Date : February 02, 2021

Certificate of Analysis – GC Profiling

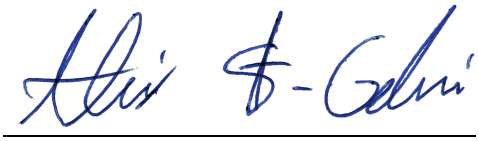
Sample identification

Internal code : 21B01-PTH01
Customer identification : Pine Scots - Hungarian - P70108207R
Type : Essential oil
Source : *Pinus sylvestris*
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 : Sylvain Mercier, M. Sc., Chimiste
Analysis date : February 02, 2021

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: Clear liquid
Refractive index: 1.4725 ± 0.0003 (20 °C; method PC-MAT-016)

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
Toluene	tr	Simple phenolic
Santene	0.05	Normonoterpene
Hashishene	0.01	Monoterpene
Tricyclene	0.09	Monoterpene
α-Thujene	0.03	Monoterpene
α-Pinene	40.09	Monoterpene
Camphene	1.10	Monoterpene
α-Fenchene	0.05	Monoterpene
Thuja-2,4(10)-diene	0.07	Monoterpene
β-Pinene	19.90	Monoterpene
Sabinene	0.05	Monoterpene
Unknown	0.13	Monoterpene
Myrcene	3.25	Monoterpene
trans-Carane?	0.04	Monoterpene
α-Phellandrene	0.17	Monoterpene
Pseudolimonene	0.10	Monoterpene
Δ3-Carene	15.20	Monoterpene
α-Terpinene	1.34	Monoterpene
para-Cymene	1.30	Monoterpene
β-Phellandrene	1.15	Monoterpene
Limonene	8.02	Monoterpene
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	0.14	Monoterpene
Unknown	0.02	Oxygenated monoterpene
Terpinolene isomer	0.03	Monoterpene
Terpinolene	0.85	Monoterpene
para-Cymenene	0.02	Monoterpene
α-Pinene oxide	0.03	Monoterpenic ether
Linalool	0.03	Monoterpenic alcohol
endo-Fenchol	0.06	Monoterpenic alcohol
trans-Pinocarveol	0.06	Monoterpenic alcohol
Camphor	0.01	Monoterpenic ketone
trans-Verbenol	0.04	Monoterpenic alcohol
Camphene hydrate	0.02	Monoterpenic alcohol
Pinocamphone	0.01	Monoterpenic ketone
Pinocarvone	0.01	Monoterpenic ketone
Borneol	0.08	Monoterpenic alcohol
Isopinocamphone	0.02	Monoterpenic ketone
Terpinen-4-ol	0.04	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α-Terpineol	0.56	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.03	Monoterpenic alcohol
Methylchavicol	0.03	Phenylpropanoid

Verbenone	0.03	Monoterpenic ketone
trans-Carveol	0.01	Monoterpenic alcohol
Thymol methyl ether	0.01	Monoterpenic ether
Carvone	0.01	Monoterpenic ketone
Bornyl acetate	1.47	Monoterpenic ester
Isobornyl acetate	0.01	Monoterpenic ester
α-Cubebene	0.02	Sesquiterpene
α-Longipinene	0.01	Sesquiterpene
Longicyclene	0.03	Sesquiterpene
α-Ylangene	0.01	Sesquiterpene
α-Copaene	0.08	Sesquiterpene
β-Elemene	0.02	Sesquiterpene
allo-Isolongifolene	0.53	Sesquiterpene
β-Caryophyllene	1.83	Sesquiterpene
β-Copaene	0.03	Sesquiterpene
trans-Muurola-3,5-diene	0.01	Sesquiterpene
α-Humulene	0.20	Sesquiterpene
trans-Cadina-1(6),4-diene	0.03	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
α-Selinene	0.01	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
trans-Calamenene	0.01	Sesquiterpene
δ-Cadinene	0.13	Sesquiterpene
trans-Cadina-1,4-diene	0.02	Sesquiterpene
α-Elemol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.08	Sesquiterpenic ether
Longiborneol	0.01	Sesquiterpenic alcohol
Humulene epoxide II	0.01	Sesquiterpenic ether
meta-Camphorene	0.04	Diterpene
para-Camphorene	0.01	Diterpene
Unknown	0.03	Unknown
Consolidated total	**99.08%**	

