

Date : 2023-08-10

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23H03-PTH01

Customer Identification : Lime Steam Distilled - LL0110R

Type : Essential Oil

Source : *Citrus aurantifolia* ct. Distilled

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 : Amélie Simard, Analyste

Date : 2023-08-10

PHYSICOCHEMICAL DATA

Refractive index : 1.4756 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-08-03

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
4,5-Dihydrotoluene	0.07	Alkene
3-Methylenecyclohexadiene	0.01	Alkene
Octane	0.01	Alkane
Cyclofenchene	0.01	Monoterpene
Bornylene	0.04	Monoterpene
Tricyclene	0.03	Monoterpene
α -Thujene	0.04	Monoterpene
α -Pinene	1.24	Monoterpene
β -Fenchene?	0.01	Monoterpene
Camphene	0.50	Monoterpene
α -Fenchene	0.20	Monoterpene
1,4-Dimethyl-4-vinylcyclohexene?	0.02	Monoterpene
Unknown	0.04	Monoterpene
Geranic oxide	0.16	Monoterpenic ether
Sabinene	0.04	Monoterpene
β -Pinene	2.43	Monoterpene
3-Methyl-3-cyclohexenone	0.02	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
<i>trans</i> -Dehydroxylinool oxide	0.04	Monoterpenic ether
Dehydro-1,8-cineole	0.02	Monoterpenic ether
Myrcene	1.28	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Menthatriene isomer I	0.06	Monoterpene
Pseudolimonene	0.05	Monoterpene
α -Phellandrene	0.32	Monoterpene
Δ^3 -Carene	0.04	Monoterpene
1,4-Cineole	1.50	Monoterpenic ether
α -Terpinene	2.27	Monoterpene
<i>meta</i> -Cymene	0.02	Monoterpene
<i>para</i> -Cymene	2.53	Monoterpene
β -Phellandrene	0.28	Monoterpene
1,8-Cineole	1.04	Monoterpenic ether
Limonene	49.79	Monoterpene
(Z?)-Citroxide	0.02	Monoterpenic ether
(Z)- β -Ocimene	0.17	Monoterpene
(E?)-Citroxide	0.17	Monoterpenic ether
(E)- β -Ocimene	0.37	Monoterpene
γ -Terpinene	12.28	Monoterpene
<i>para</i> -Mentha-3,8-diene	0.05	Monoterpene
Unknown	0.01	Oxygenated monoterpene

Terpinolene isomer	0.20	Monoterpene
<i>para</i> -Cymenene	0.21	Monoterpene
Terpinolene	8.80	Monoterpene
Linalool	0.11	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
<i>para</i> -Mentha-1,3,8-triene	0.03	Monoterpene
<i>endo</i> -Fenchol	0.26	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
Myrcenol	0.03	Monoterpenic alcohol
Limona ketone	0.02	Normonoterpenic ketone
<i>allo</i> -Ocimene	0.01	Monoterpene
<i>cis</i> -Limonene oxide	0.01	Monoterpenic ether
1-Terpineol	0.24	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.01	Monoterpenic ether
<i>cis</i> - β -Terpineol	0.28	Monoterpenic alcohol
Unknown	0.02	Unknown
Epoxyterpinolene	0.06	Monoterpenic ether
Isoborneol	0.03	Monoterpenic alcohol
(<i>Z</i>)-Ocimenol	0.02	Monoterpenic alcohol
Borneol	0.20	Monoterpenic alcohol
α -Phellandren-8-ol	0.08	Monoterpenic alcohol
(<i>E</i>)-Ocimenol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.36	Monoterpenic alcohol
4-Methylacetophenone	0.02	Simple phenolic
<i>para</i> -Cymen-8-ol	0.07	Monoterpenic alcohol
α -Terpineol	5.66	Monoterpenic alcohol
γ -Terpineol	0.49	Monoterpenic alcohol
<i>trans</i> -Piperitol	0.02	Monoterpenic alcohol
Decanal	0.04	Aliphatic aldehyde
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
<i>cis</i> -Carveol	0.02	Monoterpenic alcohol
Unknown	0.03	Oxygenated monoterpene
Neral	0.11	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
Geranial	0.17	Monoterpenic aldehyde
Unknown	0.01	Unknown
Unknown	0.02	Oxygenated monoterpene
<i>cis</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Unknown	0.04	Unknown
δ -Elemene	0.05	Sesquiterpene
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.13	Monoterpenic ester
7-Cubebene	0.01	Sesquiterpene
Geranyl acetate	0.10	Monoterpenic ester

