Date : June 17, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20F10-PTH09
Customer identification : Peppermint Indian - India - P50110912R
Type : Essential oil
Source : *Mentha x piperita*
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sylvain Mercier, M. Sc., Chimiste
Analysis date : June 12, 2020

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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. The results only describe the samples that were submitted to the assays.

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.4603 ± 0.0003 (20 °C; method PC-MAT-016)

EUROPEAN PHARMACOPOEIA 9.0 - 07/2012:0405 - PEPPERMINT OIL

Compound	Min. %	Max. %	Observed %	Complies?
Carvone		1.0	0.1	Yes
Pulegone		3.0	1.1	Yes
Menthol	30.0	55.0	34.7	Yes
Menthyl acetate	2.8	10.0	5.9	Yes
Isomenthone	1.5	10.0	3.7	Yes
Menthofuran	1.0	8.0	2.8	Yes
Menthone	14.0	32.0	25.3	Yes
1,8-Cineole	3.5	8.0	5.3	Yes
Limonene	1.0	3.5	2.5	Yes
Total isopulegol		0.20	0.12	Yes
Refractive index	1.457	1.467	1.460	Yes

NOW 57585:2019.1 - NOW FOODS PEPPERMINT (INDIAN) OIL

Compound	Min. %	Max. %	Observed %	Complies?
β-Caryophyllene	0.5	4.0	2.2	Yes
Menthyl acetate	1.7	9.0	5.9	Yes
Pulegone	0.5	8.0	1.1	Yes
Menthol	32	49	35	Yes
neo-Menthol	1.5	6.0	3.5	Yes
Menthofuran	1.0	8.5	2.8	Yes
Isomenthone	1	8	4	Yes
Menthone	13	33	25	Yes
cis-Sabinene hydrate	0.001	2.900	0.336	Yes
1,8-Cineole	2	8	5	Yes
Limonene	1	4	2	Yes
Octan-3-ol	0.1	1.0	0.2	Yes

CONCLUSION

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

Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Isobutyral	tr	Aliphatic aldehyde
Isobutanol	tr	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	0.02	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Ethyl 2-methylbutyrate	0.01	Aliphatic ester
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
Hexanol	tr	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.03	Furan
α-Thujene	0.04	Monoterpene
α-Pinene	0.89	Monoterpene
trans-3-Methylcyclohexanol	0.01	Aliphatic alcohol
Camphene	0.03	Monoterpene
3-Methylcyclohexanone	0.05	Aliphatic ketone
Thuja-2,4(10)-diene	0.01	Monoterpene
β-Pinene	1.14	Monoterpene
Sabinene	0.49	Monoterpene
Octen-3-ol	0.06	Aliphatic alcohol
cis-Carane	tr	Monoterpene
Octan-3-one	0.02	Aliphatic ketone
Myrcene	0.22	Monoterpene
Octan-3-ol	0.20	Aliphatic alcohol
α-Phellandrene	0.04	Monoterpene
Pseudolimonene	0.02	Monoterpene
α-Terpinene	0.23	Monoterpene
para-Cymene	0.20	Monoterpene
Limonene	2.47	Monoterpene
1,8-Cineole	5.34	Monoterpenic ether
2-Ethylhexanol	0.02	Aliphatic alcohol
(*Z*)-β-Ocimene	0.21	Monoterpene
(*E*)-β-Ocimene	0.06	Monoterpene
γ-Terpinene	0.40	Monoterpene
cis-Sabinene hydrate	0.34	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Terpinolene	0.13	Monoterpene
para-Cymenene	0.02	Monoterpene
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.19	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.06	Aliphatic ester
Amyl isovalerate	0.04	Aliphatic ester
Octen-3-yl acetate	0.01	Aliphatic ester
cis-para-Menth-2-en-1-ol	0.05	Monoterpenic alcohol

