CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23E09-PTH01
Customer identification : Mandarin Green - Brazil - M10107R
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 : Amélie Simard, Analyste
Analysis date : May 15, 2023

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

MÉTHODE CERTIFIÉE
✳ISO 17025:2017
CERTIFIED METHOD

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PHYSICOCHEMICAL DATA

Physical aspect: Green brownish liquid
Refractive index: 1.4757 ± 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
Heptanal	0.01	Aliphatic aldehyde
α-Thujene	0.70	Monoterpene
α-Pinene	1.93	Monoterpene
Camphene	0.02	Monoterpene
α-Fenchene	0.01	Monoterpene
β-Pinene	1.40	Monoterpene
Sabinene	0.24	Monoterpene
Myrcene	1.74	Monoterpene
α-Phellandrene	0.07	Monoterpene
Pseudolimonene	0.01	Monoterpene
Octanal	0.07	Aliphatic aldehyde
α-Terpinene	0.36	Monoterpene
para-Cymene	0.58	Monoterpene
Limonene	71.25	Monoterpene
β-Phellandrene	0.22	Monoterpene
(Z)-β-Ocimene	0.02	Monoterpene
(E)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	17.05	Monoterpene
cis-Sabinene hydrate	0.04	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
para-Cymenene	tr	Monoterpene
Terpinolene	0.78	Monoterpene
trans-Sabinene hydrate	0.07	Monoterpenic alcohol
Linalool	0.16	Monoterpenic alcohol
Nonanal	0.04	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
trans-Limonene oxide	0.02	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
Epoxyterpinolene	0.02	Monoterpenic ether
Citronellal	0.03	Monoterpenic aldehyde
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.09	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.21	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	0.03	Monoterpenic alcohol
Thymol methyl ether	0.01	Monoterpenic ether
Carvone	0.01	Monoterpenic ketone
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Geranial	0.01	Monoterpenic aldehyde

