Date : March 21, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22C08-PTH01
Customer identification : Bergamot (Bergapten Free) ORGANIC - BQ01081121R
Type : Essential oil
Source : *Citrus bergamia*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Pamela Lavoie, M.Sc., Chimiste
Analysis date : March 21, 2022

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid
Refractive index: 1.4645 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Nonane	tr	Alkane
Tricyclene	0.01	Monoterpene
α-Thujene	0.25	Monoterpene
α-Pinene	1.17	Monoterpene
Camphene	0.04	Monoterpene
β-Pinene	7.09	Monoterpene
Sabinene	1.15	Monoterpene
Myrcene	0.87	Monoterpene
α-Phellandrene	0.02	Monoterpene
Pseudolimonene	tr	Monoterpene
Octanal	tr	Aliphatic aldehyde
Δ3-Carene	tr	Monoterpene
α-Terpinene	0.09	Monoterpene
para-Cymene	0.15	Monoterpene
1,8-Cineole	0.35*	Monoterpenic ether
β-Phellandrene	0.35*	Monoterpene
Limonene	39.52	Monoterpene
(*Z*)-β-Ocimene	0.03	Monoterpene
(*E*)-β-Ocimene	0.07	Monoterpene
γ-Terpinene	5.07	Monoterpene
cis-Sabinene hydrate	tr	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	0.21	Monoterpene
trans-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
Hotrienol	0.01	Monoterpenic alcohol
Linalool	14.93	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	tr	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	Monoterpenic ether
Camphor	tr	Monoterpenic ketone
Epoxyterpinolene	0.01	Monoterpenic ether
Citronellal	0.01	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
α-Terpineol	tr	Monoterpenic alcohol
Hodiendiol	tr	Monoterpenic alcohol
Unknown	0.01	Unknown
Decanal	0.01	Aliphatic aldehyde
Octyl acetate	tr	Aliphatic ester
Nerol	0.01	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Unknown	0.01	Unknown
Neral	0.02	Monoterpenic aldehyde
Geraniol	0.09	Monoterpenic alcohol
Linalyl acetate	26.32	Monoterpenic ester

(*trans*?)-Linalool oxide acetate (fur.)?	0.05	Monoterpenic ester
Geranial	0.02	Monoterpenic aldehyde
Unknown	tr	Unknown
Bornyl acetate	0.01	Monoterpenic ester
Hodiendiol derivative	0.01	Oxygenated monoterpene
Unknown	0.01	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.26	Monoterpenic ester
Geranyl acetate	0.24	Monoterpenic ester
β-Caryophyllene	0.14	Sesquiterpene
cis-α-Bergamotene	0.01	Sesquiterpene
trans-α-Bergamotene	0.25	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.02	Sesquiterpene
(*Z*)-α-Bisabolene	0.04	Sesquiterpene
β-Bisabolene	0.40	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
(*E*)-α-Bisabolene	0.01	Sesquiterpene
Germacrene D-4-ol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene
Myristic acid	0.01	Aliphatic acid
Nootkatone	0.02	Sesquiterpenic ketone
meta-Camphorene	0.01	Diterpene
Palmitic acid	0.02	Aliphatic acid
para-Camphorene	tr	Diterpene
Linoleic acid	0.01	Aliphatic acid
Oleic acid	0.02	Aliphatic acid
Stearic acid	0.01	Aliphatic acid
Consolidated total	**99.35%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