β-Elemene	0.05	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
Dodecanal	0.02	Aliphatic aldehyde
<i>cis</i> -α-Bergamotene	0.02	Sesquiterpene
β-Caryophyllene	0.34	Sesquiterpene
α-Santalene	0.04	Sesquiterpene
γ-Elemene	0.02	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.60	Sesquiterpene
α-Humulene	0.08	Sesquiterpene
(<i>E</i>)-β-Farnesene	0.05	Sesquiterpene
β-Santalene	0.04	Sesquiterpene
Selina-4,11-diene	0.10	Sesquiterpene
α-Amorphene	0.04	Sesquiterpene
Unknown	0.05	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
δ-Selinene	0.17	Sesquiterpene
α-Selinene	0.07	Sesquiterpene
(<i>Z</i>)-α-Bisabolene	0.12	Sesquiterpene
β-Bisabolene	1.13	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)-α-Farnesene	0.34	Sesquiterpene
(<i>Z</i>)-γ-Bisabolene	0.07	Sesquiterpene
δ-Cadinene	0.05	Sesquiterpene
Selina-4,7(11)-diene?	0.13	Sesquiterpene
Selina-3,7(11)-diene	0.04	Sesquiterpene
(<i>E</i>)-α-Bisabolene	0.06	Sesquiterpene
Germacrene B	0.05	Sesquiterpene
Caryophyllenyl alcohol	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Globulol	0.01	Sesquiterpenic alcohol
Junenol	0.03	Sesquiterpenic alcohol
10-epi-γ-Eudesmol	0.02	Sesquiterpenic alcohol
γ-Eudesmol	0.03	Sesquiterpenic alcohol
Unknown	0.01	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
epi-α-Bisabolol	0.02	Sesquiterpenic alcohol
α-Bisabolol	0.03	Sesquiterpenic alcohol
Consolidated total	99.33	

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

Note: no correction factor was applied

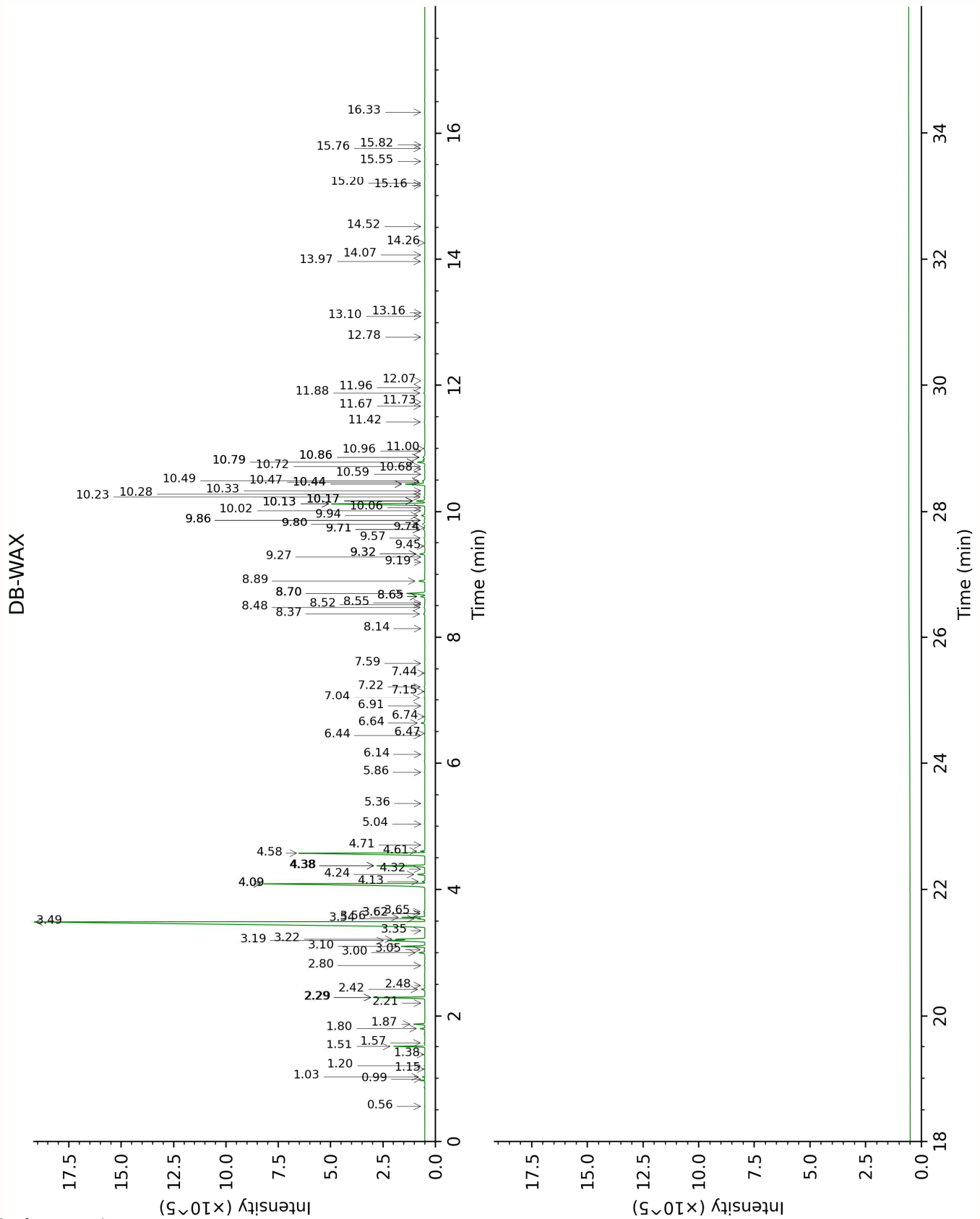
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

