CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23L11-FSE02
Customer Identification : Peppermint Willamette
Type : Essential Oil
Source : *Mentha x piperita*
Customer : Flowers Shining Everywhere Inc.

Checked an approved by:

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

MÉTHODE CERTIFIÉE ISO 17025:2017 CERTIFIED METHOD

Laboratoire PhytoChemia

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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

Physicochemical data

Refractive index : 1.4599 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.

Conclusion

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

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Analysis Summary - Consolidated Contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Ethanol	0.01	Aliphatic alcohol
Isobutyral	0.02	Aliphatic aldehyde
Isobutanol	0.02	Aliphatic alcohol
Isovaleral	0.06	Aliphatic aldehyde
2-Methylbutyral	0.04	Aliphatic aldehyde
Penten-3-ol	tr	Aliphatic alcohol
Valeral	tr	Aliphatic aldehyde
2-Ethylfuran	0.02	Furan
Isoamyl alcohol	0.03	Aliphatic alcohol
2-Methylbutanol	0.03	Aliphatic alcohol
(2*E*)-Hexenal	0.03	Aliphatic aldehyde
(3*Z*)-Hexenol	0.02	Aliphatic alcohol
(2*E*)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.02	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.03	Furan
Heptanal	0.01	Aliphatic aldehyde
α-Thujene	0.05	Monoterpene
α-Pinene	0.67	Monoterpene
Camphene	0.02	Monoterpene
3-Methylcyclohexanone	0.02	Aliphatic ketone
α-Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.49	Monoterpene
β-Pinene	0.91	Monoterpene
Octen-3-ol	0.15	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
Myrcene	0.22	Monoterpene
Octan-3-ol	0.27	Aliphatic alcohol
α-Phellandrene	0.02	Monoterpene
Octanal	0.01	Aliphatic aldehyde
α-Terpinene	0.29	Monoterpene
para-Cymene	0.18	Monoterpene
1,8-Cineole	4.93	Monoterpenic ether
Limonene	1.46	Monoterpene
2-Ethylhexanol	0.01	Aliphatic alcohol
(*Z*)-β-Ocimene	0.25	Monoterpene
(*E*)-β-Ocimene	0.08	Monoterpene
γ-Terpinene	0.48	Monoterpene
cis-Sabinene hydrate	0.99	Monoterpenic alcohol

cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
trans-Linalool oxide (fur.)	tr	Monoterpenic alcohol
Terpinolene	0.14	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Sabinene hydrate	0.10	Monoterpenic alcohol
Nonan-3-ol	0.04	Aliphatic alcohol
Linalool	0.18	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.05	Aliphatic ester
Isoamyl isovalerate	0.02	Aliphatic ester
Amyl isovalerate	0.13	Aliphatic ester
Octen-3-yl acetate	0.02	Aliphatic ester
cis-para-Menth-2-en-1-ol	0.09	Monoterpenic alcohol
Octan-3-yl acetate	0.04	Aliphatic ester
allo-Ocimene	0.01	Monoterpene
trans-Sabinol	0.01	Monoterpenic alcohol
cis-α-Dihydroterpineol	0.03	Monoterpenic alcohol
neo-Isopulegol	0.05	Monoterpenic alcohol
Isopulegol	0.08	Monoterpenic alcohol
Menthone	21.78	Monoterpenic ketone
Isomenthone	2.83	Monoterpenic ketone
Menthofuran	1.60	Monoterpenic ether
neo-Menthol	3.35	Monoterpenic alcohol
δ-Terpineol	0.19	Monoterpenic alcohol
Lavandulol	0.05	Monoterpenic alcohol
Menthol	42.63	Monoterpenic alcohol
Terpinen-4-ol	1.03	Monoterpenic alcohol
Isomenthol	0.84	Monoterpenic alcohol
neoiso-Menthol	0.23	Monoterpenic alcohol
α-Terpineol	0.12	Monoterpenic alcohol
Myrtenol	0.01	Monoterpenic alcohol
trans-Isopiperitenol	0.02	Monoterpenic alcohol
Unknown	tr	Unknown
trans-Piperitol	0.01	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Pulegone	0.21	Monoterpenic ketone
Carvone	0.04	Monoterpenic ketone
Piperitone	0.44	Monoterpenic ketone
cis-Carvone oxide	0.01	Monoterpenic ketone
neo-Menthyl acetate	0.22	Monoterpenic ester
Decanol	0.02	Aliphatic alcohol
2-Ethylmenthone?	0.10	Aliphatic ketone
Dihydroedulan II	0.04	Terpenic ether
Menthyl acetate	4.91	Monoterpenic ester
Bicycloelemene	0.01	Sesquiterpene

