Date : March 06, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

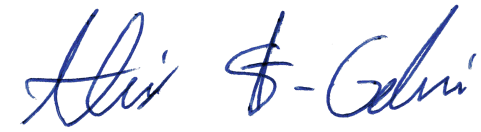
SAMPLE IDENTIFICATION

Internal code : 18B20-PLG15-1-CC
Customer identification : Bergamot
Type : Essential oil
Source : *Citrus aurantium* var. *bergamia*
Customer : Plant Guru

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : February 28, 2018

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow greenish liquid
Refractive index: 1.4650 ± 0.0003 (20 °C)

CONCLUSION

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

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Tricyclene	tr	tr	Monoterpene
α-Thujene	0.18	0.19	Monoterpene
α-Pinene	0.95	0.97	Monoterpene
Camphene	0.04*	0.04	Monoterpene
α-Fenchene	[0.04]*	tr	Monoterpene
β-Pinene	7.85*	6.98	Monoterpene
Sabinene	[7.85]*	0.95	Monoterpene
Myrcene	0.75	0.76	Monoterpene
α-Phellandrene	0.02	0.02	Monoterpene
Octanal	0.03	0.03	Aliphatic aldehyde
Δ3-Carene	tr	tr	Monoterpene
α-Terpinene	0.07	0.07	Monoterpene
para-Cymene	0.21	0.27	Monoterpene
1,8-Cineole	35.60*	0.21*	Monoterpenic ether
β-Phellandrene	[35.60]*	[0.21]*	Monoterpene
Limonene	[35.60]*	35.59	Monoterpene
(*Z*)-β-Ocimene	0.06	6.12*	Monoterpene
(*E*)-β-Ocimene	0.10	0.11	Monoterpene
γ-Terpinene	6.04	[6.12]*	Monoterpene
cis-Sabinene hydrate	0.02	0.05*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.03	0.03	Monoterpenic alcohol
Terpinolene	0.19*	0.15	Monoterpene
trans-Linalool oxide (fur.)	[0.19]*	[0.05]*	Monoterpenic alcohol
trans-Sabinene hydrate	tr	tr	Monoterpenic alcohol
Linalool	11.83	11.87	Monoterpenic alcohol
cis-Limonene oxide	0.02	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	0.01	Monoterpenic ether
Camphor	0.02	0.02	Monoterpenic ketone
Citronellal	0.01	0.01	Monoterpenic aldehyde
Terpinen-4-ol	0.03	0.03	Monoterpenic alcohol
α-Terpineol	0.03	0.04*	Monoterpenic alcohol
Unknown	0.02		Unknown
Decanal	0.01	0.01	Aliphatic aldehyde
Octyl acetate	0.13	0.12	Aliphatic ester
Citronellol	0.06*	0.01	Monoterpenic alcohol
Nerol	[0.06]*	0.02	Monoterpenic alcohol
Neral	0.08	0.06	Monoterpenic aldehyde
Geraniol	31.77*	0.05	Monoterpenic alcohol
Linalyl acetate	[31.77]*	31.27	Monoterpenic ester
Unknown	0.19		Unknown
Geranial	0.13	0.39*	Monoterpenic aldehyde
Bornyl acetate	0.02	0.09	Monoterpenic ester
Unknown	tr		Unknown
cis-para-Mentha-2,8-diene-1-hydroperoxide	tr		Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	0.02		Monoterpenic peroxide
Linalyl propionate	0.01	0.01	Monoterpenic ester

