



PLANT THERAPY
100% PURE ESSENTIAL OILS

GC/MS BATCH NUMBER: OQ0100

ESSENTIAL OIL: ORANGE ESSENCE
BOTANICAL NAME: CITRUS SINENSIS

KEY CONSTITUENTS PRESENT IN THIS BATCH OF ORANGE ESSENCE OIL	%
LIMONENE	93.5
MYRCENE	1.7

Date : September 24, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18I17-PTH1-1-CC

Customer identification : Orange Essence - OQ010088R

Type : Essential oil

Source : *Citrus sinensis*

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : September 18, 2018

Checked and approved by :

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4718 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethyl acetate	tr	tr	Aliphatic ester
Heptane	0.01	0.01	Alkane
Toluene	tr	0.05*	Simple phenolic
Hexanal	0.01	0.01	Aliphatic aldehyde
Ethyl butyrate	0.05	[0.05]*	Aliphatic ester
(2E)-Hexenal	0.01	93.63*	Aliphatic aldehyde
Heptanal	0.01*	tr	Aliphatic aldehyde
Nonane	[0.01]*	tr	Alkane
α -Thujene	0.01	0.01	Monoterpene
α -Pinene	0.45	0.45	Monoterpene
Camphene	tr	tr	Monoterpene
Unknown	tr		Unknown
Unknown	tr		Unknown
Sabinene	0.33*	0.31	Monoterpene
β -Pinene	[0.33]*	0.04	Monoterpene
Heptanol	0.01	0.01*	Aliphatic alcohol
6-Methyl-5-hepten-2-one	tr	tr	Aliphatic ketone
Myrcene	1.69	1.70	Monoterpene
α -Phellandrene	0.31*	0.01	Monoterpene
Pseudolimonene	[0.31]*	0.01	Monoterpene
Octanal	[0.31]*	0.29	Aliphatic aldehyde
Δ^3 -Carene	0.13	0.12	Monoterpene
para-Cymene	93.73*	0.02	Monoterpene
Limonene	[93.73]*	[93.63]*	Monoterpene
1,8-Cineole	[93.73]*	0.18	Monoterpenic ether
(Z)- β -Ocimene	tr	tr	Monoterpene
(E)- β -Ocimene	0.02	0.02	Monoterpene
γ -Terpinene	0.01	0.02	Monoterpene
cis-Sabinene hydrate	0.01	[0.01]*	Monoterpenic alcohol
Octanol	0.07	0.07	Aliphatic alcohol
Isoterpinolene	tr	tr	Monoterpene
Terpinolene	0.02*	0.02	Monoterpene
para-Cymenene	[0.02]*	tr	Monoterpene
6,7-Epoxymyrcene	0.01	0.01	Monoterpenic ether
Linalool	0.52	0.53*	Monoterpenic alcohol
Nonanal	0.06	0.05	Aliphatic aldehyde
(E)-4,8-Dimethyl-1,3,7-nonatriene	0.01	0.01	Monoterpene
trans-para-Mentha-2,8-dien-1-ol	0.05	0.06	Monoterpenic alcohol
Limona ketone	tr	tr	Normonoterpenic ketone
cis-Limonene oxide	0.13	0.13	Monoterpenic ether
(Z)-Ocimene epoxide?	0.12*	tr	Monoterpenic ether
trans-Limonene oxide	[0.12]*	0.08	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	[0.12]*	0.08	Monoterpenic alcohol
neoiso-Thujol	0.01	0.07*	Monoterpenic alcohol
Citronellal	0.05	0.05	Monoterpenic aldehyde
Unknown	0.01		Unknown
Unknown	tr	tr	Unknown
Terpinen-4-ol	0.04*	0.01	Monoterpenic alcohol

