

Date : October 18, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18J11-PTH2-1-CC

Customer identification : HoneyBell - HA410188R

Type : Essential oil

Source : Blend of oils

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 : October 18, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid

Refractive index: 1.4720 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. Sinensals confirm the presence of orange oil, and nootkatone that of grapefruit. Ethyl decanoate comes from cognac oil.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethyl acetate	tr	tr	Aliphatic ester
Diethyl acetal	tr	0.01	Aliphatic acetal
Isoamyl alcohol	0.01	0.02*	Aliphatic alcohol
2-Methylbutanol	tr	tr	Aliphatic alcohol
Hexanal	0.01	0.01	Aliphatic aldehyde
Ethyl butyrate	0.04	0.04	Aliphatic ester
(2E)-Hexenal	0.01	[0.02]*	Aliphatic aldehyde
Heptanal	tr	tr	Aliphatic aldehyde
α -Thujene	tr	tr	Monoterpene
α -Pinene	0.49	0.49	Monoterpene
Camphene	tr	tr	Monoterpene
Sabinene	0.46*	0.37	Monoterpene
β -Pinene	[0.46]*	0.10	Monoterpene
Myrcene	1.72	1.74	Monoterpene
Octanal	0.28	0.27	Aliphatic aldehyde
Δ 3-Carene	0.13	0.13	Monoterpene
para-Cymene	93.27*	0.03	Monoterpene
β -Phellandrene	[93.27]*	92.85*	Monoterpene
1,8-Cineole	[93.27]*	0.24	Monoterpenic ether
Limonene	[93.27]*	[92.85]*	Monoterpene
(E)- β -Ocimene	0.04	0.05	Monoterpene
γ -Terpinene	0.04	0.05	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Octanol	0.04	0.06*	Aliphatic alcohol
Terpinolene	0.05*	0.05	Monoterpene
Isoterpinolene	[0.05]*	0.01	Monoterpene
6,7-Epoxymyrcene	0.01	tr	Monoterpenic ether
Linalool	0.47*	0.43	Monoterpenic alcohol
Nonanal	[0.47]*	0.04	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.03	0.03	Monoterpenic alcohol
cis-Limonene oxide	0.06	0.06	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.03	0.10*	Monoterpenic alcohol
trans-Limonene oxide	0.03*	0.04	Monoterpenic ether
neoiso-Thujol	[0.03]*	0.01	Monoterpenic alcohol
Citronellal	0.04*	0.06*	Monoterpenic aldehyde
Menthone	[0.04]*	0.01	Monoterpenic ketone
Isomenthone	0.01	[0.06]*	Monoterpenic ketone
Unknown	0.01		Unknown
Terpinen-4-ol	0.02	0.01	Monoterpenic alcohol
α -Terpineol	0.09	0.09	Monoterpenic alcohol
Ethyl octanoate	0.01	0.02	Aliphatic ester
Decanal	0.25	0.23	Aliphatic aldehyde
Octyl acetate	0.02	0.02	Aliphatic ester
trans-Carveol	0.03	0.05	Monoterpenic alcohol
Nerol	0.01	0.01	Monoterpenic alcohol
Citronellol	0.05	0.01	Monoterpenic alcohol
Carvone	0.10*	0.07*	Monoterpenic ketone
Neral	[0.10]*	[0.10]*	Monoterpenic aldehyde

