



GC/MS BATCH NUMBER: PJ0102

ESSENTIAL OIL: PALO SANTO

BOTANICAL NAME: BURSERA GRAVEOLENS

ORIGIN: ECUADOR

KEY CONSTITUENTS PRESENT IN THIS BATCH OF PALO SANTO OIL	%
LIMONENE	65.6
MENTHOFURAN	13.5
α-TERPINEOL	9.1
CARVONE	1.3
GERMACRENE D	1.3

Date : May 01, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18D27-PTH1-1-CC

Customer identification : Palo Santo - Ecuador - PJ010281R

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 : April 30, 2018

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Light 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	tr	Simple phenolic
3-Methylcyclopentanone	0.07		Aliphatic ketone
α-Thujene	0.01	0.01	Monoterpene
α-Pinene	0.18	0.18	Monoterpene
3-Methylcyclohexanone	0.02	0.02	Aliphatic ketone
Sabinene	0.09*	0.05	Monoterpene
β-Pinene	[0.09]*	0.02	Monoterpene
Hexahydroacetophenone epimer I	0.13	0.08	Aliphatic ketone
Hexahydroacetophenone epimer II	0.08	0.08	Aliphatic ketone
Dehydro-1,8-cineole	0.04	0.03	Monoterpenic ether
Myrcene	0.56	0.56	Monoterpene
α-Phellandrene	0.15*	0.11	Monoterpene
Pseudolimonene	[0.15]*	0.02	Monoterpene
Octanal	0.02	0.02	Aliphatic aldehyde
Δ3-Carene	0.01	0.01	Monoterpene
α-Terpinene	0.01	0.01	Monoterpene
para-Cymene	0.85	0.91	Monoterpene
Limonene	65.44*	65.59	Monoterpene
β-Phellandrene	[65.44]*	[0.20]	Monoterpene
1,8-Cineole	[65.44]*	0.20	Monoterpenic ether
(E)-β-Ocimene	0.01	0.01	Monoterpene
γ-Terpinene	0.12	0.15	Monoterpene
Terpinolene	0.08*	0.02	Monoterpene
para-Cymenene	[0.08]*	0.05	Monoterpene
Linalool	0.04	0.04	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.16	0.99*	Monoterpenic alcohol
Limona ketone	0.03	0.04	Normonoterpenic ketone
cis-Limonene oxide	0.05	0.05	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.14	0.26	Monoterpenic alcohol
trans-Limonene oxide	0.07	0.07	Monoterpenic ether
cis-β-Terpineol	0.08	0.07*	Monoterpenic alcohol
Menthone	0.09	0.09	Monoterpenic ketone
Menthofuran	13.55*	13.51	Monoterpenic ether
Isomenthone	[13.55]*	0.09	Monoterpenic ketone
neo-Menthol	0.13*	0.03	Monoterpenic alcohol
trans-β-Terpineol	[0.13]*	0.10	Monoterpenic alcohol
trans-Isopulegone	0.07	[0.07]*	Monoterpenic ketone
Terpinen-4-ol	0.11	0.02	Monoterpenic alcohol
trans-para-Mentha-1(7),8-dien-2-ol	0.02	0.28*	Monoterpenic alcohol
α-Terpineol	9.05	10.25*	Monoterpenic alcohol
cis-Dihydrocarvone	0.18*	0.12	Monoterpenic ketone
Unknown	[0.18]*	0.03	Unknown
trans-Dihydrocarvone	0.04	0.03	Monoterpenic ketone
trans-Isopiperitenol	0.12	0.15	Monoterpenic alcohol
cis-Isopiperitenol	0.04*	0.04	Monoterpenic alcohol
4,7-Dimethylbenzofuran?	[0.04]*		Phenylpropanoid
trans-Carveol	0.29	[0.28]*	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.04	0.16	Monoterpenic alcohol

