

**Date :** April 20, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 20D16-PTH02

**Customer identification :** Rosemary Organic - France - R5010797R

**Type :** Essential oil

**Source :** *Rosmarinus officinalis* ct. 1,8-Cineole

**Customer :** Plant Therapy

**ANALYSIS**

**Method:** PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** April 20, 2020

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:**  $1.4670 \pm 0.0003$  (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	%	Classe
Isovaleral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
(3Z)-Hexenol	0.02	Aliphatic alcohol
Hexanol	tr	Aliphatic alcohol
Bornylene	0.01	Monoterpene
Hashishene	0.02	Monoterpene
Tricyclene	0.15	Monoterpene
$\alpha$ -Thujene	0.39	Monoterpene
$\alpha$ -Pinene	10.15	Monoterpene
Camphene	4.29	Monoterpene
$\alpha$ -Fenchene	0.06	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
$\beta$ -Pinene	8.08	Monoterpene
Sabinene	0.16	Monoterpene
Octen-3-ol	0.13	Aliphatic alcohol
Octan-3-one	0.08	Aliphatic ketone
Myrcene	1.39	Monoterpene
Octan-3-ol	0.01	Aliphatic alcohol
$\alpha$ -Phellandrene	0.14	Monoterpene
Pseudolimonene	0.03	Monoterpene
$\Delta^3$ -Carene	0.27	Monoterpene
$\alpha$ -Terpinene	0.41	Monoterpene
para-Cymene	0.98	Monoterpene
1,8-Cineole	44.78	Monoterpenic ether
Limonene	2.07	Monoterpene
(Z)- $\beta$ -Ocimene	0.05	Monoterpene
(E)- $\beta$ -Ocimene	0.07	Monoterpene
$\gamma$ -Terpinene	0.78	Monoterpene
cis-Sabinene hydrate	0.12	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Fenchone	0.01	Monoterpenic ketone
Terpinolene	0.41	Monoterpene
para-Cymenene	0.03	Monoterpene
trans-Sabinene hydrate	0.06	Monoterpenic alcohol
Linalool	0.75	Monoterpenic alcohol
Unknown	0.02	Unknown
endo-Fenchol	0.04	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
$\alpha$ -Campholenal	0.02	Monoterpenic aldehyde
Camphor	11.00	Monoterpenic ketone
Camphene hydrate	0.03	Monoterpenic alcohol
Isoborneol	0.01	Monoterpenic alcohol
Pinocamphone	0.02	Monoterpenic ketone
Pinocarvone	0.02	Monoterpenic ketone
Borneol	2.74	Monoterpenic alcohol

δ-Terpineol	0.36	Monoterpenic alcohol
Isopinocampone	0.03	Monoterpenic ketone
Terpinen-4-ol	0.81	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	1.60	Monoterpenic alcohol
Myrtenol	0.03	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
cis-para-Mentha-1(7),8-dien-2-ol	0.01	Monoterpenic alcohol
Bornyl formate	0.02	Monoterpenic ester
Citronellol	0.02	Monoterpenic alcohol
Bornyl acetate	1.04	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
cis-para-Mentha-2,8-diene-1-hydroperoxide?	0.01	Monoterpenic peroxide
Unknown	0.01	Unknown
Unknown	0.02	Monoterpenic alcohol
α-Cubebene	0.05	Sesquiterpene
Eugenol	0.02	Phenylpropanoid
α-Ylangene	0.06	Sesquiterpene
α-Copaene	0.19	Sesquiterpene
Methyleugenol	0.09	Phenylpropanoid
β-Caryophyllene	3.36	Sesquiterpene
β-Copaene	0.13	Sesquiterpene
Aromadendrene	0.06	Sesquiterpene
α-Humulene	0.38	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
(E)-β-Farnesene	0.02	Sesquiterpene
γ-Murolene	0.17	Sesquiterpene
α-Amorphene	0.01	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
α-Selinene	0.05	Sesquiterpene
Unknown	0.03	Unknown
α-Murolene	0.07	Sesquiterpene
β-Bisabolene	0.06	Sesquiterpene
γ-Cadinene	0.06	Sesquiterpene
δ-Cadinene	0.24	Sesquiterpene
trans-Calamenene	0.02	Sesquiterpene
trans-Cadina-1,4-diene	0.02	Sesquiterpene
α-Calacorene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.12	Sesquiterpenic ether
Caryophylladienol II	0.01	Sesquiterpenic alcohol
14-Hydroxy-(Z)-caryophyllene	0.01	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	0.01	Sesquiterpenic alcohol
meta-Camphorene	0.01	Diterpene
<b>Consolidated total</b>	<b>99.22%</b>	

