

Date : 2023-12-08

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23L01-PTH04

Customer Identification : Lemon - Argentina - L60117R

Type : Essential Oil

Source : *Citrus x limon*

Customer : Plant Therapy

Checked and approved by:

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 : 2023-12-06

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 : 2023-12-01

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
Heptane	tr	Alkane
Octane	tr	Alkane
2,6-Dimethyl-1,5-heptadiene	0.01	Normonoterpene
Heptanal	0.01	Aliphatic aldehyde
Tricyclene	0.01	Monoterpene
α -Thujene	0.39	Monoterpene
α -Pinene	1.90	Monoterpene
α -Fenchene	tr	Monoterpene
Camphene	0.06	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
β -Pinene	13.07	Monoterpene
Sabinene	2.19	Monoterpene
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Myrcene	1.33	Monoterpene
Pseudolimonene	0.01	Monoterpene
α -Phellandrene	0.04	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
Octanal	0.11	Aliphatic aldehyde
α -Terpinene	0.17	Monoterpene
<i>para</i> -Cymene	0.43	Monoterpene
β -Phellandrene	0.32	Monoterpene
Limonene	63.26	Monoterpene
1,8-Cineole	0.03	Monoterpenic ether
(<i>Z</i>)- β -Ocimene	0.05	Monoterpene
(<i>E</i>)- β -Ocimene	0.09	Monoterpene
γ -Terpinene	8.03	Monoterpene
<i>cis</i> -Sabinene hydrate	0.04	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.34	Monoterpene
<i>trans</i> -Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.10	Monoterpenic alcohol
Nonanal	0.14	Aliphatic aldehyde
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.03	Monoterpenic ether
<i>trans</i> -Limonene oxide	0.03	Monoterpenic ether
Camphor	0.01	Monoterpenic ketone
Epoxyterpinolene	0.02	Monoterpenic ether
Citronellal	0.09	Monoterpenic aldehyde
Borneol	0.03	Monoterpenic alcohol
Terpinen-4-ol	0.06	Monoterpenic alcohol

Unknown	0.01	Oxygenated monoterpene
Isogeranial	0.01	Monoterpenic aldehyde
α -Terpineol	0.24	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.01	Oxygenated monoterpene
Decanal	0.07	Aliphatic aldehyde
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
Nerol	0.06	Monoterpenic alcohol
2,3-Epoxygeranial?	0.03	Monoterpenic aldehyde
Neral	0.85	Monoterpenic aldehyde
Geraniol	0.04	Monoterpenic alcohol
Geranial	1.41	Monoterpenic aldehyde
Undecanal	0.03	Aliphatic aldehyde
Citronellyl acetate	0.04	Monoterpenic ester
Neryl acetate	0.68	Monoterpenic ester
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.41	Monoterpenic ester
β -Elemene	0.01	Sesquiterpene
Tetradecane	0.02	Alkane
Dodecanal	0.02	Aliphatic aldehyde
β -Caryophyllene	0.14	Sesquiterpene
<i>cis</i> - α -Bergamotene	0.05	Sesquiterpene
α -Santalene	0.02	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.37	Sesquiterpene
α -Humulene	0.02	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.03	Sesquiterpene
β -Santalene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
Geranyl propionate	0.01	Monoterpenic ester
<i>trans</i> - β -Bergamotene	0.03	Sesquiterpene
Valencene	0.06	Sesquiterpene
Bicyclogermacrene	0.04	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	0.06	Sesquiterpene
γ -Cadinene	0.01	Sesquiterpene
β -Bisabolene	0.54	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.01	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.02	Sesquiterpene
Spathulenol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
α -Bisabolol	0.04	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>Z</i>)-Farnesal	0.01	Sesquiterpenic aldehyde
Nootkatone	0.01	Sesquiterpenic ketone

Citropten	0.05	Furanocoumarin
Palmitic acid	0.06	Aliphatic acid
Stearic acid	0.19	Aliphatic acid
Tricosane	0.01	Alkane
Byakangelicol	0.03	Furanocoumarin
Heptacosane	0.01	Alkane
Nonacosane	0.02	Alkane
Consolidated total	98.48	

