



GC/MS BATCH NUMBER: BQ0102

ESSENTIAL OIL: BERGAMOT ORGANIC
BOTANICAL NAME: CITRUS BERGAMIA
ORIGIN: ITALY

KEY CONSTITUENTS PRESENT IN THIS BATCH OF BERGAMOT ORGANIC OIL	%
LIMONENE	36.3
LINALYL ACETATE	33.2
LINALOOL	12.1
γ-TERPINENE	6.5
β-PINENE	6.1
α-PINENE	1.0

Comments from Robert Tisserand: Very fine clean, mellow-citrus odor quality. Constituents are in expected amounts for bergapten-free Bergamot oil.

Date : May 11, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18D30-PTH5-1-CC

Customer identification : Bergamot BF Organic - Italy – BQ010282R

Type : Essential oil

Source : *Citrus bergamia*

Customer : Plant Therapy

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 : May 08, 2018

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4620 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.05	0.07	Aliphatic alcohol
Toluene	tr	tr	Simple phenolic
Tricyclene	tr	tr	Monoterpene
α -Thujene	0.04	0.04	Monoterpene
α -Pinene	1.02	1.02	Monoterpene
α -Fenchene	0.02*	tr	Monoterpene
Camphene	[0.02]*	0.02	Monoterpene
Sabinene	6.60*	0.56	Monoterpene
β -Pinene	[6.60]*	6.05	Monoterpene
Myrcene	0.84	0.85	Monoterpene
α -Phellandrene	0.02*	0.02	Monoterpene
Pseudolimonene	[0.02]*	0.01	Monoterpene
Octanal	0.10	0.09	Aliphatic aldehyde
Δ^3 -Carene	0.04	0.04	Monoterpene
α -Terpinene	0.05	0.05	Monoterpene
para-Cymene	36.83	0.49	Monoterpene
Limonene	[36.83]*	36.31	Monoterpene
1,8-Cineole	[36.83]*	0.13*	Monoterpenic ether
β -Phellandrene	[36.83]*	[0.13]*	Monoterpene
(Z)- β -Ocimene	0.01	6.50*	Monoterpene
(E)- β -Ocimene	0.06	0.06	Monoterpene
γ -Terpinene	6.47	[6.50]*	Monoterpene
cis-Sabinene hydrate	0.03	0.07*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.03	0.03	Monoterpenic alcohol
Isoterpinolene	0.01	tr	Monoterpene
Terpinolene	0.11*	0.07	Monoterpene
trans-Linalool oxide (fur.)	[0.11]*	[0.07]*	Monoterpenic alcohol
Linalool	12.01*	12.06	Monoterpenic alcohol
Nonanal	[12.01]*	0.01	Aliphatic aldehyde
cis-Limonene oxide	0.01	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	tr	Monoterpenic ether
Camphor	0.01	0.01	Monoterpenic ketone
Citronellal	tr	tr	Monoterpenic aldehyde
Terpinen-4-ol	tr	tr	Monoterpenic alcohol
α -Terpineol	0.01	0.02*	Monoterpenic alcohol
γ -Terpineol	0.01	tr	Monoterpenic alcohol
Unknown	tr		Unknown
Decanal	0.01	tr	Aliphatic aldehyde
Octyl acetate	0.14	0.14	Aliphatic ester
Nerol	0.01	tr	Monoterpenic alcohol
Citronellol	0.05	0.05	Monoterpenic alcohol
Neral	0.23	0.21	Monoterpenic aldehyde
Linalyl acetate	33.37*	33.19*	Monoterpenic ester
Geraniol	[33.37]*	0.02	Monoterpenic alcohol
Unknown	[33.37]*		Unknown
Geranial	0.45	0.32	Monoterpenic aldehyde
Bornyl acetate	tr	tr	Monoterpenic ester
Unknown	0.02		Unknown

<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.01		Monoterpenic peroxide
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	tr		Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	tr		Monoterpenic peroxide
Linalyl propionate	0.01	0.01	Monoterpenic ester
γ-Terpinyl acetate	0.02	0.02	Monoterpenic ester
Unknown	0.05		Monoterpenic ester
Hodiendiol derivative III	0.31*		Oxygenated monoterpene
Neryl acetate	[0.31]*	0.30	Monoterpenic ester
Geranyl acetate	0.26	0.26	Monoterpenic ester
Dodecanal	tr	0.01	Aliphatic aldehyde
<i>cis</i> -α-Bergamotene	0.13*	[33.19]*	Sesquiterpene
β-Caryophyllene	[0.13]*	0.12	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.02	0.02	Sesquiterpene
α-Humulene	tr	tr	Sesquiterpene
(<i>E</i>)-β-Farnesene	0.01	tr	Sesquiterpene
Germacrene D	tr	[0.02]*	Sesquiterpene
(<i>Z</i>)-α-Bisabolene	0.03	tr	Sesquiterpene
Hodiendiol derivative II	tr		Oxygenated monoterpene
β-Bisabolene	0.02	0.02	Sesquiterpene
(<i>E</i>)-Nerolidol	tr	tr	Sesquiterpenic alcohol
α-Bisabolol	tr	tr	Sesquiterpenic alcohol
Stearic acid	tr	tr	Aliphatic acid
Total identified	99.48%	99.31%	