Piperitenone	0.01	Monoterpenic ketone
α-Cubebene	0.01	Sesquiterpene
Evodone	0.02	Monoterpenic ketone
Eugenol	0.02	Phenylpropanoid
α-Copaene	0.05	Sesquiterpene
β-Bourbonene	0.31	Sesquiterpene
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.08	Sesquiterpene
Unknown	0.04	Unknown
Unknown	0.02	Sesquiterpene
Isocaryophyllene	0.03	Sesquiterpene
β-Caryophyllene	1.96	Sesquiterpene
β-Copaene	0.05	Sesquiterpene
trans-α-Bergamotene	0.01	Sesquiterpene
Isogermacrene D	0.03	Sesquiterpene
α-Humulene	0.08	Sesquiterpene
Muurola-4,11-diene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.33	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	1.61	Sesquiterpene
Menthalactone	0.01	Monoterpenic lactone
Bicyclogermacrene	0.29	Sesquiterpene
Viridiflorene	0.02	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.07	Sesquiterpene
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Spathulenol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Viridiflorol	0.18	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
τ-Muurolol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.01	Sesquiterpenic alcohol
Mint sulfide?	0.02	Sesquiterpenic sulfide
Phytone	0.01	Terpenic ketone
Consolidated total	**99.12**	

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.

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

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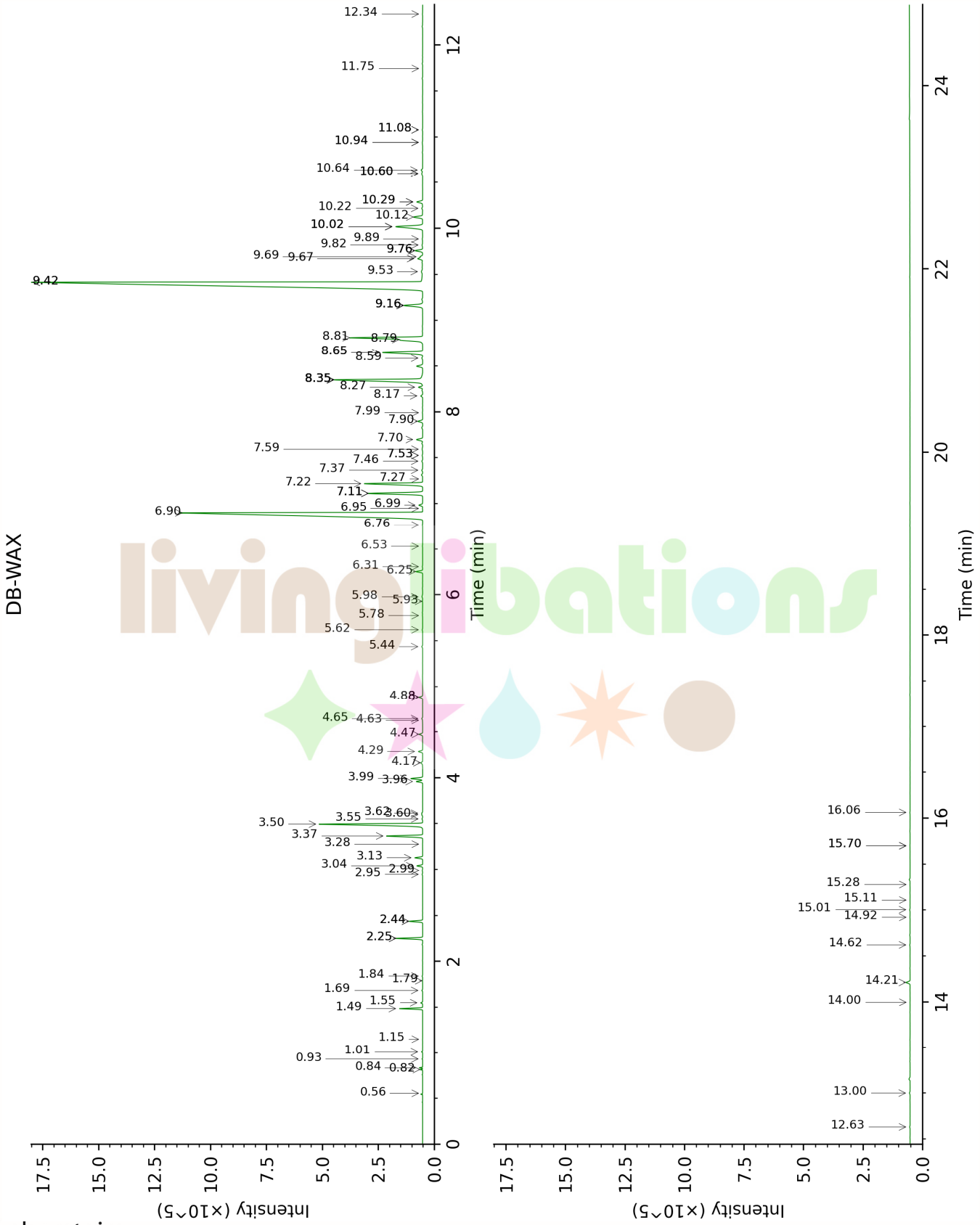

