

Date : January 24, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19A15-PTH04-1-CC

Customer identification : Palo Santo - Peru - PJ0104712R

Type : Essential oil

Source : *Bursera graveolens*

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 : Benoit Roger, Ph. D.

Analysis date : January 17, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: faintly yellow liquid

Refractive index: 1.4765 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Toluene	tr	0.01*	Simple phenolic
3-Methylcyclopentanone	0.08	66.42*	Aliphatic ketone
α -Thujene	tr	[0.01]*	Monoterpene
α -Pinene	0.07	0.07	Monoterpene
3-Methylcyclohexanone	0.02	0.02	Aliphatic ketone
Sabinene	0.01	tr	Monoterpene
β -Pinene	0.01	0.01	Monoterpene
Hexahydroacetophenone epimer I	0.09	0.09	Aliphatic ketone
Hexahydroacetophenone epimer II	0.09	0.09	Aliphatic ketone
Dehydro-1,8-cineole	0.04	0.03	Monoterpenic ether
Myrcene	0.31	0.30	Monoterpene
α -Phellandrene	0.14*	0.09	Monoterpene
Pseudolimonene	[0.14]*	0.02	Monoterpene
Δ^3 -Carene	0.01	0.01	Monoterpene
α -Terpinene	0.01	0.01	Monoterpene
para-Cymene	1.02	1.02	Monoterpene
β -Phellandrene	67.10*	0.22*	Monoterpene
Limonene	[67.10]*	[66.42]*	Monoterpene
(Z)- β -Ocimene	[67.10]*	0.07*	Monoterpene
1,8-Cineole	[67.10]*	[0.22]*	Monoterpenic ether
(E)- β -Ocimene	0.01	tr	Monoterpene
γ -Terpinene	0.03	[0.07]*	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.09*	11.82*	Monoterpenic alcohol
para-Cymenene	[0.09]*	0.05	Monoterpene
Terpinolene	[0.09]*	0.03	Monoterpene
Linalool	0.06	0.12*	Monoterpenic alcohol
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.18	1.02*	Monoterpenic alcohol
Limona ketone	0.04	0.05	Normonoterpenic ketone
<i>cis</i> -Limonene oxide	0.05	0.05	Monoterpenic ether
<i>cis</i> -para-Mentha-2,8-dien-1-ol	0.16	0.22	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.08	0.08	Monoterpenic ether
<i>cis</i> - β -Terpineol	0.08	0.09	Monoterpenic alcohol
Menthone	0.13	0.14	Monoterpenic ketone
Menthofuran	11.94*	[11.82]*	Monoterpenic ether
Isomenthone	[11.94]*	0.18	Monoterpenic ketone
neo-Menthol	0.06*	0.02	Monoterpenic alcohol
<i>trans</i> - β -Terpineol	[0.06]*	0.33*	Monoterpenic alcohol
<i>trans</i> -Isopulegone	0.07	[1.02]*	Monoterpenic ketone
Terpinen-4-ol	0.11	0.05	Monoterpenic alcohol
<i>trans</i> -para-Mentha-1(7),8-dien-2-ol	0.01	0.33*	Monoterpenic alcohol
α -Terpineol	9.15	[10.45]	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.19*	0.22*	Monoterpenic ketone
Unknown	[0.19]*	0.02	Unknown
<i>trans</i> -Isopiperitenol	0.16*	0.14	Monoterpenic alcohol
<i>trans</i> -Dihydrocarvone	[0.16]*	0.01	Monoterpenic ketone
4,7-Dimethylbenzofuran?	0.04*		Phenylpropanoid
<i>cis</i> -Isopiperitenol	[0.04]*	0.05	Monoterpenic alcohol
<i>trans</i> -Carveol	0.33	[0.33]*	Monoterpenic alcohol

