

Date : February 24, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21B23-PTH19

Customer identification : Bergamot Mint - USA - G0D0817G

Type : Essential oil

Source : *Mentha citrata*

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : February 24, 2021

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4601 ± 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
Ethanol	0.01	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isobutanol	0.01	Aliphatic alcohol
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.02	Aliphatic alcohol
2-Methylbutanol	0.02	Aliphatic alcohol
(2E)-Hexenal	0.01	Aliphatic aldehyde
(3Z)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Isoamyl acetate	tr	Aliphatic ester
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.01	Furan
Nonane	0.01	Alkane
α -Thujene	0.02	Monoterpene
α -Pinene	0.11	Monoterpene
Camphene	0.01	Monoterpene
α -Fenchene	0.01	Monoterpene
Benzaldehyde	0.01	Simple phenolic
β -Pinene	0.59	Monoterpene
Sabinene	0.11	Monoterpene
Octen-3-ol	0.09	Aliphatic alcohol
Octan-3-one	0.02	Aliphatic ketone
Myrcene	0.83	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.01	Monoterpenic ether
Octan-3-ol	0.09	Aliphatic alcohol
α -Phellandrene	0.03	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.01	Monoterpenic ether
α -Terpinene	0.02	Monoterpene
para-Cymene	0.19	Monoterpene
Limonene	0.59	Monoterpene
1,8-Cineole	0.36	Monoterpenic ether
(Z)- β -Ocimene	1.05	Monoterpene
(E)- β -Ocimene	0.71	Monoterpene
γ -Terpinene	0.16	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.05	Monoterpenic alcohol
α -Pinene oxide analog	0.01	Monoterpenic ether
Terpinolene	0.13	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.08	Monoterpenic alcohol
Linalool	40.31	Monoterpenic alcohol
Octen-3-yl acetate	0.35	Aliphatic ester
Octan-3-yl acetate	0.24	Aliphatic ester
allo-Ocimene	0.02	Monoterpene
<i>trans</i> -Pinocarveol	0.01	Monoterpenic alcohol
(Z)-Myroxide	0.01	Monoterpenic ether

Isopulegol	0.01	Monoterpenic alcohol
Menthone	0.10	Monoterpenic ketone
Pinocamphone	0.02	Monoterpenic ketone
Isomenthone	0.03	Monoterpenic ketone
neo-Menthol	0.03	Monoterpenic alcohol
Isopinocamphone	0.76	Monoterpenic ketone
Menthol	0.46	Monoterpenic alcohol
Terpinen-4-ol	0.08	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
Myrtenal	0.05	Monoterpenic aldehyde
α -Terpineol	1.87	Monoterpenic alcohol
Hodiendiol	0.12	Monoterpenic alcohol
Methylchavicol	0.02	Phenylpropanoid
Nerol	0.38	Monoterpenic alcohol
Thymol methyl ether	0.02	Monoterpenic ether
Carvone	0.23	Monoterpenic ketone
Carvacrol methyl ether	0.02	Monoterpenic ether
Geraniol	1.05	Monoterpenic alcohol
Linalyl acetate	39.01	Monoterpenic ester
<i>cis</i> -Linalool oxide acetate (pyr.)	0.01	Monoterpenic ester
Menthyl acetate	0.03	Monoterpenic ester
Dihydroedulan II	0.01	Terpenic ether
Carvacrol	0.02	Monoterpenic alcohol
Myrtenyl acetate	0.03	Monoterpenic ester
Hodiendiol derivative	0.03	Oxygenated monoterpene
α -Cubebene	0.02	Sesquiterpene
Unknown	0.06	Unknown
Unknown	0.03	Oxygenated monoterpene
Citronellyl acetate	0.03	Monoterpenic ester
Unknown	0.03	Oxygenated monoterpene
Neryl acetate	0.63	Monoterpenic ester
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.05	Sesquiterpene
Geranyl acetate	1.21	Monoterpenic ester
β -Elemene	0.10	Sesquiterpene
(<i>Z</i>)-Jasmone	0.06	Jasmonate
Unknown	0.11	Unknown
Unknown	0.04	Sesquiterpene
β -Caryophyllene	3.09	Sesquiterpene
α -Humulene	0.12	Sesquiterpene
allo-Aromadendrene	0.03	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.25	Sesquiterpene
Germacrene D	0.72	Sesquiterpene
δ -Amorphene	0.05	Sesquiterpene
γ -Cadinene	0.05	Sesquiterpene
β -Dihydroagarofuran	0.04	Sesquiterpenic ether
δ -Cadinene	0.05	Sesquiterpene
α -Elemol	0.29	Sesquiterpenic alcohol
(<i>E</i>)-Nerolidol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether
Viridiflorol	0.41	Sesquiterpenic alcohol

