

**Date :** June 18, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 19F10-PTH09-1-SCC

**Customer identification :** Bergamot Mint - India - BT010181R

**Type :** Essential oil

**Source :** *Mentha citrata*

**Customer :** Plant Therapy

**ANALYSIS**

**Method:** PC-PA-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 :** June 16, 2019

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:**  $1.4600 \pm 0.0003$  (20 °C)

*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	%	Classe
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.02	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.01	Furan
$\alpha$ -Thujene	0.02	Monoterpene
$\alpha$ -Pinene	0.09	Monoterpene
Camphene	0.01	Monoterpene
Sabinene	0.12	Monoterpene
$\beta$ -Pinene	0.79	Monoterpene
Octen-3-ol	0.08	Aliphatic alcohol
Octan-3-one	0.02	Aliphatic ketone
Myrcene	0.91	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
Octan-3-ol	0.08	Aliphatic alcohol
$\alpha$ -Phellandrene	0.02	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.01	Monoterpenic ether
$\alpha$ -Terpinene	0.03	Monoterpene
para-Cymene	0.13	Monoterpene
Limonene	0.60	Monoterpene
1,8-Cineole	0.34	Monoterpenic ether
( <i>Z</i> )- $\beta$ -Ocimene	1.20	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.82	Monoterpene
$\gamma$ -Terpinene	0.20	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.04	Monoterpenic alcohol
Terpinolene	0.16	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.06	Monoterpenic alcohol
Linalool	40.16	Monoterpenic alcohol
Octen-3-yl acetate	0.27	Aliphatic ester
Octan-3-yl acetate	0.24	Aliphatic ester
<i>trans</i> -Pinocarveol	0.02	Monoterpenic alcohol
Isopulegol	0.01	Monoterpenic alcohol
Menthone	0.06	Monoterpenic ketone
Pinocamphone	0.03	Monoterpenic ketone
Isomenthone	0.02	Monoterpenic ketone
neo-Menthol	0.02	Monoterpenic alcohol
Isopinocamphone	1.02	Monoterpenic ketone
Menthol	0.23	Monoterpenic alcohol
Terpinen-4-ol	0.08	Monoterpenic alcohol
Myrtenal	0.05	Monoterpenic aldehyde
$\alpha$ -Terpineol	1.97	Monoterpenic alcohol
Methylchavicol	0.05	Phenylpropanoid
Hodiendiol	0.05	Monoterpenic alcohol
Nerol	0.39	Monoterpenic alcohol
Carvone	0.29	Monoterpenic ketone
Carvacrol methyl ether	0.01	Monoterpenic ether
Geraniol	1.04	Monoterpenic alcohol

