

Date : 2023-11-23

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23K23-NPA03

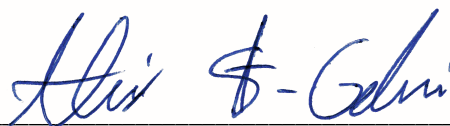
Customer Identification : Marjoram - Origanum Marjorana - Egypt - NPS00113 - Lot # NP0288

Type : Essential Oil

Source : *Origanum majorana* ct. Carvacrol

Customer : Nature Packaged

Checked and approved by:



Alexis St-Gelais, Ph. D., Chimiste 2013-174

Notes: 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.

This report is an update from the first version issued on 2023-11-23 to format it for online publication.

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 : Alexis St-Gelais, Ph. D., Chimiste 2013-174

Date : 2023-11-23

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
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	0.03	Aliphatic ester
Hexanal	tr	Aliphatic aldehyde
Octane	tr	Alkane
(2E)-Hexenal	0.02	Aliphatic aldehyde
(3Z)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Hashishene	0.01	Monoterpene
Tricyclene	tr	Monoterpene
α -Thujene	0.63	Monoterpene
α -Pinene	0.80	Monoterpene
α -Fenchene	tr	Monoterpene
Camphene	0.03	Monoterpene
β -Pinene	0.45	Monoterpene
Sabinene	8.28	Monoterpene
Octan-3-one	0.04	Aliphatic ketone
Myrcene	2.06	Monoterpene
Pseudolimonene	0.06	Monoterpene
α -Phellandrene	0.33	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
α -Terpinene	7.61	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
<i>para</i> -Cymene	1.17	Monoterpene
Limonene	2.10	Monoterpene
1,8-Cineole	0.12	Monoterpenic ether
β -Phellandrene	1.82	Monoterpene
(Z)- β -Ocimene	0.03	Monoterpene
(E)- β -Ocimene	0.04	Monoterpene
γ -Terpinene	12.16	Monoterpene
<i>cis</i> -Sabinene hydrate	4.10	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	2.78	Monoterpene
<i>trans</i> -Sabinene hydrate	20.83	Monoterpenic alcohol

Unknown	0.02	Oxygenated monoterpene
Linalool	1.10	Monoterpenic alcohol
Unknown	0.01	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	1.44	Monoterpenic alcohol
α -Campholenal	0.02	Monoterpenic aldehyde
4-Hydroxy-4-methylcyclohex-2-enone	0.02	Aliphatic alcohol
<i>trans</i> -Pinocarveol	0.07	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.78	Monoterpenic alcohol
Epoxyterpinolene	0.02	Monoterpenic ether
1,4-Dimethyl-4-acetylcyclohexene	0.04	Monoterpenic ketone
Pinocarvone	0.01	Monoterpenic ketone
Isomenthone	0.02	Monoterpenic ketone
Borneol	0.01	Monoterpenic alcohol
δ -Terpineol	0.04	Monoterpenic alcohol
Terpinen-4-ol	19.15	Monoterpenic alcohol
Cryptone	0.03	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.03	Monoterpenic alcohol
α -Terpineol	2.93	Monoterpenic alcohol
Myrtenol	tr	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.30	Monoterpenic alcohol
Methylchavicol	0.01	Phenylpropanoid
<i>cis</i> -Dihydrocarvone	0.06	Monoterpenic ketone
<i>trans</i> -Dihydrocarvone	0.04	Monoterpenic ketone
Unknown	0.02	Unknown
<i>trans</i> -Piperitol	0.38	Monoterpenic alcohol
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
<i>cis</i> -Carveol	0.03	Monoterpenic alcohol
Citronellol	0.05	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
<i>trans</i> -Sabinene hydrate acetate	0.28	Monoterpenic ester
Geraniol	0.07	Monoterpenic alcohol
Linalyl acetate	1.97	Monoterpenic ester
<i>trans</i> -Ascaridole glycol	0.07	Monoterpenic alcohol
Citronellyl formate	0.01	Monoterpenic ester
Bornyl acetate	0.02	Monoterpenic ester
<i>cis</i> -Ascaridole glycol	0.03	Monoterpenic alcohol
Terpinen-4-yl acetate	0.09	Monoterpenic ester
Thymol analogue II	0.01	Monoterpenic alcohol
Unknown	0.01	Monoterpenic alcohol
Unknown	0.05	Monoterpenic alcohol
Bicycloelemene	0.03	Sesquiterpene
α -Cubebene	0.01	Sesquiterpene
Eugenol	0.02	Phenylpropanoid
Neryl acetate	0.03	Monoterpenic ester
α -Copaene	0.01	Sesquiterpene

