Date : July 29, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21G15-PTH02
Customer identification : Lemon Essence - Italy - LX01052111R
Type : Essential oil
Source : *Citrus x limon* ct. Distilled
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : July 28, 2021

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4738 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

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Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Octane	0.01	Alkane
Nonane	0.01	Alkane
Tricyclene	0.01	Monoterpene
α-Thujene	0.28	Monoterpene
α-Pinene	1.45	Monoterpene
Camphene	0.06	Monoterpene
α-Fenchene	0.01	Monoterpene
β-Pinene	9.46	Monoterpene
Sabinene	0.50	Monoterpene
6-Methyl-5-hepten-2-one	0.04	Aliphatic ketone
Myrcene	1.37	Monoterpene
α-Phellandrene	0.04	Monoterpene
Octanal	0.04	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.27	Monoterpene
para-Cymene	0.87	Monoterpene
Limonene	67.69	Monoterpene
1,8-Cineole	0.38	Monoterpenic ether
(*Z*)-β-Ocimene	0.06	Monoterpene
(*E*)-β-Ocimene	0.11	Monoterpene
γ-Terpinene	9.16	Monoterpene
cis-Sabinene hydrate	tr	Monoterpenic alcohol
Octanol	0.05	Aliphatic alcohol
Terpinolene	0.53	Monoterpene
trans-Sabinene hydrate	tr	Monoterpenic alcohol
Linalool	0.21	Monoterpenic alcohol
Nonanal	0.06	Aliphatic aldehyde
endo-Fenchol	0.03	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
cis-Limonene oxide	0.04	Monoterpenic ether
trans-Limonene oxide	0.01	Monoterpenic ether
Camphor	0.03	Monoterpenic ketone
Epoxyterpinolene	0.02	Monoterpenic ether
Citronellal	tr	Monoterpenic aldehyde
Borneol	0.03	Monoterpenic alcohol
Terpinen-4-ol	0.77	Monoterpenic alcohol
Isogeranial	0.04	Monoterpenic aldehyde
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α-Terpineol	0.65	Monoterpenic alcohol
Decanal	tr	Aliphatic aldehyde
trans-Carveol	0.01	Monoterpenic alcohol
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
Nerol	0.14	Monoterpenic alcohol
2,3-Epoxygeranial?	0.03	Monoterpenic aldehyde
Neral	0.79	Monoterpenic aldehyde

Geraniol	0.19	Monoterpenic alcohol
Perillaldehyde	0.03	Monoterpenic aldehyde
Geranial	1.23	Monoterpenic aldehyde
Limonen-10-ol	0.02	Monoterpenic alcohol
Undecanal	tr	Aliphatic aldehyde
trans-para-Mentha-2,8-diene-1-hydroperoxide	0.01	Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	tr	Monoterpenic peroxide
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.50	Monoterpenic ester
α-Copaene	tr	Sesquiterpene
Geranyl acetate	0.32	Monoterpenic ester
Dodecanal	0.01	Aliphatic aldehyde
β-Caryophyllene	0.16	Sesquiterpene
cis-α-Bergamotene	tr	Sesquiterpene
α-Santalene	0.01	Sesquiterpene
trans-α-Bergamotene	0.32	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
Neryl propionate	0.01	Monoterpenic ester
β-Santalene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.03	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
trans-β-Bergamotene	0.02	Sesquiterpene
Valencene	tr	Sesquiterpene
α-Selinene	0.02	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
(*Z*)-α-Bisabolene	0.01	Sesquiterpene
β-Bisabolene	0.45	Sesquiterpene
(*E*)-α-Bisabolene	0.01	Sesquiterpene
Spathulenol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Viridiflorol	tr	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
α-Bisabolol	0.01	Sesquiterpenic alcohol
meta-Camphorene	0.01	Diterpene
Consolidated total	**98.90%**	

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.