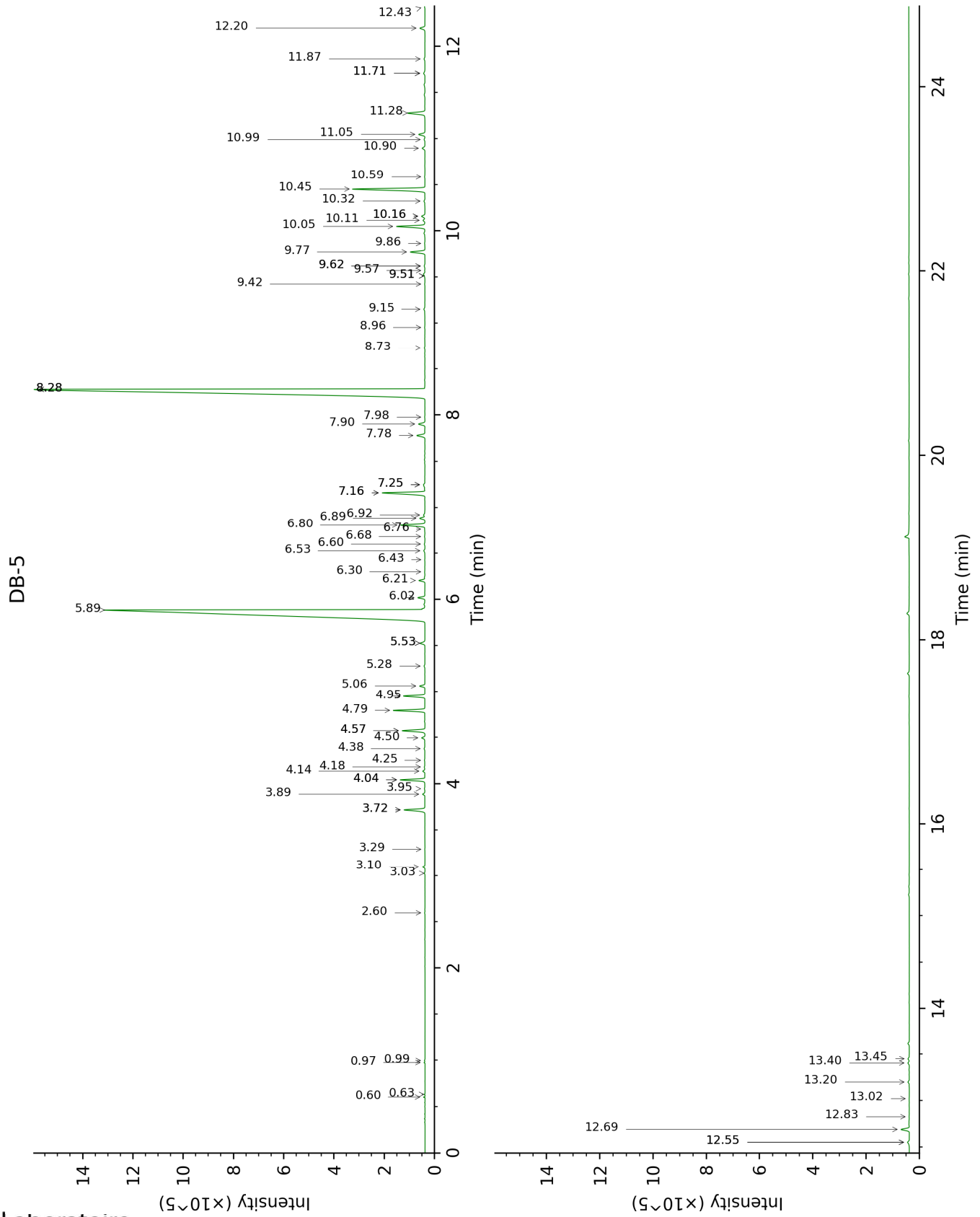
Linalyl acetate	38.41	Monoterpenic ester
Menthyl acetate	0.03	Monoterpenic ester
Carvacrol	0.02	Monoterpenic alcohol
Myrtenyl acetate	0.07	Monoterpenic ester
Hodiendiol derivative	0.02	Oxygenated monoterpene
$\alpha$ -Cubebene	0.02	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.06	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Citronellyl acetate	0.03	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.64	Monoterpenic ester
$\alpha$ -Copaene	0.02	Sesquiterpene
Geranyl acetate	1.25	Monoterpenic ester
$\beta$ -Elemene	0.09	Sesquiterpene
(Z)-Jasmone	0.05	Jasmonate
Unknown	0.11	Unknown
Unknown	0.05	Sesquiterpene
$\beta$ -Caryophyllene	3.43	Sesquiterpene
$\beta$ -Copaene	0.02	Sesquiterpene
$\alpha$ -Humulene	0.13	Sesquiterpene
allo-Aromadendrene	0.04	Sesquiterpene
(E)- $\beta$ -Farnesene	0.29	Sesquiterpene
Germacrene D	0.86	Sesquiterpene
$\beta$ -Dihydroagarofuran	0.06	Sesquiterpenic ether
$\gamma$ -Cadinene	0.02	Sesquiterpene
$\delta$ -Cadinene	0.05	Sesquiterpene
$\alpha$ -Elemol	0.25	Sesquiterpenic alcohol
(E)-Nerolidol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether
Caryophyllene oxide	0.04	Sesquiterpenic ether
Viridiflorol	0.37	Sesquiterpenic alcohol
Ledol	0.01	Sesquiterpenic alcohol
10-epi- $\gamma$ -Eudesmol	0.01	Sesquiterpenic alcohol
$\gamma$ -Eudesmol	0.06	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.07	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.06	Sesquiterpenic alcohol
<b>Consolidated total</b>	<b>98.56%</b>	

