

Black Spruce

Picea mariana

Batch No. #CA-59116

Canada

Aldehydes 0.19%

α campholenal	0.15
citranellal	0.02
nonanal	0.01
geranial	0.01

Ethers 1.43%

1,8 cineole + β phellandrene	1.42
thymol methyl ether	0.01

Esters 28.28%

bornyl acetate	26.19
isobornyl acetate	0.76
endo-fenchyl acetate	0.39
geranyl acetate	0.24
cis-verbenyl acetate	0.16
trans-pinocarvyl acetate	0.15
terpinyl acetate analog	0.1
citronellyl acetate	0.09
α terpinyl acetate	0.08
trans-carvyl acetate	0.05
exo-2-hydroxycineole acetate	0.04
myrtenyl acetate	0.02
3-methyl-3-butenyl isovalerate	0.01

Ketones 0.31%

fenchone	0.11
camphor	0.09
piperitone	0.04
isopinocampnone	0.04
carvone	0.02
pinocampnone	0.01

Other 4.74%

santene	3.87
unknown	0.62
γ campholenal	0.09
(3Z) hexanal	0.07
stearic acid	0.03
hexanol	0.02
(1,8Z,11Z,14Z)-heptadecatetraene	0.02
palmitic acid	0.01
acetic acid	0.01

Monoterpenes 57.8%

camphene	22.29
α pinene	15.94
Δ3-carene	5.48
limonene	3.47
myrcene	3.25
β pinene	2.73
tricyclene	2.45
terpinolene	0.90
α phellandrene	0.38
α terpinene	0.21
γ terpinene	0.20
para cymene	0.13
bornylene	0.1
α fenchene	0.09
para-cymenene	0.06
sabinene	0.03
(E)-β ocimene	0.02
(Z)-β-ocimene	0.02
thuja-2,4(10)-diene	0.02
meta-cymene	0.01
meta-cymenene	0.01
ortho-cymene	0.01

Monoterpenols 2.69%

borneol	1.04
camphene hydrate	0.51
terpinen-4-ol	0.22
linalool	0.16
isoborneol	0.13
citronellol	0.09
geraniol	0.04
endo-fenchol	0.03
para-cymen-8-ol	0.02
trans-pinocarveol	0.09
α terpineol	0.36

Sesquiterpenes 3%

δ cadinene	1.12
α muurolene	0.32
γ cadinene	0.32
β caryophyllene	0.19
β elemene	0.13
γ muurolene	0.13
(E)-α-bisabolene	0.12
trans-cadina-1(6),4-diene	0.10
germacrene D	0.07
longifolene	0.07
trans-calamenene	0.07
α cadinene	0.07
α selinene	0.06
α humulene	0.05
trans-cadina-1,4-diene	0.04
α copaene	0.04
β selinene	0.04
trans-muurola-3,5-diene	0.03
trans-muurola-4(15),5-diene	0.01
longicyclene	0.01
α calacorene	0.01

Sesquiterpenols 0.33%

α cadinol	0.13
τ cadinol	0.06
τ muurolol	0.06
1-epi-cubenol	0.02
α muurolol	0.02
cis-calamenen-10-ol	0.01
germacrene D-4-ol	0.01
globulol	0.01
Amorpha-4,9-dien-2-ol	0.01

Date : December 10, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Type : Essential oil

Source : *Picea mariana*

Customer : Nature's Gift

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 : Lindsay Girard, B. Sc.

Analysis date : December 03, 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.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4696 ± 0.0003 (20 °C)

