

Date : May 22, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20E21-PTH07

Customer identification : Lemon Oil Steam Distilled - Argentina - LI010599R

Type : Essential oil

Source : *Citrus x limon*

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 : Fanny Charlier, B. Sc.

Analysis date : May 21, 2020

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

This report is an update of the version first issued on May 22, 2020 to indicatively present comparison to a standard.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4739 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 855:2004 - OIL OF LEMON, OBTAINED BY EXPRESSION - EQUATORIAL

Compound	Min. %	Max. %	Observed %	Complies?
Geranyl acetate	tr	0.30	0.10	Yes
Neryl acetate	0.10	0.50	0.24	Yes
β-Bisabolene	0.20	0.90	0.24	Yes
Geranial	0.5	2.0	1.6	Yes
Neral	0.2	1.2	1.0	Yes
α-Terpineol		0.40	0.46	No
γ-Terpinene	6.0	12.0	5.6	No
Limonene	59.0	75.0	68.7	Yes
para-Cymene	0.05	0.35	1.24	No
β-Pinene	7.0	16.0	11.2	Yes
Sabinene	1.4	3.0	2.1	Yes
α-Pinene	1.4	3.0	1.7	Yes
α-Thujene	0.2	0.5	0.4	Yes
Refractive index	1.4730	1.4790	1.4739	Yes

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	%	Class
Tricyclene	0.01	Monoterpene
α -Thujene	0.36	Monoterpene
α -Pinene	1.70	Monoterpene
Camphene	0.06	Monoterpene
β -Pinene	11.24	Monoterpene
Sabinene	2.06	Monoterpene
6-Methyl-5-hepten-2-one	0.03	Aliphatic ketone
Myrcene	1.62	Monoterpene
α -Phellandrene	0.03	Monoterpene
Octanal	0.07	Aliphatic aldehyde
Δ^3 -Carene	0.01	Monoterpene
α -Terpinene	0.14	Monoterpene
para-Cymene	1.24	Monoterpene
Limonene	68.74	Monoterpene
1,8-Cineole	0.29	Monoterpenic ether
β -Phellandrene	0.04	Monoterpene
(Z)- β -Ocimene	0.06	Monoterpene
(E)- β -Ocimene	0.08	Monoterpene
γ -Terpinene	5.64	Monoterpene
cis-Sabinene hydrate	0.05	Monoterpenic alcohol
Terpinolene	0.26	Monoterpene
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.10	Monoterpenic alcohol
Nonanal	0.07	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.07	Monoterpenic ether
trans-Limonene oxide	0.06	Monoterpenic ether
Citronellal	0.05	Monoterpenic aldehyde
Borneol	0.03	Monoterpenic alcohol
Terpinen-4-ol	0.07	Monoterpenic alcohol
Isogeranial	0.02	Monoterpenic aldehyde
α -Terpineol	0.46	Monoterpenic alcohol
Decanal	0.03	Aliphatic aldehyde
trans-Carveol	0.02	Monoterpenic alcohol
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde
Nerol	0.06	Monoterpenic alcohol
2,3-Epoxygeranial?	0.02	Monoterpenic aldehyde
Neral	1.00	Monoterpenic aldehyde
Geraniol	0.12	Monoterpenic alcohol
Perillaldehyde	0.02	Monoterpenic aldehyde
Geranial	1.60	Monoterpenic aldehyde
Limonen-10-ol	0.02	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.24	Monoterpenic ester

