

**Date :** August 22, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 19H12-PTH03-1-CC

**Customer identification :** Honeybell - HA410296R

**Type :** Essential oil

**Source :** Blend of oils - Honeybell

**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 :** August 20, 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:** Yellow liquid

**Refractive index:**  $1.4731 \pm 0.0003$  (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
Ethyl acetate	tr	Aliphatic ester
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
Ethyl butyrate	0.04	Aliphatic ester
(2E)-Hexenal	0.01	Aliphatic aldehyde
Heptanal	tr	Aliphatic aldehyde
$\alpha$ -Thujene	0.01	Monoterpene
$\alpha$ -Pinene	0.52	Monoterpene
Camphene	0.01	Monoterpene
Sabinene	0.33	Monoterpene
$\beta$ -Pinene	0.11	Monoterpene
Myrcene	1.75	Monoterpene
$\alpha$ -Phellandrene	0.03	Monoterpene
Octanal	0.25	Aliphatic aldehyde
$\Delta^3$ -Carene	0.10	Monoterpene
$\alpha$ -Terpinene	0.01	Monoterpene
para-Cymene	0.01	Monoterpene
Limonene	92.30	Monoterpene
1,8-Cineole	0.25	Monoterpenic ether
(Z)- $\beta$ -Ocimene	tr	Monoterpene
(E)- $\beta$ -Ocimene	0.04	Monoterpene
$\gamma$ -Terpinene	0.06	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.05	Aliphatic alcohol
Terpinolene	0.06	Monoterpene
6,7-Epoxyterpinene	0.01	Monoterpenic ether
Linalool	0.44	Monoterpenic alcohol
Nonanal	0.05	Aliphatic aldehyde
endo-Fenchol	0.01	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.05	Monoterpenic alcohol
cis-Limonene oxide	0.05	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
trans-Limonene oxide	0.05	Monoterpenic ether
Menthone	0.01	Monoterpenic ketone
Citronellal	0.05	Monoterpenic aldehyde
Isomenthone	0.02	Monoterpenic ketone
Unknown	0.01	Unknown
Terpinen-4-ol	0.02	Monoterpenic alcohol
trans-para-Mentha-1(7),8-dien-2-ol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.11	Monoterpenic alcohol
Unknown	0.02	Unknown
Ethyl octanoate	0.02	Aliphatic ester
Decanal	0.24	Aliphatic aldehyde
trans-Carveol	0.03	Monoterpenic alcohol
Octyl acetate	0.03	Aliphatic ester

<i>cis</i> -Carveol	0.03	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Carvone	0.04	Monoterpenic ketone
Neral	0.09	Monoterpenic aldehyde
Geraniol	0.01	Monoterpenic alcohol
Geranial	0.07	Monoterpenic aldehyde
Limonen-10-ol	0.01	Monoterpenic alcohol
2-Hydroxypiperitone	0.01	Monoterpenic alcohol
Undecanal	0.01	Aliphatic aldehyde
para-Mentha-1,8-diene-4-hydroperoxide	0.01	Monoterpenic peroxide
Limonene hydroperoxide IV	0.01	Monoterpenic peroxide
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	0.01	Monoterpenic peroxide
$\alpha$ -Copaene	0.03	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
<i>cis</i> -para-Mentha-6,8-diene-2-hydroperoxide	0.03	Monoterpenic peroxide
$\beta$ -Elemene	0.02	Sesquiterpene
Ethyl decanoate	0.20	Aliphatic ester
Dodecanal	0.05	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.10	Sesquiterpene
$\beta$ -Copaene	0.03	Sesquiterpene
$\alpha$ -Humulene	0.02	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
Valencene	0.14	Sesquiterpene
$\alpha$ -Murolene	0.01	Sesquiterpene
(3 <i>Z</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.01	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.04	Sesquiterpene
$\delta$ -Cadinene	0.04	Sesquiterpene
$\alpha$ -Elemol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Ethyl dodecanoate	0.12	Aliphatic ester
$\beta$ -Sinensal	0.02	Sesquiterpenic aldehyde
$\alpha$ -Sinensal	0.01	Sesquiterpenic aldehyde
Nootkatone	0.06	Sesquiterpenic ketone
Palmitic acid	0.09	Aliphatic acid
Ethyl palmitate	0.05	Aliphatic ester
Stearic acid	0.13	Aliphatic acid
Isoauraptene	0.01	Coumarin
Meranzin	0.02	Coumarin
Auraptene	0.11	Coumarin
$\alpha$ -Tocopherol	0.01	Tocopherol
Tangeretin	0.03	Flavonoid
3,5,6,7,8,3',4'-Heptamethoxyflavone?	0.03	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.03	Flavonoid
<b>Consolidated total</b>	<b>99.10%</b>	

