

Date : March 16, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21B23-FEP29

Customer identification : Tangerine - Argentina - 522376-20

Type : Essential oil

Source : *Citrus reticulata* cv. Tangerine

Customer : Fern & Petal

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

Analysis date : March 16, 2021

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid

Refractive index: 1.4749 ± 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
α-Thujene	0.09	Monoterpene
α-Pinene	0.72	Monoterpene
Camphene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Sabinene	0.24	Monoterpene
β-Pinene	0.24	Monoterpene
Heptanol	0.01	Aliphatic alcohol
Myrcene	1.69	Monoterpene
α-Phellandrene	0.02	Monoterpene
Octanal	0.03	Aliphatic aldehyde
Δ ³ -Carene	0.04	Monoterpene
α-Terpinene	0.01	Monoterpene
para-Cymene	1.13	Monoterpene
Limonene	90.56	Monoterpene
β-Phellandrene	0.23	Monoterpene
(E)-β-Ocimene	0.04	Monoterpene
γ-Terpinene	0.97	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.08	Aliphatic alcohol
Terpinolene	0.08	Monoterpene
trans-Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.23	Monoterpenic alcohol
Nonanal	0.02	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.06	Monoterpenic alcohol
cis-Limonene oxide	0.22	Monoterpenic ether
trans-Limonene oxide	0.13	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
α-Terpineol	0.07	Monoterpenic alcohol
Unknown	0.04	Unknown
Decanal	0.08	Aliphatic aldehyde
trans-Carveol	0.08	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
cis-Carveol	0.05	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Neral	0.07	Monoterpenic aldehyde
Geraniol	0.01	Monoterpenic alcohol
(2E)-Decenal	0.01	Aliphatic aldehyde
Geranial	0.01	Monoterpenic aldehyde
Limonen-10-ol	0.02	Monoterpenic alcohol
para-Mentha-1,8-diene-4-hydroperoxide	0.01	Monoterpenic peroxide
Neryl acetate	0.03	Monoterpenic ester
α-Copaene	0.05	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester

