

Date : 2024-04-03

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24C19-PTH02

Customer Identification : Lemon - USA - L60118R

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 : 2024-03-28

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 : 2024-03-20

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
Hexanal	tr	Aliphatic aldehyde
Octane	0.01	Alkane
Heptanal	0.01	Aliphatic aldehyde
Tricyclene	0.01	Monoterpene
α -Thujene	0.40	Monoterpene
α -Pinene	1.91	Monoterpene
Camphene	0.07	Monoterpene
β -Pinene	13.48	Monoterpene
Sabinene	2.21	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	1.34	Monoterpene
α -Phellandrene	0.04	Monoterpene
Pseudolimonene	tr	Monoterpene
Octanal	0.10	Aliphatic aldehyde
Δ^3 -Carene	0.01	Monoterpene
α -Terpinene	0.19	Monoterpene
<i>para</i> -Cymene	0.29	Monoterpene
Limonene	63.10	Monoterpene
1,8-Cineole	0.05	Monoterpenic ether
β -Phellandrene	0.32	Monoterpene
(<i>Z</i>)- β -Ocimene	0.04	Monoterpene
(<i>E</i>)- β -Ocimene	0.08	Monoterpene
γ -Terpinene	8.85	Monoterpene
<i>cis</i> -Sabinene hydrate	0.05	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.37	Monoterpene
<i>trans</i> -Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.11	Monoterpenic alcohol
Nonanal	0.12	Aliphatic aldehyde
<i>trans</i> -Limonene oxide	0.01	Monoterpenic ether
Camphor	0.01	Monoterpenic ketone
Citronellal	0.10	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Isoneral	0.01	Monoterpenic aldehyde
Terpinen-4-ol	0.04	Monoterpenic alcohol
Isogeranial	0.01	Monoterpenic aldehyde
α -Terpineol	0.20	Monoterpenic alcohol
<i>trans</i> -Piperitol	0.01	Monoterpenic alcohol
Decanal	0.06	Aliphatic aldehyde
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde

<i>cis</i> -Carveol	0.05	Monoterpenic alcohol
Nerol	tr	Monoterpenic alcohol
2,3-Epoxygeranial?	0.01	Monoterpenic aldehyde
Neral	0.60	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
Geranial	0.95	Monoterpenic aldehyde
Geranyl formate	0.01	Monoterpenic ester
Undecanal	0.03	Aliphatic aldehyde
<i>trans</i> - <i>para</i> -Mentha-2,8-diene-1-hydroperoxide	0.01	Monoterpenic peroxide
Citronellyl acetate	0.05	Monoterpenic ester
Neryl acetate	0.67	Monoterpenic ester
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.52	Monoterpenic ester
β -Elemene	0.01	Sesquiterpene
Tetradecane	0.02	Alkane
Dodecanal	0.03	Aliphatic aldehyde
<i>cis</i> - α -Bergamotene	0.06	Sesquiterpene
β -Caryophyllene	0.18	Sesquiterpene
α -Santalene	0.02	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.46	Sesquiterpene
α -Humulene	0.02	Sesquiterpene
β -Santalene	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.05	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
Geranyl propionate	0.02	Monoterpenic ester
<i>trans</i> - β -Bergamotene	0.03	Sesquiterpene
Valencene	0.06	Sesquiterpene
Bicyclogermacrene	0.09	Sesquiterpene
β -Bisabolene	0.68	Sesquiterpene
γ -Cadinene	0.01	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.01	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.03	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Germacrene D-4-ol	0.02	Sesquiterpenic alcohol
Unknown	0.01	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
Citropten	0.04	Furanocoumarin
Palmitic acid	0.05	Aliphatic acid
Linoleic acid	0.02	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.04	Aliphatic acid
Stearic acid	0.08	Aliphatic acid
Heraclenin	0.05	Furanocoumarin
Byakangelicol	0.03	Furanocoumarin