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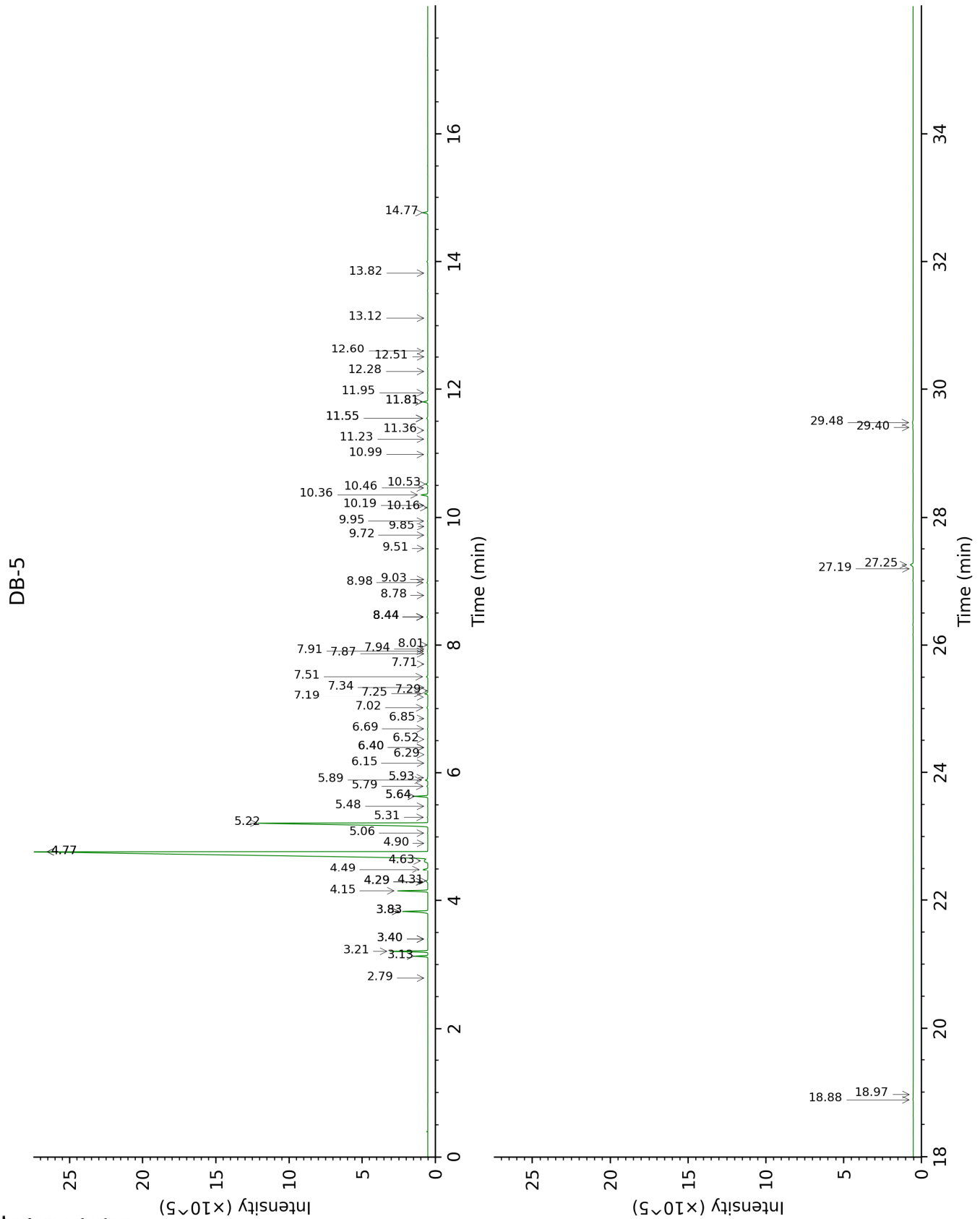|		
Isopiperitenone	0.01	Monoterpenic ketone
cis-Ascaridole glycol	0.02	Monoterpenic alcohol
Thymol	0.06	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
Limonene *trans*-glycol	0.02	Monoterpenic alcohol
Unknown	0.02	Sesquiterpene
Neryl acetate	0.01	Monoterpenic ester
α-Copaene	0.02	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
Dimethyl anthranilate	0.47	Phenolic ester
Dodecanal	0.03	Aliphatic aldehyde
β-Caryophyllene	0.15	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
(2*E*)-Dodecenal	0.02	Aliphatic aldehyde
Germacrene D	0.02	Sesquiterpene
α-Selinene	0.05	Sesquiterpene
Bicyclogermacrene	0.02	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.33	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Spathulenol	0.01	Sesquiterpenic alcohol
Tetradecanal	0.01	Aliphatic aldehyde
(2*E*)-Tetradecenal	0.01	Aliphatic aldehyde
α-Sinensal	0.35	Sesquiterpenic aldehyde
Linoleic acid	0.05	Aliphatic acid
Oleic acid	0.04	Aliphatic acid
Tetramethoxyflavone isomer	0.01	Flavonoid
Tangeretin	0.29	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.04	Flavonoid
Nobiletin	0.09	Flavonoid
Consolidated total	**99.71%**	