α-Terpinyl acetate	0.01	0.01	Monoterpenic ester
Unknown	0.03		Monoterpenic ester
Neryl acetate	0.42*	[0.39]*	Monoterpenic ester
Hodiendiol derivative III	[0.42]*		Oxygenated monoterpene
Geranyl acetate	0.36	0.35	Monoterpenic ester
Dodecanal	0.01	0.01	Aliphatic aldehyde
β-Caryophyllene	0.10	0.10	Sesquiterpene
cis-α-Bergamotene	0.01	0.01	Sesquiterpene
α-Humulene	0.01	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.01	0.01	Sesquiterpene
Germacrene D	0.01	[0.04]*	Sesquiterpene
(*Z*)-α-Bisabolene	0.09*	tr	Sesquiterpene
Hodiendiol derivative II	[0.09]*		Oxygenated monoterpene
β-Bisabolene	0.07	0.06	Sesquiterpene
(*E*)-Nerolidol	0.01	0.01	Sesquiterpenic alcohol
Nootkatone	0.02	0.02	Sesquiterpenic ketone
Citropten	0.10		Furanocoumarin
Unknown	0.09		Unknown
Bergapten	0.08		Furanocoumarin
Linoleic acid	0.05	0.06	Aliphatic acid
Oleic acid	0.06	0.06	Aliphatic acid
Total identified	**97.74%**	**97.22%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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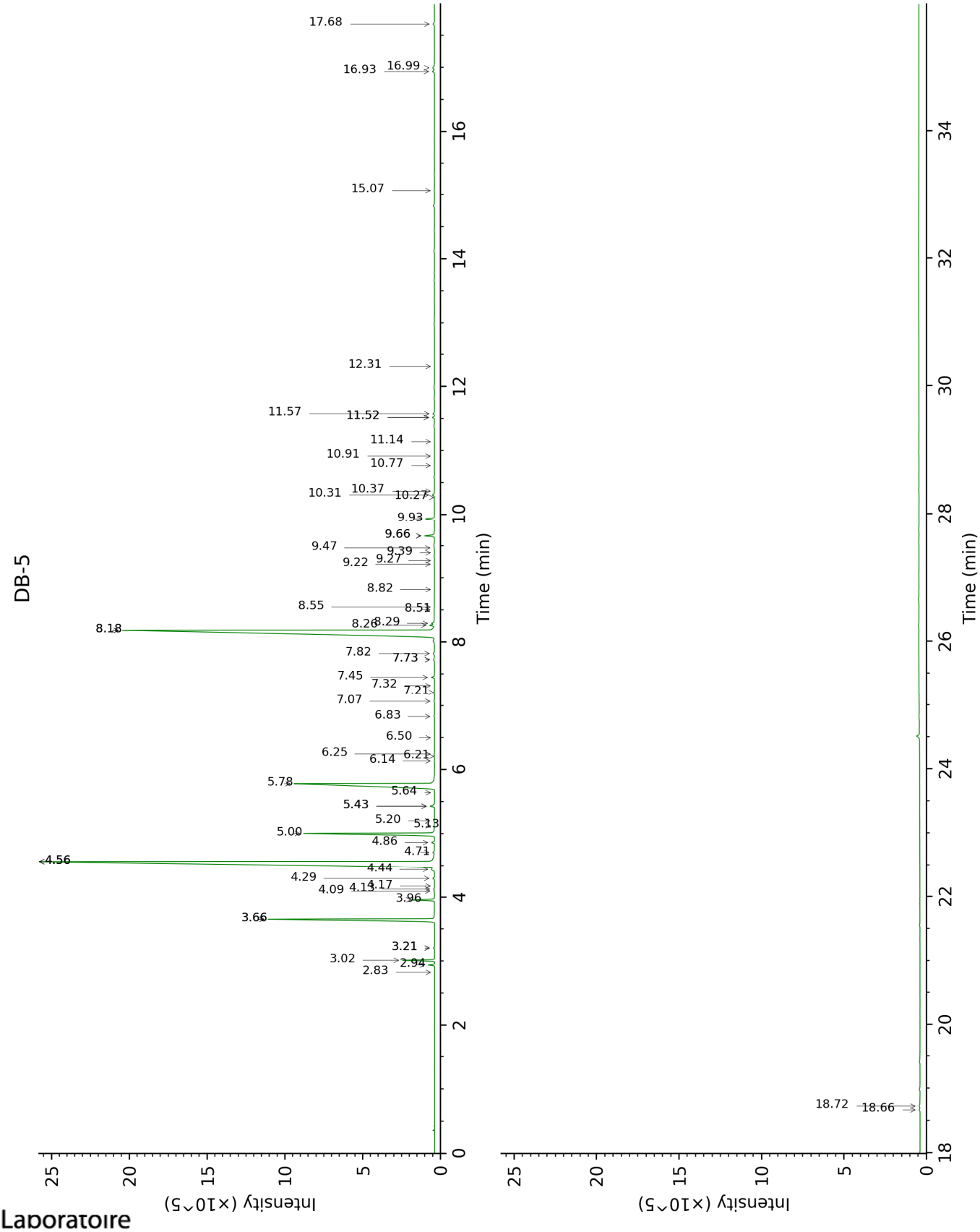
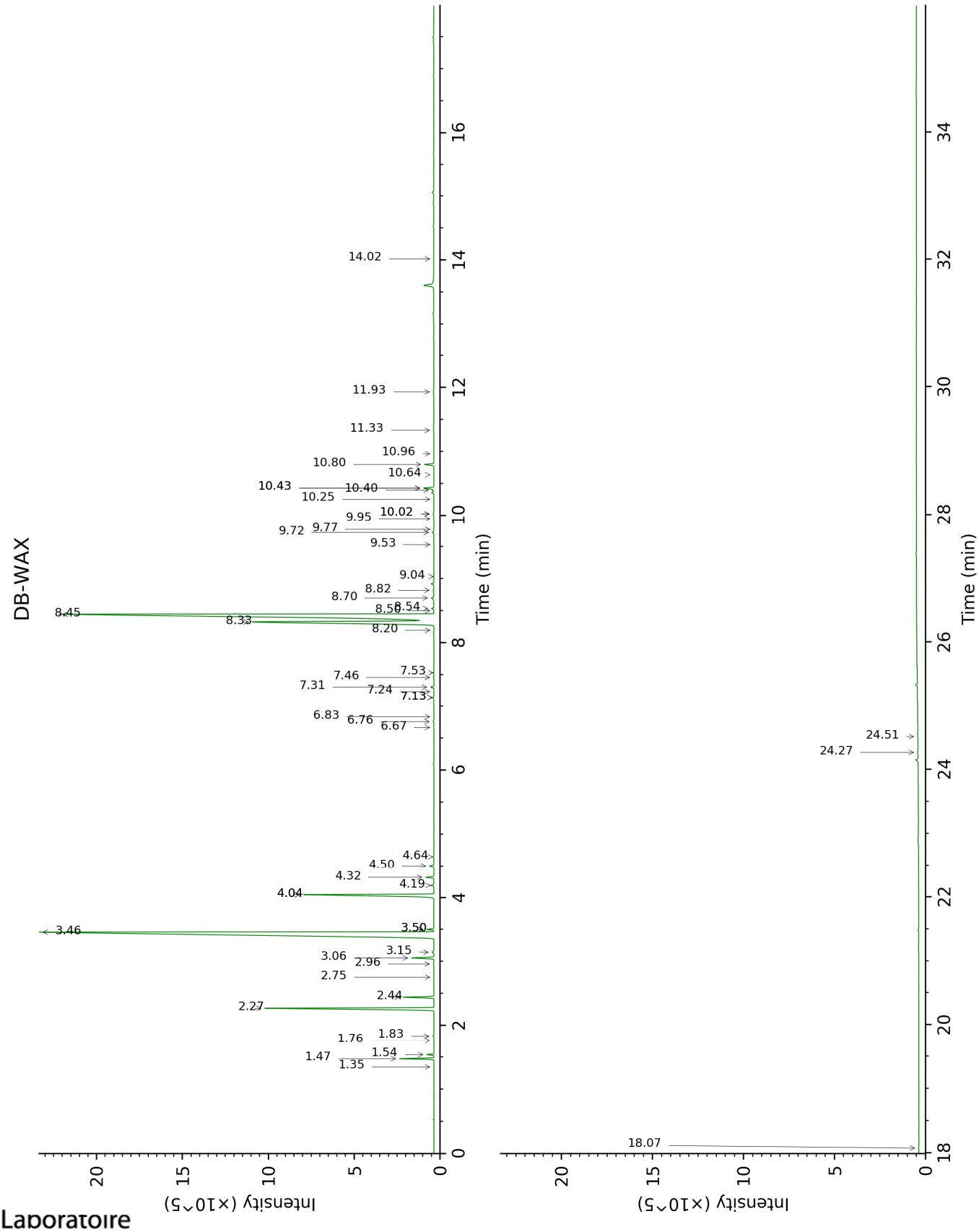