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

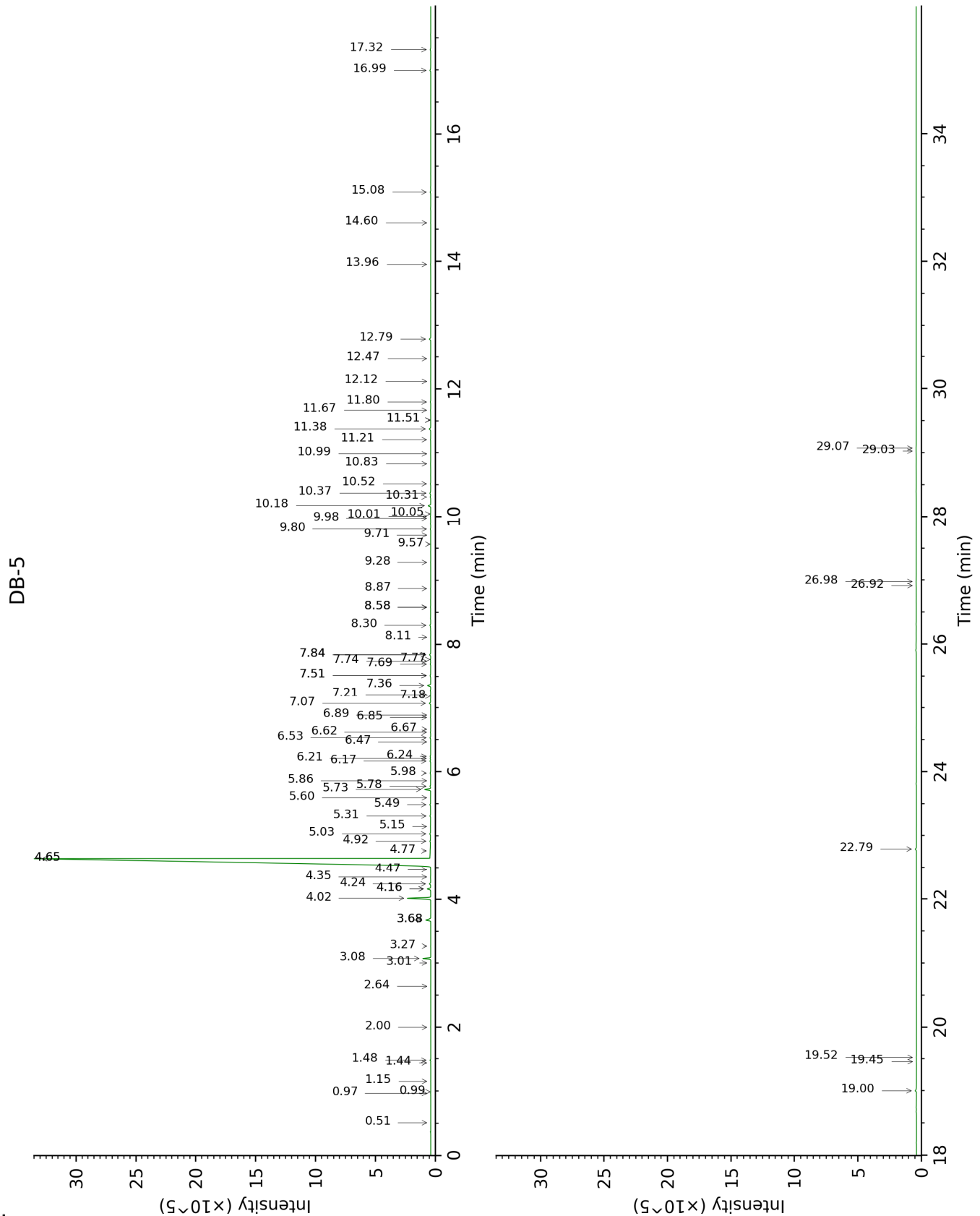
Note: no correction factor was applied

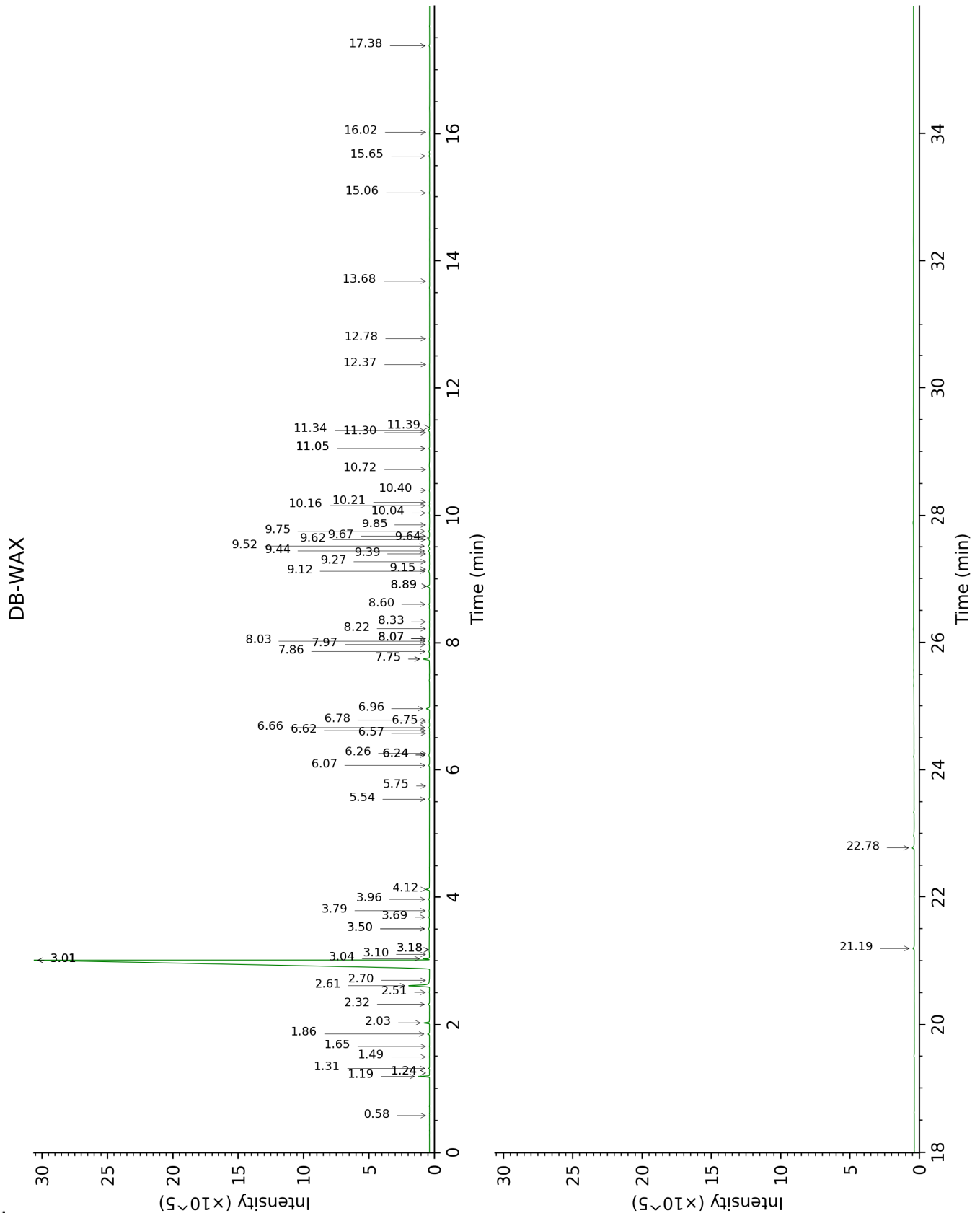
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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	%
Ethyl acetate	0.51	597	tr	0.58	852	tr
Isoamyl alcohol	0.97	735	0.01	3.18*	1179	0.01
2-Methylbutanol	0.99	738	tr	3.18*	1179	[0.01]
Toluene	1.15	760	tr	1.24*†	1000	0.01
Hexanal	1.44	800	0.01	1.65	1043	0.01
Ethyl butyrate	1.48	806	0.04	1.31	1007	0.04
(2E)-Hexenal	2.00	848	0.01	3.10	1173	0.01
Heptanal	2.64	901	tr	3.01*	1166	92.30
α-Thujene	3.01	925	0.01	1.24*†	1000	[0.01]
α-Pinene	3.08	930	0.52	1.19	990	0.51
Camphene	3.27	942	0.01	1.49	1026	0.01
