

Date : 2024-04-15

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24C28-PTH01

Customer Identification : Organic Marjoram - Egypt - MJ0110R

Type : Essential Oil

Source : *Origanum majorana* ct. Sabinene hydrate

Customer : Plant Therapy

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

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 : 2024-04-10

PHYSICOCHEMICAL DATA

Refractive index : 1.4735 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2024-03-28

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
Isobutyral	tr	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	0.01	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl 2-methylbutyrate	0.02	Aliphatic ester
Hexanal	0.01	Aliphatic aldehyde
Octane	tr	Alkane
(2E)-Hexenal	0.02	Aliphatic aldehyde
(3Z)-Hexenol	0.02	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Hashishene	0.01	Monoterpene
Isobutyl isobutyrate	tr	Aliphatic ester
Tricyclene	tr	Monoterpene
α -Thujene	0.68	Monoterpene
α -Pinene	0.81	Monoterpene
Camphene	0.03	Monoterpene
α -Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	0.46	Monoterpene
Sabinene	8.19	Monoterpene
Octen-3-ol	0.01	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
Myrcene	1.99	Monoterpene
Pseudolimonene	0.06	Monoterpene
α -Phellandrene	0.44	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
α -Terpinene	8.51	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
<i>para</i> -Cymene	1.27	Monoterpene
1,8-Cineole	0.14	Monoterpenic ether
Limonene	1.83	Monoterpene
β -Phellandrene	1.91	Monoterpene
(Z)- β -Ocimene	0.03	Monoterpene
(E)- β -Ocimene	0.04	Monoterpene
γ -Terpinene	13.63	Monoterpene
<i>cis</i> -Sabinene hydrate	3.22	Monoterpenic alcohol

<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	3.13	Monoterpene
<i>para</i> -Cymenene	0.02	Monoterpene
<i>trans</i> -Sabinene hydrate	11.32	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Linalool	4.95	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	1.45	Monoterpenic alcohol
α -Campholenal	0.04	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	0.86	Monoterpenic alcohol
Epoxyterpinolene	0.01	Monoterpenic ether
Camphene hydrate	tr	Monoterpenic alcohol
1,4-Dimethyl-4-acetylcyclohexene	0.03	Monoterpenic ketone
Unknown	tr	Unknown
Pinocarvone	0.01	Monoterpenic ketone
Isomenthone	0.01	Monoterpenic ketone
Borneol	0.06	Monoterpenic alcohol
δ -Terpineol	0.02	Monoterpenic alcohol
Terpinen-4-ol	22.41	Monoterpenic alcohol
Cryptone	0.03	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
α -Terpineol	3.17	Monoterpenic alcohol
Myrtenal	tr	Monoterpenic aldehyde
<i>cis</i> -Piperitol	0.30	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.17	Monoterpenic ketone
Myrtenol	0.01	Monoterpenic alcohol
Methylchavicol	0.07	Phenylpropanoid
<i>trans</i> -Dihydrocarvone	0.11	Monoterpenic ketone
Unknown	0.02	Unknown
<i>trans</i> -Piperitol	0.43	Monoterpenic alcohol
<i>trans</i> -Carveol	0.03	Monoterpenic alcohol
Nerol	0.03	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Carvone	0.04	Monoterpenic ketone
Carvenone	0.03	Monoterpenic ketone
<i>trans</i> -Sabinene hydrate acetate	0.39	Monoterpenic ester
Linalyl acetate	1.34	Monoterpenic ester
Geraniol	0.01	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.09	Monoterpenic alcohol
Citronellyl formate	0.01	Monoterpenic ester
Bornyl acetate	0.05	Monoterpenic ester
<i>cis</i> -Ascaridole glycol	0.04	Monoterpenic alcohol

