PLANT THERAPY
100% PURE ESSENTIAL OILS

GC/MS BATCH NUMBER: P50107

ESSENTIAL OIL: PEPPERMINT
BOTANICAL NAME: MENTHA X PIPERITA
ORIGIN: INDIAN

KEY CONSTITUENTS PRESENT IN THIS BATCH OF PEPPERMINT OIL	%
MENTHOL	36.5
MENTHONE	25.6
MENTHYL ACETATE	6.3
β-PHELLANDRENE + 1,8-CINEOLE	5.4
ISOMENTHONE	4.0
neo-MENTHOL	3.7
MENTHOFURAN	2.5
LIMONENE	2.4
β-CARYOPHYLLENE	2.2
β-PINENE	1.2

Comments from Robert Tisserand: Beautiful fresh, creamy-minty odor profile. Eleven of 12 key ISO constituents are within range for non-US Peppermint oil, which is normal.

Date : September 27, 2018

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 18I20-PTH3-1-CC
Customer identification : Peppermint - Indian - P5010785R
Type : Essential oil
Source : *Mentha x piperita*
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 : Lindsay Girard, B. Sc.
Analysis date : September 21, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4595 ± 0.0003 (20 °C)

CONCLUSION

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

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Isovaleral	0.01	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	0.03*	Aliphatic alcohol
2-Methylbutanol	0.01	5.42*	Aliphatic alcohol
(2*E*)-Hexenal	0.01	[0.03]*	Aliphatic aldehyde
(3*Z*)-Hexenol	0.01	0.01	Aliphatic alcohol
Hexanol	0.01	0.01	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.02	0.02	Furan
α-Thujene	0.04	0.03	Monoterpene
α-Pinene	0.85	0.84	Monoterpene
Camphene	0.04	0.02	Monoterpene
Thuja-2,4(10)-diene	0.01	0.49*	Monoterpene
β-Pinene	1.71*	1.23	Monoterpene
Sabinene	[1.71]*	[0.49]*	Monoterpene
Octen-3-ol	0.04	0.06*	Aliphatic alcohol
Octan-3-one	0.03	0.02	Aliphatic ketone
Myrcene	0.17	0.17	Monoterpene
Octan-3-ol	0.16	0.16	Aliphatic alcohol
α-Phellandrene	0.05*	0.03	Monoterpene
Pseudolimonene	[0.05]*	0.02	Monoterpene
Δ3-Carene	0.01	0.01	Monoterpene
α-Terpinene	0.19	0.20	Monoterpene
para-Cymene	0.15	0.15	Monoterpene
β-Phellandrene	7.76*	[5.42]*	Monoterpene
Limonene	[7.76]*	2.38	Monoterpene
1,8-Cineole	[7.76]*	[5.42]*	Monoterpenic ether
(*Z*)-β-Ocimene	0.13	0.12	Monoterpene
(*E*)-β-Ocimene	0.04	0.04	Monoterpene
γ-Terpinene	0.29	0.30	Monoterpene
cis-Sabinene hydrate	0.26	0.27	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	0.01	Monoterpenic alcohol
Octanol	0.01	0.05	Aliphatic alcohol
para-Cymenene	0.10*	0.01	Monoterpene
Terpinolene	[0.10]*	0.10	Monoterpene
trans-Sabinene hydrate	0.03	0.04	Monoterpenic alcohol
Linalool	0.11*	0.20*	Monoterpenic alcohol
Isoamyl isovalerate	[0.11]*	0.03	Aliphatic ester
2-Methylbutyl 2-methylbutyrate	0.03*	0.04	Aliphatic ester
Nonanal	[0.03]*	0.01	Aliphatic aldehyde
Amyl isovalerate	0.02	0.02	Aliphatic ester
Unknown	tr		Unknown
cis-para-Menth-2-en-1-ol	0.04	[0.20]*	Monoterpenic alcohol
Octan-3-yl acetate	0.01	0.01	Aliphatic ester
Camphor	0.03	0.04	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	[0.03]	0.03*	Monoterpenic alcohol
neo-Isopulegol	0.15*	6.28*	Monoterpenic alcohol
Isopulegol	[0.15]*	[6.28]*	Monoterpenic alcohol
Menthone	25.55	25.67	Monoterpenic ketone