Geranyl acetate	0.04	Monoterpenic ester
β -Elemene	0.01	Sesquiterpene
β -Caryophyllene	2.39	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
α -Humulene	0.11	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
(1S,2S,4S)- <i>para</i> -Menthane-1,2,4-triol	0.02	Monoterpenic alcohol
Viridiflorene	0.01	Sesquiterpene
Bicyclogermacrene	1.33	Sesquiterpene
α -Muurolene	0.01	Sesquiterpene
γ -Cadinene	0.05	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	0.02	Sesquiterpenic alcohol
Isospathulenol	0.04	Sesquiterpenic alcohol
τ -Cadinol	0.01	Sesquiterpenic alcohol
14-Hydroxy-(<i>Z</i>)-caryophyllene	0.01	Sesquiterpenic alcohol
Unknown	0.02	Diterpene
Consolidated total	99.36	

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

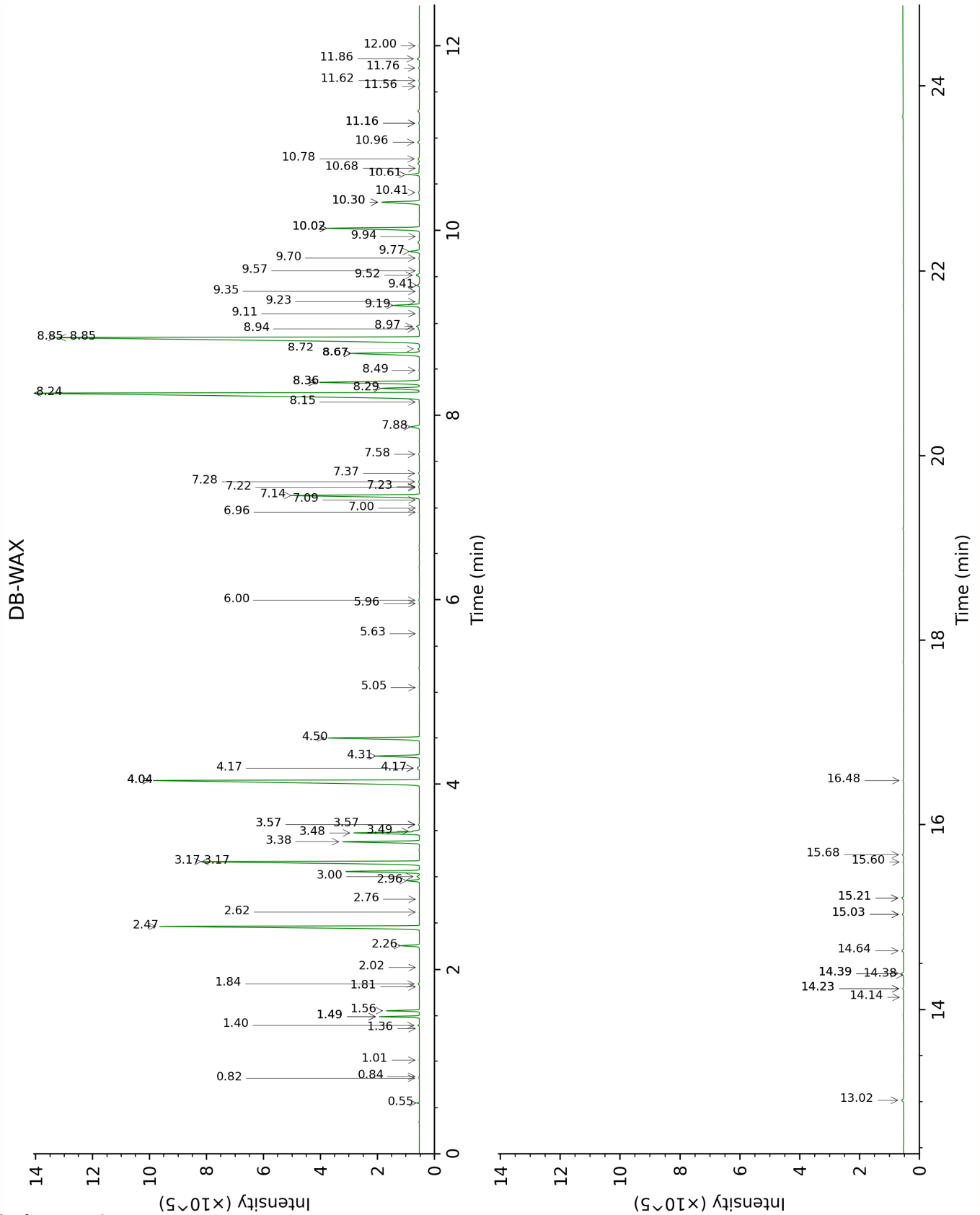
Note: no correction factor was applied

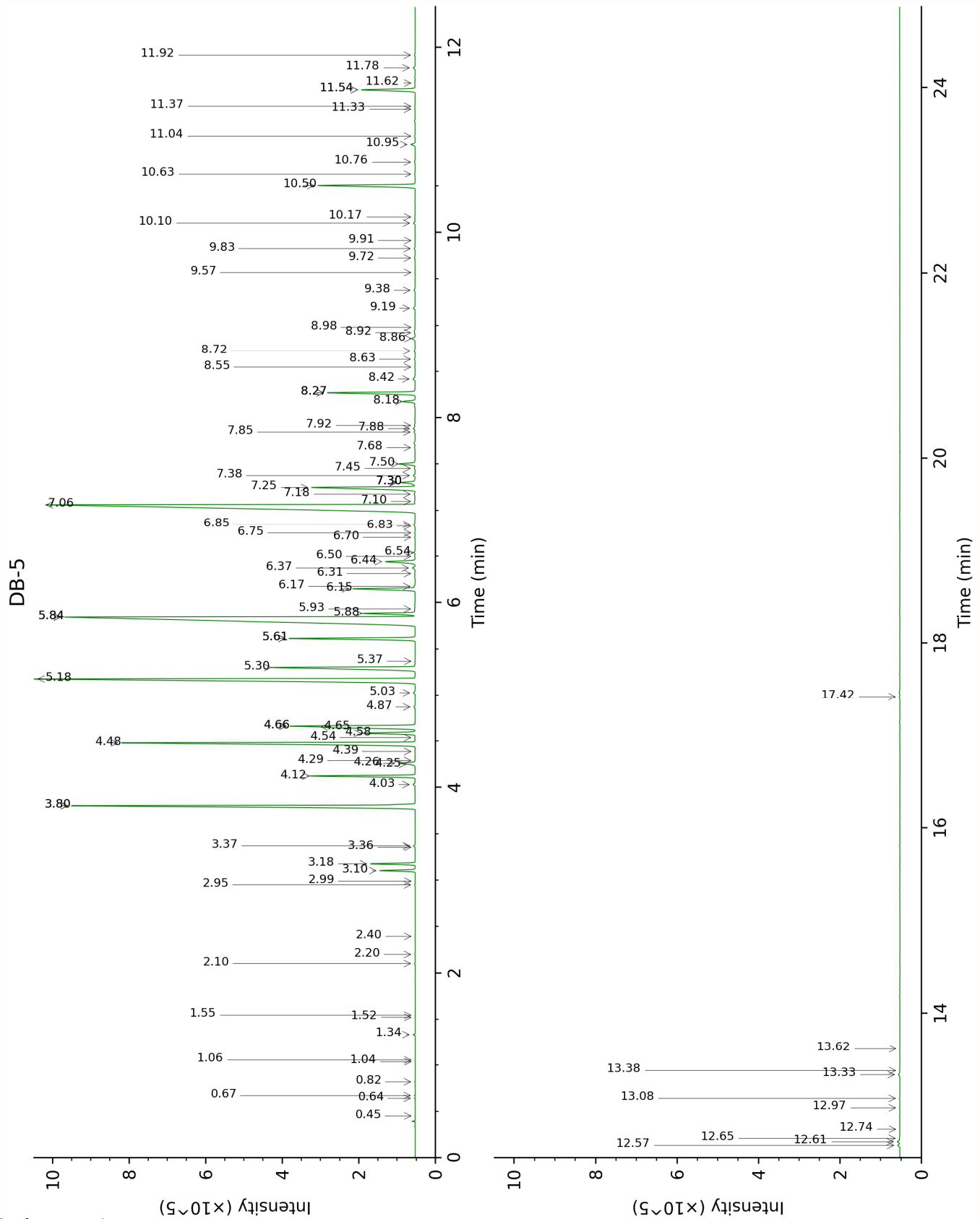
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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		
