Date : 2024-04-03

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 24C19-PTH01
Customer Identification : Sweet Orange - Brazil - O20114R
Type : Essential Oil
Source : *Citrus sinensis*
Customer : Plant Therapy

Checked an approved by:

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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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 : 2024-03-28

Physicochemical data

Refractive index : 1.4732 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2024-03-20

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
Hexanal	tr	Aliphatic aldehyde
α-Thujene	0.01	Monoterpene
α-Pinene	0.55	Monoterpene
Camphene	0.01	Monoterpene
Sabinene	0.23	Monoterpene
β-Pinene	0.04	Monoterpene
Myrcene	1.87	Monoterpene
α-Phellandrene	0.04	Monoterpene
Octanal	0.32	Aliphatic aldehyde
Pseudolimonene	0.01	Monoterpene
Δ3-Carene	0.15	Monoterpene
α-Terpinene	tr	Monoterpene
para-Cymene	0.01	Monoterpene
1,8-Cineole	tr	Monoterpenic ether
Limonene	93.36	Monoterpene
β-Phellandrene	0.26	Monoterpene
(*Z*)-β-Ocimene	tr	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	0.04	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.04	Aliphatic alcohol
Terpinolene	0.03	Monoterpene
Linalool	0.36	Monoterpenic alcohol
Nonanal	0.03	Aliphatic aldehyde
trans-*para*-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
cis-Limonene oxide	0.04	Monoterpenic ether
trans-Limonene oxide	0.03	Monoterpenic ether
cis-*para*-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
Citronellal	0.05	Monoterpenic aldehyde
Terpinen-4-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.05	Monoterpenic alcohol
cis-Piperitol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.01	Oxygenated monoterpene
Decanal	0.25	Aliphatic aldehyde
Octyl acetate	0.01	Aliphatic ester
trans-Carveol	0.03	Monoterpenic alcohol
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde
cis-Carveol	0.02	Monoterpenic alcohol
Nerol	tr	Monoterpenic alcohol

Citronellol	0.02	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone
Neral	0.08	Monoterpenic aldehyde
Geraniol	0.01	Monoterpenic alcohol
Geranial	0.10	Monoterpenic aldehyde
Decanol	0.01	Aliphatic alcohol
Limonen-10-ol	0.01	Monoterpenic alcohol
Undecanal	0.01	Aliphatic aldehyde
Limonene *trans*-glycol	0.01	Monoterpenic alcohol
α-Cubebene	0.01	Sesquiterpene
Citronellyl acetate	0.01	Monoterpenic ester
Neryl acetate	0.01	Monoterpenic ester
α-Copaene	0.02	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
Dodecanal	0.03	Aliphatic aldehyde
β-Caryophyllene	0.02	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.01	Sesquiterpene
γ-Muurolene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
Valencene	0.04	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.01	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Caryophyllene oxide	0.01	Sesquiterpenic ether
τ-Cadinol	0.01	Sesquiterpenic alcohol
β-Sinensal	0.03	Sesquiterpenic aldehyde
α-Sinensal	0.02	Sesquiterpenic aldehyde
Nootkatone	0.01	Sesquiterpenic ketone
Palmitic acid	0.04	Aliphatic acid
cis-Vaccenic acid?	0.01	Aliphatic acid
Stearic acid	0.14	Aliphatic acid
Tangeretin isomer	0.08	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.06	Flavonoid
Nobiletin	0.03	Flavonoid
Consolidated total	**98.95**	