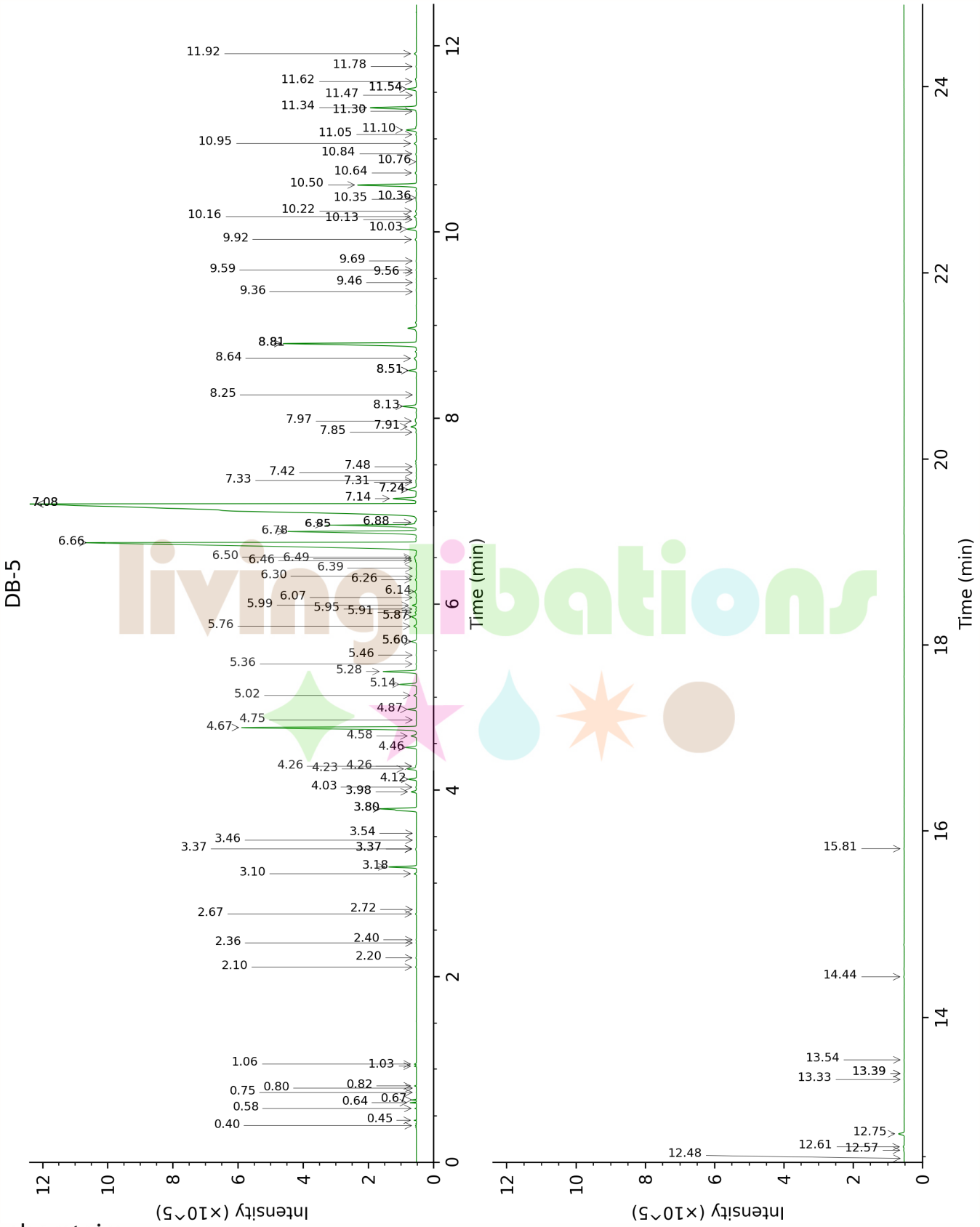

FULL ANALYSIS DATA

Ethanol	Column DB-WAX			Column DB-5		
	0.93	909.0	0.01	0.40	500.4	0.01
Isobutyral	0.56	784.0	tr	0.45	537.0	0.02
Isobutanol	2.25*	1067.5	[0.92]	0.58	620.3	0.02
Isovaleral	0.84	886.6	0.06	0.64	641.0	0.06
2-Methylbutyral	0.82	880.2	0.04	0.67	651.1	0.04
Penten-3-ol	2.99	1129.7	0.02	0.75	678.0	tr
Valeral	1.15	942.1	tr	0.80	693.4	tr
2-Ethylfuran	1.01	920.7	0.02	0.82	701.5	0.02
Isoamyl alcohol	3.62	1177.0	0.04	1.03	732.8	0.03
2-Methylbutanol	3.60	1175.8	0.04	1.06	735.9	0.03
(2*E*)-Hexenal	3.55	1172.3	0.03	2.10	849.6	0.03
(3*Z*)-Hexenol	5.93	1344.7	0.01	2.20	857.8	0.02
(2*E*)-Hexenol	6.31	1371.6	0.02	2.36	870.9	0.01
Hexanol	5.62	1322.5	0.02	2.40	873.7	0.02
trans-2,5-Diethyltetrahydrofuran	1.69	1013.9	0.02	2.67	896.4	0.03
Heptanal	3.28	1151.4	tr	2.72	900.3	0.01
α-Thujene	1.55	1001.3	0.05	3.10	926.4	0.05
α-Pinene	1.49	992.6	0.67	3.18	931.2	0.67
Camphene	1.84	1028.7	0.02	3.37*	943.9	[0.04]
3-Methylcyclohexanone	4.88*	1268.6	[0.16]	3.37*	943.9	[0.04]
