

Date : February 28, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19B27-PTH02-1-SCC

Customer identification : Thyme Linalool - Spain - TL0104712R

Type : Essential oil

Source : *Thymus vulgaris* ct. Linalool

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 : Alexis St-Gelais, M. Sc., chimiste

Analysis date : February 28, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4658 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
(3Z)-Hexenol	0.01	0.01	Aliphatic alcohol
Hexanol	0.01		Aliphatic alcohol
Hashishene	0.16	2.03*	Monoterpene
Tricyclene	0.03	0.04	Monoterpene
α -Thujene	1.25	1.23	Monoterpene
α -Pinene	1.91	[2.03]*	Monoterpene
Unknown	0.01	0.01	Monoterpene
Camphene	0.73	0.71	Monoterpene
Thuja-2,4(10)-diene	0.01	0.02	Monoterpene
Sabinene	0.79*	0.51	Monoterpene
β -Pinene	[0.79]*	0.31	Monoterpene
Octen-3-ol	0.05	0.05	Aliphatic alcohol
Octan-3-one	0.06	0.05	Aliphatic ketone
Myrcene	3.41	3.29	Monoterpene
Octan-3-ol	0.03	0.04	Aliphatic alcohol
α -Phellandrene	0.23*	0.21	Monoterpene
Pseudolimonene	[0.23]*	0.01	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.01*	3.85*	Monoterpenic ether
Δ^3 -Carene	[0.01]*	0.01	Monoterpene
α -Terpinene	1.90	1.85	Monoterpene
para-Cymene	1.59	1.57	Monoterpene
1,8-Cineole	2.93*	1.51*	Monoterpenic ether
Limonene	[2.93]*	1.38	Monoterpene
β -Phellandrene	[2.93]*	[1.51]*	Monoterpene
Lavender lactone	0.03	0.02	Aliphatic lactone
(Z)- β -Ocimene	0.05	[3.85]*	Monoterpene
(E)- β -Ocimene	0.19	0.19	Monoterpene
γ -Terpinene	3.83	[3.85]*	Monoterpene
<i>cis</i> -Sabinene hydrate	0.57	0.88*	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.26	0.26	Monoterpenic alcohol
Terpinolene	1.02*	0.72	Monoterpene
para-Cymenene	[1.02]*	0.01	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	[1.02]*	[0.88]*	Monoterpenic alcohol
<i>trans</i> -Sabinene hydrate	0.02	0.26	Monoterpenic alcohol
Linalool	64.03	63.92	Monoterpenic alcohol
Hotrienol	0.46	0.52*	Monoterpenic alcohol
endo-Fenchol	0.01	0.01	Monoterpenic alcohol
Unknown	0.01	0.01	Oxygenated monoterpene
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.22*	0.14*	Monoterpenic alcohol
<i>cis</i> -para-Mentha-2-en-1-ol	[0.22]*	0.15*	Monoterpenic alcohol
<i>cis</i> -para-Mentha-2,8-dien-1-ol	0.13*	0.04	Monoterpenic alcohol
<i>trans</i> -para-Mentha-2-en-1-ol	[0.13]*	[0.14]*	Monoterpenic alcohol
Camphor	1.20	1.04	Monoterpenic ketone
<i>trans</i> -Verbenol	0.06	0.04	Monoterpenic alcohol
Hexyl isobutyrate	0.12	0.12	Aliphatic ester
Nerol oxide	0.03	[0.88]*	Aliphatic ether
(E)-2,6-Dimethyl-1,5,7-octatrien-3-ol	0.04	0.05	Monoterpenic alcohol
Borneol	1.00	2.02*	Monoterpenic alcohol

