CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21B05-PTH01
Customer identification : Grapefruit, Pink Organic - GK0104206R
Type : Essential oil
Source : *Citrus x paradisi* cv. Pink
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 : Benoit Roger, Ph. D.
Analysis date : February 12, 2021

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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 February 12, 2021 to correct a mistake in the lot number.

MÉTHODE CERTIFIÉE
✳ISO 17025:2017 CERTIFIED METHOD

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid
Refractive index: 1.4765 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3053:2005 - OIL OF GRAPEFRUIT, OBTAINED BY EXPRESSION

Compound	Min. %	Max. %	Observed %	Complies?
α-Pinene	0.2	0.6	0.5	Yes
Sabinene	0.1	0.6	0.3	Yes
β-Pinene	0.05	0.20	0.06	Yes
Myrcene	1.5	2.5	1.7	Yes
Limonene	92	96	91	No
Octanal	0.2	0.8	0.4	Yes
Nonanal	0.04	0.10	0.06	Yes
Decanal	0.1	0.6	0.3	Yes
Neral	0.02	0.04	0.05	No
β-Caryophyllene	0.2	0.5	0.3	Yes
Nootkatone	0.01	0.80	0.23	Yes
Refractive index	1.4740	1.4790	1.4765	Yes

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
α-Pinene	0.49	Monoterpene
Camphene	0.03	Monoterpene
β-Pinene	0.06	Monoterpene
Sabinene	0.34	Monoterpene
Myrcene	1.68	Monoterpene
Octanal	0.37	Aliphatic aldehyde
α-Phellandrene	0.02	Monoterpene
Limonene	91.14	Monoterpene
(*E*)-β-Ocimene	0.10	Monoterpene
Octanol	0.03	Aliphatic alcohol
Terpinolene	tr	Monoterpene
Linalool	0.08	Monoterpenic alcohol
Nonanal	0.06	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.04	Monoterpenic alcohol
trans-Limonene oxide	0.01	Monoterpenic ether
Citronellal	0.09	Monoterpenic aldehyde
α-Terpineol	0.03	Monoterpenic alcohol
Decanal	0.30	Aliphatic aldehyde
Octyl acetate	0.02	Aliphatic ester
trans-Carveol	0.01	Monoterpenic alcohol
Neral	0.05	Monoterpenic aldehyde
Geranial	0.08	Monoterpenic aldehyde
Undecanal	0.01	Aliphatic aldehyde
α-Terpinyl acetate	0.01	Monoterpenic ester
Limonene hydroperoxide IV	0.02	Monoterpenic peroxide
α-Copaene	0.11	Sesquiterpene
Geranyl acetate	0.07	Monoterpenic ester
β-Cubebene	0.10	Sesquiterpene
β-Elemene	0.02	Sesquiterpene
Dodecanal	0.04	Aliphatic aldehyde
β-Caryophyllene	0.29	Sesquiterpene
α-Humulene	0.05	Sesquiterpene
(*E*)-β-Farnesene	0.02	Sesquiterpene
Germacrene D	0.09	Sesquiterpene
Bicyclogermacrene	0.04	Sesquiterpene
α-Muurolene	0.05	Sesquiterpene
Cubebol	0.02	Sesquiterpenic alcohol
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.14	Sesquiterpene
α-Elemol	0.03	Sesquiterpenic alcohol
(*E*)-Nerolidol	0.02	Sesquiterpenic alcohol
Germacrene D-4-ol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
β-Sinensal	0.03	Sesquiterpenic aldehyde
Myristic acid	0.05	Aliphatic acid