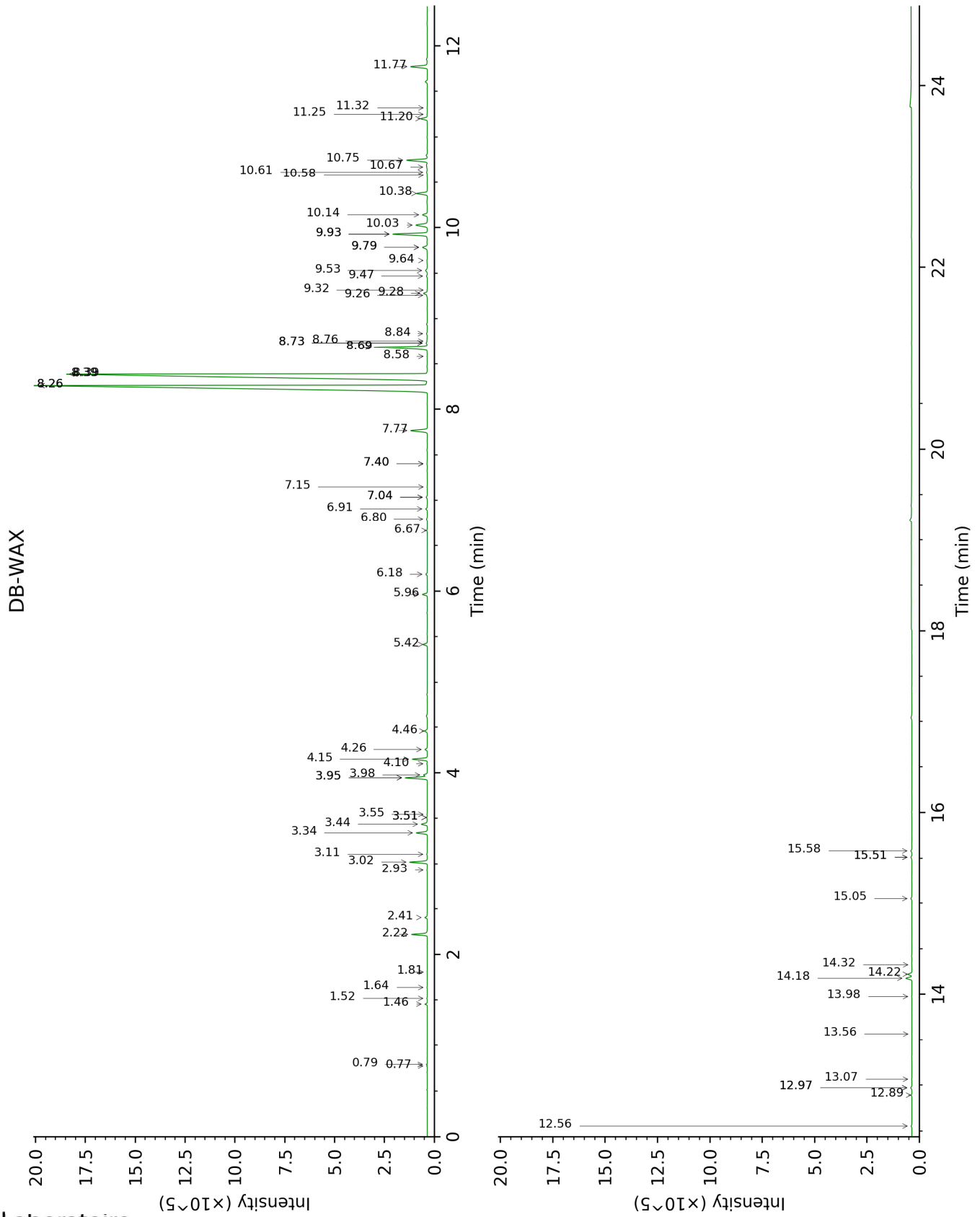
Note: no correction factor was applied

**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	%
Isovaleral	0.60	638	0.02	0.79	887	0.02
2-Methylbutyral	0.63	649	0.01	0.77	881	0.01
Isoamyl alcohol	0.97	733	0.02	3.51*	1175	0.04
2-Methylbutanol	1.00	736	0.01	3.55	1178	0.01
<i>trans</i> -2,5-Diethyltetrahydrofuran	2.60	895	0.01	1.64	1013	0.01
$\alpha$ -Thujene	3.03	924	0.02	1.52	1002	0.02
$\alpha$ -Pinene	3.10	929	0.09	1.46	996	0.09
Camphene	3.29	942	0.01	1.81	1029	0.01
Sabinene	3.72*	970	0.91	2.41	1087	0.12
$\beta$ -Pinene	3.72*	970	[0.91]	2.22	1069	0.79
Octen-3-ol	3.89	981	0.08	6.91	1417	0.09
Octan-3-one	3.95	985	0.02	4.10	1220	0.03
Myrcene	4.04*	991	0.93	3.02	1137	0.91
<i>trans</i> -Dehydroxylinalool oxide	4.04*	991	[0.93]	3.51*	1175	[0.04]
Octan-3-ol	4.14	997	0.08	6.18	1364	0.09
$\alpha$ -Phellandrene	4.18	1000	0.02	2.93	1129	0.02
<i>cis</i> -Dehydroxylinalool oxide	4.25	1005	0.01	3.95*	1209	1.20
$\alpha$ -Terpinene	4.38	1012	0.03	3.11	1143	0.03
para-Cymene	4.50	1020	0.13	4.26	1232	0.12
Limonene	4.57*	1025	0.95	3.34	1162	0.60