Octan-3-yl acetate	0.02	Aliphatic ester
trans-Sabinol	0.06	Monoterpenic alcohol
Isopulegol	0.12	Monoterpenic alcohol
Menthone	25.26	Monoterpenic ketone
Menthofuran	2.83	Monoterpenic ether
Isomenthone	3.74	Monoterpenic ketone
neo-Menthol	3.51	Monoterpenic alcohol
δ-Terpineol	0.13	Monoterpenic alcohol
Terpinen-4-ol	0.85	Monoterpenic alcohol
Menthol	34.73	Monoterpenic alcohol
Isomenthol	0.53	Monoterpenic alcohol
α-Terpineol	0.24	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
neoiso-Menthol	0.14	Monoterpenic alcohol
Myrtenol	0.02	Monoterpenic alcohol
Methylchavicol	0.01	Phenylpropanoid
Unknown	0.01	Unknown
Decanal	0.02	Aliphatic aldehyde
trans-Piperitol	0.02	Monoterpenic alcohol
Pulegone	1.06	Monoterpenic ketone
Citronellol	0.06	Monoterpenic alcohol
Carvone	0.10	Monoterpenic ketone
(2*E*)-Hexenyl isovalerate	0.01	Aliphatic ester
Unknown	0.01	Unknown
Piperitone	0.47	Monoterpenic ketone
Isopiperitenone	0.01	Monoterpenic ketone
neo-Menthyl acetate	0.34	Monoterpenic ester
2-Ethylmenthone?	0.03	Aliphatic ketone
Bornyl acetate	0.07	Monoterpenic ester
Dihydroedulan II	0.05	Terpenic ether
Menthyl acetate	5.89	Monoterpenic ester
Thymol	0.06	Monoterpenic alcohol
Isomenthyl acetate	0.23	Monoterpenic alcohol
Bicycloelemene	0.03	Sesquiterpene
α-Cubebene	tr	Sesquiterpene
Eugenol	0.02	Phenylpropanoid
α-Copaene	0.03	Sesquiterpene
β-Bourbonene	0.15	Sesquiterpene
1,5-diepi-β-Bourbonene	0.02	Sesquiterpene
β-Elemene	0.07	Sesquiterpene
Unknown	0.03	Unknown
(*Z*)-Jasmone	0.02	Jasmonate
Isocaryophyllene	0.04	Sesquiterpene
β-Caryophyllene	2.24	Sesquiterpene
β-Ylangene	0.07	Sesquiterpene
Unknown	0.03	Unknown
β-Copaene	0.03	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
trans-α-Bergamotene	0.02	Sesquiterpene
Isogermacrene D	0.02	Sesquiterpene
α-Humulene	0.10	Sesquiterpene
Muurola-4,11-diene	0.02	Sesquiterpene

(*E*)-β-Farnesene	0.26	Sesquiterpene
Germacrene D	1.11	Sesquiterpene
Menthalactone	0.04	Monoterpenic lactone
Bicyclogermacrene	0.14	Sesquiterpene
Viridiflorene	0.06	Sesquiterpene
5-Methyl-2,4-diisopropylphenol	0.01	Terpene derivative
α-Muurolene	0.05	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.06	Sesquiterpene
Isocaryophyllene epoxide B	0.01	Sesquiterpenic ether
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Spathulenol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.05	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Viridiflorol	0.11	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Unknown
α-Eudesmol	0.02	Sesquiterpenic alcohol
α-Cadinol	0.01	Sesquiterpenic alcohol
Mint sulfide?	0.01	Sesquiterpenic sulfide
meta-Camphorene	0.01	Diterpene
para-Camphorene	0.02	Diterpene
Consolidated total	**98.83%**	