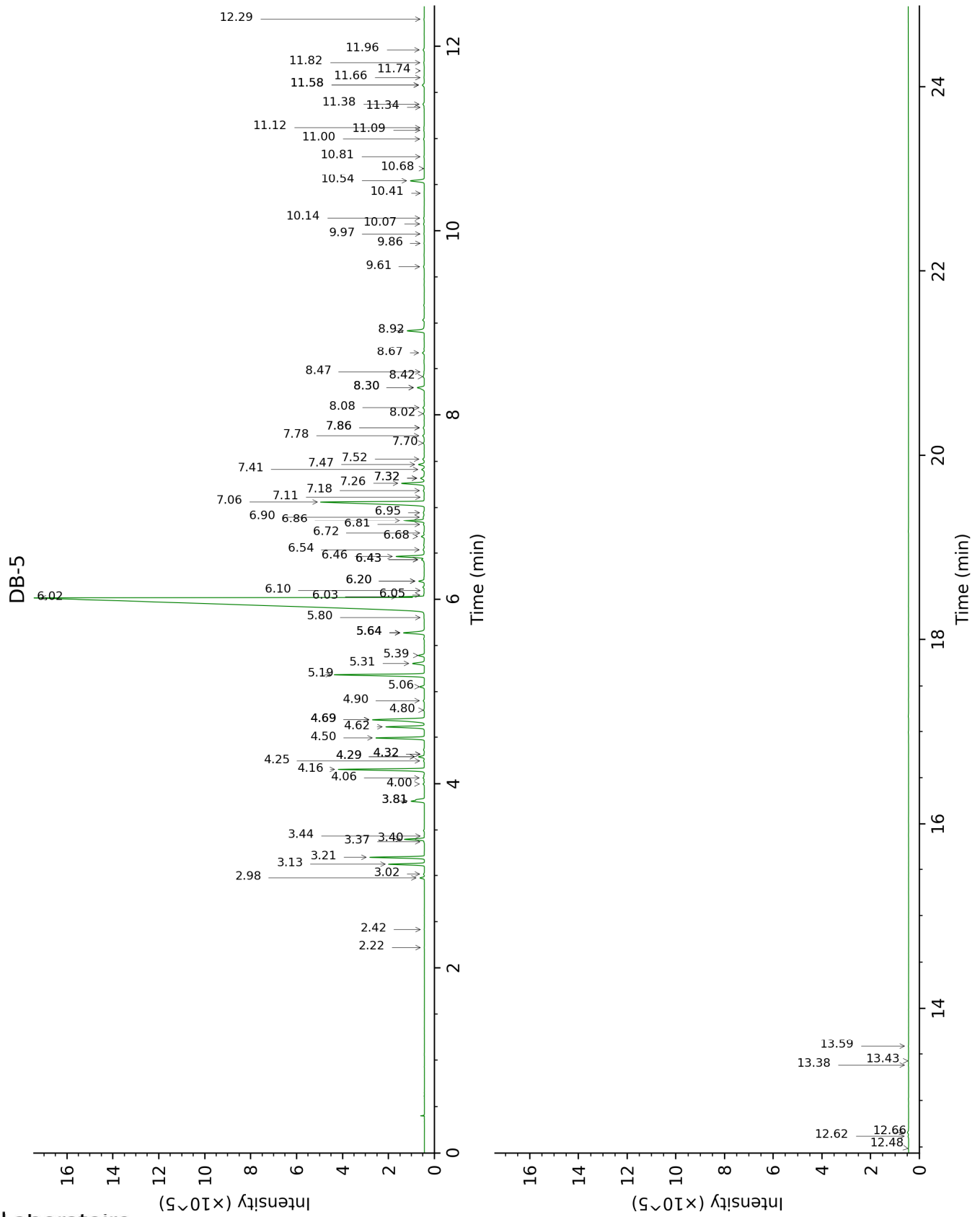
Unknown	0.07		Oxygenated monoterpene
<i>cis</i> -Linalool oxide (pyr.)	0.06	0.08	Monoterpenic alcohol
Terpinen-4-ol	6.07	6.03*	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (pyr.)	0.01	0.03	Monoterpenic alcohol
para-Cymen-8-ol	0.05	0.04	Monoterpenic alcohol
α -Terpineol	1.04	[2.02]*	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.21*	0.06	Monoterpenic ketone
Myrtenal	[0.21]*	[0.52]*	Monoterpenic aldehyde
<i>trans</i> -Dihydrocarvone	0.12	0.12	Monoterpenic ketone
Verbenone	0.25	0.25	Monoterpenic ketone
<i>trans</i> -Piperitol	0.07	0.04	Monoterpenic alcohol
<i>trans</i> -Carveol	0.03	0.05	Monoterpenic alcohol
Bornyl formate	0.08	[0.15]*	Monoterpenic ester
<i>cis</i> -Carveol	0.05*	0.01	Monoterpenic alcohol
Thymol methyl ether	[0.05]*	0.78*	Monoterpenic ether
Carvone	0.04	0.03	Monoterpenic ketone
Carvacrol methyl ether	0.06	[6.03]*	Monoterpenic ether
Linalyl acetate	0.39*	0.34	Monoterpenic ester
Geraniol	[0.39]*	0.12	Monoterpenic alcohol
Geranial	0.08	[0.14]*	Monoterpenic aldehyde
Unknown	0.02		Unknown
Bornyl acetate	0.09	0.12	Monoterpenic ester
Thymol	0.82	0.83	Monoterpenic alcohol
α -Terpinyl acetate	0.04	0.04	Monoterpenic ester