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

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

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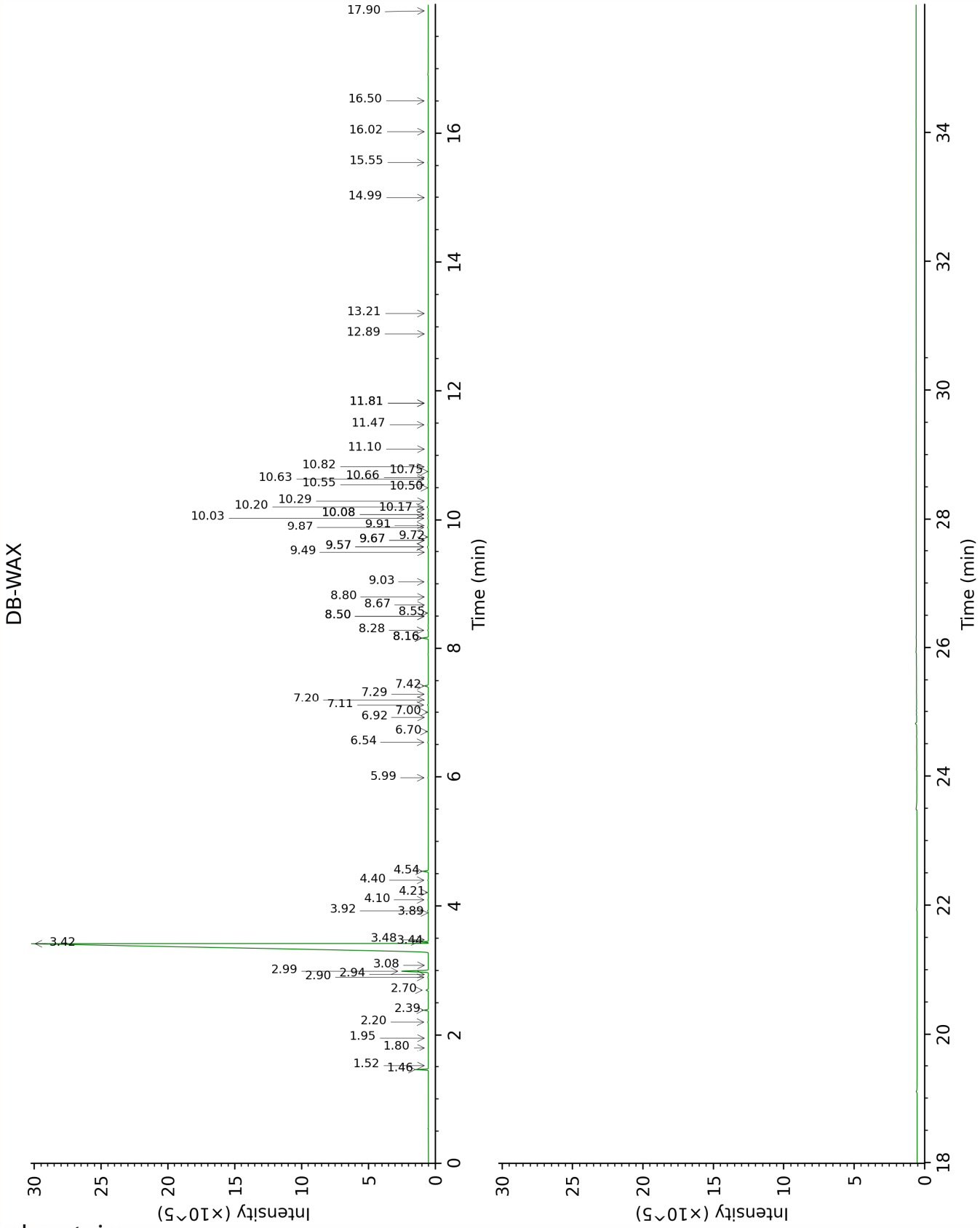
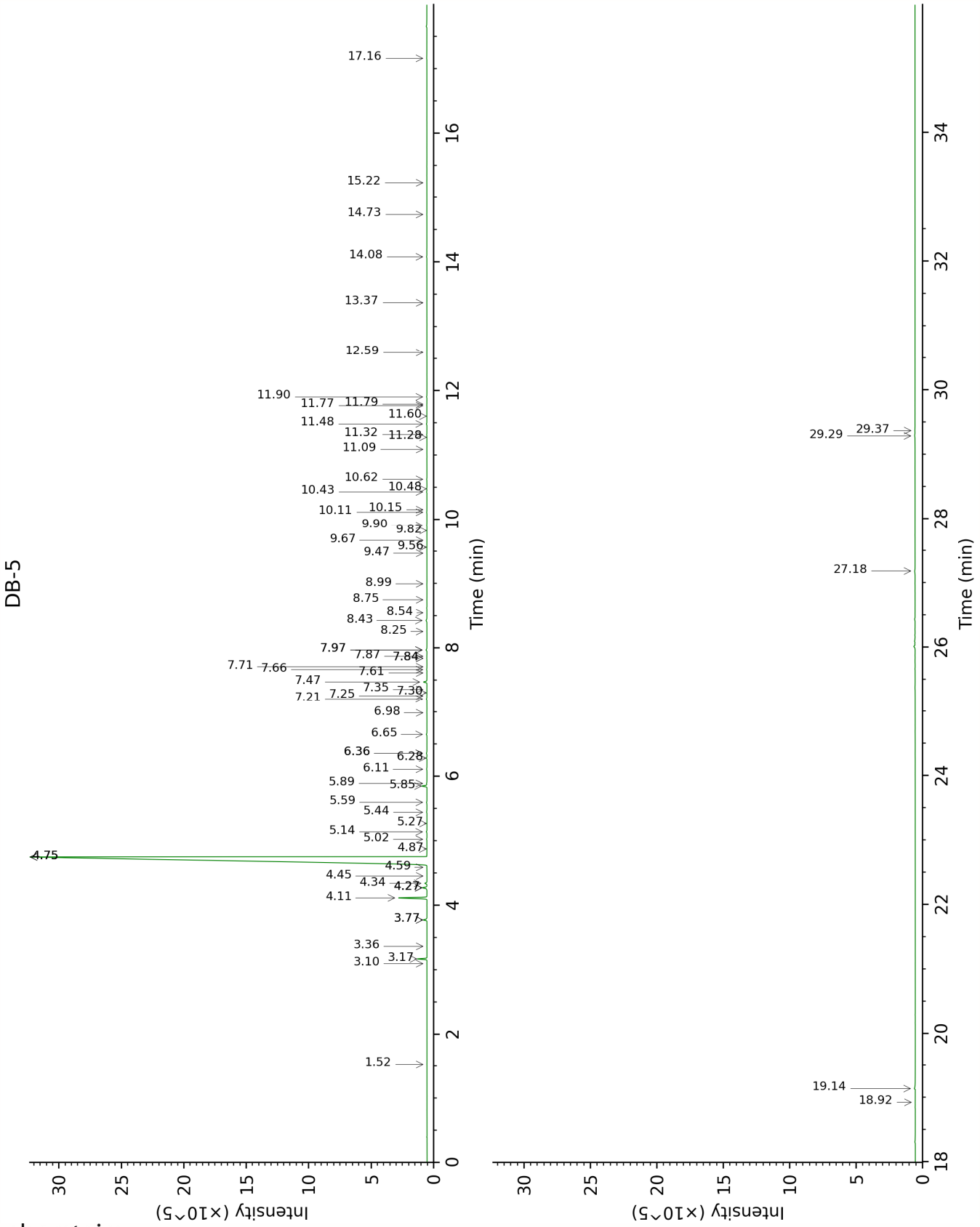

