterpene
β -Pinene	0.64	Monoterpene
<i>cis-para</i> -Menthane	tr	Monoterpene
Octen-3-ol	0.07	Aliphatic alcohol
<i>cis</i> -Carane	0.01	Monoterpene
<i>trans-para</i> -Menthane	tr	Monoterpene
Octan-3-one	0.05	Aliphatic ketone
Myrcene	0.17	Monoterpene
α -Phellandrene	0.01	Monoterpene
Octan-3-ol	0.24	Aliphatic alcohol
Pseudolimonene	0.03	Monoterpene
Δ^3 -Carene	0.02	Monoterpene
α -Terpinene	0.14	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
<i>para</i> -Cymene	0.12	Monoterpene
1,8-Cineole	3.96	Monoterpenic ether
Limonene	1.54	Monoterpene
2-Ethylhexanol	0.01	Aliphatic alcohol
(Z)- β -Ocimene	0.17	Monoterpene
(E)- β -Ocimene	0.06	Monoterpene
γ -Terpinene	0.24	Monoterpene
<i>cis</i> -Sabinene hydrate	0.77	Monoterpenic alcohol
<i>para</i> -Mentha-3,8-diene	0.01	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.07	Aliphatic alcohol
<i>para</i> -Cymenene	0.01	Monoterpene
Terpinolene	0.09	Monoterpene
<i>trans</i> -Sabinene hydrate	0.08	Monoterpenic alcohol

Linalool	0.20	Monoterpenic alcohol
Nonan-3-ol	0.02	Aliphatic alcohol
2-Methylbutyl 2-methylbutyrate	0.04	Aliphatic ester
Isoamyl isovalerate	0.01	Aliphatic ester
Amyl isovalerate	0.07	Aliphatic ester
Octen-3-yl acetate	0.02	Aliphatic ester
<i>cis-para</i> -Menth-2-en-1-ol	0.05	Monoterpenic alcohol
Octan-3-yl acetate	0.04	Aliphatic ester
<i>trans</i> -Sabinol	0.01	Monoterpenic alcohol
Isopulegol	0.16	Monoterpenic alcohol
Menthone	17.34	Monoterpenic ketone
Isomenthone	2.89	Monoterpenic ketone
Menthofuran	3.04	Monoterpenic ether
neo-Menthol	3.56	Monoterpenic alcohol
δ -Terpineol	0.05	Monoterpenic alcohol
Terpinen-4-ol	1.00	Monoterpenic alcohol
Menthol	45.27	Monoterpenic alcohol
Isomenthol	0.62	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.02	Monoterpenic alcohol
neoiso-Menthol	0.04	Monoterpenic alcohol
α -Terpineol	0.25	Monoterpenic alcohol
Myrtenal	0.03	Monoterpenic aldehyde
Myrtenol	0.01	Monoterpenic alcohol
<i>trans</i> -Isopiperitenol	0.06	Monoterpenic alcohol
Unknown	0.01	Unknown
<i>trans</i> -Piperitol	0.04	Monoterpenic alcohol
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
(3Z)-Hexenyl 2-methylbutyrate	0.03	Aliphatic ester
Pulegone	0.93	Monoterpenic ketone
Carvone	0.03	Monoterpenic ketone
Unknown	0.01	Unknown
Piperitone	0.53	Monoterpenic ketone
<i>cis</i> -Carvone oxide	0.01	Monoterpenic ketone
neo-Menthyl acetate	0.32	Monoterpenic ester
Decanol	0.09	Aliphatic alcohol
2-Ethylmenthone?	0.09	Aliphatic ketone
Dihydroedulan I	0.04	Terpenic ether
Menthyl acetate	6.97	Monoterpenic ester
Dihydroedulan II	0.05	Terpenic ether
Thymol	0.03	Monoterpenic alcohol
Isomenthyl acetate	0.26	Monoterpenic alcohol
neoiso-Menthyl acetate?	0.01	Monoterpenic ester
Bicycloelemene	0.05	Sesquiterpene
Menthofuro lactone isomer I	0.01	Monoterpenic lactone
Menthofuro lactone isomer II	0.02	Monoterpenic lactone

