

Date : June 09, 2023

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23F02-PTH01


Customer identification : Marjoram - Egypt - M20112R

Type : Essential oil

Source : *Origanum majorana* ct. Sabinene hydrate

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Amélie Simard, Analyste

Analysis date : June 08, 2023

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4728 ± 0.0003 (20 °C; method PC-MAT-016)

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
Acetone	tr	Aliphatic ketone
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	0.01	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.02	Aliphatic ester
Hexanal	0.01	Aliphatic aldehyde
(2E)-Hexenal	0.03	Aliphatic aldehyde
(3Z)-Hexenol	0.02	Aliphatic alcohol
(2E)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Hashishene	0.02	Monoterpene
α -Thujene	0.62	Monoterpene
α -Pinene	0.79	Monoterpene
Camphene	0.03	Monoterpene
α -Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	0.44	Monoterpene
Sabinene	7.73	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
Octen-3-ol	0.01	Aliphatic alcohol
3-Methylpentyl acetate	0.01	Aliphatic ester
Octan-3-one	0.05	Aliphatic ketone
Myrcene	2.00	Monoterpene
Pseudolimonene	0.07	Monoterpene
α -Phellandrene	0.30	Monoterpene
(3Z)-Hexenyl acetate	0.02	Aliphatic ester
α -Terpinene	6.96	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
para-Cymene	2.39	Monoterpene
Limonene	1.97	Monoterpene
1,8-Cineole	1.87	Monoterpenic ether
(Z)- β -Ocimene	0.03	Monoterpene
(E)- β -Ocimene	0.04	Monoterpene
γ -Terpinene	11.91	Monoterpene
cis-Sabinene hydrate	3.80	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	2.74	Monoterpene
para-Cymenene	0.02	Monoterpene
trans-Sabinene hydrate	16.77	Monoterpenic alcohol
Linalool	1.42	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Unknown	0.04	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	1.35	Monoterpenic alcohol

α-Campholenal	0.03	Monoterpenic aldehyde
4-Hydroxy-4-methylcyclohex-2-enone	0.03	Aliphatic alcohol
<i>trans</i> -Pinocarveol	0.08	Monoterpenic alcohol
<i>trans</i> -para-Menth-2-en-1-ol	0.81	Monoterpenic alcohol
Epoxyterpinolene	0.02	Monoterpenic ether
1,4-Dimethyl-4-acetylcyclohexene	0.03	Monoterpenic ketone
Unknown	0.08	Unknown
Pinocarvone	0.01	Monoterpenic ketone
Isomenthone	0.01	Monoterpenic ketone
Borneol	0.01	Monoterpenic alcohol
δ-Terpineol	0.05	Monoterpenic alcohol
Terpinen-4-ol	21.90	Monoterpenic alcohol
Cryptone	0.05	Normonoterpenic ketone
para-Cymen-8-ol	0.04	Monoterpenic alcohol
α-Terpineol	3.00	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
<i>cis</i> -Piperitol	0.28	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.03	Monoterpenic ketone
Myrtenol	0.01	Monoterpenic alcohol
<i>trans</i> -Dihydrocarvone	0.10	Monoterpenic ketone
Unknown	0.02	Unknown
<i>trans</i> -Piperitol	0.46	Monoterpenic alcohol
<i>trans</i> -Carveol	0.03	Monoterpenic alcohol
Nerol	0.04	Monoterpenic alcohol
Citronellol	0.04	Monoterpenic alcohol
Unknown	0.03	Oxygenated monoterpene
Neral	0.03	Monoterpenic aldehyde
Carvenone	0.03	Monoterpenic ketone
<i>trans</i> -Sabinene hydrate acetate	0.59	Monoterpenic ester
Linalyl acetate	1.91	Monoterpenic ester
Geraniol	0.07	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.08	Monoterpenic alcohol
Geranial	tr	Monoterpenic aldehyde
Citronellyl formate	0.01	Monoterpenic ester
Bornyl acetate	0.04	Monoterpenic ester
<i>cis</i> -Ascaridole glycol	0.05	Monoterpenic alcohol
Terpinen-4-yl acetate	0.16	Monoterpenic ester
Thymol	0.04	Monoterpenic alcohol
Unknown	0.03	Monoterpenic alcohol
Unknown	0.13	Monoterpenic alcohol
Bicycloelemene	0.04	Sesquiterpene
α-Cubebene	0.01	Sesquiterpene
Eugenol	0.09	Phenylpropanoid
Neryl acetate	0.03	Monoterpenic ester
α-Copaene	0.02	Sesquiterpene
Geranyl acetate	0.05	Monoterpenic ester
β-Elemene	0.02	Sesquiterpene
β-Caryophyllene	2.56	Sesquiterpene
Aromadendrene	0.03	Sesquiterpene
α-Humulene	0.14	Sesquiterpene
allo-Aromadendrene	0.03	Sesquiterpene
Germacrene D	0.02	Sesquiterpene

