

Date : 2024-05-16

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24E03-PTH03

Customer Identification : Sweet Marjoram - Hungary - M20113R

Type : Essential Oil

Source : *Origanum majorana* ct. Sabinene hydrate

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 : 2024-05-15

PHYSICOCHEMICAL DATA

Refractive index : 1.4589 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2024-05-08

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
Ethanol	0.01	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	0.01	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.01	Aliphatic ester
(2E)-Hexenal	0.02	Aliphatic aldehyde
(3Z)-Hexenol	0.01	Aliphatic alcohol
Hashishene	0.01	Monoterpene
Tricyclene	tr	Monoterpene
α -Thujene	0.49	Monoterpene
α -Pinene	0.81	Monoterpene
Camphene	0.04	Monoterpene
Sabinene	6.65	Monoterpene
β -Pinene	0.77	Monoterpene
3-Methyl-3-cyclohexenone	tr	Aliphatic ketone
Octen-3-ol	0.01	Aliphatic alcohol
3-Methylpentyl acetate	0.01	Aliphatic ester
Octan-3-one	0.04	Aliphatic ketone
Myrcene	1.49	Monoterpene
Pseudolimonene	0.06	Monoterpene
α -Phellandrene	0.30	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
(3Z)-Hexenyl acetate	tr	Aliphatic ester
α -Terpinene	7.45	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
<i>para</i> -Cymene	4.96	Monoterpene
β -Phellandrene	[1.46]	Monoterpene
Limonene	4.06	Monoterpene
1,8-Cineole	[1.46]	Monoterpenic ether
(Z)- β -Ocimene	0.02	Monoterpene
(E)- β -Ocimene	0.05	Monoterpene
γ -Terpinene	14.46	Monoterpene
<i>cis</i> -Sabinene hydrate	2.98	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
<i>para</i> -Cymenene	0.02	Monoterpene
Terpinolene	2.95	Monoterpene

<i>trans</i> -Sabinene hydrate	9.44	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Linalool	1.33	Monoterpenic alcohol
Unknown	0.04	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	1.15	Monoterpenic alcohol
α -Campholenal	0.03	Monoterpenic aldehyde
4-Hydroxy-4-methylcyclohex-2-enone	0.03	Aliphatic alcohol
<i>trans</i> -Pinocarveol	0.07	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.68	Monoterpenic alcohol
Unknown	0.03	Unknown
1,4-Dimethyl-4-acetylcyclohexene	0.04	Monoterpenic ketone
Pinocarvone	tr	Monoterpenic ketone
Isomenthone	0.01	Monoterpenic ketone
Borneol	0.07	Monoterpenic alcohol
δ -Terpineol	0.02	Monoterpenic alcohol
Terpinen-4-ol	22.47	Monoterpenic alcohol
Cryptone	0.03	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
α -Terpineol	2.53	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.07	Monoterpenic ketone
<i>cis</i> -Piperitol	0.26	Monoterpenic alcohol
Methylchavicol	0.02	Phenylpropanoid
<i>trans</i> -Dihydrocarvone	0.06	Monoterpenic ketone
Unknown	0.02	Unknown
<i>trans</i> -Piperitol	0.35	Monoterpenic alcohol
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
<i>cis</i> -Sabinene hydrate acetate?	0.01	Monoterpenic ester
Nerol	0.03	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Neral	0.03	Monoterpenic aldehyde
Carvone	tr	Monoterpenic ketone
Carvenone	0.02	Monoterpenic ketone
<i>trans</i> -Sabinene hydrate acetate	0.80	Monoterpenic ester
Linalyl acetate	4.08	Monoterpenic ester
Geraniol	0.15	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.07	Monoterpenic alcohol
Geranial	0.02	Monoterpenic aldehyde
Unknown	0.01	Unknown
Citronellyl formate	tr	Monoterpenic ester
Bornyl acetate	0.04	Monoterpenic ester
<i>cis</i> -Ascaridole glycol	0.04	Monoterpenic alcohol
Thymol analogue I (isothymol?)	tr	Monoterpenic alcohol
Terpinen-4-yl acetate	0.18	Monoterpenic ester