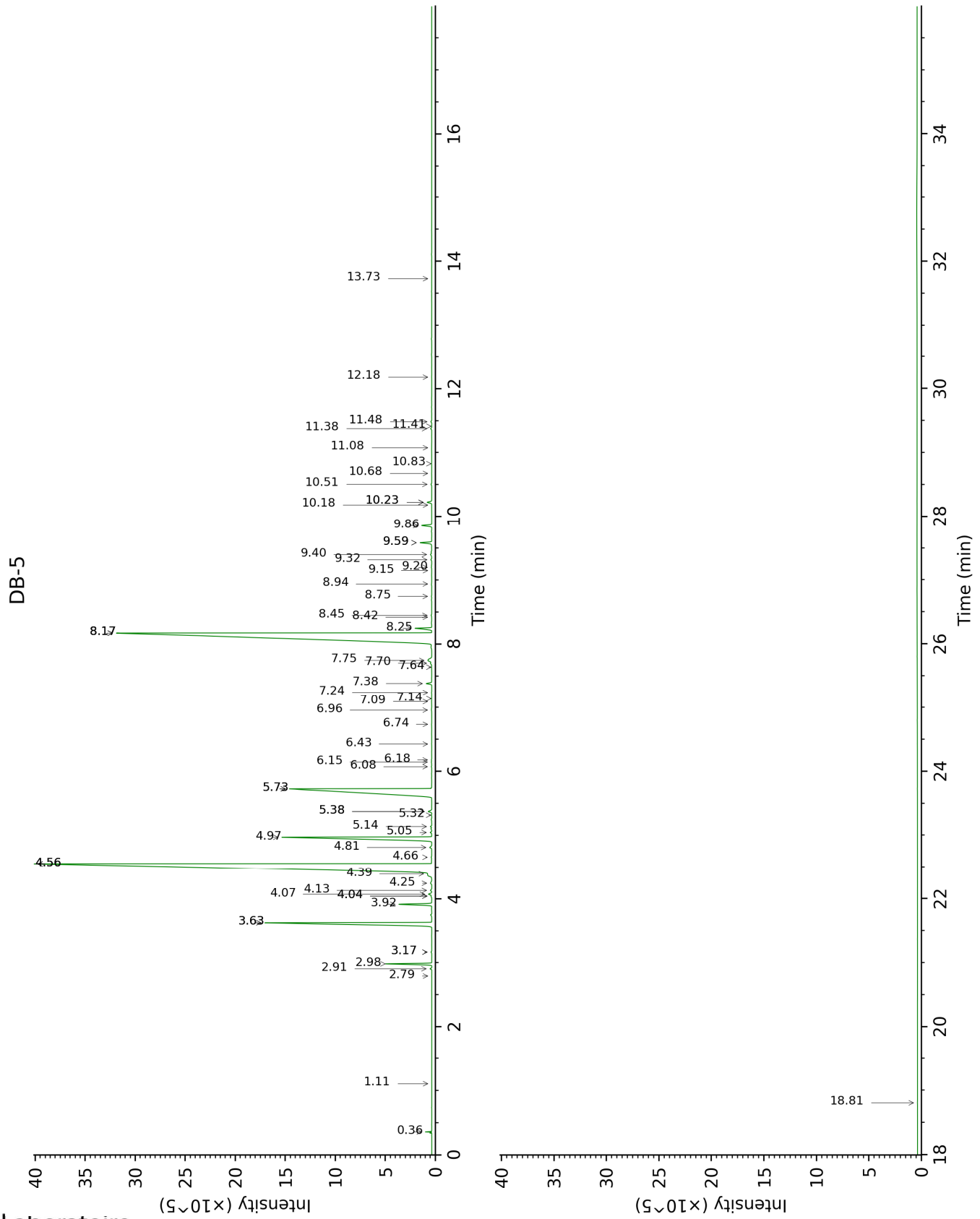
*: Two or more compounds are coeluting on this column

