

Date : 2024-02-27

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24B09-NPA07

Customer Identification : Mandarin - Italy - NPS00135 - Lot# NP0300

Type : Essential Oil

Source : *Citrus reticulata* cv. Mandarine

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 2024-02-22 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 : 1.4745 ± 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
Heptanal	0.01	Aliphatic aldehyde
α -Thujene	0.66	Monoterpene
α -Pinene	2.01	Monoterpene
Camphene	0.03	Monoterpene
α -Fenchene	tr	Monoterpene
Heptanol	tr	Aliphatic alcohol
Sabinene	0.22	Monoterpene
β -Pinene	1.67	Monoterpene
Myrcene	1.59	Monoterpene
α -Phellandrene	0.04	Monoterpene
Octanal	0.14	Aliphatic aldehyde
Δ^3 -Carene	tr	Monoterpene
α -Terpinene	0.23	Monoterpene
<i>para</i> -Cymene	0.47	Monoterpene
1,8-Cineole	tr	Monoterpenic ether
Limonene	71.95	Monoterpene
β -Phellandrene	0.21	Monoterpene
(<i>Z</i>)- β -Ocimene	0.01	Monoterpene
(<i>E</i>)- β -Ocimene	0.06	Monoterpene
γ -Terpinene	16.77	Monoterpene
<i>cis</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
<i>para</i> -Cymenene	tr	Monoterpene
Terpinolene	0.53	Monoterpene
<i>trans</i> -Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.08	Monoterpenic alcohol
Nonanal	0.03	Aliphatic aldehyde
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.01	Monoterpenic ether
<i>trans</i> -Limonene oxide	0.01	Monoterpenic ether
Epoxyterpinolene	0.01	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Unknown	0.01	Unknown
Terpinen-4-ol	0.04	Monoterpenic alcohol
α -Terpineol	0.11	Monoterpenic alcohol
Unknown	0.01	Unknown
Decanal	0.06	Aliphatic aldehyde
<i>cis</i> -Carveol	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol

Citronellol	0.01	Monoterpenic alcohol
Neral	0.02	Monoterpenic aldehyde
<i>trans</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Isopiperitenone	0.01	Monoterpenic ketone
Unknown	0.01	Oxygenated monoterpene
<i>cis</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Thymol	0.04	Monoterpenic alcohol
Undecanal	0.01	Aliphatic aldehyde
α -Copaene	0.01	Sesquiterpene
β -Cubebene	0.01	Sesquiterpene
Dimethyl anthranilate	0.46	Phenolic ester
β -Caryophyllene	0.07	Sesquiterpene
α -Humulene	0.01	Sesquiterpene
(2 <i>E</i>)-Dodecenal	0.02	Aliphatic aldehyde
Germacrene D	0.01	Sesquiterpene
α -Selinene	0.03	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.15	Sesquiterpene
δ -Cadinene	0.01	Sesquiterpene
(2 <i>E</i>)-Tetradecenal	0.01	Aliphatic aldehyde
β -Sinensal	0.02	Sesquiterpenic aldehyde
α -Sinensal	0.21	Sesquiterpenic aldehyde
Palmitic acid	0.02	Aliphatic acid
Stearic acid	0.11	Aliphatic acid
Tangeretin	0.19	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.02	Flavonoid
Nobiletin	0.04	Flavonoid
Consolidated total	98.60	

