CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21C23-PTH07
Customer identification : Lemon - L60113212R
Type : Essential oil
Source : *Citrus x limon*
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 : Seydou Ka, M. Sc.
Analysis date : April 07, 2021

Checked and approved by :

_____
Alexis St-Gelais, M. Sc., chimiste 2013-174

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MÉTHODE CERTIFIÉE
✳ISO 17025:2017
CERTIFIED METHOD

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid
Refractive index: 1.4746 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 855:2004 - OIL OF LEMON, OBTAINED BY EXPRESSION - EQUATORIAL

Compound	Min. %	Max. %	Observed %	Complies?
α-Thujene	0.2	0.5	0.3	Yes
α-Pinene	1.4	3.0	1.8	Yes
Sabinene	1.4	3.0	1.8	Yes
β-Pinene	7.0	16.0	11.4	Yes
para-Cymene	0.05	0.35	0.23	Yes
Limonene	59.0	75.0	67.0	Yes
γ-Terpinene	6.0	12.0	8.5	Yes
α-Terpineol		0.40	0.12	Yes
Neral	0.2	1.2	0.9	Yes
Geranial	0.5	2.0	1.5	Yes
β-Bisabolene	0.20	0.90	0.50	Yes
Neryl acetate	0.10	0.50	0.41	Yes
Geranyl acetate	tr	0.30	0.30	Yes
Refractive index	1.4730	1.4790	1.4746	Yes

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	0.30	Monoterpene
α-Pinene	1.81	Monoterpene
Camphene	0.06	Monoterpene
β-Pinene	11.42	Monoterpene
Sabinene	1.82	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	1.54	Monoterpene
α-Phellandrene	0.04	Monoterpene
Octanal	0.05	Aliphatic aldehyde
Δ3-Carene	tr	Monoterpene
α-Terpinene	0.18	Monoterpene
para-Cymene	0.23	Monoterpene
1,8-Cineole	0.40	Monoterpenic ether
Limonene	67.05	Monoterpene
(*Z*)-β-Ocimene	0.05	Monoterpene
(*E*)-β-Ocimene	0.10	Monoterpene
γ-Terpinene	8.46	Monoterpene
cis-Sabinene hydrate	0.03	Monoterpenic alcohol
Terpinolene	0.34	Monoterpene
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.07	Monoterpenic alcohol
Nonanal	0.06	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	tr	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
trans-Limonene oxide	tr	Monoterpenic ether
Camphor	tr	Monoterpenic ketone
Citronellal	0.04	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
Isogeranial	0.01	Monoterpenic aldehyde
α-Terpineol	0.12	Monoterpenic alcohol
trans-Piperitol	0.01	Monoterpenic alcohol
Decanal	0.03	Aliphatic aldehyde
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde
Nerol	0.05	Monoterpenic alcohol
2,3-Epoxygeranial?	0.02	Monoterpenic aldehyde
Neral	0.95	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
Perillaldehyde	0.02	Monoterpenic aldehyde
Geranial	1.53	Monoterpenic aldehyde
Undecanal	0.02	Aliphatic aldehyde
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.41	Monoterpenic ester

