

Date : 2025-01-08

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 24L13-PTH02

**Customer Identification :** Green Mandarin - Brazil - M10110R

**Type :** Essential Oil

**Source :** *Citrus reticulata* cv. *Mandarine*

**Customer :** Plant Therapy

Checked and approved by:

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

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## 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 :** 2024-12-19

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4763 \pm 0.0003$  (20 °C)

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

**Analyst :** Cindy Caron B. Sc.

**Date :** 2024-12-16

## 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
Nonane	0.01	Alkane
$\alpha$ -Thujene	0.77	Monoterpene
$\alpha$ -Pinene	2.07	Monoterpene
Camphene	0.02	Monoterpene
Sabinene	0.26	Monoterpene
$\beta$ -Pinene	1.60	Monoterpene
Myrcene	1.77	Monoterpene
$\alpha$ -Phellandrene	0.07	Monoterpene
Octanal	0.07	Aliphatic aldehyde
$\alpha$ -Terpinene	0.42	Monoterpene
<i>para</i> -Cymene	0.58	Monoterpene
Limonene	66.92	Monoterpene
1,8-Cineole	0.01	Monoterpenic ether
$\beta$ -Phellandrene	0.21	Monoterpene
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.03	Monoterpene
$\gamma$ -Terpinene	20.05	Monoterpene
<i>cis</i> -Sabinene hydrate	0.06	Monoterpenic alcohol
Octanol	0.04	Aliphatic alcohol
Terpinolene	0.94	Monoterpene
<i>para</i> -Cymenene	0.01	Monoterpene
<i>trans</i> -Sabinene hydrate	0.10	Monoterpenic alcohol
Linalool	0.14	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	0.02	Monoterpenic ether
<i>trans</i> -Limonene oxide	0.02	Monoterpenic ether
Epoxyterpinolene	0.02	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.08	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.35	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Decanal	0.07	Aliphatic aldehyde
Octyl acetate	0.01	Aliphatic ester
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol

Thymol methyl ether	0.01	Monoterpenic ether
Carvone	0.03	Monoterpenic ketone
Neral	0.02	Monoterpenic aldehyde
Piperitone	tr	Monoterpenic ketone
Geraniol	0.01	Monoterpenic alcohol
Isopiperitenone	0.01	Monoterpenic ketone
Perillaldehyde	0.04	Monoterpenic aldehyde
Geranial	0.01	Monoterpenic aldehyde
Perilla alcohol	0.01	Monoterpenic alcohol
Thymol	0.14	Monoterpenic alcohol
Undecanal	0.01	Aliphatic aldehyde
$\alpha$ -Copaene	0.02	Sesquiterpene
Geranyl acetate	0.05	Monoterpenic ester
$\beta$ -Cubebene	0.01	Sesquiterpene
$\beta$ -Elemene	0.01	Sesquiterpene
Dimethyl anthranilate	0.67	Phenolic ester
Dodecanal	0.03	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.16	Sesquiterpene
$\alpha$ -Humulene	0.02	Sesquiterpene
(2E)-Dodecenal	0.01	Aliphatic aldehyde
Germacrene D	0.01	Sesquiterpene
$\alpha$ -Selinene	0.07	Sesquiterpene
(3E,6E)- $\alpha$ -Farnesene	0.32	Sesquiterpene
$\delta$ -Cadinene	0.02	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
Tetradecanal	0.01	Aliphatic aldehyde
(2E)-Tetradecenal	0.01	Aliphatic aldehyde
$\alpha$ -Sinensal	0.37	Sesquiterpenic aldehyde
Myristic acid	0.01	Aliphatic acid
Palmitic acid	0.10	Aliphatic acid
Phytol	0.02	Diterpenic alcohol
Linoleic acid	0.06	Aliphatic acid
Oleic acid	0.10	Aliphatic acid
Stearic acid	0.01	Aliphatic acid
Tangeretin	0.27	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.07	Flavonoid
Nobiletin	0.16	Flavonoid
<b>Consolidated total</b>	<b>99.75</b>	