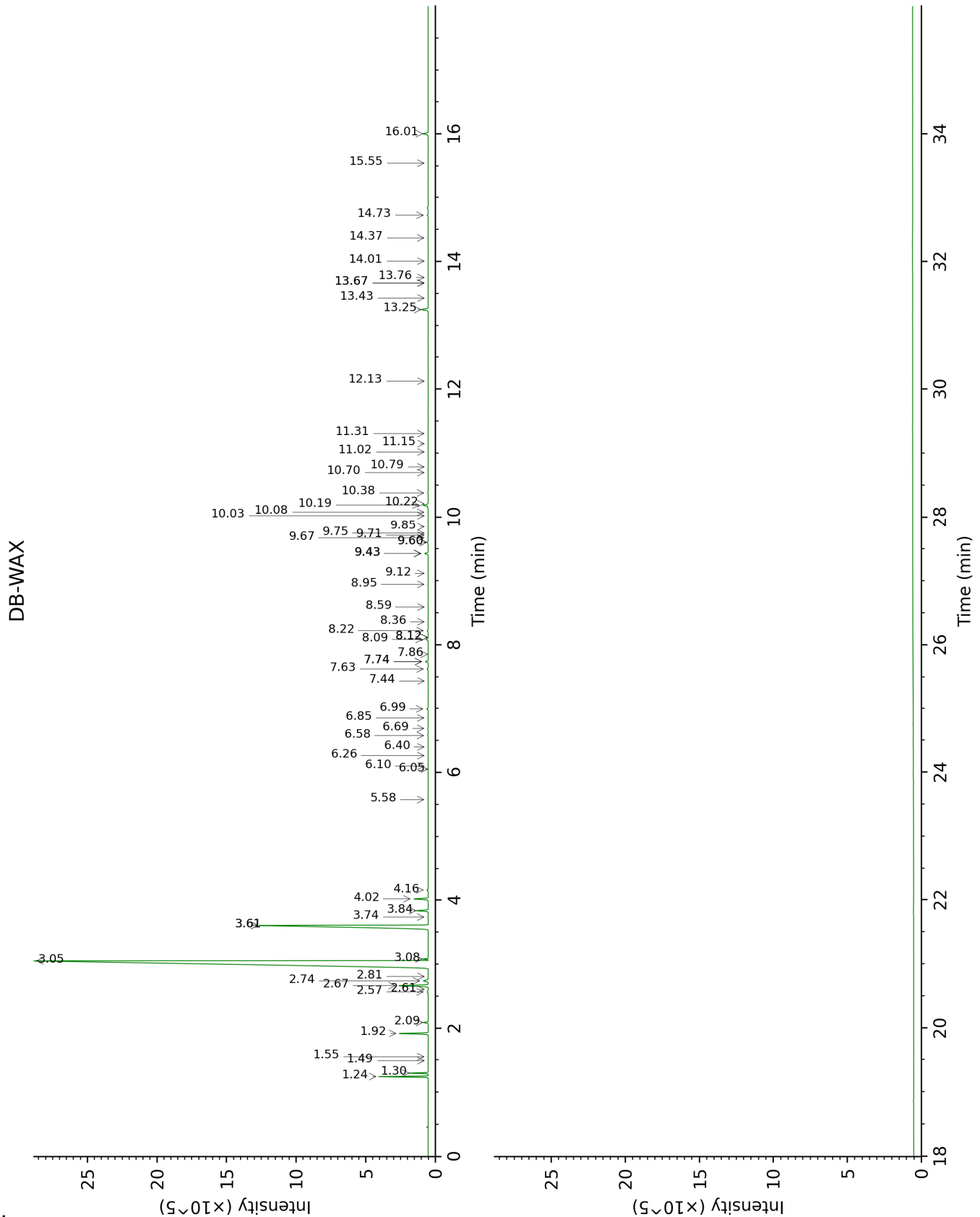tr: The compound has been detected below 0.005% of total signal.

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	%
Heptanal	2.79	904	0.01	2.81	1146	0.01
α-Thujene	3.13	926	0.70	1.30	1001	0.71
α-Pinene	3.21	931	1.93	1.24	992	1.94
Camphene	3.40*	944	0.03	1.55	1027	0.02
α-Fenchene	3.40*	944	[0.03]	1.49	1021	0.01
β-Pinene	3.83*	972	1.63	1.92	1066	1.40
Sabinene	3.83*	972	[1.63]	2.09	1083	0.24
Myrcene	4.15	993	1.74	2.67	1134	1.75
α-Phellandrene	4.29*†	1002	0.14	2.57	1126	0.07
Pseudolimonene	4.29*†	1002	[0.14]	2.61	1129	0.01
Octanal	4.31†	1004	[0.14]	4.16	1254	0.07
α-Terpinene	4.49	1015	0.36	2.74	1140	0.36
para-Cymene	4.63	1024	0.58	3.84	1229	0.63
Limonene	4.77*	1032	71.00	3.05	1166	71.25
β-Phellandrene	4.77*	1032	[71.00]	3.08	1168	0.22
(*Z*)-β-Ocimene	4.90	1041	0.02	3.61*	1211	17.18
(*E*)-β-Ocimene	5.06	1051	0.03	3.74	1221	0.02
γ-Terpinene	5.22	1060	17.05	3.61*	1211	[17.18]
cis-Sabinene hydrate	5.31	1066	0.04	6.58	1426	0.04
Octanol	5.48	1077	0.02	7.86	1523	0.02
para-Cymenene	5.64*	1086	0.78	6.05	1387	tr
Terpinolene	5.64*	1086	[0.78]	4.02	1243	0.78
trans-Sabinene hydrate	5.79	1096	0.07	7.63	1505	0.06
Linalool	5.89	1102	0.16	7.74*	1514	0.15
Nonanal	5.93	1105	0.04	5.58	1352	0.02
trans-para-Mentha-2,8-dien-1-ol	6.15	1119	0.01	8.59	1581	0.01
cis-Limonene oxide	6.29	1128	0.01	6.10	1391	0.01
trans-Limonene oxide	6.40*	1134	0.02	6.26	1403	0.02
cis-para-Mentha-2,8-dien-1-ol	6.40*	1134	[0.02]	9.12	1623	0.01
Epoxyterpinolene	6.52	1143	0.02	6.40	1413	0.02
Citronellal	6.69	1153	0.03	6.69	1435	0.03
Borneol	6.85	1163	0.02	9.43*	1649	0.24
Terpinen-4-ol	7.02	1174	0.09	8.22	1552	0.07
para-Cymen-8-ol	7.19	1185	0.01	11.15	1794	0.01
α-Terpineol	7.25	1189	0.21	9.43*	1649	[0.24]
Unknown [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	7.29	1191	0.01	7.44	1491	0.01
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.34	1195	0.01	7.74*	1514	[0.15]
Decanal	7.51	1205	0.09	6.99	1458	0.09
trans-Carveol	7.71	1218	0.01	11.02	1783	0.01
Nerol	7.87	1229	0.01	10.70	1756	0.02

