

Date : April 16, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20E21-PTH11

Customer identification : Blood Orange - Italy - O10110203R

Type : Essential oil

Source : *Citrus sinensis*

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 27, 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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 June 03, 2020 to indicatively present comparison to a standard.

PHYSICOCHEMICAL DATA

Physical aspect: Bright orange liquid

Refractive index: 1.4736 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3140:2011 - OIL OF SWEET ORANGE, OBTAINED BY PHYSICAL EXTRACTION OF THE PEEL

Compound	Min. %	Max. %	Observed %	Complies?
β-Sinensal	0.01	0.06	0.03	Yes
Geranial	0.05	0.20	0.11	Yes
Valencene	0.01	0.40	0.12	Yes
Neral	0.03	0.10	0.07	Yes
Linalool	0.15	0.70	0.18	Yes
Decanal	0.1	0.7	0.3	Yes
Nonanal	0.01	0.06	0.05	Yes
Octanal	0.1	0.4	0.3	Yes
Limonene	93.0	96.0	92.6	No
Myrcene	1.5	3.5	1.9	Yes
Sabinene	0.2	0.8	0.5	Yes
β-Pinene	0.02	0.15	0.14	Yes
α-Pinene	0.4	0.8	0.5	Yes
Refractive index	1.4700	1.4760	1.4736	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
α -Thujene	0.01	Monoterpene
α -Pinene	0.53	Monoterpene
Sabinene	0.46	Monoterpene
β -Pinene	0.14	Monoterpene
Myrcene	1.92	Monoterpene
α -Phellandrene	0.06	Monoterpene
Octanal	0.28	Aliphatic aldehyde
Δ^3 -Carene	0.35	Monoterpene
α -Terpinene	0.02	Monoterpene
para-Cymene	0.01	Monoterpene
Limonene	92.62	Monoterpene
1,8-Cineole	0.28	Monoterpenic ether
(Z)- β -Ocimene	0.02	Monoterpene
(E)- β -Ocimene	0.05	Monoterpene
γ -Terpinene	0.07	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.06	Monoterpene
Linalool	0.18	Monoterpenic alcohol
Nonanal	0.05	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
trans-Limonene oxide	0.01	Monoterpenic ether
Citronellal	0.05	Monoterpenic aldehyde
Terpinen-4-ol	0.01	Monoterpenic alcohol
α -Terpineol	0.04	Monoterpenic alcohol
Decanal	0.29	Aliphatic aldehyde
trans-Piperitol	0.03	Monoterpenic alcohol
trans-Carveol	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Citronellol	0.01	Monoterpenic alcohol
Neral	0.07	Monoterpenic aldehyde
Geraniol	0.01	Monoterpenic alcohol
Geranial	0.11	Monoterpenic aldehyde
Limonen-10-ol	0.01	Monoterpenic alcohol
Undecanal	0.01	Aliphatic aldehyde
Neryl acetate	0.02	Monoterpenic ester
α -Copaene	0.02	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β -Elemene	0.01	Sesquiterpene
Dodecanal	0.06	Aliphatic aldehyde
β -Caryophyllene	0.04	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
α -Humulene	0.01	Sesquiterpene
(E)- β -Farnesene	0.01	Sesquiterpene