<i>cis</i> -para-Mentha-1(7),8-dien-2-ol	0.05	0.18*	Monoterpenic alcohol
<i>cis</i> -Carveol	0.17	0.17	Monoterpenic alcohol
Pulegone	0.78	[1.02]*	Monoterpenic ketone
Carvone	1.38	1.42*	Monoterpenic ketone
Unknown	0.06	0.06	Unknown
Perillaldehyde	0.02	0.02	Monoterpenic aldehyde
Limonen-10-ol	0.02	0.03	Monoterpenic alcohol
Perillyl alcohol	0.02	0.01	Monoterpenic alcohol
Unknown	0.05		Unknown
Unknown	0.06		Unknown
Menthofuroolactone isomer I	0.15		Monoterpenic lactone
Menthofuroolactone isomer II	0.18		Monoterpenic lactone
Evodone	0.06		Monoterpenic ketone
Menthofuroolactone	0.10	[0.18]*	Aliphatic alcohol
α -Ylangene	0.03	0.03	Sesquiterpene
α -Copaene	0.05	0.05	Sesquiterpene
β -Cubebene	0.02	0.10*	Sesquiterpene
β -Elemene	0.08	[0.22]*	Sesquiterpene
α -Cedrene	0.03	[0.12]*	Sesquiterpene
β -Ylangene	0.03	0.02	Sesquiterpene
8-Hydroxycarvotanacetone	0.01	0.03	Monoterpenic alcohol
β -Copaene	0.06*	0.04	Sesquiterpene
<i>cis</i> -Thujopsene	[0.06]*	0.02	Sesquiterpene
β -Barbatene	0.19*	0.05	Sesquiterpene
β -Humulene	[0.19]*	[0.10]*	Sesquiterpene
Menthofuroolactone isomer III	[0.19]*		Monoterpenic lactone
<i>cis</i> - β -Bergamotene?	0.02		Sesquiterpene
Unknown	0.10	0.09	Sesquiterpene
γ -Murolene	0.15	[0.33]*	Sesquiterpene
Germacrene D	1.23	10.45	Sesquiterpene
β -Selinene	0.04	0.06	Sesquiterpene
Unknown	0.05	0.02	Unknown
Menthallactone	0.41	0.40	Monoterpenic lactone
α -Selinene	0.09	[1.42]*	Sesquiterpene
α -Murolene	0.08	0.06	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.29*	0.21	Sesquiterpene
γ -Cadinene	[0.29]*	0.14	Sesquiterpene
Unknown	0.07		Sesquiterpene
<i>trans</i> -Calamenene	0.16*	0.01	Sesquiterpene
δ -Cadinene	[0.16]*	0.15	Sesquiterpene
Menthofuroolactone analog	0.04		Monoterpenic lactone
α -Cadinene	0.02	0.01	Sesquiterpene
1,5-Epoxy-salvial-4(14)-ene	0.10	0.17	Sesquiterpenic ether
7 α -Hydroxymintlactone	0.02		Monoterpenic alcohol
Spathulenol	0.03	0.06	Sesquiterpenic alcohol
Globulol	0.01	0.03	Sesquiterpenic alcohol
Salvial-4(14)-en-1-one	0.03	0.02	Aliphatic alcohol
Unknown	0.04		Oxygenated sesquiterpene
Junenol	0.17	0.15*	Sesquiterpenic alcohol
1-epi-Cubenol	0.03	0.02	Sesquiterpenic alcohol
Cubenol	0.06*	[0.15]*	Sesquiterpenic alcohol
τ -Cadinol	[0.06]*	0.03	Sesquiterpenic alcohol

τ -Muurolol	[0.06]*	0.04	Sesquiterpenic alcohol
β -Eudesmol	0.04	0.07	Sesquiterpenic alcohol
Unknown	0.05	0.03	Sesquiterpenic alcohol
α -Cadinol	0.05	0.11	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1 α -ol	0.02	0.04	Sesquiterpenic alcohol
Total identified	98.52%	97.87%	

