Date : February 07, 2023

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 23A24-NSO01
Customer identification : Organic Essential Oil: Lemon Lot No: 000280 Botanical Species: Citrus limon
Type : Essential oil
Source : *Citrus x limon*
Customer : Natural Sourcing LLC

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 : Candide Morin, analyste
Analysis date : February 06, 2023

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Physical aspect: Bright yellow liquid
Refractive index: 1.4743 ± 0.0003 (20 °C; method PC-MAT-016)

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
Octane	tr	Alkane
Tricyclene	0.01	Monoterpene
α-Thujene	0.38	Monoterpene
α-Pinene	1.84	Monoterpene
Camphene	0.07	Monoterpene
Sabinene	2.10	Monoterpene
β-Pinene	12.08	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	1.43	Monoterpene
α-Phellandrene	0.04	Monoterpene
Pseudolimonene	0.01	Monoterpene
Octanal	0.08	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.18	Monoterpene
para-Cymene	0.19	Monoterpene
1,8-Cineole	0.34	Monoterpenic ether
Limonene	66.80	Monoterpene
(*Z*)-β-Ocimene	0.07	Monoterpene
(*E*)-β-Ocimene	0.12	Monoterpene
γ-Terpinene	7.83	Monoterpene
cis-Sabinene hydrate	0.06	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.35	Monoterpene
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.10	Monoterpenic alcohol
Nonanal	0.13	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	Monoterpenic ether
Camphor	0.01	Monoterpenic ketone
Citronellal	0.06	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
Isogeranial	0.01	Monoterpenic aldehyde
α-Terpineol	0.18	Monoterpenic alcohol
Decanal	0.04	Aliphatic aldehyde
Nerol	0.03	Monoterpenic alcohol
2,3-Epoxygeranial?	0.01	Monoterpenic aldehyde
Neral	0.74	Monoterpenic aldehyde
Carvone	0.02	Monoterpenic ketone
Geraniol	0.02	Monoterpenic alcohol
Geranial	1.13	Monoterpenic aldehyde
Perillaldehyde	0.02	Monoterpenic aldehyde
Limonen-10-ol	0.01	Monoterpenic alcohol
Undecanal	0.03	Aliphatic aldehyde

Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.37	Monoterpenic ester
Geranyl acetate	0.20	Monoterpenic ester
Dodecanal	0.02	Aliphatic aldehyde
β-Caryophyllene	0.22	Sesquiterpene
cis-α-Bergamotene	0.02	Sesquiterpene
trans-α-Bergamotene	0.34	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.04	Sesquiterpene
Geranyl propionate	0.01	Monoterpenic ester
trans-β-Bergamotene	0.02	Sesquiterpene
Valencene	0.02	Sesquiterpene
Bicyclogermacrene	0.07	Sesquiterpene
(*Z*)-α-Bisabolene	0.05	Sesquiterpene
β-Bisabolene	0.50	Sesquiterpene
(*E*)-α-Bisabolene	0.02	Sesquiterpene
Spathulenol	0.03	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
α-Bisabolol	0.03	Sesquiterpenic alcohol
Citropten	0.06	Furanocoumarin
Linoleic acid	0.01	Aliphatic acid
Oleic acid	0.01	Aliphatic acid
cis-Vaccenic acid?	0.01	Aliphatic acid
Stearic acid	0.13	Aliphatic acid
Consolidated total	**98.90%**	

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.