Sabinene	3.68*	969	0.44	2.03	1083	0.33
β-Pinene	3.68*	969	[0.44]	1.86	1064	0.11
Myrcene	4.02	992	1.75	2.61	1134	1.75
α-Phellandrene	4.16*	1001	0.28	2.51	1125	0.03
Octanal	4.16*	1001	[0.28]	4.12	1252	0.25
Δ3-Carene	4.24	1006	0.10	2.32	1110	0.10
α-Terpinene	4.35	1013	0.01	2.70	1140	0.02
para-Cymene	4.47	1021	0.01	3.79	1227	0.03
Limonene	4.65*	1032	92.56	3.01*	1166	[92.30]
1,8-Cineole	4.65*	1032	[92.56]	3.04	1168	0.25
(Z)-β-Ocimene	4.77	1039	tr	3.50*	1206	0.08
(E)-β-Ocimene	4.92	1049	0.04	3.68	1219	0.05
γ-Terpinene	5.03	1056	0.06	3.50*	1206	[0.08]
cis-Sabinene hydrate	5.15	1063	0.01	6.57	1430	0.01
Octanol	5.31	1074	0.05	7.86	1528	0.05
Terpinolene	5.49	1085	0.06	3.96	1240	0.06
6,7-Epoxymyrcene	5.60	1092	0.01	5.75	1370	tr
Linalool	5.73	1100	0.44	7.75*	1518	0.45