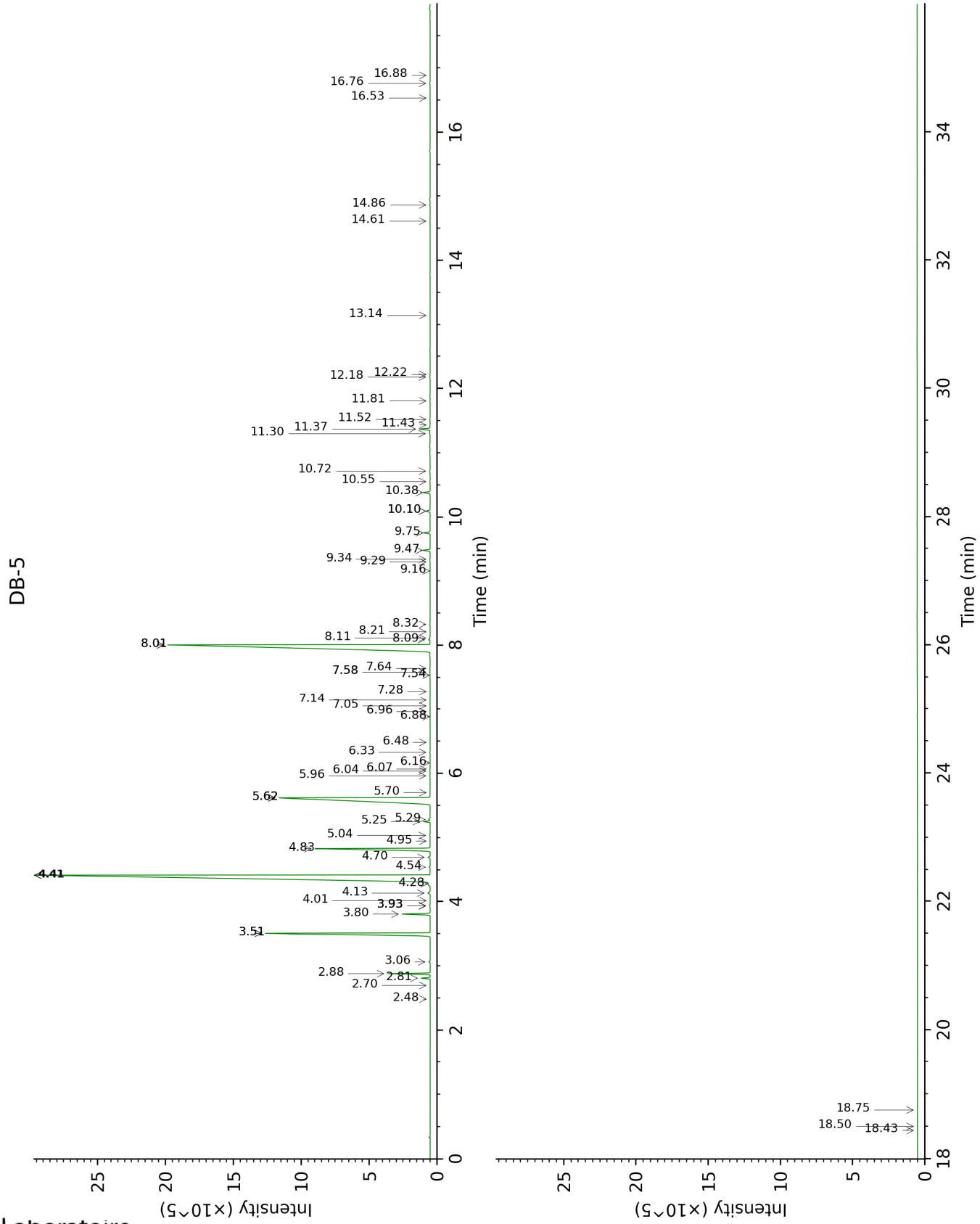
Note: no correction factor was applied

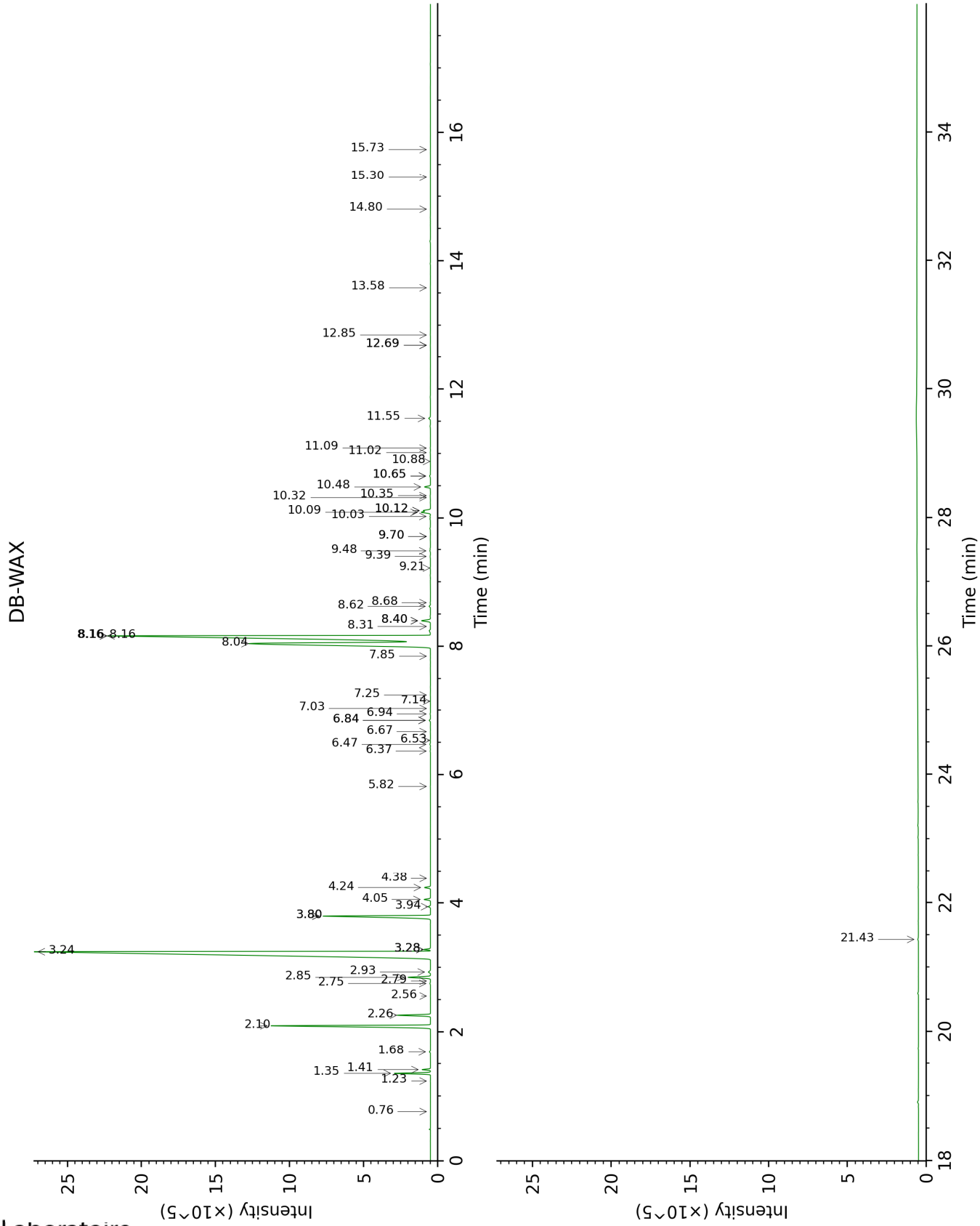
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Intensity (×10^5)
Time (min)
16.88
16.76
16.53
14.86
14.61
13.14
12.18
12.22
11.81
11.52
11.43
11.30
11.37
10.72
10.55
10.38
10.10
9.75
9.47
9.34
9.29
9.16
8.32
8.21
8.11
8.09
8.01
7.64
7.58
7.54
7.28
7.14
7.05
6.96
6.88
6.48
6.33
6.16
6.07
6.04
5.96
5.70
5.62
5.29
5.25
5.04
4.95
4.83
4.70
4.54
4.41
4.28
4.13
4.01
3.93
3.80
3.51
3.06
2.88
2.81
2.70
2.48
18.75
18.50
18.43


DB-WAX
Intensity (×10^5)
Time (min)
15.73
15.30
14.80
13.58
12.85
12.69
11.55
11.09
11.02
10.88
10.65
10.48
10.32
10.35
10.09
10.03
10.12
9.70
9.48
9.39
9.21
8.62
8.68
8.31
8.40
8.16
8.16
8.04
7.85
7.25
7.14
7.03
6.94
6.84
6.67
6.53
6.47
6.37
5.82
4.38
4.24
4.05
3.94
3.80
3.24
3.28
2.85
2.93
2.75
2.79
2.56
2.26
2.10
1.68
1.35
1.41
1.23
0.76
21.43