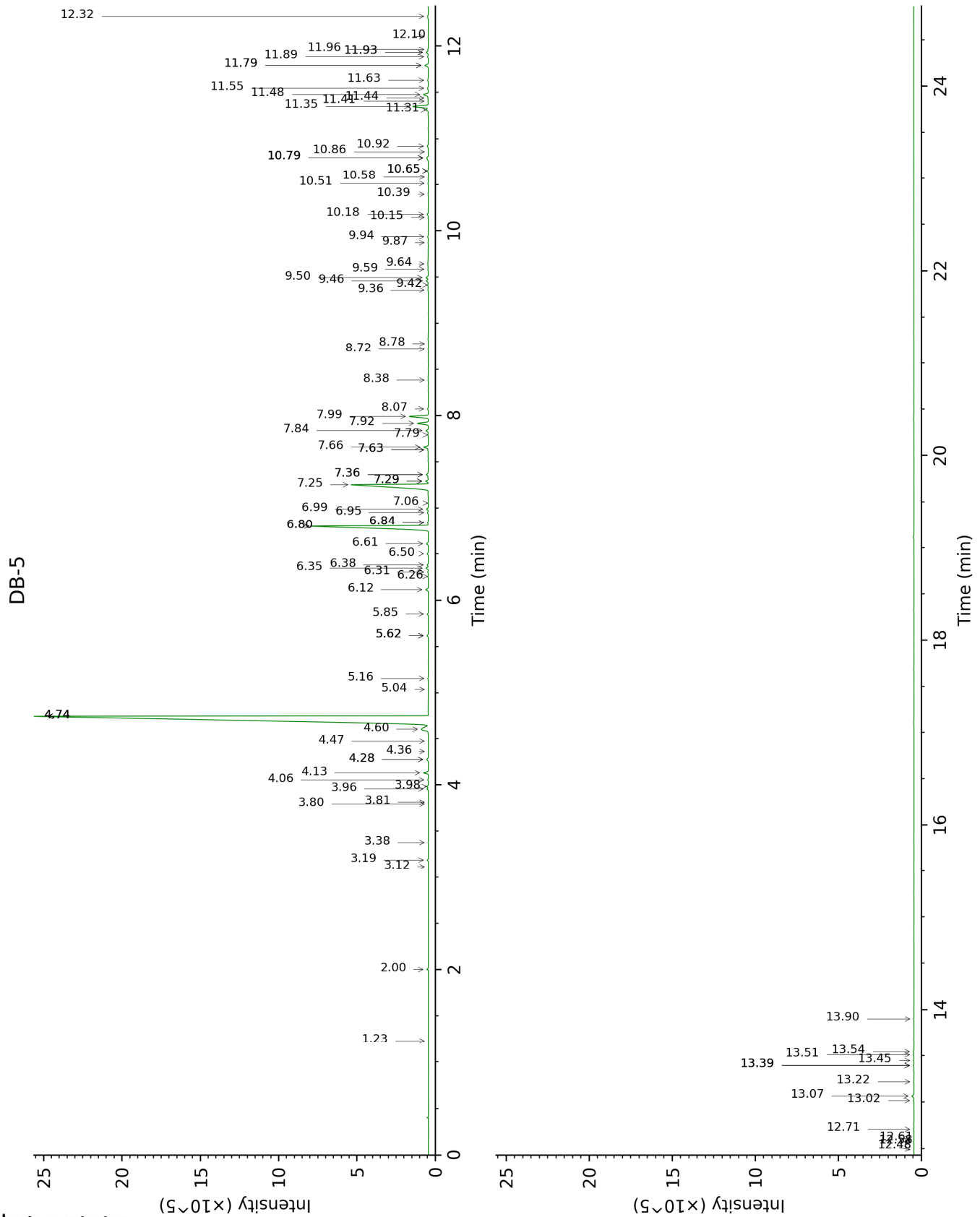
*: Two or more compounds are coeluting on this column

