

Date : January 25, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22A19-PTH01

Customer identification : Mandarin Green - Brazil - M10105216R

Type : Essential oil

Source : *Citrus reticulata* cv. Mandarine

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-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 2014-005

Analysis date : January 24, 2022

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Green brownish liquid

Refractive index: 1.4758 ± 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	%	Class
Octane	tr	Alkane
Heptanal	0.02	Aliphatic aldehyde
α -Thujene	0.82	Monoterpene
α -Pinene	2.14	Monoterpene
Camphene	0.02	Monoterpene
α -Fenchene	tr	Monoterpene
Heptanol	0.01	Aliphatic alcohol
β -Pinene	1.67	Monoterpene
Sabinene	0.27	Monoterpene
Myrcene	1.65	Monoterpene
α -Phellandrene	0.07	Monoterpene
Octanal	0.09	Aliphatic aldehyde
α -Terpinene	0.45	Monoterpene
para-Cymene	0.86	Monoterpene
β -Phellandrene	0.22	Monoterpene
Limonene	66.12	Monoterpene
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.03	Monoterpene
γ -Terpinene	20.79	Monoterpene
cis-Sabinene hydrate	0.06	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Terpinolene	0.99	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Sabinene hydrate	0.10	Monoterpenic alcohol
Linalool	0.18	Monoterpenic alcohol
Nonanal	0.03	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	Monoterpenic ether
Epoxyterpinolene	0.01	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Terpinen-4-ol	0.07	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α -Terpineol	0.27	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Decanal	0.07	Aliphatic aldehyde
trans-Carveol	0.01	Monoterpenic alcohol
Nerol	0.02	Monoterpenic alcohol
Citronellol	0.04	Monoterpenic alcohol
Neral	0.02	Monoterpenic aldehyde
Piperitone	0.01	Monoterpenic ketone
Geraniol	0.01	Monoterpenic alcohol

Geranial	0.02	Monoterpenic aldehyde
<i>cis</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Thymol	0.12	Monoterpenic alcohol
Undecanal	0.01	Aliphatic aldehyde
Limonene <i>trans</i> -glycol	0.01	Monoterpenic alcohol
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
β -Cubebene	0.02	Sesquiterpene
β -Elemene	0.01	Sesquiterpene
Dimethyl anthranilate	0.66	Phenolic ester
Dodecanal	0.02	Aliphatic aldehyde
β -Caryophyllene	0.16	Sesquiterpene
α -Humulene	0.02	Sesquiterpene
(2 <i>E</i>)-Dodecenal	0.02	Aliphatic aldehyde
Germacrene D	0.01	Sesquiterpene
α -Selinene	0.06	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.40	Sesquiterpene
γ -Cadinene	0.01	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Germacrene D-4-ol	tr	Sesquiterpenic alcohol
α -Sinensal	0.37	Sesquiterpenic aldehyde
Myristic acid	0.01	Aliphatic acid
meta-Camphorene	0.02	Diterpene
Palmitic acid	0.07	Aliphatic acid
para-Camphorene	0.01	Diterpene
Phytol	0.01	Diterpenic alcohol
Linoleic acid	0.04	Aliphatic acid
Oleic acid	0.05	Aliphatic acid
Stearic acid	0.04	Aliphatic acid
Tangeretin	0.22	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.03	Flavonoid
Nobiletin	0.10	Flavonoid
Consolidated total	99.82%	