Thymol	0.05	Monoterpenic alcohol
Unknown	0.01	Monoterpenic alcohol
Bicycloelemene	0.03	Sesquiterpene
α -Cubebene	0.01	Sesquiterpene
Eugenol	0.01	Phenylpropanoid
Neryl acetate	0.02	Monoterpenic ester
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.15	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
β -Caryophyllene	3.37	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
Aromadendrene	0.03	Sesquiterpene
α -Humulene	0.09	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.02	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
Bicyclgermacrene	1.10	Sesquiterpene
Viridiflorene	0.03	Sesquiterpene
α -Muurolene	0.02	Sesquiterpene
γ -Cadinene	tr	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.04	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
Isocaryophyllene epoxide B	0.01	Sesquiterpenic ether
Spathulenol	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.27	Sesquiterpenic ether
Globulol	0.03	Sesquiterpenic alcohol
Viridiflorol	0.01	Sesquiterpenic alcohol
Humulene epoxide II	0.02	Sesquiterpenic ether
10- <i>epi</i> - γ -Eudesmol	0.01	Sesquiterpenic alcohol
Isospathulenol	0.05	Sesquiterpenic alcohol
τ -Cadinol	0.02	Sesquiterpenic alcohol
Consolidated total	99.20	

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

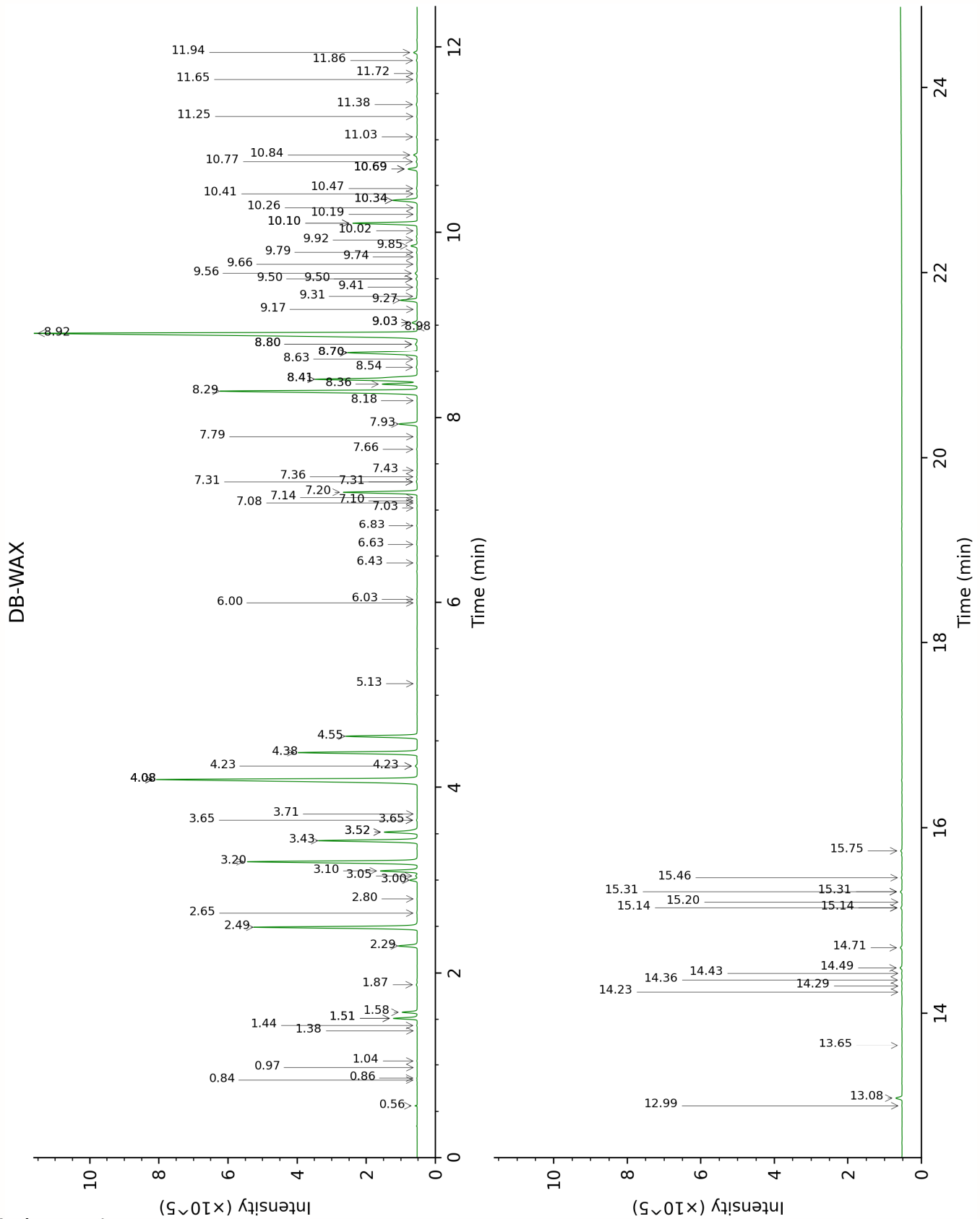
Note: no correction factor was applied

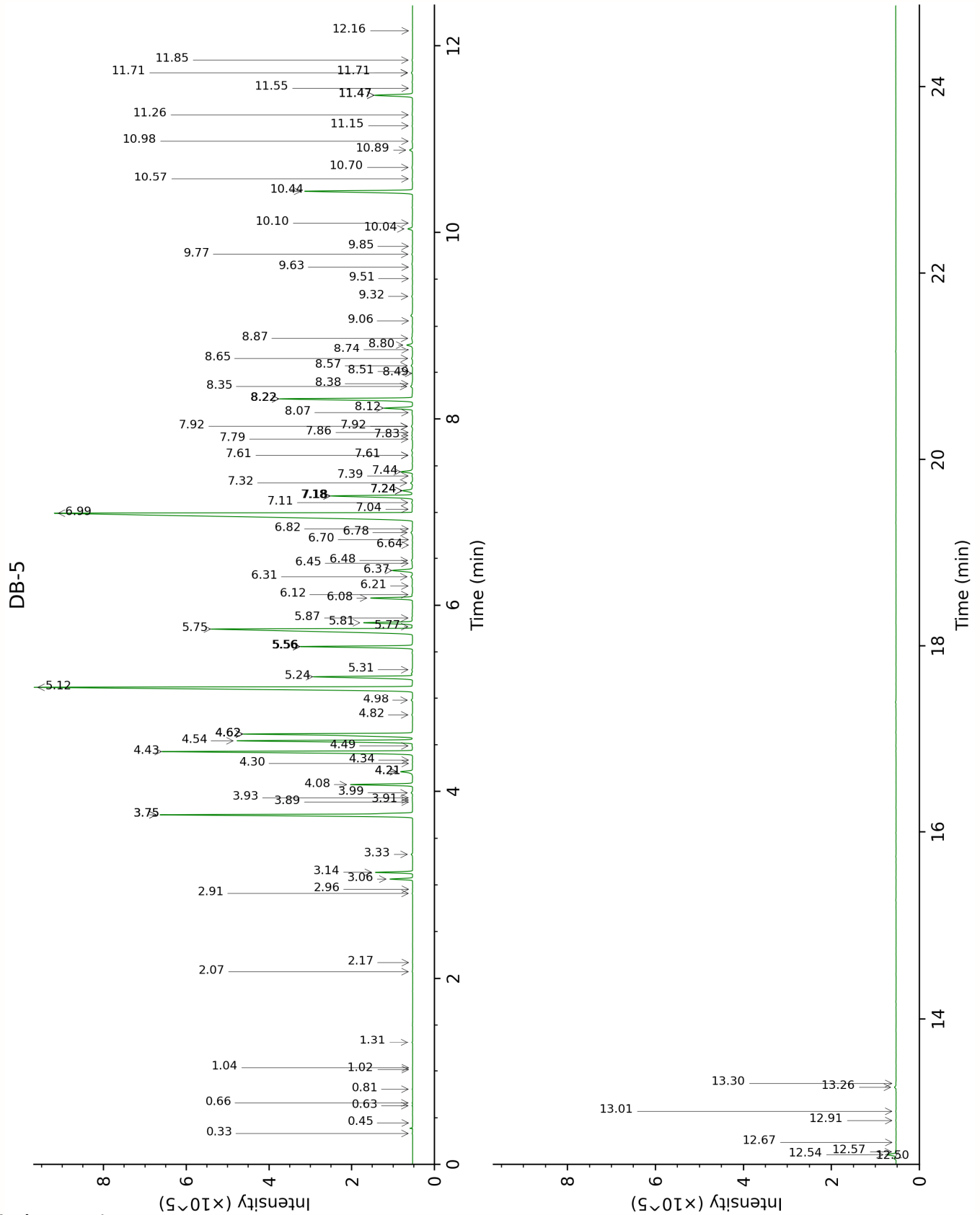
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Ethanol	Column DB-WAX			Column DB-5		
	0.97	908.0	tr	0.33	499.5	0.01
Isobutylal	0.56	778.9	0.03	0.45	537.9	tr
Isovaleral	0.86	888.8	0.01	0.63	641.5	0.01
2-Methylbutylal	0.84	881.3	tr	0.66	651.9	0.01
2-Ethylfuran	1.04	919.1	0.01	0.81	702.8	0.01
Isoamyl alcohol	3.65*	1174.9	[0.03]	1.02	733.4	tr
2-Methylbutanol	3.71	1180.0	0.01	1.04	736.1	tr
Methyl 2-methylbutyrate	1.44	979.9	0.02	1.31	774.8	0.01
(2E)-Hexenal	3.65*	1174.9	[0.03]	2.07	850.1	0.02
(3Z)-Hexenol	6.03	1347.0	0.01	2.17	858.1	0.01
Hashishene	1.51*	991.8	[0.83]	2.91	916.5	0.01
Tricyclene	1.38	971.0	tr	2.96	919.4	tr
α -Thujene	1.58	998.7	0.50	3.06	926.7	0.49
α -Pinene	1.51*	991.8	[0.83]	3.14	931.5	0.81
Camphene	1.87	1027.2	0.04	3.33	944.2	0.04
Sabinene	2.49	1086.3	6.65	3.75*	972.2	[7.45]