	0.55	777.0	0.03	0.45	537.7	tr
Isovaleral	0.84	885.8	0.01	0.64	641.9	0.01
2-Methylbutyral	0.82	879.1	0.01	0.67	651.9	0.01
2-Ethylfuran	1.01	919.7	0.01	0.82	701.9	0.01
Isoamyl alcohol	3.57*	1171.4	[0.02]	1.04	734.1	tr
2-Methylbutanol	3.57*	1171.4	[0.02]	1.06	736.7	tr
Methyl 2-methylbutyrate	1.40	977.5	0.03	1.34	775.0	0.03
Hexanal	2.02	1044.2	tr	1.52	800.6	tr
Octane				1.55	803.8	tr
(2E)-Hexenal	3.57*	1171.4	[0.02]	2.10	850.1	0.02
(3Z)-Hexenol	5.96	1345.5	0.01	2.20	858.2	0.01
Hexanol	5.64	1322.4	0.01	2.40	874.1	0.01
Hashishene	1.49*	991.7	[0.81]	2.95	916.7	0.01
Tricyclene	1.36	972.3	tr	2.99	919.3	tr
α -Thujene	1.56	1000.2	0.63	3.10	926.8	0.63
α -Pinene	1.49*	991.7	[0.81]	3.18	931.6	0.80
α -Fenchene	1.81	1024.5	tr	3.36	943.4	tr
Camphene	1.84	1027.4	0.03	3.37	944.3	0.03
β -Pinene	2.26	1066.4	0.45	3.80*	972.7	[8.73]
Sabinene	2.47	1086.0	8.28	3.80*	972.7	[8.73]