1,8-Cineole	4.57*	1025	[0.95]	3.44	1169	0.34
( <i>Z</i> )- $\beta$ -Ocimene	4.79	1038	1.20	3.95*	1209	[1.20]
( <i>E</i> )- $\beta$ -Ocimene	4.95	1048	0.82	4.15	1224	0.81
$\gamma$ -Terpinene	5.06	1055	0.20	3.98	1211	0.21
<i>cis</i> -Linalool oxide (fur.)	5.28	1069	0.04	6.67	1399	0.04
Terpinolene	5.53*	1084	0.22	4.46	1247	0.16
<i>trans</i> -Linalool oxide (fur.)	5.53*	1084	[0.22]	7.04*	1426	0.08
Linalool	5.89	1107	40.16	8.26*†	1519	78.61
Octen-3-yl acetate	6.02	1116	0.27	5.96	1348	0.27
Octan-3-yl acetate	6.20	1128	0.24	5.42	1308	0.23
<i>trans</i> -Pinocarveol	6.30	1134	0.02	9.32	1602	0.01
Isopulegol	6.43	1142	0.01	8.39*†	1529	[78.61]
Menthone	6.53	1148	0.06	6.80	1408	0.06
Pinocamphone	6.60	1153	0.03	7.40*	1454	0.04
Isomenthone	6.68	1158	0.02	7.15	1435	0.02
neo-Menthol	6.76	1164	0.02	8.76†	1558	[0.11]
Isopinocamphone	6.80	1166	1.02	7.77	1481	1.05
Menthol	6.89	1172	0.23	9.28	1599	0.23
Terpinen-4-ol	6.92	1174	0.08	8.74*†	1556	0.11
Myrtenal	7.16*	1189	2.02	8.84	1564	0.05
$\alpha$ -Terpineol	7.16*	1189	[2.02]	9.93*	1652	2.03
Methylchavicol	7.25*	1195	0.10	9.47	1614	0.05
Hodiendiol	7.25*	1195	[0.10]	12.97*	1914	0.08