(1S,2S,4S)-para-Menthane-1,2,4-triol	0.03	Monoterpenic alcohol
Bicyclogermacrene	1.25	Sesquiterpene
Viridiflorene	0.05	Sesquiterpene
α -Muurolene	0.01	Sesquiterpene
γ -Cadinene	0.06	Sesquiterpene
δ -Cadinene	0.03	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Spathulenol	0.10	Sesquiterpenic alcohol
Caryophyllene oxide	0.10	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Globulol	0.04	Sesquiterpenic alcohol
Viridiflorol	0.02	Sesquiterpenic alcohol
Humulene epoxide II	0.02	Sesquiterpenic ether
10-epi- γ -Eudesmol	0.02	Sesquiterpenic alcohol
Caryophylladienol II	0.01	Sesquiterpenic alcohol
Isospathulenol	0.08	Sesquiterpenic alcohol
τ -Cadinol	0.02	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	0.01	Sesquiterpenic alcohol
Unknown	0.03	Diterpene
Consolidated total	98.91%	

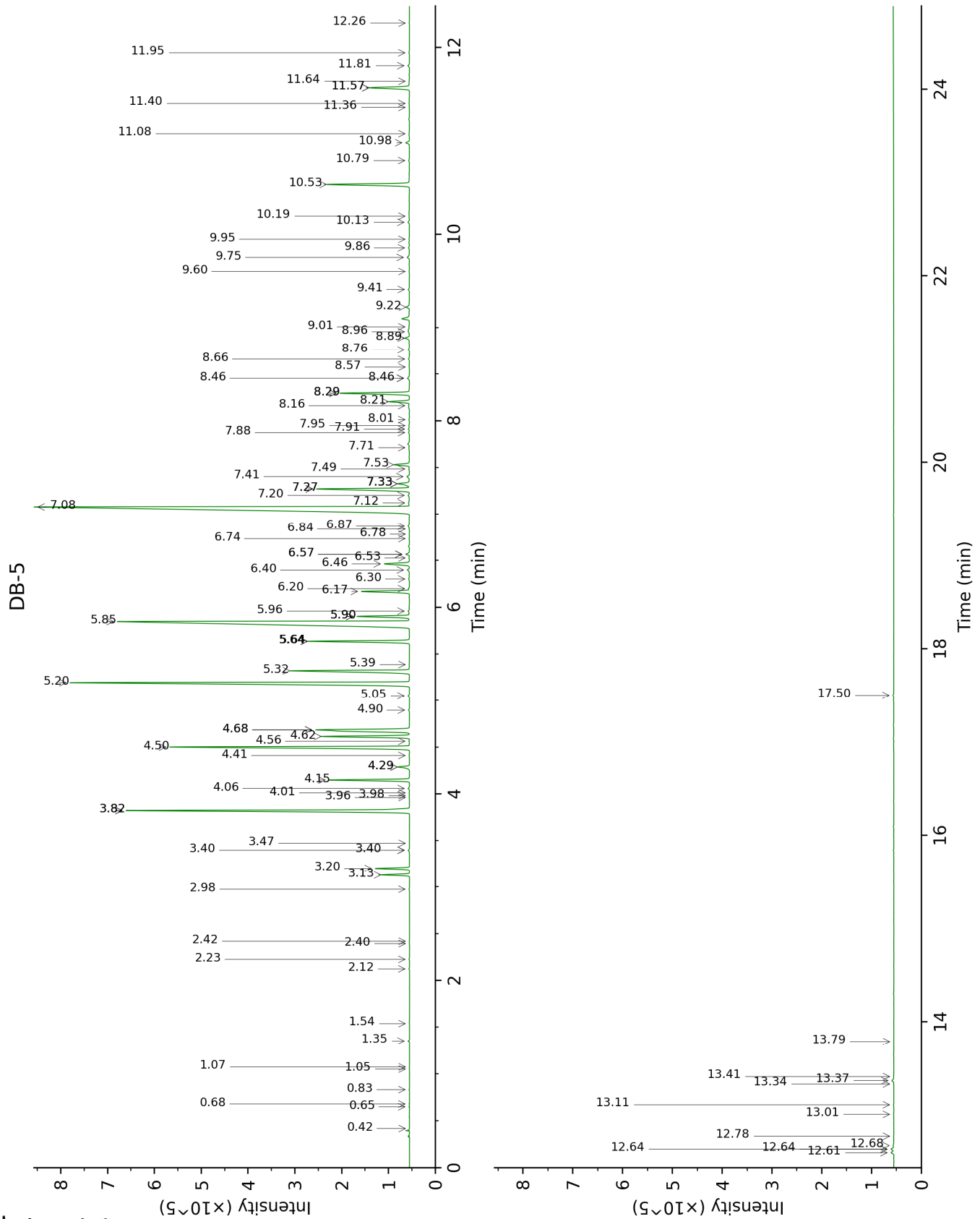
tr: The compound has been detected below 0.005% of total signal.