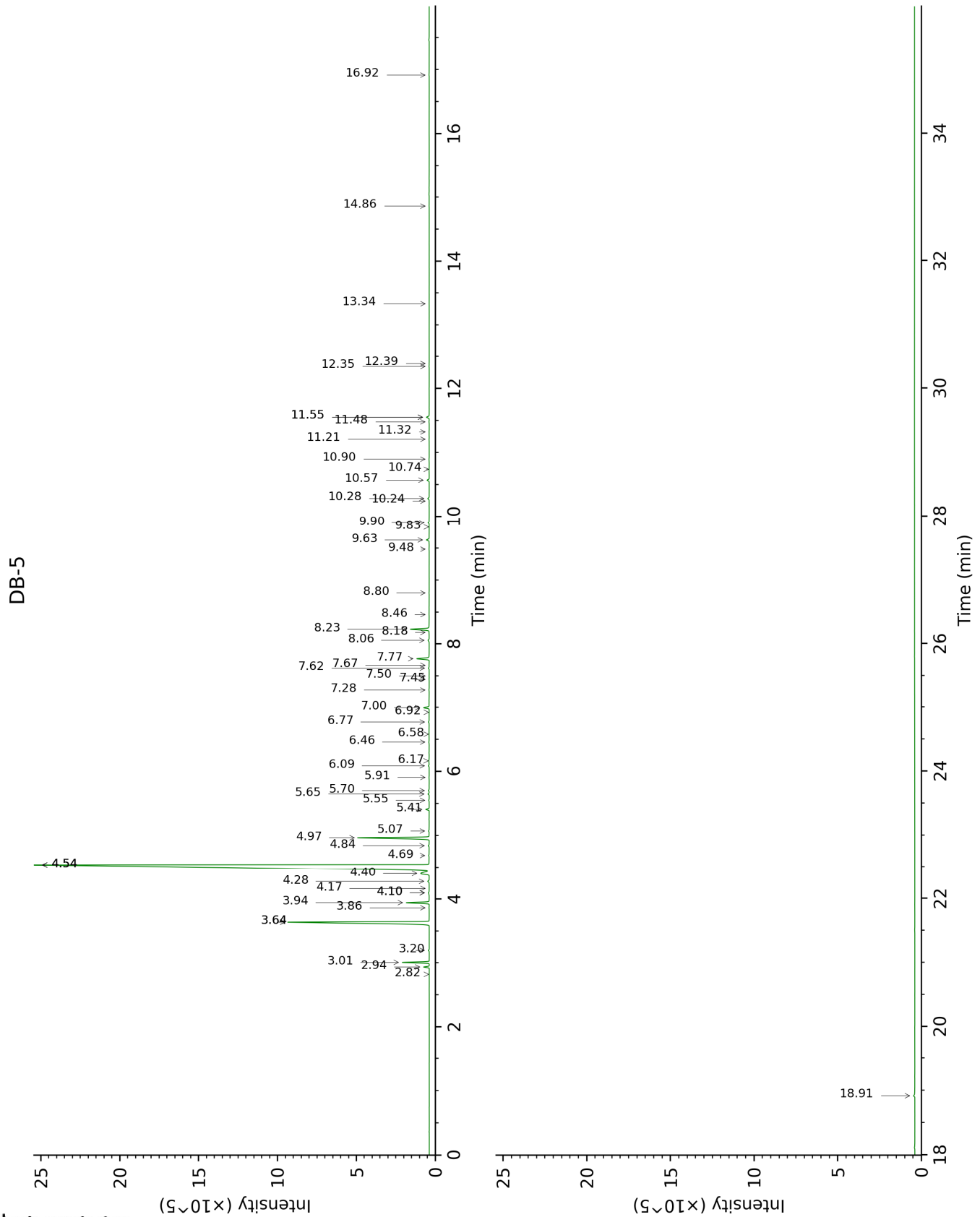
β-Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.10	Monoterpenic ester
Dodecanal	0.01	Aliphatic aldehyde
β-Caryophyllene	0.13	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.18	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
(<i>E</i>)-β-Farnesene	0.02	Sesquiterpene
<i>trans</i> -β-Bergamotene	0.02	Sesquiterpene
Valencene	0.02	Sesquiterpene
(<i>Z</i>)-α-Bisabolene	0.02	Sesquiterpene
β-Bisabolene	0.24	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
Spathulenol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene
Myristic acid	0.02	Aliphatic acid
Citropten	0.04	Furanocoumarin
Stearic acid	0.15	Aliphatic acid
Consolidated total	98.88%	