Geraniol	0.01	0.01	Monoterpenic alcohol
(2E)-Decenal	0.01	0.01	Aliphatic aldehyde
Isopiperitenone	0.01	0.01	Monoterpenic ketone
Geranial	0.11*	0.08*	Monoterpenic aldehyde
Perillaldehyde	[0.11]*	0.01	Monoterpenic aldehyde
Limonen-10-ol	0.02	0.02	Monoterpenic alcohol
Undecanal	0.01	0.01	Aliphatic aldehyde
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.03		Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	0.02		Monoterpenic peroxide
Limonene hydroperoxide IV	tr		Monoterpenic peroxide
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	0.02		Monoterpenic peroxide
α -Copaene	0.02	0.03	Sesquiterpene
<i>cis</i> -para-Mentha-6,8-diene-2-hydroperoxide	0.01		Monoterpenic peroxide
Geranyl acetate	0.02	0.04	Monoterpenic ester
β -Elemene	0.03	0.08*	Sesquiterpene
Ethyl decanoate	0.19	0.17*	Aliphatic ester
Dodecanal	0.04	0.03	Aliphatic aldehyde
β -Caryophyllene	0.07*	[0.08]*	Sesquiterpene
<i>cis</i> - α -Bergamotene	[0.07]*	[0.06]*	Sesquiterpene
β -Copaene	0.02	0.03	Sesquiterpene
(Z)- β -Farnesene?	0.01	[0.17]*	Sesquiterpene
Isoamyl octanoate	0.02*		Aliphatic ester
α -Humulene	[0.02]*	0.01	Sesquiterpene
Germacrene D	0.02	0.02	Sesquiterpene
Bicyclogermacrene	0.14*	[0.08]*	Sesquiterpene
Valencene	[0.14]*	0.13	Sesquiterpene
α -Muurolene	0.01	[0.07]*	Sesquiterpene
β -Bisabolene	0.01	0.01	Sesquiterpene
(3E,6E)- α -Farnesene	0.01	0.02	Sesquiterpene
δ -Cadinene	0.03	0.04	Sesquiterpene
α -Elemol	0.01	0.01	Sesquiterpenic alcohol
Germacrene D-4-ol	0.01*	0.01	Sesquiterpenic alcohol
Spathulenol	[0.01]*	tr	Sesquiterpenic alcohol
Dodecanoic acid	0.01	0.02	Aliphatic acid
Ethyl dodecanoate	0.10	0.11	Aliphatic ester
β -Sinensal	0.02	0.02	Sesquiterpenic aldehyde
α -Sinensal	0.01	0.01	Sesquiterpenic aldehyde
Nootkatone	0.07	0.05	Sesquiterpenic ketone
Palmitic acid	0.02	0.01	Aliphatic acid
Meranzin	0.01		Coumarin
Total identified	99.09%	98.78%	

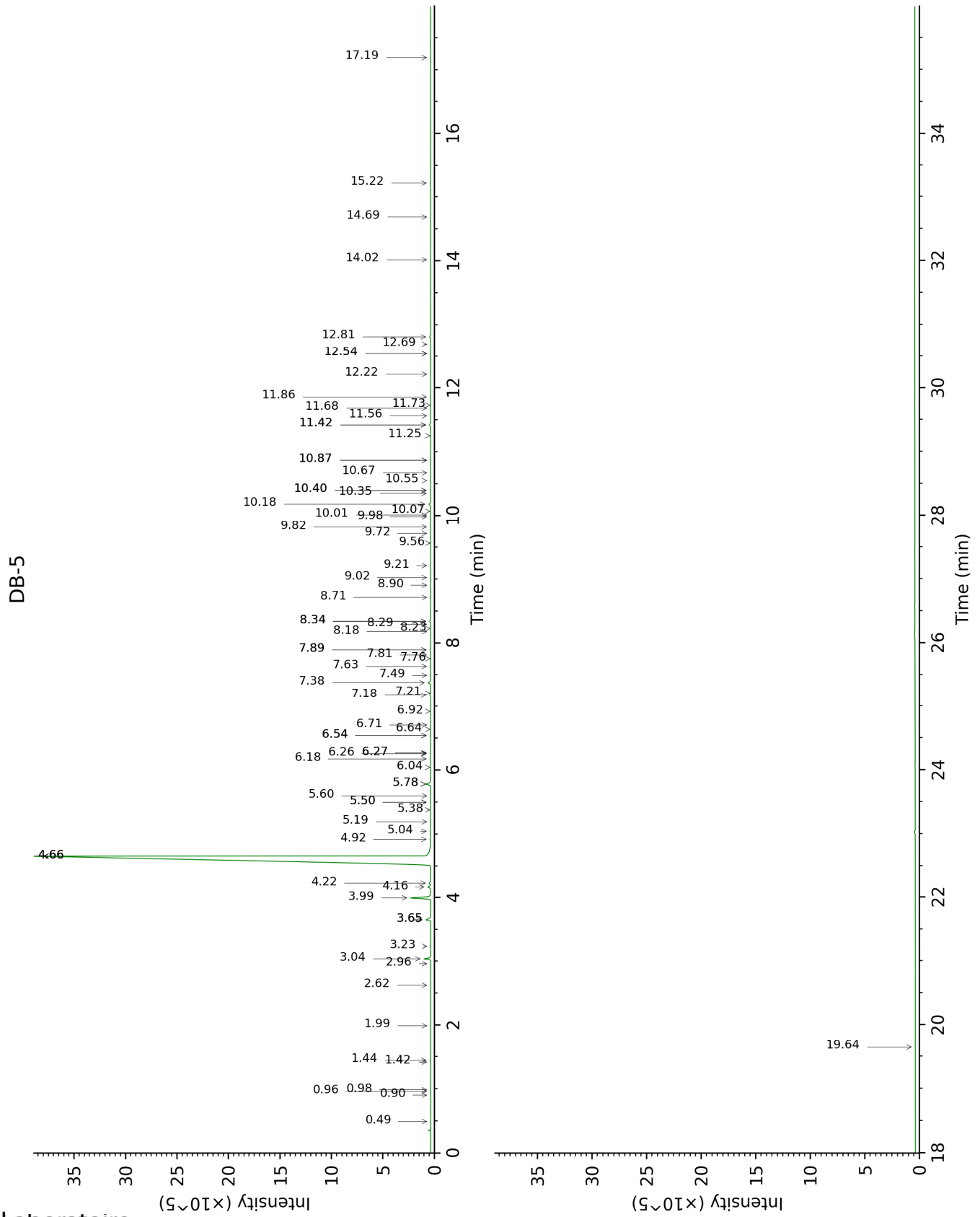
*: Two or more compounds are coeluting on this column