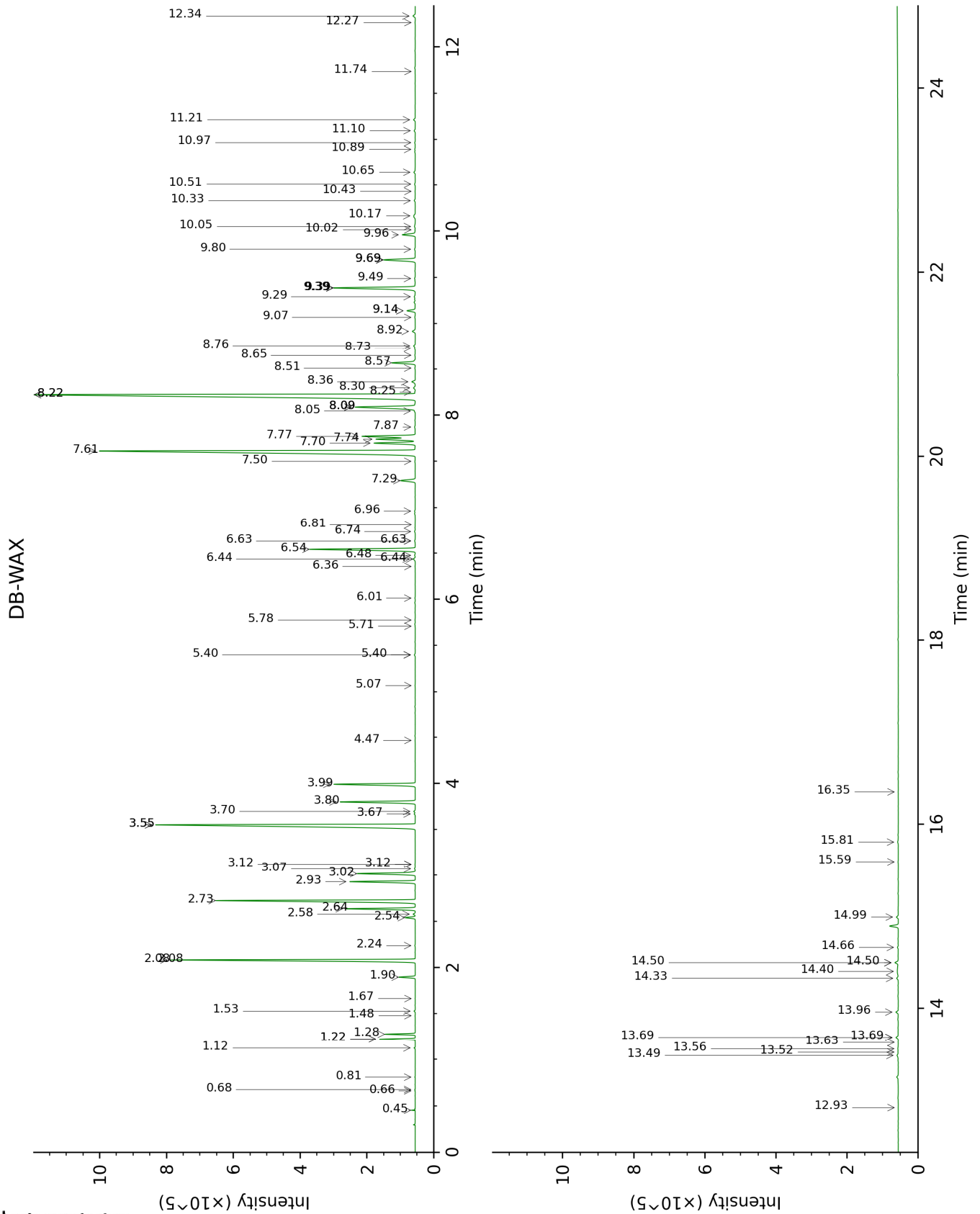
Note: no correction factor was applied

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.

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





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetone	0.42	509	tr	0.45	784	0.04
Isovaleral	0.65	641	tr	0.68	886	0.01
2-Methylbutyral	0.68	651	tr	0.66	881	0.01
2-Ethylfuran	0.83	702	0.01	0.81	921	0.01
Isoamyl alcohol	1.05	733	tr	3.12*	1175	0.02
2-Methylbutanol	1.07	736	tr	3.12*	1175	[0.02]
Methyl 2-methylbutyrate	1.35	774	0.02	1.12	975	0.02
Hexanal	1.54	800	0.01	1.66	1043	tr
(2E)-Hexenal	2.12	849	0.03	3.07	1171	0.03
(3Z)-Hexenol	2.23	858	0.02	5.40*	1344	0.04
(2E)-Hexenol	2.40	871	0.01	5.71	1367	0.01
Hexanol	2.42	873	0.01	5.07	1320	0.01
Hashishene	2.98	916	0.02	1.22*	993	0.78
α-Thujene	3.13	926	0.62	1.28	1002	0.63
α-Pinene	3.20	931	0.79	1.22*	993	[0.78]
Camphene	3.40*	944	0.04	1.53	1029	0.03
α-Fenchene	3.40*	944	[0.04]	1.48	1024	0.01
Thuja-2,4(10)-diene	3.47	948	0.01	2.08*	1086	7.74