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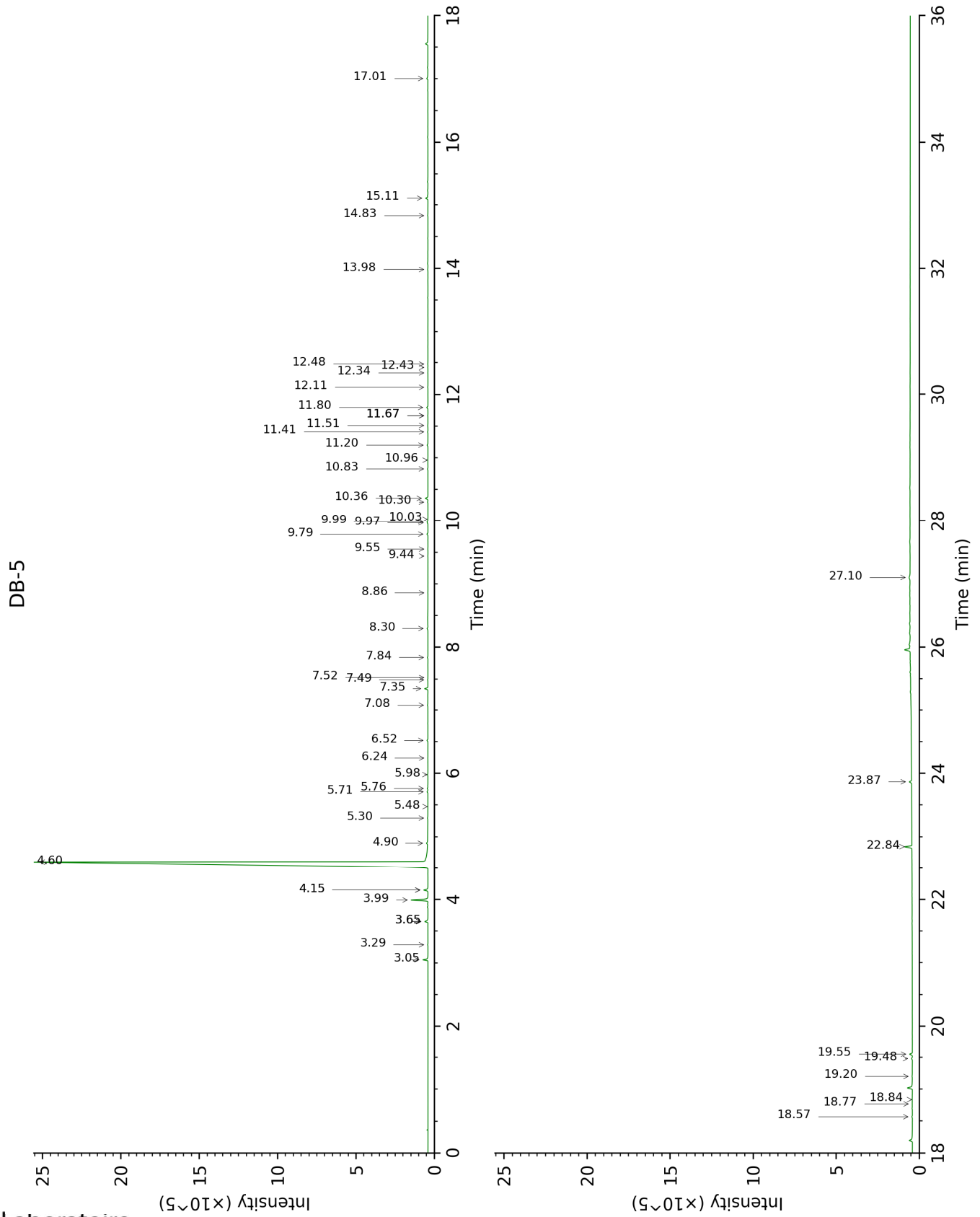|		
Nootkatone	0.23	Sesquiterpenic ketone
Palmitic acid	0.14	Aliphatic acid
Osthole	0.05	Coumarin
Oleic acid	0.03	Aliphatic acid
cis-Vaccenic acid?	0.02	Aliphatic acid
7-Methoxy-8-(2-formyl-2-methylpropyl)coumarin	0.03	Coumarin
Isoauraptene	0.09	Coumarin
Meranzin	0.28	Coumarin
Auraptene	0.76	Coumarin
Epoxyaurapten	0.24	Coumarin
Tangeretin	0.21	Flavonoid
Consolidated total	**98.38%**	