Neryl acetate	0.01	0.01	Monoterpenic ester
Bornyl propionate	0.02		Monoterpenic ester
β -Bourbonene	0.03	0.04	Sesquiterpene
Geranyl acetate	0.03	0.05	Monoterpenic ester
α -Gurjunene	0.01	0.01	Sesquiterpene
β -Caryophyllene	0.67	[0.78]*	Sesquiterpene
β -Copaene	0.01	0.01*	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.02	[0.01]*	Sesquiterpene
α -Humulene	0.04	0.03	Sesquiterpene
allo-Aromadendrene	0.03	0.03	Sesquiterpene
<i>cis</i> -Cadina-1(6),4-diene	0.02	0.04	Sesquiterpene
γ -Muurolene	0.02	0.01	Sesquiterpene
Germacrene D	0.08	0.07	Sesquiterpene
Viridiflorene	0.10*	[2.02]*	Sesquiterpene
Bicyclogermacrene	[0.10]*	[0.14]*	Sesquiterpene
α -Muurolene	0.02	0.14	Sesquiterpene
Aromadendra-1(10),4(15)-diene	0.01	0.01	Sesquiterpene
γ -Cadinene	0.03	0.02	Sesquiterpene
δ -Cadinene	0.06	0.07	Sesquiterpene
α -Elemol	0.02	0.03	Sesquiterpenic alcohol
Geranyl butyrate	0.01	0.02	Monoterpenic ester
Spathulenol	0.03	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	0.05	Sesquiterpenic ether
Isospathulenol	0.02	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.02	0.01	Sesquiterpenic alcohol
α -Cadinol	0.01	0.03	Sesquiterpenic alcohol
Total identified	99.30%	98.77%	