β-Pinene	3.82*	972	8.18	1.90	1067	0.44
Sabinene	3.82*	972	[8.18]	2.08*	1086	[7.74]
3-Methyl-3-cyclohexenone	3.96	981	0.01	5.78	1372	0.01
Octen-3-ol	3.98	982	0.01	6.44*	1420	0.09
3-Methylpentyl acetate	4.01	984	0.01			
Octan-3-one	4.06	987	0.05	3.70	1222	0.05
Myrcene	4.15	993	2.00	2.64	1135	2.00
Pseudolimonene	4.29*	1002	0.37	2.58	1130	0.07
α-Phellandrene	4.29*	1002	[0.37]	2.54	1127	0.30
(3Z)-Hexenyl acetate	4.41	1010	0.02	4.47	1282	0.01
α-Terpinene	4.50	1016	6.96	2.73	1142	6.96
Carvomenthene	4.56	1019	0.02	2.24	1102	0.02
para-Cymene	4.62	1023	2.39	3.80	1230	2.39
Limonene	4.68*	1027	3.84	2.93	1159	1.97
1,8-Cineole	4.68*	1027	[3.84]	3.02	1166	1.87
(Z)-β-Ocimene	4.90	1040	0.03	3.55*	1211	11.94
(E)-β-Ocimene	5.05	1050	0.04	3.67	1220	0.03
γ-Terpinene	5.20	1059	11.91	3.55*	1211	[11.94]
cis-Sabinene hydrate	5.32	1067	3.80	6.54	1428	3.79
cis-Linalool oxide (fur.)	5.39	1071	0.01			
Terpinolene	5.64*	1086	2.75	3.99	1245	2.74
para-Cymenene	5.64*	1086	[2.75]	6.01	1389	0.02

