



GC/MS BATCH NUMBER: PJ0103

ESSENTIAL OIL: PALO SANTO

BOTANICAL NAME: BURSERA GRAVEOLENS

ORIGIN: PERU

KEY CONSTITUENTS PRESENT IN THIS BATCH OF PALO SANTO OIL	%
LIMONENE	66.0
MENTHOFURAN	12.2
α-TERPINEOL	9.4
CARVONE	1.4
GERMACRENE D	1.3
p-CYMENE	1.1

Comments from Robert Tisserand: Characteristic woody-minty odor quality. Constituents are in expected amounts.

Date : September 17, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18I14-PTH1-1-CC

Customer identification : Palo Santo - Peru - PJ010381

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : September 14, 2018

Checked and approved by :



Sylvain Mercier, M. Sc., chimiste 2014-005

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: 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	0.01	0.01*	Simple phenolic
3-Methylcyclopentanone	0.08		Aliphatic ketone
α -Thujene	0.01	[0.01]*	Monoterpene
α -Pinene	0.16	0.17	Monoterpene
3-Methylcyclohexanone	0.03	0.02	Aliphatic ketone
Sabinene	0.15*	0.12	Monoterpene
β -Pinene	[0.15]*	0.02	Monoterpene
Hexahydroacetophenone epimer I	0.08	0.09	Aliphatic ketone
Hexahydroacetophenone epimer II	0.10	0.10	Aliphatic ketone
Dehydro-1,8-cineole	0.05	0.04	Monoterpenic ether
Myrcene	0.57	0.57	Monoterpene
Pseudolimonene	0.14*	0.02	Monoterpene
α -Phellandrene	[0.14]*	0.11	Monoterpene
Octanal	0.04	0.04	Aliphatic aldehyde
Δ 3-Carene	0.03	0.02	Monoterpene
α -Terpinene	0.01	0.02	Monoterpene
para-Cymene	67.07	1.07	Monoterpene
Limonene	[67.07]*	65.98	Monoterpene
β -Phellandrene	[67.07]*	0.22	Monoterpene
1,8-Cineole	[67.07]*	0.04	Monoterpenic ether
(E)- β -Ocimene	0.01	0.01	Monoterpene
γ -Terpinene	0.21	0.25	Monoterpene
cis-Sabinene hydrate	0.01	0.02*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	tr	0.01	Monoterpenic alcohol
Octanol	tr	tr	Aliphatic alcohol
trans-Linalool oxide (fur.)	0.07*	[0.02]*	Monoterpenic alcohol
Terpinolene	[0.07]*	0.03	Monoterpene
para-Cymenene	[0.07]*	0.06	Monoterpene
Linalool	0.05	0.05	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.17	1.03	Monoterpenic alcohol
Limona ketone	0.04	0.05*	Normonoterpenic ketone
cis-Limonene oxide	0.05	0.05	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.23*	0.19	Monoterpenic alcohol
trans-Limonene oxide	[0.23]*	0.08	Monoterpenic ether
Menthone	0.12	0.12	Monoterpenic ketone
Isomenthone	12.22*	0.15	Monoterpenic ketone
Menthofuran	[12.22]*	12.19	Monoterpenic ether
neo-Menthol	0.03	0.02	Monoterpenic alcohol
Unknown	0.07	0.19	Oxygenated monoterpene
Terpinen-4-ol	0.12*	0.04	Monoterpenic alcohol
trans-Isopulegone	[0.12]*	0.09	Monoterpenic ketone
4-Methylacetophenone	0.03	[0.27]*	Simple phenolic
α -Terpineol	9.36	9.23	Monoterpenic alcohol
Unknown	0.10*	0.04	Unknown
cis-Dihydrocarvone	[0.10]*	0.02	Monoterpenic ketone
trans-Dihydrocarvone	0.17*	0.03	Monoterpenic ketone
trans-Isopiperitenol	[0.17]*	0.27*	Monoterpenic alcohol
cis-Isopiperitenol	0.03	0.04	Monoterpenic alcohol