α -Cubebene	0.01	Sesquiterpene
Evodone	0.02	Monoterpenic ketone
Eugenol	0.03	Phenylpropanoid
α -Ylangene	0.01	Sesquiterpene
α -Copaene	0.04	Sesquiterpene
β -Bourbonene	0.31	Sesquiterpene
1,5-diepi- β -Bourbonene	0.02	Sesquiterpene
β -Cubebene	0.02	Sesquiterpene
β -Elemene	0.11	Sesquiterpene
Unknown	0.04	Unknown
Longifolene	0.02	Sesquiterpene
Isocaryophyllene	0.02	Sesquiterpene
Unknown	0.01	Unknown
β -Caryophyllene	2.57	Sesquiterpene
Unknown	0.01	Unknown
β -Copaene	0.08	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.02	Sesquiterpene
Isogermacrene D	0.05	Sesquiterpene
α -Humulene	0.15	Sesquiterpene
Muurola-4,11-diene	0.03	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.22	Sesquiterpene
γ -Muurolene	0.05	Sesquiterpene
Germacrene D	1.23	Sesquiterpene
Menthallactone	0.01	Monoterpenic lactone
Viridiflorene	0.03	Sesquiterpene
Bicyclogermacrene	0.21	Sesquiterpene
α -Muurolene	0.02	Sesquiterpene
ϵ -Amorphene	0.02	Sesquiterpene
γ -Cadinene	0.02	Sesquiterpene
<i>trans</i> -Calamenene	0.02	Sesquiterpene
δ -Cadinene	0.05	Sesquiterpene
α -Cadinene	tr	Sesquiterpene
Isocaryophyllene epoxide B	0.01	Sesquiterpenic ether
7 α -Hydroxymintlactone	0.01	Monoterpenic alcohol
(<i>E</i>)-Nerolidol	0.01	Sesquiterpenic alcohol
Spathulenol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.04	Sesquiterpenic ether
Viridiflorol	0.06	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.01	Sesquiterpenic alcohol
α -Cadinol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Consolidated total	99.27	

