

Date : 2024-02-27

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24B09-NPA09

Customer Identification : Grapefruit - Italy - NPS00137 - Lot# NP0302

Type : Essential Oil

Source : *Citrus x paradisi* cv. Red

Customer : Nature Packaged

Checked and approved by:



Sylvain Mercier, M. Sc., Chimiste 2014-005

Notes: 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 from the first version issued on 2024-02-23 to format it for online publication.



GAS CHROMATOGRAPHIC ANALYSIS

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

✖ISO

Results : See analysis summary (next page)

Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005

Date : 2024-02-20

PHYSICOCHEMICAL DATA

Refractive index : 1.4739 ± 0.0003 (20 °C)

Method : PC-MAT-016 - Measure of the refractive index of a liquid.

Analyst : Cindy Caron B. Sc.

Date : 2024-02-12

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 -Pinene	0.28	Monoterpene
Sabinene	0.24	Monoterpene
β -Pinene	0.03	Monoterpene
Heptanol	0.01	Aliphatic alcohol
Myrcene	1.58	Monoterpene
Octanal	0.23	Aliphatic aldehyde
α -Phellandrene	0.03	Monoterpene
β -Phellandrene	0.26	Monoterpene
<i>para</i> -Cymene	0.01	Monoterpene
Limonene	94.90	Monoterpene
(<i>Z</i>)- β -Ocimene	0.01	Monoterpene
(<i>E</i>)- β -Ocimene	0.10	Monoterpene
γ -Terpinene	0.01	Monoterpene
<i>cis</i> -Sabinene hydrate	tr	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.01	Monoterpene
Linalool	0.05	Monoterpenic alcohol
Nonanal	0.05	Aliphatic aldehyde
(<i>E</i>)-4,8-Dimethylnona-1,3,7-triene	0.01	Terpene derivative
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.02	Monoterpenic ether
<i>cis-para</i> -Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.02	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Terpinen-4-ol	0.01	Monoterpenic alcohol
α -Terpineol	0.01	Monoterpenic alcohol
Decanal	0.06	Aliphatic aldehyde
Octyl acetate	0.01	Aliphatic ester
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
<i>cis</i> -Carveol	0.02	Monoterpenic alcohol
Neral	0.03	Monoterpenic aldehyde
Geranial	0.02	Monoterpenic aldehyde
α -Terpinyl acetate	tr	Monoterpenic ester
Limonene hydroperoxide IV	0.01	Monoterpenic peroxide
α -Copaene	0.03	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
β -Cubebene	0.03	Sesquiterpene
β -Elemene	0.01	Sesquiterpene
Dodecanal	0.01	Aliphatic aldehyde
β -Caryophyllene	0.31	Sesquiterpene

α -Humulene	0.02	Sesquiterpene
(E)- β -Farnesene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
δ -Cadinene	0.03	Sesquiterpene
α -Elemol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
β -Sinensal	0.01	Sesquiterpenic aldehyde
Nootkatone	0.25	Sesquiterpenic ketone
Osthole	0.02	Coumarin
Stearic acid	0.07	Aliphatic acid
Isoauraptene	0.01	Coumarin
Meranzin	0.04	Coumarin
Unknown	0.01	Coumarin
Auraptene	0.22	Coumarin
Epoxyaurapten	0.05	Coumarin
Tangeretin	0.04	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.01	Flavonoid
Consolidated total	99.36	

