CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23D12-PTH05
Customer identification : Mandarin Green ORGANIC - Brazil - MI0105R
Type : Essential oil
Source : *Citrus reticulata* cv. Mandarine
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 : Sylvain Mercier, M. Sc., Chimiste 2014-005
Analysis date : April 13, 2023

Checked and approved by :

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

MÉTHODE CERTIFIÉE
✱ISO 17025:2017
CERTIFIED METHOD

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PhytoChemia

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow green liquid
Refractive index: 1.4752 ± 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	tr	Alkane
Nonane	tr	Alkane
Heptanal	0.01	Aliphatic aldehyde
α-Thujene	0.79	Monoterpene
α-Pinene	2.22	Monoterpene
Camphene	0.01	Monoterpene
α-Fenchene	tr	Monoterpene
β-Pinene	1.48	Monoterpene
Sabinene	0.25	Monoterpene
Myrcene	1.74	Monoterpene
Pseudolimonene	0.01	Monoterpene
α-Phellandrene	0.06	Monoterpene
Octanal	0.10	Aliphatic aldehyde
α-Terpinene	0.32	Monoterpene
para-Cymene	1.15	Monoterpene
β-Phellandrene	0.21	Monoterpene
Limonene	70.38	Monoterpene
(Z)-β-Ocimene	tr	Monoterpene
(E)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	17.04	Monoterpene
cis-Sabinene hydrate	0.04	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Terpinolene	0.78	Monoterpene
para-Cymenene	tr	Monoterpene
trans-Sabinene hydrate	0.06	Monoterpenic alcohol
Linalool	0.15	Monoterpenic alcohol
Nonanal	0.03	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.04	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
trans-Limonene oxide	0.04	Monoterpenic ether
Epoxyterpinolene	0.04	Monoterpenic ether
Citronellal	0.03	Monoterpenic aldehyde
Borneol	0.04	Monoterpenic alcohol
Terpinen-4-ol	0.05	Monoterpenic alcohol
Nonanol	0.01	Aliphatic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.22	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Decanal	0.09	Aliphatic aldehyde
trans-Carveol	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Thymol methyl ether	0.01	Monoterpenic ether