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

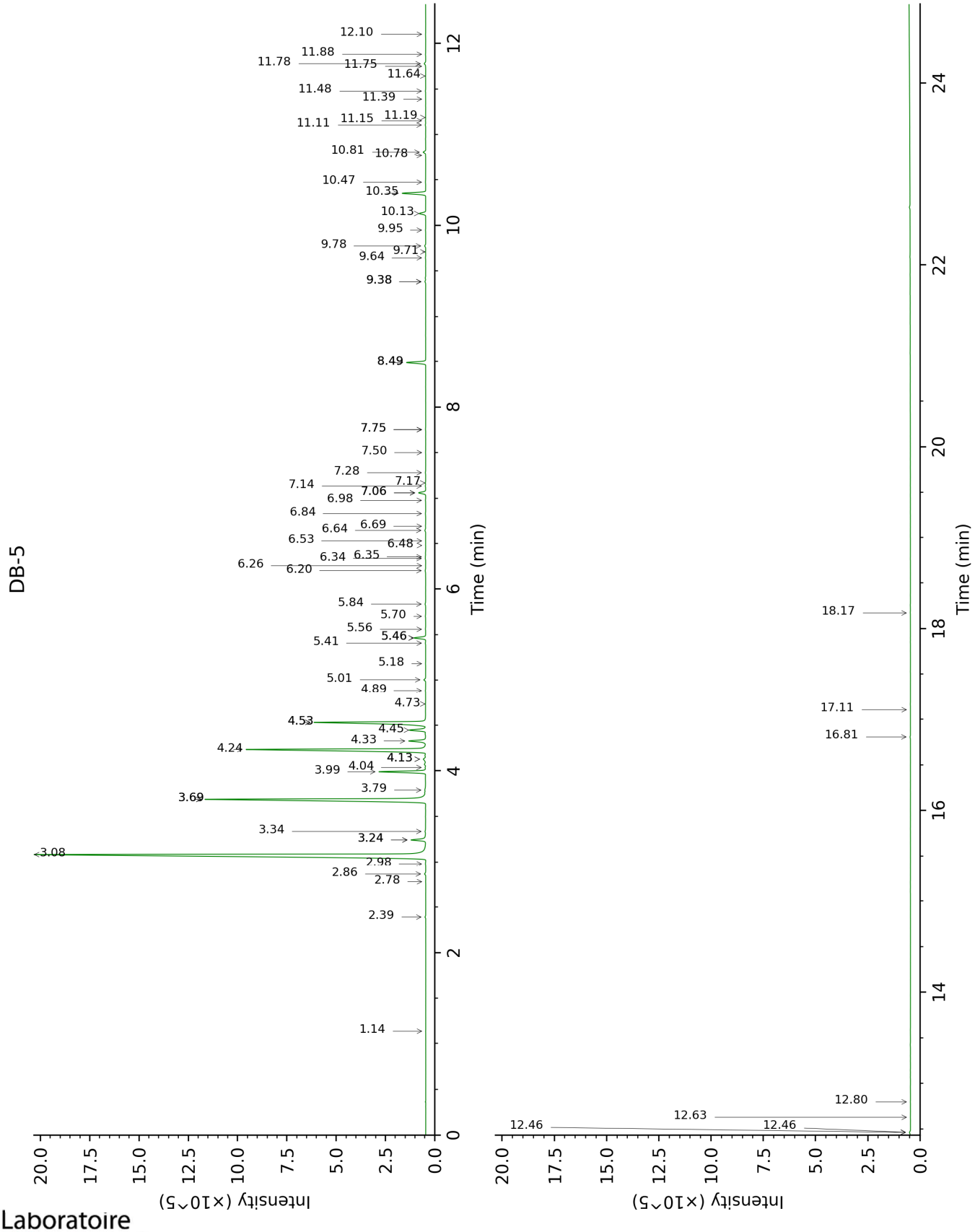
Note: no correction factor was applied

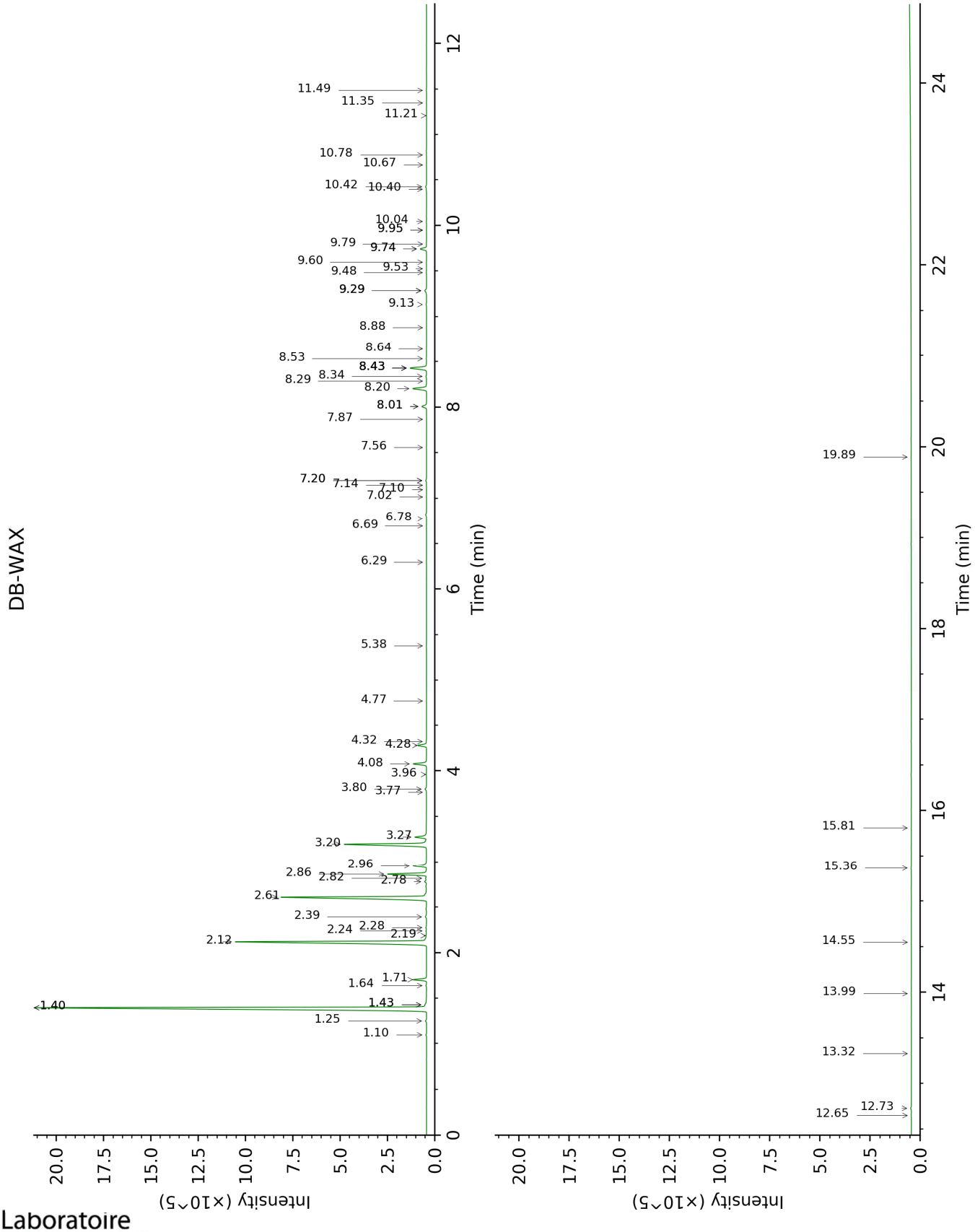
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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
12.10
11.88
11.78
11.75
11.64
11.48
11.39
11.11
11.15
11.19
10.81
10.78
10.47
10.35
10.13
9.95
9.78
9.71
9.64
9.38
8.49
7.75
7.50
7.28
7.14
7.17
7.06
6.98
6.84
6.64
6.69
6.53
6.48
6.34
6.35
6.26
6.20
5.84
5.70
5.56
5.46
5.41
5.18
5.01
4.89
4.73
4.53
4.45
4.33
4.24
4.13
3.99
4.04
3.79
3.69
3.34
3.24
3.08
2.98
2.86
2.78
2.39
1.14
Time (min)
Intensity (×10^5)
18.17
17.11
16.81
12.80
12.63
12.46
12.46
Time (min)
Intensity (×10^5)


