Date : May 07, 2018

Certificate of Analysis - GC Profiling

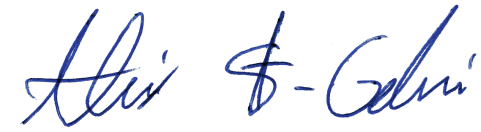
Sample identification

Internal code : 18D30-HBN3-1-CC
Customer identification : Tea Tree - 041837218
Type : Essential oil
Source : *Melaleuca alternifolia* ct. Terpinen-4-ol
Customer : Health & Beauty Natural Oils

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 : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : May 02, 2018

Checked and approved by :



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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

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

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4775 ± 0.0003 (20 °C)

COMPLIANCE WITH ISO 4730:2017 (OIL OF MELALEUCA, TERPINEN-4-OL TYPE (TEA TREE OIL))

Compound	Prescribed content		Observed %	Complies?
	Min. %	Max. %		
α-Pinene	1	4	2.5	Yes
Sabinene	tr	3.5	0.2	Yes
α-Terpinene	6	12	9.1	Yes
Limonene	0.5	1.5	0.9	Yes
para-Cymene	0.5	8	2.9	Yes
1,8-Cineole	tr	10	3.2	Yes
γ-Terpinene	14	28	19.4	Yes
Terpinolene	1.5	5	3.3	Yes
Terpinen-4-ol	35	48	39.5	Yes
α-Terpineol	2	5	2.9	Yes
Aromadendrene	0.2	3	1.3	Yes
Viridiflorene	0.1	3	1.1	Yes
δ-Cadinene	0.2	3	1.2	Yes
Globulol	tr	1	0.4	Yes
Viridiflorol	tr	1	0.2	Yes
Refractive index	1.475	1.482	1.4775	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for tea tree oil.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.14	0.14	Aliphatic alcohol
Isobutyral	0.03	0.04	Aliphatic aldehyde
Ethyl acetate	0.01	tr	Aliphatic ester
Isobutanol	tr	0.69*	Aliphatic alcohol
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	0.03	0.02	Aliphatic aldehyde
Isoamyl alcohol	tr	tr	Aliphatic alcohol
2-Methylbutanol	tr	tr	Aliphatic alcohol
Toluene	0.01	tr	Simple phenolic
(3*Z*)-Hexenol	0.05	0.06	Aliphatic alcohol
(2*E*)-Hexenol	tr	0.02*	Aliphatic alcohol
α-Thujene	0.87	0.88	Monoterpene
α-Pinene	2.46	2.48	Monoterpene
Camphene	0.02*	0.01	Monoterpene
α-Fenchene	[0.02]*	tr	Monoterpene
Thuja-2,4(10)-diene	tr	0.21*	Monoterpene
β-Pinene	0.90*	[0.69]*	Monoterpene
Sabinene	[0.90]*	[0.21]*	Monoterpene
3-Methyl-3-cyclohexenone?	0.06		Aliphatic ketone
Myrcene	0.81	0.82	Monoterpene
α-Phellandrene	0.53*	0.52	Monoterpene
Pseudolimonene	[0.53]*	0.01	Monoterpene
(3*Z*)-Hexenyl acetate	0.01	0.01	Aliphatic ester
α-Terpinene	9.05	9.11	Monoterpene
Carvomenthene	0.05	0.04	Aliphatic alcohol
para-Cymene	2.92	2.90	Monoterpene
Limonene	4.10	0.86	Monoterpene
1,8-Cineole	[4.10]*	3.22*	Monoterpenic ether
β-Phellandrene	[4.10]*	[3.22]*	Monoterpene
(*Z*)-β-Ocimene	tr	19.50*	Monoterpene
(*E*)-β-Ocimene	0.02	0.02	Monoterpene
γ-Terpinene	19.37	[19.50]*	Monoterpene
cis-Sabinene hydrate	0.04	0.03	Monoterpenic alcohol
Terpinolene	3.34*	3.29	Monoterpene
para-Cymenene	[3.34]*	0.07	Monoterpene
trans-Sabinene hydrate	0.05	0.04	Monoterpenic alcohol
Linalool	0.07	0.07	Monoterpenic alcohol
Unknown	0.01	0.06	Monoterpenic alcohol
para-Mentha-1,3,8-triene	0.01	[0.02]*	Monoterpene
cis-para-Menth-2-en-1-ol	0.20	0.20	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.02	0.03*	Aliphatic alcohol
Cosmene isomer I	0.02	0.02	Monoterpene
Camphor	0.16*	0.02	Monoterpenic ketone
trans-Pinocarveol	[0.16]*	0.34*	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.02	0.16	Monoterpenic alcohol
Unknown	0.05	0.08*	Unknown
Borneol	0.02	3.04*	Monoterpenic alcohol