Squalene	0.02	Triterpene
Consolidated total	98.81	

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

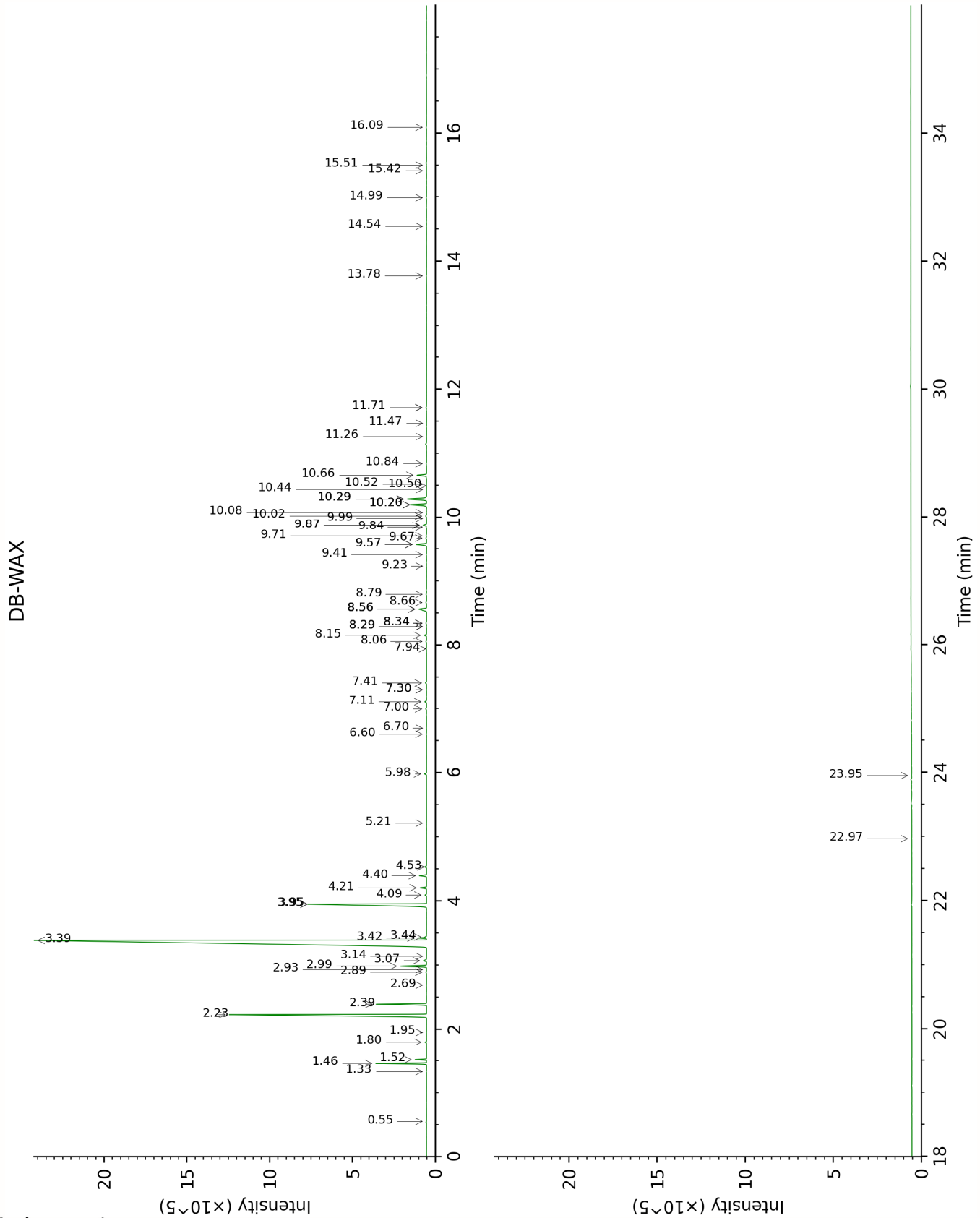
Note: no correction factor was applied

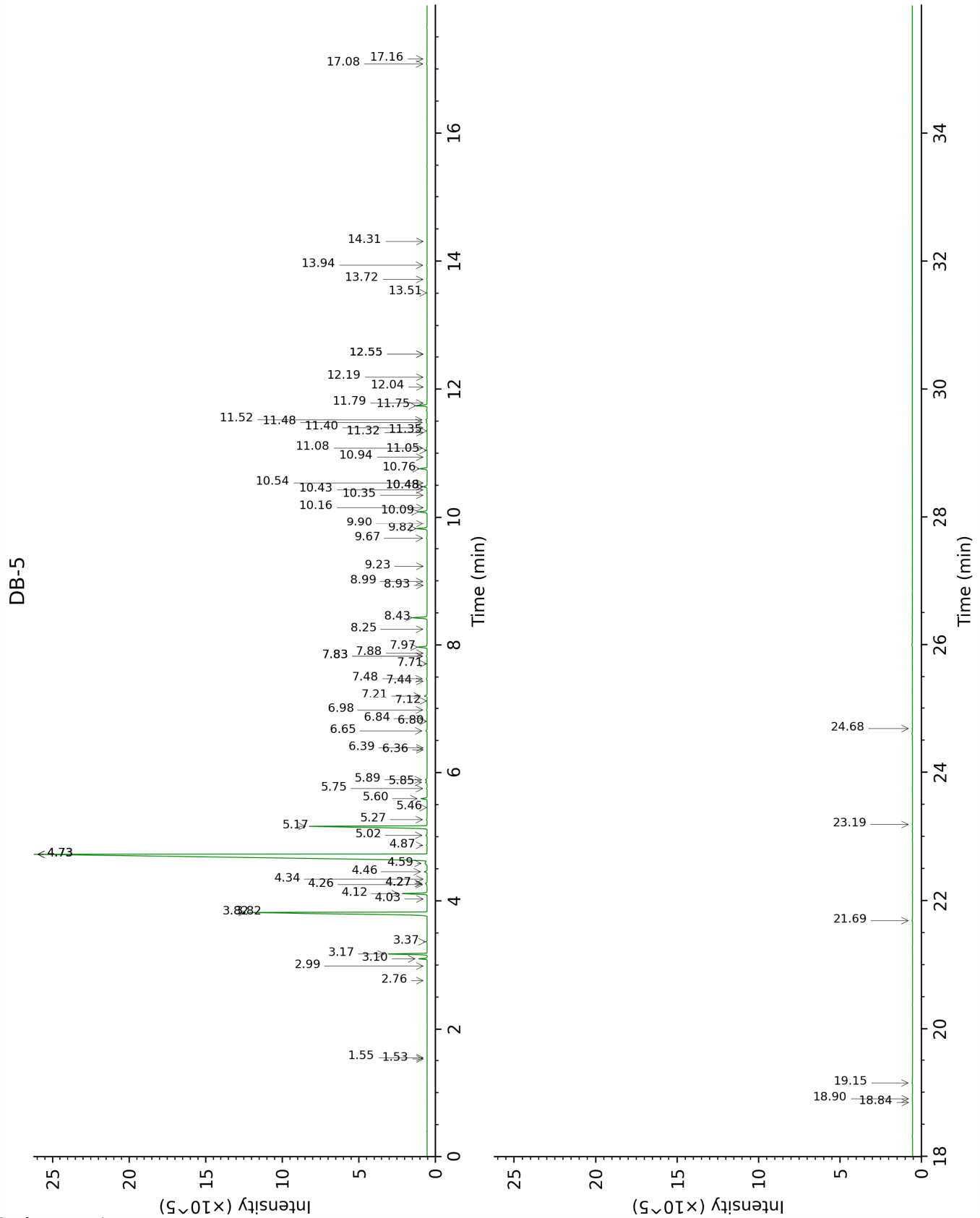
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Hexanal	Column DB-WAX			Column DB-5		
	1.95	1045.6	tr	1.53	800.8	tr
Octane	0.55	788.7	0.01	1.55	803.7	0.01
Heptanal	3.14	1147.2	tr	2.76	903.9	0.01
Tricyclene	1.33	975.8	0.01	2.99	919.2	0.01
α -Thujene	1.52	1003.6	0.40	3.10	926.6	0.40
α -Pinene	1.46	994.8	1.90	3.18	931.6	1.91
Camphene	1.80	1031.2	0.06	3.37	944.1	0.07
β -Pinene	2.23	1071.6	13.48	3.82*	974.1	[15.74]
Sabinene	2.39	1087.0	2.21	3.82*	974.1	[15.74]
6-Methyl-5-hepten-2-one	5.22	1298.7	0.01	4.03	988.0	0.01