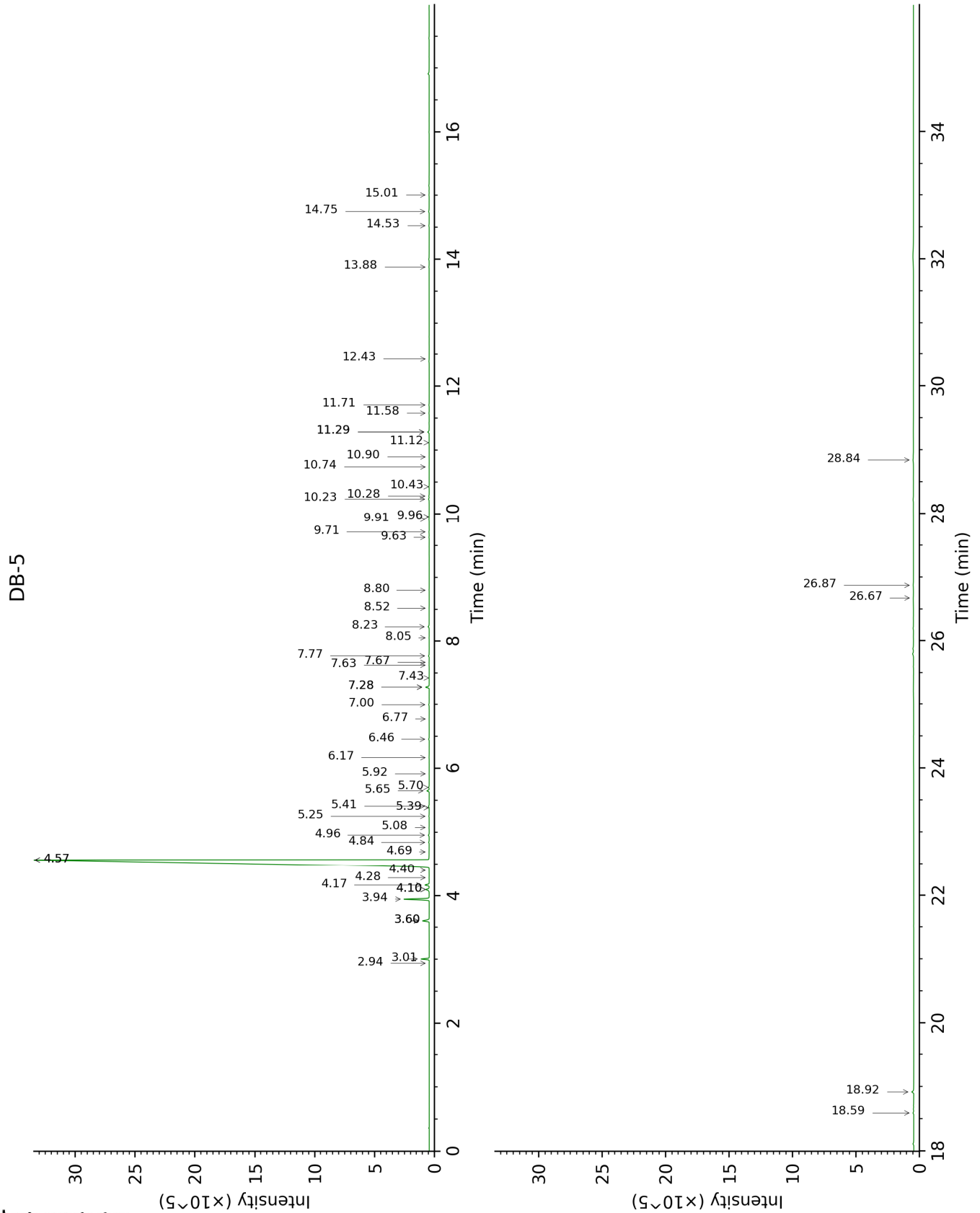
Germacrene D	0.02	Sesquiterpene
Valencene	0.12	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Caryophyllene oxide	0.01	Sesquiterpenic ether
β-Sinensal	0.03	Sesquiterpenic aldehyde
α-Sinensal	0.03	Sesquiterpenic aldehyde
Myristic acid	0.06	Aliphatic acid
Nootkatone	0.02	Sesquiterpenic ketone
Linoleic acid	0.08	Aliphatic acid
Stearic acid	0.23	Aliphatic acid
Tetramethoxyflavone isomer	0.05	Flavonoid
Tangeretin	0.06	Flavonoid
Nobiletin	0.10	Flavonoid
Consolidated total	98.92%	