4,7-Dimethylbenzofuran?	0.05		Phenylpropanoid
trans-Carveol	0.31	0.32	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.05	0.07	Monoterpenic alcohol
cis-Carveol	0.16	0.16	Monoterpenic alcohol
Pulegone	0.82	[1.03]	Monoterpenic ketone
Carvone	1.35	1.40*	Monoterpenic ketone
Unknown	0.07		Unknown
Unknown	0.02		Unknown
Perillaldehyde	0.02	0.03	Monoterpenic aldehyde
Limonen-10-ol	0.02	0.03	Monoterpenic alcohol
Perillyl alcohol	0.03	0.01	Monoterpenic alcohol
cis-para-Mentha-2,8-diene-1-hydroperoxide	0.02		Monoterpenic peroxide
Unknown	0.08		Unknown
Unknown	0.03		Unknown
Menthofurolactone isomer I	0.18		Monoterpenic lactone
Menthofurolactone isomer II	0.22		Monoterpenic lactone
α -Ylangene	0.03	0.03	Sesquiterpene
α -Copaene	0.05	0.04	Sesquiterpene
cis- β -Elemene	0.02	0.01	Sesquiterpene
β -Cubebene	0.02	0.03	Sesquiterpene
β -Elemene	0.09	0.22	Sesquiterpene
α -Cedrene	0.01	0.02	Sesquiterpene
β -Ylangene	0.04	0.02	Sesquiterpene
β -Copaene	0.09*	0.04	Sesquiterpene
cis-Thujopsene	[0.09]*	0.05	Sesquiterpene
8-Hydroxycarotanacetone	[0.09]*	0.01	Monoterpenic alcohol
Menthofurolactone isomer III	0.10*		Monoterpenic lactone
β -Humulene	[0.10]*	[0.05]*	Sesquiterpene
β -Barbatene	0.06*	0.03	Sesquiterpene
cis- β -Bergamotene?	[0.06]*		Sesquiterpene
Unknown	0.09	0.09	Sesquiterpene
γ -Muurolene	0.13	0.14	Sesquiterpene
Germacrene D	1.25	1.22	Sesquiterpene
β -Selinene	0.04	0.03	Sesquiterpene
Unknown	0.03		Unknown
Menthylactone	0.45	0.42	Monoterpenic lactone
α -Selinene	0.09	[1.40]*	Sesquiterpene
α -Muurolene	0.09	0.09	Sesquiterpene
γ -Cadinene	0.30*	[0.27]*	Sesquiterpene
(3E,6E)- α -Farnesene	[0.30]*	0.21	Sesquiterpene
Unknown	0.05		Sesquiterpene
δ -Cadinene	0.19*	[0.27]*	Sesquiterpene
trans-Calamenene	[0.19]*	0.01	Sesquiterpene
Menthofurolactone analog	0.04		Monoterpenic lactone
α -Cadinene	0.02	0.02	Sesquiterpene
1,5-EpoxySalvial-4(14)-ene	0.05	0.04	Sesquiterpenic ether
7 α -Hydroxymintlactone	0.03	0.03	Monoterpenic alcohol
Spathulenol	0.04	0.08	Sesquiterpenic alcohol
Salvia-4(14)-en-1-one	0.02	0.02	Aliphatic alcohol
Unknown	0.02		Oxygenated sesquiterpene
Junenol	0.17	0.15	Sesquiterpenic alcohol

Laboratoire
PhytoChemia

Plus que des analyses... des conseils

1-epi-Cubenol	0.02	0.02	Sesquiterpenic alcohol
Cubenol	0.03	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.05*	0.02	Sesquiterpenic alcohol
τ-Muurolol	[0.05]*	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.04	0.06	Sesquiterpenic alcohol
Unknown	0.04	0.02	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1α-ol	0.03	0.05	Sesquiterpenic alcohol
Total identified	98.40%	97.86%	