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	%	Classe
Acetic acid	0.01	Aliphatic acid
Isovaleral	tr	Aliphatic aldehyde
Toluene	tr	Simple phenolic
(3Z)-Hexenol	0.07	Aliphatic alcohol
Hexanol	0.02	Aliphatic alcohol
Santene	3.87	Normonoterpene
Unknown	0.07	Normonoterpene
Bornylene	0.10	Monoterpene
Tricyclene	2.45	Monoterpene
α -Pinene	15.94	Monoterpene
Camphene	22.29	Monoterpene
α -Fenchene	0.09	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
meta-Cymene	0.01	Monoterpene
Sabinene	0.03	Monoterpene
β -Pinene	2.73	Monoterpene
Myrcene	3.25	Monoterpene
α -Phellandrene	0.38	Monoterpene
Δ^3 -Carene	5.48	Monoterpene
α -Terpinene	0.21	Monoterpene
ortho-Cymene	0.01	Monoterpene
para-Cymene	0.13	Monoterpene
Limonene	3.47	Monoterpene
1,8-Cineole	1.42*	Monoterpenic ether
β -Phellandrene	[1.42]*	Monoterpene
(Z)- β -Ocimene	0.02	Monoterpene
(E)- β -Ocimene	0.02	Monoterpene
γ -Terpinene	0.20	Monoterpene
Unknown	0.06	Oxygenated monoterpene
meta-Cymenene	0.01	Monoterpene
Fenchone	0.11	Monoterpenic ketone
γ -Campholenal	0.09	Aliphatic alcohol
Terpinolene	0.90	Monoterpene
para-Cymenene	0.06	Monoterpene
Unknown	0.01	Unknown
Linalool	0.16	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	0.03	Monoterpenic alcohol
3-Methyl-3-butenyl isovalerate	0.01	Aliphatic ester
α -Campholenal	0.15	Monoterpenic aldehyde
<i>trans</i> -Pinocarveol	0.09	Monoterpenic alcohol
Camphor	0.09	Monoterpenic ketone
Camphene hydrate	0.51	Monoterpenic alcohol
Isoborneol	0.13	Monoterpenic alcohol
Citronellal	0.02	Monoterpenic aldehyde
Pinocamphone	0.01	Monoterpenic ketone
Borneol	1.04	Monoterpenic alcohol

Unknown	0.07	Unknown
Isopinocampone	0.04	Monoterpenic ketone
Terpinen-4-ol	0.22	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α -Terpineol	0.36	Monoterpenic alcohol
Unknown	0.03	Unknown
endo-Fenchyl acetate	0.39	Monoterpenic ester
Citronellol	0.09	Monoterpenic alcohol
Thymol methyl ether	0.01	Monoterpenic ether
Unknown	0.04	Oxygenated monoterpene
Carvone	0.02	Monoterpenic ketone
Piperitone	0.04	Monoterpenic ketone
Geraniol	0.04	Monoterpenic alcohol
Geranial	0.01	Monoterpenic aldehyde
Unknown	0.03	Unknown
Bornyl acetate	26.19	Monoterpenic ester
Isobornyl acetate	0.76	Monoterpenic ester
<i>cis</i> -Verbenyl acetate	0.16	Monoterpenic ester
Unknown	0.18	Monoterpenic ester
<i>trans</i> -Pinocarvyl acetate	0.15	Monoterpenic ester
Myrtenyl acetate	0.02	Monoterpenic ester
Terpinyl acetate analog	0.10	Monoterpenic ester
<i>trans</i> -Carvyl acetate	0.05	Monoterpenic ester
exo-2-Hydroxycineole acetate	0.04	Monoterpenic ester
α -Terpinyl acetate	0.08	Monoterpenic ester
Citronellyl acetate	0.09	Monoterpenic ester
Longicyclene	0.01	Sesquiterpene
Unknown	0.03	Oxygenated monoterpene
α -Copaene	0.04	Sesquiterpene
Geranyl acetate	0.24	Monoterpenic ester
β -Elemene	0.13	Sesquiterpene
Longifolene	0.07	Sesquiterpene
β -Caryophyllene	0.19	Sesquiterpene
<i>trans</i> -Muurolo-3,5-diene	0.03	Sesquiterpene
α -Humulene	0.05	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.10	Sesquiterpene
γ -Muurolole	0.13	Sesquiterpene
Germacrene D	0.07	Sesquiterpene
β -Selinene	0.04	Sesquiterpene
<i>trans</i> -Muurolo-4(15),5-diene	0.01	Sesquiterpene
α -Selinene	0.06	Sesquiterpene
α -Muurolole	0.32	Sesquiterpene
γ -Cadinene	0.32	Sesquiterpene
<i>trans</i> -Calamenene	0.07	Sesquiterpene
δ -Cadinene	1.12	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.04	Sesquiterpene
α -Cadinene	0.07	Sesquiterpene
α -Calacorene	0.01	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.12	Sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Germacrene D-4-ol	0.01	Sesquiterpenic alcohol