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

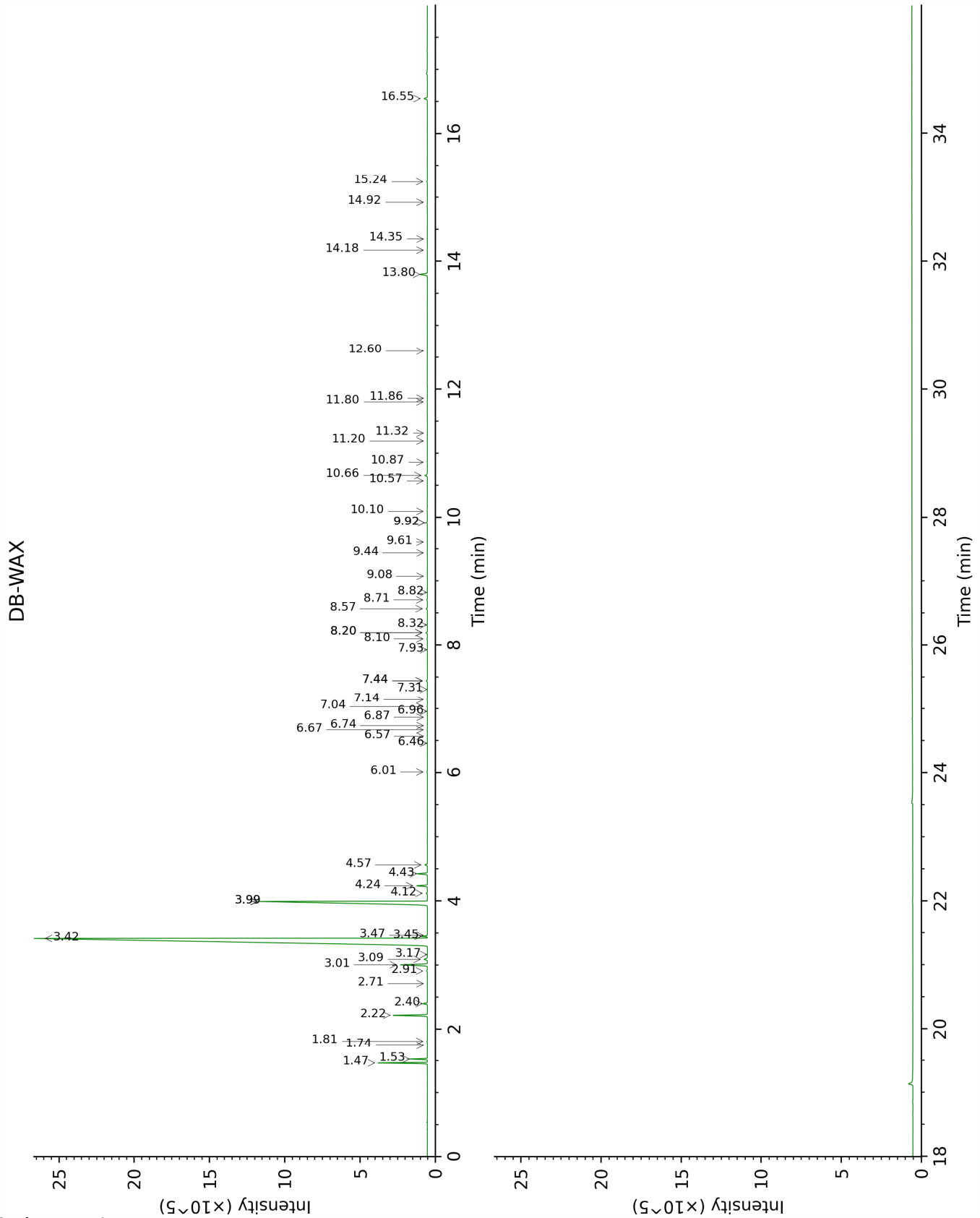
Note: no correction