Terpinen-4-yl acetate	0.19	Monoterpenic ester
Thymol	0.04	Monoterpenic alcohol
Unknown	0.02	Monoterpenic alcohol
Unknown	0.01	Monoterpenic alcohol
Bicycloelemene	0.03	Sesquiterpene
α -Cubebene	0.01	Sesquiterpene
Eugenol	0.03	Phenylpropanoid
Neryl acetate	0.03	Monoterpenic ester
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.04	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
β -Caryophyllene	2.47	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
Aromadendrene	0.06	Sesquiterpene
α -Humulene	0.12	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.01	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.01	Sesquiterpene
γ -Murolene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
Bicyclogermacrene	1.26	Sesquiterpene
Viridiflorene	0.03	Sesquiterpene
α -Murolene	0.02	Sesquiterpene
γ -Cadinene	0.02	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.04	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
Spathulenol	0.06	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	Sesquiterpenic ether
Globulol	0.02	Sesquiterpenic alcohol
Viridiflorol	0.01	Sesquiterpenic alcohol
Humulene epoxide II	0.01	Sesquiterpenic ether
10-epi- γ -Eudesmol	0.01	Sesquiterpenic alcohol
Caryophylladienol II	0.01	Sesquiterpenic alcohol
Isospathulenol	0.05	Sesquiterpenic alcohol
τ -Muurolol	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Diterpene
Consolidated total	99.20	

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

Note: no correction factor was applied

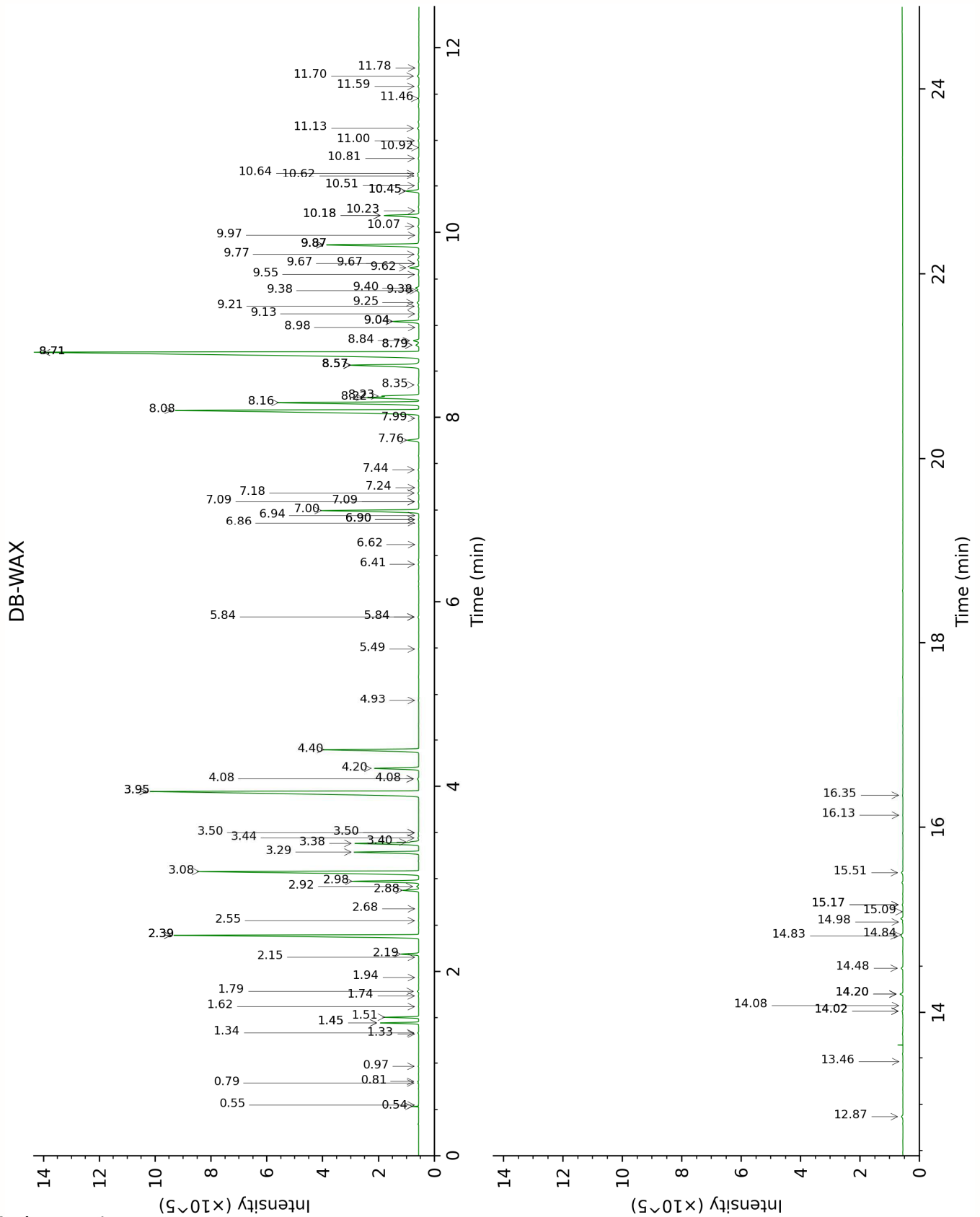
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

