

**Date :** August 23, 2022

**CERTIFICATE OF ANALYSIS – GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 22H16-PTH01

**Customer identification :** Orange Sweet ORGANIC - USA - O30113R

**Type :** Essential oil

**Source :** *Citrus sinensis*

**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 :** Amélie Simard, Analyste

**Analysis date :** August 18, 2022

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Light orange liquid

**Refractive index:**  $1.4738 \pm 0.0003$  (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
$\alpha$ -Thujene	tr	Monoterpene
$\alpha$ -Pinene	0.56	Monoterpene
Camphene	0.01	Monoterpene
$\beta$ -Pinene	0.02	Monoterpene
Sabinene	0.19	Monoterpene
Myrcene	1.98	Monoterpene
$\alpha$ -Phellandrene	0.03	Monoterpene
Pseudolimonene	tr	Monoterpene
Octanal	0.20	Aliphatic aldehyde
$\Delta^3$ -Carene	0.09	Monoterpene
para-Cymene	0.01	Monoterpene
Limonene	94.67	Monoterpene
$\beta$ -Phellandrene	0.27	Monoterpene
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.03	Monoterpene
$\gamma$ -Terpinene	0.01	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.02	Monoterpene
Linalool	0.33	Monoterpenic alcohol
Nonanal	0.05	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
Citronellal	0.05	Monoterpenic aldehyde
Unknown	0.01	Unknown
Terpinen-4-ol	tr	Monoterpenic alcohol
$\alpha$ -Terpineol	0.04	Monoterpenic alcohol
Decanal	0.20	Aliphatic aldehyde
trans-Carveol	0.01	Monoterpenic alcohol
Nerol	0.02	Monoterpenic alcohol
Neral	0.05	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
Perillaldehyde	0.01	Monoterpenic aldehyde
Geranial	0.08	Monoterpenic aldehyde
Limonen-10-ol	0.01	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
$\alpha$ -Copaene	0.03	Sesquiterpene
Geranyl acetate	0.03	Monoterpenic ester
$\beta$ -Elemene	0.01	Sesquiterpene
Dodecanal	0.05	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.02	Sesquiterpene
$\beta$ -Copaene	0.03	Sesquiterpene
$\alpha$ -Humulene	0.01	Sesquiterpene

(E)-β-Farnesene	0.01	Sesquiterpene
γ-Murolene	0.01	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
Valencene	0.04	Sesquiterpene
α-Murolene	0.01	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
β-Sinensal	0.03	Sesquiterpenic aldehyde
α-Sinensal	0.02	Sesquiterpenic aldehyde
Nootkatone	0.01	Sesquiterpenic ketone
meta-Camphorene	0.01	Diterpene
Stearic acid	0.01	Aliphatic acid
Tetramethoxyflavone isomer	0.02	Flavonoid
Tangeretin	0.05	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.12	Flavonoid
Nobiletin	0.06	Flavonoid
<b>Consolidated total</b>	<b>99.76%</b>	