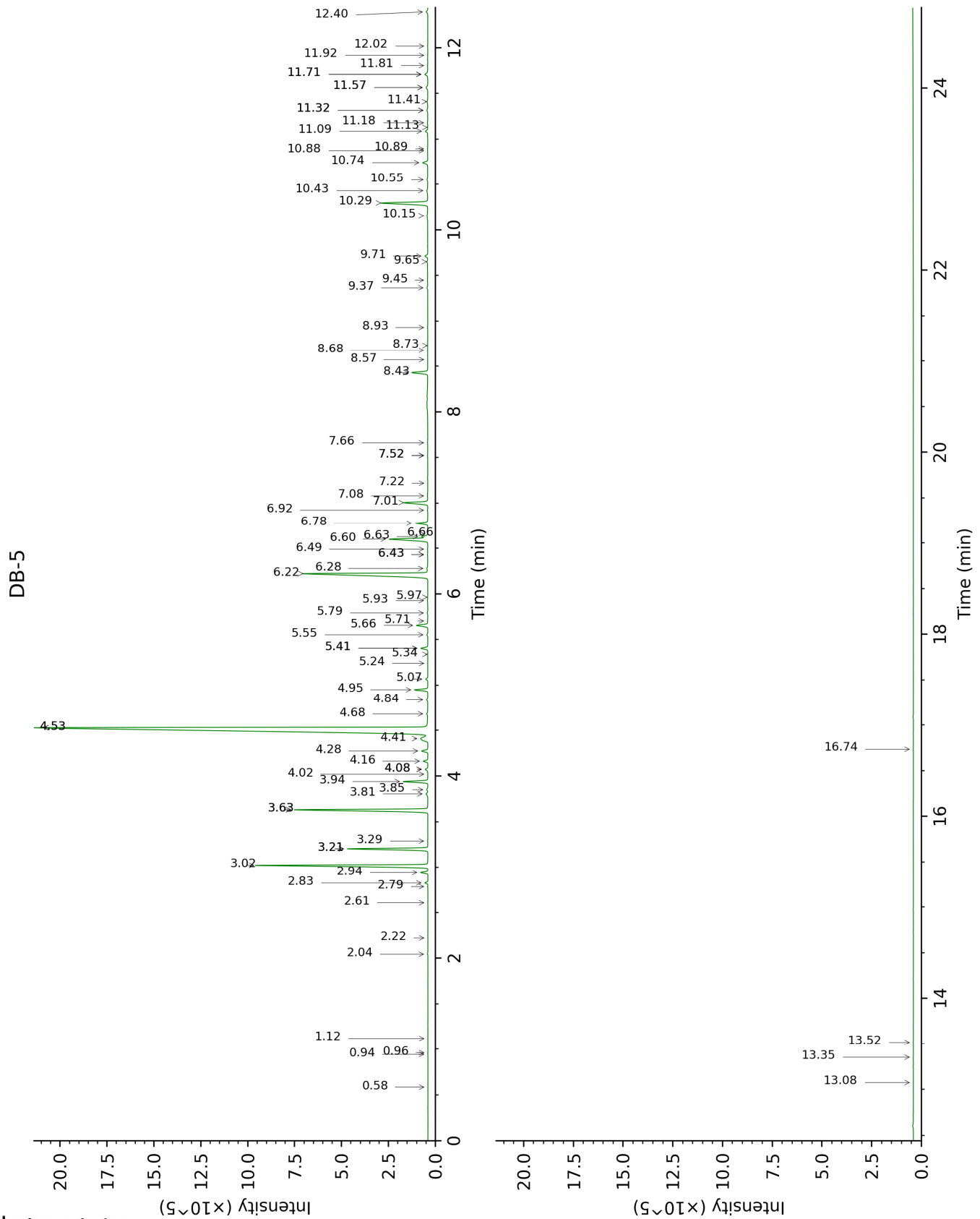
tr: The compound has been detected below 0.005% of total signal.