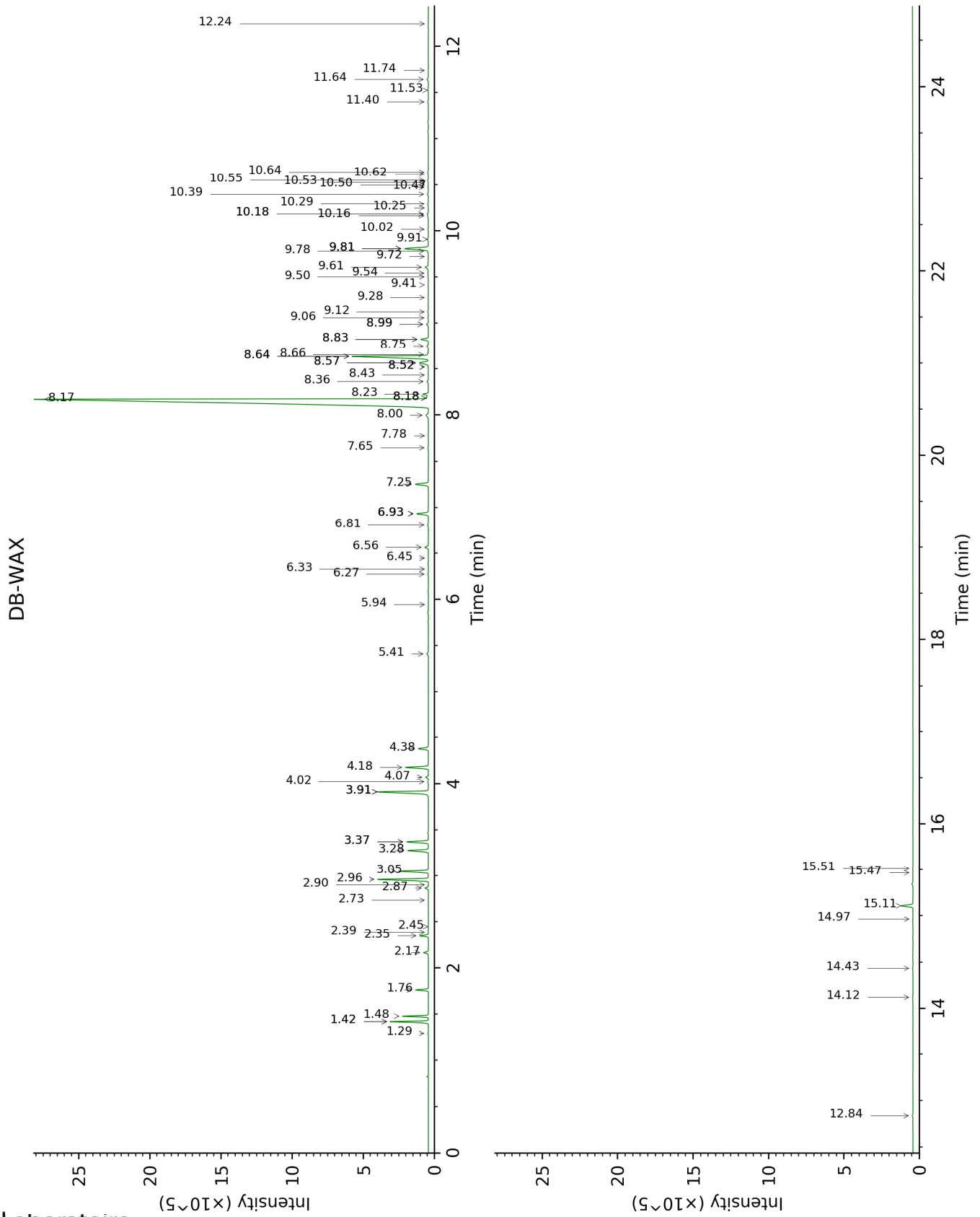
*: Two or more compounds are coeluting on this column