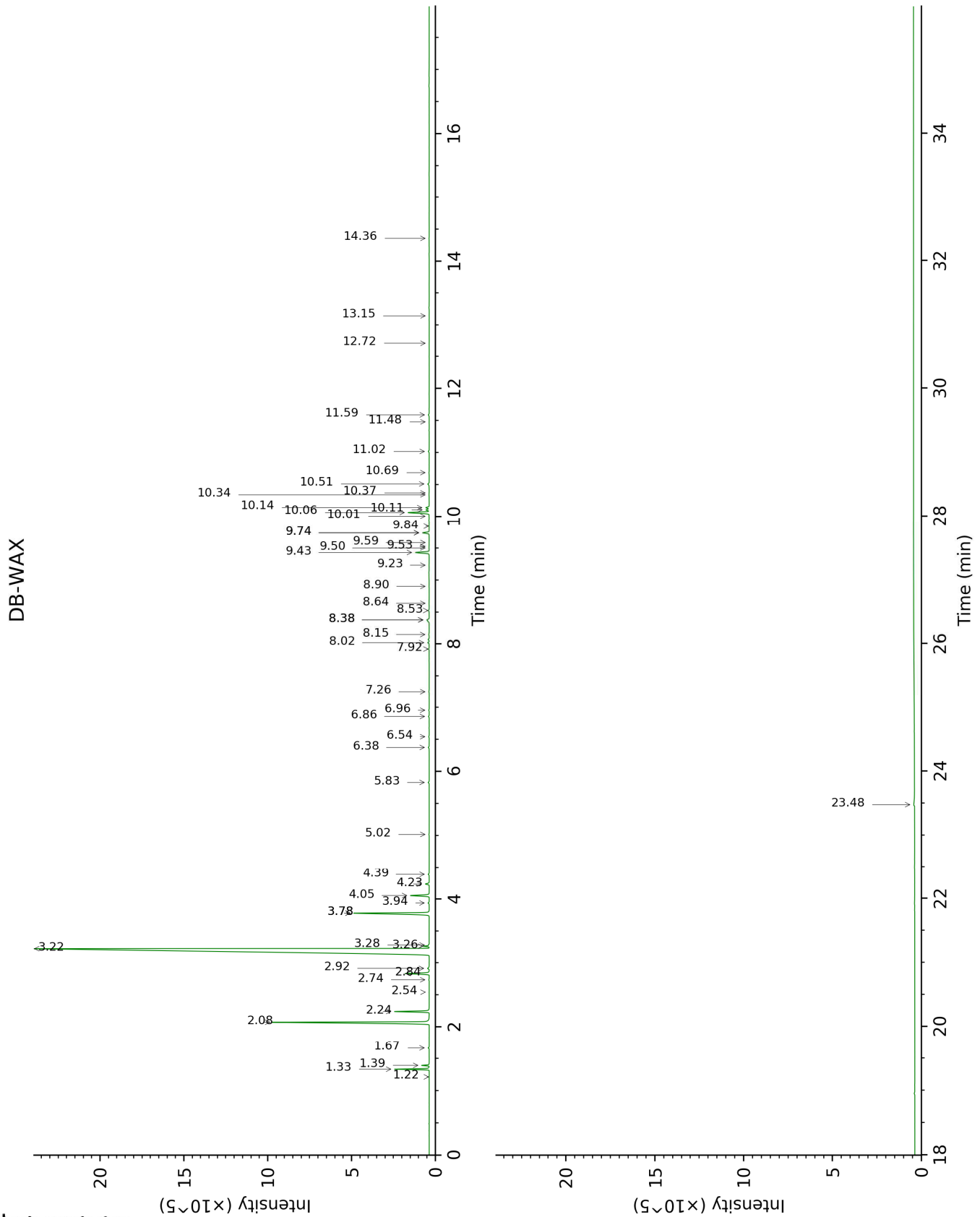
Note: no correction factor was applied

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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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Tricyclene	2.82	918	0.01	1.22	969	0.01
α -Thujene	2.94	925	0.36	1.39	998	0.35
α -Pinene	3.01	930	1.70	1.34	989	1.67
Camphene	3.20	942	0.06	1.67	1024	0.06
β -Pinene	3.64*	971	13.36	2.08	1065	11.24
Sabinene	3.64*	971	[13.36]	2.24	1082	2.06
6-Methyl-5-hepten-2-one	3.86	986	0.03	5.02	1295	0.03
Myrcene	3.94	992	1.62	2.84	1131	1.62
α -Phellandrene	4.10*	1002	0.10	2.74	1123	0.03
Octanal	4.10*	1002	[0.10]	4.39	1249	0.07
Δ^3 -Carene	4.16	1006	0.01	2.54	1108	0.01
α -Terpinene	4.28	1013	0.14	2.92	1137	0.14
para-Cymene	4.40	1021	1.24	4.05	1225	1.29
Limonene	4.54*	1030	69.45	3.22	1162	68.74
1,8-Cineole	4.54*	1030	[69.45]	3.26	1164	0.29
β -Phellandrene	4.54*	1030	[69.45]	3.28	1166	0.04
(Z)- β -Ocimene	4.69	1039	0.06	3.78*	1204	5.68
(E)- β -Ocimene	4.84	1049	0.08	3.94	1216	0.08
γ -Terpinene	4.97	1057	5.64	3.78*	1204	[5.68]
<i>cis</i> -Sabinene hydrate	5.07	1063	0.05	6.86	1426	0.05
Terpinolene	5.41	1084	0.26	4.23	1238	0.26
<i>trans</i> -Sabinene hydrate	5.55	1094	0.04	7.92	1505	0.05
Linalool	5.65	1100	0.10	8.02	1513	0.11
Nonanal	5.70	1103	0.07	5.83	1350	0.07
<i>trans</i> -para-Mentha-2,8-dien-1-ol	5.91	1116	0.02	8.90	1581	0.02
<i>cis</i> -Limonene oxide	6.09	1128	0.07	6.38	1390	0.07
<i>trans</i> -Limonene oxide	6.17	1133	0.06	6.54	1402	0.04
Citronellal	6.46	1152	0.05	6.96	1433	0.04
Borneol	6.58	1160	0.03	9.74*	1648	0.49
Terpinen-4-ol	6.77	1173	0.07	8.52	1552	0.07