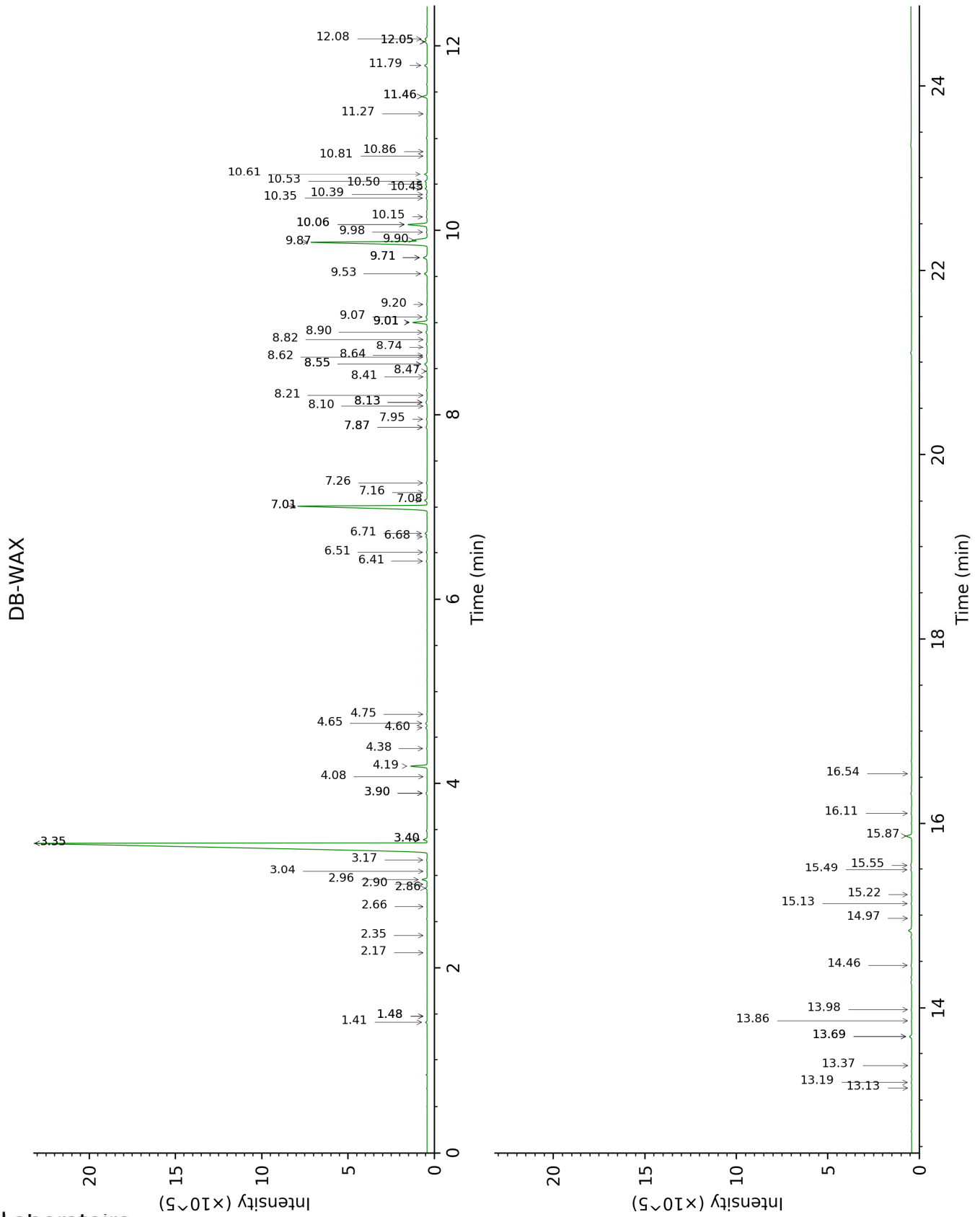
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Toluene	1.23	756	tr	1.48*	1003	0.01
3-Methylcyclopentanone	2.00	838	0.08	3.36*	1167	66.42
α -Thujene	3.12	924	tr	1.48*	1003	[0.01]
α -Pinene	3.19	929	0.07	1.41	994	0.07
3-Methylcyclohexanone	3.38	942	0.02	4.75	1275	0.02
Sabinene	3.80	969	0.01	2.35	1085	tr
β -Pinene	3.82	970	0.01	2.16	1067	0.01
Hexahydroacetophenone epimer I	3.96	980	0.09	4.60	1264	0.09
Hexahydroacetophenone epimer II	3.98	981	0.09	4.65	1267	0.09
Dehydro-1,8-cineole	4.06	986	0.04	3.18	1152	0.03
Myrcene	4.13	991	0.31	2.96	1135	0.30
α -Phellandrene	4.28*	1000	0.14	2.86	1128	0.09
Pseudolimonene	4.28*	1000	[0.14]	2.90	1131	0.02
Δ 3-Carene	4.36	1006	0.01	2.66	1112	0.01
α -Terpinene	4.47	1013	0.01	3.04	1142	0.01
para-Cymene	4.60	1021	1.02	4.19	1232	1.02
β -Phellandrene	4.74*	1030	67.10	3.40*	1170	0.22
Limonene	4.74*	1030	[67.10]	3.36*	1167	[66.42]
(Z)- β -Ocimene	4.74*	1030	[67.10]	3.90*	1210	0.07
1,8-Cineole	4.74*	1030	[67.10]	3.40*	1170	[0.22]
(E)- β -Ocimene	5.04	1049	0.01	4.08	1223	tr
γ -Terpinene	5.16	1056	0.03	3.90*	1210	[0.07]
<i>trans</i> -Linalool oxide (fur.)	5.62*	1085	0.09	7.01*	1432	11.82
para-Cymenene	5.62*	1085	[0.09]	6.41	1387	0.05
Terpinolene	5.62*	1085	[0.09]	4.38	1246	0.03
Linalool	5.85	1100	0.06	8.14*	1517	0.12
<i>trans</i> -para-Mentha-2,8- dien-1-ol	6.12	1117	0.18	9.01*	1585	1.02
Limona ketone	6.26	1126	0.04	7.95	1503	0.05
<i>cis</i> -Limonene oxide	6.31	1129	0.05	6.51	1394	0.05
<i>cis</i> -para-Mentha-2,8- dien-1-ol	6.35	1132	0.16	9.53	1627	0.22
<i>trans</i> -Limonene oxide	6.38	1134	0.08	6.68	1407	0.08
<i>cis</i> - β -Terpineol	6.50	1142	0.08	9.07	1590	0.09
Menthone	6.61	1149	0.13	6.71	1410	0.14
Menthofuran	6.80*	1161	11.94	7.01*	1432	[11.82]
Isomenthone	6.80*	1161	[11.94]	7.08	1437	0.18
neo-Menthol	6.84*	1164	0.06	8.62	1555	0.02
<i>trans</i> - β -Terpineol	6.84*	1164	[0.06]	9.71*	1642	0.33
<i>trans</i> -Isopulegone	6.95	1171	0.07	9.01*	1585	[1.02]
Terpinen-4-ol	6.99	1174	0.11	8.64	1557	0.05
<i>trans</i> -para-Mentha- 1(7),8-dien-2-ol	7.06	1178	0.01	11.46*	1788	0.33
α -Terpineol	7.26	1191	9.15	9.87†	1655	[10.45]
<i>cis</i> -Dihydrocarvone	7.29*	1193	0.19	8.55*	1549	0.22
Unknown [m/z 121, 79]	7.29*	1193	[0.19]	8.10	1514	0.02