<i>cis</i> -Carveol	0.15	0.15	Monoterpenic alcohol
Pulegone	0.82	[0.99]*	Monoterpenic ketone
Carvone	1.32	1.39	Monoterpenic ketone
Unknown	0.06		Unknown
Perillaldehyde	0.02	0.01	Monoterpenic aldehyde
Limonen-10-ol	0.02	0.02	Monoterpenic alcohol
Perillyl alcohol	0.03	0.02	Monoterpenic alcohol
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.01		Monoterpenic peroxide
Unknown	0.02		Unknown
Unknown	0.06		Unknown
Menthofurolactone isomer I	0.19		Monoterpenic lactone
Menthofurolactone isomer II	0.22		Monoterpenic lactone
Evodone	0.03	0.02	Monoterpenic ketone
α -Ylangene	0.02	0.02	Sesquiterpene
α -Copaene	0.04	0.04	Sesquiterpene
β -Cubebene	0.02	0.02	Sesquiterpene
β -Elemene	0.08	0.09	Sesquiterpene
α -Cedrene	0.01	0.01	Sesquiterpene
β -Ylangene	0.03	0.03	Sesquiterpene
8-Hydroxycarvotanacetone	0.06*	0.01	Monoterpenic alcohol
β -Copaene	[0.06]*	0.04	Sesquiterpene
β -Humulene	0.08*	0.07	Sesquiterpene
Menthofurolactone isomer III	[0.08]*		Monoterpenic lactone
β -Barbatene	0.06	0.03	Sesquiterpene
<i>cis</i> - β -Bergamotene?	0.01		Sesquiterpene
Unknown	0.09	0.08	Sesquiterpene
γ -Muurolene	0.14	0.18	Sesquiterpene
Germacrene D	1.27	[10.25]*	Sesquiterpene
β -Selinene	0.04	0.03	Sesquiterpene
Unknown	0.03		Unknown
Menthylactone	0.44	0.41	Monoterpenic lactone
(3E,6E)- α -Farnesene	0.27*	0.17*	Sesquiterpene
γ -Cadinene	[0.27]*	0.23	Sesquiterpene
Unknown	0.07		Sesquiterpene
δ -Cadinene	0.15	[0.17]*	Sesquiterpene
<i>trans</i> -Calamenene	0.04	0.04	Sesquiterpene
Menthofurolactone analog	0.01		Monoterpenic lactone
α -Cadinene	0.02	0.01	Sesquiterpene
1,5-Epoxyosalvial-4(14)-ene	0.03	0.03	Sesquiterpenic ether
7 α -Hydroxymintlactone	0.01		Monoterpenic alcohol
Spathulenol	0.03	0.06	Sesquiterpenic alcohol
Globulol	0.02	0.02	Sesquiterpenic alcohol
Salvia-4(14)-en-1-one	0.02	0.01	Aliphatic alcohol
Unknown	0.14*		Oxygenated sesquiterpene
Junenol	[0.14]*	0.13	Sesquiterpenic alcohol
1-epi-Cubenol	0.02	0.02*	Sesquiterpenic alcohol
τ -Cadinol	0.05*	0.01	Sesquiterpenic alcohol
τ -Muurolol	[0.05]*	0.03	Sesquiterpenic alcohol
Cubenol	[0.05]*	[0.02]*	Sesquiterpenic alcohol
β -Eudesmol	0.04	0.14*	Sesquiterpenic alcohol
Unknown	0.06	0.03	Sesquiterpenic alcohol

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α -Cadinol	0.05	[0.14]*	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1 α -ol	0.01	0.02	Sesquiterpenic alcohol
Total identified	98.18%	98.07%	