α-Fenchene	1.79	1023.9	0.01	3.37*	943.9	[0.04]
Thuja-2,4(10)-diene	2.44*	1085.0	[0.47]	3.46	950.1	0.01
Benzaldehyde	7.53*	1460.8	[0.03]	3.54	954.9	0.01
Sabinene	2.44*	1085.0	[0.47]	3.80*	972.2	[1.40]
β-Pinene	2.25*	1067.5	[0.92]	3.80*	972.2	[1.40]
Octen-3-ol	6.98	1420.8	0.16	3.98	984.2	0.15
Octan-3-one	4.16*	1217.4	[0.09]	4.03	987.5	0.03
Myrcene	3.04	1133.5	0.21	4.12	993.1	0.22
Octan-3-ol	6.25	1367.8	0.27	4.23	1000.3	0.27
α-Phellandrene	2.95	1126.5	0.02	4.26*	1002.2	[0.04]
Octanal	4.63	1250.2	0.01	4.26*	1002.2	[0.04]
α-Terpinene	3.13	1140.2	0.30	4.46	1015.0	0.29
para-Cymene	4.29	1226.1	0.17	4.58	1022.6	0.18
1,8-Cineole	3.50	1168.0	4.93	4.67*	1028.3	[6.38]
Limonene	3.37	1158.2	1.46	4.67*	1028.3	[6.38]
2-Ethylhexanol	7.46	1456.1	0.04	4.75	1033.4	0.01
(*Z*)-β-Ocimene	3.96	1202.9	0.24	4.87	1040.4	0.25
(*E*)-β-Ocimene	4.16*	1217.4	[0.09]	5.02	1050.3	0.08
γ-Terpinene	3.99	1205.2	0.48	5.14	1057.7	0.48
cis-Sabinene hydrate	7.11*	1430.2	[2.61]	5.28	1066.3	0.99
cis-Linalool oxide (fur.)	6.76	1404.5	0.01	5.36	1071.3	0.02

