Date : August 25, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20H18-PTH03
Customer identification : Lavender organic - Bulgaria - L5011298R
Type : Essential oil
Source : *Lavandula angustifolia*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc., chimiste à l'entraînement
Analysis date : August 19, 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

Méthode certifiée ISO 17025:2017 Certified method

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

PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.4629 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3515:2004 - OIL OF CLONAL LAVENDER - BULGARIA

Compound	Min. %	Max. %	Observed %	Complies?
α-Terpineol	0.8	2.0	1.4	Yes
Lavandulyl acetate	2	5	3	Yes
Terpinen-4-ol	2	5	5	Yes
Lavandulol	0.3		1.2	Yes
Linalyl acetate	30	42	23	No
Linalool	22	34	33	Yes
Camphor		0.6	0.2	Yes
Octan-3-one	0.2	1.6	1.3	Yes
(E)-β-Ocimene	2	5	3	Yes
(Z)-β-Ocimene	3	9	6	Yes
β-Phellandrene		0.6	0.2	Yes
1,8-Cineole		2.0	0.5	Yes
Limonene		0.6	0.4	Yes
Refractive index	1.4590	1.4630	1.4629	Yes

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	%	Class
Ethanol	tr	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
Methacrolein	tr	Aliphatic aldehyde
3-Buten-2-one	tr	Aliphatic ketone
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isovaleral	0.02	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	0.01	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
Butyl acetate	0.01	Aliphatic ester
Methyl hexyl ether	0.11	Aliphatic ether
(3*Z*)-Hexenol	0.03	Aliphatic alcohol
Hexanol	0.08	Aliphatic alcohol
Tricyclene	0.02	Monoterpene
α-Thujene	0.14	Monoterpene
α-Pinene	0.27	Monoterpene
Camphene	0.15	Monoterpene
α-Fenchene	tr	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.01	Aliphatic lactone
Thuja-2,4(10)-diene	0.01	Monoterpene
Butyl isobutyrate	0.02	Aliphatic ester
β-Pinene	0.03	Monoterpene
Sabinene	0.04	Monoterpene
Octen-3-ol	0.36	Aliphatic alcohol
Octan-3-one	1.31	Aliphatic ketone
Myrcene	0.94	Monoterpene
Butyl butyrate	0.09	Aliphatic ester
Octan-3-ol	0.26	Aliphatic alcohol
α-Phellandrene	0.04	Monoterpene
Pseudolimonene	0.01	Monoterpene
cis-Dehydroxylinalool oxide	0.02	Monoterpenic ether
Δ3-Carene	0.11	Monoterpene
α-Terpinene	0.08	Monoterpene
Hexyl acetate	0.53	Aliphatic ester
ortho-Cymene	0.04	Monoterpene
para-Cymene	0.16	Monoterpene
Limonene	0.38	Monoterpene
1,8-Cineole	0.53	Monoterpenic ether
β-Phellandrene	0.16	Monoterpene
(*Z*)-β-Ocimene	6.32	Monoterpene
(*E*)-β-Ocimene	3.09	Monoterpene
γ-Terpinene	0.23	Monoterpene
cis-Sabinene hydrate	0.05	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.13	Monoterpenic alcohol