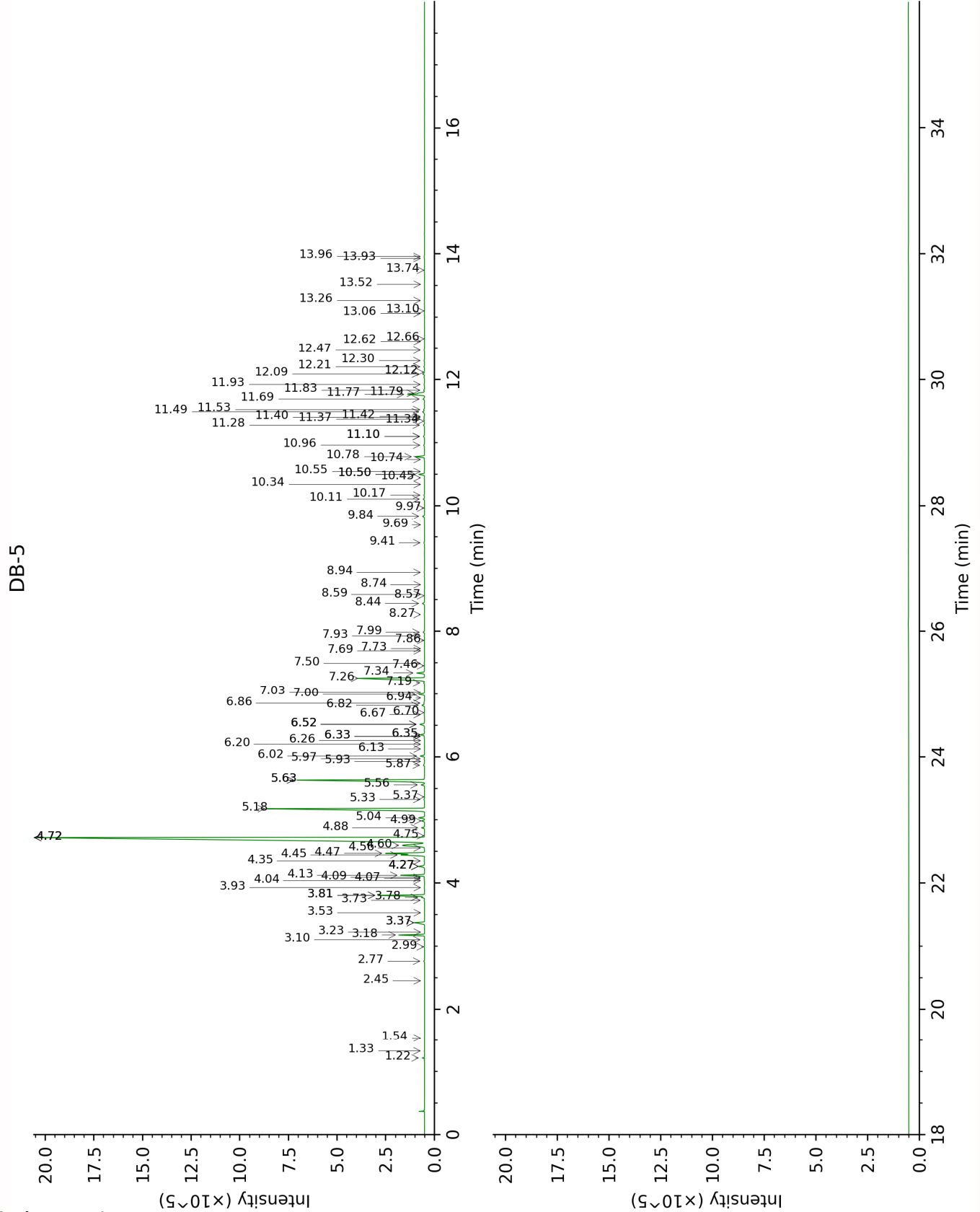
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is