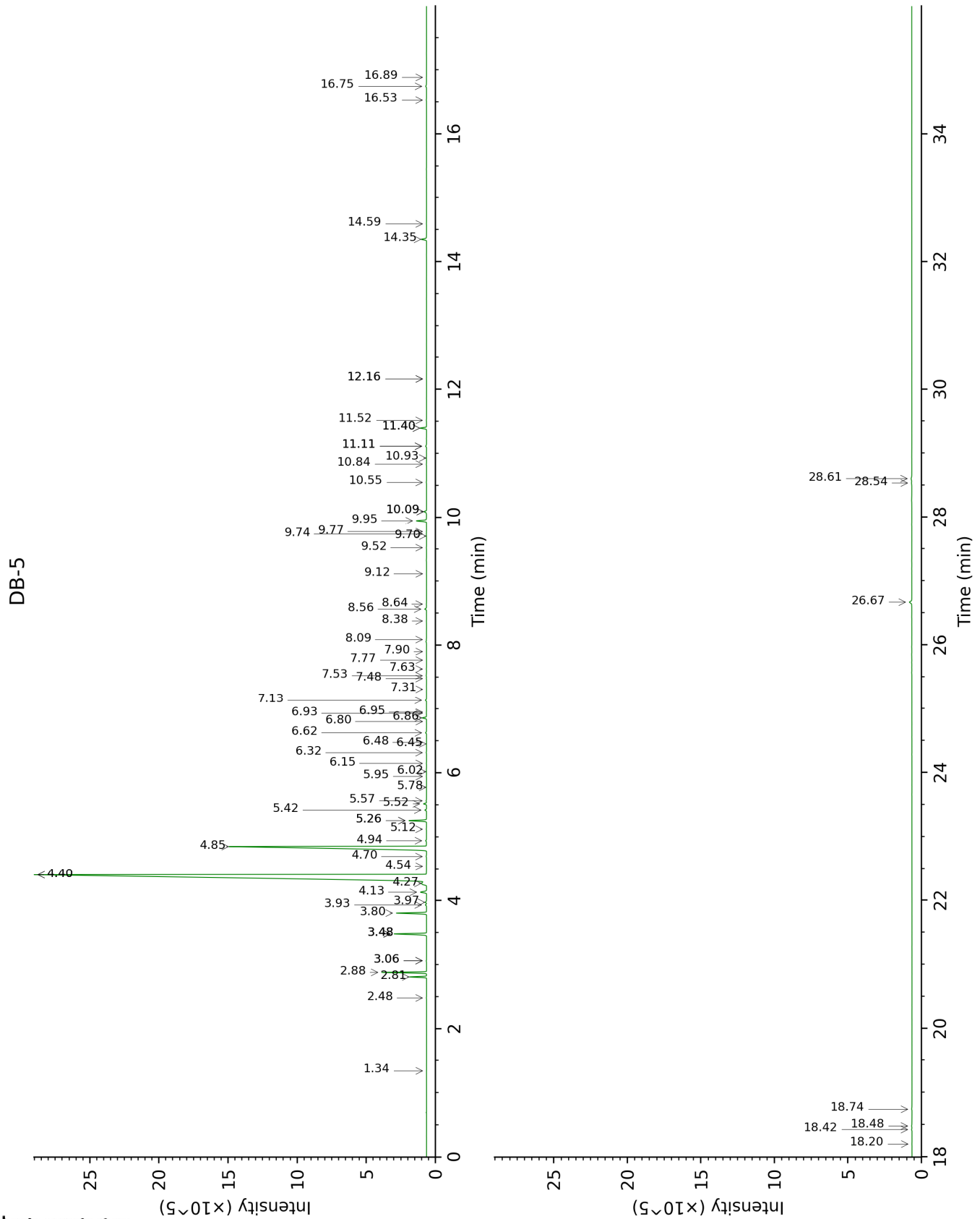
tr: The compound has been detected below 0.005% of total signal.

