

Date : January 24, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19A23-PTH02-1-CC

Customer identification : Lemon Essence - Argentina - LX010088R

Type : Essential oil

Source : *Citrus x limon*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Benoit Roger, Ph. D.

Analysis date : January 23, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4725 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Toluene	0.01	0.26*	Simple phenolic
Octane	tr	tr	Alkane
Heptanal	tr	0.01	Aliphatic aldehyde
Tricyclene	tr	tr	Monoterpene
α -Thujene	0.25	[0.26]*	Monoterpene
α -Pinene	1.30	1.31	Monoterpene
Camphene	0.05*	0.05	Monoterpene
α -Fenchene	[0.05]*	0.01	Monoterpene
β -Pinene	9.42*	8.93	Monoterpene
Sabinene	[9.42]*	0.47	Monoterpene
6-Methyl-5-hepten-2-one	0.03	0.03	Aliphatic ketone
Myrcene	1.39	1.39	Monoterpene
Octanal	0.09*	0.05	Aliphatic aldehyde
α -Phellandrene	[0.09]*	0.04	Monoterpene
Δ^3 -Carene	0.01	0.01	Monoterpene
α -Terpinene	0.25	0.25	Monoterpene
para-Cymene	0.42	1.12	Monoterpene
β -Phellandrene	68.81*	0.36*	Monoterpene
1,8-Cineole	[68.81]*	[0.36]*	Monoterpenic ether
Limonene	[68.81]*	67.71	Monoterpene
(Z)- β -Ocimene	0.06	9.31*	Monoterpene
(E)- β -Ocimene	0.11	0.11	Monoterpene
γ -Terpinene	9.25*	[9.31]*	Monoterpene
cis-Sabinene hydrate	[9.25]*	tr	Monoterpenic alcohol
Octanol	0.05	0.05	Aliphatic alcohol
Terpinolene	0.54	0.54	Monoterpene
trans-Sabinene hydrate	tr	0.01	Monoterpenic alcohol
Linalool	0.22	0.23	Monoterpenic alcohol
Nonanal	0.08	0.07	Aliphatic aldehyde
endo-Fenchol	0.04	0.04	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.03	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.05	0.05	Monoterpenic ether
trans-Limonene oxide	0.04	0.03	Monoterpenic ether
Camphor	0.02	0.01	Monoterpenic ketone
Epoxyterpinolene	0.05	0.03	Monoterpenic ether
Citronellal	tr	tr	Monoterpenic aldehyde
Borneol	0.03	0.76*	Monoterpenic alcohol
Terpinen-4-ol	0.85	0.84	Monoterpenic alcohol
Isogeranial	0.02	0.04*	Monoterpenic aldehyde
α -Terpineol	0.74	[0.76]*	Monoterpenic alcohol
Decanal	0.04	0.05	Aliphatic aldehyde
Nerol	0.16*	0.15	Monoterpenic alcohol
2,3-Epoxygeranial?	[0.16]*		Monoterpenic aldehyde
Neral	0.88	0.95*	Monoterpenic aldehyde
Geraniol	0.21	0.22	Monoterpenic alcohol
trans-Ascaridole glycol	0.03	0.02	Monoterpenic alcohol
Geranial	1.37	1.40	Monoterpenic aldehyde
Undecanal	0.02	0.02	Aliphatic aldehyde

<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.01		Monoterpenic peroxide
Unknown	0.02	0.01*	Unknown
Citronellyl acetate	0.03	[0.95]*	Monoterpenic ester
Neryl acetate	0.57	1.07*	Monoterpenic ester
Geranyl acetate	0.36	0.37	Monoterpenic ester
Dodecanal	0.01	0.02	Aliphatic aldehyde
β -Caryophyllene	0.23*	0.33	Sesquiterpene
<i>cis</i> - α -Bergamotene	[0.23]*	[0.04]*	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.35	0.23	Sesquiterpene
Neryl propionate	0.02	0.01	Monoterpenic ester
(<i>E</i>)- β -Farnesene	0.04	0.03	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.02	0.03	Sesquiterpene
Valencene	0.06	0.05*	Sesquiterpene
Bicyclogermacrene	0.01	0.01	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	0.04	0.04	Sesquiterpene
β -Bisabolene	0.49*	[1.07]*	Sesquiterpene
γ -Cadinene	[0.49]*	0.02	Sesquiterpene
(<i>Z</i>)- γ -Bisabolene	0.01	[0.05]*	Sesquiterpene
δ -Cadinene	0.01	0.01	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.01	0.01	Sesquiterpene
Spathulenol	0.03	0.03	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.03*	[0.01]*	Sesquiterpenic ether
Caryophyllene oxide	[0.03]*	0.02	Sesquiterpenic ether
Globulol	[0.03]*	0.01	Sesquiterpenic alcohol
Unknown	0.01	0.01	Oxygenated sesquiterpene
Unknown	0.01	0.01	Oxygenated sesquiterpene
α -Bisabolol	0.01	0.03	Sesquiterpenic alcohol
Total identified	99.25%	99.26%	