Nerol	7.78	1231	0.39	11.20	1758	0.40
Carvone	7.90	1239	0.29	10.14	1669	0.31
Carvacrol methyl ether	7.98	1244	0.01	8.74*†	1556	[0.11]
Geraniol	8.28*	1265	39.51	11.77	1807	1.04
Linalyl acetate	8.28*	1265	[39.51]	8.39*†	1529	[78.61]
Menthyl acetate	8.73	1296	0.03	8.26*†	1519	[78.61]
Carvacrol	8.96	1307	0.02	15.51*	2157	0.07
Myrtenyl acetate	9.15	1321	0.07	9.78*	1640	0.37
Hodiendiol derivative	9.42	1340	0.02	13.07	1922	0.02
α-Cubebene	9.51*†	1346	0.09	7.04*	1426	[0.08]
α-Terpinyl acetate	9.51*†	1346	[0.09]	9.93*	1652	[2.03]
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.57	1350	0.01	11.25	1762	0.02
Citronellyl acetate	9.62*	1353	0.04	9.64	1628	0.03
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.62*	1353	[0.04]	11.32	1768	0.02
Neryl acetate	9.77	1364	0.64	10.38	1688	0.65
α-Copaene	9.86	1370	0.02	7.40*	1454	[0.04]
Geranyl acetate	10.05	1383	1.25	10.75	1719	1.24
β-Elementene	10.11	1388	0.09	8.69*	1552	3.47
(Z)-Jasmone	10.16*	1391	0.16	12.56	1876	0.05
Unknown [m/z 119, 43 (57), 91 (50), 134 (36), 93 (29), 79 (28)...]	10.16*	1391	[0.16]			
Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	10.32	1403	0.05			
β-Caryophyllene	10.45	1412	3.43	8.69*	1552	[3.47]
β-Copaene	10.58	1422	0.02	8.58	1544	0.02
α-Humulene	10.90	1446	0.13	9.53	1619	0.14
allo-Aromadendrene	10.99	1453	0.04	9.26	1597	0.03
(E)-β-Farnesene	11.05	1457	0.29	9.78*	1640	[0.37]
Germacrene D	11.28	1474	0.86	10.03	1660	0.85
β-Dihydroagarofuran	11.71*	1506	0.08	10.61	1708	0.06
γ-Cadinene	11.71*	1506	[0.08]	10.58	1705	0.02
δ-Cadinene	11.86	1518	0.05	10.67	1713	0.05
α-Elemol	12.20	1544	0.25	14.22	2030	0.24
(E)-Nerolidol	12.43	1562	0.02	13.98	2007	0.02
Caryophyllene oxide isomer	12.55*	1572	0.11	12.89	1906	0.04
Caryophyllene oxide	12.55*	1572	[0.11]	12.97*	1914	[0.08]
Viridiflorol	12.69	1582	0.37	14.18	2026	0.37
Ledol	12.83	1593	0.01	13.56	1968	0.01
10-epi-γ-Eudesmol	13.02	1609	0.01	14.32	2040	0.01
γ-Eudesmol	13.20	1623	0.06	15.05	2110	0.06
β-Eudesmol	13.40	1640	0.07	15.58	2164	0.06
α-Eudesmol	13.45	1644	0.06	15.51*	2157	[0.07]
<b>Total identified</b>		<b>98.61%</b>			<b>98.32%</b>	

<b>Total reported</b>	<b>98.66%</b>	<b>98.36%</b>
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\*: 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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index