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

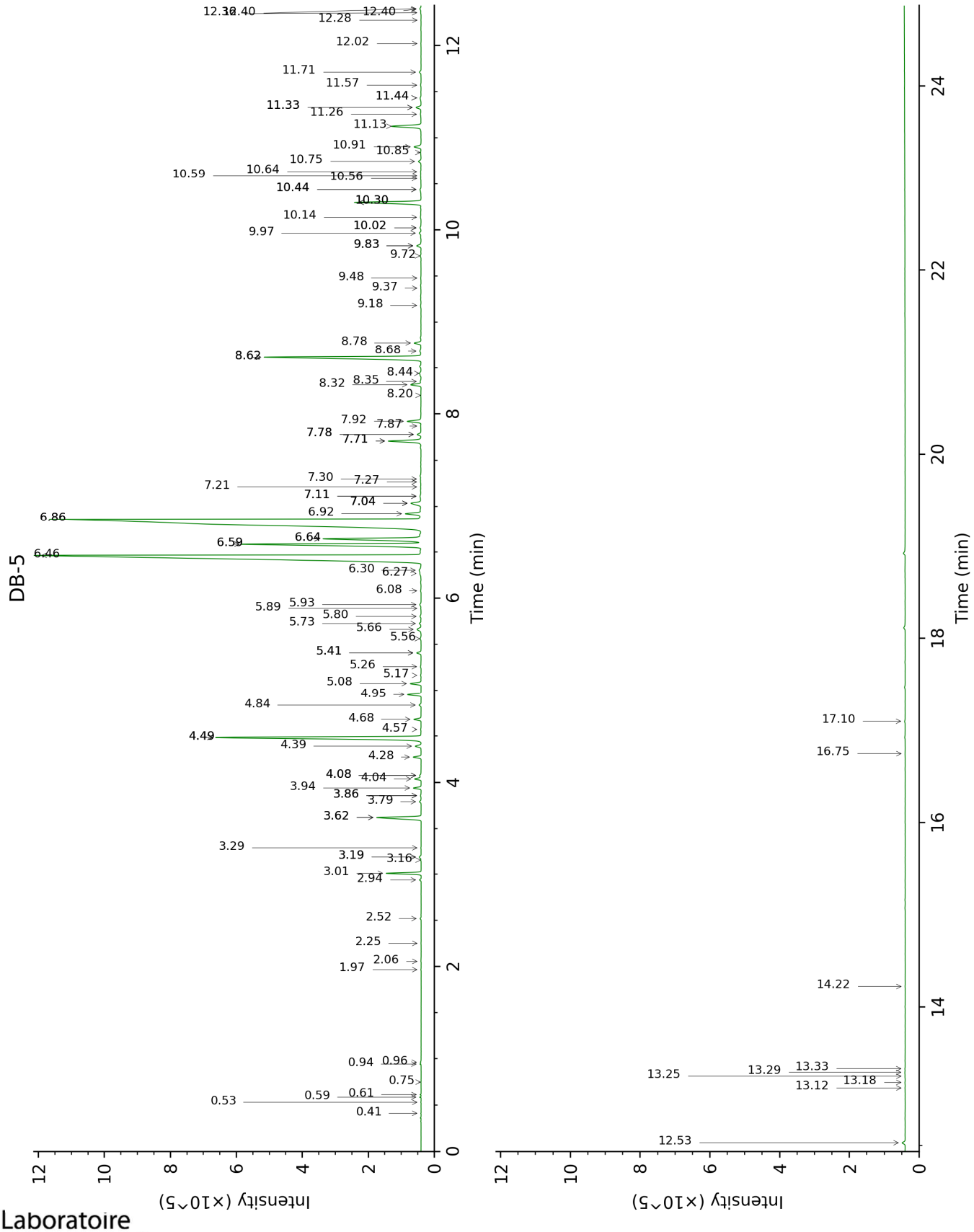
Note: no correction factor was applied

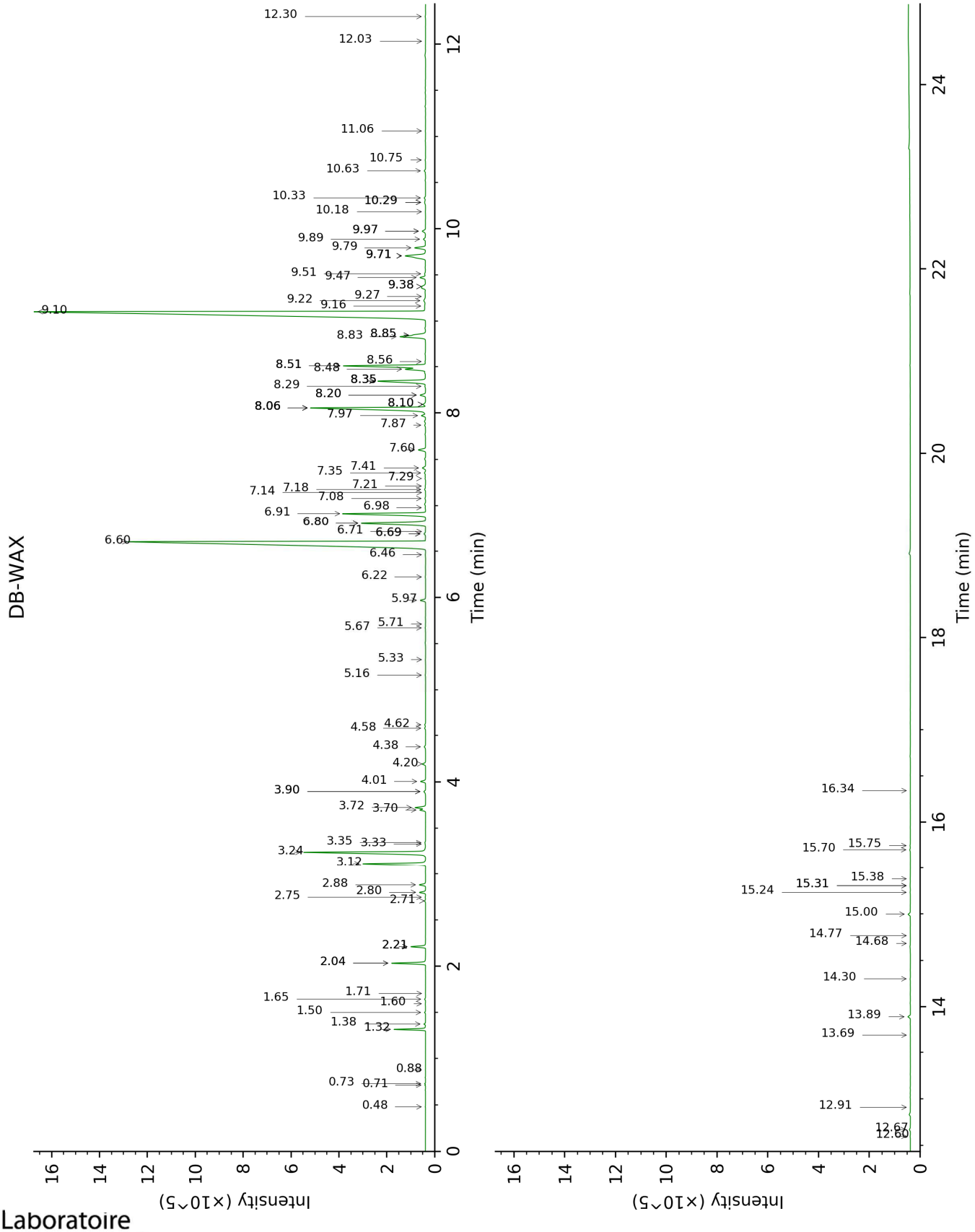
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Intensity (×10^5)
Time (min)
12.40
12.28
12.02
11.71
11.57
11.44
11.33
11.26
11.13
10.91
10.85
10.75
10.64
10.59
10.56
10.44
10.30
10.14
10.02
9.97
9.83
9.72
9.48
9.37
9.18
8.78
8.68
8.62
8.44
8.35
8.32
8.20
7.92
7.87
7.78
7.71
7.30
7.27
7.21
7.11
7.04
6.92
6.86
6.64
6.59
6.46
6.30
6.27
6.08
5.93
5.89
5.80
5.73
5.66
5.56
5.41
5.26
5.17
5.08
4.95
4.84
4.68
4.57
4.49
4.39
4.28
4.08
4.04
3.94
3.86
3.79
3.62
3.29
3.19
3.16
3.01
2.94
2.52
2.25
2.06
1.97
0.94
0.96
0.75
0.59
0.61
0.53
0.41
17.10
16.75
14.22
13.25
13.29
13.33
13.12
13.18
12.53