DB-5
17.68
16.93
16.99
15.07
12.31
11.57
11.52
11.14
10.91
10.77
10.31
10.37
10.27
9.93
9.66
9.47
9.39
9.22
9.27
8.82
8.55
8.51
8.18
8.26
8.29
7.82
7.73
7.45
7.32
7.21
7.07
6.83
6.50
6.25
6.14
6.21
5.78
5.64
5.43
5.20
5.13
5.00
4.86
4.71
4.56
4.44
4.29
4.09
4.15
4.17
3.96
3.66
3.21
3.02
2.94
2.83
18.72
18.66
Time (min)
Intensity (×10^5)


DB-WAX
Intensity (×10^5)
Time (min)
14.02
11.93
11.33
10.96
10.80
10.64
10.43
10.40
10.25
10.02
9.95
9.77
9.72
9.53
9.04
8.82
8.70
8.54
8.45
8.33
8.20
7.53
7.46
7.31
7.24
7.13
6.83
6.76
6.67
4.64
4.50
4.32
4.19
4.04
3.50
3.46
3.15
3.06
2.96
2.75
2.44
2.27
1.83
1.76
1.54
1.47
1.35
24.51
24.27
18.07

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Tricyclene	2.83	913	tr	1.35	975	tr
α-Thujene	2.94	920	0.18	1.54	1002	0.19
α-Pinene	3.02	925	0.95	1.47	995	0.97
Camphene	3.21*	938	0.04	1.83	1030	0.04
α-Fenchene	3.21*	938	[0.04]	1.76	1023	tr
β-Pinene	3.66*	968	7.85	2.27	1071	6.98
Sabinene	3.66*	968	[7.85]	2.44	1087	0.95
Myrcene	3.96	988	0.75	3.06	1135	0.76
α-Phellandrene	4.10	997	0.02	2.96	1128	0.02
Octanal	4.13	999	0.03	4.64	1251	0.03
Δ3-Carene	4.17	1002	tr	2.76	1112	tr
α-Terpinene	4.29	1010	0.07	3.15	1142	0.07
para-Cymene	4.44	1019	0.21	4.32	1228	0.27
1,8-Cineole	4.56*	1027	35.60	3.50*	1168	0.21
β-Phellandrene	4.56*	1027	[35.60]	3.50*	1168	[0.21]
Limonene	4.56*	1027	[35.60]	3.46	1165	35.59
(*Z*)-β-Ocimene	4.71	1036	0.06	4.04*	1209	6.12
(*E*)-β-Ocimene	4.86	1046	0.10	4.19	1219	0.11
γ-Terpinene	5.00	1054	6.04	4.04*	1209	[6.12]
cis-Sabinene hydrate	5.13	1062	0.02	7.13*	1430	0.05
cis-Linalool oxide (fur.)	5.20	1067	0.03	6.76	1402	0.03
Terpinolene	5.43*	1081	0.19	4.50	1241	0.15
trans-Linalool oxide (fur.)	5.43*	1081	[0.19]	7.13*	1430	[0.05]
trans-Sabinene hydrate	5.64	1094	tr	8.20	1509	tr
Linalool	5.78	1103	11.83	8.33	1519	11.87
cis-Limonene oxide	6.14	1126	0.02	6.67	1395	0.01
trans-Limonene oxide	6.21	1130	0.01	6.84	1408	0.01
Camphor	6.24	1133	0.02	7.46	1454	0.02
Citronellal	6.50	1149	0.01	7.24	1437	0.01
Terpinen-4-ol	6.83	1170	0.03	8.82	1557	0.03
α-Terpineol	7.07	1185	0.03	10.02*	1652	0.04
Unknown [m/z 43, 71 (80), 67 (55), 59 (51), 68 (44), 41 (43)...]	7.21	1194	0.02			
Decanal	7.32	1201	0.01	7.53	1459	0.01
Octyl acetate	7.45	1210	0.13	7.31	1442	0.12
Citronellol	7.73*	1228	0.06	10.96	1729	0.01
Nerol	7.73*	1228	[0.06]	11.33	1760	0.02
Neral	7.82	1235	0.08	9.72	1628	0.06
Geraniol	8.18*†	1259	31.77	11.93	1812	0.05
Linalyl acetate	8.18*†	1259	[31.77]	8.45	1528	31.27