Unknown	[0.04]*	[0.07]*	Oxygenated monoterpene
<i>trans</i> -Isocarveol	0.01	tr	Monoterpenic alcohol
α -Terpineol	0.09	0.10	Monoterpenic alcohol
Unknown	0.03	0.03	Unknown
Unknown	0.05*	[0.53]*	Unknown
<i>trans</i> -Isopiperitenol	[0.05]*	0.02	Monoterpenic alcohol
Decanal	0.23	0.22	Aliphatic aldehyde
Octyl acetate	0.02	0.02	Aliphatic ester
<i>trans</i> -Carveol	0.08*	0.08	Monoterpenic alcohol
Unknown	[0.08]*	tr	Oxygenated monoterpene
<i>cis</i> -Carveol	0.07*	0.06	Monoterpenic alcohol
Citronellol	[0.07]*	0.03*	Monoterpenic alcohol
Nerol	[0.07]*	0.01	Monoterpenic alcohol
Neral	0.13*	0.01	Monoterpenic aldehyde
Carvone	[0.13]*	0.13	Monoterpenic ketone
(2Z)-Decenal	tr		Aliphatic aldehyde
Geraniol	0.01	0.02	Monoterpenic alcohol
(2E)-Decenal	0.01	tr	Aliphatic aldehyde
Isopiperitenone	0.01	0.01	Monoterpenic ketone
Perillaldehyde	0.02	[0.03]*	Monoterpenic aldehyde
Geranial	0.08	0.12*	Monoterpenic aldehyde
Limonen-10-ol	0.02	0.01	Monoterpenic alcohol
Undecanal	0.01	0.01	Aliphatic aldehyde
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.08		Monoterpenic peroxide
Limonene hydroperoxide I	tr		Monoterpenic peroxide
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.07		Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	0.04		Monoterpenic peroxide
α -Cubebene	0.01	0.01	Sesquiterpene
Limonene hydroperoxide IV	0.01		Monoterpenic peroxide
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	0.08*		Monoterpenic peroxide
Neryl acetate	[0.08]*	0.02	Monoterpenic ester
α -Copaene	0.03	0.03	Sesquiterpene
Geranyl acetate	0.07*	0.03	Monoterpenic ester
<i>cis</i> -para-Mentha-6,8-diene-2-hydroperoxide	[0.07]*		Monoterpenic peroxide
β -Cubebene	0.02	0.02	Sesquiterpene
β -Elemene	0.02	0.04*	Sesquiterpene
Unknown	tr		Sesquiterpene
Dodecanal	0.03	0.04	Aliphatic aldehyde
β -Caryophyllene	0.03	[0.04]*	Sesquiterpene
β -Copaene	0.03	0.02	Sesquiterpene
α -Humulene	0.01	0.01	Sesquiterpene
(E)- β -Farnesene	tr	[0.07]*	Sesquiterpene
γ -Muurolene	tr	[0.07]*	Sesquiterpene
Germacrene D	0.01	0.02	Sesquiterpene
Valencene	0.24*	0.23	Sesquiterpene
Bicyclogermacrene	[0.24]*	[0.12]*	Sesquiterpene
α -Muurolene	0.02*	[0.12]*	Sesquiterpene

(3Z,6E)- α -Farnesene	[0.02]*	tr	Sesquiterpene
γ -Cadinene	0.02*	0.04	Sesquiterpene
7-epi- α -Selinene	[0.02]*	[0.04]*	Sesquiterpene
δ -Cadinene	0.02	[0.04]*	Sesquiterpene
α -Elemol	tr	0.01	Sesquiterpenic alcohol
Spathulenol	tr	tr	Sesquiterpenic alcohol
Caryophyllene oxide	0.01*	0.01	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.01]*	tr	Sesquiterpenic ether
β -Sinensal	0.01	0.01	Sesquiterpenic aldehyde
α -Sinensal	tr	0.01	Sesquiterpenic aldehyde
Nootkatone	tr	tr	Sesquiterpenic ketone
Total identified	99.58%	99.48%	