Nonanal	5.78	1103	0.05	5.54	1354	0.05
endo-Fenchol	5.86	1109	0.01	8.07*†	1543	[0.07]
trans-para-Mentha-2,8-dien-1-ol	5.98	1117	0.05	8.60	1585	0.04
cis-Limonene oxide	6.17	1129	0.05	6.07	1393	0.06
cis-para-Mentha-2,8-dien-1-ol	6.21†	1132	0.08	9.15	1629	0.01
trans-Limonene oxide	6.24†	1134	[0.08]	6.24*	1405	0.07
Menthone	6.47	1148	0.01	6.26	1407	0.01
Citronellal	6.53	1152	0.05	6.66	1437	0.05
Isomenthone	6.62	1158	0.02	6.62	1433	0.02
Unknown [m/z 79, 56 (53), 55 (53), 136 (50), 41 (49), 80 (42)...]	6.67	1161	0.01			
Terpinen-4-ol	6.85	1173	0.02	8.22	1556	0.01
trans-para-Mentha-1(7),8-dien-2-ol	6.89	1176	0.01	11.05*	1788	0.04
α-Terpineol	7.07	1188	0.11	9.44	1652	0.11
Unknown [m/z 121, 79]	7.18	1195	0.02	7.75*	1518	[0.45]