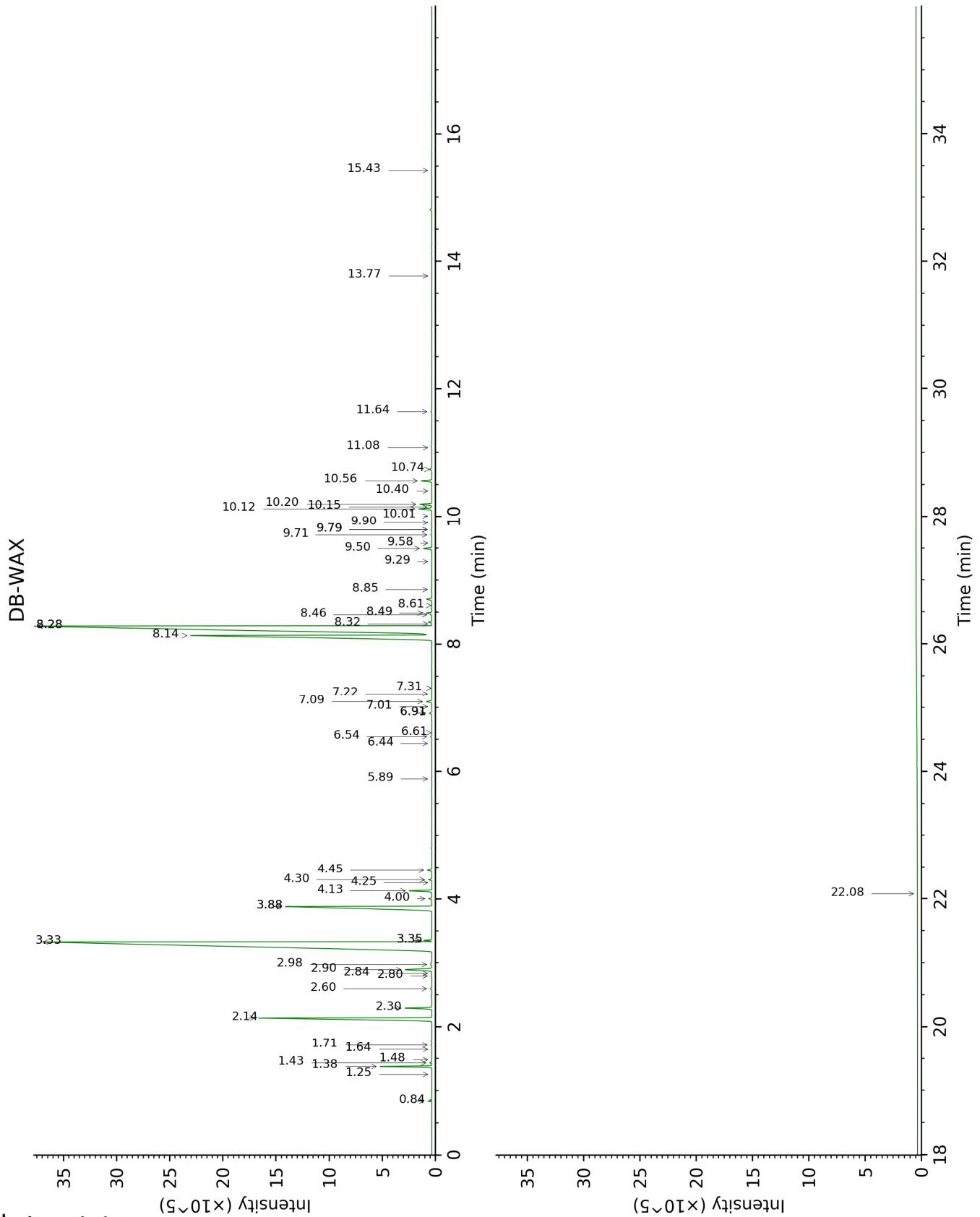
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.36	496	0.05	0.84	905	0.07
Toluene	1.11	752	tr	1.48	1006	tr
Tricyclene	2.80	914	tr	1.25	973	tr
α -Thujene	2.91	922	0.04	1.43	1002	0.04
α -Pinene	2.98	927	1.02	1.38	994	1.02
α -Fenchene	3.17*	939	0.02	1.64	1023	tr
Camphene	3.17*	939	[0.02]	1.71	1029	0.02
Sabinene	3.63*	970	6.60	2.30	1087	0.56
β -Pinene	3.63*	970	[6.60]	2.14	1072	6.05
Myrcene	3.92	990	0.84	2.90	1136	0.85
α -Phellandrene	4.04*	998	0.02	2.80	1128	0.02
Pseudolimonene	4.04*	998	[0.02]	2.84	1132	0.01
Octanal	4.07	1000	0.10	4.45	1251	0.09
Δ 3-Carene	4.13	1004	0.04	2.60	1113	0.04
α -Terpinene	4.24	1011	0.05	2.98	1142	0.05
para-Cymene	4.39†	1020	36.83	4.13	1228	0.49
Limonene	4.56*†	1031	[36.83]	3.33	1170	36.31
1,8-Cineole	4.56*†	1031	[36.83]	3.35*	1171	0.13
β -Phellandrene	4.56*†	1031	[36.83]	3.35*	1171	[0.13]
(Z)- β -Ocimene	4.66	1037	0.01	3.88*	1211	6.50
(E)- β -Ocimene	4.81	1047	0.06	4.00	1220	0.06
γ -Terpinene	4.97	1057	6.47	3.88*	1211	[6.50]
cis-Sabinene hydrate	5.05	1062	0.03	6.91*	1430	0.07
cis-Linalool oxide (fur.)	5.14	1068	0.03	6.54	1402	0.03
Isoterpinolene	5.32	1079	0.01	4.25	1237	tr
Terpinolene	5.38*	1083	0.11	4.30	1241	0.07
trans-Linalool oxide (fur.)	5.38*	1083	[0.11]	6.91*	1430	[0.07]
Linalool	5.73*	1105	12.01	8.14	1521	12.06
Nonanal	5.73*	1105	[12.01]	5.89	1355	0.01
cis-Limonene oxide	6.08	1127	0.01	6.44	1394	0.01
trans-Limonene oxide	6.15	1132	0.01	6.60	1407	tr
Camphor	6.18	1134	0.01	7.22	1452	0.01
Citronellal	6.43	1150	tr	7.02	1437	tr
Terpinen-4-ol	6.74	1170	tr	8.61	1558	tr
α -Terpineol	6.96	1184	0.01	9.79*	1652	0.02
γ -Terpineol	7.10	1193	0.01	9.90	1661	tr
Unknown [m/z 43, 71 (80), 67 (55), 59 (51), 68 (44), 41 (43)...]	7.14	1196	tr			
Decanal	7.24	1202	0.01	7.31	1459	tr
Octyl acetate	7.38	1212	0.14	7.09	1443	0.14
Nerol	7.64	1229	0.01	11.08	1759	tr