DB-WAX
11.49
11.35
11.21
10.78
10.67
10.42
10.40
10.04
9.95
9.79
9.74
9.60
9.53
9.48
9.29
9.13
8.88
8.64
8.53
8.43
8.34
8.29
8.20
8.01
7.87
7.56
7.20
7.14
7.10
7.02
6.78
6.69
6.29
5.38
4.77
4.32
4.28
4.08
3.96
3.80
3.77
3.27
3.20
2.96
2.86
2.82
2.78
2.61
2.39
2.28
2.24
2.19
2.12
1.71
1.64
1.43
1.40
1.25
1.10
Time (min)
Intensity (×10^5)
19.89
15.81
15.36
14.55
13.99
13.32
12.73
12.65
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.14	764	tr	1.43*†	1002	[40.41]
Santene	2.39	884	0.05	1.10	950	0.05
Hashishene	2.78	914	0.01	1.40*†	998	40.41
Tricyclene	2.86	919	0.09	1.25	975	0.09
α-Thujene	2.98	927	0.03	1.43*†	1002	[40.41]
α-Pinene	3.08	934	40.09	1.40*†	998	[40.41]
Camphene	3.24*	944	1.17	1.71	1030	1.10
α-Fenchene	3.24*	944	[1.17]	1.64	1023	0.05
Thuja-2,4(10)-diene	3.34	950	0.07	2.28	1086	0.06
β-Pinene	3.69*	973	19.79	2.12	1070	19.90
Sabinene	3.69*	973	[19.79]	2.24	1082	0.05
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.79	980	0.13	2.39	1097	0.12
Myrcene	3.99	993	3.25	2.86	1135	3.26
trans-Carane?	4.04	996	0.04	2.19	1077	0.04
α-Phellandrene	4.13*	1002	0.25	2.78	1128	0.17
Pseudolimonene	4.13*	1002	[0.25]	2.82	1131	0.10
Δ3-Carene	4.24	1009	15.20	2.61	1115	14.98
α-Terpinene	4.33	1015	1.34	2.96	1142	1.29
para-Cymene	4.45	1022	1.30	4.08	1229	1.28
β-Phellandrene	4.53*	1028	9.39	3.28	1167	1.15
Limonene	4.53*	1028	[9.39]	3.20	1161	8.02
(*Z*)-β-Ocimene	4.73	1040	0.01	3.77	1206	0.01
(*E*)-β-Ocimene	4.89	1050	0.02	3.96	1220	0.02
γ-Terpinene	5.01	1058	0.14	3.80	1208	0.14
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.18	1069	0.02	4.77	1279	0.01
Terpinolene isomer	5.41	1083	0.03	4.32	1247	0.03
Terpinolene	5.46*	1087	0.88	4.28	1244	0.85
para-Cymenene	5.46*	1087	[0.88]	6.29	1388	0.02
α-Pinene oxide	5.56	1093	0.03	5.38	1322	0.03
Linalool	5.70	1102	0.03	8.01*	1516	0.52
endo-Fenchol	5.84	1110	0.06	8.34	1542	0.06
trans-Pinocarveol	6.20	1134	0.06	9.13	1604	0.05
Camphor	6.26	1138	0.01	7.10	1448	0.01
trans-Verbenol	6.34	1143	0.04	9.48	1632	0.02
Camphene hydrate	6.35	1144	0.02	8.43*	1549	1.84
Pinocamphone	6.48	1152	0.01	7.20*	1455	0.09
Pinocarvone	6.53	1156	0.01	7.87	1505	0.01
Borneol	6.64	1163	0.08	9.74*	1653	0.64