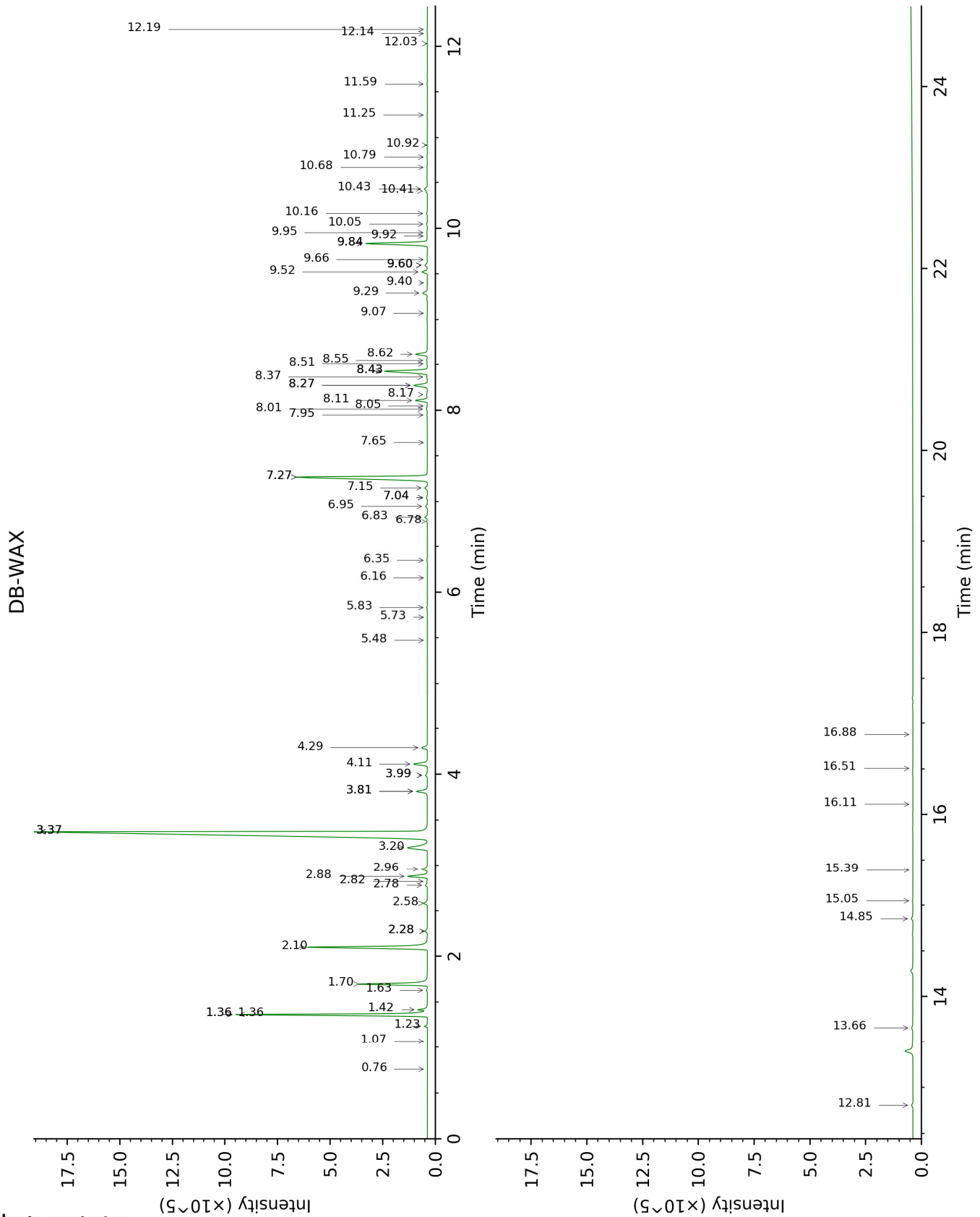
Note: no correction factor was applied

**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	%
Isovaleral	0.58	639	tr	0.76	889	tr
Isoamyl alcohol	0.94	737	tr	3.37*	1170	44.79
2-Methylbutanol	0.96	740	tr	3.37*	1170	[44.79]
Toluene	1.12	762	tr	1.36*	992	9.93
(3Z)-Hexenol	2.04	856	0.02	5.83	1348	0.03
Hexanol	2.22	871	tr	5.48	1323	0.01
Bornylene	2.61	903	0.01	1.07	943	tr
Hashishene	2.78	915	0.02	1.36*	992	[9.93]
Tricyclene	2.83	918	0.15	1.23	971	0.15
$\alpha$ -Thujene	2.94	925	0.39	1.42	998	0.56
$\alpha$ -Pinene	3.02	931	10.15	1.36*	992	[9.93]
Camphene	3.20*	942	4.37	1.70	1026	4.29
$\alpha$ -Fenchene	3.20*	942	[4.37]	1.63	1019	0.06
Thuja-2,4(10)-diene	3.29	948	0.02	2.28*	1083	0.18
$\beta$ -Pinene	3.63*	971	8.32	2.10	1066	8.08
Sabinene	3.63*	971	[8.32]	2.28*	1083	[0.18]
Octen-3-ol	3.81	982	0.13	6.83	1420	0.17
Octan-3-one	3.85	985	0.08	3.99*	1216	0.12
Myrcene	3.94	991	1.39	2.88	1132	1.38
Octan-3-ol	4.02	997	0.01	6.16	1371	0.01
$\alpha$ -Phellandrene	4.08*	1000	0.18	2.78	1124	0.14