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

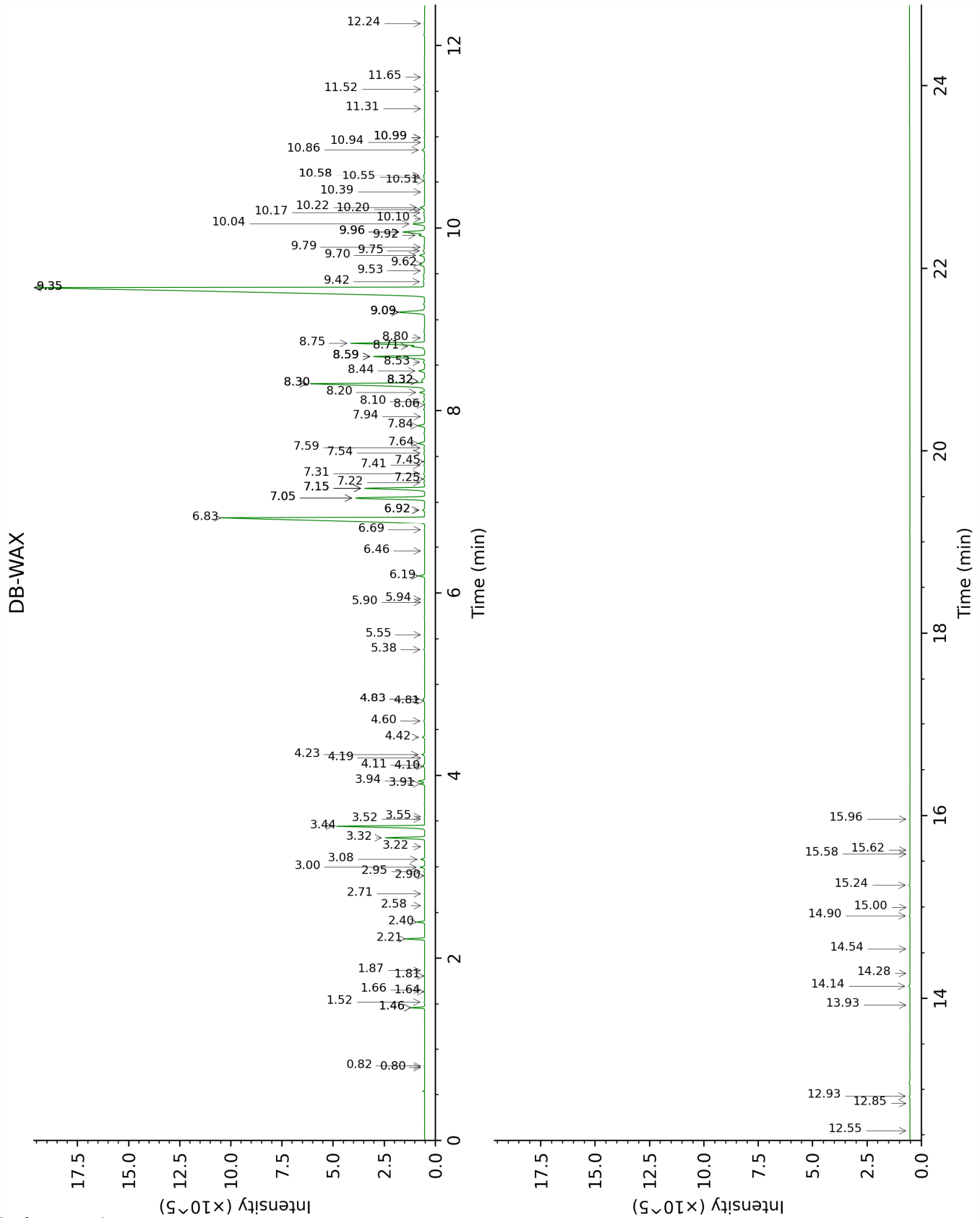
Note: no correction factor was applied

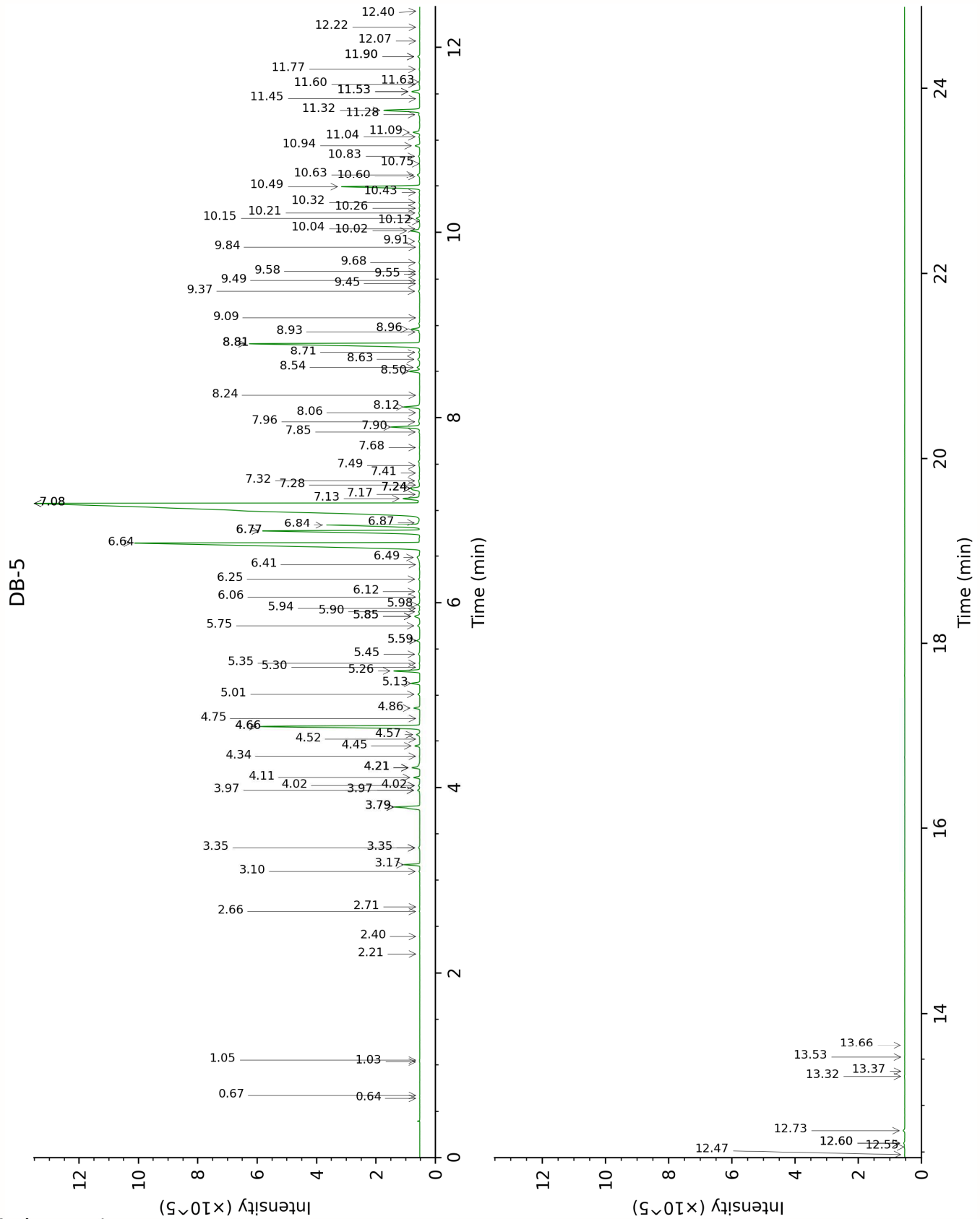
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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