Ledol	0.01	Sesquiterpenic alcohol
10-epi- γ -Eudesmol	0.02	Sesquiterpenic alcohol
γ -Eudesmol	0.08	Sesquiterpenic alcohol
β -Eudesmol	0.08	Sesquiterpenic alcohol
α -Eudesmol	0.08	Sesquiterpenic alcohol
Precocene II	0.07	Chromane
Consolidated total	98.65%	

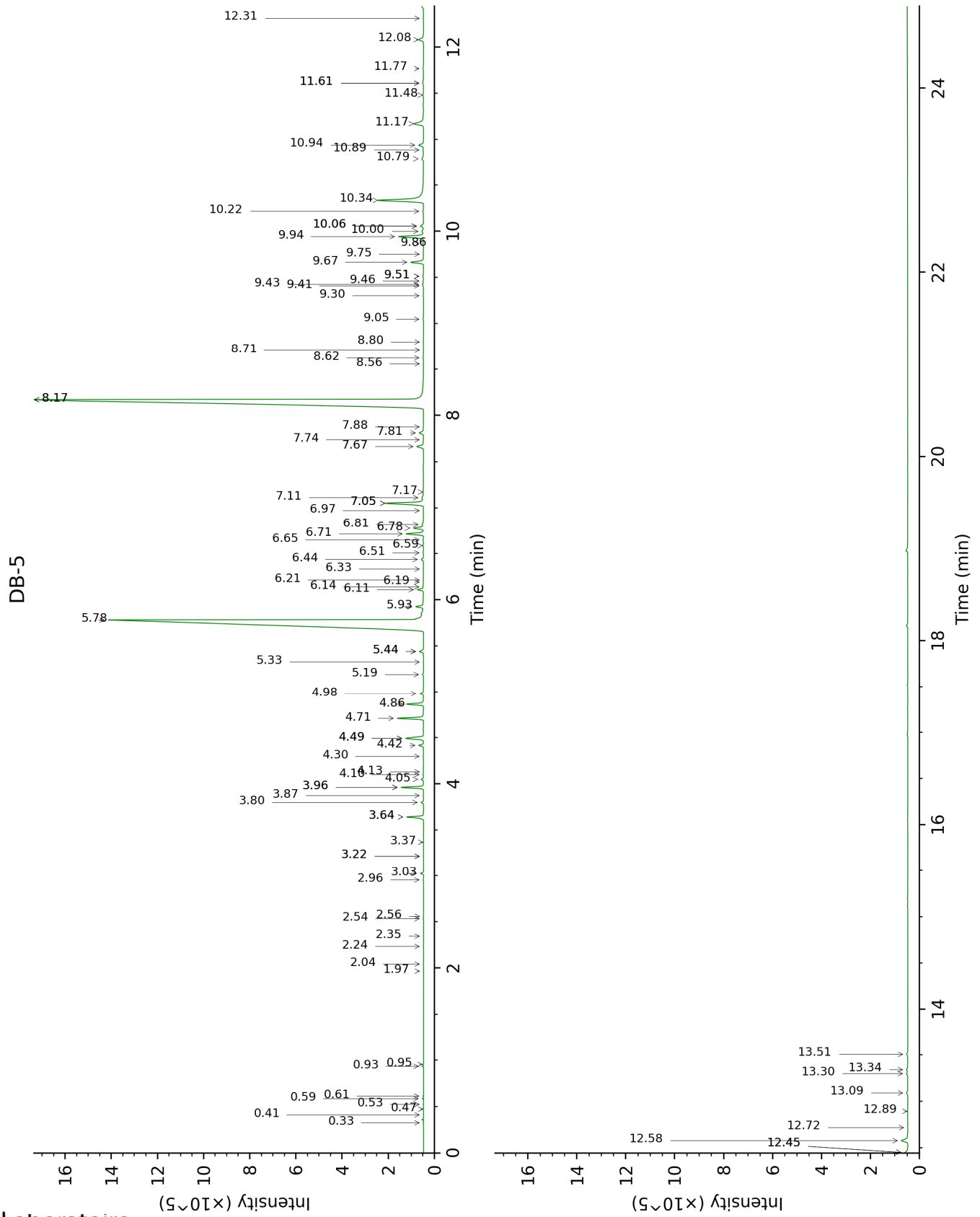
tr: The compound has been detected below 0.005% of total signal.