DB-WAX
Time (min)
Intensity (×10^5)
17.90
16.50
16.02
15.55
14.99
13.21
12.89
11.81
11.47
11.10
10.82
10.75
10.63
10.66
10.55
10.50
10.20
10.29
10.17
10.03
10.08
9.87
9.91
9.67
9.72
9.49
9.57
9.03
8.80
8.67
8.50
8.55
8.28
8.16
7.42
7.29
7.20
7.11
7.00
6.92
6.70
6.54
5.99
4.54
4.40
4.21
4.10
3.92
3.89
3.48
3.44
3.42
3.08
2.99
2.90
2.94
2.70
2.39
2.20
1.95
1.80
1.52
1.46


DB-5
17.16
15.22
14.73
14.08
13.37
12.59
11.90
11.77
11.79
11.60
11.48
11.32
11.28
11.09
10.62
10.43
10.48
10.11
10.15
9.90
9.82
9.67
9.56
9.47
8.99
8.75
8.54
8.43
8.25
7.97
7.87
7.84
7.71
7.66
7.61
7.47
7.35
7.30
7.21
7.25
6.98
6.65
6.36
6.28
6.11
5.89
5.85
5.59
5.44
5.27
5.14
5.02
4.87
4.75
4.59
4.45
4.34
4.27
4.11
3.77
3.36
3.10
3.17
1.52
Time (min)
Intensity (×10^5)
29.29
29.37
27.18
19.14
18.92
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Hexanal	1.95	1045.7	0.01	1.52	800.1	tr
α-Thujene	1.52	1003.6	0.01	3.10	926.3	0.01
α-Pinene	1.46	994.4	0.55	3.17	931.1	0.55
Camphene	1.80	1031.4	tr	3.36	944.0	0.01
Sabinene	2.39	1086.5	0.23	3.77*	970.9	[0.26]
β-Pinene	2.20	1069.1	0.04	3.77*	970.9	[0.26]
Myrcene	2.99	1135.9	1.87	4.11	993.4	1.87
α-Phellandrene	2.90	1128.7	0.04	4.27*	1003.7	[0.36]
Octanal	4.54	1250.4	0.32	4.27*	1003.7	[0.36]
Pseudolimonene	2.94	1132.1	0.01	4.27*	1003.7	[0.36]
Δ3-Carene	2.70	1113.7	0.15	4.34	1008.1	0.15
α-Terpinene	3.08	1142.8	0.01	4.45	1015.2	tr
para-Cymene	4.21	1227.0	0.02	4.59	1023.6	0.01
1,8-Cineole	3.48	1172.8	tr	4.75*	1033.6	[93.77]
Limonene	3.42	1168.2	93.36	4.75*	1033.6	[93.77]
β-Phellandrene	3.44	1170.4	0.26	4.75*	1033.6	[93.77]
(*Z*)-β-Ocimene	3.89	1204.5	0.01	4.87	1041.4	tr
(*E*)-β-Ocimene	4.10	1218.9	0.03	5.02	1050.8	0.02
γ-Terpinene	3.92	1206.7	0.05	5.14	1058.0	0.04
cis-Sabinene hydrate	7.00	1428.3	0.01	5.27	1066.1	0.01
Octanol	8.28	1525.2	0.05	5.44	1076.9	0.04
Terpinolene	4.40	1240.5	0.03	5.60	1086.6	0.03
Linalool	8.16*	1515.8	[0.38]	5.85	1102.4	0.36
Nonanal	5.99	1354.2	0.03	5.89	1104.9	0.03
trans-para-Mentha-2,8-dien-1-ol	9.03	1584.2	0.02	6.11	1118.9	0.03
cis-Limonene oxide	6.54	1393.9	0.04	6.28	1129.9	0.04
trans-Limonene oxide	6.70	1405.9	0.03	6.36*	1134.7	[0.05]
cis-para-Mentha-2,8-dien-1-ol	9.57*	1627.8	[0.08]	6.36*	1134.7	[0.05]
Citronellal	7.11	1436.6	0.05	6.65	1153.4	0.05
Terpinen-4-ol	8.67	1556.0	tr	6.98	1174.8	0.01
α-Terpineol	9.87	1652.7	0.05	7.20	1188.9	0.05
cis-Piperitol	9.67*	1636.2	[0.01]	7.25	1192.0	0.01
Unknown MISC XXXII [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	8.16*	1515.8	[0.38]	7.30	1195.2	0.01
Unknown MISC XV [m/z 121, 43 (99), 91 (85), 77 (73), 93 (41), 136 (33)... 166 (3)]				7.35	1198.4	0.01
Decanal	7.42	1459.7	0.24	7.47	1205.9	0.25