Octanol	0.01	Aliphatic alcohol
trans-Linalool oxide (fur.)	0.09	Monoterpenic alcohol
Terpinolene	0.17	Monoterpene
Rosefuran	0.04	Monoterpenic ether
Linalool	32.95	Monoterpenic alcohol
(*Z*)-6-Methyl-3,5-heptadien-2-one	0.10	Aliphatic ketone
β-Thujone	0.06	Monoterpenic ketone
Octen-3-yl acetate	0.92	Aliphatic ester
Unknown	0.04	Unknown
Octan-3-yl acetate	0.07	Aliphatic ester
allo-Ocimene	0.09	Monoterpene
(*Z*)-Myroxide	0.02	Monoterpenic ether
Camphor	0.16	Monoterpenic ketone
cis-Verbenol	0.09	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Lilac aldehyde A	0.03	Monoterpenic aldehyde
Hexyl isobutyrate	0.08	Aliphatic ester
Nerol oxide	0.02	Aliphatic ether
Borneol	0.50	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Lavandulol	1.23	Monoterpenic alcohol
Terpinen-4-ol	4.88	Monoterpenic alcohol
(3*E*,5*Z*)-Undeca-1,3,5-triene	0.02	Alkene
Cryptone	0.13	Normonoterpenic ketone
meta-Cymen-8-ol	0.05	Monoterpenic alcohol
para-Cymen-8-ol	0.06	Monoterpenic alcohol
α-Terpineol	1.42	Monoterpenic alcohol
Hexyl butyrate	0.36	Aliphatic ester
Verbenone	0.01	Monoterpenic ketone
Unknown	0.03	Unknown
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.02	Monoterpenic alcohol
Octyl acetate	0.02	Aliphatic ester
trans-Carveol	0.01	Monoterpenic alcohol
Bornyl formate	0.03	Monoterpenic ester
Nerol	0.27	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.01	Aliphatic ester
Cuminal	0.03	Monoterpenic aldehyde
Carvone	0.03	Monoterpenic ketone
Neral	0.04	Monoterpenic aldehyde
Geraniol	0.70	Monoterpenic alcohol
Linalyl acetate	22.51	Monoterpenic ester
Geranial	0.09	Monoterpenic aldehyde
iso-Isopulegyl acetate	0.03	Monoterpenic ester
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.02	Monoterpenic alcohol
Bornyl acetate	0.15	Monoterpenic ester
Cuminol	0.03	Monoterpenic alcohol
Lavandulyl acetate	3.45	Monoterpenic ester
Hexyl tiglate	0.05	Aliphatic ester
Hodiendiol derivative	0.02	Oxygenated monoterpene
Unknown	0.04	Oxygenated monoterpene
Unknown	0.07	Oxygenated monoterpene
Hodiendiol derivative III	0.02	Oxygenated monoterpene

Neryl acetate	0.45	Monoterpenic ester
α-Copaene	0.03	Sesquiterpene
β-Bourbonene	0.05	Sesquiterpene
Geranyl acetate	0.77	Monoterpenic ester
7-epi-Sesquithujene	0.10	Sesquiterpene
Hexyl hexanoate	0.11	Aliphatic ester
Isocaryophyllene	0.02	Sesquiterpene
β-Caryophyllene	3.67	Sesquiterpene
α-Santalene	0.41	Sesquiterpene
Coumarin	0.03	Coumarin
trans-α-Bergamotene	0.14	Sesquiterpene
Isogermacrene D	0.01	Sesquiterpene
Sesquisabinene A	0.07	Sesquiterpene
α-Humulene	0.14	Sesquiterpene
Lavandulyl butyrate?	0.12	Monoterpenic ester
(*E*)-β-Farnesene	3.24	Sesquiterpene
Germacrene D	0.36	Sesquiterpene
trans-β-Bergamotene	0.06	Sesquiterpene
Isodaucene	0.03	Sesquiterpene
β-Bisabolene	0.06	Sesquiterpene
γ-Cadinene	0.09	Sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
β-Sesquiphellandrene	0.02	Sesquiterpene
Isocaryophyllene epoxide B	0.05	Sesquiterpenic ether
(*E*)-Nerolidol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.36	Sesquiterpenic ether
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether
τ-Cadinol	0.09	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.03	Sesquiterpenic alcohol
epi-α-Bisabolol	0.01	Sesquiterpenic alcohol
Herniarin	0.01	Coumarin
Consolidated total	**97.76%**	