Octanol	8.35*	1522.6	[5.15]	5.46	1077.3	0.02
trans-Linalool oxide (fur.)	7.11*	1430.2	[2.61]	5.60*	1086.4	[0.16]
Terpinolene	4.48	1239.5	0.14	5.60*	1086.4	[0.16]
para-Cymenene	6.53	1387.6	0.01	5.60*	1086.4	[0.16]
trans-Sabinene hydrate	8.17	1509.1	0.08	5.76	1096.6	0.10
Nonan-3-ol	7.53*	1460.8	[0.03]	5.87*	1103.0	[0.21]
Linalool	8.27	1516.4	0.18	5.87*	1103.0	[0.21]
2-Methylbutyl 2-methylbutyrate	4.65	1251.6	0.04	5.91	1105.9	0.05
Isoamyl isovalerate	4.88*	1268.6	[0.16]	5.95	1108.2	0.02
Amyl isovalerate	4.88*	1268.6	[0.16]	5.99	1110.8	0.13
Octen-3-yl acetate	5.98	1348.1	0.05	6.07	1116.0	0.02
cis-para-Menth-2-en-1-ol	8.35*	1522.6	[5.15]	6.14	1120.1	0.09
Octan-3-yl acetate	5.44	1309.4	0.04	6.26	1128.3	0.04
allo-Ocimene	5.78	1333.6	0.01	6.30	1130.6	0.01
trans-Sabinol	10.02*	1653.8	[1.74]	6.39	1136.1	0.01
cis-α-Dihydroterpineol	8.35*	1522.6	[5.15]	6.46	1141.1	0.03
neo-Isopulegol	8.35*	1522.6	[5.15]	6.49	1142.5	0.05
Isopulegol	8.35*	1522.6	[5.15]	6.50	1143.7	0.08
Menthone	6.90	1414.5	21.76	6.66	1153.5	21.78
Isomenthone	7.22	1438.1	2.83	6.78*	1161.2	[4.44]
Menthofuran	7.11*	1430.2	[2.61]	6.78*	1161.2	[4.44]
neo-Menthol	8.81*†	1558.4	[3.43]	6.85*	1165.9	[3.53]
δ-Terpineol	9.67*†	1625.9	[0.24]	6.85*	1165.9	[3.53]
Lavandulol	9.82	1637.8	0.04	6.88	1167.9	0.05
Menthol	9.42*	1605.1	[42.66]	7.08*	1180.5	[43.67]
Terpinen-4-ol	8.79*†	1556.9	[0.95]	7.08*	1180.5	[43.67]
Isomenthol	9.16*	1585.5	[1.03]	7.14	1184.2	0.84
neoiso-Menthol	9.69*†	1627.5	[0.10]	7.24*	1190.3	[0.35]
α-Terpineol	10.02*	1653.8	[1.74]	7.24*	1190.3	[0.35]
Myrtenol	11.08*	1741.3	[0.02]	7.31	1195.3	0.01
trans-Isopiperitenol	10.60*	1701.0	[0.07]	7.33	1196.5	0.02
Unknown MEPI V [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]				7.42	1201.7	tr
trans-Piperitol	10.60*	1701.0	[0.07]	7.48	1206.0	0.01
Citronellol	10.94*	1729.7	[0.03]	7.85	1230.7	0.02
Pulegone	9.16*	1585.5	[1.03]	7.91	1234.6	0.21
Carvone	10.22	1669.9	0.04	7.97	1238.7	0.04
Piperitone	10.12	1662.3	0.45	8.13	1249.3	0.44
cis-Carvone oxide	11.08*	1741.3	[0.02]	8.25	1257.4	0.01