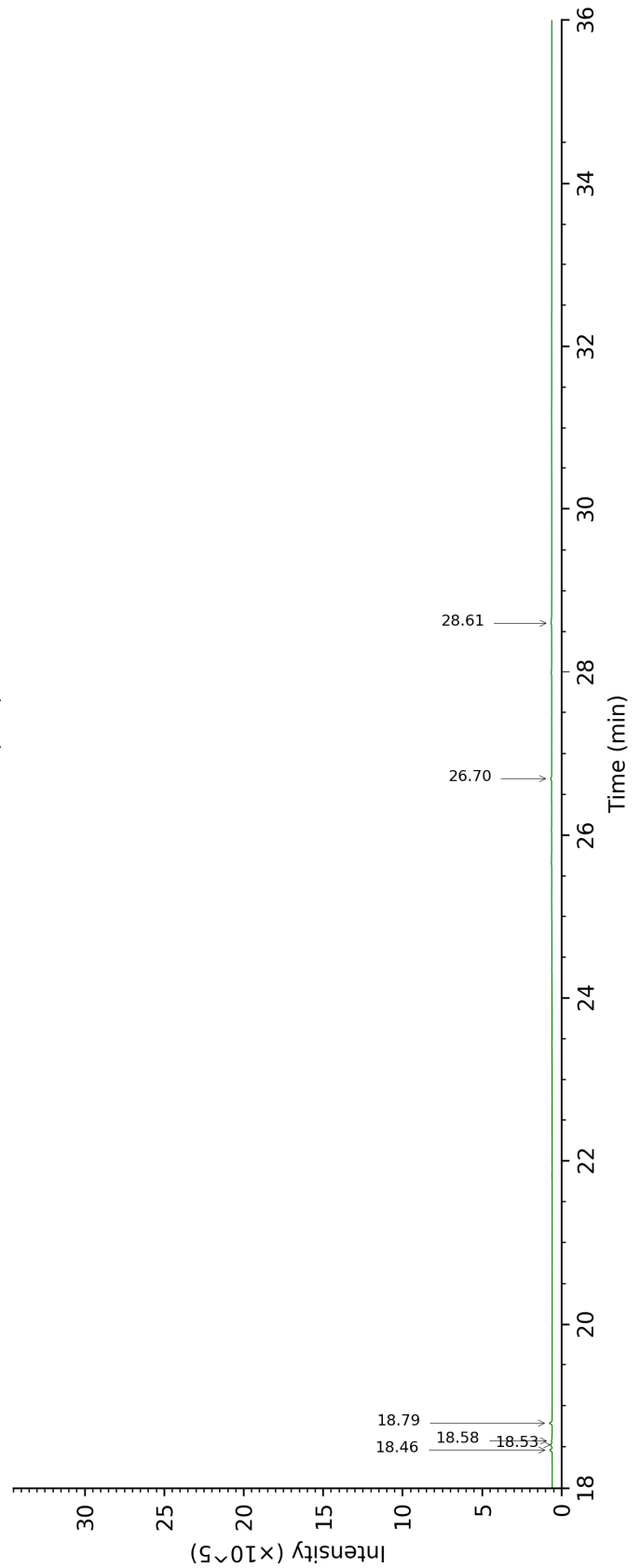
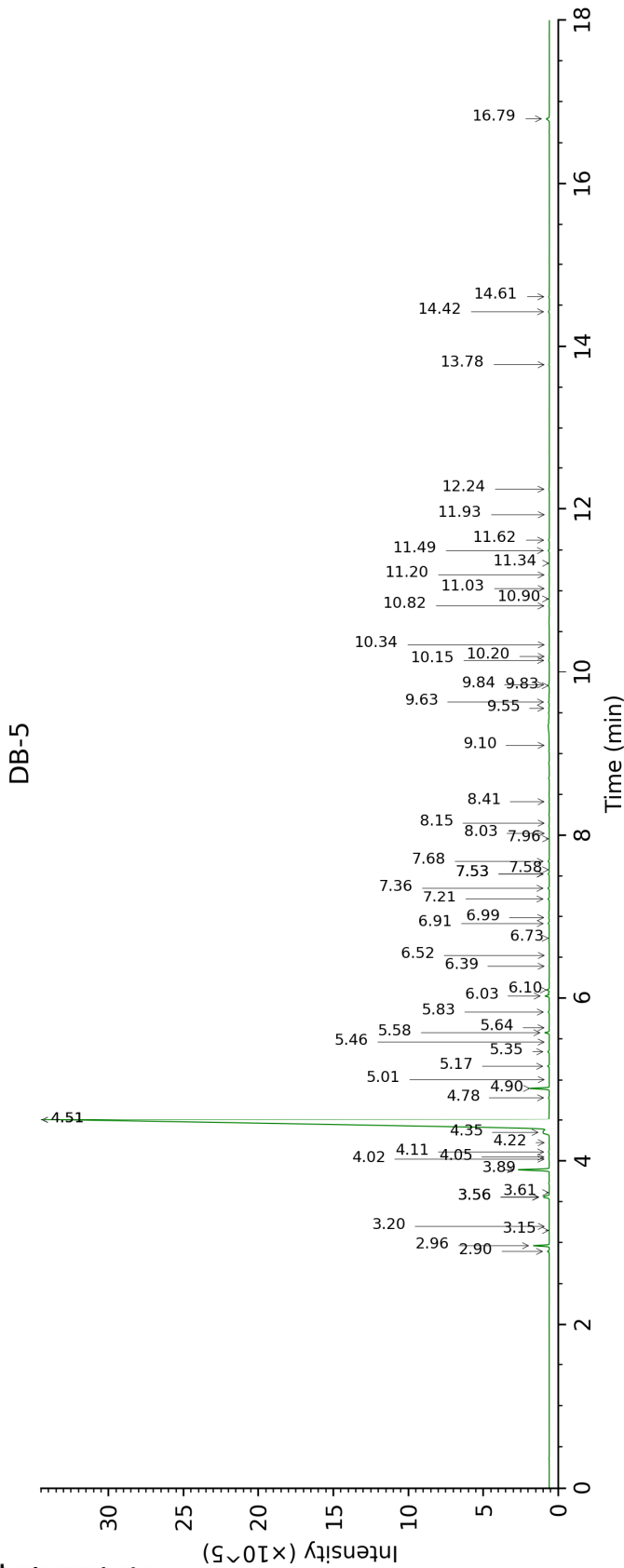
β-Elemene	0.04	Sesquiterpene
Dodecanal	0.04	Aliphatic aldehyde
β-Caryophyllene	0.02	Sesquiterpene
β-Copaene	0.01	Sesquiterpene
(E)-β-Farnesene	0.03	Sesquiterpene
(2E)-Dodecenal	0.03	Aliphatic aldehyde
Germacrene D	0.02	Sesquiterpene
Valencene	0.02	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
(3E,6E)-α-Farnesene	0.07	Sesquiterpene
δ-Cadinene	0.05	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
Germacrene D-4-ol	0.03	Sesquiterpenic alcohol
β-Sinensal	0.02	Sesquiterpenic aldehyde
α-Sinensal	0.06	Sesquiterpenic aldehyde
Myristic acid	0.05	Aliphatic acid
Palmitic acid	0.25	Aliphatic acid
Linoleic acid	0.18	Aliphatic acid
Oleic acid	0.15	Aliphatic acid
cis-Vaccenic acid?	0.10	Aliphatic acid
Stearic acid	0.20	Aliphatic acid
Tangeretin	0.09	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.10	Flavonoid
Consolidated total	99.08%	