Octan-3-one	4.18*	1216.0	[0.09]	4.03	987.7	0.04
Myrcene	3.17*	1141.1	[7.59]	4.12	993.7	2.06
Pseudolimonene	3.00	1128.9	0.07	4.25	1001.9	0.06
α -Phellandrene	2.96	1125.5	0.32	4.26	1002.7	0.33
Δ^3 -Carene	2.76	1110.4	tr	4.29	1004.7	0.01
(3Z)-Hexenyl acetate	5.05	1278.0	0.01	4.39	1010.8	0.01
α -Terpinene	3.17*	1141.1	[7.59]	4.48	1016.6	7.61
Carvomenthene	2.62	1099.9	0.01	4.54	1020.1	0.01
<i>para</i> -Cymene	4.31	1225.2	1.17	4.58	1023.1	1.17
Limonene	3.38	1157.3	2.10	4.65*†	1027.3	[1.84]
1,8-Cineole	3.49	1165.9	0.12	4.66*†	1027.8	[2.21]
β -Phellandrene	3.48	1164.5	1.82	4.66*†	1027.8	[2.21]
(Z)- β -Ocimene	4.04*	1206.5	[12.17]	4.87	1040.8	0.03
(E)- β -Ocimene	4.18*	1216.0	[0.09]	5.03	1050.6	0.04
γ -Terpinene	4.04*	1206.5	[12.17]	5.18	1060.0	12.16
<i>cis</i> -Sabinene hydrate	7.14	1429.8	4.11	5.30	1067.8	4.10
<i>cis</i> -Linalool oxide (fur.)				5.37	1071.9	0.01
<i>trans</i> -Linalool oxide (fur.)	7.09	1426.3	0.01	5.61*	1087.2	[2.80]

