Date : July 31, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19G24-PTH01-1-SCC
Customer identification : Thyme Linalool - Spain - TL010587R
Type : Essential oil
Source : *Thymus vulgaris* ct. Linalool
Customer : Plant Therapy

Analysis

Method: PC-PA-014 - 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 : July 29, 2019

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: 1.4660 ± 0.0003 (20 °C)

CONCLUSION

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

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

Analysis summary – Consolidated contents

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

Identification	%	Classe
(*E*)-2-Methyl-1,3-pentadiene	tr	Alkene
Methyl 2-methylbutyrate	tr	Aliphatic ester
Hexanol	tr	Aliphatic alcohol
Hashishene	0.04	Monoterpene
Tricyclene	0.01	Monoterpene
α-Thujene	1.05	Monoterpene
α-Pinene	0.76	Monoterpene
Unknown	0.01	Monoterpene
Camphene	0.28	Monoterpene
Thuja-2,4(10)-diene	0.03	Monoterpene
β-Pinene	0.26	Monoterpene
Sabinene	0.20	Monoterpene
Unknown	0.05	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
Myrcene	2.56	Monoterpene
Octan-3-ol	0.02	Aliphatic alcohol
α-Phellandrene	0.11	Monoterpene
Pseudolimonene	0.11	Monoterpene
cis-Dehydroxylinalool oxide	tr	Monoterpenic ether
Δ3-Carene	0.03	Monoterpene
α-Terpinene	1.63	Monoterpene
para-Cymene	2.23	Monoterpene
Limonene	0.53	Monoterpene
β-Phellandrene	0.88*	Monoterpene
1,8-Cineole	[0.88]*	Monoterpenic ether
(*Z*)-β-Ocimene	0.03	Monoterpene
(*E*)-β-Ocimene	0.16	Monoterpene
γ-Terpinene	3.65	Monoterpene
cis-Sabinene hydrate	0.39	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.26	Monoterpenic alcohol
Terpinolene	0.29	Monoterpene
trans-Linalool oxide (fur.)	0.40	Monoterpenic alcohol
para-Cymenene	0.02	Monoterpene
trans-Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	70.27	Monoterpenic alcohol
Hotrienol	0.23	Monoterpenic alcohol
endo-Fenchol	0.07	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
cis-para-Menth-2-en-1-ol	0.14	Monoterpenic alcohol
1-Terpineol	0.01	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.05	Monoterpenic alcohol
Camphor	0.45	Monoterpenic ketone
cis-Verbenol	0.02	Monoterpenic alcohol
trans-Verbenol	0.04	Monoterpenic alcohol
Nerol oxide	0.02	Aliphatic ether
(*E*)-2,6-Dimethyl-1,5,7-octatrien-3-ol	0.01	Monoterpenic alcohol

Borneol	1.06	Monoterpenic alcohol
Terpinen-4-ol	5.57	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
α-Terpineol	0.88	Monoterpenic alcohol
cis-Dihydrocarvone	0.05	Monoterpenic ketone
cis-Piperitol	0.06	Monoterpenic alcohol
Methylchavicol	0.01	Phenylpropanoid
trans-Dihydrocarvone	0.04	Monoterpenic ketone
Verbenone	0.23	Monoterpenic ketone
trans-Piperitol	0.04	Monoterpenic alcohol
trans-Carveol	0.02	Monoterpenic alcohol
Bornyl formate	0.05	Monoterpenic ester
Nerol	0.03	Monoterpenic alcohol
Thymol methyl ether	0.02	Monoterpenic ether
Carvacrol methyl ether	0.02	Monoterpenic ether
Linalyl acetate	0.28	Monoterpenic ester
Unknown	0.06	Unknown
Geranial	0.01	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.01	Monoterpenic alcohol
Bornyl acetate	0.07	Monoterpenic ester
Thymol	0.60	Monoterpenic alcohol
Carvacrol	0.28	Monoterpenic alcohol
Unknown	0.01	Monoterpenic alcohol
α-Terpinyl acetate	0.04	Monoterpenic ester
Eugenol	0.04	Phenylpropanoid
Neryl acetate	0.01	Monoterpenic ester
Bornyl propionate	0.02	Monoterpenic ester
β-Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
Isocaryophyllene	tr	Sesquiterpene
α-Gurjunene	0.01	Sesquiterpene
β-Caryophyllene	0.24	Sesquiterpene
cis-α-Bergamotene	0.11	Sesquiterpene
Aromadendrene	0.01	Sesquiterpene
trans-α-Bergamotene	0.01	Sesquiterpene
α-Humulene	0.01	Sesquiterpene
Neryl propionate	0.01	Monoterpenic ester
allo-Aromadendrene	0.03	Sesquiterpene
cis-Cadina-1(6),4-diene	0.03	Sesquiterpene
γ-Muurolene	0.01	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
allo-Aromadendr-9-ene	0.01	Sesquiterpene
Viridiflorene	0.02	Sesquiterpene
Bicyclogermacrene	0.04	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
β-Bisabolene	tr	Sesquiterpene
γ-Cadinene	0.03	Sesquiterpene
δ-Cadinene	0.07	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
Geranyl butyrate	0.01	Monoterpenic ester