(61), 93 (55), 94 (40), 91 (39), 84 (37)...						
Ethyl octanoate	7.21	1197	0.02	6.24*	1405	[0.07]
Decanal	7.36	1207	0.24	6.96	1459	0.24
<i>trans</i> -Carveol	7.51*	1217	0.07	11.05*	1788	[0.04]
Octyl acetate	7.51*	1217	[0.07]	6.78	1446	0.03
<i>cis</i> -Carveol	7.69	1230	0.03	11.39	1817	0.02
Nerol	7.74	1233	0.01	10.72	1760	tr
Citronellol	7.77	1235	0.02	10.40	1732	0.03
Carvone	7.84*	1240	0.10	9.64	1669	0.04
Neral	7.84*	1240	[0.10]	9.12	1627	0.09
Geraniol	8.11	1259	0.01	11.30	1809	0.01
Geranial	8.30	1272	0.07	9.75	1677	0.08
Limonen-10-ol	8.58*	1291	0.02	12.78	1943	0.01
2-Hydroxypiperitone	8.58*	1291	[0.02]			
Undecanal	8.87	1306	0.01	8.33	1564	0.01
para-Mentha-1,8-diene-4-hydroperoxide	9.28	1335	0.01			
Limonene hydroperoxide IV	9.57	1355	0.01			
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	9.71	1365	0.01			
$\alpha$ -Copaene	9.80	1372	0.03	6.75	1444	0.02
Geranyl acetate	9.98	1385	0.02	10.21	1716	0.03
<i>cis</i> -para-Mentha-6,8-diene-2-hydroperoxide	10.01	1387	0.03			
$\beta$ -Elemene	10.05	1390	0.02	8.07*†	1543	[0.07]
Ethyl decanoate	10.18	1399	0.20	8.89*	1608	0.21
Dodecanal	10.31	1408	0.05	9.62	1667	0.06
$\beta$ -Caryophyllene	10.37	1413	0.10	8.03†	1540	0.07
$\beta$ -Copaene	10.52	1424	0.03	7.97	1536	0.03
$\alpha$ -Humulene	10.83	1447	0.02	8.89*	1608	[0.21]
( <i>E</i> )- $\beta$ -Farnesene	10.99	1459	0.01	9.27	1639	0.01
Germacrene D	11.21	1475	0.02	9.39	1649	0.02
Valencene	11.38	1488	0.14	9.52	1659	0.13
$\alpha$ -Muurolene	11.51*	1498	0.01	9.67	1671	0.01
(3 <i>Z</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	11.51*	1498	[0.01]	9.85	1686	0.01
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	11.67	1510	0.04	10.16	1712	0.04
$\delta$ -Cadinene	11.80	1520	0.04	10.04	1702	0.05
$\alpha$ -Elemol	12.12	1546	0.02	13.68	2027	0.01
Caryophyllene oxide	12.47	1574	0.02	12.37	1904	0.01
Ethyl dodecanoate	12.79	1598	0.12	11.34	1812	0.11
$\beta$ -Sinensal	13.96	1694	0.02	15.06	2163	0.02
$\alpha$ -Sinensal	14.60	1750	0.01	16.02	2261	0.01
Nootkatone	15.08	1792	0.06	17.38	2407	0.06
Palmitic acid	16.99	1968	0.09	21.19	2862	0.12
Ethyl palmitate	17.32	1999	0.05	15.65	2222	0.05
Stearic acid	19.00	2168	0.13	22.78	3072	0.20
Isoauraptene	19.45	2215	0.01			
Meranzin	19.52	2222	0.02			
Auraptene	22.79	2594	0.11			
$\alpha$ -Tocopherol	26.92	3125	0.01			

Tangeretin	26.98	3132	0.03	
3,5,6,7,8,3',4'- Heptamethoxyflavone?	29.03	3314	0.03	
3,3',4',5,6,7,8- Heptamethoxyflavone	29.07	3318	0.03	
<b>Total identified</b>		<b>99.07%</b>		<b>98.82%</b>
<b>Total reported</b>		<b>99.09%</b>		<b>98.82%</b>

\*: 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