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

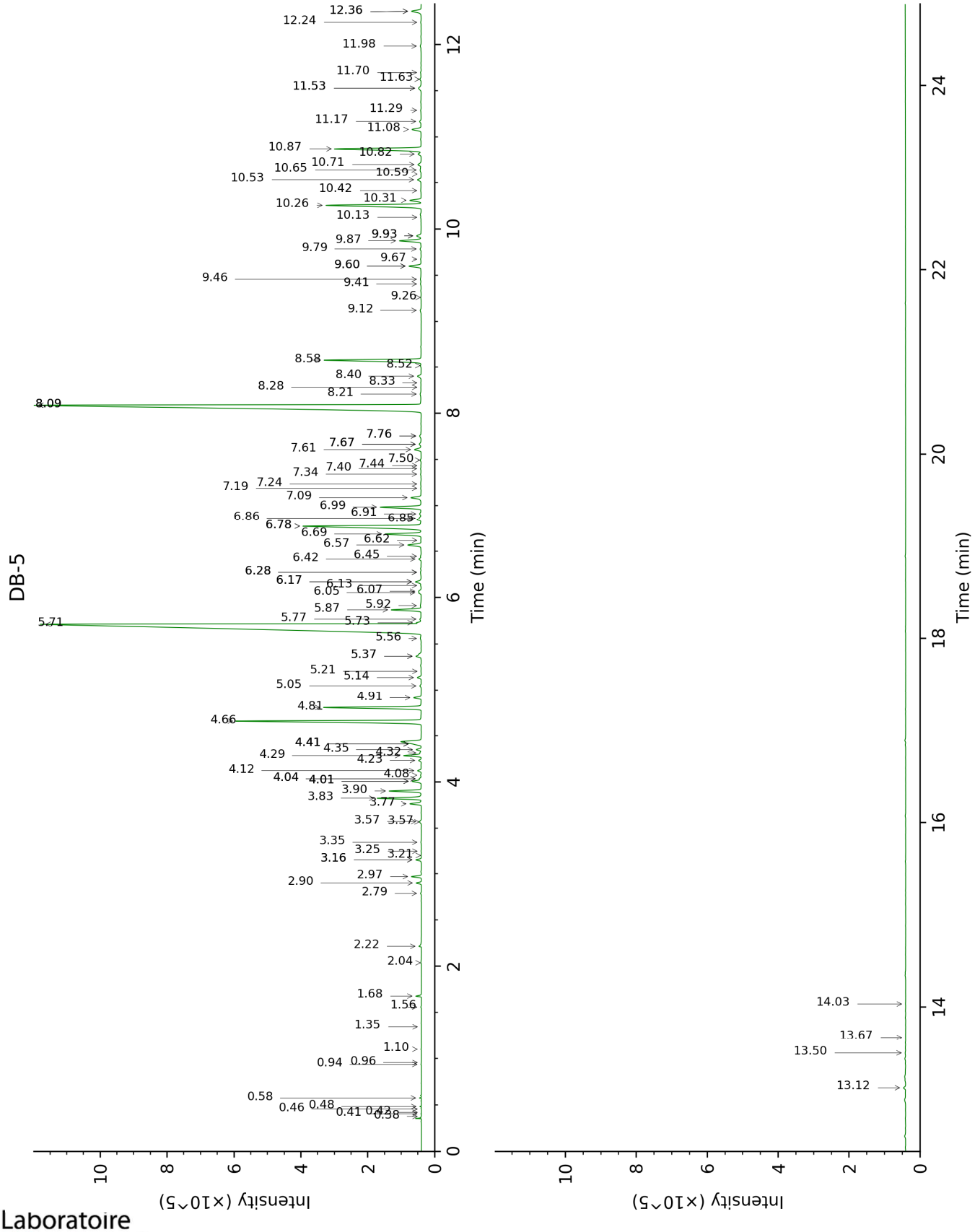
Note: no correction factor was applied

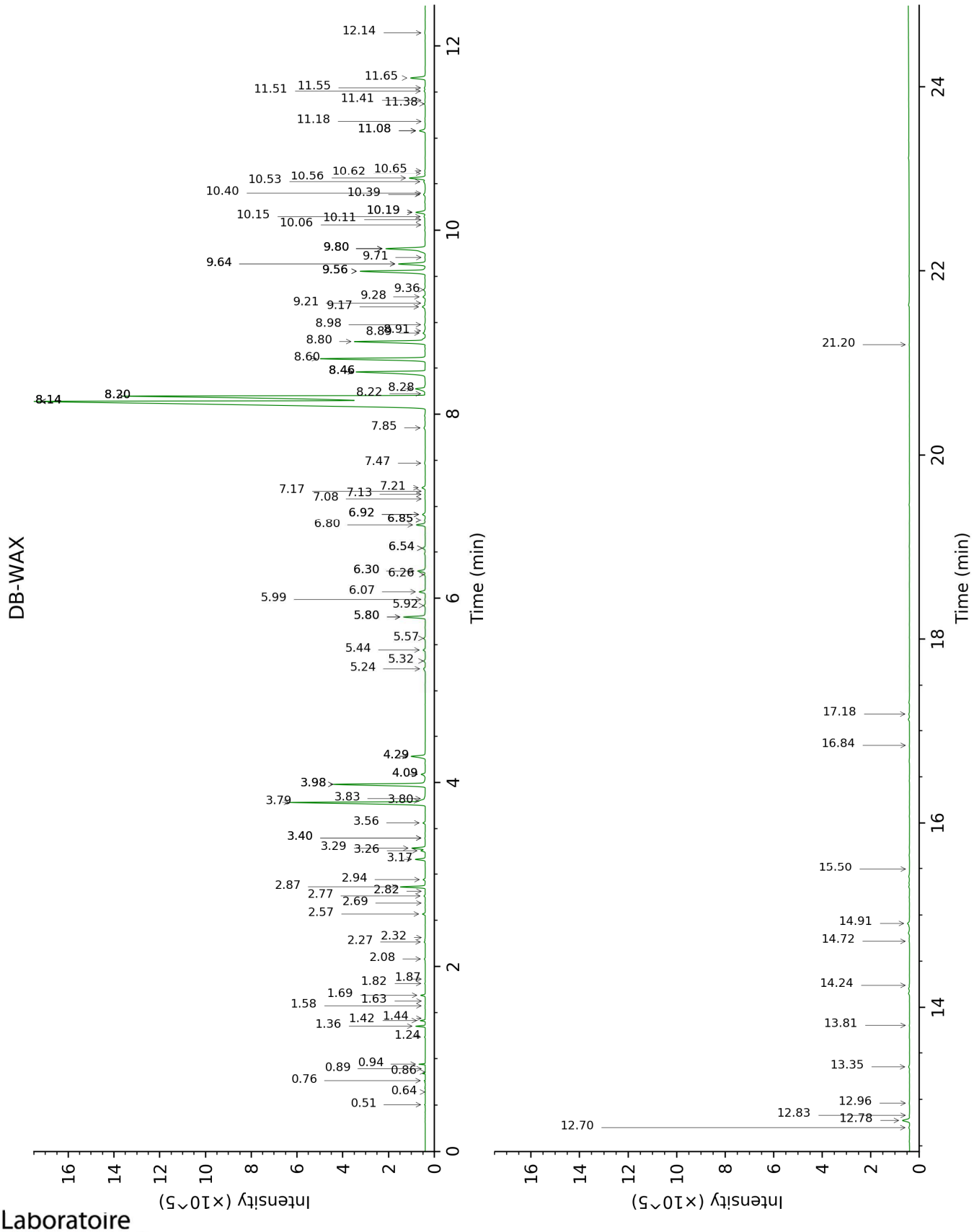
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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)
12.36
12.24
11.98
11.70
11.63
11.53
11.29
11.17
11.08
10.87
10.82
10.71
10.65
10.59
10.53
10.42
10.31
10.26
10.13
9.93
9.87
9.79
9.67
9.60
9.46
9.41
9.26
9.12
8.58
8.52
8.40
8.33
8.28
8.21
8.09
7.76
7.67
7.61
7.50
7.44
7.40
7.34
7.24
7.19
7.09
6.99
6.91
6.85
6.86
6.78
6.69
6.62
6.57
6.45
6.42
6.28
6.17
6.13
6.07
6.05
5.92
5.87
5.77
5.73
5.71
5.56
5.37
5.21
5.14
5.05
4.91
4.81
4.66
4.41
4.35
4.32
4.29
4.23
4.12
4.08
4.04
4.01
3.90
3.83
3.77
3.57
3.57
3.35
3.25
3.21
3.16
2.97
2.90
2.79
2.22
2.04
1.68
1.56
1.35
1.10
0.96
0.94
0.58
0.48
0.46
0.42
0.41
0.38
14.03
13.67
13.50
13.12