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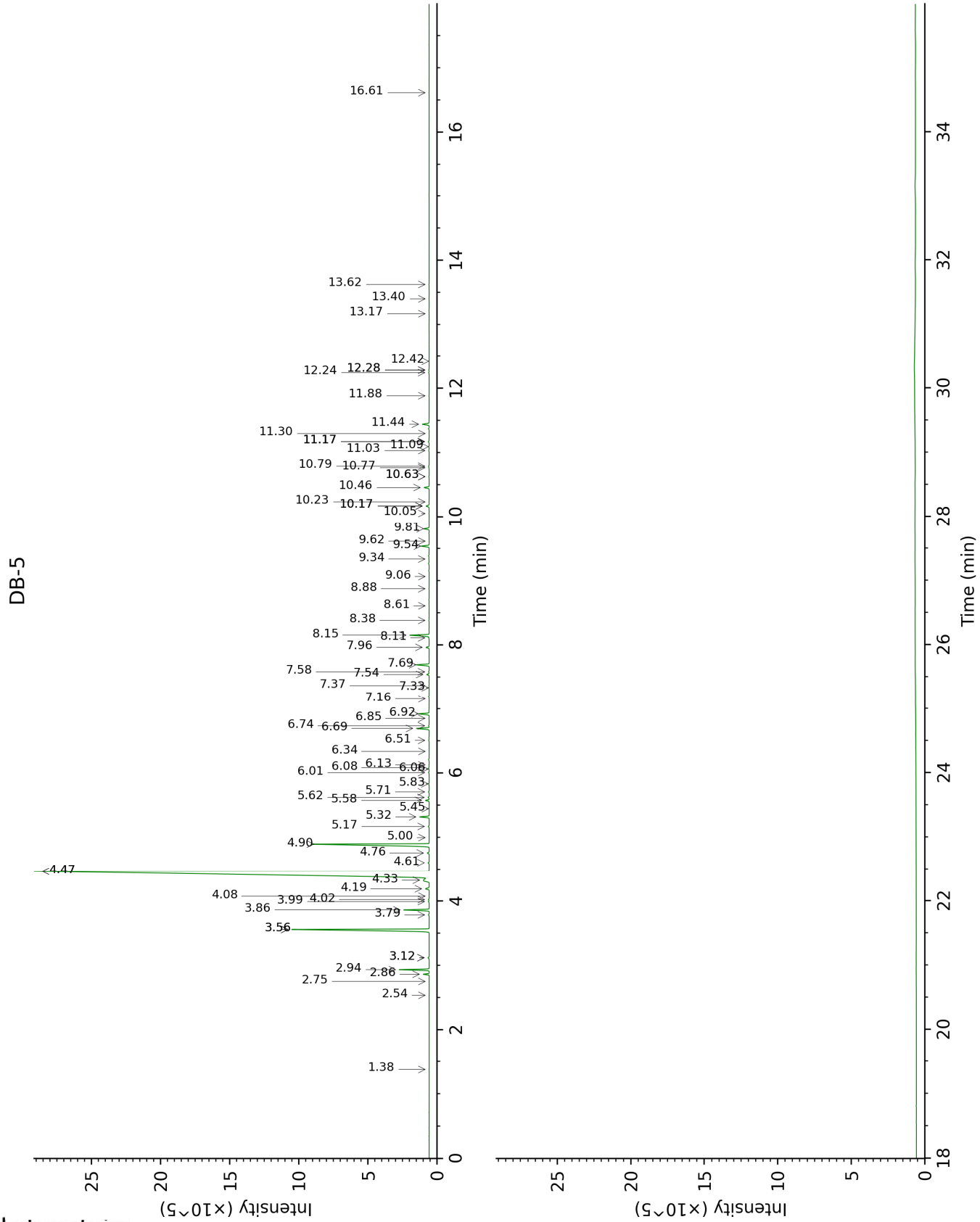
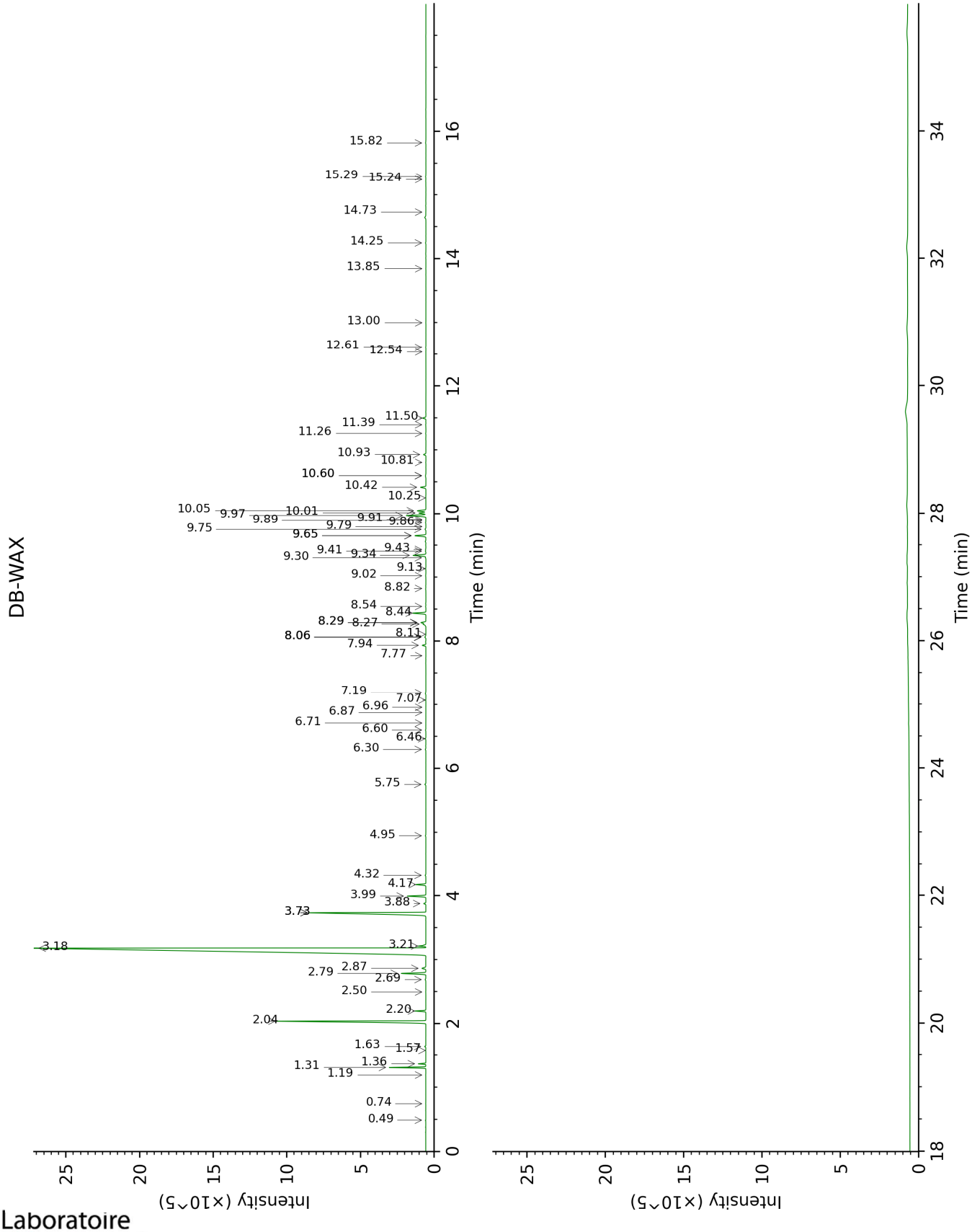