Isopinocamphone	6.69	1166	0.02	7.56	1482	0.02
Terpinen-4-ol	6.84	1176	0.04	8.53	1557	0.03
para-Cymen-8-ol	6.98	1185	0.02	11.49	1800	0.03
α-Terpineol	7.06*	1190	0.57	9.74*	1653	[0.64]
Myrtenal	7.06*	1190	[0.57]	8.64	1566	0.01
Myrtenol	7.14	1195	0.03	10.78	1739	0.03
Methylchavicol	7.17	1198	0.03	9.28*	1616	0.25
Verbenone	7.28	1205	0.03	9.60	1642	0.03
trans-Carveol	7.50	1220	0.01	11.35	1788	0.02
Thymol methyl ether	7.76*	1238	0.02	8.43*	1549	[1.84]
Carvone	7.76*	1238	[0.02]	9.95*	1670	0.02
Bornyl acetate	8.49*	1289	1.45	8.20	1531	1.47
Isobornyl acetate	8.49*	1289	[1.45]	8.29	1538	0.01
α-Cubebene	9.38*	1346	0.07	6.69	1417	0.02
α-Longipinene	9.38*	1346	[0.07]	6.78	1424	0.01
Longicyclene	9.64	1365	0.03	7.14	1451	0.03
α-Ylangene	9.71	1370	0.01	7.02	1442	0.01
α-Copaene	9.78	1374	0.08	7.20*	1455	[0.09]
β-Elemene	9.95	1386	0.02	8.43*	1549	[1.84]
allo-Isolongifolene	10.13	1399	0.53	8.01*	1516	[0.52]
β-Caryophyllene	10.35	1416	1.83	8.43*	1549	[1.84]
β-Copaene	10.47	1425	0.03	8.43*	1549	[1.84]
trans-Muurola-3,5-diene	10.78	1447	0.01	8.88	1584	0.01
α-Humulene	10.81	1450	0.20	9.28*	1616	[0.25]
trans-Cadina-1(6),4-diene	11.11	1472	0.03	9.28*	1616	[0.25]
γ-Muurolene	11.16	1476	0.02	9.53	1636	0.02
Germacrene D	11.19	1478	0.01	9.80	1658	0.03
α-Selinene	11.39	1493	0.01	9.95*	1670	[0.02]
α-Muurolene	11.48	1500	0.03	10.04	1678	0.03
γ-Cadinene	11.64	1512	0.01	10.40	1707	0.04
trans-Calamenene	11.75	1521	0.01	11.21	1776	0.02
δ-Cadinene	11.78	1523	0.13	10.42	1709	0.11
trans-Cadina-1,4-diene	11.88	1531	0.02	10.67	1730	0.02
α-Elemol	12.10	1548	0.02	13.99	2027	0.02
Caryophyllene oxide isomer	12.46*	1577	0.11	12.65	1903	0.02
Caryophyllene oxide	12.46*	1577	[0.11]	12.73	1910	0.08
Longiborneol	12.63	1590	0.01	14.55	2081	0.01
Humulene epoxide II	12.80	1603	0.01	13.32	1965	0.01
meta-Camphorene	16.81	1956	0.04	15.36	2162	0.04
para-Camphorene	17.10	1984	0.01	15.81	2207	0.02

Unknown [m/z 191, 81 (47), 95 (41), 69 (39), 109 (32), 93 (32)...]	18.17	2089	0.03	19.89	2658	0.03
Total identified		**99.00%**			**98.84%**	
Total reported		**99.17%**			**99.01%**	

*: 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