Terpinolene	4.50	1239.0	2.78	5.61*	1087.2	[2.80]
<i>trans</i> -Sabinene hydrate	8.24	1511.4	20.83	5.84*	1101.6	[20.93]
Unknown CEDE I [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	6.00	1348.0	0.02	5.84*	1101.6	[20.93]
Linalool	8.29	1515.4	1.10	5.88	1104.1	1.10
Unknown ORMA I [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	8.67*	1544.3	[2.39]	5.93	1107.1	0.01
<i>cis</i> - <i>para</i> -Menth-2-en-1-ol	8.36*	1520.4	[3.42]	6.15	1120.9	1.44
α -Campholenal	7.23	1436.7	0.02	6.18	1122.6	0.02
4-Hydroxy-4-methylcyclohex-2-enone	14.38	2031.7	0.01	6.31	1131.4	0.02
<i>trans</i> -Pinocarveol	9.41	1601.2	0.07	6.37	1135.2	0.07
<i>trans</i> - <i>para</i> -Menth-2-en-1-ol	9.19	1584.4	0.77	6.44	1139.5	0.78
Epoxyterpinolene	6.96	1416.5	0.01	6.50	1143.2	0.02
1,4-Dimethyl-4-acetylcyclohexene	7.58	1462.4	0.03	6.54	1145.8	0.04
Pinocarvone	8.15	1504.2	0.02	6.70	1156.3	0.01
Isomenthone	7.22	1436.0	0.01	6.75	1159.4	0.02
Borneol	10.02*	1650.5	[2.99]	6.83	1164.2	0.01
δ -Terpineol	9.70	1624.8	0.02	6.85	1165.4	0.04
Terpinen-4-ol	8.85*	1557.9	[19.07]	7.06	1179.0	19.15
Cryptone	9.35	1596.1	0.01	7.10	1181.3	0.03
<i>para</i> -Cymen-8-ol	11.76	1794.4	0.03	7.18	1186.3	0.03
α -Terpineol	10.02*	1650.5	[2.99]	7.25	1190.9	2.93
Myrtenol	11.16*	1744.2	[0.03]	7.30*	1194.3	[0.37]
<i>cis</i> -Piperitol	9.77	1630.5	0.30	7.30*	1194.3	[0.37]
Methylchavicol	9.57	1613.8	0.01	7.30*	1194.3	[0.37]
<i>cis</i> -Dihydrocarvone	8.72	1548.3	0.06	7.30*	1194.3	[0.37]
<i>trans</i> -Dihydrocarvone	8.94	1565.1	0.04	7.38	1199.1	0.04
Unknown PIMA 7 [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)...]	11.16*	1744.2	[0.03]	7.45	1204.0	0.02