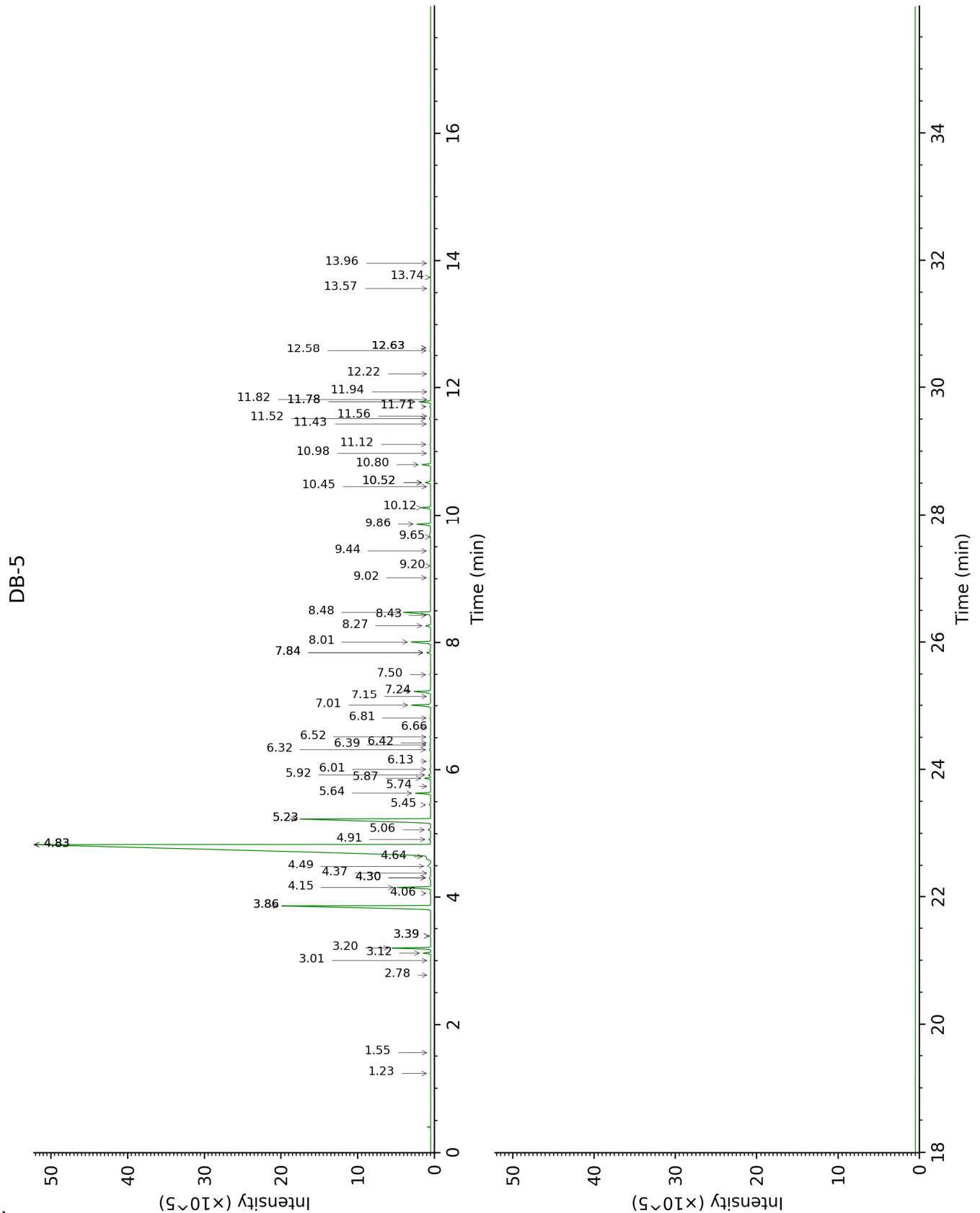
*: Two or more compounds are coeluting on this column