DB-5
Intensity (×10^5)
Time (min)
16.61
13.62
13.40
13.17
12.42
12.24
12.28
11.88
11.44
11.30
11.17
11.03
11.09
10.79
10.77
10.63
10.46
10.23
10.17
10.05
9.81
9.62
9.54
9.34
9.06
8.88
8.61
8.38
8.15
8.11
7.96
7.69
7.58
7.54
7.37
7.33
7.16
6.85
6.92
6.74
6.69
6.51
6.34
6.01
6.08
6.13
6.06
5.83
5.71
5.62
5.58
5.45
5.32
5.17
5.00
4.90
4.76
4.61
4.47
4.33
4.19
4.08
3.99
4.02
3.86
3.79
3.56
3.12
2.94
2.86
2.75
2.54
1.38


DB-WAX
Intensity (×10^5)
Time (min)
15.82
15.29
15.24
14.73
14.25
13.85
13.00
12.61
12.54
11.50
11.39
11.26
10.93
10.81
10.60
10.42
10.25
10.05
9.97
9.89
10.01
9.91
9.86
9.75
9.79
9.65
9.30
9.41
9.34
9.43
9.13
9.02
8.82
8.54
8.44
8.29
8.27
8.11
8.06
7.94
7.77
7.19
7.07
6.87
6.96
6.71
6.60
6.46
6.30
5.75
4.95
4.32
4.17
3.99
3.88
3.73
3.18
3.21
2.79
2.87
2.69
2.50
2.20
2.04
1.63
1.57
1.31
1.36
1.19
0.74
0.49

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Octane	1.38	803	0.01	0.49	788	0.01
Nonane	2.54	904	0.01	0.74	893	tr
Tricyclene	2.75	918	0.01	1.19	971	tr
α-Thujene	2.86	926	0.28	1.36	999	0.28
α-Pinene	2.94	931	1.45	1.31	991	1.45
Camphene	3.12*	943	0.06	1.63	1026	0.06
α-Fenchene	3.12*	943	[0.06]	1.57	1020	0.01
β-Pinene	3.56*	973	9.96	2.04	1068	9.46
Sabinene	3.56*	973	[9.96]	2.20	1084	0.50
6-Methyl-5-hepten-2-one	3.79	988	0.04	4.95	1301	0.03
Myrcene	3.86	994	1.37	2.79	1134	1.37
α-Phellandrene	3.99	1002	0.04	2.69	1126	0.04
Octanal	4.02	1004	0.04	4.32	1254	0.04
Δ3-Carene	4.08	1008	0.01	2.50	1110	0.01
α-Terpinene	4.19	1015	0.27	2.86	1140	0.27
para-Cymene	4.33	1024	0.87	3.99	1229	0.99
Limonene	4.47*	1033	68.23	3.18	1166	67.69
1,8-Cineole	4.47*	1033	[68.23]	3.21	1168	0.38
(*Z*)-β-Ocimene	4.60	1042	0.06	3.73*	1210	9.22
(*E*)-β-Ocimene	4.76	1051	0.11	3.88	1220	0.11
γ-Terpinene	4.90	1060	9.16	3.73*	1210	[9.22]
cis-Sabinene hydrate	5.00	1066	tr	6.71	1424	tr
Octanol	5.17	1078	0.05	8.06*	1526	0.08
Terpinolene	5.32	1087	0.53	4.17	1243	0.53
trans-Sabinene hydrate	5.45	1095	tr	7.77	1504	tr
Linalool	5.58	1104	0.21	7.94	1517	0.21
Nonanal	5.62	1106	0.06	5.75	1354	0.06
endo-Fenchol	5.71	1112	0.03	8.29*†	1544	[0.52]
trans-para-Mentha-2,8-dien-1-ol	5.83	1120	0.03	8.82	1585	0.01
cis-Limonene oxide	6.01	1131	0.04	6.30	1394	0.03
trans-Limonene oxide	6.06	1135	0.01	6.46	1406	0.03
Camphor	6.08	1136	0.03	7.07	1451	0.01
Epoxyterpinolene	6.13	1139	0.02	6.60	1416	0.02
Citronellal	6.34	1153	tr	6.87	1437	tr
Borneol	6.51	1164	0.03	9.65*	1652	0.67
Terpinen-4-ol	6.69	1176	0.77	8.44	1556	0.76
Isogeranial	6.74	1179	0.04	8.06*	1526	[0.08]
para-Cymen-8-ol	6.85	1186	0.02	11.40	1798	0.02
α-Terpineol	6.92	1191	0.65	9.65*	1652	[0.67]
Decanal	7.16	1206	tr	7.19	1460	0.01
trans-Carveol	7.34	1218	0.01	11.26	1786	0.02