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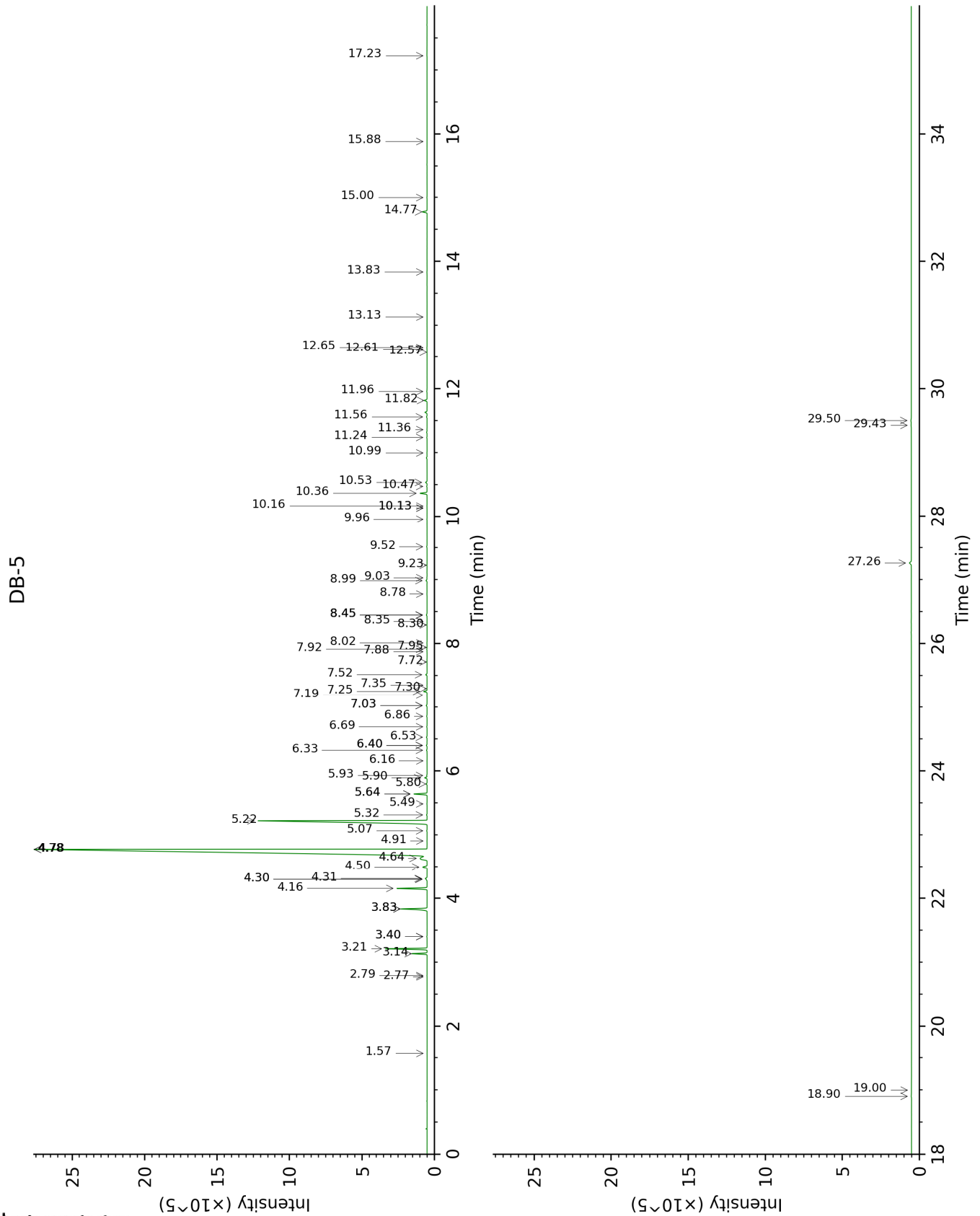|		
Carvone	0.01	Monoterpenic ketone
Geraniol	0.02	Monoterpenic alcohol
Linalyl acetate	0.01	Monoterpenic ester
Geranial	0.01	Monoterpenic aldehyde
Isopiperitenone	0.01	Monoterpenic ketone
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
cis-Ascaridole glycol	0.02	Monoterpenic alcohol
Thymol	0.08	Monoterpenic alcohol
Carvacrol	0.02	Monoterpenic alcohol
trans-para-Mentha-2,8-diene-1-hydroperoxide	0.01	Monoterpenic peroxide
Limonene *trans*-glycol	0.03	Monoterpenic alcohol
α-Copaene	0.01	Sesquiterpene
β-Cubebene	0.01	Sesquiterpene
Geranyl acetate	tr	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
Dimethyl anthranilate	0.47	Phenolic ester
Dodecanal	0.03	Aliphatic aldehyde
β-Caryophyllene	0.11	Sesquiterpene
α-Humulene	0.01	Sesquiterpene
(2*E*)-Dodecenal	0.02	Aliphatic aldehyde
Germacrene D	0.01	Sesquiterpene
α-Selinene	0.04	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.19	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Germacrene D-4-ol	0.01	Sesquiterpenic alcohol
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Tetradecanal	0.01	Aliphatic aldehyde
(2*E*)-Tetradecenal	0.01	Aliphatic aldehyde
α-Sinensal	0.33	Sesquiterpenic aldehyde
Myristic acid	0.01	Aliphatic acid
Phytone	0.01	Terpenic ketone
Palmitic acid	0.03	Aliphatic acid
Linoleic acid	0.04	Aliphatic acid
cis-Vaccenic acid?	0.04	Aliphatic acid
Tangeretin	0.20	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.03	Flavonoid
Nobiletin	0.06	Flavonoid
Δ3-Carene	tr	Monoterpene
Consolidated total	**99.53%**	

