

Date : 2024-12-20

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 24L09-PTH01

**Customer Identification :** Organic Lemon - Argentina - L70115R

**Type :** Essential Oil

**Source :** *Citrus x limon*

**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 :** 2024-12-17

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4745 \pm 0.0003$  (20 °C)

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

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

**Date :** 2024-12-10

## 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
Octane	0.01	Alkane
Tricyclene	0.01	Monoterpene
$\alpha$ -Thujene	0.40	Monoterpene
$\alpha$ -Pinene	1.85	Monoterpene
Camphene	0.06	Monoterpene
$\beta$ -Pinene	11.00	Monoterpene
Sabinene	1.99	Monoterpene
Myrcene	1.57	Monoterpene
Pseudolimonene	tr	Monoterpene
$\alpha$ -Phellandrene	0.04	Monoterpene
Octanal	0.09	Aliphatic aldehyde
$\alpha$ -Terpinene	0.14	Monoterpene
<i>para</i> -Cymene	0.18	Monoterpene
Limonene	68.12	Monoterpene
$\beta$ -Phellandrene	0.31	Monoterpene
1,8-Cineole	0.03	Monoterpenic ether
( <i>Z</i> )- $\beta$ -Ocimene	0.05	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.09	Monoterpene
$\gamma$ -Terpinene	7.83	Monoterpene
<i>cis</i> -Sabinene hydrate	0.05	Monoterpenic alcohol
Terpinolene	0.32	Monoterpene
<i>trans</i> -Sabinene hydrate	0.05	Monoterpenic alcohol
Linalool	0.10	Monoterpenic alcohol
Nonanal	0.13	Aliphatic aldehyde
$\Delta^3$ -Carene	tr	Monoterpene
<i>cis</i> -Limonene oxide	0.01	Monoterpenic ether
Camphor	0.02	Monoterpenic ketone
Citronellal	0.06	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
$\alpha$ -Terpineol	0.19	Monoterpenic alcohol
Decanal	0.04	Aliphatic aldehyde
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde
Nerol	0.05	Monoterpenic alcohol
2,3-Epoxygeranial?	0.02	Monoterpenic aldehyde
Neral	0.87	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
Geranial	1.43	Monoterpenic aldehyde
Undecanal	0.03	Aliphatic aldehyde
Citronellyl acetate	0.02	Monoterpenic ester

Neryl acetate	0.40	Monoterpenic ester
Geranyl acetate	0.19	Monoterpenic ester
Tetradecane	0.02	Alkane
Dodecanal	0.01	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.18	Sesquiterpene
<i>cis</i> - $\alpha$ -Bergamotene	0.03	Sesquiterpene
$\alpha$ -Santalene	0.01	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.32	Sesquiterpene
$\alpha$ -Humulene	0.02	Sesquiterpene
$\beta$ -Santalene	0.01	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.05	Sesquiterpene
<i>trans</i> - $\beta$ -Bergamotene	0.03	Sesquiterpene
Valencene	0.02	Sesquiterpene
Bicyclogermacrene	0.05	Sesquiterpene
( <i>Z</i> )- $\alpha$ -Bisabolene	0.05	Sesquiterpene
$\beta$ -Bisabolene	0.48	Sesquiterpene
( <i>E</i> )- $\alpha$ -Bisabolene	0.02	Sesquiterpene
Spathulenol	0.02	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
$\alpha$ -Bisabolol	0.03	Sesquiterpenic alcohol
Citropten	0.06	Furanocoumarin
Palmitic acid	0.04	Aliphatic acid
Linoleic acid	0.03	Aliphatic acid
Oleic acid	0.04	Aliphatic acid
Stearic acid	0.02	Aliphatic acid
Heraclenin	0.08	Furanocoumarin
<b>Consolidated total</b>	<b>99.50</b>	