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

4,5-Dihydrotoluene	Column DB-WAX			Column DB-5		
	1.03	914.1	0.07	1.22	757.4	0.07
3-Methylenecyclohexadiene	1.15	932.8	0.01	1.33	772.9	0.01
Octane	0.56	777.5	0.01	1.54	801.9	0.01
Cyclofenchene	0.99	908.7	0.01	2.45	877.4	0.01
Bornylene	1.20	940.7	0.02	2.76	902.8	0.04
Tricyclene	1.38	967.7	0.02	2.99	918.0	0.03
α -Thujene	1.58	994.8	0.03	3.10	925.4	0.04
α -Pinene	1.51	987.2	1.25	3.18	930.3	1.24
β -Fenchene?				3.22	933.3	0.01
Camphene	1.87	1023.1	0.50	3.37*	943.1	[0.72]
α -Fenchene	1.80	1016.4	0.20	3.37*	943.1	[0.72]
1,4-Dimethyl-4-vinylcyclohexene?	2.21	1054.9	0.01	3.53	953.5	0.02
Unknown CIAU I [m/z 93, 91 (60), 121 (55), 136 (42), 79 (40)]	2.30*	1063.4	[2.48]	3.73	966.4	0.04
Geranic oxide	2.42	1075.6	0.17	3.78	969.5	0.16
Sabinene	2.48	1081.5	0.04	3.81*	971.6	[2.47]
β -Pinene	2.30*	1063.4	[2.48]	3.81*	971.6	[2.47]
3-Methyl-3-cyclohexenone	6.44	1371.4	0.03	3.93	979.6	0.02
6-Methyl-5-hepten-2-one	5.36	1294.2	0.01	4.04	987.0	0.02
<i>trans</i> -Dehydroxylinalool oxide	3.62*	1171.1	[0.05]	4.07	989.1	0.04
Dehydro-1,8-cineole	3.35	1150.2	0.01	4.09	990.4	0.02
Myrcene	3.10	1131.1	1.29	4.13	992.6	1.28
Octanal	4.71	1251.6	0.01	4.27*	1001.8	[0.43]
Menthatriene isomer I	3.65	1173.6	0.06	4.27*	1001.8	[0.43]
Pseudolimonene	3.05	1127.0	0.05	4.27*	1001.8	[0.43]
α -Phellandrene	3.00	1123.4	0.32	4.27*	1001.8	[0.43]
Δ^3 -Carene	2.80	1107.6	0.04	4.35	1007.3	0.04
1,4-Cineole	3.22	1139.8	1.41	4.45	1013.2	1.50
α -Terpinene	3.20	1138.2	2.38	4.47	1014.8	2.27
<i>meta</i> -Cymene	4.32	1223.7	0.02	4.56	1020.1	0.02
<i>para</i> -Cymene	4.38*	1227.7	[2.51]	4.60	1022.7	2.53
β -Phellandrene	3.54	1164.9	0.28	4.72*	1030.4	[50.80]
1,8-Cineole	3.56	1166.6	1.04	4.72*	1030.4	[50.80]
Limonene	3.49	1161.0	49.79	4.72*	1030.4	[50.80]
(Z)-Citroxide	3.62*	1171.1	[0.05]	4.75	1032.2	0.02
(Z)- β -Ocimene	4.09*	1206.9	[12.55]	4.88	1040.1	0.17
(E)-Citroxide	4.13	1209.3	0.13	4.99	1046.9	0.17
(E)- β -Ocimene	4.24	1217.6	0.37	5.04	1049.9	0.37