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

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	%
(3Z)-Hexenol	2.22	855	0.01	5.94	1349	0.01
Hexanol	2.42	871	0.01			
Hashishene	2.98	914	0.16	1.42*	994	2.03
Tricyclene	3.02	916	0.03	1.29	975	0.04
α -Thujene	3.13	924	1.25	1.48	1003	1.23
α -Pinene	3.21	929	1.91	1.42*	994	[2.03]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.37	940	0.01	2.45	1094	0.01
Camphene	3.40	941	0.73	1.76	1029	0.71
Thuja-2,4(10)-diene	3.44	944	0.01	2.39	1088	0.02
Sabinene	3.81*	968	0.79	2.35	1084	0.51
β -Pinene	3.81*	968	[0.79]	2.17	1067	0.31
Octen-3-ol	4.00	980	0.05	6.81	1413	0.05
Octan-3-one	4.06	985	0.06	4.02	1219	0.05
Myrcene	4.16	991	3.41	2.96	1134	3.29
Octan-3-ol	4.25	997	0.03	6.27	1373	0.04
α -Phellandrene	4.29*	1000	0.23	2.86	1127	0.21
Pseudolimonene	4.29*	1000	[0.23]	2.90	1130	0.01
<i>cis</i> -Dehydroxylinalool oxide	4.32*	1002	0.01	3.91*	1210	3.85
Δ 3-Carene	4.32*	1002	[0.01]	2.73	1117	0.01
α -Terpinene	4.50	1012	1.90	3.05	1142	1.85
para-Cymene	4.62	1020	1.59	4.18	1230	1.57
1,8-Cineole	4.69*	1025	2.93	3.37*	1167	1.51
Limonene	4.69*	1025	[2.93]	3.28	1160	1.38
β -Phellandrene	4.69*	1025	[2.93]	3.37*	1167	[1.51]
Lavender lactone	4.80	1031	0.03	9.28	1605	0.02
(Z)- β -Ocimene	4.90	1038	0.05	3.91*	1210	[3.85]
(E)- β -Ocimene	5.06	1047	0.19	4.07	1222	0.19
γ -Terpinene	5.19	1056	3.83	3.91*	1210	[3.85]
<i>cis</i> -Sabinene hydrate	5.31	1063	0.57	6.93*	1423	0.88
<i>cis</i> -Linalool oxide (fur.)	5.40	1068	0.26	6.56	1394	0.26
Terpinolene	5.64*	1084	1.02	4.38	1246	0.72
para-Cymenene	5.64*	1084	[1.02]	6.45	1386	0.01
<i>trans</i> -Linalool oxide (fur.)	5.64*	1084	[1.02]	6.93*	1423	[0.88]
<i>trans</i> -Sabinene hydrate	5.80	1094	0.02	8.00	1504	0.26
Linalool	6.02	1108	64.03	8.17	1517	63.92
Hotrienol	6.03	1108	0.46	8.83*	1569	0.52
endo-Fenchol	6.05	1110	0.01	8.43	1538	0.01
Unknown [m/z 41, 67 (75), 69 (59), 79	6.10	1113	0.01	6.33	1377	0.01

(55), 81 (44), 71 (41)... 150 (5)]						
<i>trans</i> -para-Mentha-2,8-dien-1-ol	6.20*	1119	0.22	8.99*	1582	0.14
<i>cis</i> -para-Menth-2-en-1-ol	6.20*	1119	[0.22]	8.18*	1518	0.15
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.43*	1134	0.13	9.50	1623	0.04
<i>trans</i> -para-Menth-2-en-1-ol	6.43*	1134	[0.13]	8.99*	1582	[0.14]
Camphor	6.46	1136	1.20	7.25	1447	1.04
<i>trans</i> -Verbenol	6.54	1141	0.06	9.54	1626	0.04
Hexyl isobutyrate	6.68	1150	0.12	5.41	1310	0.12
Nerol oxide	6.72	1152	0.03	6.93*	1423	[0.88]
(<i>E</i>)-2,6-Dimethyl-1,5,7-octatrien-3-ol	6.81	1158	0.04	10.29	1688	0.05
Borneol	6.86	1161	1.00	9.81*	1648	2.02
Unknown [m/z 43, 71 (87), 95 (50), 81 (38), 109 (30), 41 (27)...152 (5)]	6.90	1164	0.07			
<i>cis</i> -Linalool oxide (pyr.)	6.94	1167	0.06	10.40	1697	0.08
Terpinen-4-ol	7.06	1174	6.07	8.64*	1554	6.03
<i>trans</i> -Linalool oxide (pyr.)	7.11	1178	0.01	10.62	1716	0.03
para-Cymen-8-ol	7.18	1182	0.05	11.53	1794	0.04
α -Terpineol	7.26	1188	1.04	9.81*	1648	[2.02]
<i>cis</i> -Dihydrocarvone	7.32*	1191	0.21	8.66	1555	0.06
Myrtenal	7.32*	1191	[0.21]	8.83*	1569	[0.52]
<i>trans</i> -Dihydrocarvone	7.41	1197	0.12	8.75	1563	0.12
Verbenone	7.47	1201	0.25	9.61	1632	0.25
<i>trans</i> -Piperitol	7.52	1204	0.07	10.47	1703	0.04
<i>trans</i> -Carveol	7.70	1216	0.03	11.40	1783	0.05
Bornyl formate	7.78	1222	0.08	8.18*	1518	[0.15]
<i>cis</i> -Carveol	7.86*	1227	0.05	11.74	1813	0.01
Thymol methyl ether	7.86*	1227	[0.05]	8.57*	1548	0.78
Carvone	8.02	1238	0.04	10.02	1666	0.03
Carvacrol methyl ether	8.08	1242	0.06	8.64*	1554	[6.03]
Linalyl acetate	8.30*	1257	0.39	8.23	1522	0.34
Geraniol	8.30*	1257	[0.39]	11.64	1804	0.12
Geranial	8.42	1265	0.08	10.18*†	1679	[0.14]
Unknown [m/z 82, 109 (35), 135 (22), 127 (19), 54 (16), 43 (14)...]	8.47	1268	0.02			
Bornyl acetate	8.67	1282	0.09	8.36	1532	0.12