neo-Menthyl acetate	7.90	1488.3	0.22	8.51*	1274.9	[0.25]
Decanol	10.94*	1729.7	[0.03]	8.51*	1274.9	[0.25]
2-Ethylmenthone?				8.64	1283.6	0.10
Dihydroedulan II	7.59	1465.7	0.04	8.81*	1294.7	[4.94]
Menthyl acetate	8.35*	1522.6	[5.15]	8.81*	1294.7	[4.94]
Bicycloelemene	7.27	1441.8	0.01	9.36	1333.1	0.01
Piperitenone	12.34	1850.0	0.01	9.46	1340.0	0.01
α-Cubebene	6.95	1418.1	0.01	9.56	1347.4	0.01
Evodone	12.63	1875.7	0.02	9.59	1349.5	0.02
Eugenol	15.00	2097.5	0.02	9.69	1356.3	0.02
α-Copaene	7.36	1448.8	0.04	9.92	1372.4	0.05
β-Bourbonene	7.70	1473.5	0.30	10.03	1380.2	0.31
β-Cubebene	7.99	1495.1	0.01	10.13	1387.4	0.02
β-Elemene	8.65*	1545.6	[1.98]	10.16	1389.6	0.08
Unknown MEPI VII [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]				10.22	1393.7	0.04
Unknown MEPI VIII [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	11.75	1797.7	0.01	10.35	1402.6	0.02
Isocaryophyllene	8.35*	1522.6	[5.15]	10.36	1403.7	0.03
β-Caryophyllene	8.65*	1545.6	[1.98]	10.50	1413.9	1.96
β-Copaene	8.59	1540.9	0.04	10.64	1424.0	0.05
trans-α-Bergamotene	8.65*	1545.6	[1.98]	10.76	1432.9	0.01
Isogermacrene D	9.16*	1585.5	[1.03]	10.84	1439.2	0.03
α-Humulene	9.53	1614.5	0.11	10.95	1447.5	0.08
Muurola-4,11-diene	9.42*	1605.1	[42.66]	11.05	1454.6	0.02
(*E*)-β-Farnesene	9.76*	1632.9	[0.34]	11.10	1458.2	0.33
γ-Muurolene	9.76*	1632.9	[0.34]	11.30	1473.1	0.02
Germacrene D	10.02*	1653.8	[1.74]	11.34	1476.0	1.61
Menthalactone	16.06	2203.7	0.01	11.47	1485.9	0.01
Bicyclogermacrene	10.29*	1675.5	[0.29]	11.54*	1490.9	[0.31]
Viridiflorene	9.89	1643.1	0.02	11.54*	1490.9	[0.31]
α-Muurolene	10.29*	1675.5	[0.29]	11.62	1496.8	0.02
γ-Cadinene	10.60*	1701.0	[0.07]	11.78	1509.0	0.02
δ-Cadinene	10.64	1704.3	0.08	11.92	1519.8	0.07
(*E*)-Nerolidol	14.00	2000.8	0.01	12.48	1564.3	0.01
Spathulenol	14.62	2060.6	0.02	12.57	1571.3	0.03
Caryophyllene oxide	13.00	1908.8	0.04	12.61	1574.1	0.04
Viridiflorol	14.21	2021.5	0.19	12.75	1585.1	0.18
Isospathulenol	15.70*	2167.0	[0.02]	13.33	1632.1	0.01
τ-Cadinol	15.11	2108.0	0.01	13.40*	1637.4	[0.01]
τ-Muurolol	15.28	2124.9	0.01	13.40*	1637.4	[0.01]

α-Cadinol	15.70*	2167.0	[0.02]	13.54	1649.5	0.01
Mint sulfide?				14.44	1724.6	0.02
Phytone	14.92	2089.5	0.01	15.81	1845.4	0.01
Total reported		98.65%			99.12%	

*: 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