δ-Terpineol	0.02	0.01	Monoterpenic alcohol
Terpinen-4-ol	39.47	40.72*	Monoterpenic alcohol
Dill ether	0.02	0.01	Monoterpenic ether
para-Cymen-8-ol	0.09	0.05	Monoterpenic alcohol
α-Terpineol	2.94	[3.04]*	Monoterpenic alcohol
cis-Piperitol	0.06	0.04	Monoterpenic alcohol
Unknown	0.01		Oxygenated monoterpene
trans-Piperitol	0.11	1.33*	Monoterpenic alcohol
endo-Fenchyl acetate	0.01	0.03	Monoterpenic ester
exo-2-Hydroxycineole	0.02	0.02	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.03	0.01	Monoterpenic alcohol
Nerol	0.03	0.04	Monoterpenic alcohol
Piperitone	0.06	0.12*	Monoterpenic ketone
cis-Carvenone oxide?	0.01		Monoterpenic ketone
trans-Ascaridole glycol	0.06	0.08	Monoterpenic alcohol
cis-Ascaridole glycol?	0.01	0.04	Monoterpenic alcohol
Thymol	0.04	0.06*	Monoterpenic alcohol
Carvacrol	0.01	0.03	Monoterpenic alcohol
Unknown	0.07	0.07	Monoterpenic alcohol
Bicycloelemene	0.03	0.02	Sesquiterpene
α-Cubebene	0.05	0.06	Sesquiterpene
Unknown	0.04	[0.03]*	Unknown
Cyclosativene II	0.01	tr	Sesquiterpene
Isoledene	0.07	[0.08]*	Sesquiterpene
α-Copaene	0.12	0.13	Sesquiterpene
7-Cubebene	0.06	0.06	Sesquiterpene
7-Cubebene epimer?	0.02	0.01	Aliphatic alcohol
β-Cubebene	0.02	0.05*	Sesquiterpene
β-Elemene	0.03	0.11*	Sesquiterpene
α-Gurjunene	0.44	0.40	Sesquiterpene
Methyleugenol	0.01	0.03	Phenylpropanoid
β-Maaliene	0.02	[0.05]*	Sesquiterpene
β-Caryophyllene	0.44	0.41	Sesquiterpene
γ-Maaliene	0.08	[0.11]*	Sesquiterpene
β-Gurjunene	0.02	0.04	Sesquiterpene
α-Maaliene	0.09	0.07	Sesquiterpene
Aromadendrene	1.34	[40.72]*	Sesquiterpene
Selina-5,11-diene	0.16	0.18	Sesquiterpene
trans-Muurola-3,5-diene	0.13	0.13	Sesquiterpene
α-Humulene	0.13	0.09	Sesquiterpene
allo-Aromadendrene	0.61	0.60	Sesquiterpene
Valerena-4,7(11)-diene	0.05	0.05	Sesquiterpene
γ-Gurjunene	0.05	0.06	Sesquiterpene
trans-Cadina-1(6),4-diene	0.41	[0.34]*	Sesquiterpene
γ-Muurolene	0.04*	1.23*	Sesquiterpene
Selina-4,11-diene	[0.04]*	0.03	Sesquiterpene
Germacrene D	0.11	0.12	Sesquiterpene
β-Selinene	0.12*	[0.12]*	Sesquiterpene
(1S,2S,4S)-para-Menthane-1,2,4-triol	[0.12]*		Monoterpenic alcohol
allo-Aromadendr-9-ene	0.08	0.17	Sesquiterpene
δ-Selinene	0.12	[1.23]*	Sesquiterpene
α-Selinene	1.85*	0.70*	Sesquiterpene