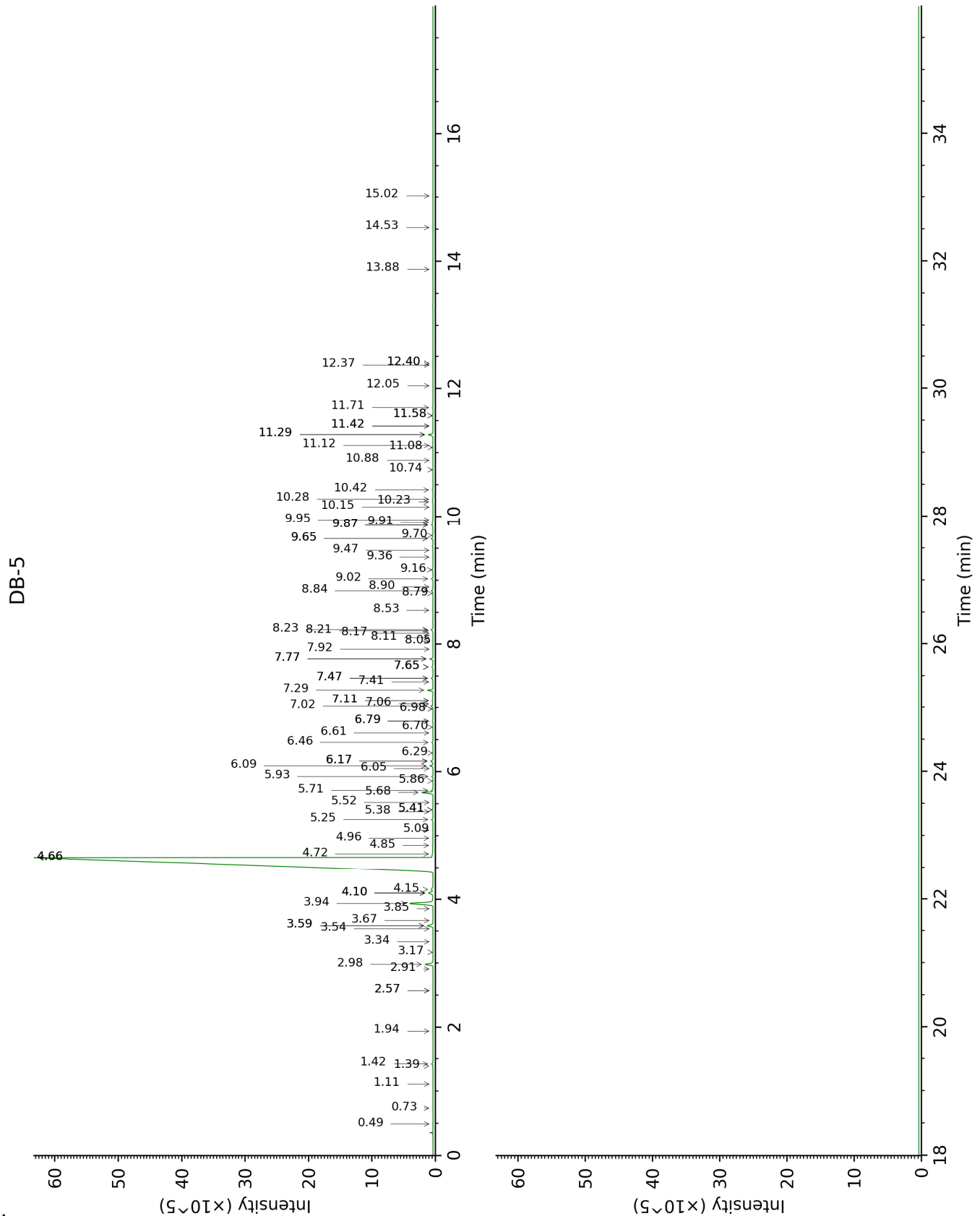
*: Two or more compounds are coeluting on this column