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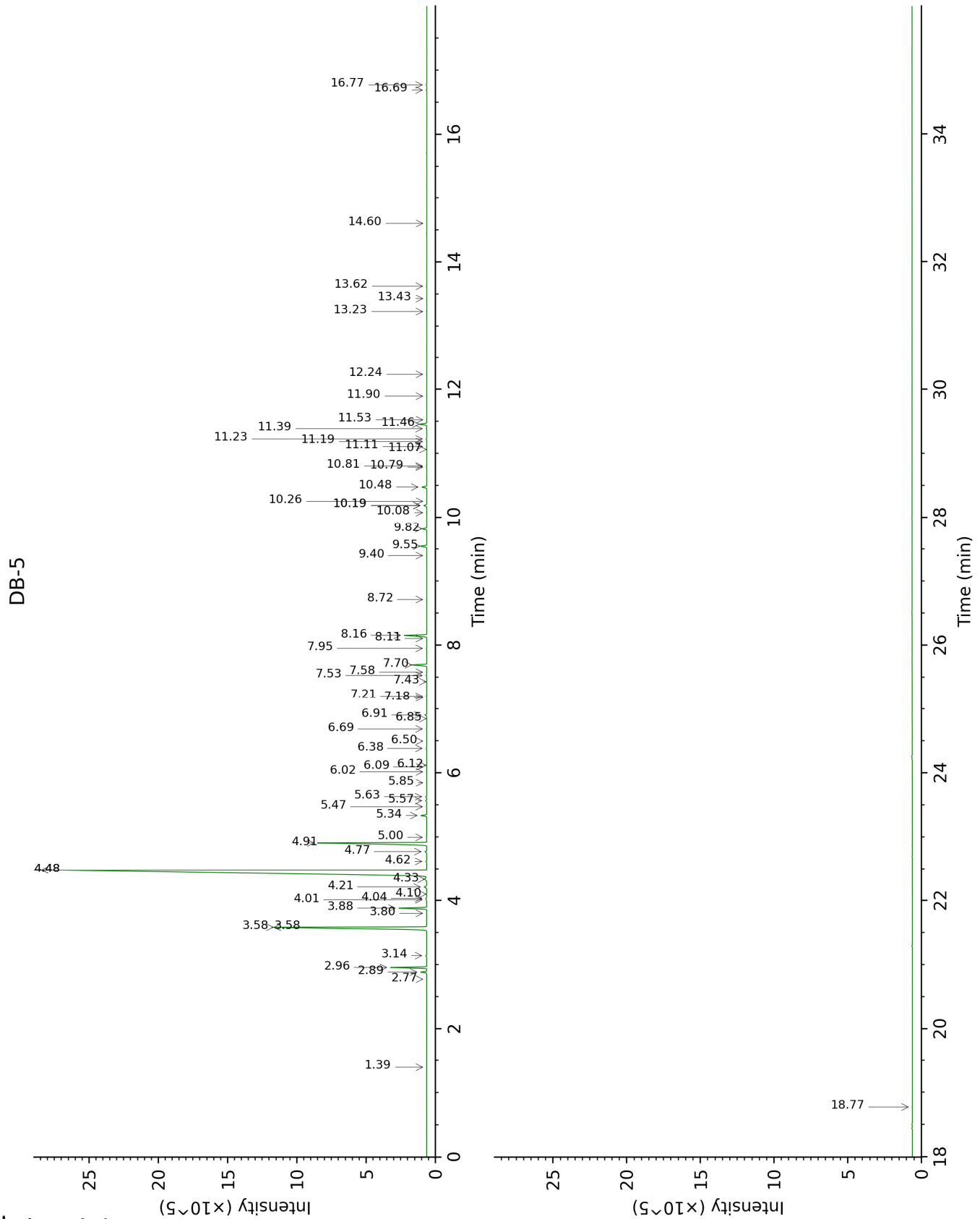| Geranyl acetate	0.30	Monoterpenic ester
Dodecanal	0.02	Aliphatic aldehyde
cis-α-Bergamotene	0.02	Sesquiterpene
β-Caryophyllene	0.17	Sesquiterpene
α-Santalene	0.01	Sesquiterpene
trans-α-Bergamotene	0.33	Sesquiterpene
β-Santalene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.04	Sesquiterpene
β-Selinene	0.01	Sesquiterpene
trans-β-Bergamotene	0.02	Sesquiterpene
Valencene	0.02	Sesquiterpene
Bicyclogermacrene	0.04	Sesquiterpene
(*Z*)-α-Bisabolene	0.05	Sesquiterpene
β-Bisabolene	0.50	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
(*E*)-α-Bisabolene	0.02	Sesquiterpene
Spathulenol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	tr	Oxygenated sesquiterpene
α-Bisabolol	0.02	Sesquiterpenic alcohol
Myristic acid	0.01	Aliphatic acid
Citropten	0.04	Furanocoumarin
Palmitic acid	0.05	Aliphatic acid
Stearic acid	0.01	Aliphatic acid
Consolidated total	**99.09%**	