Citronellol	7.70	1234	0.05	10.74	1730	0.05
Neral	7.75	1236	0.23	9.50	1628	0.21
Linalyl acetate	8.17*	1265	33.37	8.28*	1533	33.19
Geraniol	8.17*	1265	[33.37]	11.64	1807	0.02
Unknown [m/z 43, 111 (47), 93 (41), 55 (28), 67 (23), 41 (22)...]	8.17*	1265	[33.37]			
Geranial	8.25	1270	0.45	10.12	1679	0.32
Bornyl acetate	8.42	1282	tr	8.32	1535	tr
Unknown [m/z 43, 121 (74), 93 (42), 95 (38), 107 (29), 41 (29), 136 (28)...]	8.45	1284	0.02			
<i>cis</i> -para-Mentha- 2,8-diene-1- hydroperoxide	8.75	1304	0.01			
<i>trans</i> -para- Mentha-2,8- diene-1- hydroperoxide	8.94	1318	tr			
para-Mentha- 1,8-diene-4- hydroperoxide	9.15	1332	tr			
Linalyl propionate	9.20	1336	0.01	8.85	1577	0.01
γ-Terpinyl acetate	9.32	1344	0.02	9.71	1645	0.02
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.40	1350	0.05			
Hodiendiol derivative III	9.58*	1363	0.31			
Neryl acetate	9.58*	1363	[0.31]	10.20	1685	0.30
Geranyl acetate	9.86	1382	0.26	10.56	1715	0.26
Dodecanal	10.18	1406	tr	10.01	1670	0.01
<i>cis</i> -α- Bergamotene	10.23*	1409	0.13	8.28*	1533	[33.19]
β-Caryophyllene	10.23*	1409	[0.13]	8.49	1548	0.12
<i>trans</i> -α- Bergamotene	10.51	1430	0.02	8.46	1546	0.02
α-Humulene	10.68	1443	tr	9.29	1611	tr
(<i>E</i>)-β-Farnesene	10.83	1454	0.01	9.58	1635	tr
Germacrene D	11.08	1473	tr	9.79*	1652	[0.02]
(<i>Z</i>)-α-Bisabolene	11.38	1495	0.03	10.40	1702	tr
Hodiendiol derivative II	11.41	1498	tr			
β-Bisabolene	11.48	1503	0.02	10.15	1681	0.02
(<i>E</i>)-Nerolidol	12.18	1558	tr	13.77	2001	tr

α -Bisabolol	13.73	1684	tr	15.43	2163	tr
Stearic acid	18.81	2161	tr	22.08	2932	tr
Total identified		99.48%			99.31%	
Total reported		99.55%			99.31%	

*: 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