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

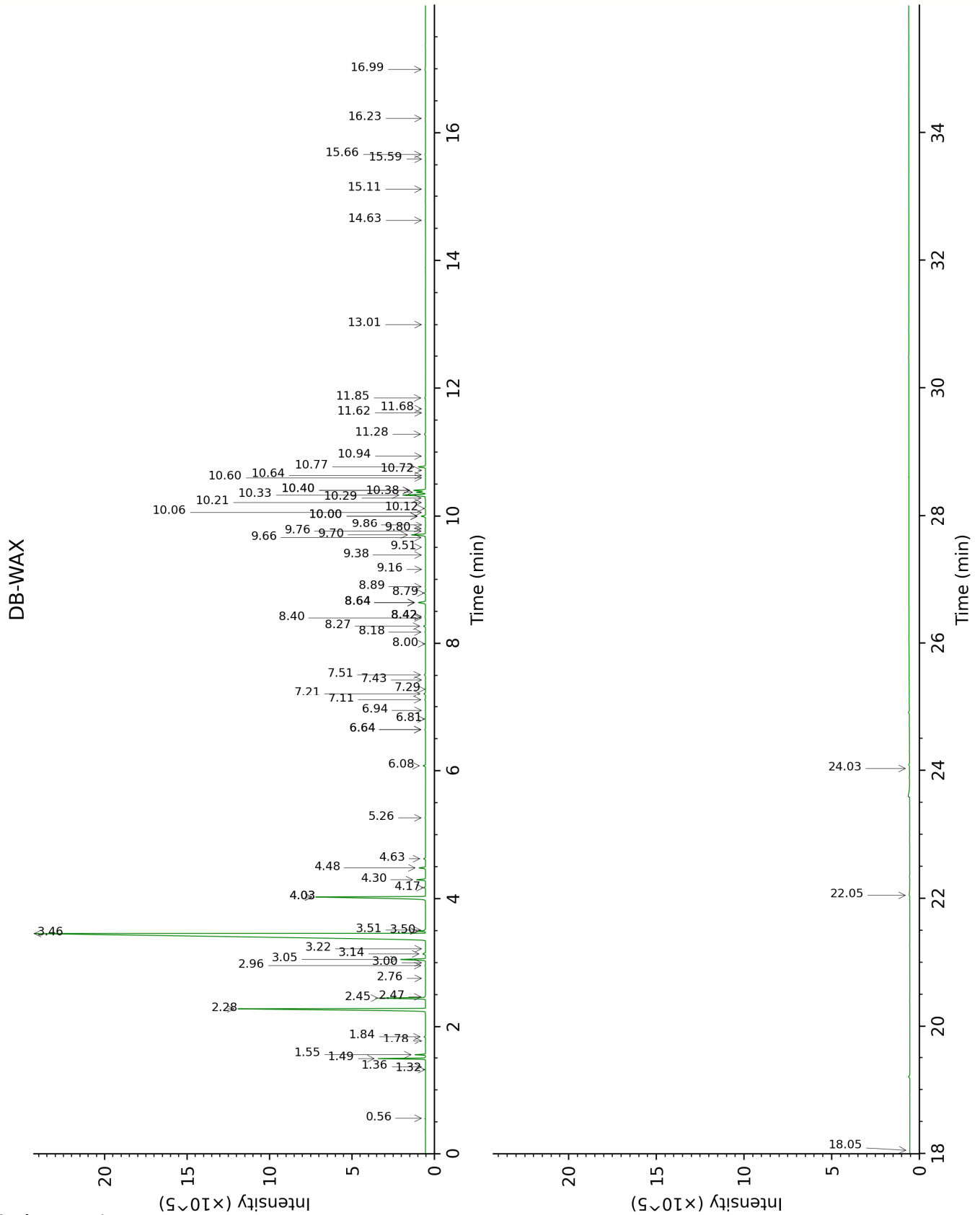
Note: no correction factor was applied

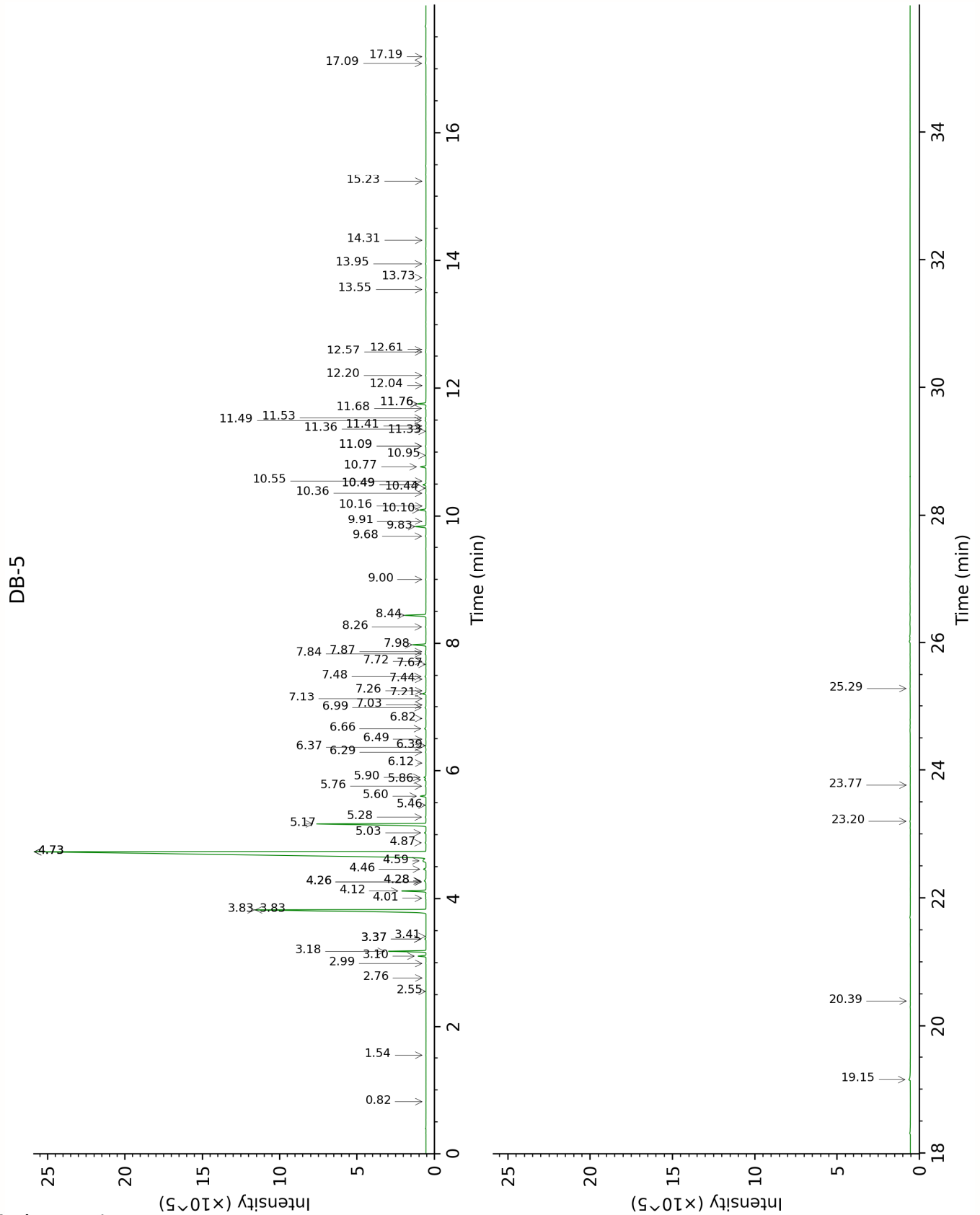
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Heptane	Column DB-WAX			Column DB-5		
				0.82	700.8	tr
Octane	0.56	782.0	tr	1.54	803.7	tr
2,6-Dimethyl-1,5-heptadiene	1.32	965.6	tr	2.55	886.9	0.01
Heptanal	3.22	1145.1	0.01	2.76	904.1	0.01
Tricyclene	1.36	972.1	0.01	2.99	919.2	0.01
α -Thujene	1.55	999.9	0.39	3.10	926.8	0.39
α -Pinene	1.49	991.7	1.88	3.18	931.7	1.90
α -Fenchene	1.78	1021.2	tr	3.37*	944.3	[0.07]
Camphene	1.84	1027.3	0.06	3.37*	944.3	[0.07]
Thuja-2,4(10)-diene	2.47	1086.1	0.03	3.41	947.0	0.02
β -Pinene	2.28	1068.4	13.07	3.83*	974.2	[15.27]
Sabinene	2.45	1084.3	2.19	3.83*	974.2	[15.27]
6-Methyl-5-hepten-2-one	5.26	1293.0	0.03	4.01	986.1	0.02
Myrcene	3.05	1132.5	1.33	4.12	993.6	1.33
Pseudolimonene	3.00	1128.6	0.01	4.26*†	1002.9	[0.03]
α -Phellandrene	2.96	1125.3	0.04	4.26*†	1002.9	[0.03]