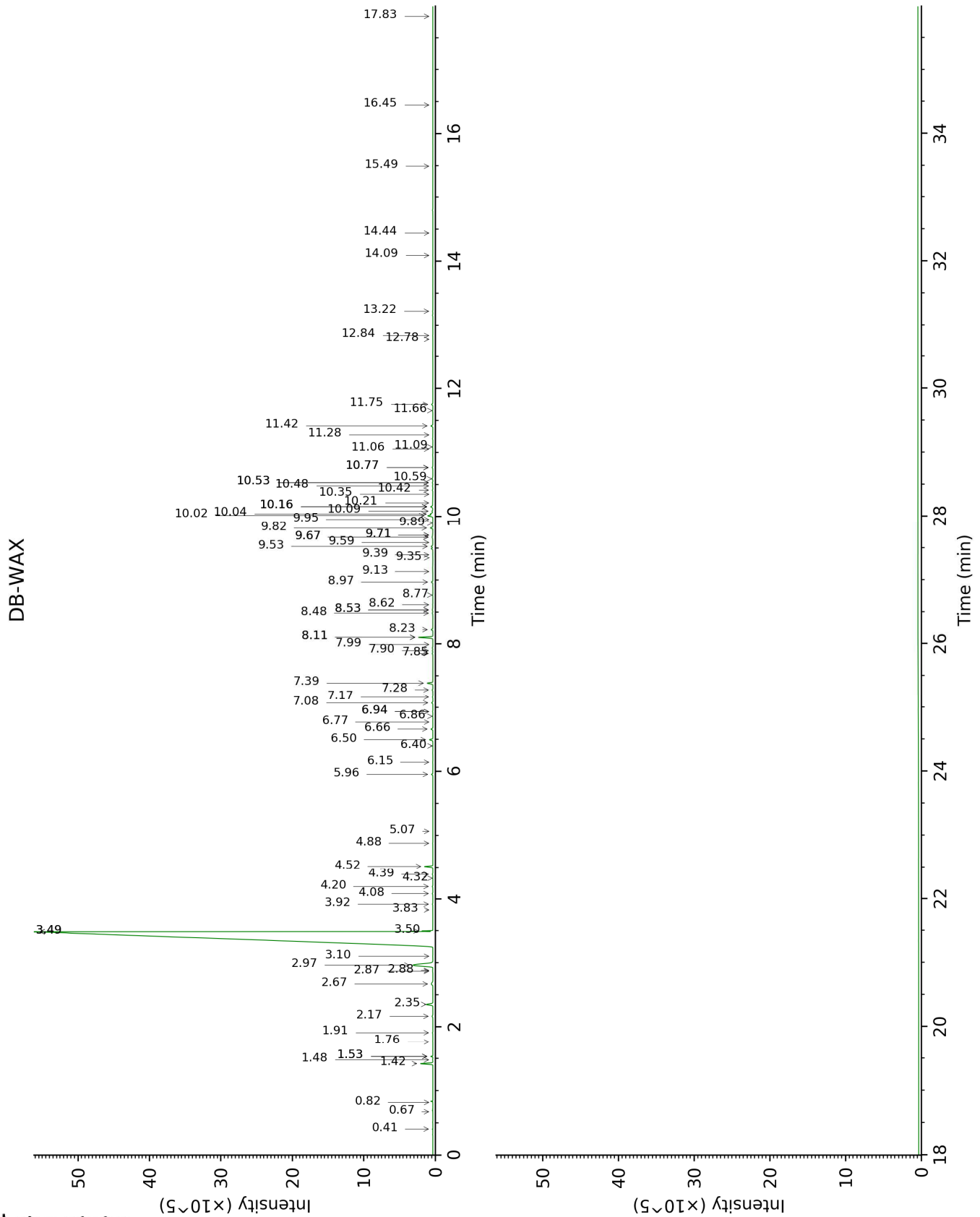
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethyl acetate	0.49	606	tr	0.67	850	tr
Heptane	0.74	696	0.01	0.41	690	0.01
Toluene	1.11	755	tr	1.53*	1008	0.05
Hexanal	1.39	797	0.01	1.91	1045	0.01
Ethyl butyrate	1.42	802	0.05	1.53*	1008	[0.05]
(2E)-Hexenal	1.94	846	0.01	3.49*	1180	93.63
Heptanal	2.57*	900	0.01	3.10	1150	tr
Nonane	2.57*	900	[0.01]	0.82	899	tr
α-Thujene	2.91	923	0.01	1.48	1002	0.01
α-Pinene	2.98	928	0.45	1.42	996	0.45
Camphene	3.17	941	tr	1.76	1030	tr
Unknown [m/z 55, 70 (27), 43 (25), 83 (22), 84 (20)...]	3.34	952	tr			
Unknown [m/z 43, 41 (71), 57 (70), 82 (63), 69 (58), 56 (49), 85 (45)...]	3.54	966	tr			
Sabinene	3.59*	969	0.33	2.35	1089	0.31
β-Pinene	3.59*	969	[0.33]	2.17	1070	0.04
Heptanol	3.67	974	0.01	6.94*	1428	0.01
6-Methyl-5-hepten-2-one	3.85	986	tr	5.07	1293	tr
Myrcene	3.94	992	1.69	2.97	1140	1.70
α-Phellandrene	4.10*	1003	0.31	2.87	1132	0.01
Pseudolimonene	4.10*	1003	[0.31]	2.88	1133	0.01
Octanal	4.10*	1003	[0.31]	4.52	1254	0.29
Δ3-Carene	4.15	1006	0.13	2.67	1117	0.12
para-Cymene	4.66*	1038	93.73	4.20	1231	0.02
Limonene	4.66*	1038	[93.73]	3.49*	1180	[93.63]
1,8-Cineole	4.66*	1038	[93.73]	3.50	1181	0.18
(Z)-β-Ocimene	4.72	1042	tr	3.83	1205	tr
(E)-β-Ocimene	4.85	1050	0.02	4.08	1224	0.02
γ-Terpinene	4.96	1058	0.01	3.92	1212	0.02
cis-Sabinene hydrate	5.09	1066	0.01	6.94*	1428	[0.01]
Octanol	5.26	1076	0.07	8.23	1524	0.07
Isoterpinolene	5.38	1084	tr	4.32	1241	tr
Terpinolene	5.41*	1086	0.02	4.39	1245	0.02
para-Cymenene	5.41*	1086	[0.02]	6.40	1388	tr
6,7-Epoxymyrcene	5.52	1093	0.01	6.15	1370	0.01
Linalool	5.68	1103	0.52	8.11*	1515	0.53
Nonanal	5.71	1105	0.06	5.96	1357	0.05
(E)-4,8-Dimethyl-1,3,7-nonatriene	5.86	1114	0.01	4.88	1280	0.01
trans-para-Mentha-2,8-dien-1-ol	5.93	1118	0.05	8.97	1581	0.06