DB-WAX
Time (min)
Intensity (×10^5)
12.30
12.03
11.06
10.75
10.63
10.33
10.29
10.18
9.97
9.89
9.79
9.71
9.51
9.47
9.38
9.27
9.22
9.16
9.10
8.85
8.83
8.56
8.51
8.48
8.35
8.29
8.20
8.10
8.06
7.97
7.87
7.60
7.41
7.35
7.29
7.21
7.18
7.14
7.08
6.98
6.91
6.80
6.71
6.69
6.60
6.46
6.22
5.97
5.71
5.67
5.33
5.16
4.62
4.58
4.38
4.20
4.01
3.90
3.72
3.70
3.35
3.33
3.24
3.12
2.88
2.80
2.75
2.71
2.21
2.04
1.71
1.65
1.60
1.50
1.38
1.32
0.88
0.73
0.71
0.48
16.34
15.75
15.70
15.38
15.31
15.24
15.00
14.77
14.68
14.30
13.89
13.69
12.91
12.67
12.60

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.41	530	tr	0.48	782	tr
Isobutanol	0.53	617	tr	2.04*	1065	1.14
Isovaleral	0.59	640	0.01	0.73	885	0.02
2-Methylbutyral	0.61	652	0.01	0.71	879	0.01
2-Ethylfuran	0.75	707	tr	0.88	918	tr
Isoamyl alcohol	0.94	737	0.02	3.34	1176	0.03
2-Methylbutanol	0.96	740	0.01	3.33	1174	0.01
Ethyl 2-methylbutyrate	1.97	851	0.01	1.60	1022	0.01
(3*Z*)-Hexenol	2.06	858	0.01	5.71	1346	0.01
Hexanol	2.25	874	tr	5.33	1318	0.02
trans-2,5-Diethyltetrahydrofuran	2.52	896	0.03	1.50	1012	0.03
α-Thujene	2.94	925	0.04	1.38	1000	0.05
α-Pinene	3.01	930	0.89	1.32	990	0.88
trans-3-Methylcyclohexanol	3.16	940	0.01	6.71	1419	0.01
Camphene	3.19*	942	0.08	1.65	1026	0.03
3-Methylcyclohexanone	3.19*	942	[0.08]	4.58	1269	0.05
Thuja-2,4(10)-diene	3.29	948	0.01	2.21*	1083	0.50
β-Pinene	3.62*	970	1.65	2.04*	1065	[1.14]
Sabinene	3.62*	970	[1.65]	2.21*	1083	[0.50]
Octen-3-ol	3.79	982	0.06	6.69*	1418	0.07
cis-Carane	3.86*	986	0.03	1.71	1032	tr
Octan-3-one	3.86*	986	[0.03]	3.90*	1218	0.08
Myrcene	3.94	991	0.22	2.80	1132	0.22
Octan-3-ol	4.04	998	0.20	5.97	1365	0.21
α-Phellandrene	4.08*	1000	0.05	2.71	1125	0.04
Pseudolimonene	4.08*	1000	[0.05]	2.75	1128	0.02
α-Terpinene	4.28	1013	0.23	2.88	1139	0.23
para-Cymene	4.39	1020	0.20	4.01	1226	0.20
Limonene	4.49*	1026	7.80	3.12	1157	2.47
1,8-Cineole	4.49*	1026	[7.80]	3.24	1167	5.34
2-Ethylhexanol	4.57	1032	0.02	7.21	1457	0.02
(*Z*)-β-Ocimene	4.68	1039	0.21	3.70	1203	0.20
(*E*)-β-Ocimene	4.84	1048	0.06	3.90*	1218	[0.08]
γ-Terpinene	4.95	1056	0.40	3.72	1205	0.42
cis-Sabinene hydrate	5.08	1063	0.34	6.80*	1426	3.18
cis-Linalool oxide (fur.)	5.17	1069	0.02	6.46	1401	0.02
Octanol	5.26	1075	0.02	8.10*	1524	0.12
Terpinolene	5.41*	1084	0.14	4.20	1240	0.13
para-Cymenene	5.41*	1084	[0.14]	6.22	1383	0.02
trans-Sabinene hydrate	5.56	1094	0.04	7.87	1506	0.04
Linalool	5.66	1101	0.19	7.97	1514	0.17
2-Methylbutyl 2-methylbutyrate	5.73	1105	0.06	4.38	1254	0.07
Amyl isovalerate	5.80	1110	0.04	4.62	1272	0.04