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Unknown [m/z 43, 111 (47), 93 (41), 55 (28), 67 (23), 41 (22)...]	8.26	1264	0.19			
Geranial	8.29	1266	0.13	10.43*	1684	0.39
Bornyl acetate	8.51	1281	0.02	8.54	1535	0.09
Unknown [m/z 43, 121 (74), 93 (42), 95 (38), 107 (29), 41 (29), 136 (28)...]	8.55	1283	tr			
cis-para-Mentha-2,8-diene-1-hydroperoxide	8.82	1302	tr			
para-Mentha-1,8-diene-4-hydroperoxide	9.22	1330	0.02			
Linalyl propionate	9.27	1334	0.01	9.04	1573	0.01
α-Terpinyl acetate	9.39	1342	0.01	9.95	1646	0.01
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.47	1347	0.03			
Neryl acetate	9.66*	1361	0.42	10.43*	1684	[0.39]
Hodiendiol derivative III	9.66*	1361	[0.42]			
Geranyl acetate	9.93	1380	0.36	10.80	1715	0.35
Dodecanal	10.27	1404	0.01	10.25	1670	0.01
β-Caryophyllene	10.31	1407	0.10	8.70	1547	0.10
cis-α-Bergamotene	10.37	1411	0.01	8.50	1532	0.01
α-Humulene	10.77	1441	0.01	9.53	1612	0.01
(*E*)-β-Farnesene	10.91	1452	0.01	9.77	1632	0.01
Germacrene D	11.14	1468	0.01	10.02*	1652	[0.04]
(*Z*)-α-Bisabolene	11.52*	1496	0.09	10.64	1702	tr
Hodiendiol derivative II	11.52*	1496	[0.09]			
β-Bisabolene	11.57	1501	0.07	10.40	1682	0.06
(*E*)-Nerolidol	12.31	1558	0.01	14.02	2000	0.01
Nootkatone	15.07	1787	0.02	18.08	2416	0.02
Citropten	16.94	1958	0.10			
Unknown [m/z 266, 43 (89), 44 (67), 176 (49), 207 (44), 55 (38)...]	16.99	1964	0.09			

Bergapten	17.68	2030	0.08			
Linoleic acid	18.66	2129	0.05	24.51	3229	0.06
Oleic acid	18.72	2135	0.06	24.27	3193	0.06
Total identified		**97.74%**			**97.22%**	
Total reported		**98.08%**			**97.22%**	

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

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