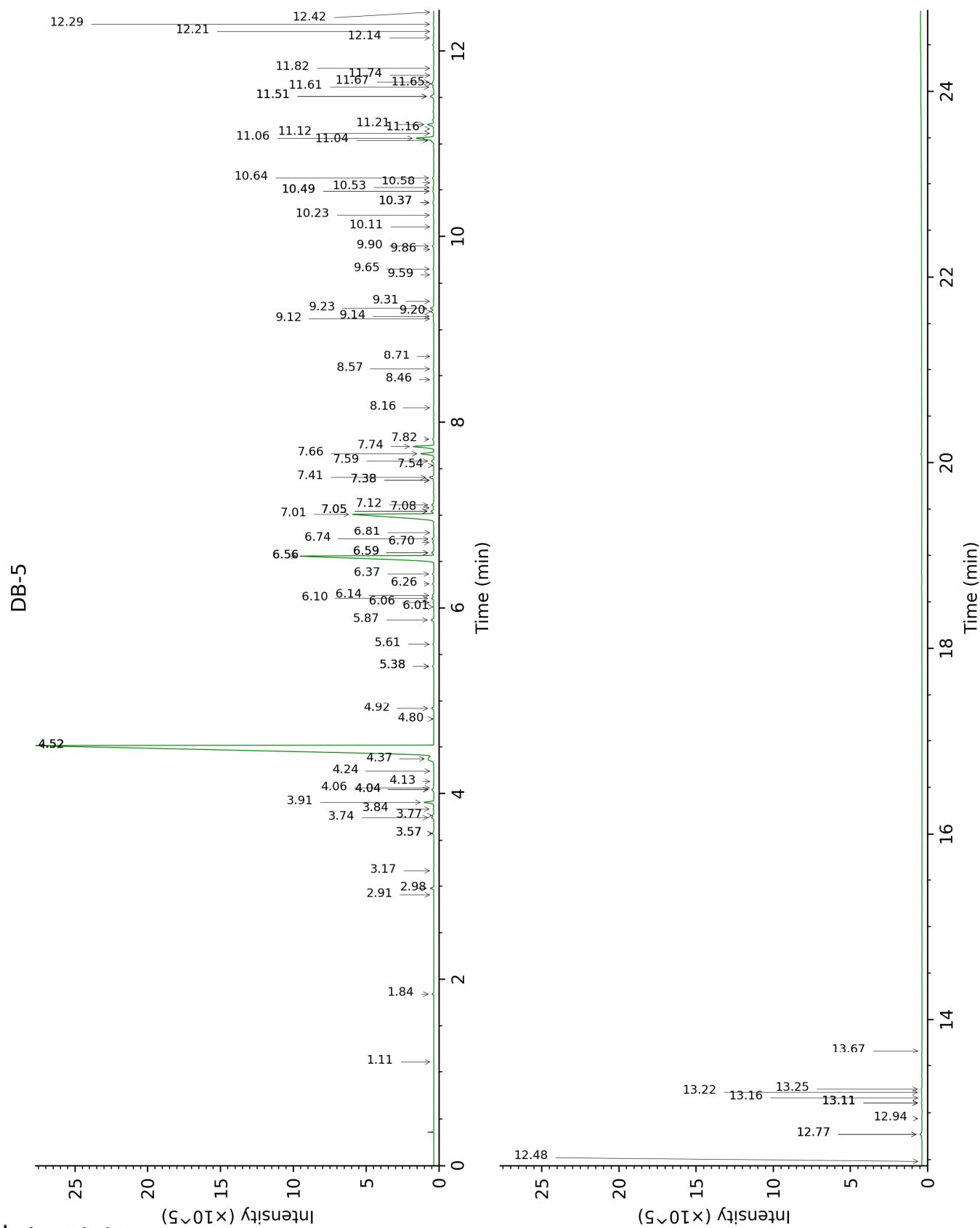
*: Two or more compounds are coeluting on this column