Spathulenol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	Sesquiterpenic ether
Isospathulenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Sesquiterpenic alcohol
α-Eudesmol	tr	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
α-Bisabolol	0.02	Sesquiterpenic alcohol
meta-Camphorene	0.03	Diterpene
para-Camphorene	0.02	Diterpene
Consolidated total	**97.92%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

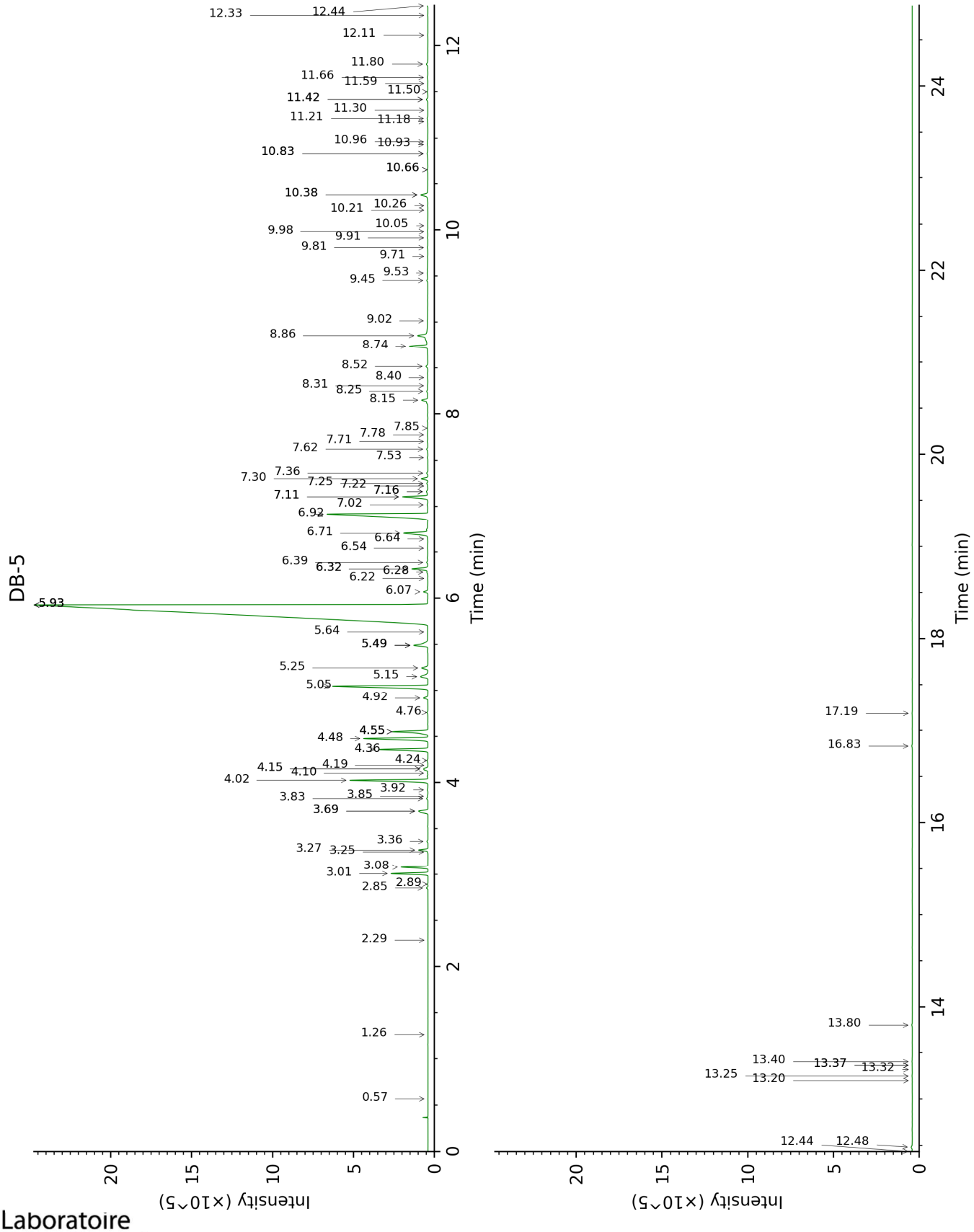
Note: no correction factor was applied

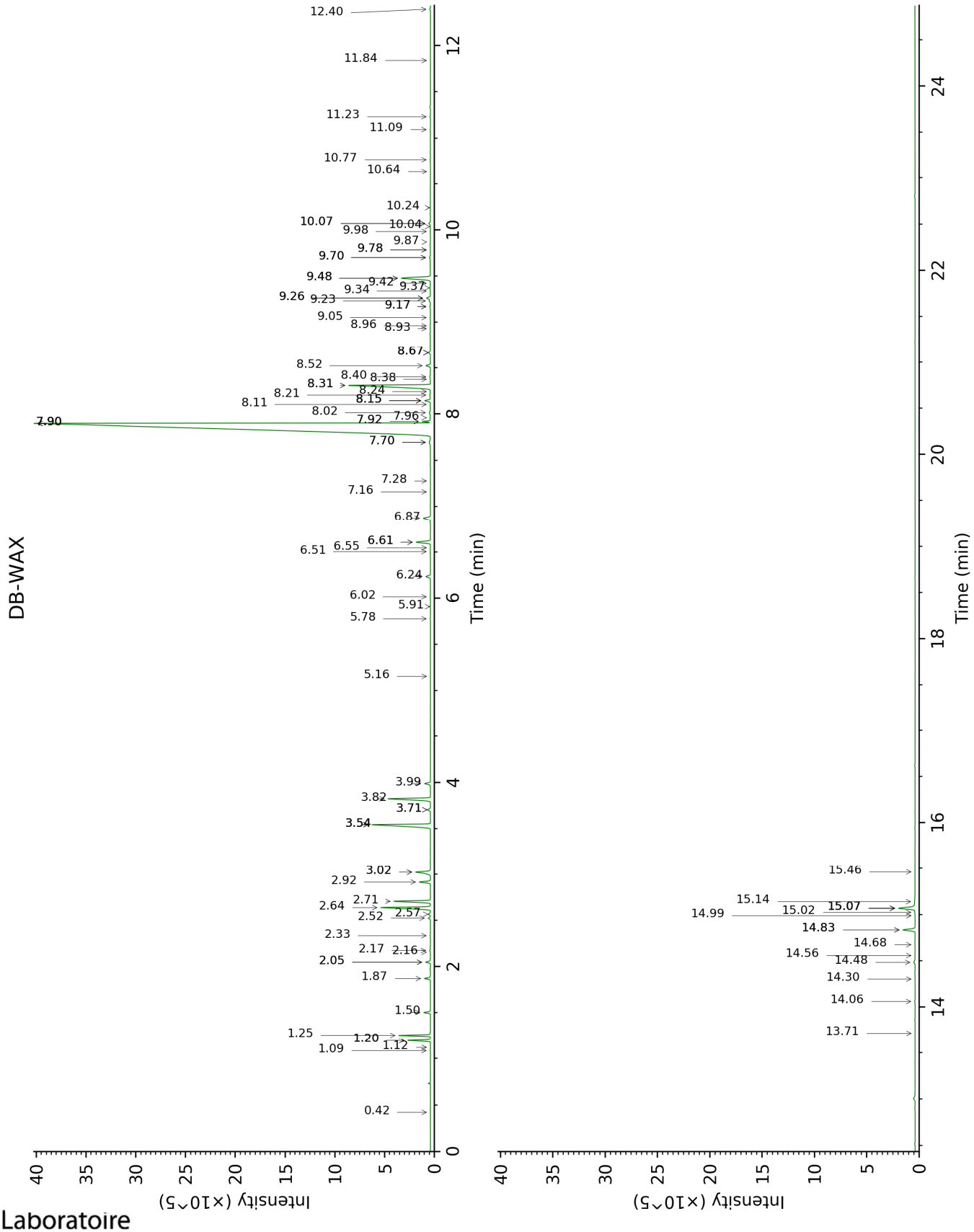
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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
Time (min)
Intensity (×10^5)
12.33
12.44
12.11
11.80
11.66
11.59
11.50
11.42
11.30
11.21
11.18
10.96
10.93
10.83
10.66
10.38
10.21
10.26
10.05
9.98
9.91
9.81
9.71
9.53
9.45
9.02
8.86
8.74
8.52
8.40
8.31
8.25
8.15
7.85
7.78
7.71
7.62
7.53
7.36
7.30
7.25
7.22
7.16
7.11
7.02
6.92
6.71
6.64
6.54
6.39
6.32
6.28
6.22
6.07
5.93
5.64
5.49
5.25
5.15
5.05
4.92
4.76
4.55
4.48
4.36
4.24
4.19
4.15
4.10
4.02
3.92
3.85
3.83
3.69
3.36
3.27
3.25
3.08
3.01
2.89
2.85
2.29
1.26
0.57
17.19
16.83
13.80
13.40
13.37
13.32
13.25
13.20
12.44
12.48