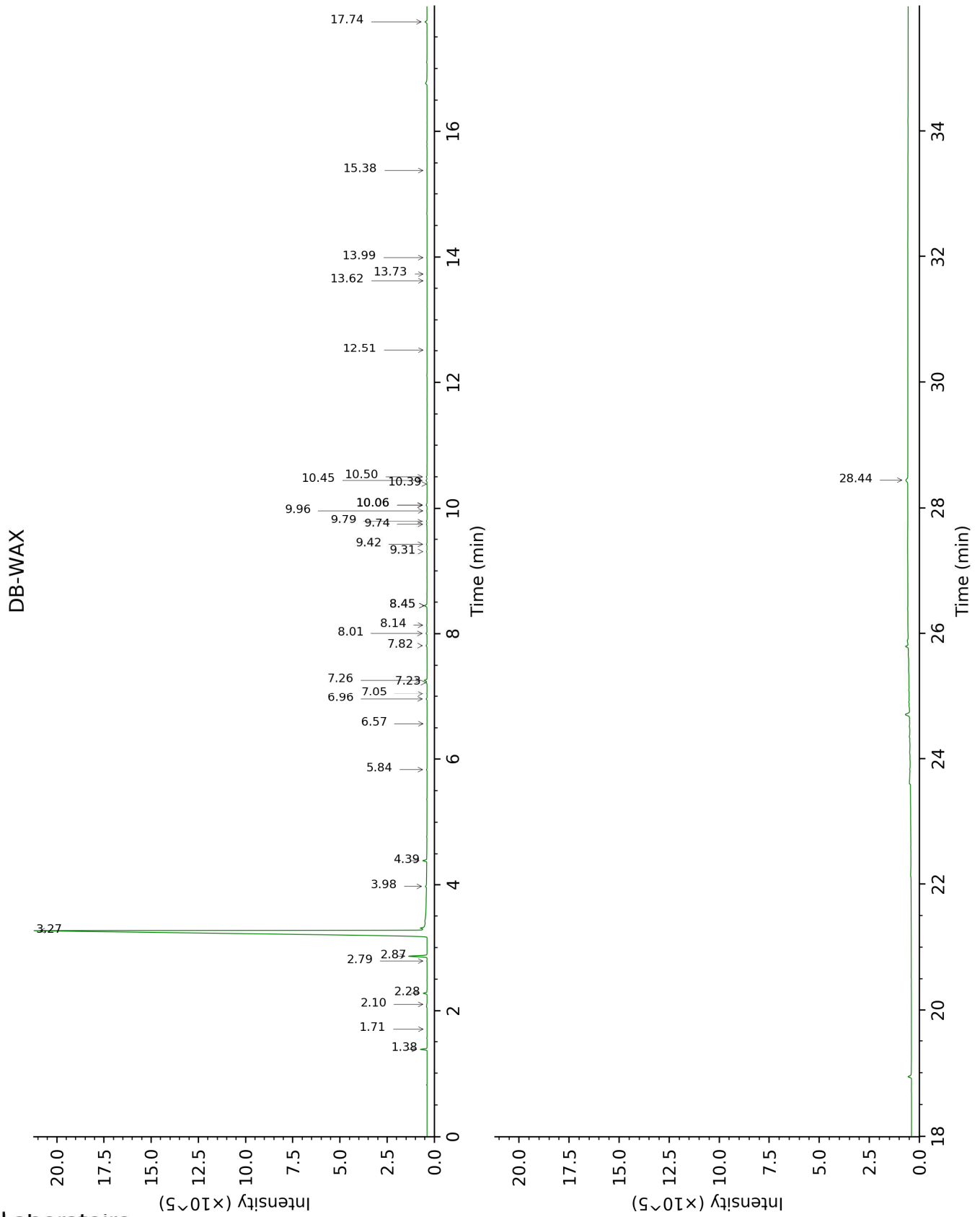tr: The compound has been detected below 0.005% of total signal.