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

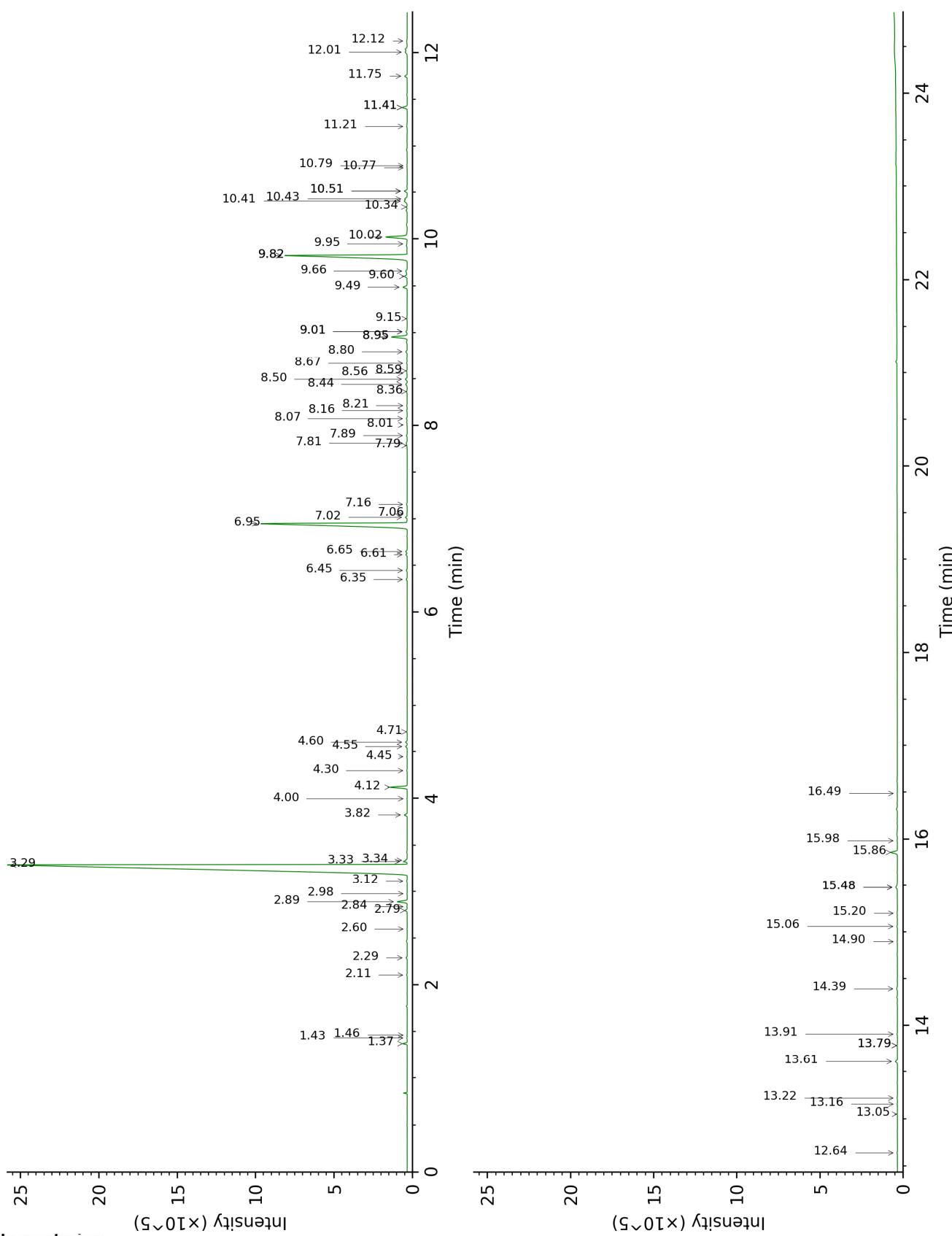
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.11	752	tr	1.46	1005	tr
3-Methylcyclopentanone	1.84	836	0.07			
α-Thujene	2.91	922	0.01	1.43	1002	0.01
α-Pinene	2.98	926	0.18	1.37	993	0.18
3-Methylcyclohexanone	3.17	940	0.02	4.71	1270	0.02
Sabinene	3.57*	966	0.09	2.29	1086	0.05
β-Pinene	3.57*	966	[0.09]	2.11	1068	0.02
Hexahydroacetophenone epimer I	3.74	978	0.13	4.56	1259	0.08
Hexahydroacetophenone epimer II	3.77	980	0.08	4.60	1262	0.08
Dehydro-1,8-cineole	3.84	984	0.04	3.12	1153	0.03
Myrcene	3.91	989	0.56	2.89	1136	0.56
α-Phellandrene	4.04*	998	0.15	2.80	1128	0.11
Pseudolimonene	4.04*	998	[0.15]	2.84	1132	0.02
Octanal	4.06	999	0.02	4.45	1251	0.02
Δ3-Carene	4.13	1004	0.01	2.60	1113	0.01
α-Terpinene	4.24	1011	0.01	2.98	1142	0.01
para-Cymene	4.37	1019	0.85	4.12	1228	0.91
Limonene	4.52*	1028	65.44	3.29	1166	65.59
β-Phellandrene	4.52*	1028	[65.44]	3.33†	1169	[0.20]
1,8-Cineole	4.52*	1028	[65.44]	3.34†	1170	0.20
(E)-β-Ocimene	4.80	1046	0.01	4.00	1219	0.01
γ-Terpinene	4.92	1054	0.12	3.82	1207	0.15
Terpinolene	5.38*	1083	0.08	4.30	1240	0.02
para-Cymenene	5.38*	1083	[0.08]	6.35	1388	0.05
Linalool	5.61	1098	0.04	8.07	1516	0.04
trans-para-Mentha-2,8-dien-1-ol	5.87	1114	0.16	8.95*	1585	0.99
Limona ketone	6.01	1123	0.03	7.89	1502	0.04
cis-Limonene oxide	6.06	1126	0.05	6.44	1395	0.05
cis-para-Mentha-2,8-dien-1-ol	6.10	1129	0.14	9.49	1627	0.26
trans-Limonene oxide	6.14	1131	0.07	6.61	1407	0.07
cis-β-Terpineol	6.26	1139	0.08	9.01*	1589	0.07
Menthone	6.37	1146	0.09	6.65	1410	0.09
Menthofuran	6.56*	1158	13.55	6.95	1432	13.51
Isomenthone	6.56*	1158	[13.55]	7.02	1437	0.09
neo-Menthol	6.59*	1161	0.13	8.58	1556	0.03
trans-β-Terpineol	6.59*	1161	[0.13]	9.66	1641	0.10
trans-Isopulegone	6.70	1168	0.07	9.01*	1589	[0.07]
Terpinen-4-ol	6.74	1170	0.11	8.56	1554	0.02
trans-para-Mentha-1(7),8-dien-2-ol	6.81	1175	0.02	11.41*	1788	0.28
α-Terpineol	7.01	1188	9.05	9.82*	1654	10.25
cis-Dihydrocarvone	7.05*	1190	0.18	8.50	1549	0.12
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91	7.05*	1190	[0.18]	8.16	1523	0.03