Myrcene	2.99	1135.6	1.34	4.12	993.5	1.34
α -Phellandrene	2.89	1128.5	0.04	4.26*†	1002.7	[0.03]
Pseudolimonene	2.93	1131.6	tr	4.27*†	1003.9	[0.12]
Octanal	4.53	1250.0	0.10	4.27*†	1003.9	[0.12]
Δ 3-Carene	2.69	1113.2	0.01	4.34	1008.2	0.01
α -Terpinene	3.07	1142.0	0.19	4.46	1015.4	0.19
<i>para</i> -Cymene	4.21	1226.7	0.32	4.59	1023.5	0.29
Limonene	3.39	1166.1	63.10	4.73*	1032.4	[63.63]
1,8-Cineole	3.44	1170.0	0.05	4.73*	1032.4	[63.63]
β -Phellandrene	3.42	1168.8	0.32	4.73*	1032.4	[63.63]
(<i>Z</i>)- β -Ocimene	3.95*	1208.6	[8.87]	4.87	1041.2	0.04
(<i>E</i>)- β -Ocimene	4.09	1218.7	0.08	5.02	1050.9	0.08
γ -Terpinene	3.95*	1208.6	[8.87]	5.16	1059.7	8.85
<i>cis</i> -Sabinene hydrate	7.00	1428.0	0.05	5.27	1066.2	0.05