Isomenthone	6.42*	3.98	Monoterpenic ketone
Menthofuran	[6.42]*	2.45	Monoterpenic ether
neo-Menthol	3.95*	3.82*	Monoterpenic alcohol
δ-Terpineol	[3.95]*	0.21*	Monoterpenic alcohol
Terpinen-4-ol	37.32	[3.82]*	Monoterpenic alcohol
Menthol	[37.32]	36.49	Monoterpenic alcohol
Isomenthol	0.42	1.29*	Monoterpenic alcohol
α-Terpineol	0.11	0.19	Monoterpenic alcohol
neoiso-Menthol	0.21	[0.21]*	Monoterpenic alcohol
Unknown	0.01		Unknown
trans-Piperitol	0.01	0.04*	Monoterpenic alcohol
Unknown	0.04		Unknown
trans-Carveol	0.01	0.02	Monoterpenic alcohol
Citronellol	0.02	0.02	Monoterpenic alcohol
Pulegone	0.91	[1.29]*	Monoterpenic ketone
Carvone	0.10	0.11*	Monoterpenic ketone
Piperitone	0.37	0.37	Monoterpenic ketone
Isopiperitenone	0.01	0.01	Monoterpenic ketone
neo-Menthyl acetate	0.35	0.35	Monoterpenic ester
Decanol	0.08	0.09	Aliphatic alcohol
2-Ethylmenthone?	0.07		Aliphatic ketone
Dihydroedulan I	0.03	0.01	Terpenic ether
Menthyl acetate	6.28*	[6.28]*	Monoterpenic ester
Dihydroedulan II	[6.28]*	0.01	Terpenic ether
Isomenthyl acetate	0.21	0.22	Monoterpenic alcohol
α-Cubebene	0.01	[0.06]*	Sesquiterpene
Evodone	0.01	0.01	Monoterpenic ketone
Menthofurolactone	0.09*	0.02	Aliphatic alcohol
Eugenol	[0.09]*	0.01	Phenylpropanoid
α-Copaene	0.03	0.03	Sesquiterpene
β-Bourbonene	0.13	0.12	Sesquiterpene
β-Elemene	0.01	0.59	Sesquiterpene
Unknown	0.04		Unknown
Unknown	0.02		Sesquiterpene
Isocaryophyllene	0.02	[6.28]*	Sesquiterpene
β-Caryophyllene	2.23	2.33	Sesquiterpene
Isogermacrene D	0.02	[0.03]*	Sesquiterpene
α-Humulene	0.07	0.05	Sesquiterpene
(*E*)-β-Farnesene	0.19	0.22	Sesquiterpene
Germacrene D	0.79	0.78	Sesquiterpene
Menthalactone	0.01		Monoterpenic lactone
Bicyclogermacrene	0.12*	0.12	Sesquiterpene
Viridiflorene	[0.12]*	0.01	Sesquiterpene
ε-Amorphene	0.03	[0.11]*	Sesquiterpene
γ-Cadinene	0.01	[0.04]*	Sesquiterpene
δ-Cadinene	0.04	0.04	Sesquiterpene
trans-Cadina-1,4-diene	0.01	0.01	Sesquiterpene
Spathulenol	0.02	0.01	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.04*	0.05*	Sesquiterpenic ether
Caryophyllene oxide	[0.04]*	[0.05]*	Sesquiterpenic ether
Viridiflorol	0.08	0.08	Sesquiterpenic alcohol
Isospathulenol	0.01	0.01*	Sesquiterpenic alcohol

Unknown	0.01	0.01	Sesquiterpenic alcohol
α-Cadinol	0.01	[0.01]*	Sesquiterpenic alcohol
Total identified	**98.93%**	**98.73%**	