factor was applied

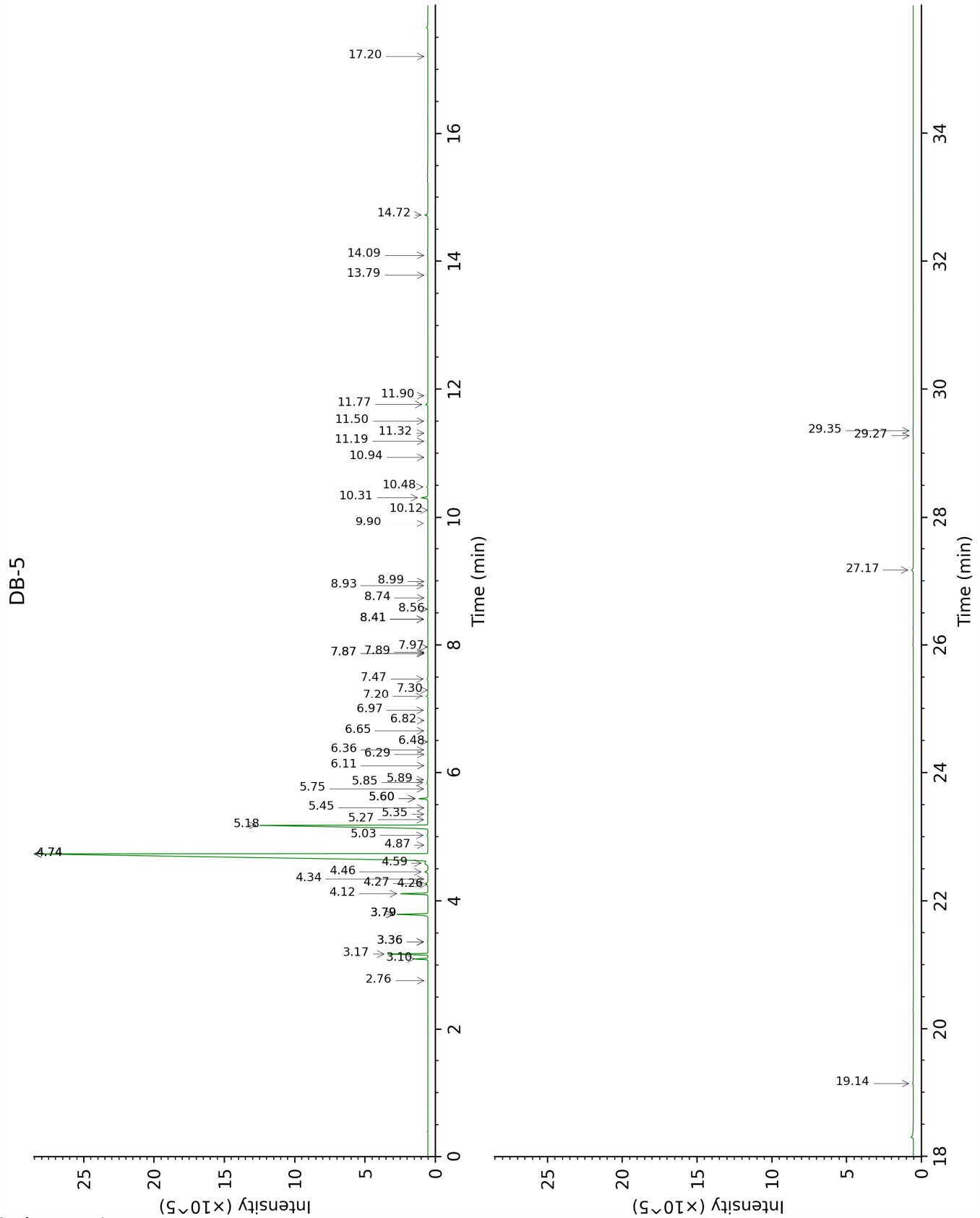
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