Δ 3-Carene	2.76	1110.2	0.01	4.28*†	1003.9	[0.15]
Octanal	4.63	1247.9	0.11	4.28*†	1003.9	[0.15]
α -Terpinene	3.14	1139.1	0.17	4.46	1015.4	0.17
<i>para</i> -Cymene	4.30	1224.7	0.47	4.59	1023.5	0.43
β -Phellandrene	3.50	1166.0	0.32	4.73*	1032.4	[63.81]
Limonene	3.46	1163.1	63.26	4.73*	1032.4	[63.81]
1,8-Cineole	3.51	1167.3	0.03	4.73*	1032.4	[63.81]
(<i>Z</i>)- β -Ocimene	4.03*	1205.6	[8.07]	4.87	1041.1	0.05
(<i>E</i>)- β -Ocimene	4.17	1215.9	0.10	5.03	1050.8	0.09
γ -Terpinene	4.03*	1205.6	[8.07]	5.17	1059.5	8.03
<i>cis</i> -Sabinene hydrate	7.11	1428.0	0.04	5.28	1066.1	0.04
Octanol	8.40	1523.5	0.02	5.46	1077.7	0.01
Terpinolene	4.48	1237.8	0.35	5.60	1086.6	0.34
<i>trans</i> -Sabinene hydrate	8.18	1506.7	0.04	5.76	1096.3	0.04
Linalool	8.27	1513.8	0.11	5.86	1102.4	0.10
Nonanal	6.08	1353.8	0.13	5.90	1104.9	0.14
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.16	1581.7	0.01	6.12	1119.1	0.01
<i>cis</i> -Limonene oxide	6.64*	1393.8	[0.04]	6.29	1129.8	0.03
<i>trans</i> -Limonene	6.81	1405.8	0.03	6.37	1134.8	0.03