Isogeranial	6.92	1183	0.02	8.15	1523	0.05
α -Terpineol	7.00	1187	0.46	9.74*	1648	[0.49]
Decanal	7.28	1206	0.03	7.26	1455	0.04
<i>trans</i> -Carveol	7.45	1218	0.02	11.48	1793	0.01
2,3-Epoxyneral?	7.50	1221	0.01			
Nerol	7.62	1230	0.06	11.02	1754	0.07
2,3-Epoxygeranial?	7.67	1233	0.02			
Neral	7.77	1240	1.00	9.43	1623	1.06
Geraniol	8.06	1260	0.12	11.59	1803	0.08
Perillaldehyde	8.18	1268	0.02	10.69	1726	0.03

Geranial	8.23	1272	1.60	10.06	1674	1.60
Limonen-10-ol	8.46	1288	0.02	13.15	1942	0.01
Undecanal	8.80	1306	0.02	8.64	1560	0.02
Citronellyl acetate	9.48	1354	0.02	9.50	1629	0.02
Neryl acetate	9.63	1364	0.24	10.14	1680	0.26
β-Bourbonene	9.83	1379	0.01			
Geranyl acetate	9.90	1384	0.10	10.51	1711	0.14
Dodecanal	10.24	1408	0.01	10.01	1670	0.02
β-Caryophyllene	10.28	1411	0.13	8.38*†	1540	0.29
<i>trans</i> -α-Bergamotene	10.57	1432	0.18	8.38*†	1540	[0.29]
α-Humulene	10.74	1445	0.02	9.23	1607	0.02
(<i>E</i>)-β-Farnesene	10.90	1457	0.02	9.53	1631	0.02
<i>trans</i> -β-Bergamotene	11.21	1480	0.02	9.59	1636	0.01
Valencene	11.32	1489	0.02	9.84	1656	0.02
(<i>Z</i>)-α-Bisabolene	11.48	1500	0.02	10.34	1697	0.02
β-Bisabolene	11.55*	1506	0.25	10.11	1678	0.24
γ-Cadinene	11.55*	1506	[0.25]	10.37	1699	0.01
Spathulenol	12.35	1568	0.02	14.36	2056	0.02
Caryophyllene oxide	12.39	1572	0.01	12.72	1903	0.01
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.34	1648	0.01			
Myristic acid	14.86	1778	0.02			
Citropten	16.92	1967	0.04			
Stearic acid	18.91	2167	0.15	23.48	3110	0.22
Total identified		99.30%			98.97%	
Total reported		99.32%			98.97%	

*: 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