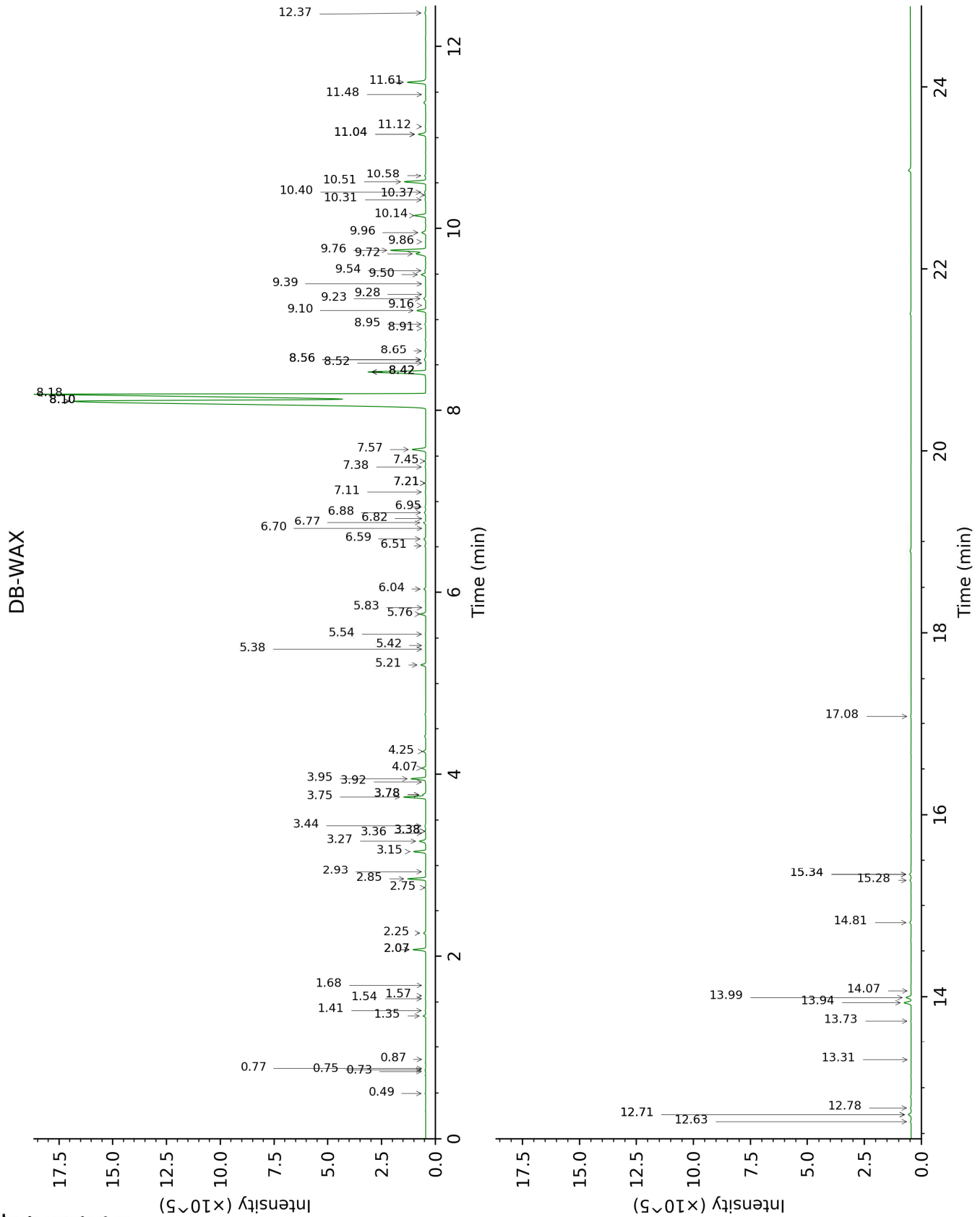
Note: no correction factor was applied

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	%
Ethanol	0.33	507	0.01	0.87	912	tr
Isobutyral	0.41	536	tr	0.50	783	0.02
2-Methyl-3-buten-2-ol	0.47	587	tr			
Isobutanol	0.52	618	0.01	2.07*	1066	0.60
Isovaleral	0.59	641	0.02	0.75	887	0.02
2-Methylbutyral	0.61	651	0.01	0.73	880	0.01
Isoamyl alcohol	0.93	731	0.02	3.38*	1175	0.02
2-Methylbutanol	0.95	734	0.02	3.36	1173	0.01
(2E)-Hexenal	1.97	848	0.01	3.44	1179	0.05
(3Z)-Hexenol	2.04	854	0.01	5.83	1354	0.01
Hexanol	2.24	870	0.01	5.42	1324	0.02
Isoamyl acetate	2.35	880	tr			
<i>trans</i> -2,5-Diethyltetrahydrofuran	2.54	896	0.01	1.54	1013	0.01
Nonane	2.56	898	0.01	0.77	893	tr
α -Thujene	2.96	925	0.02	1.41	1000	0.02
α -Pinene	3.03	930	0.11	1.35	992	0.10
Camphene	3.22*	942	0.01	1.68	1028	0.01
α -Fenchene	3.22*	942	[0.01]	1.57	1016	0.01
Benzaldehyde	3.37	953	0.01	7.20*	1455	0.02
β -Pinene	3.64*	971	0.70	2.07*	1066	[0.60]
Sabinene	3.64*	971	[0.70]	2.26	1084	0.11
Octen-3-ol	3.80	981	0.09	6.77	1422	0.11