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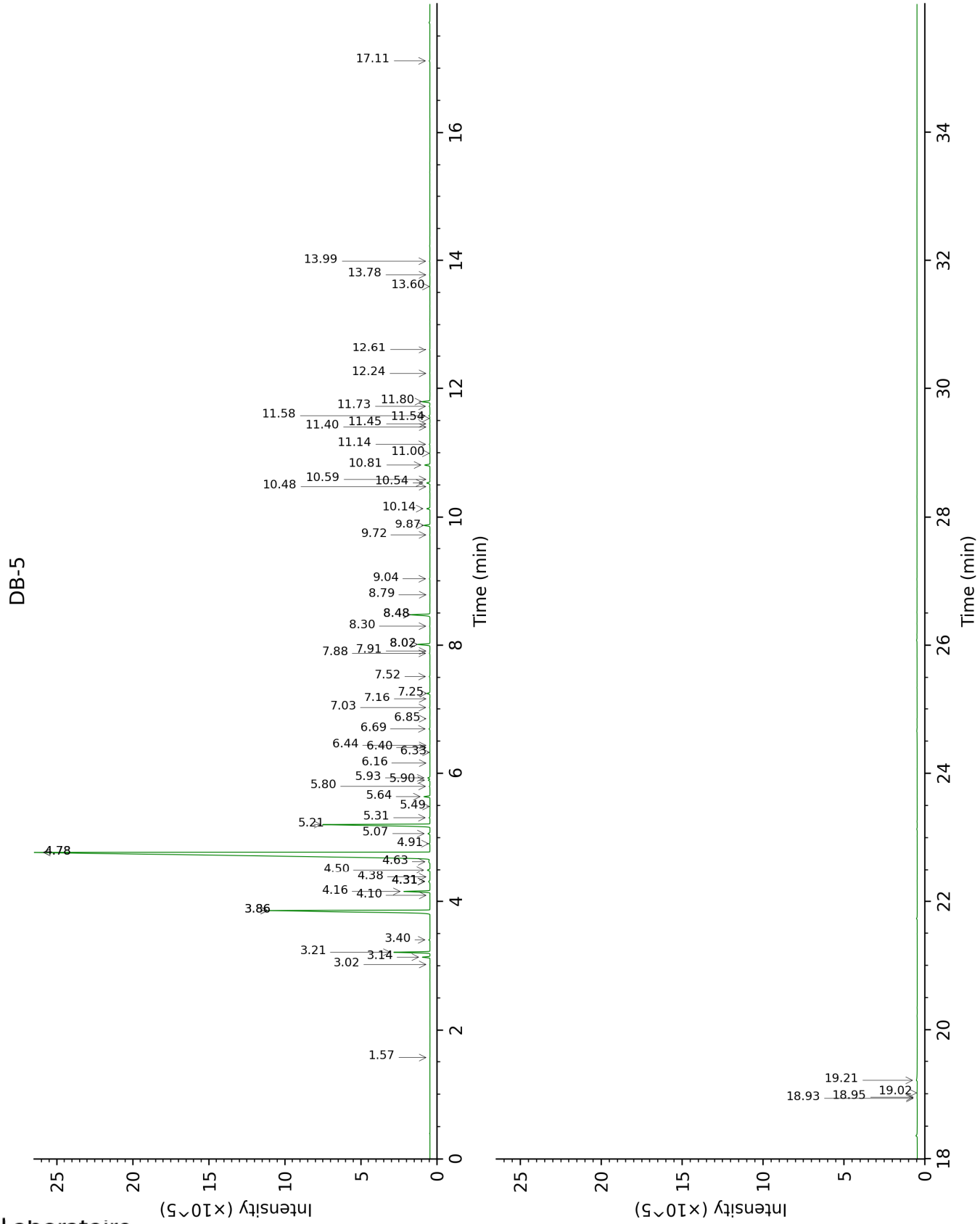
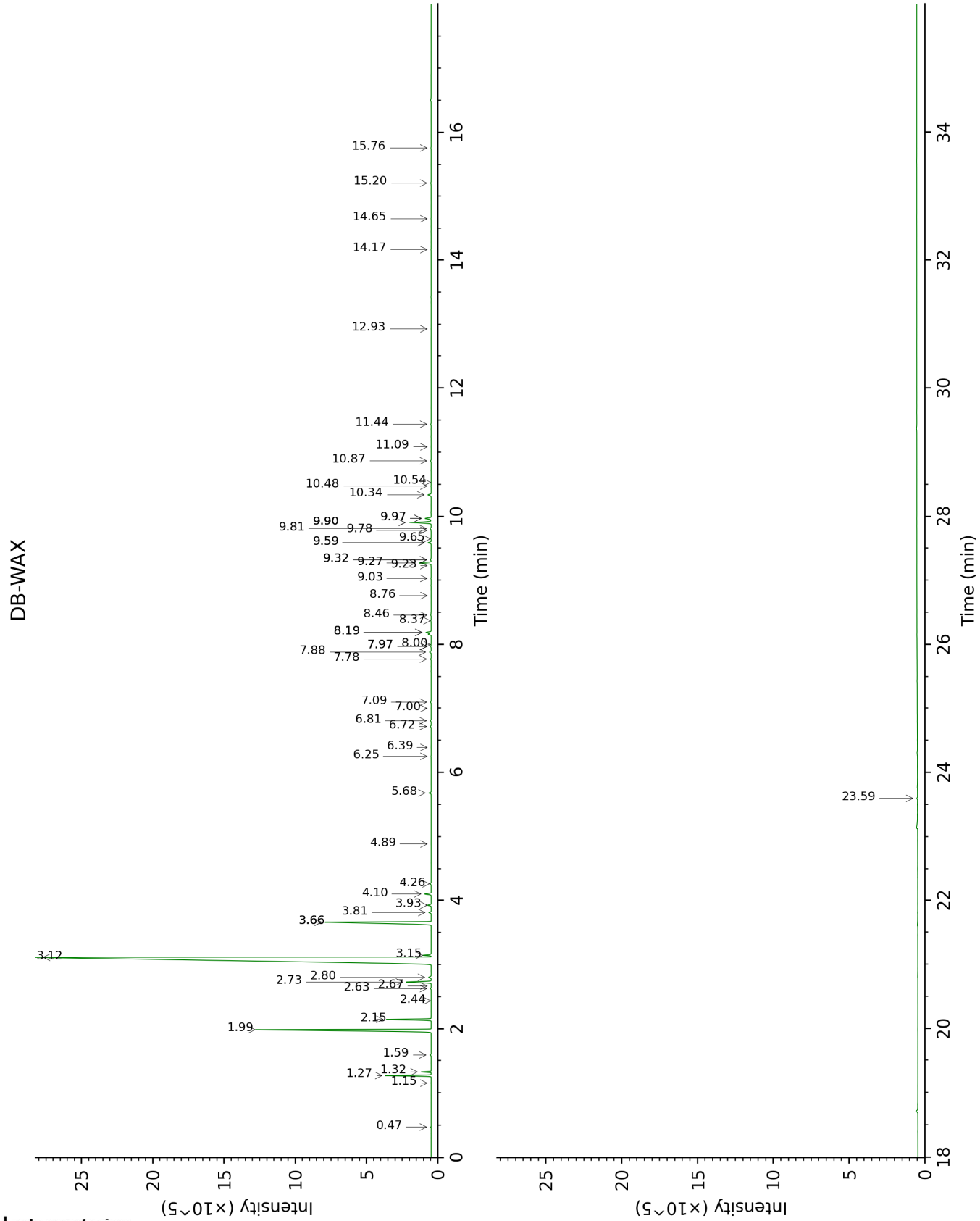