β -Pinene	2.29	1067.1	0.77	3.75*	972.2	[7.45]
3-Methyl-3-cyclohexenone	6.43	1375.2	0.02	3.89	981.2	tr
Octen-3-ol	7.03	1419.0	0.01	3.91	982.7	0.01
3-Methylpentyl acetate	4.08*	1206.8	[14.40]	3.93	984.2	0.01
Octan-3-one	4.23*	1217.0	[0.08]	3.99	987.7	0.04
Myrcene	3.10	1133.8	1.50	4.08	993.6	1.49
Pseudolimonene	3.05	1129.7	0.06	4.21*	1002.7	[0.37]
α -Phellandrene	3.00	1126.2	0.30	4.21*	1002.7	[0.37]
Δ^3 -Carene	2.80	1110.9	0.01	4.30	1008.3	0.01
(3Z)-Hexenyl acetate	5.13	1279.2	0.01	4.34	1010.6	tr
α -Terpinene	3.20	1141.3	7.42	4.43	1016.3	7.45
Carvomenthene	2.65	1099.3	0.02	4.49	1020.1	0.02
<i>para</i> -Cymene	4.38	1227.1	4.96	4.54	1023.5	4.96
β -Phellandrene	3.52*	1165.3	[1.46]	4.62*	1028.1	[5.55]
Limonene	3.43	1158.4	4.06	4.62*	1028.1	[5.55]
1,8-Cineole	3.52*	1165.3	[1.46]	4.62*	1028.1	[5.55]
(Z)- β -Ocimene	4.08*	1206.8	[14.40]	4.82	1041.0	0.02
(E)- β -Ocimene	4.23*	1217.0	[0.08]	4.98	1050.8	0.05
γ -Terpinene	4.08*	1206.8	[14.40]	5.12	1059.9	14.46
<i>cis</i> -Sabinene hydrate	7.20	1431.5	3.01	5.24	1067.0	2.98
<i>cis</i> -Linalool oxide (fur.)	6.83	1404.3	0.02	5.31	1071.8	0.02