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

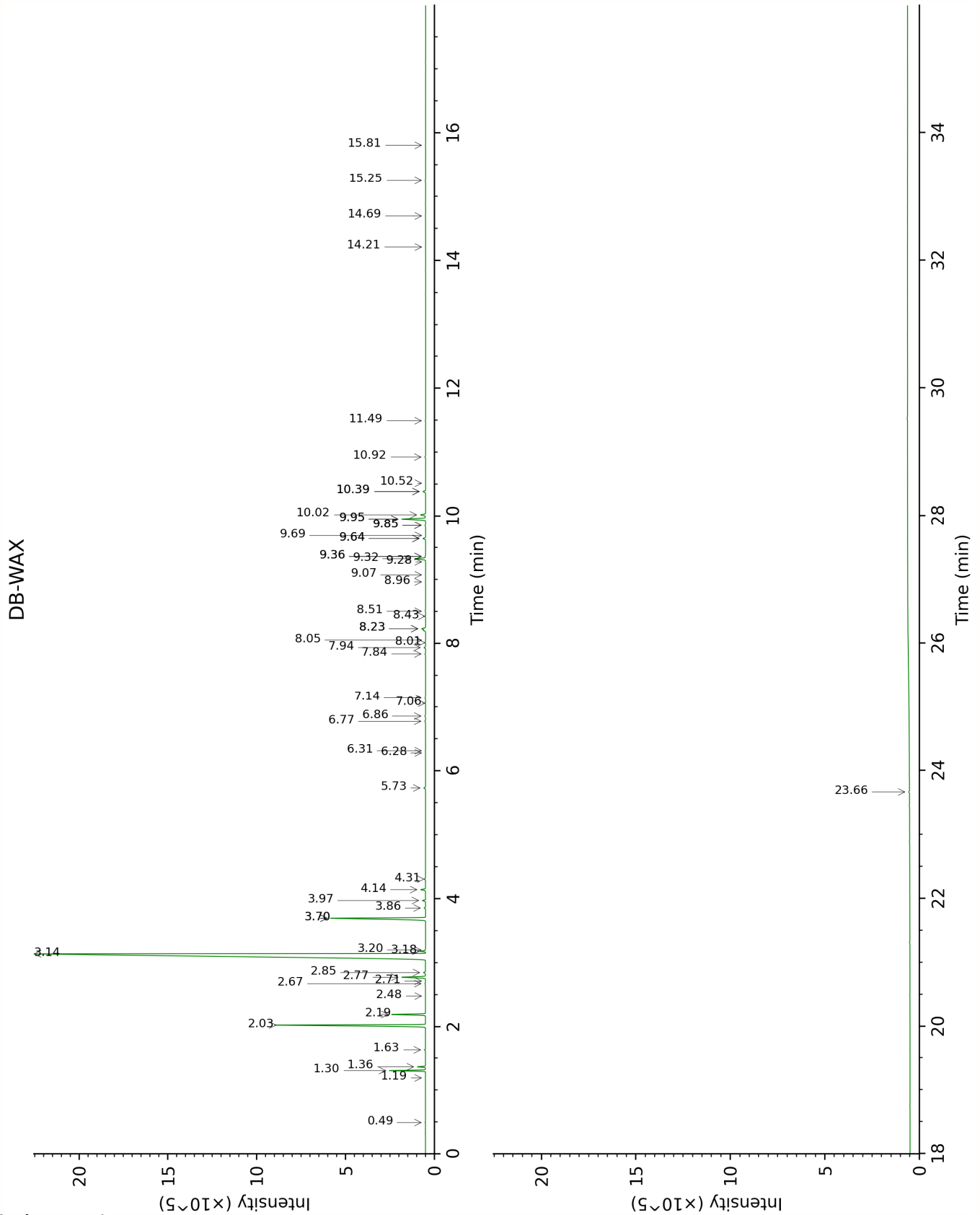
Note: no correction factor was applied

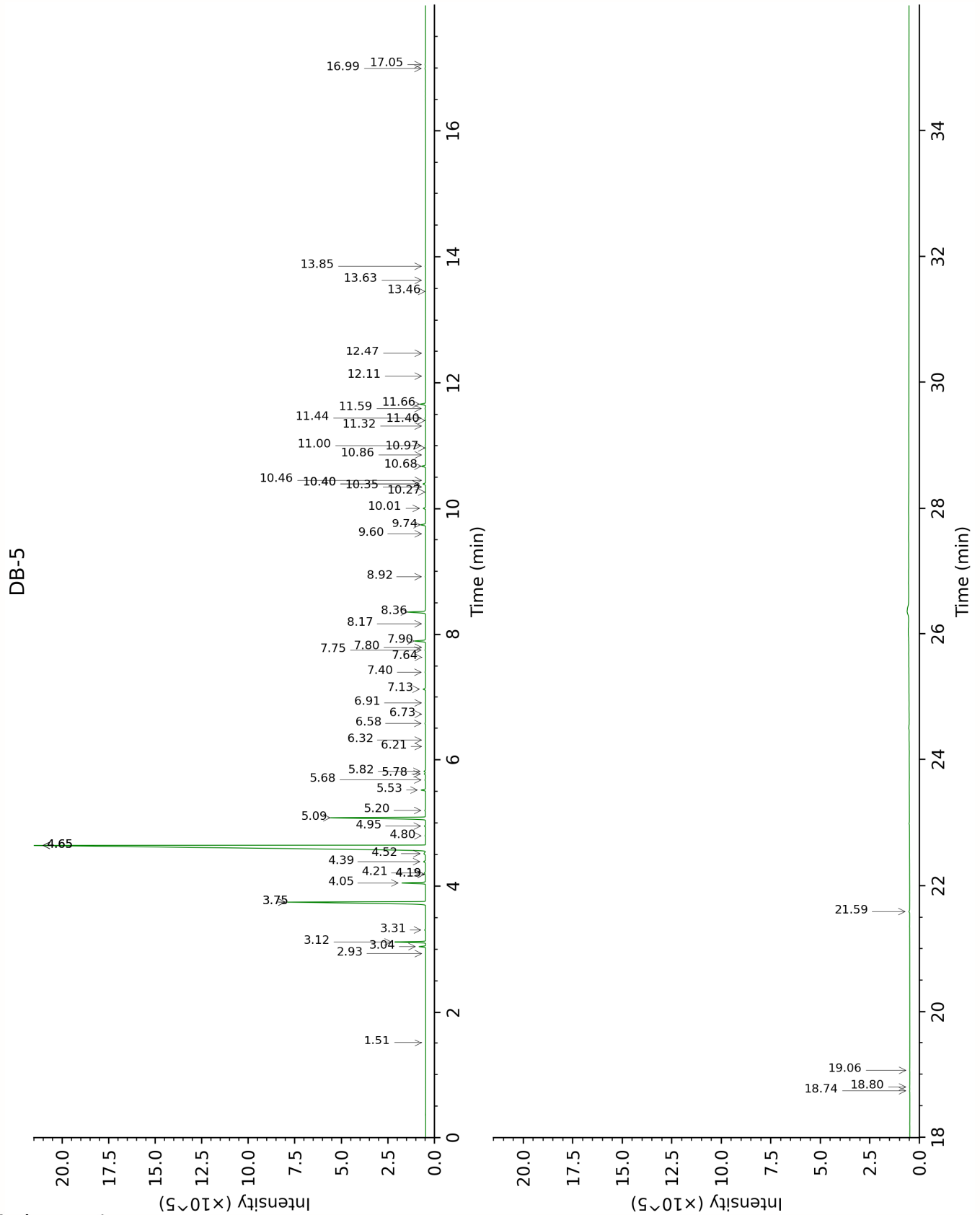
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Octane	Column DB-WAX			Column DB-5		
	0.49	785.1	0.01	1.51	803.9	0.01
Tricyclene	1.19	970.7	0.01	2.93	918.7	0.01
$\alpha$ -Thujene	1.36	999.0	0.39	3.04	926.1	0.40
$\alpha$ -Pinene	1.30	990.7	1.86	3.12	931.0	1.85
Camphene	1.63	1026.2	0.06	3.31	943.6	0.06
$\beta$ -Pinene	2.03	1067.2	11.00	3.75*	973.0	[12.98]
Sabinene	2.19	1084.3	1.99	3.75*	973.0	[12.98]
Myrcene	2.78	1133.8	1.58	4.05	993.2	1.57
Pseudolimonene	2.71	1128.9	tr	4.19*	1002.3	[0.04]
$\alpha$ -Phellandrene	2.67	1125.7	0.04	4.19*	1002.3	[0.04]
Octanal	4.31	1252.0	0.08	4.21	1003.8	0.09
$\alpha$ -Terpinene	2.85	1139.6	0.14	4.39	1014.9	0.14
<i>para</i> -Cymene	3.97	1227.3	0.21	4.52	1022.9	0.18
Limonene	3.14	1162.9	68.12	4.65*	1031.1	[68.64]
$\beta$ -Phellandrene	3.18	1166.2	0.31	4.65*	1031.1	[68.64]
1,8-Cineole	3.20	1167.8	0.03	4.65*	1031.1	[68.64]
( <i>Z</i> )- $\beta$ -Ocimene	3.70*	1206.9	[7.84]	4.80	1040.6	0.05