DB-5
Intensity (×10^5)
Time (min)
17.11
13.99
13.78
13.60
12.61
12.24
11.80
11.73
11.58
11.54
11.45
11.40
11.14
11.00
10.81
10.59
10.54
10.48
10.14
9.87
9.72
9.04
8.79
8.48
8.30
8.02
7.91
7.88
7.52
7.25
7.16
7.03
6.85
6.69
6.44
6.40
6.33
6.16
5.93
5.90
5.80
5.64
5.49
5.31
5.21
5.07
4.91
4.78
4.63
4.50
4.38
4.31
4.16
4.10
3.86
3.40
3.21
3.14
3.02
1.57
19.21
18.93
18.95
19.02


DB-WAX
Intensity (×10^5)
Time (min)
15.76
15.20
14.65
14.17
12.93
11.44
11.09
10.87
10.54
10.48
10.34
9.97
9.90
9.81
9.78
9.65
9.59
9.32
9.27
9.23
9.03
8.76
8.46
8.37
8.19
8.00
7.97
7.88
7.78
7.09
7.00
6.81
6.72
6.39
6.25
5.68
4.89
4.26
4.10
3.93
3.81
3.66
3.15
3.12
2.80
2.73
2.67
2.63
2.44
2.15
1.99
1.59
1.32
1.27
1.15
0.47
23.59