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

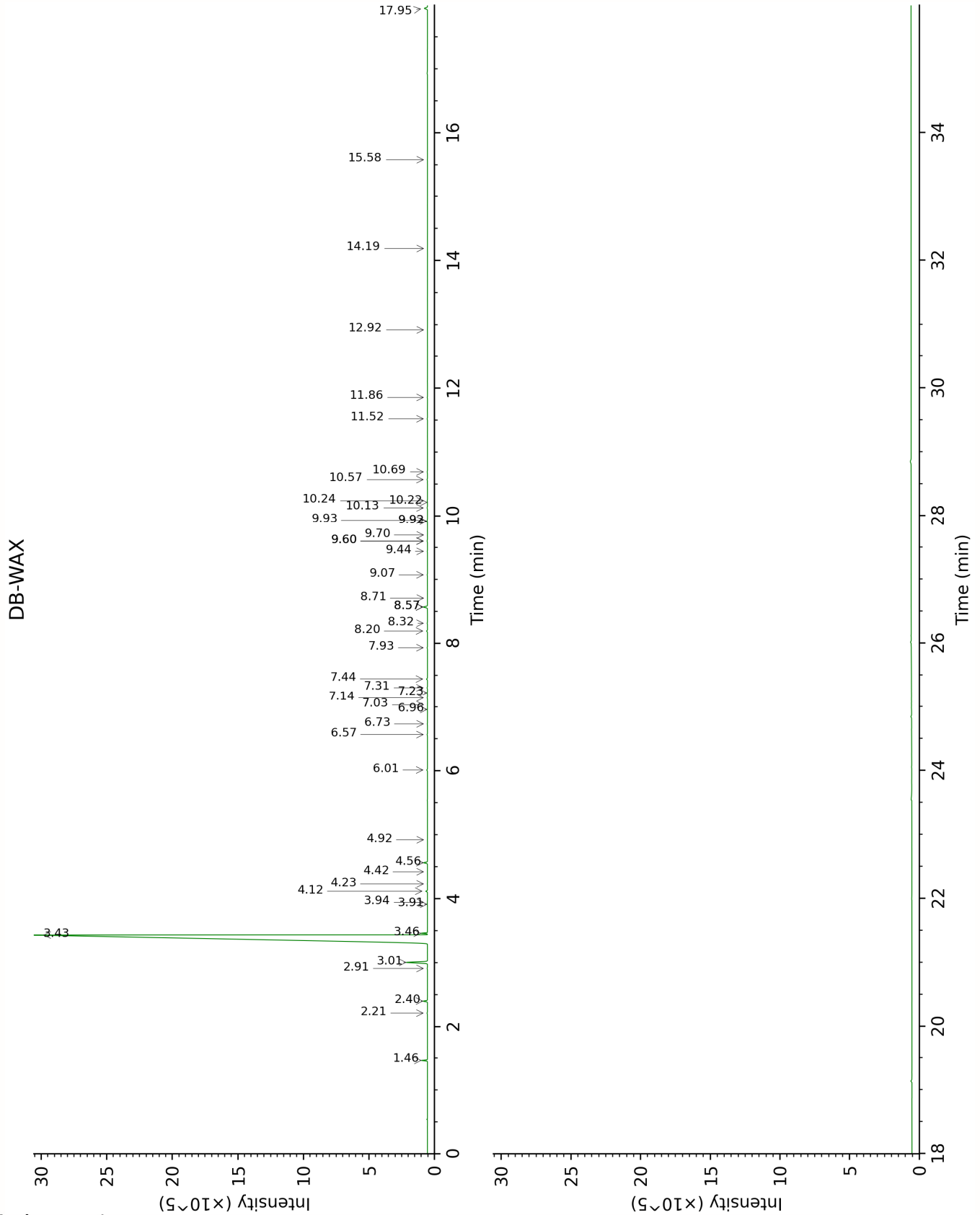
Note: no correction