( <i>E</i> )- $\beta$ -Ocimene	3.86	1218.6	0.09	4.95	1050.3	0.09
$\gamma$ -Terpinene	3.70*	1206.9	[7.84]	5.09	1058.6	7.83
<i>cis</i> -Sabinene hydrate	6.77	1431.6	0.06	5.20	1065.9	0.05
Terpinolene	4.14	1239.9	0.32	5.52	1086.2	0.32
<i>trans</i> -Sabinene hydrate	7.84	1511.3	0.05	5.68	1096.3	0.05
Linalool	7.94	1519.0	0.11	5.78	1102.3	0.10
Nonanal	5.73	1355.3	0.12	5.82	1104.9	0.13
$\Delta^3$ -Carene	2.48	1110.2	tr			
<i>cis</i> -Limonene oxide	6.28	1394.8	0.01	6.22	1130.0	0.01
Camphor	7.06	1452.7	0.01	6.32	1136.5	0.02
Citronellal	6.86	1437.7	0.05	6.58	1153.4	0.06
Borneol	9.64*	1654.1	[0.20]	6.73	1162.8	0.01
Terpinen-4-ol	8.43	1557.1	0.03	6.91	1174.2	0.03
$\alpha$ -Terpineol	9.64*	1654.1	[0.20]	7.14	1188.8	0.19
Decanal	7.14	1459.0	0.05	7.40	1206.1	0.04
2,3-Epoxyneral?				7.64	1222.0	0.01
Nerol	10.92	1761.1	0.06	7.75	1229.6	0.05
2,3-Epoxygeranial?				7.80	1232.6	0.02
Neral	9.32	1628.3	0.85	7.90	1239.3	0.87
Geraniol	11.49	1809.9	0.03	8.17	1257.6	0.03
Geranial	9.95*	1679.5	[1.87]	8.36	1270.1	1.43
Undecanal	8.50	1563.3	0.03	8.92	1307.8	0.03
Citronellyl acetate	9.28	1624.4	0.02	9.60	1355.8	0.02