FULL ANALYSIS DATA

Isovaleral	Column DB-WAX			Column DB-5		
	0.82	884.8	tr	0.64	641.2	tr
2-Methylbutyral	0.80	878.7	tr	0.67	651.6	tr
Isoamyl alcohol	3.55	1175.8	0.01	1.03	733.2	0.01
2-Methylbutanol	3.52	1173.7	0.02	1.05	736.0	tr
(3Z)-Hexenol	5.94	1347.5	0.01	2.21	858.6	tr
Hexanol	5.55	1319.3	0.01	2.40	874.1	0.01
<i>trans</i> -2,5-Diethyltetrahydrofuran	1.66	1014.4	0.01	2.66	896.1	0.01
Heptanal	3.22	1150.7	0.01	2.71	900.2	0.01
α -Thujene	1.52	1001.3	0.02	3.10	926.4	0.02
α -Pinene	1.46*	992.0	[0.39]	3.17	931.2	0.39
Camphene	1.81	1028.9	0.01	3.35*	943.1	[0.05]
3-Methylcyclohexanone	4.81	1268.2	0.03	3.35*	943.1	[0.05]
Sabinene	2.40	1084.5	0.26	3.79*	972.1	[0.91]
β -Pinene	2.21	1067.1	0.64	3.79*	972.1	[0.91]
<i>cis-para</i> -Menthane	1.46*	992.0	[0.39]	3.79*	972.1	[0.91]
Octen-3-ol	6.92*	1418.6	[0.09]	3.97*	984.0	[0.07]
<i>cis</i> -Carane	1.87	1034.6	0.01	3.97*	984.0	[0.07]
<i>trans-para</i> -Menthane	1.64	1012.7	tr	4.02*	987.4	[0.06]
Octan-3-one	4.11*†	1217.7	[0.07]	4.02*	987.4	[0.06]
Myrcene	3.00	1133.6	0.16	4.11	993.1	0.17
α -Phellandrene	2.90	1126.5	0.01	4.21*	1000.0	[0.30]
Octan-3-ol	6.19	1365.7	0.24	4.21*	1000.0	[0.30]
Pseudolimonene	2.95	1129.9	0.03	4.21*	1000.0	[0.30]
Δ 3-Carene	2.71	1111.5	0.01	4.34	1008.0	0.02
α -Terpinene	3.08	1140.2	0.14	4.45	1015.0	0.14
Carvomenthene	2.58	1101.5	0.01	4.52	1019.6	0.01
<i>para</i> -Cymene	4.23	1226.1	0.10	4.57	1022.6	0.12
1,8-Cineole	3.44	1167.8	3.96	4.66*	1028.1	[5.53]
Limonene	3.32	1158.2	1.54	4.66*	1028.1	[5.53]
2-Ethylhexanol	7.40	1455.2	0.04	4.74	1033.5	0.01
(Z)- β -Ocimene	3.91	1203.2	0.17	4.86	1040.5	0.17
(E)- β -Ocimene	4.10*†	1216.8	[0.03]	5.01	1050.3	0.06
γ -Terpinene	3.94	1205.4	0.25	5.13	1057.6	0.24
<i>cis</i> -Sabinene hydrate	7.05*	1428.5	[3.81]	5.26	1066.0	0.77
<i>para</i> -Mentha-3,8-diene	4.19	1223.4	tr	5.30	1068.4	0.01
<i>cis</i> -Linalool oxide (fur.)	6.69	1402.1	0.02	5.35	1071.1	0.02
Octanol	8.32*†	1524.6	[0.24]	5.44	1077.2	0.07
<i>para</i> -Cymenene	6.46	1385.4	0.01	5.59*	1086.4	[0.10]
Terpinolene	4.42	1239.7	0.09	5.59*	1086.4	[0.10]
<i>trans</i> -Sabinene hydrate	8.10	1507.2	0.07	5.75	1096.4	0.08