154 (2)]						
<i>trans</i> -Piperitol	10.61*	1697.4	[0.40]	7.50	1207.2	0.38
<i>trans</i> -Carveol	11.62	1782.9	0.02	7.68	1218.9	0.02
<i>cis</i> -Carveol	12.00	1815.5	0.02	7.85	1230.1	0.03
Citronellol	10.96	1726.9	0.06	7.88	1232.6	0.05
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.56	1777.6	0.01	7.92	1234.9	0.02
<i>trans</i> -Sabinene hydrate acetate	7.88	1484.1	0.28	8.18	1252.0	0.28
Geraniol	11.86	1803.2	0.07	8.27*	1258.4	[2.04]
Linalyl acetate	8.36*	1520.4	[3.42]	8.27*	1258.4	[2.04]
<i>trans</i> -Ascaridole glycol	14.39*	2033.1	[0.08]	8.42	1268.3	0.07
Citronellyl formate	9.11	1577.6	0.02	8.55	1276.9	0.01
Bornyl acetate	8.49	1530.2	0.02	8.63	1282.5	0.02
<i>cis</i> -Ascaridole glycol	15.03*	2094.8	[0.04]	8.72	1288.7	0.03
Terpinen-4-yl acetate	8.97	1567.1	0.10	8.86	1297.7	0.09
Thymol analogue II	15.60	2151.1	0.02	8.92	1302.0	0.01
Unknown MEAL I analog	14.14	2008.9	0.02	8.98	1305.9	0.01
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.21*	2112.3	[0.06]	9.19	1320.4	0.05
Bicycloelemene	7.28	1440.6	0.03	9.38	1333.9	0.03
α -Cubebene	7.00	1419.7	0.01	9.57	1347.3	0.01
Eugenol	15.03*	2094.8	[0.04]	9.72	1358.2	0.02
Neryl acetate	10.41	1681.3	0.03	9.83	1365.4	0.03
α -Copaene	7.37	1447.2	0.03	9.91	1371.5	0.01
Geranyl acetate	10.78	1711.9	0.05	10.10	1384.6	0.04
β -Elemene	8.67*	1544.3	[2.39]	10.17	1389.3	0.01
β -Caryophyllene	8.67*	1544.3	[2.39]	10.50	1413.5	2.39
β -Copaene	8.67*	1544.3	[2.39]	10.63	1423.1	0.02
Aromadendrene	8.85*	1557.9	[19.07]	10.76	1432.8	0.02
α -Humulene	9.52	1610.0	0.10	10.95	1446.9	0.11
allo- Aromadendrene	9.24	1587.5	0.02	11.04	1453.6	0.02
Germacrene D (1S,2S,4S)- <i>para</i> - Menthane-1,2,4- triol	10.02*	1650.5	[2.99]	11.33	1475.1	0.01
				11.36	1477.5	0.02

Viridiflorene	9.94	1643.4	0.01	11.54*	1490.7	[1.34]
Bicyclogermacrene	10.30*	1673.0	[1.32]	11.54*	1490.7	[1.34]
α -Muurolene	10.30*	1673.0	[1.32]	11.62	1496.1	0.01
γ -Cadinene	10.61*	1697.4	[0.40]	11.78	1508.5	0.05
δ -Cadinene	10.68	1703.3	0.01	11.92	1519.2	0.02
Spathulenol	14.64	2056.9	0.06	12.57	1570.4	0.06
Caryophyllene oxide	13.02	1905.3	0.07	12.61	1573.5	0.06
Globulol	14.23*	2017.7	[0.03]	12.65	1576.3	0.02
Viridiflorol	14.23*	2017.7	[0.03]	12.74	1584.0	0.01
Humulene epoxide II				12.98	1602.1	0.01
10-epi- γ -Eudesmol	14.39*	2033.1	[0.08]	13.08	1610.5	0.02
Isospathulenol	15.68	2159.1	0.04	13.33	1631.6	0.04
τ -Cadinol	15.21*	2112.3	[0.06]	13.38	1635.3	0.01
14-Hydroxy-(Z)-caryophyllene				13.62	1654.8	0.01
Unknown PISI IV [m/z 257, 258 (20), 91 (19), 272 (18)]	16.48	2241.0	0.03	17.42	1994.5	0.02
Total reported		97.04%			99.45%	

*: 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