Limona ketone	6.05	1126	tr	7.99	1506	tr
<i>cis</i> -Limonene oxide	6.09	1129	0.13	6.50	1395	0.13
(<i>Z</i>)-Ocimene epoxide?	6.17*	1134	0.12	6.77	1416	tr
<i>trans</i> -Limonene oxide	6.17*	1134	[0.12]	6.66	1408	0.08
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.17*	1134	[0.12]	9.53	1626	0.08
neoiso-Thujol	6.29	1142	0.01	9.67*†	1638	0.07
Citronellal	6.46	1153	0.05	7.08	1438	0.05
Unknown [m/z 79, 56 (53), 55 (53), 136 (50), 41 (49), 80 (42)...]	6.61	1162	0.01			
Unknown [m/z 55, 96 (88), 67 (43), 41 (25), 43 (22)... 154 (1)]	6.70	1168	tr	9.95	1660	tr
Terpinen-4-ol	6.79*†	1174	0.04	8.62	1554	0.01
Unknown [m/z 69, 84 (62), 41 (30), 123 (26), 97 (24), 109 (23)...]	6.79*†	1174	[0.04]	9.70*†	1640	[0.07]
<i>trans</i> -Isocarveol	6.98	1186	0.01	11.06	1752	tr
α -Terpineol	7.02	1189	0.09	9.82	1649	0.10
Unknown [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	7.06	1191	0.03	7.85	1495	0.03
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.11*†	1194	0.05	8.11*	1515	[0.53]
<i>trans</i> -Isopiperitenol	7.11*†	1194	[0.05]	10.42	1698	0.02
Decanal	7.28	1206	0.23	7.39	1461	0.22
Octyl acetate	7.41	1214	0.02	7.17	1445	0.02
<i>trans</i> -Carveol	7.47*	1218	0.08	11.42	1783	0.08
Unknown [m/z 122, 91 (56), 79 (33), 95 (33), 107 (31), 43 (30), 77 (30), 135 (27)... 150 (9)]	7.47*	1218	[0.08]	9.35	1611	tr
<i>cis</i> -Carveol	7.65*†	1230	0.07	11.75	1812	0.06
Citronellol	7.65*†	1230	[0.07]	10.77*	1728	0.03
Nerol	7.65*†	1230	[0.07]	11.09	1755	0.01
Neral	7.77*	1239	0.13	9.59	1631	0.01
Carvone	7.77*	1239	[0.13]	10.04	1667	0.13
(<i>2Z</i>)-Decenal	7.92	1249	tr			
Geraniol	8.05	1257	0.01	11.66	1803	0.02