Octen-3-yl acetate	5.89	1115	0.01	5.67	1343	0.02
cis-para-Menth-2-en-1-ol	5.93	1118	0.05	8.06*	1521	6.05
Octan-3-yl acetate	6.08	1128	0.02	5.16	1306	0.02
trans-Sabinol	6.27	1140	0.06	9.71*	1651	1.41
Isopulegol	6.30	1142	0.12	8.06*	1521	[6.05]
Menthone	6.46	1152	25.26	6.60	1411	25.22
Menthofuran	6.59*	1160	6.56	6.80*	1426	[3.18]
Isomenthone	6.59*	1160	[6.56]	6.91	1434	3.74
neo-Menthol	6.64*	1164	3.68	8.51*	1556	3.52
δ-Terpineol	6.64*	1164	[3.68]	9.38*†	1624	0.32
Terpinen-4-ol	6.86*	1178	35.81	8.48	1553	0.85
Menthol	6.86*	1178	[35.81]	9.10	1602	34.73
Isomenthol	6.92	1182	0.53	8.85*†	1582	[1.64]
α-Terpineol	7.04*	1190	0.46	9.71*	1651	[1.41]
Myrtenal	7.04*	1190	[0.46]	8.56	1560	0.02
neoiso-Menthol	7.04*	1190	[0.46]	9.38*†	1624	[0.32]
Myrtenol	7.11*	1195	0.06	10.75	1738	0.02
Methylchavicol	7.11*	1195	[0.06]	9.27	1616	0.01
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.21	1201	0.01			
Decanal	7.27	1205	0.02	7.18	1454	0.04
trans-Piperitol	7.30	1207	0.02	10.28*	1698	0.07
Pulegone	7.71*	1235	1.12	8.83†	1581	1.64
Citronellol	7.71*	1235	[1.12]	10.63	1728	0.06
Carvone	7.78*	1240	0.14	9.89	1666	0.10
(2*E*)-Hexenyl isovalerate	7.78*	1240	[0.14]	7.14	1451	0.01
Unknown [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25)...]	7.87	1247	0.01	10.18	1690	0.01
Piperitone	7.92	1250	0.47	9.79	1658	0.49
Isopiperitenone	8.20	1270	0.01	11.06	1765	0.01
neo-Menthyl acetate	8.32	1278	0.34	7.60	1486	0.32
2-Ethylmenthone?	8.35	1280	0.03			
Bornyl acetate	8.44	1286	0.07	8.20*	1532	0.24
Dihydroedulan II	8.62*	1298	5.94	7.35	1467	0.05
Menthyl acetate	8.62*	1298	[5.94]	8.06*	1521	[6.05]
Thymol	8.68	1303	0.06	15.00	2128	0.10
Isomenthyl acetate	8.78	1305	0.23	8.20*	1532	[0.24]
Bicycloelemene	9.18	1334	0.03	6.98	1439	0.02
α-Cubebene	9.37	1347	tr	6.69*	1418	[0.07]
Eugenol	9.48	1355	0.02	14.68	2096	0.01
α-Copaene	9.72	1372	0.03	7.08	1447	0.03
β-Bourbonene	9.83*	1379	0.17	7.41	1471	0.15
1,5-diepi-β-Bourbonene	9.83*	1379	[0.17]	7.29	1463	0.02
β-Elemene	9.97	1389	0.07	8.35*	1543	2.33
Unknown [m/z 107, 121 (79), 119 (66), 91	10.02*	1393	0.05			