DB-WAX
Intensity (×10^5)
Time (min)
12.14
11.65
11.51
11.55
11.41
11.38
11.18
11.08
10.53
10.56
10.62
10.65
10.40
10.39
10.15
10.19
10.06
10.11
9.80
9.71
9.64
9.56
9.28
9.36
9.21
9.17
8.98
8.91
8.89
8.80
8.60
8.46
8.20
8.22
8.28
8.14
7.85
7.47
7.17
7.21
7.08
7.13
6.92
6.85
6.80
6.54
6.30
6.26
6.07
5.99
5.92
5.80
5.57
5.44
5.32
5.24
4.29
4.09
3.98
3.83
3.80
3.79
3.56
3.40
3.29
3.26
3.17
2.94
2.87
2.82
2.77
2.69
2.57
2.32
2.27
2.08
1.87
1.82
1.69
1.63
1.58
1.44
1.42
1.36
1.24
0.94
0.89
0.86
0.76
0.64
0.51
21.20
17.18
16.84
15.50
14.91
14.72
14.24
13.81
13.35
12.96
12.83
12.78
12.70

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.38	512	tr	0.86	908	tr
Isobutyral	0.41	537	tr	0.50	783	0.02
Methacrolein	0.42	550	tr	0.64	841	tr
3-Buten-2-one	0.46	581	tr	0.89	914	tr
2-Methyl-3-buten-2-ol	0.48	605	0.01	1.58	1016	0.01
Isovaleral	0.58	641	0.02	0.76	887	0.02
Isoamyl alcohol	0.94	734	0.01	3.40*	1177	0.02
2-Methylbutanol	0.96	737	tr	3.40*	1177	[0.02]
Toluene	1.10	758	0.01	1.44	1002	0.01
Hexanal	1.35	795	tr	1.87	1045	0.01
Butyl acetate	1.56	817	0.01	1.82	1040	0.01
Methyl hexyl ether	1.68	827	0.11	0.94	922	0.12
(3*Z*)-Hexenol	2.04	858	0.03	5.80*	1349	0.95
Hexanol	2.22	873	0.08	5.44	1323	0.09
Tricyclene	2.79	918	0.02	1.24	972	0.02
α-Thujene	2.90	925	0.14	1.42	1000	0.13
α-Pinene	2.97	930	0.27	1.36	992	0.26
Camphene	3.16*	943	0.16	1.69	1027	0.15
α-Fenchene	3.16*	943	[0.16]	1.63	1021	tr
5,5-Dimethyl-2(5H)-furanone	3.21	946	0.01	8.46*	1546	3.76
Thuja-2,4(10)-diene	3.25	949	0.01	2.32	1090	tr
Butyl isobutyrate	3.35	955	0.02	2.69	1121	0.01
β-Pinene	3.57†	970	[0.08]	2.08	1067	0.03
Sabinene	3.57†	970	0.08	2.27	1085	0.04
Octen-3-ol	3.77	983	0.36	6.80	1421	0.39
Octan-3-one	3.83	987	1.31	3.98*	1220	4.33
Myrcene	3.90	992	0.94	2.86	1135	0.89
Butyl butyrate	4.01*	1000	0.33	3.56	1190	0.09
Octan-3-ol	4.01*	1000	[0.33]	6.07	1368	0.26
α-Phellandrene	4.04*	1001	0.06	2.77	1127	0.04
Pseudolimonene	4.04*	1001	[0.06]	2.82	1131	0.01
cis-Dehydroxylinalool oxide	4.08	1004	0.02	3.83	1209	0.06
Δ3-Carene	4.12	1007	0.11	2.57	1112	0.10
α-Terpinene	4.23	1014	0.08	2.94	1141	0.08
Hexyl acetate	4.29	1017	0.53	4.28*	1242	0.72
ortho-Cymene	4.32	1019	0.04	4.09*	1228	0.17
para-Cymene	4.35	1021	0.16	4.09*	1228	[0.17]
Limonene	4.41*†	1025	1.10	3.17	1159	0.38
1,8-Cineole	4.41*†	1025	[1.10]	3.29	1168	0.53
β-Phellandrene	4.41*†	1025	[1.10]	3.26	1166	0.16
(*Z*)-β-Ocimene	4.66	1041	6.32	3.79	1206	6.18
(*E*)-β-Ocimene	4.81	1050	3.09	3.98*	1220	[4.33]
γ-Terpinene	4.91	1057	0.23	3.80	1207	0.20
cis-Sabinene	5.05	1065	0.05	6.92*	1430	0.14