Bicyclogermacrene	[1.85]*	0.14	Sesquiterpene
Viridiflorene	[1.85]*	[1.23]*	Sesquiterpene
Epizonarene	0.17*	0.05	Sesquiterpene
α-Muurolene	[0.17]*	[0.70]*	Sesquiterpene
γ-Cadinene	0.04	0.42*	Sesquiterpene
δ-Cadinene	1.75*	[1.33]*	Sesquiterpene
trans-Calamenene	[1.75]*	0.12	Sesquiterpene
Zonarene	[1.75]*	[0.42]*	Sesquiterpene
trans-Cadina-1,4-diene	0.22	0.22	Sesquiterpene
α-Calacorene	0.02	0.03	Sesquiterpene
Eudesma-5,7(11)-diene	0.09	0.03	Sesquiterpene
Maaliol	0.11	0.04	Sesquiterpenic alcohol
Spathulenol	0.09	0.11	Sesquiterpenic alcohol
Globulol	0.37	0.35	Sesquiterpenic alcohol
Gleenol	0.03	0.04	Sesquiterpenic alcohol
Viridiflorol	0.18	0.17	Sesquiterpenic alcohol
Cubeban-11-ol	0.14	0.24*	Sesquiterpenic alcohol
Ledol	0.13	0.05	Sesquiterpenic alcohol
10-epi-Cubenol	0.02		Sesquiterpenic alcohol
Rosifoliol	0.14	0.14	Sesquiterpenic alcohol
1-epi-Cubenol	0.21	0.20	Sesquiterpenic alcohol
Isospathulenol	0.06	0.06	Sesquiterpenic alcohol
Cubenol	0.13	[0.24]*	Sesquiterpenic alcohol
α-Muurolol	0.04	[0.06]*	Sesquiterpenic alcohol
Total identified	**99.07%**	**98.75%**	

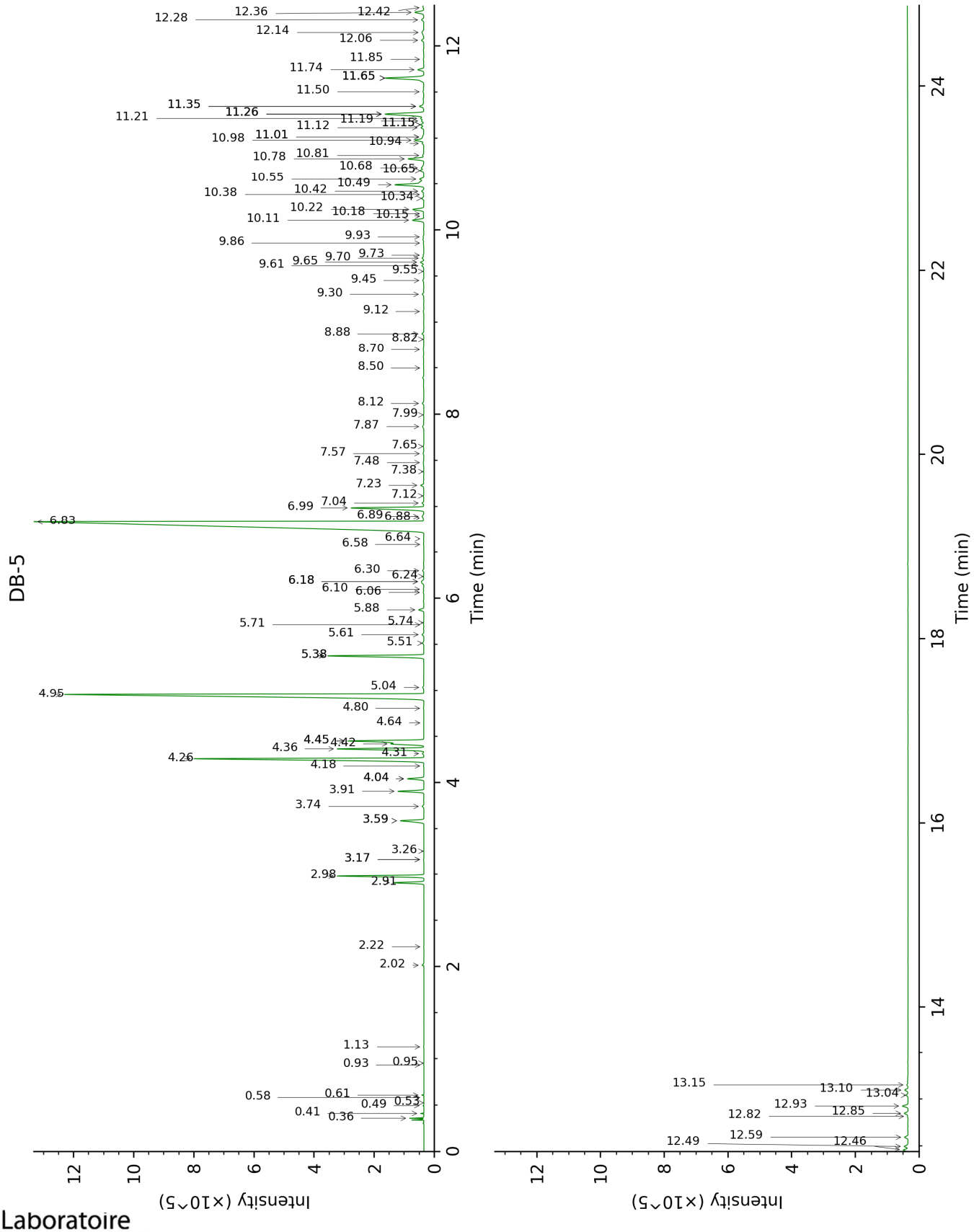
*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
tr: The compound has been detected below 0.005% of total signal.