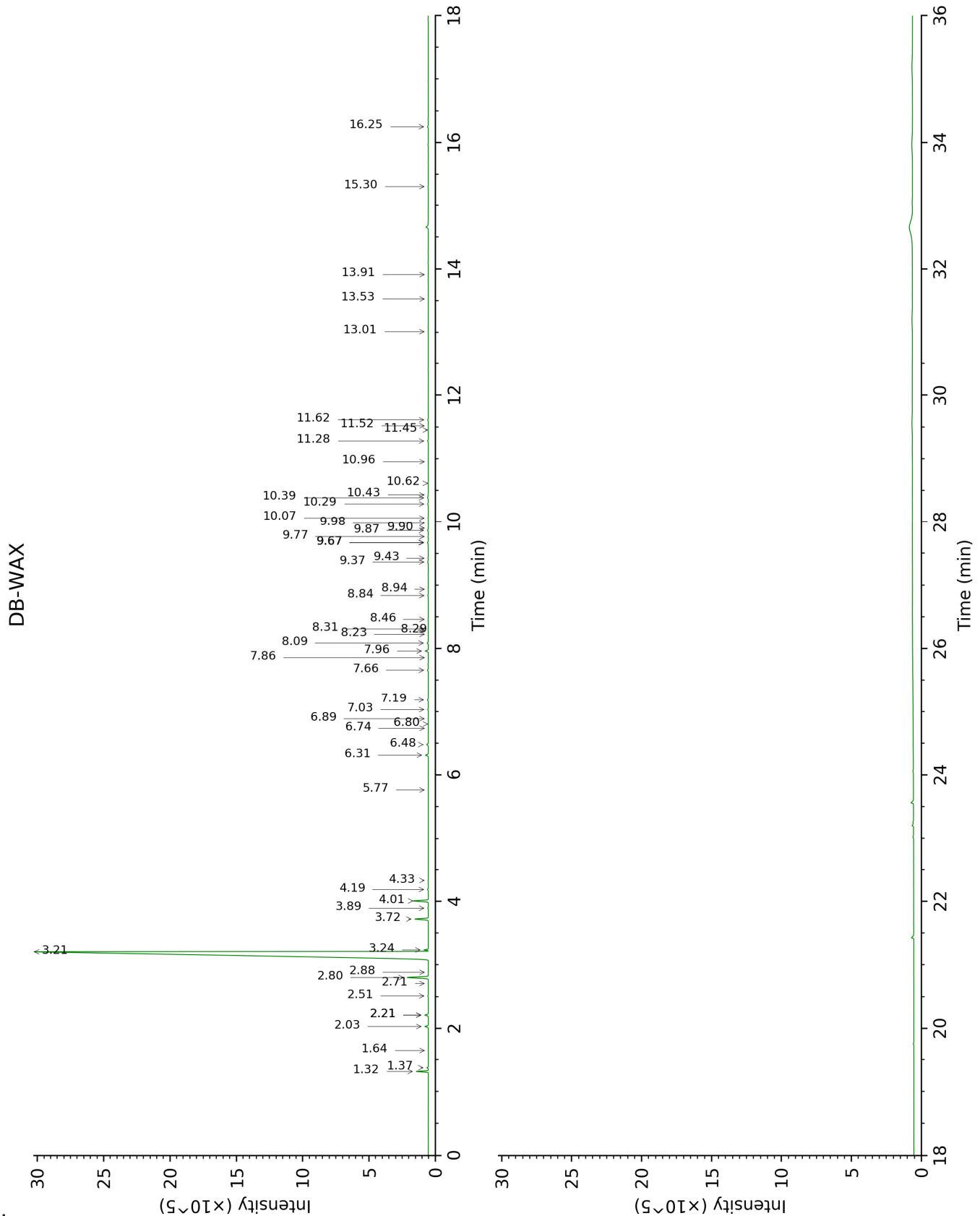
Note: no correction factor was applied

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	%
α-Thujene	2.90	925	0.09	1.37	1001	0.09
α-Pinene	2.96	930	0.72	1.32	992	0.72
Camphene	3.15	942	0.01	1.64	1027	0.01
Thuja-2,4(10)-diene	3.20	946	0.01	2.21*	1084	0.24
Sabinene	3.56*	970	0.48	2.21*	1084	[0.24]
β-Pinene	3.56*	970	[0.48]	2.03	1066	0.24
Heptanol	3.61	973	0.01	6.74	1425	0.01
Myrcene	3.89	992	1.69	2.80	1135	1.72
α-Phellandrene	4.02	1001	0.02	2.71	1127	0.01
Octanal	4.05	1003	0.03	4.33	1253	0.03
Δ3-Carene	4.11	1007	0.04	2.51	1112	0.04
α-Terpinene	4.22	1014	0.01	2.88	1141	0.01
para-Cymene	4.35†	1022	91.48	4.01	1229	1.13
Limonene	4.51*†	1032	[91.48]	3.21	1167	90.56
β-Phellandrene	4.51*†	1032	[91.48]	3.24	1169	0.23
(E)-β-Ocimene	4.78	1049	0.04	3.89	1220	0.04
γ-Terpinene	4.90	1057	0.97	3.72	1208	0.98
cis-Sabinene hydrate	5.01	1064	0.01	6.80	1430	0.01
Octanol	5.17	1074	0.08	8.09	1527	0.09
Terpinolene	5.35	1085	0.08	4.19	1242	0.07
trans-Sabinene hydrate	5.46	1093	0.02	7.86	1510	0.01
Linalool	5.58	1100	0.23	7.96	1518	0.23
Nonanal	5.64	1104	0.02	5.77	1354	0.02
trans-para-Mentha-2,8-dien-1-ol	5.83	1116	0.06	8.84	1586	0.04
cis-Limonene oxide	6.03	1129	0.22	6.31	1394	0.23
trans-Limonene oxide	6.10	1134	0.13	6.48	1406	0.13
Citronellal	6.39	1153	0.02	6.89	1436	0.02
Borneol	6.52	1161	0.01	9.67*	1653	0.09
Terpinen-4-ol	6.73	1175	0.03	8.46	1557	0.04
α-Terpineol	6.91	1187	0.07	9.67*	1653	[0.09]
Unknown [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	6.99	1192	0.04	7.66	1494	0.08
Decanal	7.21	1206	0.08	7.19	1459	0.08
trans-Carveol	7.36	1216	0.08	11.28	1788	0.06