DB-WAX
12.40
11.84
11.23
11.09
10.77
10.64
10.24
10.07
10.04
9.98
9.87
9.78
9.70
9.48
9.42
9.37
9.34
9.26
9.23
9.17
9.05
8.96
8.93
8.67
8.52
8.40
8.38
8.31
8.24
8.21
8.15
8.11
8.02
7.96
7.92
7.90
7.70
7.28
7.16
6.87
6.61
6.55
6.51
6.24
6.02
5.91
5.78
5.16
3.99
3.82
3.71
3.54
3.02
2.92
2.71
2.64
2.57
2.52
2.33
2.17
2.16
2.05
1.87
1.50
1.25
1.20
1.12
1.09
0.42
Time (min)
Intensity (×10^5)
15.46
15.14
15.07
15.02
14.99
14.83
14.68
14.56
14.48
14.30
14.06
13.71
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
(*E*)-2-Methyl-1,3-pentadiene	0.57	628	tr	0.42	766	tr
Methyl 2-methylbutyrate	1.26	776	tr	1.12	978	tr
Hexanol	2.29	871	tr	5.16	1326	tr
Hashishene	2.85	915	0.04	1.20*	992	0.80
Tricyclene	2.89	918	0.01	1.09	972	0.01
α-Thujene	3.01	925	1.05	1.26	1001	1.07
α-Pinene	3.08	930	0.76	1.20*	992	[0.80]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.25	941	0.01	2.16	1096	0.01
Camphene	3.27	942	0.28	1.50	1027	0.28
Thuja-2,4(10)-diene	3.36	948	0.03	2.05*	1084	0.23
β-Pinene	3.69*	970	0.46	1.87	1066	0.26
Sabinene	3.69*	970	[0.46]	2.05*	1084	[0.23]
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.83	979	0.05	2.18	1098	0.04
Octen-3-ol	3.85	981	0.02	6.51	1425	0.02
Octan-3-one	3.92	985	0.03	3.70*	1221	0.16
Myrcene	4.02	992	2.56	2.64	1136	2.56
Octan-3-ol	4.10	997	0.02	5.78	1372	0.02
α-Phellandrene	4.15*	1000	0.22	2.52	1126	0.11
Pseudolimonene	4.15*	1000	[0.22]	2.57	1130	0.11
cis-Dehydroxylinalool oxide	4.19	1003	tr	3.54*	1209	3.69
Δ3-Carene	4.24	1006	0.03	2.34	1111	0.02
α-Terpinene	4.36	1014	1.63	2.71	1141	1.64
para-Cymene	4.48	1021	2.23	3.82	1230	2.22
Limonene	4.55*	1026	1.41	2.92	1158	0.53
β-Phellandrene	4.55*	1026	[1.41]	3.02*	1167	0.89
1,8-Cineole	4.55*	1026	[1.41]	3.02*	1167	[0.89]
(*Z*)-β-Ocimene	4.76	1039	0.03	3.54*	1209	[3.69]
(*E*)-β-Ocimene	4.92	1049	0.16	3.70*	1221	[0.16]
γ-Terpinene	5.05	1057	3.65	3.54*	1209	[3.69]
cis-Sabinene hydrate	5.15	1064	0.39	6.61*	1433	0.79
cis-Linalool oxide (fur.)	5.25	1070	0.26	6.24	1405	0.26
Terpinolene	5.49*	1085	0.71	3.99	1242	0.29
trans-Linalool oxide (fur.)	5.49*	1085	[0.71]	6.61*	1433	[0.79]
para-Cymenene	5.49*	1085	[0.71]	6.02	1389	0.02
trans-Sabinene	5.64	1094	0.02	7.70*	1514	0.13