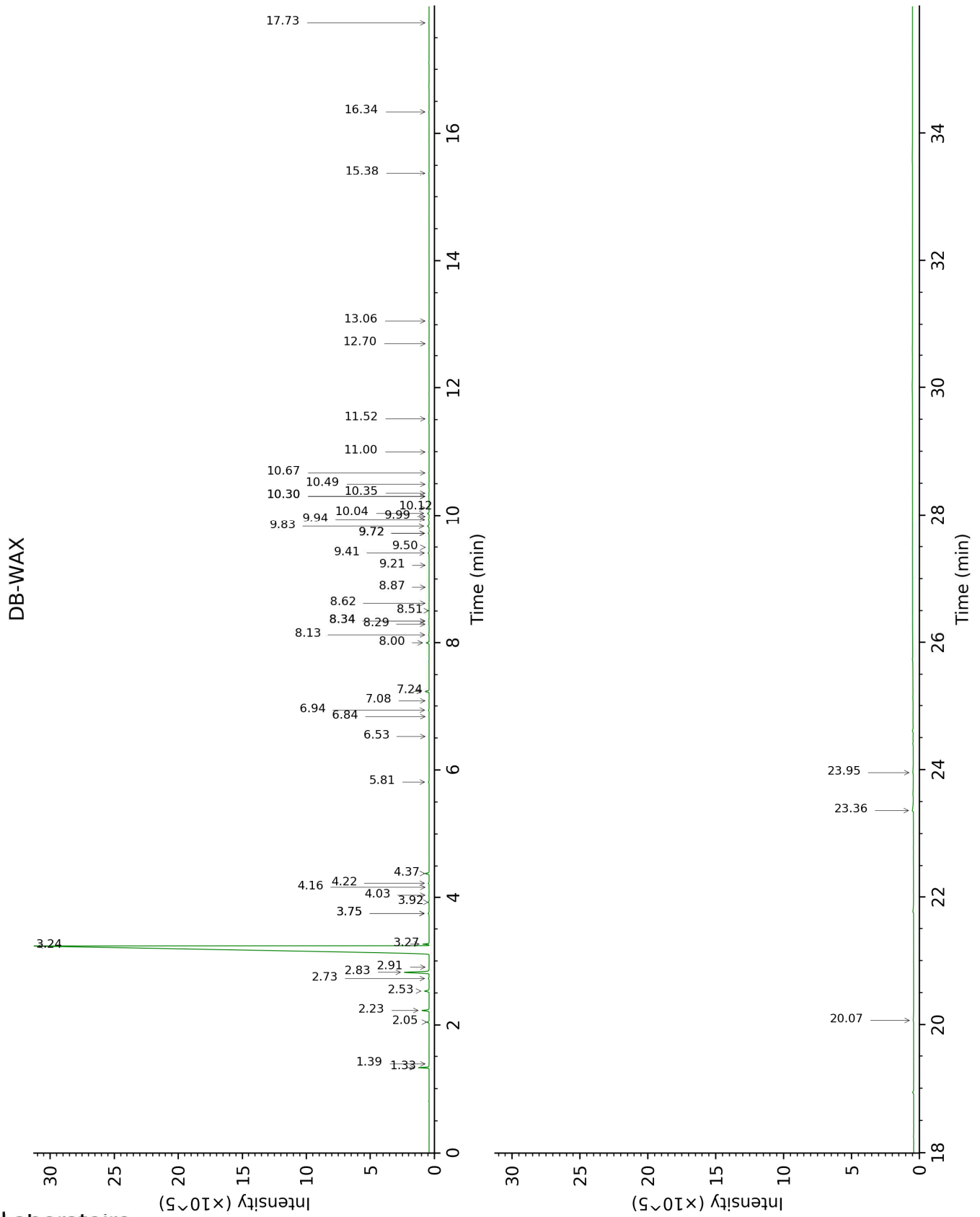
Note: no correction factor was applied

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	2.94	925	0.01	1.39	1001	0.01
α -Pinene	3.01	930	0.53	1.33	992	0.53
Sabinene	3.60*	969	0.59	2.23	1084	0.46
β -Pinene	3.60*	969	[0.59]	2.05	1066	0.14
Myrcene	3.94	992	1.92	2.83	1135	1.95
α -Phellandrene	4.10*	1002	0.33	2.73	1127	0.06
Octanal	4.10*	1002	[0.33]	4.37	1253	0.28
Δ^3 -Carene	4.17	1006	0.35	2.53	1112	0.34
α -Terpinene	4.28	1013	0.02	2.91	1141	0.01
para-Cymene	4.40	1021	0.01	4.03	1228	0.02
Limonene	4.57*	1031	91.87	3.24	1167	92.62
1,8-Cineole	4.57*	1031	[91.87]	3.27	1170	0.28
(Z)- β -Ocimene	4.69	1039	0.02	3.75*†	1207	0.08
(E)- β -Ocimene	4.84	1049	0.05	3.92	1220	0.04
γ -Terpinene	4.96	1056	0.07	3.75*†	1207	[0.08]
cis-Sabinene hydrate	5.08	1063	0.01	6.84	1429	0.01
Octanol	5.25	1074	0.03	8.13	1526	0.04
Isoterpinolene	5.39	1083	0.01	4.16	1237	0.01
Terpinolene	5.41	1084	0.06	4.22	1242	0.06
Linalool	5.65	1100	0.18	8.00	1516	0.19
Nonanal	5.70	1103	0.05	5.81	1354	0.05
trans-para-Mentha-2,8-dien-1-ol	5.92	1117	0.01	8.87	1584	0.01
trans-Limonene oxide	6.17	1133	0.01	6.53	1405	0.01
Citronellal	6.46	1152	0.05	6.94	1436	0.05
Terpinen-4-ol	6.77	1173	0.01	8.50	1556	0.01
α -Terpineol	7.00	1187	0.04	9.72*	1652	0.06
Decanal	7.28*	1206	0.30	7.24	1459	0.29
trans-Piperitol	7.28*	1206	[0.30]	10.35	1704	0.03
trans-Carveol	7.43	1216	0.01			
Nerol	7.63	1230	0.01	11.00	1759	0.01