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FULL ANALYSIS DATA

Heptanal	Column DB-WAX			Column DB-5		
	3.17	1146.5	tr	2.76	904.0	0.01
α -Thujene	1.53	1001.8	0.67	3.10	926.6	0.66
α -Pinene	1.47	992.8	2.01	3.17	931.5	2.01
Camphene	1.81	1029.1	0.03	3.36*	944.0	[0.03]
α -Fenchene	1.74	1022.8	tr	3.36*	944.0	[0.03]
Heptanol	6.96	1421.9	tr	3.79*	972.4	[1.89]
Sabinene	2.40	1084.8	0.22	3.79*	972.4	[1.89]
β -Pinene	2.22	1067.7	1.67	3.79*	972.4	[1.89]
Myrcene	3.01	1134.3	1.61	4.12	993.5	1.59
α -Phellandrene	2.91	1127.0	0.05	4.26	1002.9	0.04
Octanal	4.56	1250.3	0.13	4.27	1003.9	0.14
Δ^3 -Carene	2.71	1112.0	0.01	4.34	1008.4	tr
α -Terpinene	3.09	1140.9	0.24	4.46	1015.4	0.23
<i>para</i> -Cymene	4.24	1226.9	0.55	4.59	1023.9	0.47
1,8-Cineole	3.47	1169.4	tr	4.74*	1032.9	[72.24]
Limonene	3.42	1165.7	71.95	4.74*	1032.9	[72.24]
β -Phellandrene	3.45	1168.3	0.21	4.74*	1032.9	[72.24]
(<i>Z</i>)- β -Ocimene	3.99*	1209.3	[16.79]	4.87	1041.5	0.01
(<i>E</i>)- β -Ocimene	4.12	1218.5	0.06	5.02	1051.0	0.06
γ -Terpinene	3.99*	1209.3	[16.79]	5.18	1060.7	16.77
<i>cis</i> -Sabinene hydrate	7.04	1427.7	0.02	5.27	1066.3	0.02
<i>cis</i> -Linalool oxide (fur.)	6.67	1400.5	0.02	5.35	1071.5	0.02
Octanol	8.32	1524.1	0.02	5.45	1077.7	0.01
<i>para</i> -Cymenene	6.46	1385.3	tr	5.60*	1086.8	[0.53]
Terpinolene	4.43	1240.3	0.53	5.60*	1086.8	[0.53]
<i>trans</i> -Sabinene hydrate	8.10	1507.2	0.03	5.75	1096.3	0.03
Linalool	8.20*	1514.7	[0.08]	5.85	1102.5	0.08
Nonanal	6.01	1353.1	0.03	5.89	1105.3	0.03
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.08	1583.1	0.01	6.11	1119.2	0.01
<i>cis</i> -Limonene oxide	6.57	1393.2	0.01	6.29	1130.3	0.01
<i>trans</i> -Limonene oxide	6.74	1405.3	0.01	6.36	1134.9	0.01
Epoxyterpinolene	6.87	1415.1	0.01	6.48	1142.9	0.01
Citronellal	7.14	1435.7	0.02	6.65	1153.8	0.02
Unknown UNKN XXV [m/z 43, 109 (68), 67 (62), 81 (36), 41 (31), 137 (29), 79 (26)...]	7.44*	1458.1	[0.07]	6.82	1164.1	0.01
Terpinen-4-ol	8.71	1554.4	0.04	6.98	1174.3	0.04
α -Terpineol	9.92*	1650.5	[0.12]	7.20	1188.9	0.11
Unknown MISC XXXII [m/z 121, 79 (61), 93	8.20*	1514.7	[0.08]	7.30	1195.0	0.01

(55), 94 (40), 91 (39), 84 (37)...						
Decanal	7.44*	1458.1	[0.07]	7.47	1206.1	0.06
cis-Carveol	11.86	1814.0	0.01	7.87*	1232.6	[0.01]
Nerol	11.20	1757.0	0.01	7.87*	1232.6	[0.01]
Citronellol	10.86	1728.9	0.02	7.89	1234.0	0.01
Neral	9.61	1625.6	0.02	7.97	1239.5	0.02
trans-Ascaridole glycol	14.35	2041.8	0.01	8.41*	1268.4	[0.04]
Isopiperitenone	11.32	1767.4	0.01	8.41*	1268.4	[0.04]
Unknown CIAU V [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	12.60	1879.8	0.01	8.56	1278.8	0.01
cis-Ascaridole glycol	14.92	2096.8	0.01	8.74	1290.6	0.01
Thymol	15.24	2128.8	0.04	8.93	1303.4	0.04
Undecanal	8.82	1563.5	0.01	8.99	1307.8	0.01
α -Copaene	7.31	1448.0	0.01	9.90	1372.1	0.01
β -Cubebene	7.93	1494.4	0.01	10.12	1387.0	0.01
Dimethyl anthranilate	13.80	1989.6	0.48	10.31	1400.7	0.46
β -Caryophyllene	8.57	1543.7	0.07	10.48	1413.0	0.07
α -Humulene	9.44	1611.8	0.01	10.94	1447.2	0.01
(2E)-Dodecenal	11.80	1809.0	0.02	11.19	1465.9	0.02
Germacrene D	9.92*	1650.5	[0.12]	11.32	1475.3	0.01
α -Selinene	10.10	1665.4	0.02	11.50	1489.2	0.03
(3E,6E)- α -Farnesene	10.66	1711.4	0.18	11.76	1508.7	0.15
δ -Cadinene	10.57	1704.1	0.01	11.90	1519.4	0.01
(2E)-Tetradecenal	14.18	2025.2	0.01	13.79	1670.5	0.01
β -Sinensal				14.09	1695.9	0.02
α -Sinensal	16.54	2261.7	0.23	14.72	1749.8	0.21
Palmitic acid				17.20	1975.5	0.02
Stearic acid				19.14	2169.2	0.11
Tangeretin				27.17	3139.9	0.19
3,3',4',5,6,7,8- Heptamethoxyflavone				29.28	3321.1	0.02
Nobiletin				29.35	3326.3	0.04
Total reported		98.41%			98.69%	

*: 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