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

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DB-WAX

17.74

15.38

13.99
13.62 13.73

12.51

10.45 10.50 10.39
9.96 10.06
9.79 9.74
9.42 9.31

8.45
8.01 8.14
7.82

7.26 7.23
6.96 7.05

6.57

5.84

4.39

3.98

3.27

2.79 2.87
2.28
2.10
1.71
1.38

28.44

Time (min)

Time (min)

Intensity (×10^5)

Intensity (×10^5)

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
α-Pinene	3.05	930	0.49	1.38	995	0.53
Camphene	3.29	946	0.03	1.71	1030	tr
β-Pinene	3.65*	970	0.34	2.10	1068	0.06
Sabinene	3.65*	970	[0.34]	2.28	1086	0.34
Myrcene	3.99	992	1.68	2.87	1135	1.77
Octanal	4.15*	1002	0.44	4.40	1253	0.37
α-Phellandrene	4.15*	1002	[0.44]	2.79	1129	0.02
Limonene	4.60	1031	91.14	3.27	1167	92.69
(*E*)-β-Ocimene	4.90	1049	0.10	3.98	1221	0.11
Octanol	5.30	1074	0.03	8.14	1526	0.02
Terpinolene	5.48	1086	tr			
Linalool	5.71	1100	0.08	8.01	1516	0.09
Nonanal	5.76	1104	0.06	5.84	1355	0.06
trans-para-Mentha-2,8-dien-1-ol	5.98	1118	0.04			
trans-Limonene oxide	6.24	1135	0.01	6.57	1407	0.02
Citronellal	6.52	1153	0.09	6.96	1437	0.10
α-Terpineol	7.08	1189	0.03	9.74	1653	0.04
Decanal	7.35	1207	0.30	7.26	1460	0.31
Octyl acetate	7.49	1217	0.02	7.05	1444	0.04
trans-Carveol	7.52	1219	0.01			
Neral	7.84	1241	0.05	9.42	1627	0.05
Geranial	8.30	1273	0.08	10.06*	1679	0.12
Undecanal	8.86	1306	0.01			
α-Terpinyl acetate	9.44	1347	0.01			
Limonene hydroperoxide IV	9.55	1355	0.02			
α-Copaene	9.79	1372	0.11	7.23	1457	0.10
Geranyl acetate	9.97	1384	0.07	10.50	1716	0.08
β-Cubebene	9.99	1386	0.10	7.82	1501	0.11
β-Elemene	10.03	1389	0.02	8.45*	1550	0.28
Dodecanal	10.30	1408	0.04	9.96	1672	0.04
β-Caryophyllene	10.36	1413	0.29	8.45*	1550	[0.28]
α-Humulene	10.83	1447	0.05	9.31	1618	0.05
(*E*)-β-Farnesene	10.96	1458	0.02			
Germacrene D	11.20	1475	0.09	9.79	1658	0.07
Bicyclogermacrene	11.41	1491	0.04	10.06*	1679	[0.12]
α-Muurolene	11.51	1498	0.05	10.06*	1679	[0.12]
Cubebol	11.67*	1510	0.03	12.51	1892	0.02
γ-Cadinene	11.67*	1510	[0.03]	10.39	1706	0.02
δ-Cadinene	11.80	1520	0.14	10.45	1711	0.12
α-Elemol	12.11	1545	0.03	13.99	2029	0.03
(*E*)-Nerolidol	12.34	1563	0.02	13.73	2004	0.02
Germacrene D-4-ol	12.43	1570	0.02	13.62	1994	0.02
Caryophyllene oxide	12.48	1574	0.03			
β-Sinensal	13.98	1696	0.03	15.38	2167	0.03
Myristic acid	14.83	1769	0.05			
Nootkatone	15.11	1793	0.23	17.74	2416	0.25

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Compound	R.T.	R.I.	%	R.T.	R.I.	%
Palmitic acid	17.01	1967	0.14			
Osthole	18.57	2121	0.05			
Oleic acid	18.77	2142	0.03			
cis-Vaccenic acid?	18.84	2149	0.02			
7-Methoxy-8-(2-formyl-2-methylpropyl)coumarin	19.20	2186	0.03			
Isoauraptene	19.48	2216	0.09			
Meranzin	19.55	2223	0.28			
Auraptene	22.84	2598	0.76	28.44	3780	0.39
Epoxyaurapten	23.87	2726	0.24			
Tangeretin	27.10	3142	0.21			
Total identified		**98.36%**			**98.35%**	
Total reported		**98.36%**			**98.35%**	

*: 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)
R.I.: Retention index

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