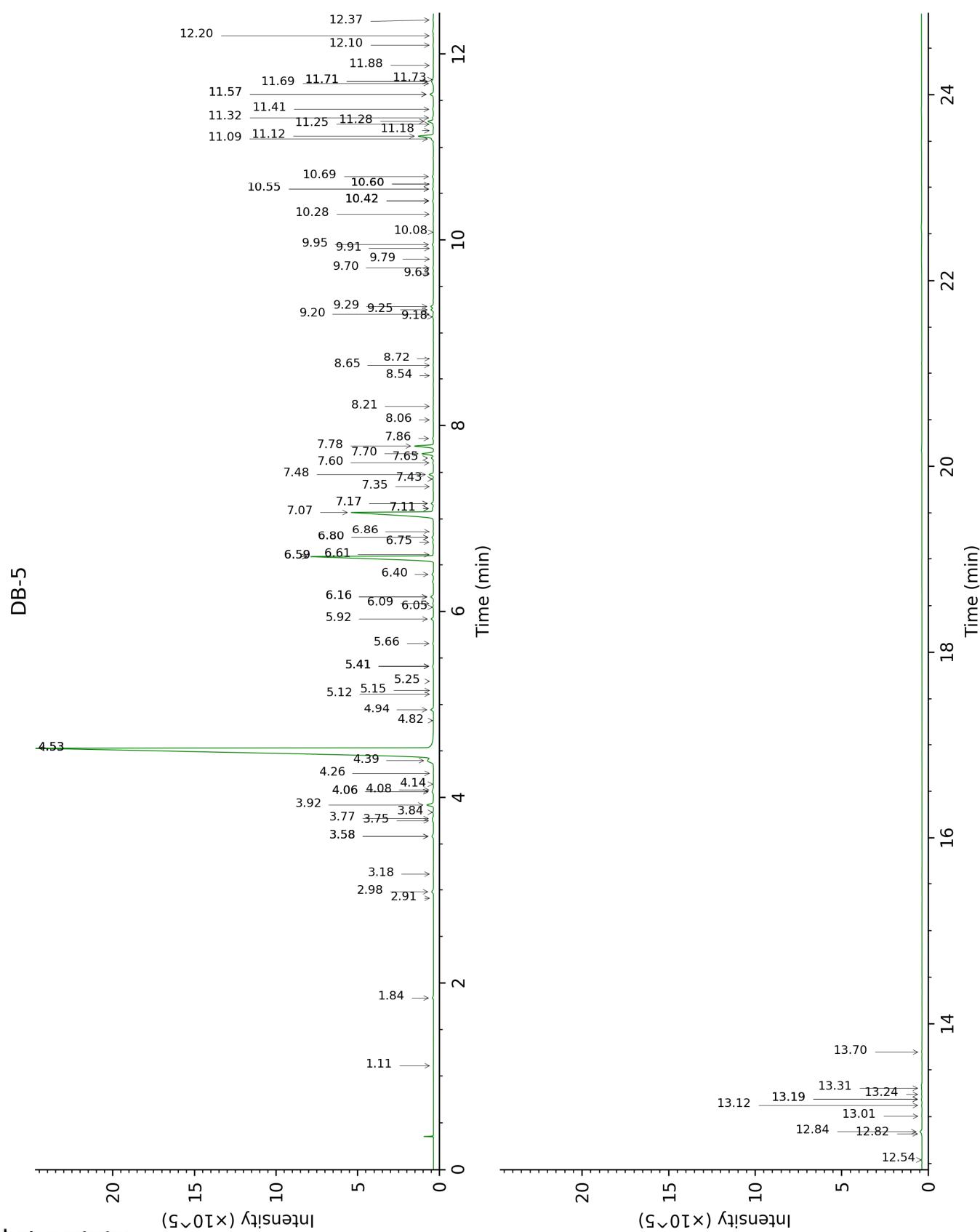
*: Two or more compounds are coeluting on this column