factor was applied

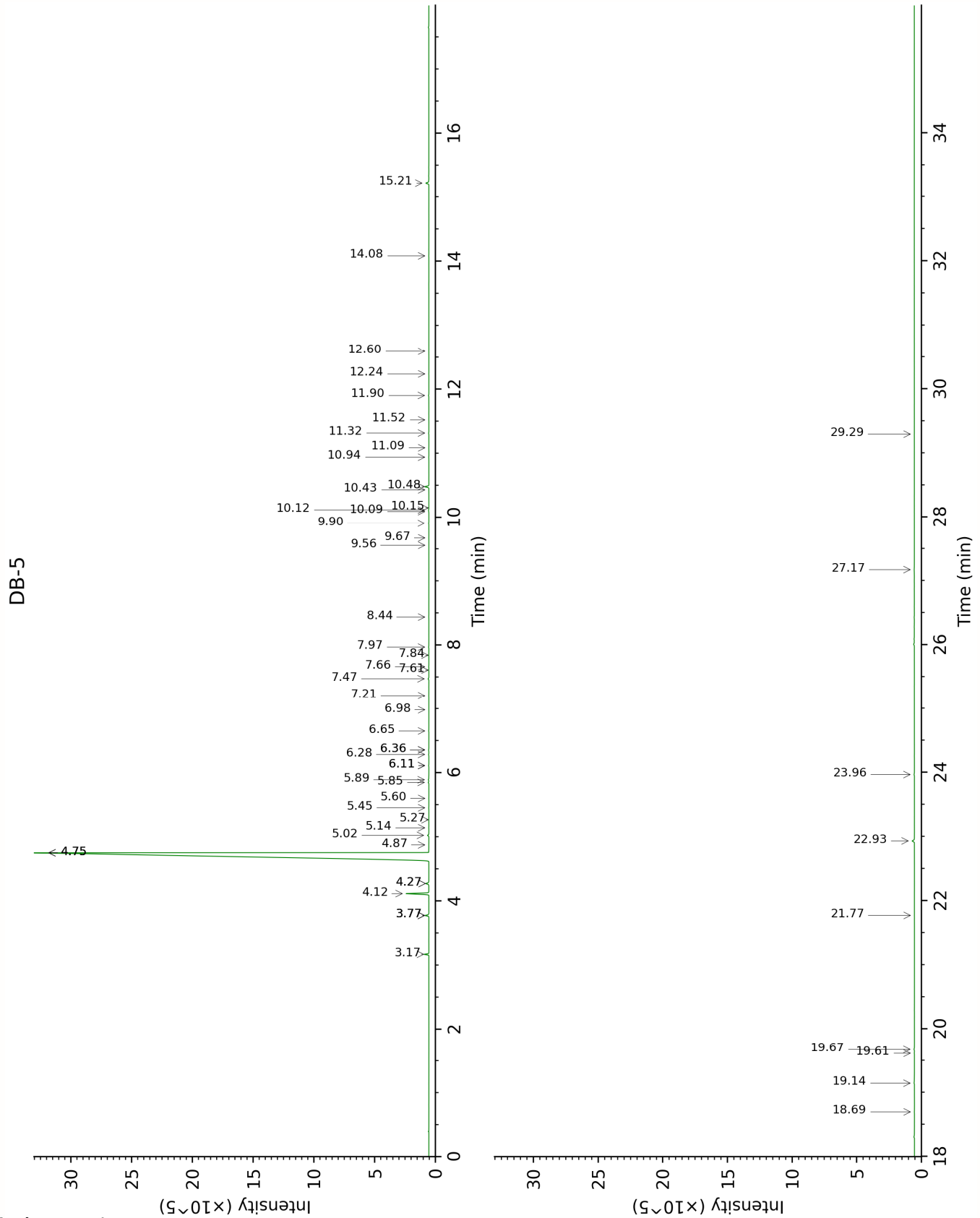
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