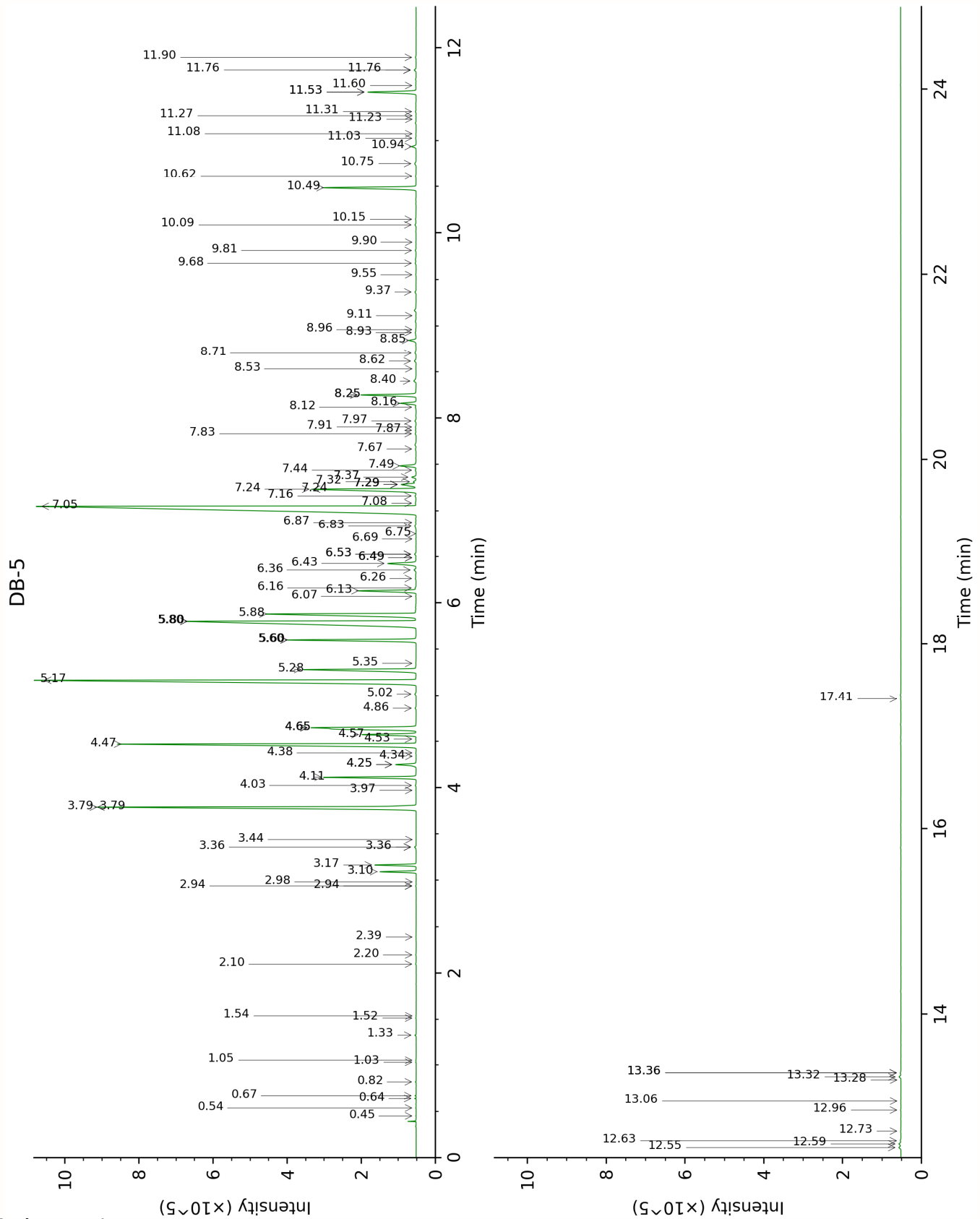
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is