Citronellol	7.67	1233	0.01	10.67	1731	0.02
Neral	7.77	1240	0.07	9.41	1627	0.08
Geraniol	8.06	1259	0.01	11.52	1803	0.01
Geranial	8.23	1271	0.11	10.04	1678	0.12
Limonen-10-ol	8.52	1292	0.01	13.06	1942	0.02
Undecanal	8.80	1307	0.01	8.62	1565	0.02
Neryl acetate	9.63	1365	0.02	10.12	1685	0.02
α -Copaene	9.71	1371	0.02	7.08	1447	0.02
Geranyl acetate	9.92	1385	0.02	10.49	1716	0.02
β -Elemene	9.96	1388	0.01	8.34*	1543	0.04
Dodecanal	10.24	1408	0.06	9.94	1670	0.06
β -Caryophyllene	10.28	1412	0.04	8.34*	1543	[0.04]
β -Copaene	10.43	1423	0.02	8.29	1539	0.02
α -Humulene	10.74	1446	0.01	9.22	1611	0.01
(E)- β -Farnesene	10.90	1457	0.01	9.50	1634	0.02
Germacrene D	11.12	1474	0.02	9.72*	1652	[0.06]

Valencene	11.29*	1486	0.14	9.83	1661	0.12
Bicyclogermacrene	11.29*	1486	[0.14]	9.99	1674	0.01
γ-Cadinene	11.58	1509	0.02	10.30*†	1700	0.06
δ-Cadinene	11.71	1519	0.03	10.30*†	1700	[0.06]
Caryophyllene oxide	12.43	1575	0.01	12.70	1909	0.01
β-Sinensal	13.88	1693	0.03	15.38	2166	0.03
α-Sinensal	14.52	1749	0.03	16.34	2264	0.02
Myristic acid	14.75	1768	0.06	20.07	2684	0.08
Nootkatone	15.00	1791	0.02	17.73	2414	0.02
Linoleic acid	18.59	2134	0.08	23.96	3192	0.08
Stearic acid	18.92	2168	0.23	23.36	3110	0.24
Tetramethoxyflavone isomer	26.67	3126	0.05			
Tangeretin	26.87	3148	0.06			
Nobiletin	28.84	3334	0.10			
Total identified		97.87%			98.79%	
Total reported		97.87%			98.79%	

*: 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