hydrate						
cis-Linalool oxide (fur.)	5.14	1071	0.13	6.54*	1403	0.14
Octanol	5.20	1075	0.01	8.22	1528	0.03
trans-Linalool oxide (fur.)	5.37*†	1086	0.26	6.92*	1430	[0.14]
Terpinolene	5.37*†	1086	[0.26]	4.28*	1242	[0.72]
Rosefuran	5.56	1098	0.04	5.92	1358	0.06
Linalool	5.71	1108	32.95	8.14*†	1522	56.02
(*Z*)-6-Methyl-3,5-heptadien-2-one	5.73	1108	0.10	8.20*†	1526	[56.02]
β-Thujone	5.77	1111	0.06	6.30*	1385	0.35
Octen-3-yl acetate	5.87	1118	0.92	5.80*	1349	[0.95]
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	5.92	1120	0.04	9.64*	1639	1.24
Octan-3-yl acetate	6.06	1129	0.07	5.24	1309	0.11
allo-Ocimene	6.07	1130	0.09	5.57	1332	0.08
(*Z*)-Myroxide	6.13	1134	0.02	6.85*	1425	0.04
Camphor	6.17*	1137	0.23	7.21	1452	0.16
cis-Verbenol	6.17*	1137	[0.23]	9.36	1616	0.09
Unknown [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)]	6.28*	1144	0.04	7.08	1442	0.01
Lilac aldehyde A	6.28*	1144	[0.04]			
Hexyl isobutyrate	6.42	1153	0.08	5.32	1315	0.07
Nerol oxide	6.45	1155	0.02	6.85*	1425	[0.04]
Borneol	6.57	1162	0.50	9.80*	1652	2.11
cis-Linalool oxide (pyr.)	6.62	1166	0.01	10.40	1701	0.03
Lavandulol	6.69	1170	1.23	9.64*	1639	[1.24]
Terpinen-4-ol	6.78*	1176	4.93	8.60	1557	4.88
(3*E*,5*Z*)-Undeca-1,3,5-triene	6.78*	1176	[4.93]	5.99	1362	0.02
Cryptone	6.85	1180	0.13	9.17	1602	0.18
meta-Cymen-8-ol	6.86	1181	0.05	11.51	1795	0.05
para-Cymen-8-ol	6.91	1184	0.06	11.55	1798	0.04
α-Terpineol	6.99	1189	1.42	9.80*	1652	[2.11]
Hexyl butyrate	7.09	1196	0.36	6.30*	1385	[0.35]
Verbenone	7.19	1202	0.01	9.70	1645	0.02
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.24	1205	0.03	6.26	1382	0.04
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.34	1212	0.02	11.41	1787	0.02
Octyl acetate	7.40	1217	0.02	7.13	1446	0.02
trans-Carveol	7.44	1219	0.01	11.38	1783	0.03
Bornyl formate	7.50	1223	0.03	8.14*†	1522	[56.02]
Nerol	7.61	1230	0.27	11.08*	1759	0.30
Hexyl 2-	7.67*	1234	0.09	6.54*	1403	[0.14]