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

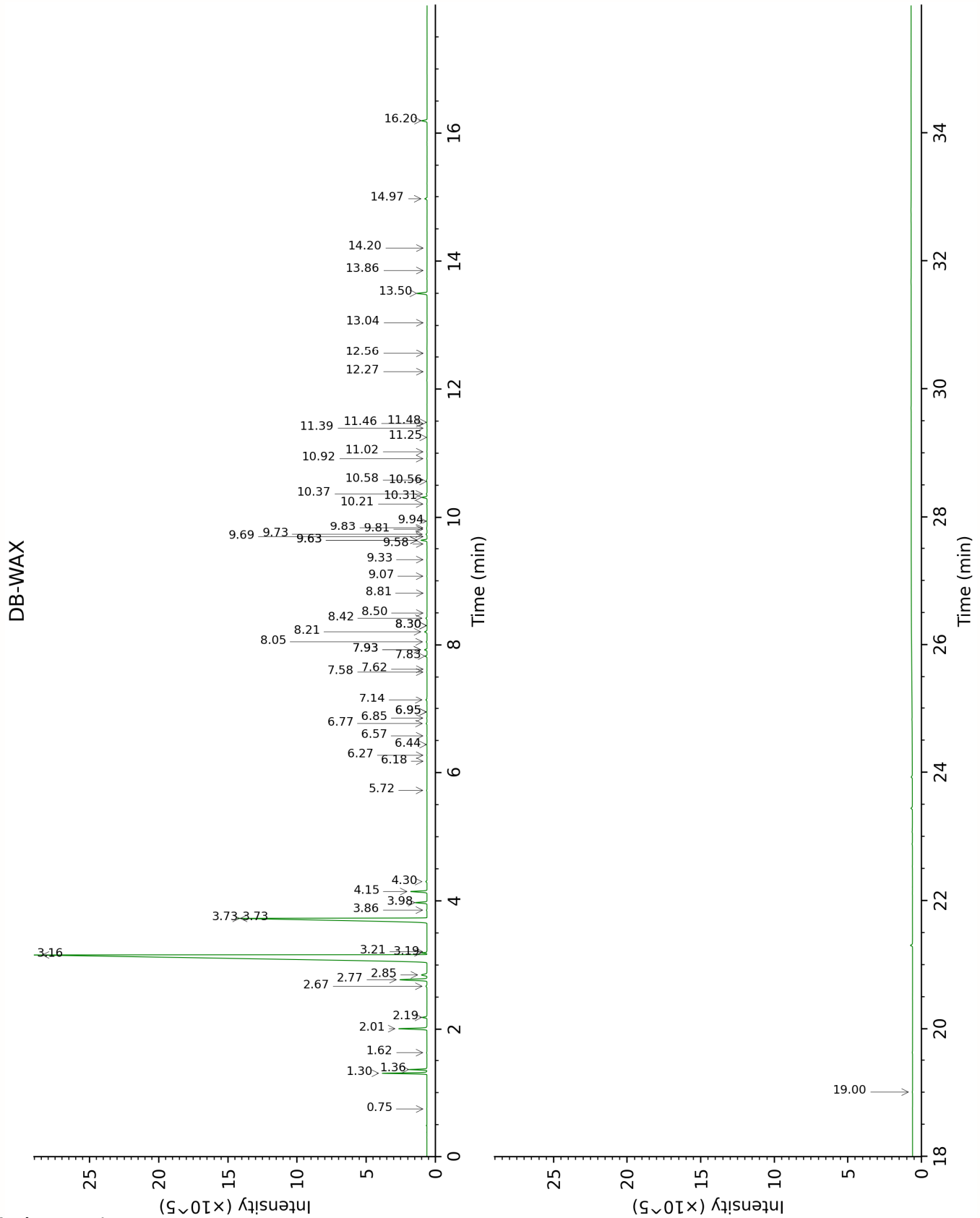
Note: no correction factor was applied

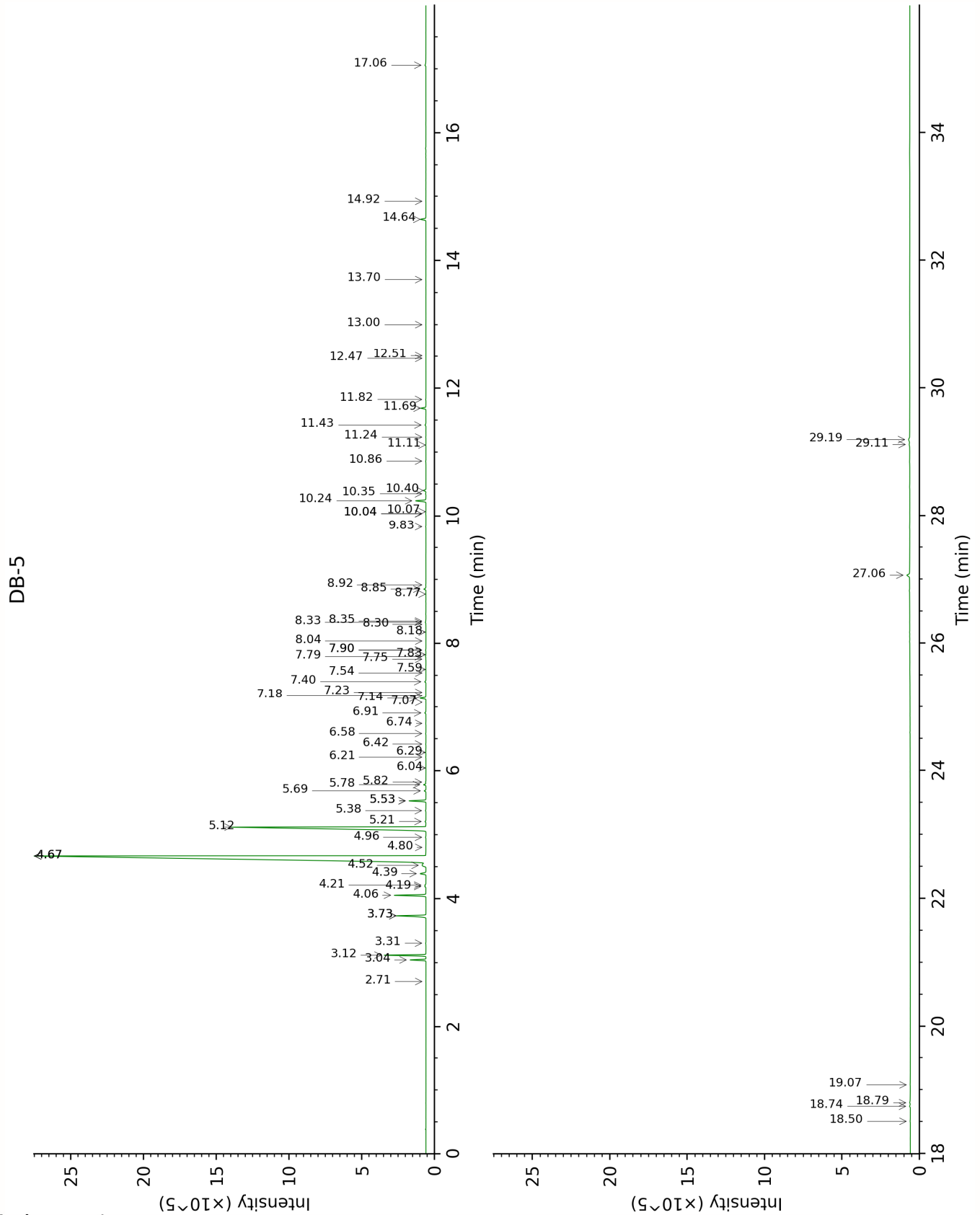
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Nonane	Column DB-WAX			Column DB-5		
	0.75	891.5	tr	2.71	903.8	0.01
$\alpha$ -Thujene	1.36	998.8	0.78	3.04	926.2	0.77
$\alpha$ -Pinene	1.30	990.6	2.08	3.12	931.2	2.07
Camphene	1.62	1025.9	0.02	3.31	943.6	0.02
Sabinene	2.19	1083.6	0.26	3.74*	972.1	[1.84]
$\beta$ -Pinene	2.01	1065.4	1.60	3.74*	972.1	[1.84]
Myrcene	2.77	1133.7	1.78	4.06	993.4	1.77
$\alpha$ -Phellandrene	2.67	1125.5	0.07	4.19	1002.5	0.07
Octanal	4.30	1251.7	0.07	4.21	1003.9	0.07
$\alpha$ -Terpinene	2.85	1139.6	0.42	4.39	1015.1	0.42
<i>para</i> -Cymene	3.98	1227.5	0.66	4.52	1023.3	0.58
Limonene	3.16	1164.5	66.92	4.67*	1032.4	[67.04]
1,8-Cineole	3.21	1168.6	0.01	4.67*	1032.4	[67.04]
$\beta$ -Phellandrene	3.19	1167.1	0.21	4.67*	1032.4	[67.04]
(Z)- $\beta$ -Ocimene	3.73*	1209.3	[20.09]	4.80	1040.9	0.01
(E)- $\beta$ -Ocimene	3.86	1218.8	0.03	4.96	1050.8	0.03
$\gamma$ -Terpinene	3.73*	1209.3	[20.09]	5.12	1060.8	20.05