tr: The compound has been detected below 0.005% of total signal.
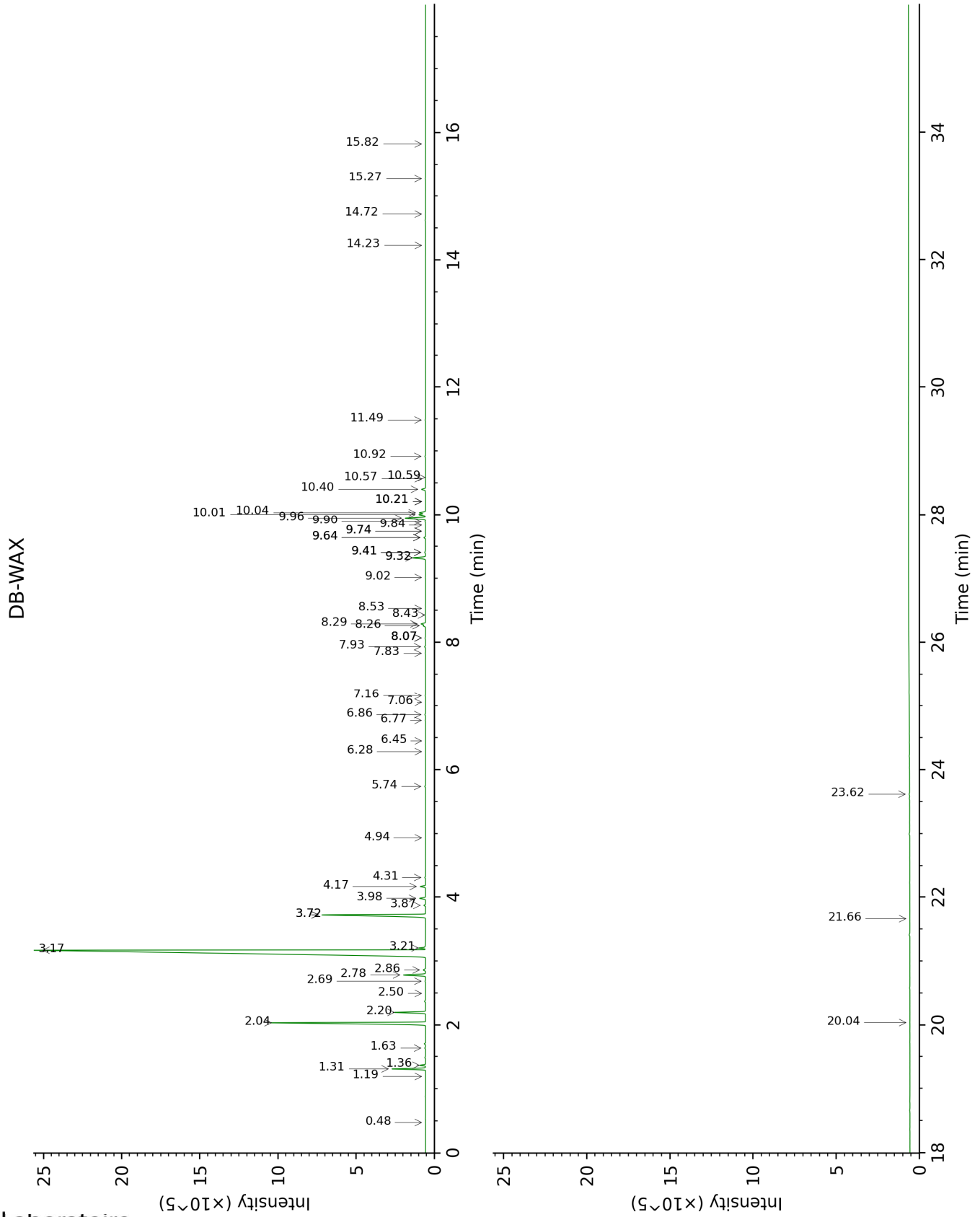
Note: no correction factor was applied

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

16.77 16.69
14.60
13.62 13.43
13.23
12.24
11.90
11.53 11.46
11.39
11.23 11.19 11.11 11.07
10.81 10.79
10.48
10.26 10.19 10.08
9.82
9.40 9.55
8.72
8.16 8.11
7.95
7.53 7.58 7.70
7.43
7.21 7.18
6.91 6.85
6.69
6.38 6.50
6.02 6.09 6.12
5.85
5.47 5.63 5.57
5.34
5.00
4.91
4.77 4.62
4.48
4.33
4.21 4.10
4.01 4.04
3.88 3.80
3.58 3.58
3.14
2.96 2.89
2.77
1.39

18.77

Time (min)

Intensity (×10^5)

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DB-WAX

15.82
15.27
14.72
14.23
11.49
10.92
10.57 10.59
10.40
10.21
10.01 10.04
9.96 9.90
9.64 9.74 9.84
9.41 9.32
9.02
8.53 8.43
8.29 8.26
8.07
7.93 7.83
7.16 7.06
6.86 6.77
6.45
6.28
5.74
4.94
4.31
4.17
3.98
3.72 3.87
3.21
3.17
2.78 2.86
2.69
2.50
2.20
2.04
1.63
1.36
1.31
1.19
0.48

23.62
21.66
20.04

Time (min)

Time (min)

Intensity (×10^5)

Intensity (×10^5)