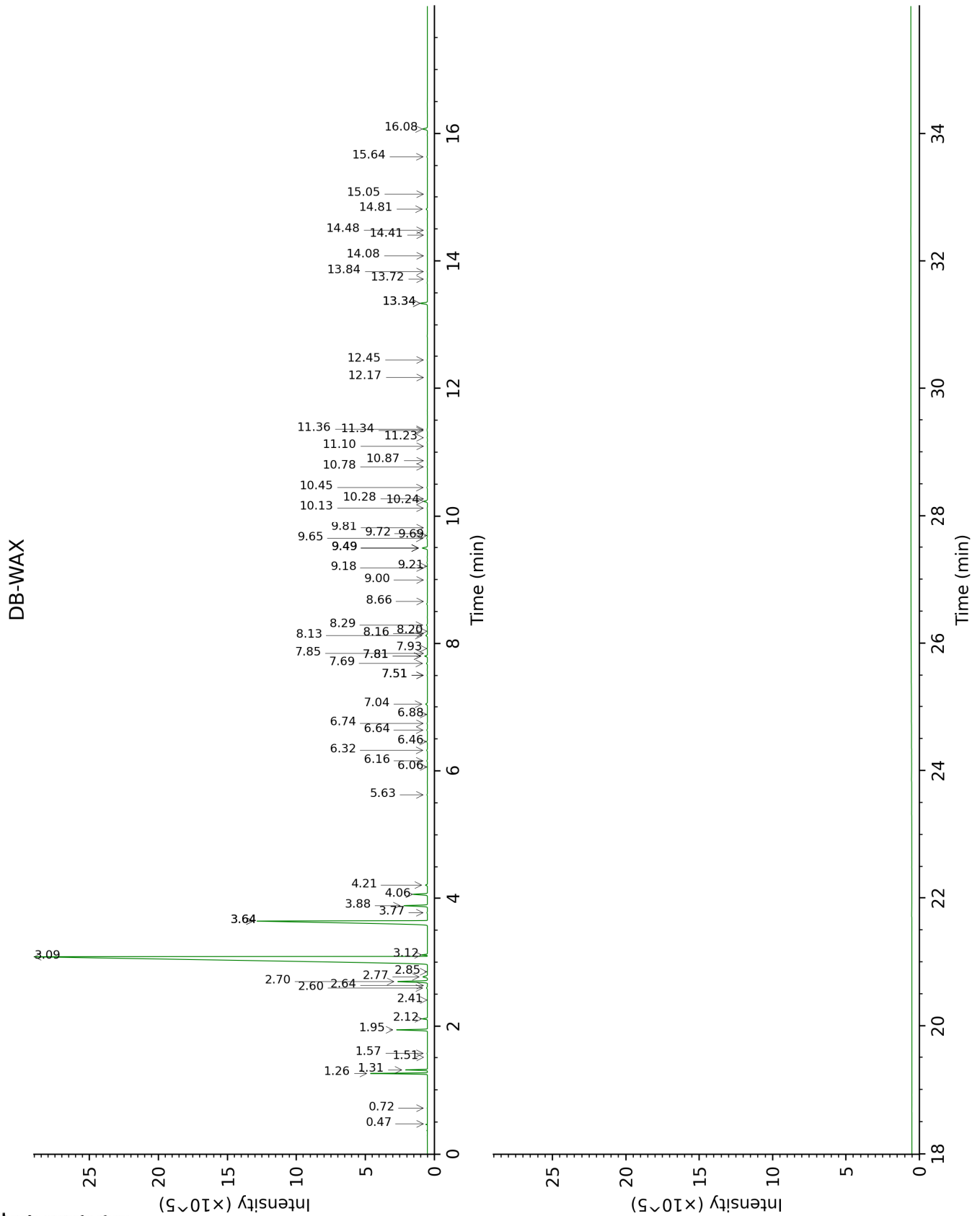tr: The compound has been detected below 0.005% of total signal.

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

Time (min)

Intensity (×10^5)

Time (min)

Intensity (×10^5)

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DB-WAX

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Octane	1.57	803	tr	0.47	790	tr
Nonane	2.77	902	tr	0.72	894	0.01
Heptanal	2.79	904	0.01	2.85	1146	0.01
α-Thujene	3.14	926	0.79	1.31	999	0.79
α-Pinene	3.21	931	2.22	1.26	991	2.22
Camphene	3.40*	944	0.02	1.57	1026	0.01
α-Fenchene	3.40*	944	[0.02]	1.51	1020	tr
β-Pinene	3.84*	972	1.72	1.94	1065	1.48
Sabinene	3.84*	972	[1.72]	2.12	1083	0.25
Myrcene	4.16	993	1.74	2.70	1134	1.75
Pseudolimonene	4.30*†	1003	0.17	2.64	1129	0.01
α-Phellandrene	4.30*†	1003	[0.17]	2.60	1126	0.06
Octanal	4.31†	1004	[0.17]	4.21	1254	0.10
α-Terpinene	4.50	1015	0.32	2.77	1140	0.33
para-Cymene	4.64	1024	1.15	3.88	1230	1.24
β-Phellandrene	4.78*	1033	70.63	3.12	1168	0.21
Limonene	4.78*	1033	[70.63]	3.09	1166	70.38
(Z)-β-Ocimene	4.91	1041	tr	3.64*	1211	17.05
(E)-β-Ocimene	5.07	1051	0.03	3.78	1221	0.03
γ-Terpinene	5.22	1060	17.04	3.64*	1211	[17.05]
cis-Sabinene hydrate	5.32	1066	0.04	6.64	1428	0.04
Octanol	5.49	1077	0.02	7.93	1525	0.02
Terpinolene	5.64*	1087	0.78	4.06	1243	0.78
para-Cymenene	5.64*	1087	[0.78]	6.06	1385	tr
trans-Sabinene hydrate	5.80	1096	0.06	7.69	1507	0.06
Linalool	5.90	1102	0.15	7.81*	1516	0.15
Nonanal	5.93	1105	0.03	5.63	1353	0.03
trans-para-Mentha-2,8-dien-1-ol	6.16	1119	0.01	8.66	1583	0.01
cis-Limonene oxide	6.33	1130	0.04	6.16	1392	0.03
cis-para-Mentha-2,8-dien-1-ol	6.40*	1135	0.05	9.18	1625	0.01
trans-Limonene oxide	6.40*	1135	[0.05]	6.32	1404	0.04
Epoxyterpinolene	6.53	1143	0.04	6.46	1414	0.04
Citronellal	6.69	1153	0.03	6.74	1436	0.03
Borneol	6.86	1164	0.04	9.50*	1650	0.37
Terpinen-4-ol	7.02*	1174	0.07	8.29	1554	0.05
Nonanol	7.02*	1174	[0.07]	9.21	1627	0.01
para-Cymen-8-ol	7.19	1185	0.01	11.23	1796	0.02
α-Terpineol	7.26	1189	0.22	9.50*	1650	[0.37]
Unknown [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	7.30	1192	0.01	7.51*	1493	0.02
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.35	1195	0.01	7.81*	1516	[0.15]