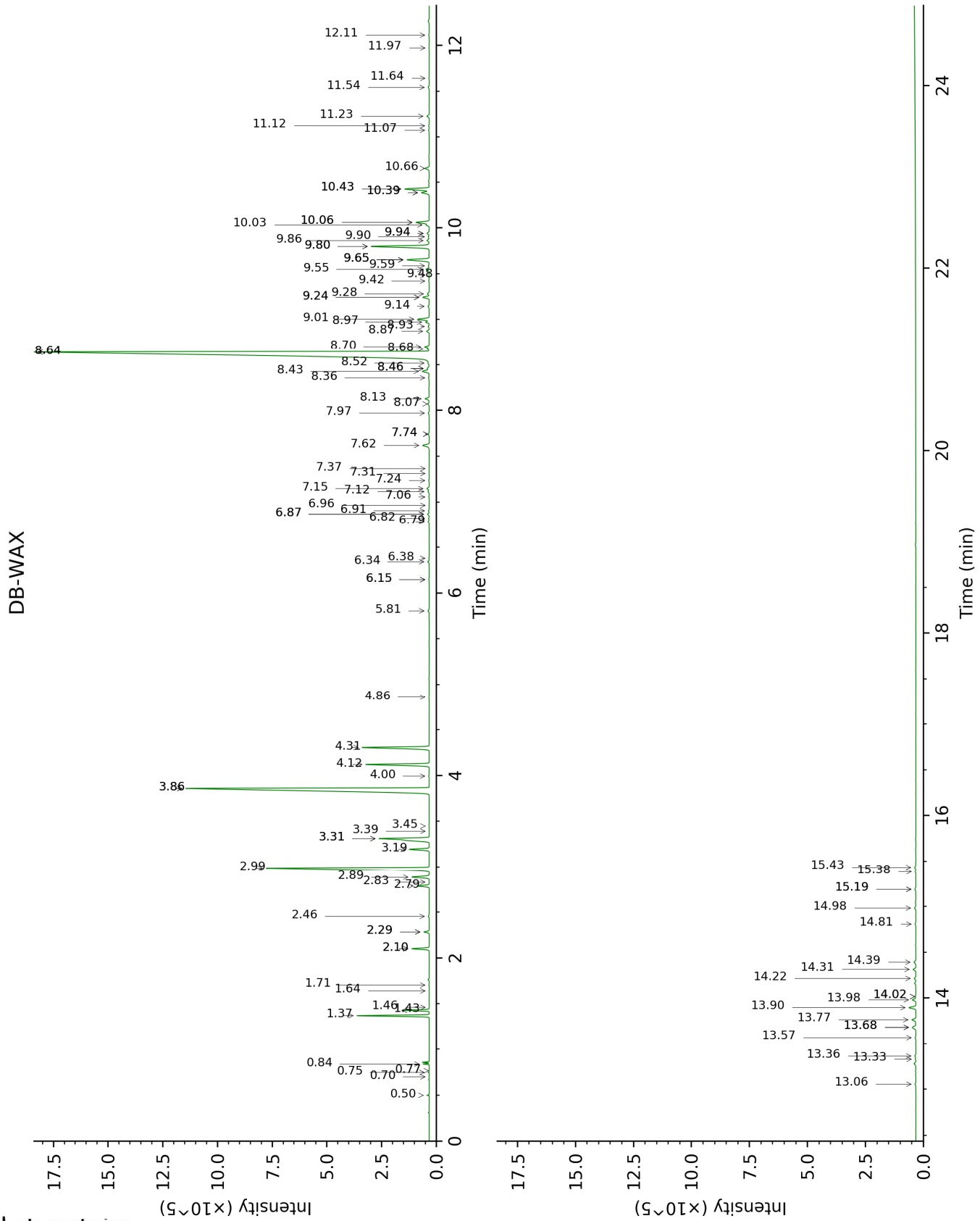
Note: no correction factor was applied

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

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)
12.28
12.36
12.42
12.14
12.06
11.85
11.74
11.65
11.50
11.35
11.21
11.26
11.19
11.15
11.12
10.98
11.01
10.94
10.78
10.81
10.68
10.65
10.55
10.49
10.38
10.42
10.34
10.22
10.18
10.15
10.11
9.93
9.86
9.61
9.65
9.70
9.73
9.55
9.45
9.30
9.12
8.88
8.82
8.70
8.50
8.12
7.99
7.87
7.65
7.57
7.48
7.38
7.23
7.12
6.99
7.04
6.89
6.88
6.83
6.64
6.58
6.30
6.24
6.18
6.10
6.06
5.88
5.74
5.71
5.61
5.51
5.38
5.04
4.95
4.80
4.64
4.45
4.42
4.36
4.31
4.26
4.18
4.04
3.91
3.74
3.59
3.26
3.17
2.98
2.91
2.22
2.02
1.13
0.93
0.95
0.58
0.61
0.49
0.53
0.41
0.36
13.15
13.10
13.04
12.93
12.82
12.85
12.49
12.59
12.46


DB-WAX
Time (min)
Intensity (×10^5)
12.11
11.97
11.64
11.54
11.23
11.12
11.07
10.66
10.43
10.39
10.06
10.03
9.94
9.90
9.86
9.80
9.65
9.59
9.55
9.48
9.42
9.28
9.24
9.14
9.01
8.97
8.93
8.87
8.70
8.68
8.64
8.52
8.46
8.43
8.36
8.13
8.07
7.97
7.74
7.62
7.37
7.31
7.24
7.15
7.12
7.06
6.96
6.91
6.87
6.82
6.79
6.38
6.34
6.15
5.81
4.86
4.31
4.12
4.00
3.86
3.45
3.39
3.31
3.19
2.99
2.89
2.83
2.79
2.46
2.29
2.10
1.71
1.64
1.46
1.43
1.37
0.84
0.77
0.75
0.70
0.50
15.43
15.38
15.19
14.98
14.81
14.39
14.31
14.22
14.02
13.98
13.90
13.77
13.68
13.57
13.36
13.33
13.06