γ-Terpinene	4.09*	1206.9	[12.55]	5.18	1058.9	12.28
<i>para</i> -Mentha-3,8-diene	4.38*	1227.7	[2.51]	5.33	1068.2	0.05
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.04	1275.9	0.01	5.37	1070.6	0.01
Terpinolene isomer	4.61	1244.5	0.19	5.56	1082.5	0.20
<i>para</i> -Cymenene	6.64	1385.5	0.21	5.63*	1087.2	[8.94]
Terpinolene	4.58	1242.2	8.80	5.63*	1087.2	[8.94]
Linalool	8.37	1514.9	0.08	5.87	1102.0	0.11
Nonanal	6.14	1349.9	0.01	5.93	1105.8	0.01
<i>para</i> -Mentha-1,3,8-triene	6.47	1373.7	0.01	5.97	1108.4	0.03
<i>endo</i> -Fenchol	8.65*	1536.2	[0.25]	6.02	1111.2	0.26
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.27	1584.2	0.01	6.13	1118.3	0.02
Myrcenol	9.19	1577.9	0.02	6.20	1123.0	0.03
Limona ketone	8.14	1497.1	0.01	6.26	1126.8	0.02
<i>allo</i> -Ocimene	5.86	1329.6	0.01	6.33*	1131.0	[0.05]
<i>cis</i> -Limonene oxide	6.74	1392.8	0.01	6.33*	1131.0	[0.05]
1-Terpineol	8.65*	1536.2	[0.25]	6.35*	1132.7	[0.26]
<i>trans</i> -Limonene oxide	6.91	1405.4	0.01	6.35*	1132.7	[0.26]
<i>cis</i> -β-Terpineol	9.32*	1587.9	[0.31]	6.52*	1143.2	[0.36]
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	7.15	1423.2	0.02	6.52*	1143.2	[0.36]
Epoxyterpinolene	7.04	1415.3	0.06	6.52*	1143.2	[0.36]
Isoborneol	9.71*	1619.1	[0.11]	6.67	1153.1	0.03
(<i>Z</i>)-Ocimanol	9.74	1621.3	0.03	6.70	1155.0	0.02
Borneol	10.13*†	1652.6	[5.81]	6.82	1162.5	0.20
α-Phellandren-8-ol	10.47	1680.1	0.09	6.86	1164.7	0.08
(<i>E</i>)-Ocimanol	10.02	1643.8	0.01	6.94	1170.0	0.02
Terpinen-4-ol	8.89	1555.0	0.36	7.00	1173.8	0.36
4-Methylacetophenone	10.79*	1706.3	[0.44]	7.03	1175.8	0.02
<i>para</i> -Cymen-8-ol	11.88	1798.3	0.08	7.19	1185.7	0.07
α-Terpineol	10.13*†	1652.6	[5.81]	7.26	1190.3	5.66
γ-Terpineol	10.17*†	1656.3	[0.50]	7.34	1195.7	0.49
<i>trans</i> -Piperitol	10.68	1697.1	0.02	7.46	1203.0	0.02
Decanal	7.59	1456.0	0.03	7.50	1205.5	0.04
<i>trans</i> -Carveol	11.74	1785.7	0.01	7.69	1218.8	0.01
2,3-Epoxyneral?				7.73	1221.2	0.02
<i>cis</i> -Carveol	12.07	1815.3	0.01	7.86	1229.8	0.02
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.67	1780.6	0.03	7.93	1234.4	0.03
Neral	9.80*	1626.5	[0.20]	7.99	1238.5	0.11