hydrate						
Linalool	5.93*	1113	71.74	7.90*	1530	70.62
Hotrienol	5.93*	1113	[71.74]	8.52	1579	0.23
endo-Fenchol	5.93*	1113	[71.74]	8.02	1540	0.07
Unknown [m/z 41, 67 (75), 69 (59), 79 (55), 81 (44), 71 (41)... 150 (5)]	5.93*	1113	[71.74]	5.91	1381	0.01
cis-para-Menth-2-en-1-ol	6.07	1122	0.14	7.92*	1532	0.25
1-Terpineol	6.22	1132	0.01	7.96	1535	0.01
trans-para-Menth-2-en-1-ol	6.28†	1136	0.60	8.67*	1590	0.10
Camphor	6.32*†	1138	[0.60]	6.87	1452	0.45
cis-Verbenol	6.32*†	1138	[0.60]	8.96	1614	0.02
trans-Verbenol	6.39	1143	0.04	9.17*	1631	0.04
Nerol oxide	6.54	1153	0.02	6.55	1428	0.01
(*E*)-2,6-Dimethyl-1,5,7-octatrien-3-ol	6.64	1160	0.01	9.98	1697	0.01
Borneol	6.71	1164	1.06	9.48*	1656	1.94
Terpinen-4-ol	6.92	1178	5.57	8.31*	1562	5.49
para-Cymen-8-ol	7.02	1184	0.03	11.23	1803	0.03
Myrtenal	7.10*	1190	0.95	8.38	1568	0.01
α-Terpineol	7.10*	1190	[0.95]	9.48*	1656	[1.94]
cis-Dihydrocarvone	7.16*	1194	0.07	8.21	1554	0.05
cis-Piperitol	7.16*	1194	[0.07]	9.23	1636	0.06
Methylchavicol	7.22	1198	0.01	9.05	1621	0.02
trans-Dihydrocarvone	7.25	1200	0.04	8.40	1570	0.04
Verbenone	7.30	1203	0.23	9.26*	1638	0.24
trans-Piperitol	7.36	1207	0.04	10.07*	1704	0.10
trans-Carveol	7.53	1218	0.02	11.09	1791	0.02
Bornyl formate	7.62	1225	0.05	7.70*	1514	[0.13]
Nerol	7.70	1231	0.03	10.77	1763	0.02
Thymol methyl ether	7.78	1236	0.02	8.15*	1550	0.28
Carvacrol methyl ether	7.85	1240	0.02	8.31*	1562	[5.49]
Linalyl acetate	8.15	1261	0.28	7.90*	1530	[70.62]
Unknown [m/z 82, 109 (35), 135 (22), 127 (19), 54 (16), 43 (14)...]	8.25	1268	0.06			
Geranial	8.31	1272	0.01	9.78*	1680	0.01
2,6-Dimethyl-1,7-octadiene-3,6-diol	8.40	1278	0.01	14.30	2087	0.01
Bornyl acetate	8.52	1287	0.07	7.90*	1530	[70.62]
Thymol	8.74	1302	0.60	14.83*	2140	0.66
Carvacrol	8.86	1305	0.28	15.07*	2163	1.02
Unknown [m/z 97, 112 (92), 83 (62),	9.02	1316	0.01	14.68	2124	0.01