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Compound						
Decanal	7.52	1206	0.09	7.04	1458	0.12
trans-Carveol	7.72	1219	0.01	11.10	1785	0.01
Nerol	7.88	1230	0.01	10.78	1757	0.02
Citronellol	7.92	1232	0.02	10.45	1730	0.03
Thymol methyl ether	7.94	1234	0.01	8.20	1546	tr
Carvone	8.02	1239	0.01	9.72	1669	0.02
Geraniol	8.30	1258	0.02	11.36	1808	0.02
Linalyl acetate	8.35	1261	0.01	7.85	1519	0.01
Geranial	8.45*	1268	0.06	9.81	1676	0.01
Isopiperitenone	8.45*	1268	[0.06]	10.87	1766	0.01
trans-Ascaridole glycol	8.45*	1268	[0.06]	13.84	2035	0.01
cis-Ascaridole glycol	8.78	1290	0.02	14.48	2098	0.02
Thymol	8.99	1304	0.08	14.81	2131	0.08
Carvacrol	9.03	1307	0.02	15.05	2154	0.02
trans-para-Mentha-2,8-diene-1-hydroperoxide	9.23	1321	0.01			
Limonene *trans*-glycol	9.52	1341	0.03	15.64	2215	0.03
α-Copaene	9.96	1372	0.01	6.88	1446	0.01
β-Cubebene	10.13*	1384	0.01	7.51*	1493	[0.02]
Geranyl acetate	10.13*	1384	[0.01]	10.28	1715	tr
β-Elemene	10.16	1387	0.01	8.16	1543	tr
Dimethyl anthranilate	10.36	1401	0.47	13.34*	1988	0.47
Dodecanal	10.47	1408	0.03	9.69	1666	0.01
β-Caryophyllene	10.53	1413	0.11	8.13	1541	0.10
α-Humulene	11.00	1447	0.01	9.00	1609	0.01
(2*E*)-Dodecenal	11.24	1465	0.02	11.34	1806	0.02
Germacrene D	11.36	1474	0.01	9.50*	1650	[0.37]
α-Selinene	11.56	1489	0.04	9.65	1663	0.03
(3*E*,6*E*)-α-Farnesene	11.82	1509	0.19	10.24	1711	0.22
δ-Cadinene	11.96	1520	0.03	10.13	1702	0.02
Germacrene D-4-ol	12.57	1568	0.01	13.34*	1988	[0.47]
Spathulenol	12.61	1571	0.01	14.08	2059	0.01
Caryophyllene oxide	12.65	1574	0.02	12.45	1904	0.01
Tetradecanal	13.13	1612	0.01	12.17	1880	0.01
(2*E*)-Tetradecenal	13.83	1670	0.01	13.72	2024	0.01
α-Sinensal	14.77	1750	0.33	16.08	2260	0.32
Myristic acid	15.00	1769	0.01			
Phytone	15.88	1848	0.01	14.41	2090	0.01
Palmitic acid	17.23	1973	0.03			
Linoleic acid	18.90	2139	0.04			
cis-Vaccenic acid?	19.00	2149	0.04			
Tangeretin	27.26	3141	0.20			
3,3',4',5,6,7,8-Heptamethoxyflavone	29.43	3323	0.03			
Nobiletin	29.50	3327	0.06			
Δ3-Carene				2.41	1110	tr
Total identified	**99.55%**			**99.28%**		
Total reported	**99.58%**			**99.28%**		

*: Two or more compounds are coeluting on this column

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[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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