(2E)-Decenal	8.10	1261	0.01	9.13	1594	tr
Isopiperitenone	8.17	1265	0.01	11.28	1771	0.01
Perillaldehyde	8.21	1268	0.02	10.77*	1728	[0.03]
Geranial	8.23	1269	0.08	10.16*	1677	0.12
Limonen-10-ol	8.53	1289	0.02	13.22	1944	0.01
Undecanal	8.80	1307	0.01	8.77	1566	0.01
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	8.84	1310	0.08			
Limonene hydroperoxide I	8.90	1314	tr			
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	9.02	1323	0.07			
para-Mentha-1,8-diene-4-hydroperoxide	9.16	1333	0.04			
α-Cubebene	9.36	1347	0.01	6.86	1422	0.01
Limonene hydroperoxide IV	9.47	1355	0.01			
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	9.65*	1368	0.08			
Neryl acetate	9.65*	1368	[0.08]	10.22	1682	0.02
α-Copaene	9.70	1371	0.03	7.28	1453	0.03
Geranyl acetate	9.87*	1383	0.07	10.59	1713	0.03
<i>cis</i> -para-Mentha-6,8-diene-2-hydroperoxide	9.87*	1383	[0.07]			
β-Cubebene	9.91	1386	0.02	7.90	1499	0.02
β-Elemene	9.95	1389	0.02	8.53*	1548	0.04
Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	10.15	1403	tr			
Dodecanal	10.23	1409	0.03	10.09	1671	0.04
β-Caryophyllene	10.28	1412	0.03	8.53*	1548	[0.04]
β-Copaene	10.42	1423	0.03	8.48	1544	0.02
α-Humulene	10.74	1447	0.01	9.40	1615	0.01
(E)-β-Farnesene	10.88	1458	tr	9.67*†	1638	[0.07]
γ-Murolene	11.08	1473	tr	9.70*†	1640	[0.07]
Germacrene D	11.12	1475	0.01	9.89	1656	0.02
Valencene	11.28*	1488	0.24	10.02	1665	0.23
Bicyclogermacrene	11.28*	1488	[0.24]	10.16*	1677	[0.12]
α-Murolene	11.42*	1498	0.02	10.16*	1677	[0.12]
(3Z,6E)-α-Farnesene	11.42*	1498	[0.02]	10.35	1692	tr
γ-Cadinene	11.58*	1510	0.02	10.48†	1703	0.04
7-epi-α-Selinene	11.58*	1510	[0.02]	10.53*†	1708	[0.04]
δ-Cadinene	11.71	1520	0.02	10.53*†	1708	[0.04]
α-Elemol	12.05	1547	tr	14.09	2025	0.01

Spathulenol	12.37	1572	tr	14.44	2059	tr
Caryophyllene oxide	12.40*	1574	0.01	12.84	1909	0.01
Caryophyllene oxide isomer	12.40*	1574	[0.01]	12.78	1903	tr
β-Sinensal	13.88	1695	0.01	15.50	2163	0.01
α-Sinensal	14.53	1751	tr	16.45	2261	0.01
Nootkatone	15.02	1794	tr	17.83	2410	tr
Total identified		99.58%			99.48%	
Total reported		99.64%			99.52%	

*: 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