43 (44), 41 (25)... 170? (4)]						
α-Terpinyl acetate	9.45	1347	0.04	9.37	1647	0.04
Eugenol	9.53	1353	0.04	14.48	2104	0.11
Neryl acetate	9.71	1366	0.01	9.87	1688	0.01
Bornyl propionate	9.81	1373	0.02			
β-Bourbonene	9.92	1380	0.01	7.16	1474	0.01
Geranyl acetate	9.98	1385	0.02	10.24	1718	0.01
β-Elemene	10.05	1389	0.01	8.10	1546	0.01
Isocaryophyllene	10.22	1401	tr	7.90*	1530	[70.62]
α-Gurjunene	10.26	1405	0.01	7.28	1483	0.01
β-Caryophyllene	10.38*	1414	0.34	8.15*	1550	[0.28]
cis-α-Bergamotene	10.38*	1414	[0.34]	7.92*	1532	[0.25]
Aromadendrene	10.66*	1434	0.02	8.24	1557	0.01
trans-α-Bergamotene	10.66*	1434	[0.02]	8.15*	1550	[0.28]
α-Humulene	10.83*	1447	0.06	8.93	1611	0.01
Neryl propionate	10.83*	1447	[0.06]	10.64	1752	0.01
allo-Aromadendrene	10.93	1455	0.03	8.67*	1590	[0.10]
cis-Cadina-1(6),4-diene	10.96	1457	0.03	8.67*	1590	[0.10]
γ-Muurolene	11.18	1473	0.01	9.26*	1638	[0.24]
Germacrene D	11.21	1476	0.03	9.42	1651	0.02
allo-Aromadendr-9-ene	11.30	1482	0.01	9.17*	1631	[0.04]
Viridiflorene	11.42*	1491	0.07	9.34	1644	0.02
Bicyclogermacrene	11.42*	1491	[0.07]	9.70*	1674	0.08
α-Muurolene	11.50	1498	0.02	9.70*	1674	[0.08]
β-Bisabolene	11.59	1504	tr	9.78*	1680	[0.01]
γ-Cadinene	11.66	1509	0.03	10.04	1701	0.02
δ-Cadinene	11.80	1521	0.07	10.07*	1704	[0.10]
α-Elemol	12.11	1545	0.01	13.71	2030	tr
Geranyl butyrate	12.33	1562	0.01	11.84	1857	0.01
Spathulenol	12.44	1571	0.03	14.06	2063	0.02
Caryophyllene oxide	12.48	1574	0.06	12.40	1907	0.04
Isospathulenol	13.20	1632	0.01	15.07*	2163	[1.02]
τ-Cadinol	13.25	1636	0.02	14.56	2112	0.02
β-Eudesmol	13.32	1642	0.01	15.07*	2163	[1.02]
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.36*	1646	0.01	14.83*	2140	[0.66]
α-Eudesmol	13.36*	1646	[0.01]	14.99	2155	tr
α-Cadinol	13.40	1649	0.02	15.14	2170	0.03
α-Bisabolol	13.80	1682	0.02	15.07*	2163	[1.02]
meta-Camphorene	16.83	1952	0.03	15.02	2159	0.02
para-Camphorene	17.19	1986	0.02	15.46	2203	0.01
Total identified		**99.09%**			**98.45%**	

Total reported	**99.22%**	**98.52%**

*: 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