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Compound	R.T.		%	R.T.		%
Citronellol	7.91	1232	0.03	10.38	1728	0.04
Thymol methyl ether	7.94	1234	0.01	8.12*	1544	0.02
Carvone	8.01	1238	0.01	9.67	1669	0.02
trans-Ascaridole glycol	8.44*	1268	0.06	13.76	2034	0.01
Geranial	8.44*	1268	[0.06]	9.75	1675	0.01
Isopiperitenone	8.44*	1268	[0.06]	10.79	1763	0.01
cis-Ascaridole glycol	8.78	1290	0.02	14.37	2094	0.04
Thymol	8.98	1303	0.06	14.73	2129	0.06
Undecanal	9.03	1307	0.02	8.36	1563	0.01
Limonene *trans*-glycol	9.51	1341	0.02	15.55	2213	0.01
Unknown [m/z 43, 81 (96), 95 (85), 67 (74), 69 (68), 41 (66)...204 (1)]	9.72	1355	0.02			
Neryl acetate	9.85	1365	0.01	9.85	1683	0.01
α-Copaene	9.95	1372	0.02	6.85	1447	0.03
Geranyl acetate	10.16	1386	0.02	10.22	1714	0.02
β-Elemene	10.19	1389	0.01	8.12*	1544	[0.02]
Dimethyl anthranilate	10.36	1400	0.47	13.25	1986	0.47
Dodecanal	10.46	1408	0.03	9.60*	1663	0.09
β-Caryophyllene	10.52	1412	0.15	8.09	1542	0.14
α-Humulene	10.99	1447	0.02	8.95	1609	0.02
(2*E*)-Dodecenal	11.23	1465	0.02	11.31	1808	0.02
Germacrene D	11.36	1475	0.02	9.43*	1649	[0.24]
α-Selinene	11.55*	1489	0.09	9.60*	1663	[0.09]
Bicyclogermacrene	11.55*	1489	[0.09]	9.72	1672	0.02
(3*E*,6*E*)-α-Farnesene	11.81*	1508	0.34	10.19	1712	0.33
γ-Cadinene	11.81*	1508	[0.34]	10.03	1698	0.01
δ-Cadinene	11.95	1519	0.03	10.08	1702	0.03
α-Elemol	12.28	1545	0.01	13.67*	2025	0.01
(*E*)-Nerolidol	12.51	1563	0.01	13.43	2002	0.01
Spathulenol	12.60	1570	0.01	14.01	2058	0.01
Tetradecanal	13.12	1612	0.01	12.13	1881	0.01
(2*E*)-Tetradecenal	13.82	1669	0.01	13.67*	2025	[0.01]
α-Sinensal	14.77	1749	0.35	16.01	2262	0.35
Linoleic acid	18.88	2137	0.05			
Oleic acid	18.97	2146	0.04			
Tetramethoxyflavone isomer	27.19	3133	0.01			
Tangeretin	27.25	3139	0.29			
3,3',4',5,6,7,8-Heptamethoxyflavone	29.40	3320	0.04			
Nobiletin	29.48	3325	0.09			
Total identified		**99.22%**			**99.28%**	
Total reported		**99.27%**			**99.28%**	

*: 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)

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R.I.: Retention index

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