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Octane	1.39	804	tr	0.48	785	tr
Tricyclene	2.77	919	0.01	1.19	972	0.01
α-Thujene	2.89	927	0.30	1.36	1001	0.31
α-Pinene	2.96	932	1.81	1.31	992	1.87
Camphene	3.14	944	0.06	1.63	1028	0.05
β-Pinene	3.58*	974	13.25	2.04	1069	11.42
Sabinene	3.58*	974	[13.25]	2.20	1085	1.82
6-Methyl-5-hepten-2-one	3.80	988	0.01	4.94	1296	0.01
Myrcene	3.88	994	1.54	2.78	1135	1.52
α-Phellandrene	4.01	1003	0.04	2.69	1127	0.04
Octanal	4.04	1004	0.05	4.31	1250	0.05
Δ3-Carene	4.10	1008	tr	2.50	1112	tr
α-Terpinene	4.21	1016	0.18	2.86	1141	0.18
para-Cymene	4.33	1023	0.23	3.98	1227	0.38
1,8-Cineole	4.48*	1033	67.85	3.21	1168	0.40
Limonene	4.48*	1033	[67.85]	3.17	1165	67.05
(Z)-β-Ocimene	4.62	1041	0.05	3.72*	1208	8.41
(E)-β-Ocimene	4.77	1051	0.10	3.87	1219	0.10
γ-Terpinene	4.91	1060	8.46	3.72*	1208	[8.41]
cis-Sabinene hydrate	5.00	1065	0.03	6.77	1430	0.03
Terpinolene	5.34	1087	0.34	4.17	1240	0.34
trans-Sabinene hydrate	5.47	1096	0.03	7.83	1510	0.03
Linalool	5.57	1102	0.07	7.94	1518	0.07
Nonanal	5.63	1105	0.06	5.74	1354	0.06
trans-para-Mentha-2,8-dien-1-ol	5.85	1119	tr			
cis-Limonene oxide	6.02	1130	0.01	6.28	1394	0.01
trans-Limonene oxide	6.10	1135	tr	6.45	1406	0.01
Camphor	6.12	1137	tr	7.06	1451	0.01
Citronellal	6.38	1154	0.04	6.86	1437	0.05
Borneol	6.50	1161	0.01	9.64*	1653	0.11
Terpinen-4-ol	6.69	1173	0.03	8.43	1556	0.03
Isogeranial	6.85	1184	0.01	8.07*	1528	0.05
α-Terpineol	6.90	1187	0.12	9.64*	1653	[0.11]
trans-Piperitol	7.18	1205	0.01	10.21*	1700	0.01
Decanal	7.20	1207	0.03	7.16	1459	0.03
2,3-Epoxyneral?	7.43	1222	0.01			
Nerol	7.53	1229	0.05	10.92	1760	0.05
2,3-Epoxygeranial?	7.58	1232	0.02			
Neral	7.70	1240	0.95	9.32*	1627	0.94
Geraniol	7.95	1257	0.03	11.49	1809	0.03
Perillaldehyde	8.11	1267	0.02	10.57	1730	0.01

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Compound	R.T.	R.I.	%	R.T.	R.I.	%
Geranial	8.16	1271	1.53	9.96	1679	1.45
Undecanal	8.72	1308	0.02	8.53	1564	0.02
Citronellyl acetate	9.40	1357	0.02	9.32*	1627	[0.94]
Neryl acetate	9.55	1367	0.41	10.04	1686	0.45
Geranyl acetate	9.82	1387	0.30	10.40	1716	0.29
Dodecanal	10.08	1405	0.02	9.84	1669	0.01
cis-α-Bergamotene	10.19*	1413	0.21	8.07*	1528	[0.05]
β-Caryophyllene	10.19*	1413	[0.21]	8.26	1543	0.17
α-Santalene	10.26	1418	0.01	8.07*	1528	[0.05]
trans-α-Bergamotene	10.48	1435	0.33	8.29	1545	0.33
β-Santalene	10.79	1458	0.02	9.02	1602	0.02
(*E*)-β-Farnesene	10.81	1460	0.04	9.41*	1634	0.08
β-Selinene	11.07	1479	0.01	9.74*	1661	0.02
trans-β-Bergamotene	11.11	1482	0.02	9.41*	1634	[0.08]
Valencene	11.19	1488	0.02	9.74*	1661	[0.02]
Bicyclogermacrene	11.23	1491	0.04	9.90	1674	0.04
(*Z*)-α-Bisabolene	11.39	1503	0.05	10.21*	1700	[0.01]
β-Bisabolene	11.46	1508	0.50	10.01	1683	0.49
γ-Cadinene	11.53	1514	0.01	10.21*	1700	[0.01]
(*E*)-α-Bisabolene	11.90	1543	0.02	10.59	1732	0.01
Spathulenol	12.24	1570	0.02	14.23	2062	0.01
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.23	1650	0.01	14.72	2110	0.01
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.43	1667	tr	15.82	2222	0.01
α-Bisabolol	13.62	1682	0.02	15.27	2166	0.02
Myristic acid	14.60	1767	0.01	20.04	2696	tr
Citropten	16.69	1958	0.04	23.62	3164	0.05
Palmitic acid	16.77	1965	0.05	21.66	2899	tr
Stearic acid	18.78	2166	0.01			
Total identified	**99.52%**			**98.94%**		
Total reported	**99.53%**			**98.96%**		

*: Two or more compounds are coeluting on this column

[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
R.T.: Retention time (minutes)
R.I.: Retention index

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