Thymol	8.92	1299	0.82	15.11	2128	0.83
α-Terpinyl acetate	9.61	1344	0.04	9.78	1646	0.04
Neryl acetate	9.86	1362	0.01	10.25	1684	0.01
Bornyl propionate	9.97	1369	0.02			
β-Bourbonene	10.07	1377	0.03	7.65	1477	0.04
Geranyl acetate	10.14	1381	0.03	10.64	1718	0.05
α-Gurjunene	10.41	1400	0.01	7.78	1486	0.01
β-Caryophyllene	10.54	1410	0.67	8.57*	1548	[0.78]
β-Copaene	10.68	1420	0.01	8.52*	1545	0.01
<i>trans</i> -α-Bergamotene	10.81	1430	0.02	8.52*	1545	[0.01]
α-Humulene	11.00	1444	0.04	9.42	1616	0.03
allo-Aromadendrene	11.09	1451	0.03	9.12	1592	0.03
<i>cis</i> -Cadina-1(6),4-diene	11.12	1453	0.02	9.06	1587	0.04
γ-Murolene	11.34	1470	0.02	9.72	1641	0.01
Germacrene D	11.38	1472	0.08	9.91	1657	0.07
Viridiflorene	11.58*	1488	0.10	9.81*	1648	[2.02]
Bicyclogermacrene	11.58*	1488	[0.10]	10.18*†	1679	[0.14]
α-Murolene	11.66	1493	0.02	10.16†	1678	0.14
Aromadendra-1(10),4(15)-diene	11.74	1499	0.01	10.50	1705	0.01
γ-Cadinene	11.82	1506	0.03	10.53	1708	0.02
δ-Cadinene	11.96	1517	0.06	10.55	1710	0.07
α-Elemol	12.30	1543	0.02	14.12	2032	0.03
Geranyl butyrate	12.48	1558	0.01	12.24	1858	0.02
Spathulenol	12.62	1568	0.03	14.43	2062	0.03
Caryophyllene oxide	12.66	1571	0.06	12.84	1911	0.05
Isospathulenol	13.38	1629	0.02	15.47	2164	0.01
τ-Cadinol	13.43	1633	0.02	14.97	2114	0.01
α-Cadinol	13.59	1646	0.01	15.51	2169	0.03
Total identified		99.30%			98.77%	
Total reported		99.41%			98.79%	

*: 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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index