oxide						
Camphor	7.43	1451.4	0.01	6.39	1136.5	0.01
Epoxyterpinolene	6.94	1415.7	0.02	6.49	1142.8	0.02
Citronellal	7.21	1435.5	0.09	6.66	1153.3	0.09
Borneol	10.00*	1648.6	[0.25]	6.82	1163.5	0.03
Terpinen-4-ol	8.79	1553.4	0.06	6.99	1174.2	0.06
Unknown CYFL V [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)]	9.86	1636.9	0.01	7.03	1176.8	0.01
Isogeranial	8.42*	1525.3	[0.05]	7.13	1183.1	0.01
α -Terpineol	10.00*	1648.6	[0.25]	7.21	1188.7	0.24
Unknown MISC XXXI [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	8.00	1492.7	0.02	7.26	1191.7	0.01
Unknown CYFL VI [m/z 84, 41 (83), 83 (79), 91 (76), 93 (67), 119 (64), 137 (63), 109 (54), 108 (54)... 152 (4)]	10.40*	1681.1	[0.72]	7.44	1203.2	0.01
Decanal	7.51	1457.2	0.07	7.48	1205.9	0.07
<i>trans</i> -Carveol	11.68	1787.6	0.01	7.67	1218.6	0.01
2,3-Epoxyneral?				7.72	1221.6	0.02
Nerol	11.28	1754.2	0.06	7.84	1229.5	0.06
2,3-Epoxygeranial?				7.87	1231.9	0.03
Neral	9.70	1624.4	0.86	7.98	1239.0	0.85
Geraniol	11.85	1802.2	0.05	8.26	1257.6	0.04
Geranial	10.33	1675.1	1.40	8.44	1269.7	1.41
Undecanal	8.89	1561.0	0.03	9.00	1307.2	0.03
Citronellyl acetate	9.66	1621.0	0.03	9.68	1354.8	0.04
Neryl acetate	10.38	1678.7	0.55	9.83	1365.4	0.68
α -Copaene	7.29	1440.7	0.01	9.92	1371.6	0.01
Geranyl acetate	10.77	1711.4	0.43	10.10	1384.4	0.41
β -Elemene	8.64*	1542.0	[0.52]	10.16	1388.7	0.01
Tetradecane	6.64*	1393.8	[0.04]	10.36	1402.8	0.02
Dodecanal	10.22	1665.8	0.03	10.44	1408.6	0.02
β -Caryophyllene	8.64*	1542.0	[0.52]	10.49*	1412.6	[0.20]
<i>cis</i> - α -Bergamotene	8.42*	1525.3	[0.05]	10.49*	1412.6	[0.20]
α -Santalene	8.42*	1525.3	[0.05]	10.55	1416.8	0.02
<i>trans</i> - α - Bergamotene	8.64*	1542.0	[0.52]	10.77	1433.4	0.37