<i>trans</i> -Linalool oxide (fur.)	7.14	1427.2	0.02	5.56*	1087.3	[2.98]
<i>para</i> -Cymenene	6.63	1389.4	0.02	5.56*	1087.3	[2.98]
Terpinolene	4.55	1239.4	2.95	5.56*	1087.3	[2.98]
<i>trans</i> -Sabinene hydrate	8.29	1512.7	9.47	5.75	1099.0	9.44
Unknown CEDE I [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	6.00	1344.3	0.01	5.77	1100.7	0.02
Linalool	8.36	1518.6	1.33	5.81	1103.3	1.33
Unknown ORMA I [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	8.70*	1544.7	[3.36]	5.86	1106.5	0.04
<i>cis-para</i> -Menth-2-en-1-ol	8.41*	1522.6	[5.26]	6.08	1120.2	1.15
α -Campholenal	7.31*	1439.7	[0.04]	6.12	1122.5	0.03
4-Hydroxy-4-methylcyclohex-2-enone	14.36	2027.6	0.04	6.21	1128.4	0.03
<i>trans</i> -Pinocarveol	9.50*	1606.9	[0.05]	6.31	1134.8	0.07
<i>trans-para</i> -Menth-2-en-1-ol	9.27	1588.5	0.70	6.37	1139.0	0.68
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	7.08	1422.9	0.01	6.45	1143.9	0.03
1,4-Dimethyl-4-acetylcyclohexene	7.66	1465.6	0.02	6.48	1145.9	0.04
Pinocarvone	8.18	1504.9	0.01	6.64	1156.4	tr
Isomenthone	7.31*	1439.7	[0.04]	6.70	1160.1	0.01
Borneol	10.10*	1654.9	[2.60]	6.78	1165.0	0.07
δ -Terpineol	9.74	1625.8	0.01	6.82	1167.5	0.02
Terpinen-4-ol	8.92	1561.2	22.35	6.99	1178.7	22.47
Cryptone	9.41	1599.7	0.03	7.04	1181.4	0.03
<i>para</i> -Cymen-8-ol	11.86	1801.5	0.03	7.11	1186.0	0.04
Myrtenal	8.98	1565.9	0.01	7.18*	1190.5	[2.54]
α -Terpineol	10.10*	1654.9	[2.60]	7.18*	1190.5	[2.54]
<i>cis</i> -Dihydrocarvone	8.80*	1552.2	[0.10]	7.24*	1194.1	[0.35]
<i>cis</i> -Piperitol	9.85	1635.3	0.26	7.24*	1194.1	[0.35]
Methylchavicol	9.66	1619.5	0.02	7.24*	1194.1	[0.35]