<i>cis</i> -Sabinene hydrate	6.77	1431.0	0.05	5.21	1066.3	0.06
Octanol	8.05	1528.0	0.05	5.38	1076.9	0.04
Terpinolene	4.15	1240.3	0.94	5.53*	1086.6	[0.94]
<i>para</i> -Cymenene	6.18	1387.5	0.01	5.53*	1086.6	[0.94]
<i>trans</i> -Sabinene hydrate	7.83	1510.7	0.10	5.69	1096.4	0.10
Linalool	7.93*	1518.4	[0.14]	5.78	1102.4	0.14
Nonanal	5.72	1354.7	0.02	5.82	1105.0	0.03
<i>trans-para</i> -Mentha-2,8-dien-1-ol	8.81	1586.9	0.01	6.04	1119.1	0.01
<i>cis</i> -Limonene oxide	6.27	1394.3	0.01	6.21	1129.9	0.02
<i>trans</i> -Limonene oxide	6.44	1406.5	0.01	6.29	1134.6	0.02
Epoxyterpinolene	6.57	1416.7	0.01	6.42	1143.0	0.02
Citronellal	6.85	1437.3	0.02	6.58	1153.5	0.02
Borneol	9.63*	1653.5	[0.36]	6.74	1163.6	0.02
Terpinen-4-ol	8.42	1556.6	0.07	6.90	1174.1	0.08
<i>para</i> -Cymen-8-ol	11.39	1801.0	0.01	7.07	1184.8	0.01
$\alpha$ -Terpineol	9.63*	1653.5	[0.36]	7.14	1189.1	0.35
Unknown MISC XXXI [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	7.58	1491.6	0.01	7.18	1191.6	0.01
Unknown MISC XXXII [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.93*	1518.4	[0.14]	7.23	1195.2	0.01