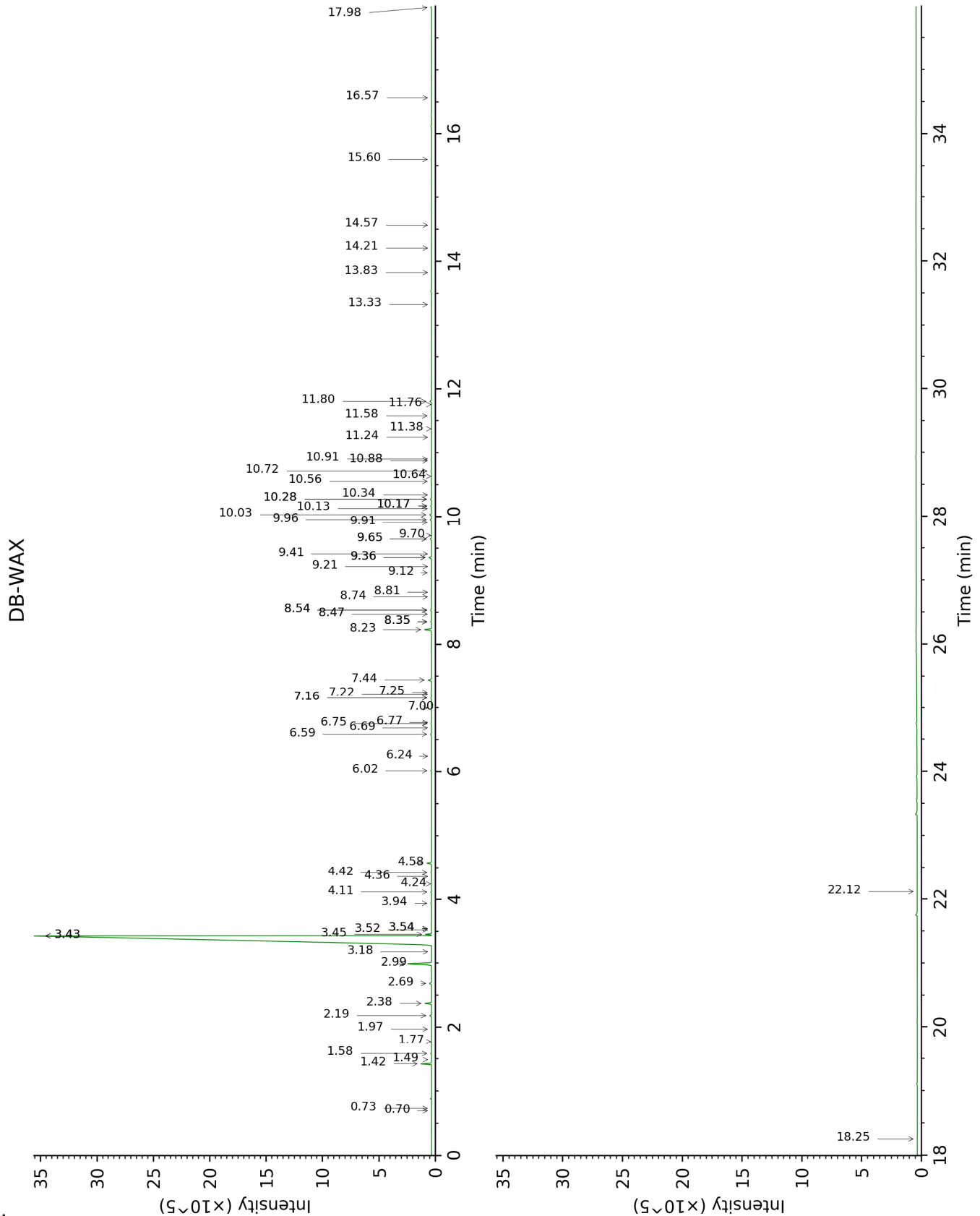
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Ethyl acetate	0.49	604	tr	0.70	858	tr
Diethyl acetal	0.90	724	tr	0.73	870	0.01
Isoamyl alcohol	0.96	733	0.01	3.54*	1178	0.02
2-Methylbutanol	0.98	736	tr	3.52	1176	tr
Hexanal	1.42	797	0.01	1.97	1047	0.01
Ethyl butyrate	1.44	801	0.04	1.58	1010	0.04
(2E)-Hexenal	1.99	849	0.01	3.54*	1178	[0.02]
Heptanal	2.62	902	tr	3.18	1150	tr
α -Thujene	2.96	924	tr	1.49	1001	tr
α -Pinene	3.04	930	0.49	1.42	992	0.49
Camphene	3.24	942	tr	1.77	1028	tr
Sabinene	3.65*	969	0.46	2.38	1085	0.37
β -Pinene	3.65*	969	[0.46]	2.18	1067	0.10
Myrcene	3.99	992	1.72	2.99	1135	1.74
Octanal	4.16	1003	0.28	4.58	1256	0.27
Δ 3-Carene	4.22	1007	0.13	2.69	1112	0.13
para-Cymene	4.66*	1033	93.27	4.24	1231	0.03
β -Phellandrene	4.66*	1033	[93.27]	3.43*	1169	92.85
1,8-Cineole	4.66*	1033	[93.27]	3.45	1171	0.24
Limonene	4.66*	1033	[93.27]	3.43*	1169	[92.85]
(E)- β -Ocimene	4.92	1050	0.04	4.11	1222	0.05