Linalool	8.20	1515.1	0.20	5.85*	1102.8	[0.22]
Nonan-3-ol	7.44	1458.2	0.02	5.85*	1102.8	[0.22]
2-Methylbutyl 2-methylbutyrate	4.60	1252.5	0.04	5.90	1105.9	0.04
Isoamyl isovalerate	4.83*	1269.6	[0.07]	5.94	1108.2	0.01
Amyl isovalerate	4.83*	1269.6	[0.07]	5.98	1110.7	0.07
Octen-3-yl acetate	5.90	1344.9	0.01	6.06	1116.0	0.02
<i>cis-para</i> -Menth-2-en-1-ol	8.30*†	1522.5	[7.12]	6.12	1119.8	0.05
Octan-3-yl acetate	5.38	1307.6	0.04	6.25	1128.3	0.04
<i>trans</i> -Sabinol	9.96*	1653.9	[1.26]	6.41	1138.3	0.01
Isopulegol	8.32*†	1524.6	[0.24]	6.49	1143.2	0.16
Menthone	6.83	1412.4	17.24	6.64	1153.1	17.34
Isomenthone	7.15*	1436.4	[2.89]	6.77*	1161.5	[5.93]
Menthofuran	7.05*	1428.5	[3.81]	6.77*	1161.5	[5.93]
neo-Menthol	8.75*†	1557.4	[3.45]	6.84	1165.7	3.56
δ-Terpineol	9.62†	1626.2	0.13	6.87	1167.5	0.05
Terpinen-4-ol	8.71*†	1554.8	[0.57]	7.08*	1180.9	[46.27]
Menthol	9.35*	1604.6	[45.29]	7.08*	1180.9	[46.27]
Isomenthol	9.08*	1583.8	[1.57]	7.13	1184.1	0.62
<i>para</i> -Cymen-8-ol	11.65	1795.9	0.01	7.18	1187.0	0.02
neoiso-Menthol	9.53	1619.5	0.04	7.24*	1191.2	[0.45]
α-Terpineol	9.92	1650.9	0.25	7.24*	1191.2	[0.45]
Myrtenal	8.80	1562.0	0.03	7.24*	1191.2	[0.45]
Myrtenol	10.99*	1739.8	[0.02]	7.28	1193.5	0.01
<i>trans</i> -Isopiperitenol	10.58*	1704.4	[0.07]	7.32	1196.4	0.06
Unknown MEPI V [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]				7.41	1201.7	0.01
<i>trans</i> -Piperitol	10.55	1702.4	0.03	7.49	1207.0	0.04
<i>trans</i> -Carveol	11.52	1784.6	0.01	7.68	1219.9	0.01
(3 <i>Z</i>)-Hexenyl 2-methylbutyrate	7.22	1441.1	0.05	7.85	1231.1	0.03
Pulegone	9.08*	1583.8	[1.57]	7.90	1234.7	0.93
Carvone	10.17	1670.9	0.05	7.96	1238.5	0.03
Unknown BUGR I [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25)...]	10.39	1689.3	0.01	8.06	1245.0	0.01
Piperitone	10.04	1661.0	0.54	8.12	1249.2	0.53
<i>cis</i> -Carvone oxide	10.99*	1739.8	[0.02]	8.24	1257.6	0.01
neo-Menthyl acetate	7.84	1487.5	0.31	8.50	1274.9	0.32
Decanol	10.86	1728.3	0.14	8.54	1277.6	0.09
2-Ethylmenthone?				8.63	1283.5	0.09
Dihydroedulan I	7.26	1444.0	0.05	8.71	1288.6	0.04