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

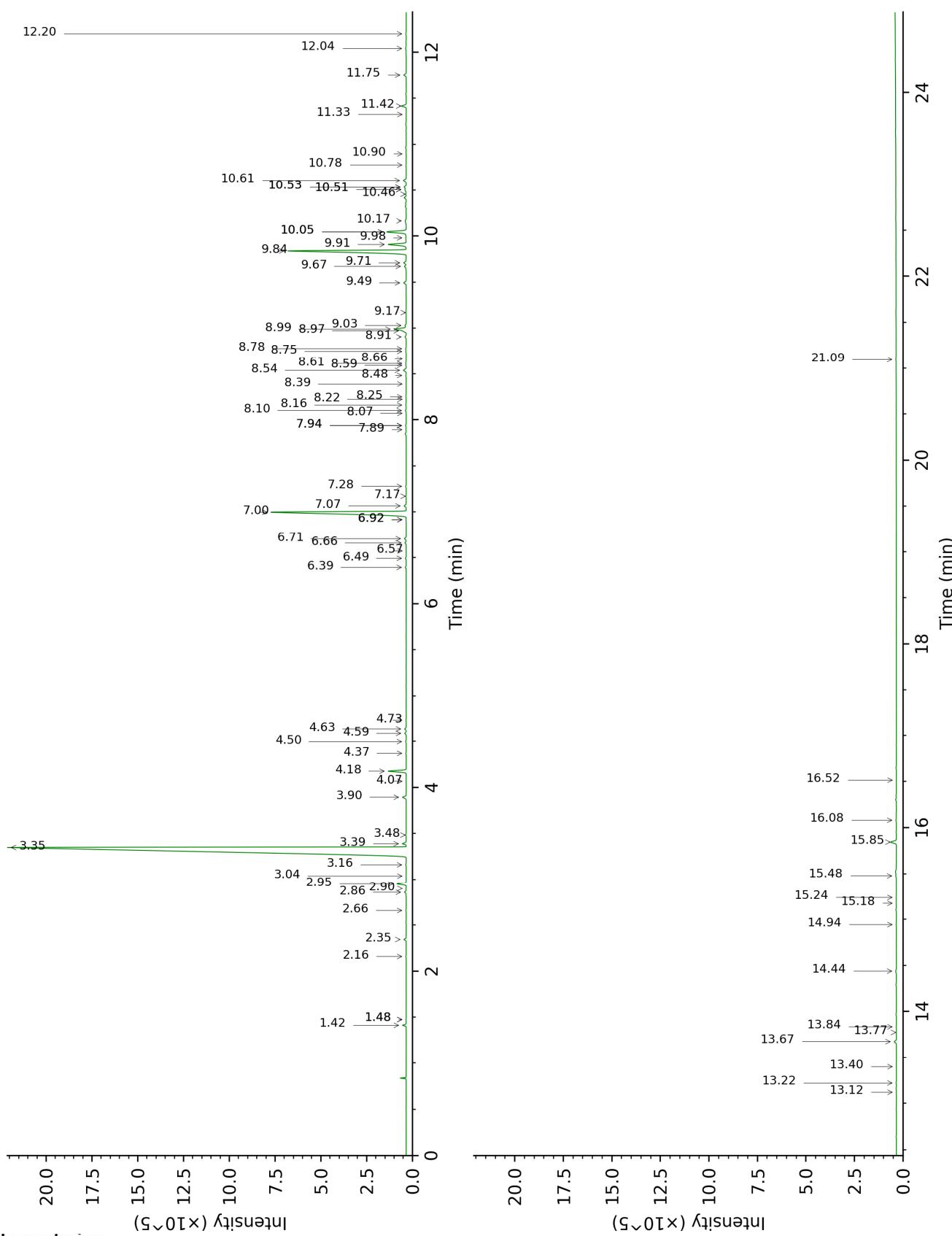
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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