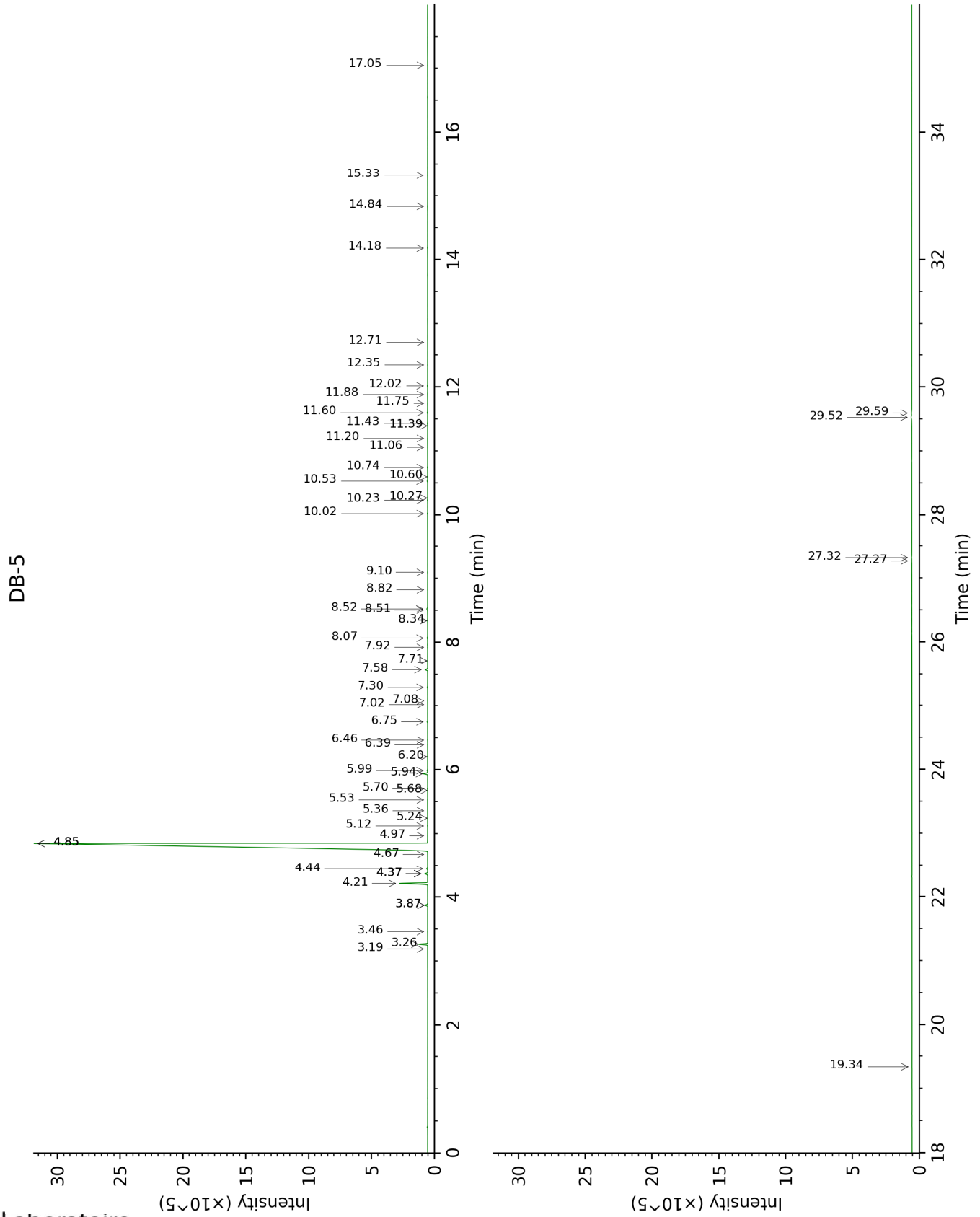
tr: The compound has been detected below 0.005% of total signal.