Menthyl acetate	8.30*†	1522.5	[7.12]	8.81*	1295.2	[7.02]
Dihydroedulan II	7.60	1469.4	0.05	8.81*	1295.2	[7.02]
Thymol	15.24	2128.6	0.04	8.93	1303.7	0.03
Isomenthyl acetate	8.44	1533.4	0.28	8.96	1305.7	0.26
neoiso-Menthyl acetate?				9.08	1314.3	0.01
Bicycloelemene	7.15*	1436.4	[2.89]	9.37	1334.4	0.05
Menthofuroolactone isomer I				9.45	1340.2	0.01
Menthofuroolactone isomer II				9.49	1342.5	0.02
α-Cubebene	6.92*	1418.6	[0.09]	9.55	1347.3	0.01
Evodone	12.55	1874.8	0.02	9.58	1349.4	0.02
Eugenol	14.90	2095.3	0.04	9.68	1356.0	0.03
α-Ylangene	7.15*	1436.4	[2.89]	9.84	1367.7	0.01
α-Copaene	7.31	1448.2	0.05	9.91	1372.2	0.04
β-Bourbonene	7.64	1473.1	0.30	10.02	1380.1	0.31
1,5-diepi-β-Bourbonene	7.54	1465.1	0.05	10.04	1381.6	0.02
β-Cubebene	7.94	1494.9	0.01	10.12	1387.2	0.02
β-Elemene	8.59*	1545.6	[2.54]	10.15	1389.6	0.11
Unknown MEPI VII [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]				10.21	1393.6	0.04
Longifolene	8.06	1504.4	0.01	10.26	1397.2	0.02
Isocaryophyllene	8.32*†	1524.6	[0.24]	10.32	1401.5	0.02
Unknown MEPI X [m/z 109, 95 (88), 69 (66), 135 (56), 82 (54), 41 (45)...]				10.43	1409.3	0.01
β-Caryophyllene	8.59*	1545.6	[2.54]	10.49	1414.0	2.57
Unknown MISC CX [m/z 177, 109 (32), 192 (26), 95 (25), 137 (23)]				10.60	1422.2	0.01
β-Copaene	8.53	1540.8	0.07	10.63	1423.9	0.08
trans-α-Bergamotene	8.59*	1545.6	[2.54]	10.75	1432.9	0.02
Isogermacrene D	9.08*	1583.8	[1.57]	10.83	1438.8	0.05
α-Humulene	9.42	1609.9	0.14	10.94	1447.3	0.15
Muurola-4,11-diene	9.35*	1604.6	[45.29]	11.04	1454.5	0.03
(E)-β-Farnesene	9.70	1633.2	0.23	11.09	1458.1	0.22
γ-Murolene	9.75	1637.2	0.08	11.28	1472.2	0.05
Germacrene D	9.96*	1653.9	[1.26]	11.32	1475.7	1.23
Menthylactone	15.96	2201.0	0.02	11.45	1485.0	0.01
Viridiflorene	9.79	1640.4	0.03	11.52*	1490.7	[0.27]

Bicyclogermacrene	10.22	1675.5	0.21	11.52*	1490.7	[0.27]
α-Murolene	10.20	1673.8	0.02	11.60	1496.6	0.02
ε-Amorphene	10.10	1665.5	0.02	11.63	1498.5	0.02
γ-Cadinene	10.51	1699.2	0.01	11.77	1508.8	0.02
trans-Calamenene	11.31	1766.7	0.02	11.90*	1519.5	[0.07]
δ-Cadinene	10.58*	1704.4	[0.07]	11.90*	1519.5	[0.07]
α-Cadinene	10.94	1735.4	0.01	12.07	1532.7	tr
Isocaryophyllene epoxide B	12.24	1847.6	0.02	12.22	1544.3	0.01
7α- Hydroxymintlactone				12.40	1558.3	0.01
(E)-Nerolidol	13.93	2001.4	0.01	12.47	1564.1	0.01
Spathulenol	14.54	2060.4	0.02	12.56	1570.7	0.02
Caryophyllene oxide isomer	12.85	1901.3	0.01	12.60*	1573.9	[0.05]
Caryophyllene oxide	12.92	1908.6	0.04	12.60*	1573.9	[0.05]
Viridiflorol	14.14	2021.4	0.06	12.73	1584.5	0.06
Isospathulenol	15.58	2162.7	0.01	13.32	1631.7	0.01
τ-Cadinol	15.00	2104.2	0.01	13.37	1636.2	0.01
α-Cadinol	15.62	2167.1	0.01	13.53	1649.0	0.01
Unknown HEBR IX [m/z 82, 81 (92), 95 (76), 67 (69), 93 (68), 107 (68), 79 (63), 91 (61)... 220 (11)]	14.28	2034.9	0.02	13.66	1659.8	0.01
Total reported		98.73%			99.50%	

*: 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