<i>trans</i> -Sabinene hydrate	5.85	1100	16.77	7.61	1510	16.60
Linalool	5.90*	1103	1.43	7.70	1516	1.42
Unknown [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.90*	1103	[1.43]	5.40*	1344	[0.04]
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	5.96	1107	0.04	8.09*	1547	2.65
<i>cis</i> -para-Menth-2-en-1-ol	6.17	1120	1.35	7.74	1520	1.38
α -Campholenal	6.20	1122	0.03	6.63*	1435	0.04
4-Hydroxy-4-methylcyclohex-2-enone	6.30	1128	0.03	13.63	2030	0.01
<i>trans</i> -Pinocarveol	6.40	1135	0.08	8.76	1600	0.06
<i>trans</i> -para-Menth-2-en-1-ol	6.46	1139	0.81	8.57	1585	0.83
Epoxyterpinolene	6.53	1143	0.02	6.36	1414	0.01
1,4-Dimethyl-4-acetylcyclohexene	6.57*	1145	0.12	6.96	1460	0.03
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.57*	1145	[0.12]	6.44*	1420	[0.09]
Pinocarvone	6.74	1156	0.01	7.50	1501	0.03
Isomenthone	6.78	1159	0.01	6.63*	1435	[0.04]
Borneol	6.84	1162	0.01	9.39*	1651	3.07
δ -Terpineol	6.87	1164	0.05	9.07	1625	0.03
Terpinen-4-ol	7.08	1178	21.90	8.22*	1558	21.79
Cryptone	7.12	1181	0.05	8.73	1598	0.03
para-Cymen-8-ol	7.20	1186	0.04	11.10	1796	0.05
α -Terpineol	7.27*	1190	3.02	9.39*	1651	[3.07]
Myrtenal	7.27*	1190	[3.02]	8.25	1560	0.02
<i>cis</i> -Piperitol	7.33*	1194	0.42	9.14*	1631	0.32
<i>cis</i> -Dihydrocarvone	7.33*	1194	[0.42]	8.05	1544	0.03
Myrtenol	7.33*	1194	[0.42]	10.43	1739	0.01
<i>trans</i> -Dihydrocarvone	7.40	1198	0.10	8.30	1564	0.08
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.49	1204	0.02	10.51	1746	0.03
<i>trans</i> -Piperitol	7.53	1207	0.46	9.96	1699	0.48
<i>trans</i> -Carveol	7.71	1219	0.03	10.97	1785	0.03
Nerol	7.88	1230	0.04	10.65	1757	0.05
Citronellol	7.91	1232	0.04	10.33	1730	0.04

Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.95	1235	0.03	10.89	1779	0.02
Neral	8.01	1239	0.03	9.14*	1631	[0.32]
Carvenone	8.16	1249	0.03	9.49	1660	0.03
<i>trans</i> -Sabinene hydrate acetate	8.20	1252	0.59	7.29	1485	0.57
Linalyl acetate	8.30*	1258	1.99	7.77	1522	1.91
Geraniol	8.30*	1258	[1.99]	11.21	1806	0.07
<i>trans</i> -Ascaridole glycol	8.46*	1268	0.08	13.69*	2035	0.10
Geranial	8.46*	1268	[0.08]	9.69*	1676	1.26
Citronellyl formate	8.58	1276	0.01	8.51	1580	0.02
Bornyl acetate	8.66	1282	0.04	7.87	1530	0.04
<i>cis</i> -Ascaridole glycol	8.76	1289	0.05	14.40	2105	0.07
Terpinen-4-yl acetate	8.89	1297	0.16	8.36	1569	0.14
Thymol	8.96	1302	0.04	14.66	2131	0.04
Unknown analog	9.01	1306	0.03	13.52	2019	0.02
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.22	1320	0.13	14.50*	2114	0.14
Bicycloelemene	9.41	1334	0.04	6.74	1443	0.03
α -Cubebene	9.60	1347	0.01	6.48	1424	0.03
Eugenol	9.75	1358	0.09	14.33	2098	0.08
Neryl acetate	9.86	1365	0.03	9.80	1686	0.04
α -Copaene	9.95	1371	0.02	6.81	1449	0.01
Geranyl acetate	10.13	1384	0.05	10.17	1716	0.05
β -Elemene	10.19	1389	0.02	8.09*	1547	[2.65]
β -Caryophyllene	10.53	1413	2.56	8.09*	1547	[2.65]
Aromadendrene	10.80	1433	0.03	8.22*	1558	[21.79]
α -Humulene	10.98	1447	0.14	8.92	1612	0.12
allo-Aromadendrene	11.08	1454	0.03	8.65	1591	0.02
Germacrene D	11.36	1475	0.02	9.39*	1651	[3.07]
(1S,2S,4S)-para-Menthane-1,2,4-triol	11.40	1478	0.03			
Bicyclogermacrene	11.57*	1490	1.31	9.69*	1676	[1.26]
Viridiflorene	11.57*	1490	[1.31]	9.29	1644	0.05
α -Muurolene	11.64	1496	0.01	9.69*	1676	[1.26]
γ -Cadinene	11.81	1508	0.06	10.02	1703	0.01
δ -Cadinene	11.95	1519	0.03	10.05	1706	0.05
Isocaryophyllene epoxide B	12.26	1544	0.02	11.74	1853	0.01
Spathulenol	12.61	1571	0.10	13.96	2062	0.10
Caryophyllene oxide	12.64*	1574	0.10	12.34	1907	0.10

Caryophyllene oxide isomer	12.64*	1574	[0.10]	12.27	1901	0.01
Globulol	12.68	1577	0.04	13.49	2016	0.07
Viridiflorol	12.78	1584	0.02	13.56	2022	0.04
Humulene epoxide II	13.01	1603	0.02	12.93	1962	0.01
10-epi- γ -Eudesmol	13.11	1611	0.02	13.69*	2035	[0.10]
Caryophylladienol II	13.34	1629	0.01	15.59	2227	0.02
Isospathulenol	13.37	1632	0.08	14.99	2165	0.07
τ -Cadinol	13.41	1636	0.02	14.50*	2114	[0.14]
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	13.79	1667	0.01	16.35	2307	0.01
Unknown [m/z 257, 258 (20), 91 (19), 272 (18)]	17.50	1999	0.03	15.81	2250	0.04
Total identified		98.75%			98.47%	
Total reported		99.04%			98.58%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

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