Decanal	7.14	1458.5	0.07	7.40	1206.1	0.07
Octyl acetate	6.95*	1444.4	[0.02]	7.54	1215.2	0.01
<i>trans</i> -Carveol	11.25	1788.7	0.01	7.59	1218.9	0.01
Nerol	10.92	1760.5	0.02	7.76	1229.7	0.01
Citronellol	10.58	1732.1	0.03	7.80	1232.4	0.03
Thymol methyl ether	8.30*	1547.7	[0.01]	7.83	1234.4	0.01
Carvone	9.83	1669.3	0.03	7.90*	1239.2	[0.03]
Neral	9.33	1629.0	0.02	7.90*	1239.2	[0.03]
Piperitone	9.69	1658.2	0.01	8.04	1248.7	tr
Geraniol	11.46	1807.5	0.01	8.18	1258.1	0.01
Isopiperitenone	11.02	1769.6	0.02	8.30	1266.1	0.01
Perillaldehyde	10.56	1730.3	0.02	8.33	1268.3	0.04
Geranial	9.94	1678.6	0.01	8.35	1269.6	0.01
Perilla alcohol	13.04	1949.8	0.01	8.77	1297.8	0.01
Thymol	14.97	2134.6	0.14	8.85	1303.1	0.14
Undecanal	8.50	1562.8	0.01	8.92	1307.7	0.01
$\alpha$ -Copaene	6.95*	1444.4	[0.02]	9.83	1372.1	0.02
Geranyl acetate	10.37	1713.8	0.05	10.04*	1387.0	[0.02]
$\beta$ -Cubebene	7.62	1494.9	0.01	10.04*	1387.0	[0.02]
$\beta$ -Elemene	8.30*	1547.7	[0.01]	10.07	1389.3	0.01
Dimethyl anthranilate	13.50	1992.0	0.67	10.24	1401.3	0.67
Dodecanal	9.81	1667.5	0.02	10.35	1409.3	0.03
$\beta$ -Caryophyllene	8.21	1540.2	0.17	10.40	1413.2	0.16
$\alpha$ -Humulene	9.07	1608.0	0.02	10.86	1447.4	0.02
(2E)-Dodecenal	11.48	1809.2	0.01	11.11	1466.1	0.01
Germacrene D	9.58	1648.8	0.02	11.24	1475.4	0.01
$\alpha$ -Selinene	9.73	1661.1	0.07	11.42	1489.4	0.07
(3E,6E)- $\alpha$ -Farnesene	10.31	1709.2	0.31	11.69	1509.3	0.32
$\delta$ -Cadinene	10.21	1700.5	0.03	11.82	1520.1	0.02
Spathulenol	14.20	2059.5	0.01	12.47	1570.6	0.01
Caryophyllene oxide	12.56	1905.0	0.01	12.51	1574.0	0.01
Tetradecanal	12.27	1879.1	0.01	13.00	1613.0	0.01
(2E)-Tetradecenal	13.86	2026.0	0.01	13.70	1671.0	0.01
$\alpha$ -Sinensal	16.20	2259.7	0.36	14.64	1750.8	0.37
Myristic acid				14.92	1775.1	0.01
Palmitic acid				17.06	1971.1	0.10
Phytol	19.00	2569.0	0.02	18.50	2113.5	0.02
Linoleic acid				18.74	2137.9	0.06
Oleic acid				18.79	2143.7	0.10
Stearic acid				19.07	2172.7	0.01
Tangeretin				27.06	3145.1	0.27
3,3',4',5,6,7,8- Heptamethoxyflavone				29.11	3326.7	0.07
Nobiletin				29.19	3332.0	0.16
Total reported		99.05%			99.56%	

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\*: 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