Bracketed value (xx): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

α-Pinene	Column DB-WAX			Column DB-5		
	1.46	992.1	0.28	3.17	931.2	0.28
Sabinene	2.40	1084.8	0.24	3.77*	971.1	[0.27]
β -Pinene	2.21	1067.0	0.03	3.77*	971.1	[0.27]
Heptanol	6.96	1421.9	0.01	3.77*	971.1	[0.27]
Myrcene	3.01	1134.3	1.59	4.12	993.5	1.58
Octanal	4.56	1250.2	0.23	4.27*	1003.9	[0.26]
α -Phellandrene	2.91	1127.0	0.03	4.27*	1003.9	[0.26]
β -Phellandrene	3.46	1169.1	0.26	4.75*	1033.8	[95.28]
<i>para</i> -Cymene	4.23	1226.4	0.01	4.75*	1033.8	[95.28]
Limonene	3.43	1166.9	94.90	4.75*	1033.8	[95.28]
(<i>Z</i>)- β -Ocimene	3.91	1203.6	0.01	4.87	1041.6	0.01
(<i>E</i>)- β -Ocimene	4.12	1218.2	0.10	5.02	1050.9	0.10
γ -Terpinene	3.94	1205.8	0.01	5.14	1058.2	0.01
<i>cis</i> -Sabinene hydrate	7.03	1427.5	0.01	5.27	1066.1	tr
Octanol	8.32	1524.1	0.03	5.45	1077.7	0.01
Terpinolene	4.42	1240.0	0.01	5.60	1086.9	0.01
Linalool	8.20	1514.6	0.06	5.85	1102.5	0.05
Nonanal	6.01	1353.0	0.05	5.89	1105.1	0.05
(<i>E</i>)-4,8-Dimethylnona-1,3,7-triene	4.92	1275.9	0.01	6.11*	1119.1	[0.02]
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.07	1582.9	0.02	6.11*	1119.1	[0.02]
<i>cis</i> -Limonene oxide	6.57	1392.9	0.03	6.28	1130.2	0.02
<i>cis-para</i> -Mentha-2,8-dien-1-ol	9.60*	1624.9	[0.04]	6.36*	1134.8	[0.04]
<i>trans</i> -Limonene oxide	6.73	1405.1	0.02	6.36*	1134.8	[0.04]
Citronellal	7.14	1435.6	0.02	6.65	1153.6	0.02
Terpinen-4-ol	8.71	1554.6	tr	6.98	1174.7	0.01
α -Terpineol	9.92*	1650.7	[0.02]	7.21	1189.1	0.01
Decanal	7.44	1458.1	0.07	7.47	1206.1	0.06
Octyl acetate	7.23	1441.9	0.02	7.61	1215.2	0.01
<i>trans</i> -Carveol	11.52	1784.7	0.02	7.66	1218.7	0.02
<i>cis</i> -Carveol	11.86	1813.6	0.02	7.84	1230.8	0.02
Neral	9.60*	1624.9	[0.04]	7.97	1239.2	0.03
Geranial	10.24	1677.0	0.02	8.44	1270.5	0.02
α -Terpinyl acetate	9.92*	1650.7	[0.02]	9.56	1347.5	tr
Limonene hydroperoxide IV				9.67	1355.7	0.01
α -Copaene	7.31	1447.9	0.03	9.90	1372.1	0.03
Geranyl acetate	10.69	1714.3	0.03	10.09	1385.2	0.01
β -Cubebene	7.93	1494.6	0.03	10.12	1386.9	0.03
β -Elemene	8.57*	1543.8	[0.32]	10.15	1389.3	0.01
Dodecanal	10.13	1667.9	0.03	10.43	1409.3	0.01

β-Caryophyllene	8.57*	1543.8	[0.32]	10.48	1413.1	0.31
α-Humulene	9.44	1611.9	0.02	10.94	1447.2	0.02
(E)-β-Farnesene	9.70	1632.7	0.01	11.09	1458.1	0.01
Germacrene D	9.93	1652.0	0.02	11.32	1475.2	0.02
Bicyclogermacrene	10.22	1675.0	0.01	11.52	1490.5	0.01
δ-Cadinene	10.57	1704.0	0.03	11.90	1519.5	0.03
α-Elemol	14.19	2026.4	0.01	12.24	1545.9	0.01
Caryophyllene oxide	12.92	1908.3	0.01	12.60	1573.9	0.01
β-Sinensal	15.58	2163.0	0.01	14.08	1695.0	0.01
Nootkatone	17.95	2412.1	0.26	15.21	1792.3	0.25
Osthole				18.69	2122.9	0.02
Stearic acid				19.14	2169.3	0.07
Isoauraptene				19.61	2218.4	0.01
Meranzin				19.67	2224.8	0.04
Unknown CIPA I [m/z 219, 247 (85), 217 (61), 161 (48), 189 (33), 232 (23)... 290 (18)]				21.77	2458.8	0.01
Auraptene				22.93	2597.5	0.22
Epoxyaurapten				23.96	2727.3	0.05
Tangeretin				27.17	3139.8	0.04
3,3',4',5,6,7,8- Heptamethoxyflavone				29.29	3322.3	0.01
Total reported		98.97%			99.44%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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