Pseudolimonene	4.08*	1000	[0.18]	2.82	1128	0.03
$\Delta$ 3-Carene	4.16	1006	0.27	2.58	1109	0.27
$\alpha$ -Terpinene	4.28	1013	0.41	2.96	1138	0.42
para-Cymene	4.41	1022	0.98	4.11	1225	1.00
1,8-Cineole	4.53*	1029	46.95	3.37*	1170	[44.79]
Limonene	4.53*	1029	[46.95]	3.20	1157	2.07
(Z)- $\beta$ -Ocimene	4.68	1039	0.05	3.81*	1204	0.83
(E)- $\beta$ -Ocimene	4.84	1048	0.07	3.99*	1216	[0.12]
$\gamma$ -Terpinene	4.95	1056	0.78	3.81*	1204	[0.83]
cis-Sabinene hydrate	5.07	1063	0.12	6.95	1429	0.13
Octanol	5.24	1074	0.01	8.27*	1528	1.05
Fenchone	5.34	1080	0.01	5.73	1341	0.01
Terpinolene	5.41*	1085	0.43	4.29	1238	0.41
para-Cymenene	5.41*	1085	[0.43]	6.35	1385	0.03
trans-Sabinene hydrate	5.56	1094	0.06	8.01	1508	0.07
Linalool	5.66	1101	0.75	8.11	1516	0.77
Unknown [m/z 139, 95 (95), 109 (64), 121 (40), 41 (23), 136 (22)...]	5.71	1104	0.02			
endo-Fenchol	5.79	1109	0.04	8.43*	1540	3.33
cis-para-Menth-2-en-1-ol	5.93	1118	0.03	8.17	1521	0.08
$\alpha$ -Campholenal	5.97	1121	0.02	7.04*	1436	0.06