Octyl acetate	7.20	1443.3	0.01	7.61	1215.3	0.01
trans-Carveol	11.47	1779.0	0.03	7.66	1218.7	0.03
2,3-Epoxyneral?				7.71	1221.6	0.01
cis-Carveol	11.81*	1808.6	[0.02]	7.84*	1230.4	[0.02]
Nerol	11.10	1756.3	tr	7.84*	1230.4	[0.02]
Citronellol	10.82	1732.5	0.02	7.87	1232.6	0.02
Carvone	10.08*	1670.2	[0.04]	7.97*	1239.1	[0.09]
Neral	9.57*	1627.8	[0.08]	7.97*	1239.1	[0.09]
Geraniol	11.81*	1808.6	[0.02]	8.25	1258.2	0.01
Geranial	10.20	1679.8	0.09	8.42	1269.6	0.10
Decanol	10.75	1726.2	tr	8.54	1277.7	0.01
Limonen-10-ol	13.21	1937.2	0.01	8.75	1291.1	0.01
Undecanal	8.80	1565.9	0.01	8.99	1307.8	0.01
Limonene *trans*-glycol	16.02	2215.3	0.01	9.47	1341.2	0.01
α-Cubebene	6.92	1422.4	tr	9.56	1347.8	0.01
Citronellyl acetate	9.49	1621.0	0.01	9.67	1355.4	0.01
Neryl acetate	10.29	1687.3	0.01	9.82	1366.1	0.01
α-Copaene	7.29	1450.1	0.02	9.90	1372.0	0.02
Geranyl acetate	10.63	1715.9	0.03	10.11	1386.7	0.02
β-Elemene	8.50*	1542.2	[0.02]	10.15	1389.5	0.01
Dodecanal	10.08*	1670.2	[0.04]	10.43	1409.1	0.03
β-Caryophyllene	8.55	1546.2	0.03	10.48	1412.7	0.02
β-Copaene	8.50*	1542.2	[0.02]	10.62	1423.7	0.02
(*E*)-β-Farnesene	9.67*	1636.2	[0.01]	11.09	1458.1	0.01
γ-Muurolene	9.72	1640.4	0.02	11.28	1472.2	0.01
Germacrene D	9.91	1655.8	0.02	11.32	1475.3	0.02
Valencene	10.03	1665.4	0.04	11.48	1487.5	0.04
α-Muurolene	10.17	1677.0	0.01	11.60	1496.5	0.01
γ-Cadinene	10.50	1704.5	0.01	11.77	1508.8	0.02
(3*E*,6*E*)-α-Farnesene	10.66	1718.2	tr	11.79	1510.5	0.01
δ-Cadinene	10.55	1708.4	0.03	11.90	1519.4	0.03
Caryophyllene oxide	12.89	1907.4	0.01	12.59	1573.7	0.01
τ-Cadinol	14.99	2110.1	0.01	13.37	1636.0	0.01
β-Sinensal	15.55	2166.5	0.03	14.08	1694.5	0.03
α-Sinensal	16.50	2265.5	0.02	14.73	1750.7	0.02
Nootkatone	17.90	2416.2	0.01	15.22	1793.0	0.01
Palmitic acid				17.16	1971.6	0.04
cis-Vaccenic acid?				18.92	2146.8	0.01
Stearic acid				19.14	2168.9	0.14
Tangeretin isomer				27.18	3141.2	0.08
3,3',4',5,6,7,8-Heptamethoxyflavone				29.29	3322.1	0.06
Nobiletin				29.37	3327.4	0.03
Total reported		98.57%			99.09%	

*: 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

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