*: 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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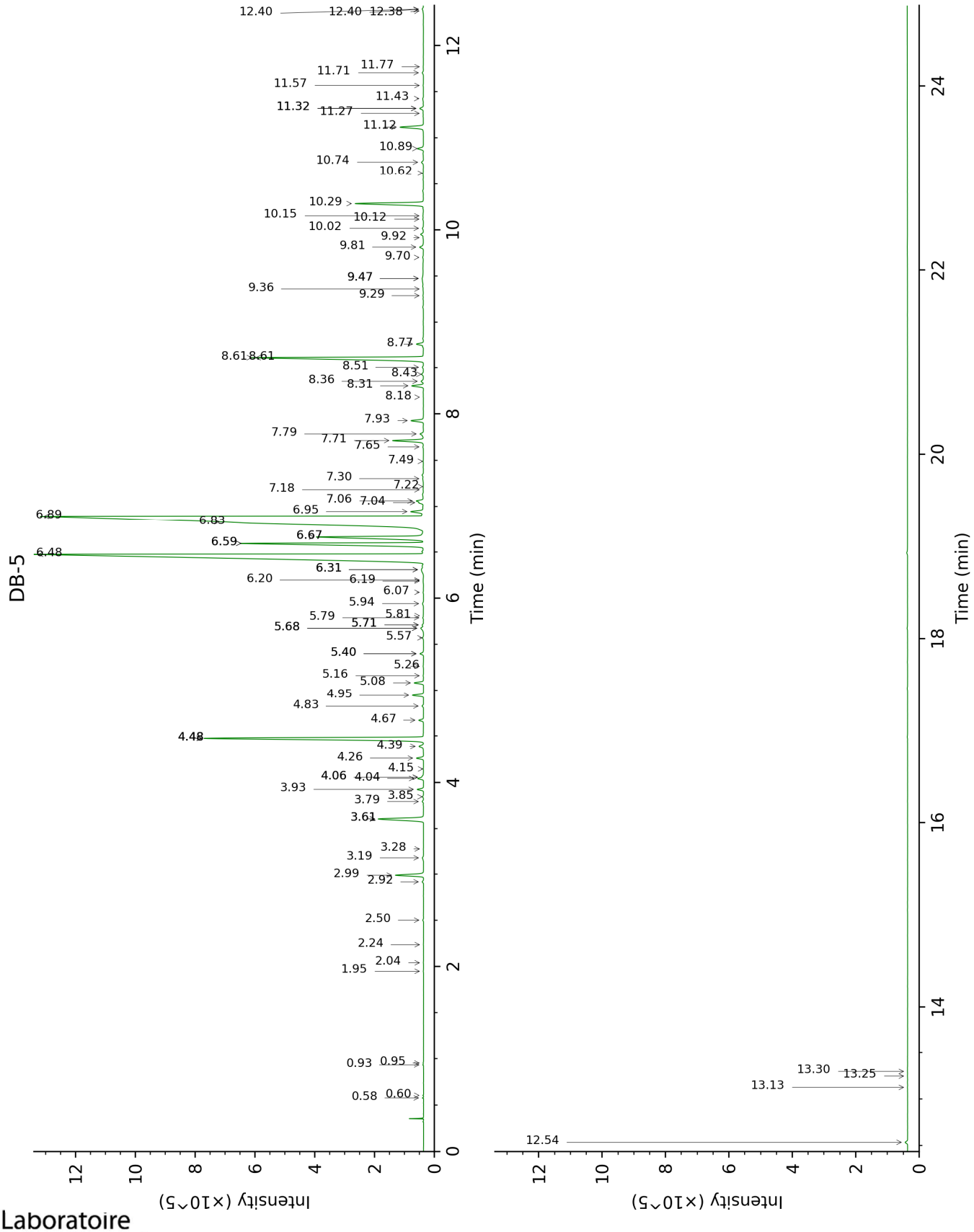
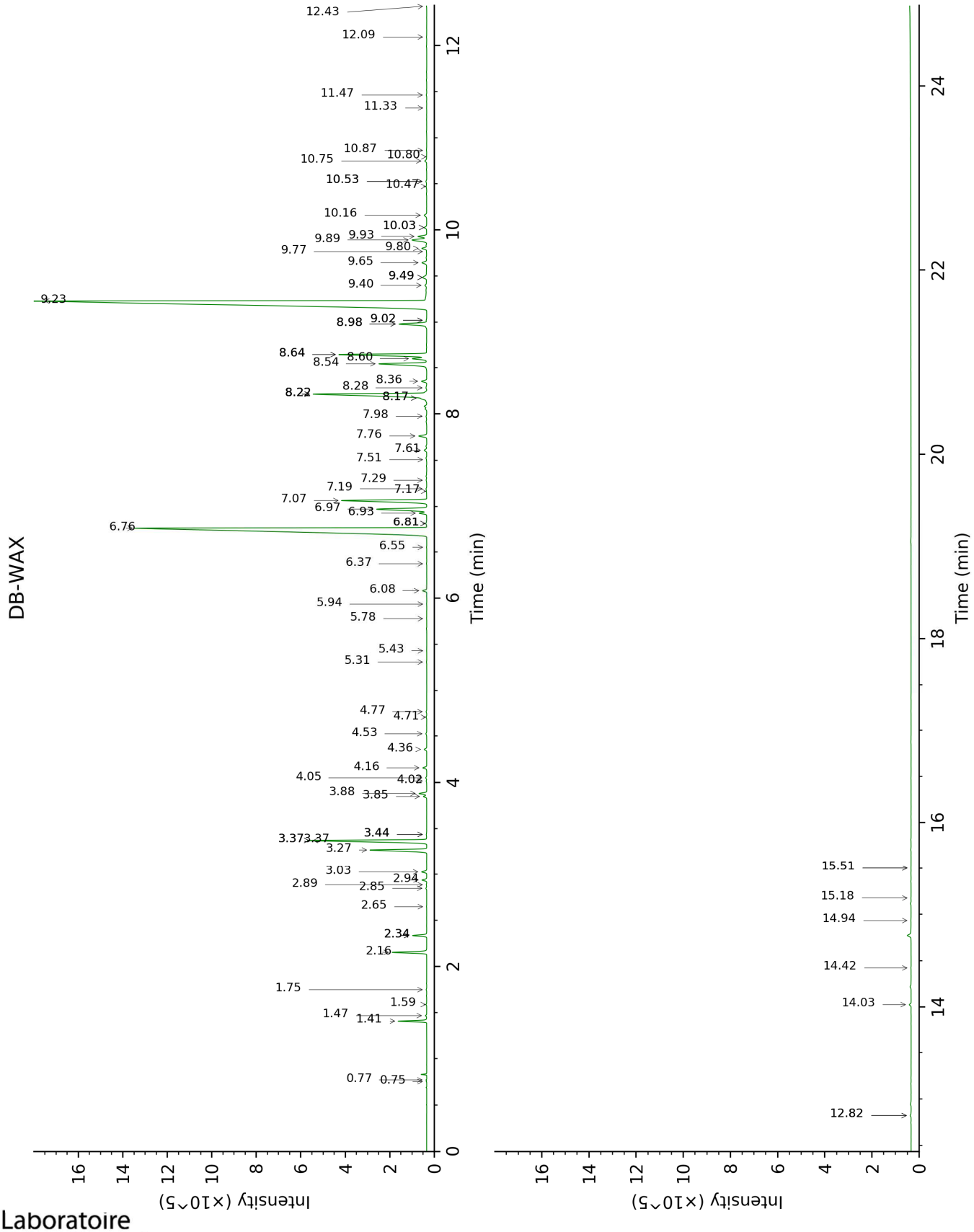