α-Humulene	9.51	1608.9	0.02	10.95	1446.7	0.02
(E)-β-Farnesene	9.80	1632.3	0.03	11.09*	1457.3	[0.04]
β-Santalene	9.38	1599.1	0.02	11.09*	1457.3	[0.04]
Germacrene D	10.06	1653.3	tr	11.33	1474.6	0.01
Geranyl propionate	11.62	1782.2	0.01	11.36	1477.1	0.01
trans-β-Bergamotene	9.76	1629.0	0.03	11.41	1480.8	0.03
Valencene	10.12	1658.3	0.06	11.49	1487.0	0.06
Bicyclogermacrene	10.28	1671.4	0.04	11.53	1490.0	0.04
(Z)-α-Bisabolene	10.60	1696.8	0.01	11.68	1501.1	0.06
γ-Cadinene	10.64	1700.0	0.01	11.76*	1506.6	[0.55]
β-Bisabolene	10.40*	1681.1	[0.72]	11.76*	1506.6	[0.55]
(E)-γ-Bisabolene	10.72	1706.8	0.01	12.04	1528.9	0.01
(E)-α-Bisabolene	10.94	1725.4	0.03	12.20	1541.2	0.02
Spathulenol	14.63	2055.8	0.02	12.57	1570.1	0.03
Caryophyllene oxide	13.00	1904.3	0.02	12.61	1573.5	0.02
Unknown CILI I [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	15.11	2102.8	0.02	13.55	1649.3	0.03
Unknown CILI II [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	16.23	2215.1	0.02	13.73	1664.5	0.03
α-Bisabolol	15.66	2157.9	0.04	13.95	1682.2	0.04
(2E,6Z)-Farnesal	15.59	2150.6	0.01	14.32	1712.9	0.01
Nootkatone	18.05	2409.2	0.01	15.23	1792.5	0.01
Citropten	24.03	3160.1	0.02	17.08	1962.7	0.05
Palmitic acid				17.19	1972.7	0.06
Stearic acid				19.15	2168.7	0.19
Tricosane	16.99	2294.7	0.06	20.39	2300.8	0.01
Byakangelicol				23.20	2629.6	0.03
Heptacosane				23.77	2700.3	0.01
Nonacosane	22.05	2890.2	0.11	25.29	2900.5	0.02
Total reported		98.26%			98.70%	

*: 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