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

Isobutyral	Column DB-WAX			Column DB-5		
	0.54	775.9	0.06	0.45	536.6	tr
2-Methyl-3-buten-2-ol	1.62	1014.6	0.01	0.54	606.4	0.01
Isovaleral	0.81	884.1	0.01	0.64	640.8	0.01
2-Methylbutyral	0.79	878.3	0.01	0.67	650.9	0.01
2-Ethylfuran	0.97	921.6	0.01	0.82	701.0	0.01
Isoamyl alcohol	3.50*	1174.6	[0.02]	1.03	732.8	0.01
2-Methylbutanol	3.50*	1174.6	[0.02]	1.05	735.9	0.01
Methyl 2-methylbutyrate	1.34	976.9	0.02	1.33	774.1	0.02
Hexanal	1.94	1044.1	tr	1.52	799.4	0.01
Octane	0.55	786.9	tr	1.54	802.8	tr
(2E)-Hexenal	3.44	1170.3	0.03	2.10	849.7	0.02
(3Z)-Hexenol	5.84*	1343.6	[0.03]	2.20	857.8	0.02
Hexanol	5.49	1318.6	0.01	2.39	873.6	0.01
Hashishene	1.45*	993.0	[0.80]	2.94*	916.2	[0.01]
Isobutyl isobutyrate	2.16	1064.7	tr	2.94*	916.2	[0.01]
Tricyclene	1.33	975.0	tr	2.98	919.0	tr
α -Thujene	1.51	1002.3	0.69	3.10	926.3	0.68
α -Pinene	1.45*	993.0	[0.80]	3.17	931.1	0.81
Camphene	1.79	1030.1	0.03	3.36*	943.7	[0.05]
α -Fenchene	1.74	1025.5	0.01	3.36*	943.7	[0.05]
Thuja-2,4(10)-diene	2.39*	1087.1	[8.18]	3.44	949.1	0.01
β -Pinene	2.19	1067.9	0.46	3.79*	972.1	[8.64]
Sabinene	2.39*	1087.1	[8.18]	3.79*	972.1	[8.64]
Octen-3-ol	6.90*	1420.6	[0.02]	3.97	984.0	0.01
Octan-3-one	4.08*	1217.9	[0.06]	4.02	987.5	0.03
Myrcene	2.98	1134.8	1.99	4.11	993.3	1.99
Pseudolimonene	2.92	1130.6	0.06	4.25*	1002.3	[0.51]
α -Phellandrene	2.88	1127.5	0.44	4.25*	1002.3	[0.51]
Δ^3 -Carene	2.68	1112.3	tr	4.34	1008.0	0.01
(3Z)-Hexenyl acetate	4.93	1278.3	0.01	4.38	1010.3	0.01
α -Terpinene	3.08	1142.9	8.51	4.47	1016.3	8.51
Carvomenthene	2.55	1101.9	0.01	4.52	1019.7	0.02
<i>para</i> -Cymene	4.20	1226.0	1.27	4.57	1022.7	1.27
1,8-Cineole	3.40	1166.9	0.14	4.65*	1027.3	[3.89]
Limonene	3.29	1158.7	1.83	4.65*	1027.3	[3.89]
β -Phellandrene	3.38	1165.9	1.91	4.65*	1027.3	[3.89]
(Z)- β -Ocimene	3.95*	1208.2	[13.65]	4.86	1040.5	0.03
(E)- β -Ocimene	4.08*	1217.9	[0.06]	5.02	1050.4	0.04