Octanol	8.29*	1525.9	[0.02]	5.46	1078.0	0.01
Terpinolene	4.40	1240.3	0.37	5.60	1086.7	0.37
<i>trans</i> -Sabinene hydrate	8.06	1507.7	0.04	5.75	1096.5	0.04
Linalool	8.16	1515.4	0.12	5.85	1102.5	0.11
Nonanal	5.98	1353.9	0.11	5.89	1105.1	0.12
<i>trans</i> -Limonene oxide	6.70	1405.4	tr	6.36	1134.8	0.01
Camphor	7.30*	1451.1	[0.01]	6.39	1136.7	0.01
Citronellal	7.11	1436.3	0.09	6.65	1153.6	0.10
Borneol	9.87*	1652.5	[0.20]	6.80	1163.1	0.01
Isoneral	7.94	1499.1	0.02	6.84	1165.8	0.01
Terpinen-4-ol	8.66	1555.4	0.04	6.98	1174.5	0.04
Isogeranial	8.29*	1525.9	[0.02]	7.12	1183.5	0.01
α -Terpineol	9.87*	1652.5	[0.20]	7.21	1189.0	0.20
<i>trans</i> -Piperitol	10.44	1699.4	0.01	7.44	1203.7	0.01
Decanal	7.41	1459.1	0.07	7.48	1206.3	0.06