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(39), 84 (37)...						
trans-Dihydrocarvone	7.08	1192	0.04	8.67	1562	0.03
trans-Isopiperitenol	7.12	1194	0.12	10.43	1704	0.15
cis-Isopiperitenol	7.38*	1212	0.04	10.34	1697	0.04
4,7-Dimethylbenzofuran?	7.38*	1212	[0.04]			
trans-Carveol	7.41	1214	0.29	11.41*	1788	[0.28]
cis-para-Mentha-1(7),8-dien-2-ol	7.54	1222	0.04	12.01	1840	0.16
cis-Carveol	7.59	1226	0.15	11.75	1817	0.15
Pulegone	7.66	1231	0.82	8.95*	1585	[0.99]
Carvone	7.74	1236	1.32	10.02	1671	1.39
Unknown [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25) ...]	7.82	1241	0.06			
Perillaldehyde	8.16	1264	0.02	10.77	1733	0.01
Limonen-10-ol	8.46	1284	0.02	13.16	1944	0.02
Perillyl alcohol	8.57	1292	0.03	13.22	1949	0.02
cis-para-Mentha-2,8-diene-1-hydroperoxide	8.71	1301	0.01			
Unknown [m/z 124, 123 (43), 121 (35), 166 (30), 93 (30), 136 (17) ...]	9.12	1330	0.02			
Unknown [m/z 150, 71 (67), 107 (54), 43 (44), 109 (42) ...]	9.14	1332	0.06			
Menthofurolactone isomer I	9.20	1336	0.19			
Menthofurolactone isomer II	9.23	1338	0.22			
Evodone	9.31	1344	0.03	12.64	1896	0.02
α-Ylangene	9.59	1364	0.02	7.06	1440	0.02
α-Copaene	9.65	1368	0.04	7.16	1448	0.04
β-Cubebene	9.86	1383	0.02	7.79	1494	0.02
β-Elemene	9.90	1386	0.08	8.44	1545	0.09
α-Cedrene	10.11	1400	0.01	8.01	1511	0.01
β-Ylangene	10.23	1409	0.03	8.21	1527	0.03
8-Hydroxycarvotanacetone	10.37*	1420	0.06	16.49	2272	0.01
β-Copaene	10.37*	1420	[0.06]	8.36	1539	0.04
β-Humulene	10.49*	1428	0.08	7.81	1496	0.07
Menthofurolactone isomer III	10.49*	1428	[0.08]			
β-Barbatene	10.53	1432	0.06	9.15	1600	0.03
cis-β-Bergamotene?	10.58	1435	0.01			
Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.64	1440	0.09	8.80	1572	0.08
γ-Murolene	11.04	1470	0.14	9.60	1637	0.18
Germacrene D	11.06	1472	1.27	9.82*	1654	[10.25]
β-Selinene	11.12	1476	0.04	9.95	1665	0.03
Unknown [m/z 149, 161 (51), 93 (43), 91 (42), 164	11.16	1479	0.03			