DB-5
Time (min)
Intensity (×10^5)
12.40
12.40
12.38
11.71
11.77
11.57
11.43
11.32
11.27
11.12
10.89
10.74
10.62
10.29
10.15
10.12
10.02
9.92
9.81
9.70
9.47
9.36
9.29
8.77
8.61
8.61
8.51
8.43
8.36
8.31
8.18
7.93
7.79
7.71
7.65
7.49
7.30
7.18
7.22
7.06
7.04
6.95
6.89
6.83
6.67
6.59
6.48
6.31
6.20
6.19
6.07
5.94
5.81
5.79
5.68
5.71
5.57
5.40
5.26
5.16
5.08
4.95
4.83
4.67
4.48
4.39
4.26
4.15
4.06
4.04
3.93
3.85
3.79
3.61
3.28
3.19
2.99
2.92
2.50
2.24
2.04
1.95
0.93
0.95
0.58
0.60
13.30
13.25
13.13
12.54


DB-WAX
Time (min)
Intensity (×10^5)
12.43
12.09
11.47
11.33
10.87
10.80
10.75
10.53
10.47
10.16
10.03
9.93
9.89
9.80
9.77
9.65
9.49
9.40
9.23
9.02
8.98
8.64
8.60
8.54
8.36
8.28
8.22
8.17
7.98
7.76
7.61
7.51
7.29
7.19
7.17
7.07
6.97
6.93
6.81
6.76
6.55
6.37
6.08
5.94
5.78
5.43
5.31
4.77
4.71
4.53
4.36
4.16
4.05
4.02
3.88
3.85
3.44
3.37
3.27
3.03
2.94
2.89
2.85
2.65
2.34
2.16
1.75
1.59
1.47
1.41
0.77
0.75
15.51
15.18
14.94
14.42
14.03
12.82