Octan-3-one	3.87	986	0.02	3.92	1216	0.02
Myrcene	3.96*	992	0.84	2.85	1134	0.83
<i>trans</i> -Dehydroxylinalool oxide	3.96*	992	[0.84]	3.38*	1175	[0.02]
Octan-3-ol	4.05	998	0.09	6.04	1369	0.09
α -Phellandrene	4.10	1001	0.03	2.75	1126	0.02
<i>cis</i> -Dehydroxylinalool oxide	4.13	1003	0.01	3.78*†	1205	[1.22]
α -Terpinene	4.30	1014	0.02	2.93	1140	0.02
<i>para</i> -Cymene	4.42	1021	0.19	4.07	1226	0.19
Limonene	4.49*	1026	0.92	3.16	1157	0.59
1,8-Cineole	4.49*	1026	[0.92]	3.27	1166	0.36
(Z)- β -Ocimene	4.71	1040	1.05	3.75†	1204	1.22
(E)- β -Ocimene	4.86	1049	0.71	3.95	1218	0.72
γ -Terpinene	4.98	1057	0.16	3.78*†	1205	[1.22]
<i>cis</i> -Linalool oxide (fur.)	5.19	1070	0.05	6.51	1403	0.05
α -Pinene oxide analog	5.33	1079	0.01	5.38	1321	0.01
Terpinolene	5.44*	1086	0.20	4.25	1240	0.13
<i>trans</i> -Linalool oxide (fur.)	5.44*	1086	[0.20]	6.88	1431	0.08
Linalool	5.78	1108	40.31	8.10*†	1523	79.37
Octen-3-yl acetate	5.93	1117	0.35	5.76	1349	0.29
Octan-3-yl acetate	6.11	1129	0.24	5.21	1309	0.25
allo-Ocimene	6.14	1131	0.02	5.54	1333	0.02