2,3-Epoxyneral?	7.37	1221	0.02			
Nerol	7.54	1233	0.14	10.93	1758	0.14
2,3-Epoxygeranial?	7.58	1236	0.03			
Neral	7.69	1243	0.79	9.34	1627	0.82
Geraniol	7.96	1262	0.19	11.50	1807	0.19
Perillaldehyde	8.11	1272	0.03	10.60*	1730	0.05
Geranial	8.15	1274	1.23	9.98	1678	1.23
Limonen-10-ol	8.38	1290	0.02	13.00	1941	0.01
Undecanal	8.61	1306	tr	8.54	1564	0.02
trans-para-Mentha-2,8-diene-1-hydroperoxide	8.88	1321	0.01			
para-Mentha-1,8-diene-4-hydroperoxide	9.06	1334	tr			
Citronellyl acetate	9.34	1353	0.02	9.30	1624	0.02
Neryl acetate	9.54	1368	0.50	10.05	1684	0.53
α-Copaene	9.62	1373	tr	6.96	1443	0.01
Geranyl acetate	9.81	1387	0.32	10.42	1715	0.34
Dodecanal	10.05	1404	0.01	9.89	1671	tr
β-Caryophyllene	10.17*	1413	0.21	8.27†	1542	0.52
cis-α-Bergamotene	10.17*	1413	[0.21]	8.11	1530	tr
α-Santalene	10.24	1418	0.01	8.06*	1526	[0.08]
trans-α-Bergamotene	10.46	1435	0.32	8.29*†	1544	[0.52]
α-Humulene	10.63*	1448	0.03	9.13	1610	0.02
Neryl propionate	10.63*	1448	[0.03]	10.81	1748	0.01
β-Santalene	10.77	1458	0.02	9.02	1601	0.02
(*E*)-β-Farnesene	10.79	1460	0.03	9.41	1632	0.03
β-Selinene	11.03	1478	0.03	9.75	1660	0.06
trans-β-Bergamotene	11.09	1482	0.02	9.43	1634	0.02
Valencene	11.17*	1488	0.05	9.79	1663	tr
α-Selinene	11.17*	1488	[0.05]	9.86	1668	0.02
Bicyclogermacrene	11.17*	1488	[0.05]	9.91	1673	0.01
(*Z*)-α-Bisabolene	11.30	1498	0.01	10.25	1701	0.02
β-Bisabolene	11.44	1509	0.45	10.01	1681	0.45
(*E*)-α-Bisabolene	11.88	1544	0.01	10.60*	1730	[0.05]
Spathulenol	12.24	1572	0.03	14.25	2059	0.03
Caryophyllene oxide	12.28*	1575	0.02	12.61	1906	0.02
Caryophyllene oxide isomer	12.28*	1575	[0.02]	12.54	1899	0.01
Viridiflorol	12.42	1586	tr	13.84	2020	0.01
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.17	1647	0.01	14.73	2106	0.02
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.40	1666	0.01	15.82	2215	0.03

α-Bisabolol	13.62	1685	0.01	15.29	2161	0.02
meta-Camphorene	16.62	1953	0.01	15.24	2157	0.01
Total identified		**99.10%**			**99.00%**	
Total reported		**99.12%**			**99.04%**	

*: 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

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