γ -Terpinene	3.95*	1208.2	[13.65]	5.17	1059.8	13.63
<i>cis</i> -Sabinene hydrate	7.00	1428.0	3.22	5.28	1067.0	3.22
<i>cis</i> -Linalool oxide (fur.)	6.62	1400.0	tr	5.35	1071.2	0.02
Terpinolene	4.40	1240.4	3.13	5.60*	1087.0	[3.14]
<i>para</i> -Cymenene	6.41	1384.7	0.02	5.60*	1087.0	[3.14]
<i>trans</i> -Sabinene hydrate	8.08	1509.4	11.32	5.80*	1099.5	[11.32]
Unknown CEDE I [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.84*	1343.6	[0.03]	5.80*	1099.5	[11.32]
Linalool	8.16	1515.9	4.91	5.88	1104.5	4.95
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.04*	1585.3	[0.85]	6.07	1116.6	0.02
<i>cis-para</i> -Menth-2-en-1-ol	8.22*†	1520.2	[1.84]	6.13	1120.5	1.45
α -Campholenal	7.09*	1435.2	[0.02]	6.16	1122.3	0.04
4-Hydroxy-4-methylcyclohex-2-enone	14.20*	2032.3	[0.10]	6.26	1128.9	0.03
<i>trans</i> -Pinocarveol	9.25	1601.2	0.06	6.36	1134.7	0.07
<i>trans-para</i> -Menth-2-en-1-ol	9.04*	1585.3	[0.85]	6.43	1139.2	0.86
Epoxyterpinolene	6.86	1417.7	0.01	6.49*	1143.2	[0.01]
Camphene hydrate	8.57*	1547.7	[2.66]	6.49*	1143.2	[0.01]
1,4-Dimethyl-4-acetylcyclohexene	7.44	1461.0	0.03	6.53*	1145.6	[0.05]
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.94	1423.9	tr	6.53*	1145.6	[0.05]
Pinocarvone	7.99	1502.7	0.01	6.69	1156.1	0.01
Isomenthone	7.09*	1435.2	[0.02]	6.75	1159.7	0.01
Borneol	9.87*	1652.4	[3.25]	6.83	1165.0	0.06
δ -Terpineol	9.55	1625.9	0.03	6.87	1167.8	0.02
Terpinen-4-ol	8.71*	1558.7	[22.38]	7.05	1179.0	22.41
Cryptone	9.21	1598.1	0.03	7.08	1181.2	0.03
<i>para</i> -Cymen-8-ol	11.70	1798.4	0.06	7.16	1186.2	0.04
α -Terpineol	9.87*	1652.4	[3.25]	7.24*	1190.8	[3.18]
Myrtenal	8.79*	1565.3	[0.13]	7.24*	1190.8	[3.18]
<i>cis</i> -Piperitol	9.62	1631.9	0.30	7.29*	1194.0	[0.47]