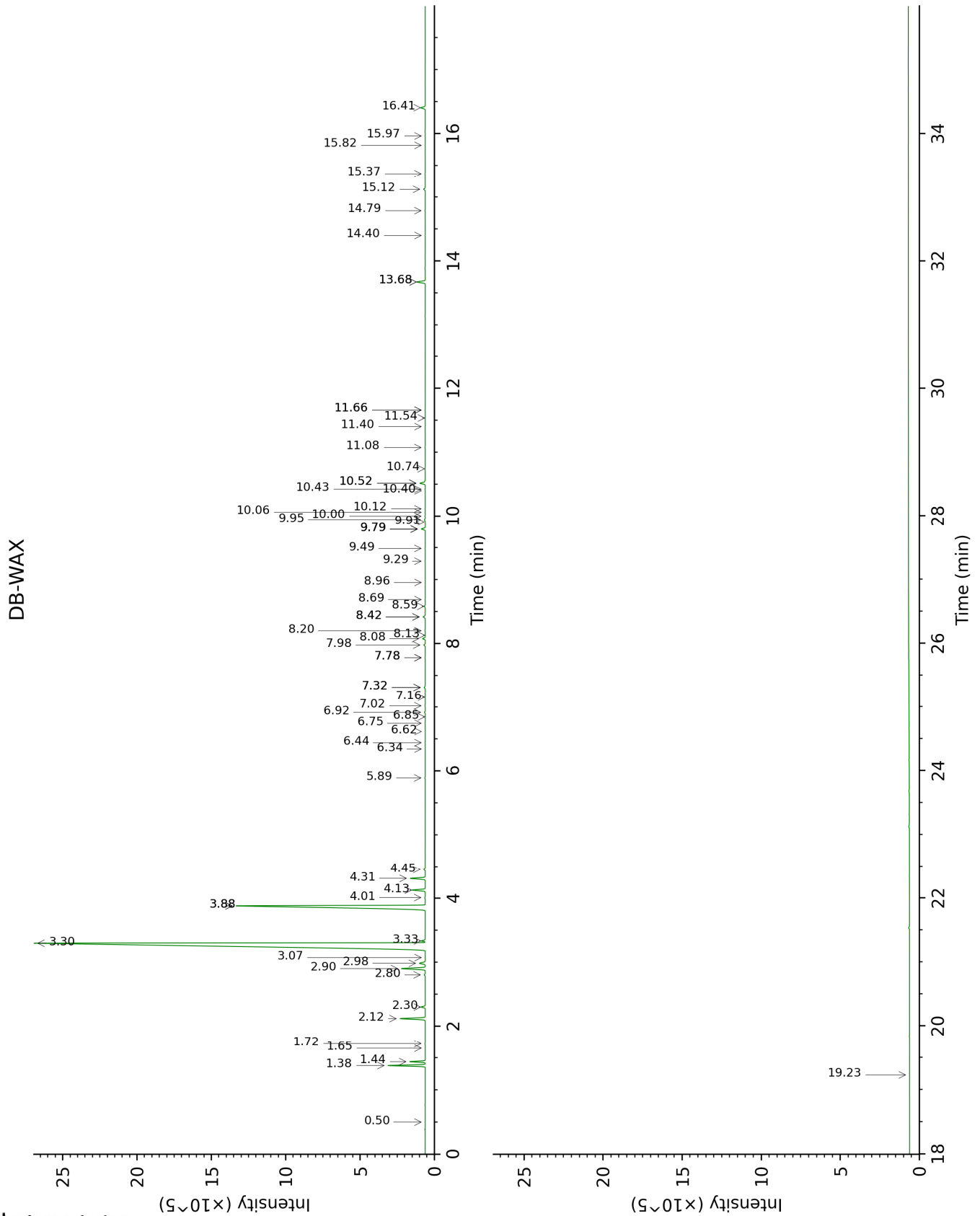
Note: no correction factor was applied

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	%
Octane	1.34	802	tr	0.50	786	tr
Heptanal	2.48	903	0.02	3.07	1148	tr
α -Thujene	2.81	926	0.82	1.44	999	0.82
α -Pinene	2.88	930	2.14	1.38	991	2.14
Camphene	3.06*	943	0.02	1.72	1027	0.02
α -Fenchene	3.06*	943	[0.02]	1.65	1020	tr
Heptanol	3.48*	971	1.91	6.85	1423	0.01
β -Pinene	3.48*	971	[1.91]	2.12	1066	1.67
Sabinene	3.48*	971	[1.91]	2.30	1084	0.27
Myrcene	3.80	993	1.65	2.90	1134	1.66
α -Phellandrene	3.93	1002	0.07	2.80	1126	0.07
Octanal	3.97	1004	0.09	4.45	1253	0.09
α -Terpinene	4.13	1015	0.45	2.98	1140	0.46
para-Cymene	4.27†	1023	66.98	4.13	1229	0.86
β -Phellandrene	4.40*†	1032	[66.98]	3.34	1168	0.22
Limonene	4.40*†	1032	[66.98]	3.30	1165	66.12
(Z)- β -Ocimene	4.54	1041	0.01	3.88*	1211	20.85
(E)- β -Ocimene	4.70	1050	0.03	4.01	1220	0.03
γ -Terpinene	4.85	1060	20.79	3.88*	1211	[20.85]
cis-Sabinene hydrate	4.94	1066	0.06	6.92	1429	0.05
Octanol	5.12	1078	0.02	8.20	1525	0.02
Terpinolene	5.26*	1086	0.98	4.31	1243	0.99
para-Cymenene	5.26*	1086	[0.98]	6.34	1386	0.01
trans-Sabinene hydrate	5.42	1096	0.10	7.98	1508	0.10
Linalool	5.52	1103	0.18	8.08	1516	0.18
Nonanal	5.57	1106	0.03	5.89	1354	0.03
trans-para-Mentha-2,8-dien-1-ol	5.78	1119	0.01	8.96	1584	0.01
cis-Limonene oxide	5.94	1130	0.01	6.44	1393	0.01
trans-Limonene oxide	6.02	1135	0.01	6.62	1406	0.01
Epoxyterpinolene	6.15	1143	0.01	6.75	1416	0.02
Citronellal	6.32	1154	0.02	7.02	1436	0.02
Borneol	6.45	1163	0.01	9.79*	1651	0.29
Unknown [m/z 43, 109 (68), 67 (62), 81 (36), 41 (31), 137 (29), 79 (26)...]	6.48	1164	0.01	7.32*	1458	0.08
Terpinen-4-ol	6.62	1174	0.07	8.58	1555	0.07
para-Cymen-8-ol	6.80	1185	0.01	11.54	1797	0.01
α -Terpineol	6.86	1189	0.27	9.79*	1651	[0.29]
Unknown [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	6.93	1194	0.01	7.78*	1493	0.02
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	6.95	1194	0.01	8.13	1520	0.01