DB-WAX



Laboratoire
PhytoChemia

Plus que des analyses... des conseils

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.11	755	0.01	1.48*	1002	0.01
3-Methylcyclopentanone	1.84	838	0.08			
α-Thujene	2.91	923	0.01	1.48*	1002	[0.01]
α-Pinene	2.98	928	0.16	1.42	995	0.17
3-Methylcyclohexanone	3.18	941	0.03	4.73	1269	0.02
Sabinene	3.58*	968	0.15	2.34	1088	0.12
β-Pinene	3.58*	968	[0.15]	2.16	1070	0.02
Hexahydroacetophenone epimer I	3.75	980	0.08	4.59	1259	0.09
Hexahydroacetophenone epimer II	3.77	981	0.10	4.64	1263	0.10
Dehydro-1,8-cineole	3.84	986	0.05	3.16	1155	0.04
Myrcene	3.92	991	0.57	2.95	1138	0.57
Pseudolimonene	4.06*	1000	0.14	2.90	1134	0.02
α-Phellandrene	4.06*	1000	[0.14]	2.86	1131	0.11
Octanal	4.08	1002	0.04	4.50	1253	0.04
Δ3-Carene	4.14	1006	0.03	2.66	1116	0.02
α-Terpinene	4.26	1013	0.01	3.04	1145	0.02
para-Cymene	4.40†	1022	67.07	4.18	1230	1.07
Limonene	4.53*†	1030	[67.07]	3.35	1169	65.98
β-Phellandrene	4.53*†	1030	[67.07]	3.39	1172	0.22
1,8-Cineole	4.53*†	1030	[67.07]	3.48	1179	0.04
(E)-β-Ocimene	4.82	1049	0.01	4.07	1222	0.01
γ-Terpinene	4.94	1056	0.21	3.90	1210	0.25
cis-Sabinene hydrate	5.12	1067	0.01	6.92*	1426	0.02
cis-Linalool oxide (fur.)	5.15	1070	tr	6.57	1401	0.01
Octanol	5.25	1076	tr	8.22	1524	tr
trans-Linalool oxide (fur.)	5.41*	1086	0.07	6.92*	1426	[0.02]
Terpinolene	5.41*	1086	[0.07]	4.37	1244	0.03
para-Cymenene	5.41*	1086	[0.07]	6.39	1388	0.06
Linalool	5.66	1101	0.05	8.10	1514	0.05
trans-para-Mentha-2,8-dien-1-ol	5.92	1118	0.17	8.97†	1582	1.03
Limona ketone	6.05	1126	0.04	7.94*	1502	0.05
cis-Limonene oxide	6.09	1129	0.05	6.49	1395	0.05
cis-para-Mentha-2,8-dien-1-ol	6.16*	1133	0.23	9.49	1623	0.19
trans-Limonene oxide	6.16*	1133	[0.23]	6.66	1407	0.08
Menthone	6.40	1149	0.12	6.71	1411	0.12
Isomenthone	6.59*	1161	12.22	7.07	1437	0.15
Menthofuran	6.59*	1161	[12.22]	7.00	1432	12.19
neo-Menthol	6.61	1162	0.03	8.66	1558	0.02
Unknown [m/z 69, 84 (62), 41 (30), 123 (26), 97 (24), 109 (23)...]	6.74	1171	0.07	9.71	1641	0.19
Terpinen-4-ol	6.80*	1174	0.12	8.61	1554	0.04
trans-Isopulegone	6.80*	1174	[0.12]	9.03	1586	0.09
4-Methylacetophenone	6.86	1179	0.03	10.53*†	1708	[0.27]

Laboratoire
PhytoChemia

Plus que des analyses... des conseils

α -Terpineol	7.07	1192	9.36	9.84	1651	9.23
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.11*	1195	0.10	8.16	1519	0.04
<i>cis</i> -Dihydrocarvone	7.11*	1195	[0.10]	8.59	1552	0.02
<i>trans</i> -Dihydrocarvone	7.17*	1198	0.17	8.75	1564	0.03
<i>trans</i> -Isopiperitenol	7.17*	1198	[0.17]	10.50*†	1706	0.27
<i>cis</i> -Isopiperitenol	7.35	1210	0.03	10.46	1701	0.04
4,7-Dimethylbenzofuran?	7.43	1216	0.05			
<i>trans</i> -Carveol	7.48	1219	0.31	11.42	1783	0.32
<i>cis</i> -para-Mentha-1(7),8-dien-2-ol	7.60	1227	0.05	12.04	1837	0.07
<i>cis</i> -Carveol	7.65	1231	0.16	11.75	1812	0.16
Pulegone	7.70	1234	0.82	8.99†	1583	[1.03]
Carvone	7.78	1239	1.35	10.05*	1668	1.40
Unknown [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25)...]	7.86	1245	0.07			
Unknown [m/z 112, 70 (63), 43 (59), 59 (51), 97 (45), 84 (22)...]	8.06	1258	0.02			
Perillaldehyde	8.21	1268	0.02	10.78	1729	0.03
Limonen-10-ol	8.54	1290	0.02	13.22	1944	0.03
Perillyl alcohol	8.65	1297	0.03	13.40	1960	0.01
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	8.72	1302	0.02			
Unknown [m/z 124, 123 (43), 121 (35), 166 (30), 93 (30), 136 (17)...]	9.18	1334	0.08			
Unknown [m/z 150, 71 (67), 107 (54), 43 (44), 109 (42)...]	9.20	1336	0.03			
Menthofurolactone isomer I	9.25	1340	0.18			
Menthofurolactone isomer II	9.29	1342	0.22			
α -Ylangene	9.64	1367	0.03	7.17	1445	0.03
α -Copaene	9.70	1371	0.05	7.28	1453	0.04
<i>cis</i> - β -Elemene	9.80	1378	0.02	8.39	1537	0.01
β -Cubebene	9.91	1386	0.02	7.90	1498	0.03
β -Elemene	9.95	1389	0.09	8.54	1548	0.22
α -Cedrene	10.08	1398	0.01	8.07	1512	0.02
β -Ylangene	10.28	1412	0.04	8.25	1526	0.02
β -Copaene	10.42*	1423	0.09	8.48	1544	0.04
<i>cis</i> -Thujopsene	10.42*	1423	[0.09]	8.78	1567	0.05
8-Hydroxycarvotanacetone	10.42*	1423	[0.09]	16.52	2268	0.01
Menthofurolactone isomer III	10.55*	1432	0.10			
β -Humulene	10.55*	1432	[0.10]	7.94*	1502	[0.05]
β -Barbatene	10.60*	1436	0.06	9.17	1597	0.03
<i>cis</i> - β -Bergamotene?	10.60*	1436	[0.06]			