Camphor	6.22†	1137	11.03	7.27*	1453	10.89
Camphene hydrate	6.28†	1141	[11.03]	8.51	1547	0.03
Isoborneol	6.43*	1151	0.03	9.40	1617	0.01
Pinocamphone	6.43*	1151	[0.03]	7.27*	1453	[10.89]
Pinocarvone	6.49	1155	0.02	7.95	1504	0.04
Borneol	6.60	1162	2.74	9.84*	1651	4.36
δ-Terpineol	6.63	1164	0.36	9.52	1626	0.37
Isopinocamphone	6.66	1166	0.03	7.65	1481	0.01
Terpinen-4-ol	6.78	1174	0.81	8.62	1555	0.81
para-Cymen-8-ol	6.92	1183	0.03	11.59	1798	0.03
α-Terpineol	7.01	1189	1.60	9.84*	1651	[4.36]
Myrtenol	7.08	1194	0.03	10.92	1741	0.02
Verbenone	7.22	1203	0.01	9.66	1637	0.02
cis-para-Mentha-1(7),8-dien-2-ol	7.52*	1224	0.02	12.03	1836	0.01
Bornyl formate	7.52*	1224	[0.02]	8.05	1511	0.02
Citronellol	7.66	1233	0.02	10.79	1730	0.03
Bornyl acetate	8.43	1287	1.04	8.27*	1528	[1.05]
Unknown [m/z 43, 93 (66), 91 (44), 41 (38), 69 (35)... 152? (1)]	8.58	1297	0.01			
cis-para-Mentha-2,8-diene-1-hydroperoxide?	8.68	1304	0.01			
Unknown [m/z 69, 41 (79), 91 (56), 92 (54), 79 (50), 77 (35)...]	8.73	1308	0.01			
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	8.93	1323	0.02	15.05	2118	0.02
α-Cubebene	9.37	1347	0.05	6.78	1417	0.06
Eugenol	9.45	1353	0.02	14.85	2098	0.14
α-Ylangene	9.65	1367	0.06	7.04*	1436	[0.06]
α-Copaene	9.72	1372	0.19	7.15	1444	0.19
Methyleugenol	10.16	1403	0.09	13.66	1984	0.10
β-Caryophyllene	10.30	1413	3.36	8.43*	1540	[3.33]
β-Copaene	10.43	1423	0.13	8.37	1536	0.05
Aromadendrene	10.55	1432	0.06	8.55	1550	0.05
α-Humulene	10.74	1446	0.38	9.29	1608	0.35
allo-Aromadendrene	10.88	1456	0.02	9.07	1590	0.01
(E)-β-Farnesene	10.90	1458	0.02	9.60*	1632	0.19
γ-Murolene	11.09	1472	0.17	9.60*	1632	[0.19]
α-Amorphene	11.13	1475	0.01	9.60*	1632	[0.19]
β-Selinene	11.18	1479	0.03	9.92	1658	0.03
α-Selinene	11.32*	1489	0.08	9.95	1661	0.05
Unknown [m/z 59, 94 (67), 95]	11.32*	1489	[0.08]			

(50), 79 (44), 43 (41), 73 (16)...						
$\alpha$ -Muurolene	11.41	1496	0.07	10.05	1668	0.05
$\beta$ -Bisabolene	11.57*	1508	0.15	10.16	1678	0.06
$\gamma$ -Cadinene	11.57*	1508	[0.15]	10.41	1698	0.06
$\delta$ -Cadinene	11.71*	1519	0.26	10.43	1700	0.24
<i>trans</i> -Calamenene	11.71*	1519	[0.26]	11.25	1769	0.02
<i>trans</i> -Cadina-1,4- diene	11.81	1527	0.02	10.68	1720	0.03
$\alpha$ -Calacorene	11.92	1536	0.01	12.14	1846	0.01
Isocaryophyllene epoxide B	12.02	1544	0.02	12.19	1850	0.03
Caryophyllene oxide	12.40	1573	0.12	12.81	1906	0.11
Caryophylladienol II	13.08	1628	0.01	16.11	2225	0.01
14-Hydroxy-( <i>Z</i> )- caryophyllene	13.35	1650	0.01	16.51	2266	0.01
(3 <i>Z</i> )-Caryophylla- 3,8(13)-dien-5 $\beta$ -ol	13.52	1664	0.01	16.88	2305	0.01
meta- Camphorene	16.74	1951	0.01	15.39	2152	0.01
<b>Total identified</b>		<b>99.38%</b>			<b>98.98%</b>	
<b>Total reported</b>		<b>99.44%</b>			<b>99.00%</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