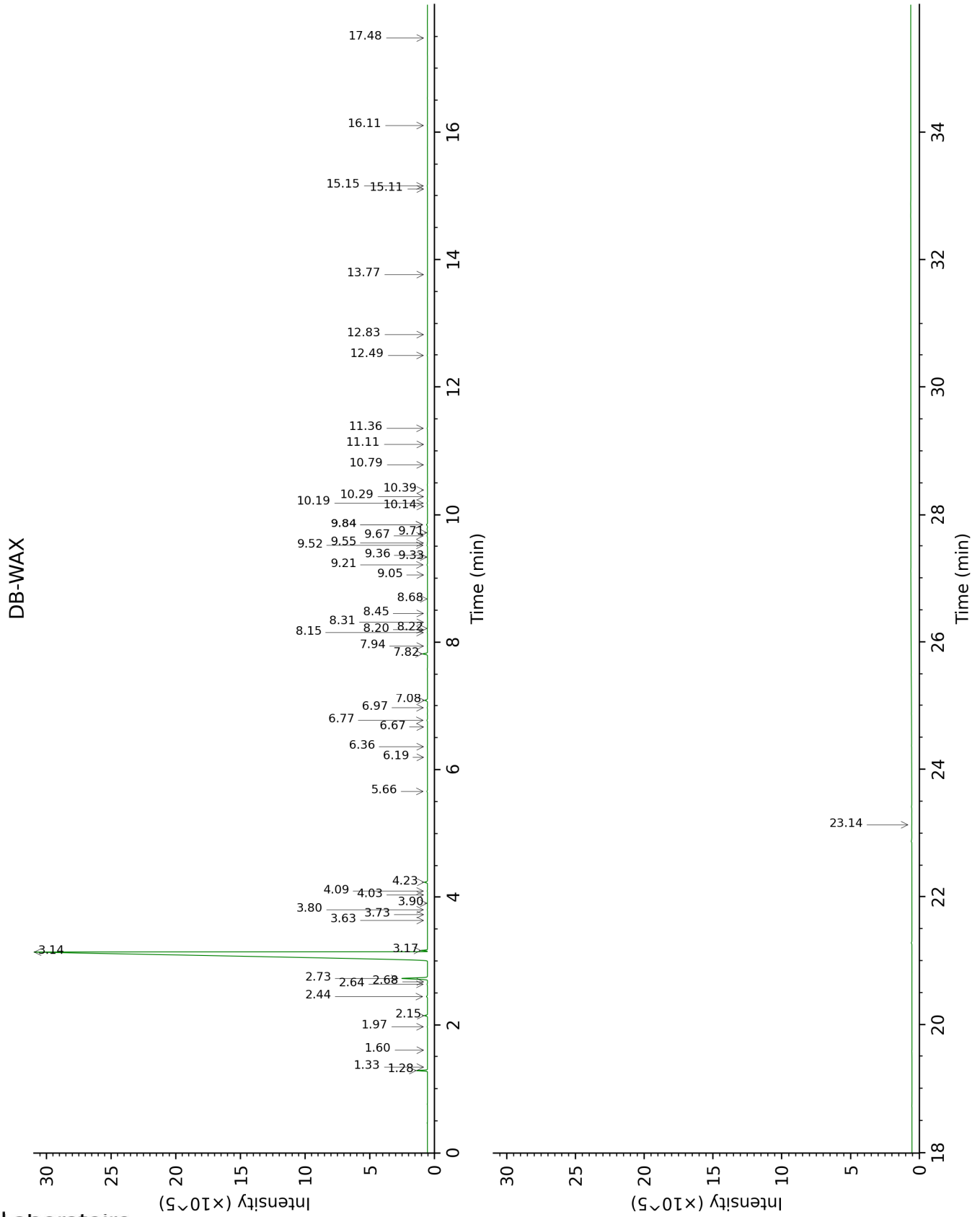
Note: no correction factor was applied

**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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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
α-Thujene	3.19	927	tr	1.34	1000	tr
α-Pinene	3.26	931	0.56	1.28	991	0.55
Camphene	3.46	944	0.01	1.60	1028	tr
β-Pinene	3.87*	971	0.21	1.97	1065	0.02
Sabinene	3.87*	971	[0.21]	2.15	1083	0.19
Myrcene	4.21	994	1.98	2.73	1133	1.97
α-Phellandrene	4.37*	1004	0.25	2.64	1126	0.03
Pseudolimonene	4.37*	1004	[0.25]	2.68	1129	tr
Octanal	4.37*	1004	[0.25]	4.23	1249	0.20
Δ3-Carene	4.44	1008	0.09	2.44	1111	0.08
para-Cymene	4.68	1023	0.01	3.90	1225	0.01
Limonene	4.85*	1034	94.80	3.14	1166	94.67
β-Phellandrene	4.85*	1034	[94.80]	3.17	1168	0.27
(Z)-β-Ocimene	4.97	1041	0.01	3.63	1205	0.01
(E)-β-Ocimene	5.12	1051	0.03	3.80	1218	0.02
γ-Terpinene	5.24	1058	0.01	3.73	1212	tr
cis-Sabinene hydrate	5.36	1065	0.01	6.67	1424	tr
Octanol	5.53	1076	0.02	7.94	1522	0.01
Isoterpinolene	5.68	1085	0.01	4.03	1235	0.01
Terpinolene	5.70	1087	0.02	4.09	1239	0.02
Linalool	5.94	1102	0.33	7.82	1512	0.34
Nonanal	5.99	1104	0.05	5.66	1350	0.04
trans-para-Mentha-2,8-dien-1-ol	6.20	1118	0.01	8.68	1580	0.01
cis-Limonene oxide	6.39	1130	0.01	6.19	1389	0.01
trans-Limonene oxide	6.46	1135	0.02	6.36	1401	0.02
Citronellal	6.75	1153	0.05	6.77	1432	0.05
Unknown [m/z 57, 95 (81), 43 (75), 41 (65), 82 (58), 55 (55)...]	7.02	1170	0.01			
Terpinen-4-ol	7.08	1174	tr	8.31	1551	tr
α-Terpineol	7.30	1188	0.04	9.52	1648	0.05
Decanal	7.58	1206	0.20	7.08	1456	0.19
trans-Carveol	7.71	1215	0.01	11.10	1782	0.01