<i>trans</i> -Pinocarveol	6.19	1134	0.01	9.16	1605	0.01
(<i>Z</i>)-Myroxide	6.21	1135	0.01	6.82	1426	0.02
Isopulegol	6.33	1143	0.01	8.18†	1529	[79.37]
Menthone	6.44	1150	0.10	6.59	1409	0.11
Pinocamphone	6.51	1154	0.02	7.20*	1455	[0.02]
Isomenthone	6.59	1159	0.03	6.94	1436	0.04
neo-Menthol	6.65	1163	0.03	8.56*	1558	0.09
Isopinocamphone	6.71	1168	0.76	7.57	1482	0.79
Menthol	6.78	1172	0.46	9.10	1601	0.48
Terpinen-4-ol	6.81	1174	0.08	8.56*	1558	[0.09]
para-Cymen-8-ol	6.97	1184	0.01	11.48	1798	0.02
Myrtenal	7.05*	1190	1.92	8.65	1566	0.05
α-Terpineol	7.05*	1190	[1.92]	9.76†	1654	[2.64]
Hodiendiol	7.11	1193	0.12	12.71*	1910	0.16
Methylchavicol	7.17	1197	0.02	9.28	1615	0.01
Nerol	7.66	1230	0.38	11.04*	1761	0.43
Thymol methyl ether	7.74	1235	0.02	8.42*	1548	3.34
Carvone	7.81	1240	0.23	9.96	1670	0.24
Carvacrol methyl ether	7.88	1245	0.02	8.52	1555	0.01
Geraniol	8.17*	1265	40.55	11.61	1810	1.05
Linalyl acetate	8.17*	1265	[40.55]	8.10*†	1523	[79.37]
<i>cis</i> -Linalool oxide acetate (pyr.)	8.56	1291	0.01	8.95	1589	0.05
Menthyl acetate	8.62	1296	0.03	8.10*†	1523	[79.37]
Dihydroedulan II	8.71	1302	0.01	7.38	1468	0.03
Carvacrol	8.80	1308	0.02	15.34*	2160	0.09
Myrtenyl acetate	9.05	1326	0.03	9.54	1636	0.06
Hodiendiol derivative	9.30	1339	0.03	12.78	1917	0.04
α-Cubebene	9.41	1347	0.02	6.70	1417	0.01
Unknown [m/z 43, 93 (40), 119 (38), 134 (30), 91 (25), 79 (23), 67 (19)...]	9.43	1348	0.06	10.58	1722	0.07
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.46	1350	0.03	11.04*	1761	[0.43]
Citronellyl acetate	9.51*	1354	0.05	9.40	1625	0.03
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.51*	1354	[0.05]	11.12	1768	0.03
Neryl acetate	9.67	1365	0.63	10.14	1686	0.62
α-Copaene	9.75	1371	0.02	7.11	1448	0.03
β-Bourbonene	9.86	1379	0.05	7.45	1473	0.04
Geranyl acetate	9.94	1384	1.21	10.51	1716	1.19
β-Elemene	10.00	1388	0.10	8.42*	1548	[3.34]
(<i>Z</i>)-Jasmone	10.06*	1392	0.17	12.37	1877	0.06
Unknown [m/z 119, 43 (57), 91 (50), 134 (36), 93 (29), 79 (28)...]	10.06*	1392	[0.17]			
Unknown [m/z 106, 119 (99), 43 (78), 91	10.22	1404	0.04			

(74), 105 (60), 134 (55)... 204 (19)]						
β-Caryophyllene	10.34	1412	3.09	8.42*	1548	[3.34]
α-Humulene	10.79	1446	0.12	9.23	1611	0.12
allo-Aromadendrene	10.89	1454	0.03	8.91	1586	0.02
(E)-β-Farnesene	10.94	1457	0.25	9.50	1633	0.26
Germacrene D	11.17	1475	0.72	9.72†	1651	2.64
δ-Amorphene	11.48	1498	0.05	9.86	1662	0.02
γ-Cadinene	11.61*	1507	0.07	10.31	1699	0.05
β-Dihydroagarofuran	11.61*	1507	[0.07]	10.37	1704	0.04
δ-Cadinene	11.77	1520	0.05	10.40	1706	0.07
α-Elemol	12.08	1544	0.29	13.99	2029	0.28
(E)-Nerolidol	12.31	1562	0.02	13.73	2004	0.02
Caryophyllene oxide	12.45*	1573	0.22	12.71*	1910	[0.16]
Caryophyllene oxide isomer	12.45*	1573	[0.22]	12.63	1903	0.04
Viridiflorol	12.58	1583	0.41	13.94	2024	0.39
Ledol	12.72	1594	0.01	13.31	1965	0.01
10-epi-γ-Eudesmol	12.89	1608	0.02	14.07	2036	0.01
γ-Eudesmol	13.09	1625	0.08	14.81	2108	0.08
β-Eudesmol	13.30	1642	0.08	15.34*	2160	[0.09]
α-Eudesmol	13.34	1645	0.08	15.28	2154	0.07
Precocene II	13.51	1659	0.07	17.08	2340	0.04
Total identified		99.08%			98.66%	
Total reported		99.20%			98.76%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not 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