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.58	638	0.01	0.77	884	0.01
2-Methylbutyral	0.60	648	0.01	0.75	878	0.01
Isoamyl alcohol	0.93	729	0.01	3.44*	1176	0.03
2-Methylbutanol	0.95	732	0.01	3.37*	1171	5.42
(2*E*)-Hexenal	1.95	847	0.01	3.44*	1176	[0.03]
(3*Z*)-Hexenol	2.04	855	0.01	5.78	1344	0.01
Hexanol	2.24	872	0.01	5.43	1320	0.01
trans-2,5-Diethyltetrahydrofuran	2.50	894	0.02	1.59	1013	0.02
α-Thujene	2.92	924	0.04	1.47	1002	0.03
α-Pinene	2.99	929	0.85	1.41	995	0.84
Camphene	3.18	942	0.04	1.75	1029	0.02
Thuja-2,4(10)-diene	3.28	948	0.01	2.34*	1087	0.49
β-Pinene	3.61*	970	1.71	2.16	1069	1.23
Sabinene	3.61*	970	[1.71]	2.34*	1087	[0.49]
Octen-3-ol	3.79	983	0.04	6.81*	1418	0.06
Octan-3-one	3.85	986	0.03	4.02	1219	0.02
Myrcene	3.93	991	0.17	2.94	1138	0.17
Octan-3-ol	4.04	999	0.16	6.08	1366	0.16
α-Phellandrene	4.06*	1000	0.05	2.85	1131	0.03
Pseudolimonene	4.06*	1000	[0.05]	2.89	1134	0.02
Δ3-Carene	4.15	1006	0.01	2.65	1115	0.01
α-Terpinene	4.26	1013	0.19	3.03	1144	0.20
para-Cymene	4.39	1021	0.15	4.16	1229	0.15
β-Phellandrene	4.48*	1027	7.76	3.37*	1171	[5.42]
Limonene	4.48*	1027	[7.76]	3.27	1163	2.38
1,8-Cineole	4.48*	1027	[7.76]	3.37*	1171	[5.42]
(*Z*)-β-Ocimene	4.67	1039	0.13	3.85	1207	0.12
(*E*)-β-Ocimene	4.83	1049	0.04	4.05	1221	0.04
γ-Terpinene	4.95	1056	0.29	3.88	1209	0.30
cis-Sabinene hydrate	5.08	1065	0.26	6.93	1427	0.27
cis-Linalool oxide (fur.)	5.16	1070	0.01	6.55	1399	0.01
Octanol	5.26	1076	0.01	8.28	1529	0.05
para-Cymenene	5.40*	1085	0.10	6.37	1386	0.01
Terpinolene	5.40*	1085	[0.10]	4.36	1243	0.10
trans-Sabinene hydrate	5.57	1096	0.03	7.98	1505	0.04
Linalool	5.68*	1102	0.11	8.17*	1520	0.20
Isoamyl isovalerate	5.68*	1102	[0.11]	4.77	1272	0.03
2-Methylbutyl 2-methylbutyrate	5.71*	1105	0.03	4.53	1255	0.04
Nonanal	5.71*	1105	[0.03]	5.94	1356	0.01
Amyl isovalerate	5.79	1110	0.02	4.71	1268	0.02
Unknown [m/z 43, 71 (75), 81 (48), 93 (48), 111 (38), 69 (34)...]	5.81	1111	tr			
cis-para-Menth-2-en-1-ol	5.94	1120	0.04	8.17*	1520	[0.20]