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Nonane	2.48	903	tr	0.76	892	tr
Tricyclene	2.70	917	0.01	1.23	973	0.01
α-Thujene	2.81	925	0.25	1.41	1001	0.25
α-Pinene	2.88	930	1.17	1.35	992	1.16
Camphene	3.06	942	0.04	1.68	1028	0.04
β-Pinene	3.51*	972	8.28	2.10	1068	7.09
Sabinene	3.51*	972	[8.28]	2.26	1084	1.15
Myrcene	3.80	992	0.87	2.85	1134	0.87
α-Phellandrene	3.93*	1001	0.03	2.75	1126	0.02
Pseudolimonene	3.93*	1001	[0.03]	2.79	1130	tr
Octanal	3.93*	1001	[0.03]	4.38	1252	tr
Δ3-Carene	4.01	1006	tr	2.56	1111	tr
α-Terpinene	4.13	1014	0.09	2.93	1140	0.09
para-Cymene	4.28	1023	0.15	4.05	1228	0.23
1,8-Cineole	4.41*	1031	39.87	3.28*	1168	0.20
β-Phellandrene	4.41*	1031	[39.87]	3.28*	1168	[0.20]
Limonene	4.41*	1031	[39.87]	3.24	1165	39.52
(*Z*)-β-Ocimene	4.54	1040	0.03	3.80*	1208	5.10
(*E*)-β-Ocimene	4.70	1050	0.07	3.94	1219	0.08
γ-Terpinene	4.83	1058	5.07	3.80*	1208	[5.10]
cis-Sabinene hydrate	4.95	1066	tr	6.84*	1429	0.05
cis-Linalool oxide (fur.)	5.04	1071	0.02	6.47	1402	0.02
Terpinolene	5.25	1085	0.21	4.24	1241	0.21
trans-Linalool oxide (fur.)	5.28	1087	0.05	6.84*	1429	[0.05]
Hotrienol	5.62*	1108	14.95	8.68	1568	0.01
Linalool	5.62*	1108	[14.95]	8.04†	1519	41.40
Nonanal	5.62*	1108	[14.95]	5.82	1355	0.01
endo-Fenchol	5.70	1113	tr	8.31	1540	0.01
cis-Limonene oxide	5.96	1130	0.01	6.36	1394	0.01
trans-Limonene oxide	6.04	1135	0.01	6.53	1406	0.01
Camphor	6.07	1137	tr	7.14	1451	tr
Epoxyterpinolene	6.16	1143	0.01	6.67	1416	0.01
Citronellal	6.33	1154	0.01	6.94	1437	0.02
Borneol	6.48	1163	0.01	9.70*	1650	0.01
α-Terpineol	6.88	1189	tr	9.70*	1650	[0.01]
Hodiendiol	6.96	1194	tr	12.69*	1907	0.01
Unknown [m/z 43, 71 (80), 67 (55), 59 (51), 68 (44), 41 (43)...]	7.05	1200	0.01	10.88	1748	0.01
Decanal	7.14	1206	0.01	7.25	1459	0.01
Octyl acetate	7.28	1215	tr	7.03	1443	tr
Nerol	7.54	1232	0.01	11.02	1760	0.01

Citronellol	7.58*	1236	0.03	10.65*	1729	0.04
Unknown [m/z 43, 71 (64), 68 (54), 81 (49), 93 (34), 121 (33)...]	7.58*	1236	[0.03]	7.85	1504	0.01
Neral	7.64	1240	0.02	9.39	1625	0.02
Geraniol	8.01*	1264	26.40	11.55	1805	0.09
Linalyl acetate	8.01*	1264	[26.40]	8.16*†	1528	[41.40]
(*trans*?)-Linalool oxide acetate (fur.)?	8.09	1269	0.05	8.62	1564	0.05
Geranial	8.11	1271	0.02	10.03	1676	0.02
Unknown [m/z 43, 121 (79), 136 (42), 107 (37), 68 (35), 95 (27), 93 (24)...]	8.21	1278	tr			
Bornyl acetate	8.32	1285	0.01	8.16*†	1528	[41.40]
Hodiendiol derivative	9.16	1343	0.01	12.85	1922	0.01
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.29	1353	0.01			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.34	1356	0.02	11.08	1766	0.01
Neryl acetate	9.48	1366	0.26	10.12*†	1684	[0.68]
Geranyl acetate	9.75	1385	0.24	10.48	1714	0.24
β-Caryophyllene	10.10*	1410	0.16	8.40*	1547	0.40
cis-α-Bergamotene	10.10*	1410	[0.16]	8.16*†	1528	[41.40]
trans-α-Bergamotene	10.38	1431	0.25	8.40*	1547	[0.40]
α-Humulene	10.55	1444	0.02	9.21	1610	0.01
(*E*)-β-Farnesene	10.72	1456	0.02	9.48	1632	0.02
(*Z*)-α-Bisabolene	11.30	1500	0.04	10.12*†	1684	[0.68]
β-Bisabolene	11.37	1505	0.40	10.09†	1682	0.68
γ-Cadinene	11.43	1510	0.01	10.32	1700	0.01
δ-Cadinene	11.52	1517	0.02	10.35	1703	0.01
(*E*)-α-Bisabolene	11.81	1540	0.01	10.65*	1729	[0.04]
Germacrene D-4-ol	12.18	1569	0.03	13.58	1990	0.01
Caryophyllene oxide	12.22	1572	0.01	12.69*	1907	[0.01]
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.14	1647	0.01	14.80	2109	0.01

Myristic acid	14.61	1771	0.01			
Nootkatone	14.86	1793	0.02			
meta-Camphorene	16.53	1947	0.01	15.30	2159	tr
Palmitic acid	16.76	1968	0.02	21.43	2867	0.03
para-Camphorene	16.88	1980	tr	15.74	2203	tr
Linoleic acid	18.43	2135	0.01			
Oleic acid	18.50	2141	0.02			
Stearic acid	18.75	2167	0.01			
Total identified		**99.34%**			**99.27%**	
Total reported		**99.39%**			**99.30%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not 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