Neryl acetate	10.02	1684.9	0.40	9.74	1365.9	0.40
Geranyl acetate	10.39*	1715.4	[0.21]	10.01	1385.1	0.19
Tetradecane	6.31	1397.3	0.02	10.27	1403.3	0.02
Dodecanal	9.85*	1671.0	[0.07]	10.35	1409.4	0.01
β-Caryophyllene	8.23*†	1542.0	[0.31]	10.40*	1412.9	[0.21]
cis-α-Bergamotene	8.01	1525.0	0.03	10.40*	1412.9	[0.21]
α-Santalene	8.05	1528.1	0.01	10.46	1417.1	0.01
trans-α-Bergamotene	8.23*†	1542.0	[0.31]	10.68	1433.8	0.32
α-Humulene	9.07	1607.9	0.02	10.86	1447.1	0.02
β-Santalene	8.96	1598.9	0.03	10.97	1455.4	0.01
(E)-β-Farnesene	9.36*	1631.3	[0.05]	11.00	1458.0	0.05
trans-β-Bergamotene	9.36*	1631.3	[0.05]	11.32	1481.3	0.03
Valencene	9.69	1658.0	0.02	11.40	1487.8	0.02
Bicyclogermacrene	9.85*	1671.0	[0.07]	11.44	1490.6	0.05
(Z)-α-Bisabolene	10.39*	1715.4	[0.21]	11.59	1502.0	0.05
β-Bisabolene	9.95*	1679.5	[1.87]	11.66	1507.3	0.48
(E)-α-Bisabolene	10.52	1726.4	0.01	12.11	1542.2	0.02
Spathulenol	14.21	2060.1	0.01	12.47	1570.7	0.02
Unknown CILI I [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	14.69	2107.1	0.04	13.46	1650.6	0.02
Unknown CILI II [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	15.81	2219.2	0.02	13.63	1665.1	0.03
α-Bisabolol	15.25	2162.4	0.05	13.85	1683.3	0.03
Citropten	23.66	3163.3	0.07	16.99	1965.0	0.06
Palmitic acid				17.06	1970.8	0.04
Linoleic acid				18.74	2138.1	0.03
Oleic acid				18.80	2144.3	0.04
Stearic acid				19.06	2171.7	0.02
Heraclenin				21.59	2450.8	0.08
Total reported		99.20%			99.66%	

\*: 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