γ -Terpinene	5.04	1057	0.04	3.94	1209	0.05
<i>cis</i> -Sabinene hydrate	5.19	1067	0.01	7.00	1427	0.01
Octanol	5.38	1078	0.04	8.35*	1528	0.06
Terpinolene	5.50*	1085	0.05	4.42	1244	0.05
Isoterpinolene	5.50*	1085	[0.05]	4.36	1240	0.01
6,7-Epoxymyrcene	5.60	1092	0.01	6.24	1372	tr
Linalool	5.78*	1103	0.47	8.23	1519	0.43
Nonanal	5.78*	1103	[0.47]	6.02	1356	0.04
<i>trans</i> -para-Mentha-2,8-dien-1-ol	6.04	1119	0.03	9.12	1587	0.03
<i>cis</i> -Limonene oxide	6.18	1128	0.06	6.59	1397	0.06
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.26	1133	0.03	9.65*	1630	0.10
<i>trans</i> -Limonene oxide	6.27*	1134	0.03	6.76	1409	0.04
neoiso-Thujol	6.27*	1134	[0.03]	9.70	1634	0.01
Citronellal	6.54*	1151	0.04	7.16*	1439	0.06
Menthone	6.54*	1151	[0.04]	6.77	1411	0.01
Isomenthone	6.64	1157	0.01	7.16*	1439	[0.06]
Unknown [m/z 79, 56 (53), 55 (53), 136 (50), 41 (49), 80 (42)...]	6.71	1161	0.01			
Terpinen-4-ol	6.92	1175	0.02	8.74	1558	0.01