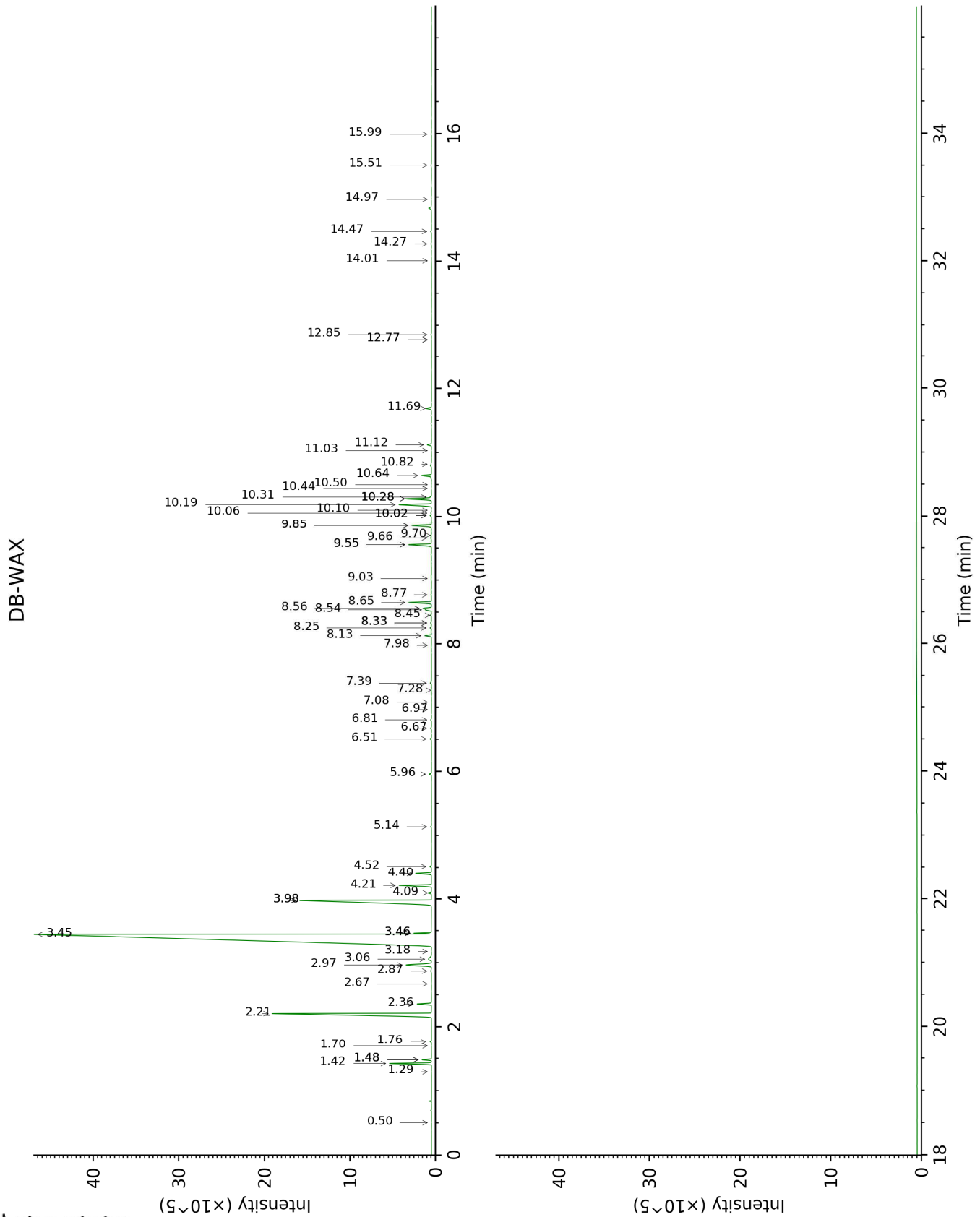
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.23	756	0.01	1.48*	1003	0.26
Octane	1.56	799	tr	0.50	785	tr
Heptanal	2.78	902	tr	3.18	1153	0.01
Tricyclene	3.01	917	tr	1.29	976	tr
α -Thujene	3.12	925	0.25	1.48*	1003	[0.26]
α -Pinene	3.20	930	1.30	1.42	995	1.31
Camphene	3.39*	942	0.05	1.76	1030	0.05
α -Fenchene	3.39*	942	[0.05]	1.70	1023	0.01
β -Pinene	3.86*	973	9.42	2.21	1072	8.93
Sabinene	3.86*	973	[9.42]	2.36	1086	0.47
6-Methyl-5-hepten-2-one	4.06	986	0.03	5.14	1305	0.03
Myrcene	4.15	992	1.39	2.97	1136	1.39
Octanal	4.30*	1002	0.09	4.52	1257	0.05
α -Phellandrene	4.30*	1002	[0.09]	2.87	1129	0.04
Δ 3-Carene	4.37	1007	0.01	2.67	1113	0.01
α -Terpinene	4.49	1014	0.25	3.06	1143	0.25
para-Cymene	4.64	1024	0.42	4.21	1234	1.12
β -Phellandrene	4.83*	1036	68.81	3.46*	1176	0.36
1,8-Cineole	4.83*	1036	[68.81]	3.46*	1176	[0.36]
Limonene	4.83*	1036	[68.81]	3.45	1174	67.71
(Z)- β -Ocimene	4.91	1041	0.06	3.98*	1216	9.31
(E)- β -Ocimene	5.06	1050	0.11	4.09	1225	0.11
γ -Terpinene	5.23*	1061	9.25	3.98*	1216	[9.31]
<i>cis</i> -Sabinene hydrate	5.23*	1061	[9.25]	6.97	1429	tr
Octanol	5.45	1075	0.05	8.25	1526	0.05
Terpinolene	5.64	1086	0.54	4.40	1248	0.54
<i>trans</i> -Sabinene hydrate	5.74	1093	tr	7.98	1505	0.01
Linalool	5.87	1101	0.22	8.13	1517	0.23
Nonanal	5.92	1104	0.08	5.96	1354	0.07
endo-Fenchol	6.01	1110	0.04	8.45	1542	0.04
<i>trans</i> -para-Mentha-2,8-dien-1-ol	6.13	1118	0.03	9.02	1586	0.01
<i>cis</i> -Limonene oxide	6.32	1130	0.05	6.51	1394	0.05
<i>trans</i> -Limonene oxide	6.39	1135	0.04	6.68	1407	0.03
Camphor	6.42	1137	0.02	7.28	1452	0.01
Epoxyterpinolene	6.52	1143	0.05	6.81	1417	0.03
Citronellal	6.66	1152	tr	7.08	1437	tr
Borneol	6.81	1162	0.03	9.85*	1654	0.76
Terpinen-4-ol	7.01	1175	0.85	8.65	1557	0.84
Isogeranial	7.15	1184	0.02	8.33*	1532	0.04
α -Terpineol	7.24	1190	0.74	9.85*	1654	[0.76]
Decanal	7.50	1207	0.04	7.39	1460	0.05