(58), 136 (55), 105 (49)... 194 (1)]						
(*Z*)-Jasmone	10.02*	1393	[0.05]	12.30	1873	0.02
Isocaryophyllene	10.14	1401	0.04	8.10*	1524	[0.12]
β-Caryophyllene	10.30*	1413	2.31	8.35*	1543	[2.33]
β-Ylangene	10.30*	1413	[2.31]	8.06*	1521	[6.05]
Unknown [m/z 177, 109 (32), 192 (26), 95 (25), 137 (23)]	10.44*	1423	0.06			
β-Copaene	10.44*	1423	[0.06]	8.29	1539	0.03
Aromadendrene	10.56	1432	0.02	8.51*	1556	[3.52]
trans-α-Bergamotene	10.59	1434	0.02	8.35*	1543	[2.33]
Isogermacrene D	10.64	1438	0.02	8.85*†	1582	[1.64]
α-Humulene	10.75	1446	0.10	9.22	1612	0.14
Muurola-4,11-diene	10.84	1454	0.02	9.16	1607	0.08
(*E*)-β-Farnesene	10.91	1458	0.26	9.47	1632	0.26
Germacrene D	11.13	1475	1.11	9.71*	1651	[1.41]
Menthalactone	11.26	1484	0.04	15.75	2203	0.02
Bicyclogermacrene	11.33*	1490	0.19	9.97*	1673	0.17
Viridiflorene	11.33*	1490	[0.19]	9.51	1636	0.06
5-Methyl-2,4-diisopropylphenol	11.44*	1498	0.05	16.34	2265	0.01
α-Muurolene	11.44*	1498	[0.05]	9.97*	1673	[0.17]
γ-Cadinene	11.57	1508	0.02	10.28*	1698	[0.07]
δ-Cadinene	11.71	1519	0.06	10.33	1702	0.06
Isocaryophyllene epoxide B	12.02	1543	0.01	12.03	1849	0.01
(*E*)-Nerolidol	12.28	1563	0.01	13.69	2001	0.01
Spathulenol	12.36	1570	0.02	14.30	2059	0.02
Caryophyllene oxide	12.40*	1573	0.06	12.67	1906	0.05
Caryophyllene oxide isomer	12.40*	1573	[0.06]	12.60	1900	0.02
Viridiflorol	12.53	1583	0.11	13.89	2020	0.11
Isospathulenol	13.12	1631	0.01	15.31*	2159	0.02
τ-Cadinol	13.18	1636	0.01	14.77	2104	0.01
Unknown [m/z 123, 43 (86), 81 (75), 95 (73), 82 (68), 161 (64), 105 (63)... 220 (6)]	13.25	1641	0.01	12.91	1928	0.01
α-Eudesmol	13.29	1645	0.02	15.24	2151	0.01
α-Cadinol	13.33	1648	0.01	15.38	2166	0.01
Mint sulfide?	14.22	1723	0.01			
meta-Camphorene	16.75	1951	0.01	15.31*	2159	[0.02]
para-Camphorene	17.10	1985	0.02	15.70	2198	0.03
Total identified		**99.16%**			**98.85%**	
Total reported		**99.20%**			**98.87%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated 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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com