α-Terpineol	7.18	1191	0.09	9.96	1654	0.09
Ethyl octanoate	7.21	1193	0.01	6.69	1404	0.02
Decanal	7.38	1204	0.25	7.44	1460	0.23
Octyl acetate	7.49	1211	0.02	7.22	1444	0.02
<i>trans</i> -Carveol	7.63	1221	0.03	11.58	1789	0.05
Nerol	7.76	1229	0.01	11.24	1761	0.01
Citronellol	7.81	1232	0.05	10.91	1732	0.01
Carvone	7.89*	1238	0.10	10.17*	1672	0.07
Neral	7.89*	1238	[0.10]	9.65*	1630	[0.10]
Geraniol	8.18	1256	0.01	11.76	1804	0.01
(2 <i>E</i>)-Decenal	8.23	1260	0.01	9.22	1595	0.01
Isopiperitenone	8.29	1264	0.01	11.38	1772	0.01
Geranial	8.34*	1267	0.11	10.28*	1680	0.08
Perillaldehyde	8.34*	1267	[0.11]	10.88	1730	0.01
Limonen-10-ol	8.71	1292	0.02	13.33	1945	0.02
Undecanal	8.90	1307	0.01	8.82	1564	0.01
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	9.02	1315	0.03			
para-Mentha-1,8-diene-4-hydroperoxide	9.21	1328	0.02			
Limonene hydroperoxide IV	9.56	1352	tr			
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	9.72	1363	0.02			
α-Copaene	9.82	1370	0.02	7.25	1446	0.03
<i>cis</i> -para-Mentha-6,8-diene-2-hydroperoxide	9.98	1381	0.01			
Geranyl acetate	10.01	1383	0.02	10.72	1716	0.04
β-Elemene	10.07	1387	0.03	8.54*	1542	0.08
Ethyl decanoate	10.18	1395	0.19	9.36*	1606	0.17
Dodecanal	10.35	1407	0.04	10.13	1668	0.03
β-Caryophyllene	10.40*	1410	0.07	8.54*	1542	[0.08]
<i>cis</i> -α-Bergamotene	10.40*	1410	[0.07]	8.35*	1528	[0.06]
β-Copaene	10.55	1422	0.02	8.47	1538	0.03
(<i>Z</i>)-β-Farnesene?	10.67	1431	0.01	9.36*	1606	[0.17]
Isoamyl octanoate	10.87*	1445	0.02			
α-Humulene	10.87*	1445	[0.02]	9.41	1611	0.01
Germacrene D	11.25	1473	0.02	9.91	1651	0.02
Bicyclogermacrene	11.42*	1485	0.14	10.28*	1680	[0.08]
Valencene	11.42*	1485	[0.14]	10.03	1660	0.13
α-Murolene	11.56	1496	0.01	10.17*	1672	[0.07]
β-Bisabolene	11.68	1505	0.01	10.34	1686	0.01
(3 <i>E</i> ,6 <i>E</i>)-α-Farnesene	11.73	1508	0.01	10.64	1710	0.02
δ-Cadinene	11.86	1518	0.03	10.56	1703	0.04
α-Elemol	12.22	1546	0.01	14.21	2027	0.01
Germacrene D-4-ol	12.54*	1571	0.01	13.83	1991	0.01
Spathulenol	12.54*	1571	[0.01]	14.57	2062	tr

Dodecanoic acid	12.69	1583	0.01	18.25	2444	0.02
Ethyl dodecanoate	12.81	1592	0.10	11.80	1809	0.11
β -Sinensal	14.02	1690	0.02	15.60	2164	0.02
α -Sinensal	14.68	1747	0.01	16.57	2262	0.01
Nootkatone	15.22	1793	0.07	17.98	2414	0.05
Palmitic acid	17.19	1974	0.02	22.12	2911	0.01
Meranzin	19.64	2222	0.01			
Total identified		99.09%			98.78%	
Total reported		99.09%			98.78%	

*: 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

R.T.: Retention time (minutes)

R.I.: Retention index