Nerol	7.84*	1230	0.16	11.12	1760	0.15
2,3-Epoxygeranial?	7.84*	1230	[0.16]			
Neral	8.01	1242	0.88	9.55*	1629	0.95
Geraniol	8.27	1259	0.21	11.69	1809	0.22
<i>trans</i> -Ascaridole glycol	8.43	1270	0.03	14.27	2046	0.02
Geranial	8.48	1274	1.37	10.19	1681	1.40
Undecanal	9.02	1307	0.02	8.77	1567	0.02
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	9.20	1320	0.01			
Unknown [m/z 82, 59 (44), 41 (43), 95 (31), 43 (29), 81 (24)...]	9.44	1337	0.02	12.77*	1905	0.01
Citronellyl acetate	9.66	1352	0.03	9.55*	1629	[0.95]
Neryl acetate	9.86	1367	0.57	10.28*	1688	1.07
Geranyl acetate	10.12	1386	0.36	10.64	1719	0.37
Dodecanal	10.45	1410	0.01	10.06	1670	0.02
β -Caryophyllene	10.52*	1414	0.23	8.56	1550	0.33
<i>cis</i> - α -Bergamotene	10.52*	1414	[0.23]	8.33*	1532	[0.04]
<i>trans</i> - α -Bergamotene	10.80	1435	0.35	8.54	1548	0.23
Neryl propionate	10.98	1448	0.02	11.03	1752	0.01
(<i>E</i>)- β -Farnesene	11.12	1459	0.04	9.66	1638	0.03
<i>trans</i> - β -Bergamotene	11.43	1483	0.02	9.70	1641	0.03
Valencene	11.52	1489	0.06	10.02*	1667	0.05
Bicyclogermacrene	11.56	1492	0.01	10.10	1674	0.01
(<i>Z</i>)- α -Bisabolene	11.71	1503	0.04	10.31	1691	0.04
β -Bisabolene	11.78*	1509	0.49	10.28*	1688	[1.07]
γ -Cadinene	11.78*	1509	[0.49]	10.44	1702	0.02
(<i>Z</i>)- γ -Bisabolene	11.82	1512	0.01	10.02*	1667	[0.05]
δ -Cadinene	11.94	1521	0.01	10.50	1707	0.01
(<i>E</i>)- α -Bisabolene	12.22	1543	0.01	10.82	1734	0.01
Spathulenol	12.58	1572	0.03	14.47	2065	0.03
Caryophyllene oxide isomer	12.63*	1576	0.03	12.77*	1905	[0.01]
Caryophyllene oxide	12.63*	1576	[0.03]	12.85	1913	0.02
Globulol	12.63*	1576	[0.03]	14.01	2021	0.01
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.57	1652	0.01	14.97	2114	0.01
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.74	1666	0.01	16.00	2218	0.01
α -Bisabolol	13.96	1685	0.01	15.51	2169	0.03
Total identified		99.25%			99.26%	

Total reported	99.29%	99.28%
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*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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