methylbutyrate						
Cuminal	7.67*	1234	[0.09]	10.62	1719	0.03
Carvone	7.76*	1240	0.09	10.06	1673	0.03
Neral	7.76*	1240	[0.09]	9.56*	1633	3.34
Geraniol	8.09*	1263	23.94	11.66	1808	0.70
Linalyl acetate	8.09*	1263	[23.94]	8.14*†	1522	[56.02]
Geranial	8.21	1271	0.09	10.15	1680	0.07
iso-Isopulegyl acetate	8.28	1276	0.03			
2,6-Dimethyl-1,7-octadiene-3,6-diol	8.33	1279	0.02	14.72	2089	0.03
Bornyl acetate	8.40	1284	0.15	8.28	1532	0.57
Cuminol	8.52	1292	0.03	14.24	2044	0.02
Lavandulyl acetate	8.58	1296	3.45	8.80	1572	3.41
Hexyl tiglate	9.12	1331	0.05	8.98	1586	0.05
Hodiendiol derivative	9.26	1341	0.02	12.96	1924	0.03
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.41	1351	0.04	11.18	1767	0.02
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.46	1354	0.07	11.08*	1759	[0.30]
Hodiendiol derivative III	9.60*	1365	0.48	12.83	1912	0.02
Neryl acetate	9.60*	1365	[0.48]	10.19*	1684	0.45
α-Copaene	9.67	1370	0.03	7.17	1449	0.01
β-Bourbonene	9.78	1378	0.05	7.47	1471	0.04
Geranyl acetate	9.87	1384	0.77	10.56	1715	0.76
7-epi-Sesquithujene	9.93*	1388	0.18	7.85	1500	0.10
Hexyl hexanoate	9.93*	1388	[0.18]	8.89	1579	0.11
Isocaryophyllene	10.13	1402	0.02	8.20*†	1526	[56.02]
β-Caryophyllene	10.26	1412	3.67	8.46*	1546	[3.76]
α-Santalene	10.31	1416	0.41	8.20*†	1526	[56.02]
Coumarin	10.42	1424	0.03	17.18	2343	0.04
trans-α-Bergamotene	10.53	1432	0.14	8.46*	1546	[3.76]
Isogermacrene D	10.59	1437	0.01	8.91	1581	0.03
Sesquisabinene A	10.65	1441	0.07	9.21	1605	0.03
α-Humulene	10.70	1445	0.14	9.28	1610	0.11
Lavandulyl butyrate?	10.82	1454	0.12	10.53	1712	0.09
(*E*)-β-Farnesene	10.87	1458	3.24	9.56*	1633	[3.34]
Germacrene D	11.08	1474	0.36	9.80*	1652	[2.11]
trans-β-Bergamotene	11.17	1480	0.06	9.56*	1633	[3.34]
Isodaucene	11.29	1489	0.03	10.11	1678	0.03
β-Bisabolene	11.53*	1507	0.15	10.19*	1684	[0.45]
γ-Cadinene	11.53*	1507	[0.15]	10.39	1700	0.09

Unknown [m/z 121, 93 (56), 91 (12), 94 (11), 122 (10)...220]	11.63	1515	0.05	13.35	1960	0.06
β-Sesquiphellandrene	11.70	1520	0.02	10.65	1722	0.03
Isocaryophyllene epoxide B	11.98	1543	0.05	12.14	1850	0.04
(*E*)-Nerolidol	12.24	1563	0.02	13.81	2002	0.02
Caryophyllene oxide	12.36*	1573	0.42	12.78	1907	0.36
Caryophyllene oxide isomer	12.36*	1573	[0.42]	12.70	1900	0.04
τ-Cadinol	13.12	1634	0.09	14.91	2108	0.16
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.50	1665	0.03	16.84	2306	0.02
epi-α-Bisabolol	13.67	1679	0.01	15.50	2167	0.01
Herniarin	14.03	1710	0.01	21.20	2812	0.01
Total identified		**98.38%**			**97.37%**	
Total reported		**98.60%**			**97.49%**	

*: 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