Nerol	7.92	1229	0.02	10.79	1754	0.02
Neral	8.07	1239	0.05	9.21	1623	0.05
Geraniol	8.34	1257	0.03	11.36	1804	0.03
Perillaldehyde	8.51	1268	0.01	10.39	1720	0.01
Geranial	8.52	1269	0.08	9.84*	1674	0.09
Limonen-10-ol	8.82	1289	0.01	12.83	1937	0.01
Undecanal	9.10	1307	0.02	8.45	1562	0.02
α-Copaene	10.02	1373	0.03	6.97	1447	0.03
Geranyl acetate	10.23	1387	0.03	10.29	1712	0.01
β-Elemene	10.27	1390	0.01	8.22	1544	0.01
Dodecanal	10.53	1409	0.05	9.71	1664	0.01
β-Caryophyllene	10.60	1414	0.02	8.20	1542	0.02
β-Copaene	10.74	1424	0.03	8.15	1538	0.02
α-Humulene	11.06	1448	0.01	9.05	1610	0.01



(E)-β-Farnesene	11.20	1458	0.01	9.33	1633	0.01
γ-Murolene	11.40	1473	0.01	9.36	1635	0.01
Germacrene D	11.43	1476	0.03	9.55	1651	0.03
Valencene	11.60	1488	0.04	9.67	1660	0.04
α-Murolene	11.75	1499	0.01	9.84*	1674	[0.09]
γ-Cadinene	11.88	1510	0.01	10.14	1699	0.01
δ-Cadinene	12.02	1520	0.03	10.19	1703	0.03
α-Elemol	12.35	1546	0.01	13.77	2025	0.01
Caryophyllene oxide	12.71	1574	0.01	12.50	1906	0.02
β-Sinensal	14.18	1694	0.03	15.16	2162	0.03
α-Sinensal	14.84	1750	0.02	16.11	2261	0.02
Nootkatone	15.33	1792	0.01	17.48	2408	0.01
meta-Camphorene	17.05	1950	0.01	15.11	2157	0.01
Stearic acid	19.34	2178	0.01	23.14	3107	tr
Tetramethoxyflavone isomer	27.27	3134	0.02			
Tangeretin	27.32	3139	0.05			
3,3',4',5,6,7,8-Heptamethoxyflavone	29.52	3321	0.12			
Nobiletin	29.59	3325	0.06			
<b>Total identified</b>		<b>99.63%</b>			<b>99.36%</b>	
<b>Total reported</b>		<b>99.64%</b>			<b>99.36%</b>	

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

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