<i>cis</i> -Dihydrocarvone	8.57*	1547.7	[2.66]	7.29*	1194.0	[0.47]
Myrtenol	10.92	1741.1	0.01	7.29*	1194.0	[0.47]
Methylchavicol	9.38*	1611.6	[0.06]	7.32	1195.9	0.07
<i>trans</i> -Dihydrocarvone	8.79*	1565.3	[0.13]	7.36	1199.1	0.11
Unknown PIMA 7 [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	11.00	1747.6	0.03	7.44	1203.9	0.02
<i>trans</i> -Piperitol	10.45*	1700.3	[0.43]	7.49	1206.9	0.43
<i>trans</i> -Carveol	11.58	1788.7	0.03	7.67	1219.1	0.03
Nerol	11.13	1759.2	0.05	7.83	1230.1	0.03
Citronellol	10.81	1731.0	0.03	7.87	1232.6	0.02
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.46	1777.4	0.02	7.91	1234.9	0.02
Carvone	10.07	1668.9	0.04	7.97	1239.3	0.04
Carvenone	9.97	1660.8	0.01	8.12	1249.2	0.03
<i>trans</i> -Sabinene hydrate acetate	7.76	1485.0	0.39	8.16	1252.0	0.39
Linalyl acetate	8.23*†	1521.5	[0.93]	8.25*	1258.1	[1.35]
Geraniol	11.78	1806.3	0.01	8.25*	1258.1	[1.35]
<i>trans</i> -Ascaridole glycol	14.20*	2032.3	[0.10]	8.40	1268.1	0.09
Citronellyl formate	8.98	1580.2	0.01	8.53	1276.9	0.01
Bornyl acetate	8.35	1530.9	0.03	8.62	1282.5	0.05
<i>cis</i> -Ascaridole glycol	14.84	2095.0	0.05	8.70	1288.4	0.04
Terpinen-4-yl acetate	8.84	1569.1	0.17	8.85	1297.8	0.19
Thymol	15.17*	2127.7	[0.03]	8.93	1303.5	0.04
Unknown MEAL I analog	14.02*	2014.1	[0.03]	8.96	1305.6	0.02
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.09	2119.9	0.01	9.11	1316.2	0.01
Bicycloelemene	7.18	1442.1	0.03	9.37	1334.1	0.03
α -Cubebene	6.90*	1420.6	[0.02]	9.55	1347.1	0.01
Eugenol	14.83	2093.8	0.05	9.68	1355.9	0.03
Neryl acetate	10.23	1682.6	0.01	9.81	1365.5	0.03
α -Copaene	7.24	1446.5	0.01	9.90	1371.8	0.01

Geranyl acetate	10.64	1716.8	0.04	10.09	1384.9	0.04
β-Elemene	8.57*	1547.7	[2.66]	10.15	1389.1	0.02
β-Caryophyllene	8.57*	1547.7	[2.66]	10.49	1413.5	2.47
β-Copaene	8.57*	1547.7	[2.66]	10.62	1423.2	0.02
Aromadendrene	8.71*	1558.7	[22.38]	10.75	1433.3	0.06
α-Humulene	9.40	1613.9	0.12	10.94	1447.0	0.12
allo-Aromadendrene	9.13	1591.7	0.02	11.03	1453.7	0.02
(E)-β-Farnesene	9.67*	1635.7	[0.02]	11.08	1457.3	0.01
trans-Cadina-1(6),4-diene	9.38*	1611.6	[0.06]	11.23	1468.9	0.01
γ-Murolene	9.67*	1635.7	[0.02]	11.27	1471.7	0.01
Germacrene D	9.87*	1652.4	[3.25]	11.31	1475.0	0.02
Bicyclgermacrene	10.18*	1678.4	[1.28]	11.52*	1490.7	[1.30]
Viridiflorene	9.77	1643.9	0.03	11.52*	1490.7	[1.30]
α-Murolene	10.18*	1678.4	[1.28]	11.60	1496.0	0.02
γ-Cadinene	10.45*	1700.3	[0.43]	11.76*	1508.5	[0.06]
(3E,6E)-α-Farnesene	10.62	1714.5	0.04	11.76*	1508.5	[0.06]
δ-Cadinene	10.50	1705.0	0.02	11.90	1519.2	0.02
Spathulenol	14.48	2059.7	0.06	12.55	1570.6	0.06
Caryophyllene oxide	12.87	1905.1	0.06	12.59	1573.7	0.06
Globulol	14.02*	2014.1	[0.03]	12.63	1576.4	0.02
Viridiflorol	14.08	2020.0	0.01	12.73	1584.5	0.01
Humulene epoxide II	13.46	1961.5	0.01	12.96	1602.4	0.01
10-epi-γ-Eudesmol	14.20*	2032.3	[0.10]	13.06	1610.3	0.01
Caryophylladienol II	16.13	2226.7	0.01	13.28	1629.0	0.01
Isospathulenol	15.51	2162.9	0.06	13.32	1631.8	0.05
τ-Murolol	15.17*	2127.7	[0.03]	13.36*	1635.4	[0.02]
τ-Cadinol	14.98	2108.6	0.02	13.36*	1635.4	[0.02]
Unknown PISI IV [m/z 257, 258 (20), 91 (19), 272 (18)]	16.35	2249.4	0.02	17.41	1995.0	0.01
Total reported		98.93%			99.25%	

*: 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