2,3-Epoxyneral?				7.71	1221.9	0.01
<i>cis</i> -Carveol	11.71*	1800.0	[0.04]	7.83*	1229.7	[0.05]
Nerol	11.26	1760.6	tr	7.83*	1229.7	[0.05]
2,3-Epoxygeranial?				7.88	1232.9	0.01
Neral	9.57*	1627.7	[0.64]	7.97	1239.2	0.60
Geraniol	11.71*	1800.0	[0.04]	8.25	1257.8	0.03
Geranial	10.20*	1679.8	[1.04]	8.43	1269.9	0.95
Geranyl formate	9.99	1662.0	0.01	8.93	1303.5	0.01
Undecanal	8.79	1565.5	0.03	8.99	1307.8	0.03
<i>trans-para</i> - Mentha-2,8-diene- 1-hydroperoxide				9.23	1324.5	0.01
Citronellyl acetate	9.57*	1627.7	[0.64]	9.67	1355.3	0.05
Neryl acetate	10.29*	1687.1	[1.41]	9.82	1365.9	0.67
α -Copaene	7.30*	1451.1	[0.01]	9.90	1371.7	0.01
Geranyl acetate	10.66	1718.4	0.53	10.09	1385.1	0.52
β -Elemene	8.56*	1547.4	[0.64]	10.16	1389.8	0.01
Tetradecane	6.60	1398.7	0.02	10.35	1403.3	0.02
Dodecanal	10.08	1669.6	0.02	10.43	1409.4	0.03
<i>cis</i> - α -Bergamotene	8.34*	1530.0	[0.05]	10.48*	1413.1	[0.24]
β -Caryophyllene	8.56*	1547.4	[0.64]	10.48*	1413.1	[0.24]
α -Santalene	8.34*	1530.0	[0.05]	10.54	1417.4	0.02
<i>trans</i> - α - Bergamotene	8.56*	1547.4	[0.64]	10.76	1434.0	0.46
α -Humulene	9.41	1614.6	0.02	10.94	1447.4	0.02
β -Santalene	9.23	1600.1	0.01	11.05	1455.3	0.01
(<i>E</i>)- β -Farnesene	9.67	1635.8	0.04	11.08	1457.8	0.05
Germacrene D	9.84	1650.0	0.02	11.32	1475.8	0.01
Geranyl propionate	11.47	1778.8	tr	11.35	1477.7	0.02
<i>trans</i> - β - Bergamotene	9.71	1638.9	0.03	11.40	1481.4	0.03
Valencene	10.02	1665.1	0.06	11.48	1487.7	0.06
Bicyclogermacrene	10.20*	1679.8	[1.04]	11.52	1490.6	0.09
β -Bisabolene	10.29*	1687.1	[1.41]	11.75	1507.2	0.68
γ -Cadinene	10.50	1704.4	0.01	11.79	1510.3	0.01
(<i>E</i>)- γ -Bisabolene	10.52	1706.3	0.01	12.04	1530.0	0.01
(<i>E</i>)- α -Bisabolene	10.84	1734.1	0.02	12.19	1542.0	0.03
Spathulenol	14.54	2066.0	0.01	12.55*	1570.1	[0.02]
Germacrene D-4-ol	13.78	1991.1	0.02	12.55*	1570.1	[0.02]
Unknown CILI I [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	14.99	2109.5	0.02	13.51	1647.7	0.01
Unknown CILI II	16.10	2222.8	0.03	13.72	1665.0	0.03

[m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]						
α-Bisabolol	15.50	2162.2	0.01	13.94	1683.1	0.04
(2E,6Z)-Farnesal	15.42	2153.4	0.01	14.31	1714.1	0.01
Citropten	23.95	3162.3	0.02	17.08	1964.4	0.04
Palmitic acid				17.16	1971.9	0.05
Linoleic acid				18.84	2138.4	0.02
cis-Vaccenic acid?				18.90	2144.3	0.04
Stearic acid				19.15	2169.9	0.08
Heraclenin				21.69	2449.8	0.05
Byakangelicol				23.19	2629.7	0.03
Squalene	22.97	3030.3	0.02	24.68	2821.4	0.02
Total reported		98.42%			99.04%	

*: 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