Laboratoire
PhytoChemia

Plus que des analyses... des conseils

Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.69	1443	0.09	8.91	1577	0.09
γ -Murolene	11.09	1473	0.13	9.67	1638	0.14
Germacrene D	11.12	1475	1.25	9.91	1657	1.22
β -Selinene	11.18	1480	0.04	9.98	1663	0.03
Unknown [m/z 149, 161 (51), 93 (43), 91 (42), 164 (42), 105 (37)...204? (11)]	11.25	1485	0.03			
Menthylactone	11.28	1487	0.45	15.84	2198	0.42
α -Selinene	11.32	1490	0.09	10.05*	1668	[1.40]
α -Murolene	11.41	1497	0.09	10.17	1678	0.09
γ -Cadinene	11.57*	1509	0.30	10.50*†	1706	[0.27]
(3E,6E)- α -Farnesene	11.57*	1509	[0.30]	10.61	1714	0.21
Unknown [m/z 161, 81 (93), 105 (66), 93 (60), 119 (60), 204 (54)...]	11.69	1518	0.05			
δ -Cadinene	11.71*	1520	0.19	10.53*†	1708	[0.27]
trans-Calamenene	11.71*	1520	[0.19]	11.33	1775	0.01
Menthofurolactone analog	11.73	1522	0.04			
α -Cadinene	11.88	1534	0.02	10.90	1739	0.02
1,5-Epoxyosalvial-4(14)-ene	12.10	1551	0.05	12.20	1851	0.04
7 α -Hydroxymintlactone	12.20	1558	0.03	21.09	2796	0.03
Spathulenol	12.37	1572	0.04	14.44	2059	0.08
Salvial-4(14)-en-1-one	12.54	1586	0.02	13.12	1934	0.02
Unknown [m/z 43, 93 (88), 91 (76), 79 (73), 69 (64), 41 (63), 95 (53).. 220 (3)]	12.82	1608	0.02			
Junenol	12.84	1610	0.17	13.67	1986	0.15
1-epi-Cubenol	13.01	1623	0.02	13.84	2001	0.02
Cubenol	13.12	1633	0.03	13.77	1995	0.02
τ -Cadinol	13.19*	1638	0.05	14.94	2108	0.02
τ -Murolol	13.19*	1638	[0.05]	15.18	2131	0.02
β -Eudesmol	13.24	1642	0.04	15.48	2162	0.06
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.31	1648	0.04	15.24	2138	0.02
Germacra-4(15),5,10(14)-trien-1 α -ol	13.70	1680	0.03	16.08	2223	0.05
Total identified	98.40%			97.86%		
Total reported	98.90%			98.20%		

*: 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