(61), 93 (55), 94 (40), 91 (39), 84 (37)...						
<i>trans</i> -Isopiperitenol	7.36*	1198	0.16	10.45	1703	0.14
<i>trans</i> -Dihydrocarvone	7.36*	1198	[0.16]	8.74	1564	0.01
4,7-Dimethylbenzofuran?	7.63*	1216	0.04			
<i>cis</i> -Isopiperitenol	7.63*	1216	[0.04]	10.39	1697	0.05
<i>trans</i> -Carveol	7.66	1218	0.33	11.46*	1788	[0.33]
<i>cis</i> -para-Mentha-1(7),8-dien-2-ol	7.79	1227	0.05	12.05*	1840	0.18
<i>cis</i> -Carveol	7.84	1230	0.17	11.79	1818	0.17
Pulegone	7.92	1235	0.78	9.01*	1585	[1.02]
Carvone	7.99	1240	1.38	10.06*	1671	1.42
Unknown [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25)...	8.07	1246	0.06	10.35	1694	0.06
Perillaldehyde	8.38	1267	0.02	10.81	1733	0.02
Limonen-10-ol	8.72	1290	0.02	13.19	1944	0.03
Perillyl alcohol	8.78	1294	0.02	13.37	1961	0.01
Unknown [m/z 124, 123 (43), 121 (35), 166 (30), 93 (30), 136 (17)...	9.36	1332	0.05			
Unknown [m/z 150, 71 (67), 107 (54), 43 (44), 109 (42)...	9.42	1336	0.06			
Menthofuroolactone isomer I	9.46	1339	0.15			
Menthofuroolactone isomer II	9.50	1341	0.18			
Evodone	9.59	1348	0.06			
Menthofuroolactone	9.64	1352	0.10	12.05*	1840	[0.18]
α -Ylangene	9.87	1368	0.03	7.16	1443	0.03
α -Copaene	9.94	1372	0.05	7.26	1451	0.05
β -Cubebene	10.15	1387	0.02	7.87*	1496	0.10
β -Elemene	10.18	1390	0.08	8.55*	1549	[0.22]
α -Cedrene	10.40	1405	0.03	8.14*	1517	[0.12]
β -Ylangene	10.51	1414	0.03	8.21	1523	0.02
8-Hydroxycarvotanacetone	10.58	1419	0.01	16.54	2275	0.03
β -Copaene	10.65*	1424	0.06	8.47	1543	0.04
<i>cis</i> -Thujopsene	10.65*	1424	[0.06]	8.82	1570	0.02
β -Barbatene	10.80*	1435	0.19	9.20	1600	0.05
β -Humulene	10.80*	1435	[0.19]	7.87*	1496	[0.10]
Menthofuroolactone isomer III	10.80*	1435	[0.19]			
<i>cis</i> - β -Bergamotene?	10.86	1440	0.02			
Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.92	1444	0.10	8.90	1577	0.09
γ -Muurolole	11.31	1474	0.15	9.71*	1642	[0.33]
Germacrene D	11.35	1476	1.23	9.90†	1657	10.45
β -Selinene	11.41	1481	0.04	9.98	1664	0.06
Unknown [m/z 149, 161	11.44	1483	0.05	8.41	1538	0.02