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.36	496	0.14	0.84	905	0.14
Isobutyral	0.41	538	0.03	0.50	772	0.04
Ethyl acetate	0.50	607	0.01	0.70	861	tr
Isobutanol	0.52	617	tr	2.10*	1068	0.69
Isovaleral	0.58	637	tr	0.77	886	tr
2-Methylbutyral	0.61	646	0.03	0.75	879	0.02
Isoamyl alcohol	0.93	726	tr	3.45	1179	tr
2-Methylbutanol	0.95	729	tr	3.39	1174	tr
Toluene	1.13	755	0.01	1.46	1005	tr
(3*Z*)-Hexenol	2.02	851	0.05	5.81	1349	0.06
(2*E*)-Hexenol	2.22	868	tr	6.15*	1374	0.02
α-Thujene	2.91	922	0.87	1.43	1001	0.88
α-Pinene	2.98	926	2.46	1.37	993	2.48
Camphene	3.17*	939	0.02	1.71	1029	0.01
α-Fenchene	3.17*	939	[0.02]	1.64	1022	tr
Thuja-2,4(10)-diene	3.26	945	tr	2.29*	1086	0.21
β-Pinene	3.59*	967	0.90	2.10*	1068	[0.69]
Sabinene	3.59*	967	[0.90]	2.29*	1086	[0.21]
3-Methyl-3-cyclohexenone?	3.74	978	0.06			
Myrcene	3.91	989	0.81	2.89	1135	0.82
α-Phellandrene	4.04*	998	0.53	2.79	1128	0.52
Pseudolimonene	4.04*	998	[0.53]	2.83	1131	0.01
(3*Z*)-Hexenyl acetate	4.18	1007	0.01	4.86	1280	0.01
α-Terpinene	4.26	1012	9.05	2.99	1143	9.11
Carvomenthene	4.31	1015	0.05	2.46	1102	0.04
para-Cymene	4.36	1019	2.92	4.12	1228	2.90
Limonene	4.42†	1022	4.10	3.20	1159	0.86
1,8-Cineole	4.45*†	1024	[4.10]	3.31*	1168	3.22
β-Phellandrene	4.45*†	1024	[4.10]	3.31*	1168	[3.22]
(*Z*)-β-Ocimene	4.64	1036	tr	3.86*	1210	19.50
(*E*)-β-Ocimene	4.80	1046	0.02	4.00	1219	0.02
γ-Terpinene	4.95	1056	19.37	3.86*	1210	[19.50]
cis-Sabinene hydrate	5.04	1061	0.04	6.91	1429	0.03
Terpinolene	5.38*	1083	3.34	4.31	1241	3.29
para-Cymenene	5.38*	1083	[3.34]	6.34	1388	0.07
trans-Sabinene hydrate	5.52	1092	0.05	7.97	1508	0.04
Linalool	5.61	1097	0.07	8.07	1516	0.07
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	5.71	1104	0.01	8.52	1551	0.06

para-Mentha-1,3,8-triene	5.74	1106	0.01	6.15*	1374	[0.02]
cis-para-Menth-2-en-1-ol	5.88	1115	0.20	8.13	1521	0.20
4-Hydroxy-4-methylcyclohex-2-enone	6.06	1127	0.02	14.02*	2024	0.03
Cosmene isomer I	6.10	1129	0.02	6.38	1390	0.02
Camphor	6.18*	1134	0.16	7.24	1454	0.02
trans-Pinocarveol	6.18*	1134	[0.16]	9.24*	1608	0.34
trans-para-Menth-2-en-1-ol	6.24	1138	0.02	8.97	1586	0.16
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.30	1142	0.05	6.87*	1426	0.08
Borneol	6.58	1160	0.02	9.80*	1652	3.04
δ-Terpineol	6.64	1164	0.02	9.48	1627	0.01
Terpinen-4-ol	6.83	1176	39.47	8.64*	1560	40.72
Dill ether	6.88	1179	0.02	7.37	1463	0.01
para-Cymen-8-ol	6.89	1180	0.09	11.54	1798	0.05
α-Terpineol	6.99	1186	2.94	9.80*	1652	[3.04]
cis-Piperitol	7.04	1189	0.06	9.59	1635	0.04
Unknown [m/z 121, 43 (99), 91 (85), 77 (73), 93 (41), 136 (33)... 166 (3)]	7.12	1194	0.01			
trans-Piperitol	7.23	1202	0.11	10.43*	1704	1.33
endo-Fenchyl acetate	7.38	1212	0.01	6.82	1423	0.03
exo-2-Hydroxycineole	7.48	1218	0.02	11.64	1807	0.02
cis-para-Mentha-1(7),8-dien-2-ol	7.57	1225	0.03	11.97	1837	0.01
Nerol	7.65	1230	0.03	11.08	1759	0.04
Piperitone	7.87	1244	0.06	9.94*	1664	0.12
cis-Carvenone oxide?	7.99	1253	0.01			
trans-Ascaridole glycol	8.12	1261	0.06	14.22	2043	0.08
cis-Ascaridole glycol?	8.50	1287	0.01	14.81	2101	0.04
Thymol	8.70	1301	0.04	15.19*	2139	0.06
Carvacrol	8.82	1309	0.01	15.38	2158	0.03
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	8.88	1313	0.07	14.98	2118	0.07
Bicycloelemene	9.12	1330	0.03	7.06	1440	0.02
α-Cubebene	9.30	1343	0.05	6.78	1420	0.06
Unknown [m/z 43,	9.45	1354	0.04	14.02*	2024	[0.03]