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Octane	1.57	802	tr	0.47	781	0.01
Tricyclene	3.02	918	0.01	1.15	968	0.01
α-Thujene	3.14	926	0.38	1.32	996	0.38
α-Pinene	3.21	931	1.84	1.27	989	1.83
Camphene	3.40	943	0.07	1.59	1024	0.06
Sabinene	3.86*	973	14.18	2.15	1082	2.10
β-Pinene	3.86*	973	[14.18]	1.99	1066	12.08
6-Methyl-5-hepten-2-one	4.10	988	0.01	4.89	1296	0.01
Myrcene	4.16	992	1.43	2.73	1132	1.42
α-Phellandrene	4.31*	1003	0.13	2.63	1124	0.04
Pseudolimonene	4.31*	1003	[0.13]	2.67	1127	0.01
Octanal	4.31*	1003	[0.13]	4.26	1253	0.08
Δ3-Carene	4.38	1007	0.01	2.44	1108	0.01
α-Terpinene	4.50	1014	0.18	2.80	1138	0.18
para-Cymene	4.63†	1022	67.39	3.93	1228	0.19
1,8-Cineole	4.78*†	1032	[67.39]	3.15	1166	0.34
Limonene	4.78*†	1032	[67.39]	3.12	1164	66.80
(*Z*)-β-Ocimene	4.91	1040	0.07	3.66*	1208	7.89
(*E*)-β-Ocimene	5.07	1050	0.12	3.81	1219	0.12
γ-Terpinene	5.21	1058	7.83	3.66*	1208	[7.89]
cis-Sabinene hydrate	5.31	1065	0.06	6.72	1429	0.05
Octanol	5.49	1076	0.01	7.97*	1524	0.03
Terpinolene	5.64	1086	0.35	4.10	1241	0.35
trans-Sabinene hydrate	5.80	1095	0.04	7.78	1508	0.04
Linalool	5.90	1102	0.10	7.88	1517	0.09
Nonanal	5.93	1104	0.13	5.68	1353	0.12
trans-para-Mentha-2,8-dien-1-ol	6.16	1118	0.01	8.76	1585	0.01
cis-Limonene oxide	6.33	1129	0.01	6.25	1394	0.02
trans-Limonene oxide	6.40	1134	0.01	6.39	1405	0.01
Camphor	6.44	1136	0.01	7.00	1450	0.01
Citronellal	6.69	1152	0.06	6.81	1436	0.06
Borneol	6.85	1162	0.01	9.59*	1652	0.18
Terpinen-4-ol	7.02	1173	0.03	8.37	1555	0.03
Isogeranial	7.16	1182	0.01	7.97*	1524	[0.03]
α-Terpineol	7.26	1188	0.18	9.59*	1652	[0.18]
Decanal	7.52	1204	0.04	7.10	1457	0.04
Nerol	7.88	1228	0.03	10.87	1758	0.04
2,3-Epoxygeranial?	7.91	1231	0.01			
Neral	8.02*	1238	0.75	9.27	1626	0.74
Carvone	8.02*	1238	[0.75]	9.78	1667	0.02
Geraniol	8.30	1256	0.02	11.44	1807	0.03

Geranial	8.48*	1268	1.22	9.90*	1677	1.70
Perillaldehyde	8.48*	1268	[1.22]	10.48	1725	0.02
Limonen-10-ol	8.79	1289	0.01	12.93	1941	0.01
Undecanal	9.04	1306	0.03	8.46	1562	0.03
Citronellyl acetate	9.72	1354	0.02	9.23	1623	0.01
Neryl acetate	9.87	1364	0.37	9.98*	1683	0.41
Geranyl acetate	10.14	1383	0.20	10.34	1714	0.22
Dodecanal	10.48	1407	0.02	9.81	1669	0.07
β-Caryophyllene	10.54	1412	0.22	8.19*†	1541	0.51
cis-α-Bergamotene	10.59	1416	0.02	8.00	1526	0.02
trans-α-Bergamotene	10.81	1432	0.34	8.19*†	1541	[0.51]
α-Humulene	11.00	1446	0.02	9.03	1606	0.02
(*E*)-β-Farnesene	11.14	1456	0.04	9.32*	1630	0.05
Geranyl propionate	11.40	1476	0.01	11.09	1777	0.01
trans-β-Bergamotene	11.45	1480	0.02	9.32*	1630	[0.05]
Valencene	11.54	1486	0.02	9.65	1656	0.02
Bicyclogermacrene	11.58	1489	0.07	9.90*	1677	[1.70]
(*Z*)-α-Bisabolene	11.73	1500	0.05	9.98*	1683	[0.41]
β-Bisabolene	11.80	1506	0.50	9.90*	1677	[1.70]
(*E*)-α-Bisabolene	12.24	1540	0.02	10.54	1730	0.01
Spathulenol	12.61	1569	0.03	14.17	2057	0.02
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.60	1649	0.02	14.65	2104	0.01
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.78	1664	0.03	15.76	2216	0.02
α-Bisabolol	13.99	1681	0.03	15.20	2159	0.03
Citropten	17.11	1960	0.06	23.60	3154	0.05
Linoleic acid	18.93	2139	0.01			
Oleic acid	18.95	2141	0.01			
cis-Vaccenic acid?	19.02	2148	0.01			
Stearic acid	19.21	2168	0.13			
Total identified		**98.99%**			**98.61%**	
Total reported		**99.03%**			**98.64%**	

*: 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