(42), 105 (37)...204? (11)]						
Menthylactone	11.21	1483	0.44	15.86	2206	0.41
(3E,6E)- α -Farnesene	11.51*	1506	0.27	10.51*	1711	0.17
γ -Cadinene	11.51*	1506	[0.27]	10.41	1702	0.23
Unknown [m/z 161, 81 (93), 105 (66), 93 (60), 119 (60), 204 (54)...]	11.61	1513	0.07			
δ -Cadinene	11.65	1516	0.15	10.51*	1711	[0.17]
trans-Calamenene	11.67	1518	0.04	11.21	1770	0.04
Menthofurolactone analog	11.74	1523	0.01			
α -Cadinene	11.82	1529	0.02	10.79	1735	0.01
1,5-Epoxyosalvial-4(14)-ene	12.14	1555	0.03	12.12	1850	0.03
7 α -Hydroxymintlactone	12.21	1560	0.01			
Spathulenol	12.29	1566	0.03	14.39	2060	0.06
Globulol	12.42	1577	0.02	13.91	2014	0.02
Salvial-4(14)-en-1-one	12.48	1582	0.02	13.05	1934	0.01
Unknown [m/z 43, 93 (88), 91 (76), 79 (73), 69 (64), 41 (63), 95 (53).. 220 (3)]	12.77*	1605	0.14			
Junenol	12.77*	1605	[0.14]	13.61	1985	0.13
1-epi-Cubenol	12.94	1619	0.02	13.79*	2002	0.02
τ -Cadinol	13.10*	1632	0.05	14.90	2110	0.01
τ -Murolol	13.10*	1632	[0.05]	15.06	2126	0.03
Cubenol	13.10*	1632	[0.05]	13.79*	2002	[0.02]
β -Eudesmol	13.16	1637	0.04	15.48*	2168	0.14
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.22	1642	0.06	15.20	2140	0.03
α -Cadinol	13.25	1645	0.05	15.48*	2168	[0.14]
Germaca-4(15),5,10(14)-trien-1 α -ol	13.67	1679	0.01	15.98	2220	0.02
Total identified		98.18%		98.07%		
Total reported		98.57%		98.21%		

*: 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