(51), 93 (43), 91 (42), 164 (42), 105 (37)...204? (11)]						
Menthylactone	11.48	1486	0.41	15.87	2205	0.40
α-Selinene	11.55	1491	0.09	10.06*	1671	[1.42]
α-Murolol	11.63	1498	0.08	10.15	1678	0.06
(3E,6E)-α-Farnesene	11.79*	1510	0.29	10.61	1716	0.21
γ-Cadinene	11.79*	1510	[0.29]	10.50	1707	0.14
Unknown [m/z 161, 81 (93), 105 (66), 93 (60), 119 (60), 204 (54)...]	11.89	1517	0.07			
trans-Calamenene	11.93*	1521	0.16	11.27	1772	0.01
δ-Cadinene	11.93*	1521	[0.16]	10.53	1709	0.15
Menthofuroolactone analog	11.96	1524	0.04			
α-Cadinene	12.10	1534	0.02	10.86	1737	0.01
1,5-Epoxysalvial-4(14)-ene	12.32	1552	0.10	12.08	1843	0.17
7α-Hydroxymintylactone	12.48	1564	0.02			
Spathulenol	12.58	1572	0.03	14.46	2065	0.06
Globulol	12.61	1574	0.01	13.98	2018	0.03
Salvial-4(14)-en-1-one	12.71	1582	0.03	13.13	1939	0.02
Unknown [m/z 43, 93 (88), 91 (76), 79 (73), 69 (64), 41 (63), 95 (53).. 220 (3)]	13.02	1607	0.04			
Junenol	13.07	1611	0.17	13.69*	1991	0.15
1-epi-Cubenol	13.22	1623	0.03	13.86	2007	0.02
Cubenol	13.39*	1638	0.06	13.69*	1991	[0.15]
τ-Cadinol	13.39*	1638	[0.06]	14.97	2114	0.03
τ-Murolol	13.39*	1638	[0.06]	15.13	2130	0.04
β-Eudesmol	13.45	1642	0.04	15.49	2167	0.07
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.51	1647	0.05	15.22	2140	0.03
α-Cadinol	13.54	1650	0.05	15.55	2173	0.11
Germacre-4(15),5,10(14)-trien-1α-ol	13.90	1680	0.02	16.11	2230	0.04
Total identified		98.52%			97.87%	
Total reported		98.99%			98.09%	

*: 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