<i>trans</i> -Dihydrocarvone	9.03*	1570.0	[0.23]	7.32	1199.4	0.06
Unknown PIMA 7 [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	11.25	1750.3	0.02	7.39	1204.2	0.02
<i>trans</i> -Piperitol	10.69*	1702.8	[0.38]	7.44	1207.2	0.35
<i>trans</i> -Carveol	11.72	1789.2	0.02	7.61*	1219.0	[0.03]
<i>cis</i> -Sabinene hydrate acetate?	7.80	1475.6	0.01	7.61*	1219.0	[0.03]
Nerol	11.38	1761.1	0.05	7.79	1230.5	0.03
Citronellol	11.03	1731.8	0.03	7.82	1233.2	0.03
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.65	1783.7	0.04	7.86	1235.3	0.02
Neral	9.78	1629.8	0.03	7.92*	1239.7	[0.04]
Carvone	10.26	1668.1	tr	7.92*	1239.7	[0.04]
Carvenone	10.19	1662.5	0.02	8.07	1249.6	0.02
<i>trans</i> -Sabinene hydrate acetate	7.93	1485.7	0.78	8.12	1252.8	0.80
Linalyl acetate	8.41*	1522.6	[5.26]	8.22*	1259.4	[4.23]
Geraniol	11.94	1809.0	0.15	8.22*	1259.4	[4.23]
<i>trans</i> -Ascaridole glycol	14.49	2040.1	0.09	8.35	1268.3	0.07
Geranial	10.41	1680.2	0.02	8.38	1270.3	0.02
Unknown CIAU IV [m/z 43, 79 (78), 128 (46), 58 (42), 127 (42)...]	13.00	1901.7	0.01	8.49	1277.7	0.01
Citronellyl formate	9.17	1581.0	0.01	8.51	1279.1	tr
Bornyl acetate	8.54	1532.6	0.05	8.57	1283.2	0.04
<i>cis</i> -Ascaridole glycol	15.14*	2102.1	[0.06]	8.65	1288.4	0.04
Thymol analogue I (isothymol?)	15.31*	2119.2	[0.07]	8.74	1294.7	tr
Terpinen-4-yl acetate	9.03*	1570.0	[0.23]	8.80	1298.5	0.18
Thymol	15.46	2134.0	0.04	8.87	1303.3	0.05
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.31*	2119.2	[0.07]	9.06	1316.4	0.01
Bicycloelemene	7.36	1443.8	0.02	9.32	1334.8	0.03

α -Cubebene	7.10	1424.6	0.01	9.51	1348.2	0.01
Eugenol	15.14*	2102.1	[0.06]	9.63	1356.8	0.01
Neryl acetate	10.47	1684.8	0.04	9.77	1366.5	0.02
α -Copaene	7.43	1448.8	0.01	9.85	1372.5	0.01
Geranyl acetate	10.84	1715.5	0.17	10.04	1385.6	0.15
β -Elemene	8.70*	1544.7	[3.36]	10.10	1389.9	0.02
β -Caryophyllene	8.70*	1544.7	[3.36]	10.44	1414.4	3.37
β -Copaene	8.63	1539.3	0.02	10.57	1424.3	0.03
Aromadendrene	8.80*	1552.2	[0.10]	10.70	1433.9	0.03
α -Humulene	9.56	1611.7	0.09	10.89	1447.8	0.09
allo-Aromadendrene	9.31	1591.8	0.03	10.98	1454.8	0.02
<i>trans</i> -Cadina-1(6),4-diene	9.50*	1606.9	[0.05]	11.15	1467.1	0.02
Germacrene D	10.02	1648.3	0.01	11.26	1475.8	0.03
Bicyclogermacrene	10.34*	1674.6	[1.12]	11.47*	1491.5	[1.13]
Viridiflorene	9.92	1640.4	0.03	11.47*	1491.5	[1.13]
α -Muurolene	10.34*	1674.6	[1.12]	11.55	1497.1	0.02
γ -Cadinene	10.69*	1702.8	[0.38]	11.71*	1509.6	[0.04]
(3E,6E)- α -Farnesene	10.77	1709.4	0.04	11.71*	1509.6	[0.04]
δ -Cadinene	10.69*	1702.8	[0.38]	11.85	1520.3	0.02
Isocaryophyllene epoxide B				12.16	1544.9	0.01
Spathulenol	14.71	2060.6	0.09	12.50	1571.4	0.07
Caryophyllene oxide	13.08	1909.3	0.27	12.54	1574.6	0.27
Globulol	14.23	2015.2	0.02	12.57	1577.1	0.03
Viridiflorol	14.29	2021.5	0.01	12.67	1584.9	0.01
Humulene epoxide II	13.65	1961.3	0.02	12.91	1603.3	0.02
10-epi- γ -Eudesmol	14.43	2034.5	0.02	13.00	1611.5	0.01
Isospathulenol	15.75	2162.4	0.06	13.26	1632.8	0.05
τ -Cadinol	15.20	2108.2	0.01	13.30	1636.2	0.02
Total reported		99.14%			99.27%	

*: 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