Geraniol	11.96	1805.8	0.02	8.27	1257.2	0.03
Geranial	10.44*	1677.7	[1.23]	8.44	1268.9	0.17
Unknown CIAU IV [m/z 43, 79 (78), 128 (46), 58 (42), 127 (42)...]	13.10	1905.7	0.01	8.57	1277.0	0.01
Unknown CIAU V [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	12.78	1876.4	0.02	8.59	1278.4	0.02
<i>cis</i> -Ascaridole glycol	15.16	2097.7	0.02	8.74	1288.8	0.02
Unknown CICA VI [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...]				8.94	1301.8	0.04
δ -Elemene	7.22	1428.5	0.05	9.41	1334.8	0.05
Citronellyl acetate	9.80*	1626.5	[0.20]	9.69	1354.8	0.02
Neryl acetate	10.49	1681.8	0.15	9.84	1365.0	0.13
7-Cubebene	7.44	1444.6	0.01	9.97	1374.2	0.01
Geranyl acetate	10.86*	1712.7	[0.16]	10.11	1384.2	0.10
β -Elemene	8.70*	1540.0	[1.15]	10.17	1388.6	0.05
Isocaryophyllene	8.48	1522.9	0.07	10.34	1400.6	0.01
Dodecanal	10.33	1669.1	0.02	10.45	1408.2	0.02
<i>cis</i> - α -Bergamotene	8.52	1526.3	0.02	10.50*	1412.3	[0.36]
β -Caryophyllene	8.70*	1540.0	[1.15]	10.50*	1412.3	[0.36]
α -Santalene	8.55	1528.5	0.01	10.55	1415.7	0.04
γ -Elemene	9.32*	1587.9	[0.31]	10.74	1429.8	0.02
<i>trans</i> - α -Bergamotene	8.70*	1540.0	[1.15]	10.78	1433.1	0.60
α -Humulene	9.57	1608.1	0.07	10.96	1446.6	0.08
(<i>E</i>)- β -Farnesene	9.86*	1631.5	[0.06]	11.10*	1456.9	[0.09]
β -Santalene	9.45	1597.9	0.04	11.10*	1456.9	[0.09]
Selina-4,11-diene	9.71*	1619.1	[0.11]	11.28	1470.2	0.10
α -Amorphene	9.86*	1631.5	[0.06]	11.34	1474.9	0.04
Unknown BOSE VII [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	10.17*†	1656.3	[0.50]	11.37	1477.1	0.05
Germacrene D	10.06	1647.6	0.02	11.40	1479.2	0.03
β -Selinene	10.17*†	1656.3	[0.50]	11.42	1480.5	0.03
δ -Selinene	9.94	1637.8	0.21	11.49	1485.9	0.17
α -Selinene	10.28	1664.9	0.02	11.53	1488.5	0.07
(<i>Z</i>)- α -Bisabolene	10.59	1690.2	0.02	11.69	1500.9	0.12
β -Bisabolene	10.44*	1677.7	[1.23]	11.77	1506.5	1.13
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	10.79*	1706.3	[0.44]	11.79	1508.0	0.34
(<i>Z</i>)- γ -Bisabolene	10.24	1661.3	0.06	11.83	1511.7	0.07
δ -Cadinene	10.72	1700.4	0.04	11.93	1518.9	0.05
Selina-4,7(11)-diene?	10.86*	1712.7	[0.16]	12.09	1531.9	0.13
Selina-3,7(11)-diene	10.96	1721.0	0.01	12.12	1534.3	0.04

(E)- α -Bisabolene	11.00	1724.3	0.05	12.21	1540.9	0.06
Germacrene B	11.42	1759.5	0.05	12.30	1548.6	0.05
Caryophyllenyl alcohol	14.07	1994.1	0.02	12.47	1561.7	0.04
Caryophyllene oxide	13.16	1911.0	0.01	12.62	1573.0	0.03
Globulol	14.26	2012.0	0.01	12.66	1576.3	0.01
Junenol	13.97	1984.4	0.05	13.06	1607.9	0.03
10-epi- γ -Eudesmol	14.52	2036.1	0.02	13.10	1611.3	0.02
γ -Eudesmol	15.20	2101.3	0.03	13.26	1624.8	0.03
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	15.56	2136.2	0.02	13.52	1645.8	0.01
Unknown CILI II [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	16.33	2213.6	0.03	13.74	1664.2	0.04
epi- α -Bisabolol	15.82	2161.7	0.01	13.93	1679.5	0.02
α -Bisabolol	15.76	2156.4	0.03	13.96	1682.1	0.03
Total reported		98.73%			99.00%	

*: 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