Decanal	7.14	1207	0.07	7.32*	1458	[0.08]
<i>trans</i> -Carveol	7.31	1218	0.01	11.40	1786	0.01
Nerol	7.48	1230	0.02	11.08	1758	0.02
Citronellol	7.53	1233	0.04	10.74	1730	0.03
Neral	7.63	1240	0.02	9.49	1626	0.02
Piperitone	7.77	1249	0.01	9.91	1660	0.01
Geraniol	7.90	1258	0.01	11.66*	1808	0.02
Geranial	8.09	1271	0.02	10.12	1677	0.02
<i>cis</i> -Ascaridole glycol	8.38	1290	0.02	14.79	2098	0.02
Thymol	8.56	1302	0.12	15.12	2131	0.12
Undecanal	8.64	1308	0.01	8.69	1563	0.01
Limonene <i>trans</i> -glycol	9.12	1341	0.01	15.97	2216	0.01
α -Copaene	9.52	1370	0.01	7.16	1446	0.02
Geranyl acetate	9.70	1383	0.01	10.52*	1711	0.43
β -Cubebene	9.74	1386	0.02	7.78*	1493	[0.02]
β -Elemene	9.77	1388	0.01	8.42*	1542	0.18
Dimethyl anthranilate	9.95	1401	0.66	13.68*	1990	0.66
Dodecanal	10.09*	1411	0.19	10.00	1668	0.02
β -Caryophyllene	10.09*	1411	[0.19]	8.42*	1542	[0.18]
α -Humulene	10.55	1445	0.02	9.29	1610	0.02
(2 <i>E</i>)-Dodecenal	10.84	1466	0.02	11.66*	1808	[0.02]
Germacrene D	10.93	1474	0.01	9.79*	1651	[0.29]
α -Selinene	11.11*	1487	0.08	9.95	1664	0.06
Bicyclogermacrene	11.11*	1487	[0.08]	10.06	1673	0.01
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	11.40*	1509	0.40	10.52*	1711	[0.43]
γ -Cadinene	11.40*	1509	[0.40]	10.40	1701	0.01
δ -Cadinene	11.52	1518	0.02	10.43	1703	0.02
Spathulenol	12.16*	1569	0.01	14.40	2060	0.01
Germacrene D-4-ol	12.16*	1569	[0.01]	13.68*	1990	[0.66]
α -Sinensal	14.35	1750	0.37	16.41	2262	0.35
Myristic acid	14.59	1772	0.01			
meta-Camphorene	16.53	1949	0.02	15.37	2156	0.02
Palmitic acid	16.75	1969	0.07			
para-Camphorene	16.89	1982	0.01	15.82	2201	0.01
Phytol	18.20	2112	0.01	19.23	2574	0.01
Linoleic acid	18.42	2136	0.04			
Oleic acid	18.48	2141	0.05			
Stearic acid	18.74	2168	0.04			
Tangeretin	26.67	3143	0.22			
3,3',4',5,6,7,8-Heptamethoxyflavone	28.54	3326	0.03			
Nobiletin	28.60	3331	0.10			
Total identified		99.52%			99.35%	
Total reported		99.56%			99.35%	

*: 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