95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...]						
Cyclosativene II	9.55	1361	0.01	6.96	1433	tr
Isoledene	9.61	1365	0.07	6.87*	1426	[0.08]
α-Copaene	9.65	1368	0.12	7.15	1447	0.13
7-Cubebene	9.70	1371	0.06	7.12	1444	0.06
7-Cubebene epimer?	9.73	1373	0.02	7.31	1459	0.01
β-Cubebene	9.86	1383	0.02	7.74*	1491	0.05
β-Elemene	9.93	1387	0.03	8.46*	1546	0.11
α-Gurjunene	10.11	1400	0.44	7.62	1482	0.40
Methyleugenol	10.15	1403	0.01	13.33	1959	0.03
β-Maaliene	10.18	1405	0.02	7.74*	1491	[0.05]
β-Caryophyllene	10.22	1409	0.44	8.43	1544	0.41
γ-Maaliene	10.34	1418	0.08	8.46*	1546	[0.11]
β-Gurjunene	10.38	1421	0.02	8.36	1538	0.04
α-Maaliene	10.42	1424	0.09	8.68	1563	0.07
Aromadendrene	10.49	1429	1.34	8.64*	1560	[40.72]
Selina-5,11-diene	10.55	1433	0.16	8.70	1565	0.18
trans-Muurola-3,5-diene	10.65	1441	0.13	8.87	1578	0.13
α-Humulene	10.68	1443	0.13	9.28	1611	0.09
allo-Aromadendrene	10.78	1450	0.61	9.00	1588	0.60
Valerena-4,7(11)-diene	10.82	1453	0.05	8.93	1582	0.05
γ-Gurjunene	10.94	1463	0.05	9.14	1600	0.06
trans-Cadina-1(6),4-diene	10.98	1465	0.41	9.24*	1608	[0.34]
γ-Muurolene	11.01*	1468	0.04	9.65*	1641	1.23
Selina-4,11-diene	11.01*	1468	[0.04]	9.42	1622	0.03
Germacrene D	11.12	1476	0.11	9.86	1658	0.12
β-Selinene	11.15*	1478	0.12	9.94*	1664	[0.12]
(1S,2S,4S)-para-Menthane-1,2,4-triol	11.15*	1478	[0.12]			
allo-Aromadendr-9-ene	11.19	1481	0.08	9.55	1632	0.17
δ-Selinene	11.22	1483	0.12	9.65*	1641	[1.23]
α-Selinene	11.26*	1486	1.85	10.06*	1674	0.70
Bicyclogermacrene	11.26*	1486	[1.85]	10.03	1672	0.14
Viridiflorene	11.26*	1486	[1.85]	9.65*	1641	[1.23]
Epizonarene	11.35*	1493	0.17	9.90	1661	0.05
α-Muurolene	11.35*	1493	[0.17]	10.06*	1674	[0.70]
γ-Cadinene	11.50	1505	0.04	10.39*	1700	0.42
δ-Cadinene	11.65*	1516	1.75	10.43*	1704	[1.33]
trans-Calamenene	11.65*	1516	[1.75]	11.23	1772	0.12
Zonarene	11.65*	1516	[1.75]	10.39*	1700	[0.42]
trans-Cadina-1,4-diene	11.74	1524	0.22	10.66	1723	0.22
α-Calacorene	11.85	1532	0.02	12.11	1849	0.03

Eudesma-5,7(11)-diene	12.06	1549	0.09	11.12	1763	0.03
Maaliol	12.14	1555	0.11	13.06	1934	0.04
Spathulenol	12.28	1566	0.09	14.39	2060	0.11
Globulol	12.36	1572	0.37	13.90	2013	0.35
Gleenol	12.42	1577	0.03	13.57	1982	0.04
Viridiflorol	12.46	1580	0.18	13.98	2021	0.17
Cubeban-11-ol	12.49	1583	0.14	13.68*	1992	0.24
Ledol	12.59	1591	0.13	13.36	1963	0.05
10-epi-Cubenol	12.82	1609	0.02			
Rosifoliol	12.85	1611	0.14	14.32	2053	0.14
1-epi-Cubenol	12.93	1618	0.21	13.76	2000	0.20
Isospathulenol	13.04	1628	0.06	15.43	2164	0.06
Cubenol	13.10	1632	0.13	13.68*	1992	[0.24]
α-Muurolol	13.16	1637	0.04	15.19*	2139	[0.06]
Total identified		**99.07%**			**98.75%**	
Total reported		**99.25%**			**98.88%**	

*: 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