Nerol	7.53*	1228	0.07	10.96	1761	0.01
cis-Carveol	7.53*	1228	[0.07]	11.62	1818	0.05
Citronellol	7.58	1232	0.02	10.62	1732	0.04
Neral	7.68	1239	0.07	9.37	1628	0.07
Geraniol	7.96	1258	0.01	11.52	1809	0.02
(2E)-Decenal	8.03	1262	0.01	8.94	1594	0.01
Geranial	8.15	1271	0.01	9.98	1679	0.01
Limonen-10-ol	8.41	1289	0.02	13.01	1944	0.03

para-Mentha-1,8-diene-4-hydroperoxide	9.10	1333	0.01			
Neryl acetate	9.56	1366	0.03	10.07	1686	0.03
α -Copaene	9.63	1371	0.05	7.03	1447	0.05
Geranyl acetate	9.83	1385	0.02	10.43	1716	0.02
β -Elemene	9.84	1386	0.04	8.31	1545	0.02
Dodecanal	10.15	1408	0.04	9.86	1669	0.07
β -Caryophyllene	10.20	1412	0.02	8.29	1543	0.02
β -Copaene	10.34	1422	0.01	8.23	1538	0.01
(E)- β -Farnesene	10.82	1458	0.03	9.42	1633	0.03
(2E)-Dodecenal	10.90	1464	0.03	11.45	1803	0.02
Germacrene D	11.03	1474	0.02	9.67*	1653	[0.09]
Valencene	11.20	1486	0.02	9.77	1661	0.03
α -Muurolene	11.34	1497	0.01	9.90	1672	0.01
(3E,6E)- α -Farnesene	11.49	1509	0.07	10.39	1712	0.09
δ -Cadinene	11.62	1519	0.05	10.29	1704	0.07
α -Elemol	11.93	1543	0.01	13.91	2029	0.01
Germacrene D-4-ol	12.24	1568	0.03	13.53	1992	0.01
β -Sinensal	13.78	1693	0.02	15.30	2165	0.02
α -Sinensal	14.42	1749	0.06	16.25	2264	0.07
Myristic acid	14.61	1765	0.05			
Palmitic acid	16.79	1965	0.25			
Linoleic acid	18.46	2131	0.18			
Oleic acid	18.53	2138	0.15			
cis-Vaccenic acid?	18.58	2143	0.10			
Stearic acid	18.79	2165	0.20			
Tangeretin	26.70	3140	0.09			
3,3',4',5,6,7,8-Heptamethoxyflavone	28.61	3326	0.10			
Total identified		98.62%			97.97%	
Total reported		98.67%			98.06%	

*: 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