Octan-3-yl acetate	6.06	1127	0.01	5.31	1311	0.01
Camphor	6.19†	1135	0.03	7.28	1453	0.04
trans-para-Menth-2-en-1-ol	6.20†	1136	[0.03]	9.02*	1586	0.03
neo-Isopulegol	6.31*	1143	0.15	8.22*	1523	6.28
Isopulegol	6.31*	1143	[0.15]	8.22*	1523	[6.28]
Menthone	6.48	1154	25.55	6.76	1415	25.67
Isomenthone	6.60*	1161	6.42	7.07	1437	3.98
Menthofuran	6.60*	1161	[6.42]	6.97	1430	2.45
neo-Menthol	6.66*	1166	3.95	8.64*	1556	3.82
δ-Terpineol	6.66*	1166	[3.95]	9.49*	1622	0.21
Terpinen-4-ol	6.83†	1176	37.32	8.64*	1556	[3.82]
Menthol	6.89†	1180	[37.32]	9.23	1602	36.49
Isomenthol	6.95	1184	0.42	8.98*	1582	1.29
α-Terpineol	7.04	1190	0.11	9.80	1648	0.19
neoiso-Menthol	7.06	1191	0.21	9.49*	1622	[0.21]
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.18	1199	0.01			
trans-Piperitol	7.22	1201	0.01	10.52*	1707	0.04
Unknown [m/z 146, 145 (94), 43 (72), 99 (41), 81 (29), 115 (25), 86 (24)...]	7.30	1207	0.04			
trans-Carveol	7.49	1220	0.01	11.47	1787	0.02
Citronellol	7.65	1230	0.02	10.87	1736	0.02
Pulegone	7.71	1235	0.91	8.98*	1582	[1.29]
Carvone	7.79	1239	0.10	10.03*	1666	0.11
Piperitone	7.93	1249	0.37	9.93	1658	0.37
Isopiperitenone	8.18	1266	0.01	11.33	1775	0.01
neo-Menthyl acetate	8.31	1274	0.35	7.76	1489	0.35
Decanol	8.36	1278	0.08	10.75	1726	0.09
2-Ethylmenthone?	8.43	1283	0.07			
Dihydroedulan I	8.51	1288	0.03	7.17	1445	0.01
Menthyl acetate	8.61*	1295	6.28	8.22*	1523	[6.28]
Dihydroedulan II	8.61*	1295	[6.28]	7.51	1470	0.01
Isomenthyl acetate	8.77	1305	0.21	8.36	1534	0.22
α-Cubebene	9.29	1342	0.01	6.81*	1418	[0.06]
Evodone	9.36	1347	0.01	12.43	1872	0.01
Menthofurolactone	9.48*	1355	0.09	12.09	1842	0.02
Eugenol	9.48*	1355	[0.09]	14.94	2107	0.01
α-Copaene	9.70	1371	0.03	7.19	1447	0.03
β-Bourbonene	9.81	1379	0.13	7.61	1477	0.12
β-Elemene	9.92	1386	0.01	8.60	1553	0.59
Unknown [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]	10.02	1394	0.04			
Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134	10.12	1401	0.02			

(55)... 204 (19)]						
Isocaryophyllene	10.15	1403	0.02	8.22*	1523	[6.28]
β-Caryophyllene	10.28	1413	2.23	8.54	1549	2.33
Isogermacrene D	10.62	1438	0.02	9.02*	1586	[0.03]
α-Humulene	10.74	1447	0.07	9.40	1616	0.05
(*E*)-β-Farnesene	10.89	1458	0.19	9.65	1636	0.22
Germacrene D	11.12	1475	0.79	9.89	1655	0.78
Menthalactone	11.27	1486	0.01			
Bicyclogermacrene	11.32*	1490	0.12	10.16	1677	0.12
Viridiflorene	11.32*	1490	[0.12]	9.77	1645	0.01
ε-Amorphene	11.43	1498	0.03	10.03*	1666	[0.11]
γ-Cadinene	11.57	1509	0.01	10.52*	1707	[0.04]
δ-Cadinene	11.71	1520	0.04	10.47	1702	0.04
trans-Cadina-1,4-diene	11.77	1525	0.01	10.80	1730	0.01
Spathulenol	12.38	1573	0.02	14.42	2057	0.01
Caryophyllene oxide isomer	12.40*	1574	0.04	12.82*	1907	0.05
Caryophyllene oxide	12.40*	1574	[0.04]	12.82*	1907	[0.05]
Viridiflorol	12.54	1585	0.08	14.03	2019	0.08
Isospathulenol	13.13	1633	0.01	15.50*	2164	0.01
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.25	1643	0.01	15.18	2132	0.01
α-Cadinol	13.30	1647	0.01	15.50*	2164	[0.01]
Total identified		**98.93%**			**98.73%**	
Total reported		**99.04%**			**98.74%**	

*: 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