Globulol	0.01	Sesquiterpenic alcohol
Unknown	0.02	Unknown
1-epi-Cubenol	0.02	Sesquiterpenic alcohol
τ -Muurolol	0.06	Sesquiterpenic alcohol
τ -Cadinol	0.06	Sesquiterpenic alcohol
α -Muurolol	0.02	Sesquiterpenic alcohol
α -Cadinol	0.13	Sesquiterpenic alcohol
<i>cis</i> -Calamennen-10-ol	0.01	Sesquiterpenic alcohol
(1,8Z,11Z,14Z)-Heptadecatetraene	0.02	Alkene
Amorpha-4,9-dien-2-ol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Palmitic acid	0.01	Aliphatic acid
Stearic acid	0.03	Aliphatic acid
Consolidated total	98.80%	

*: 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

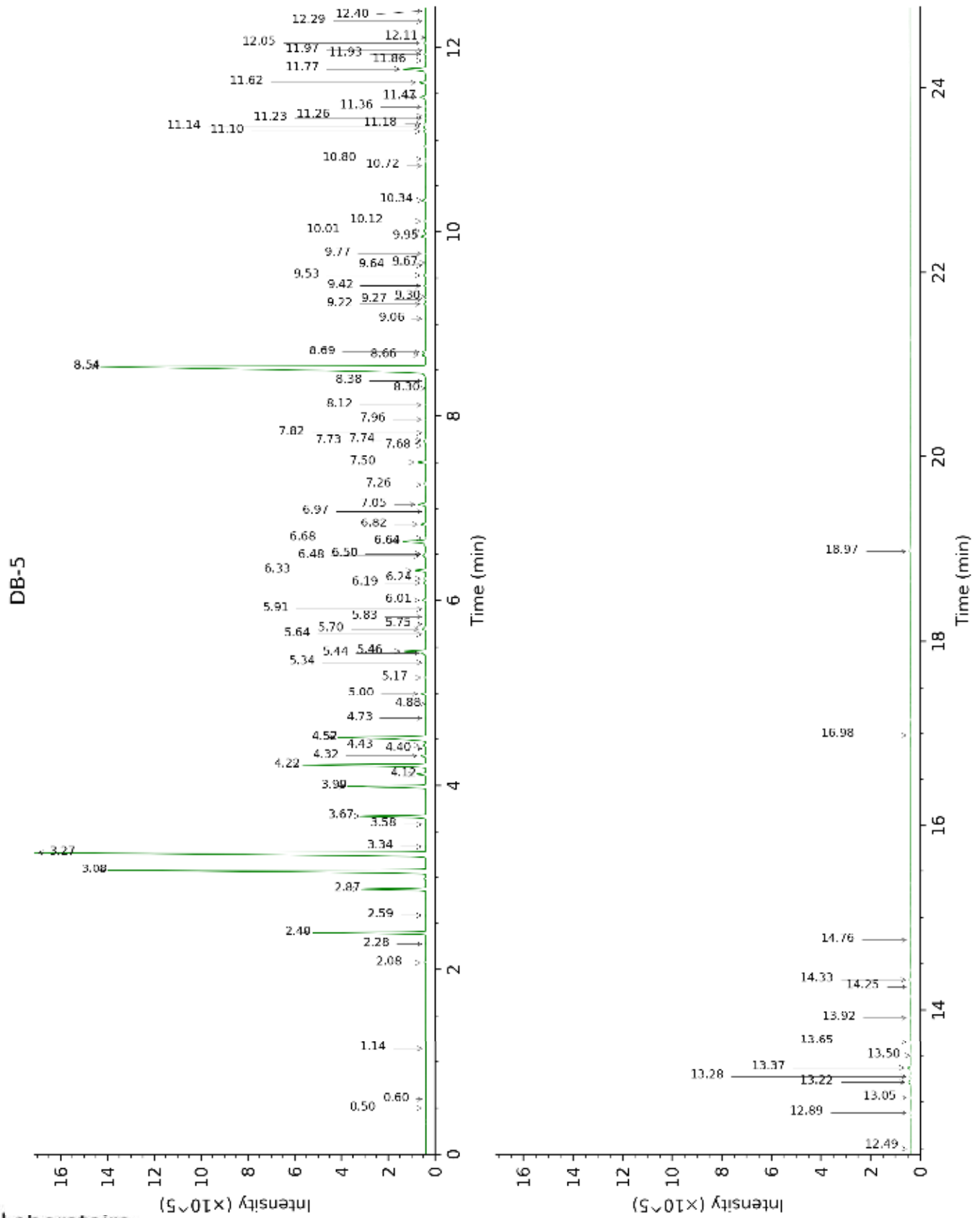
tr: The compound has been detected below 0.005% of total signal.

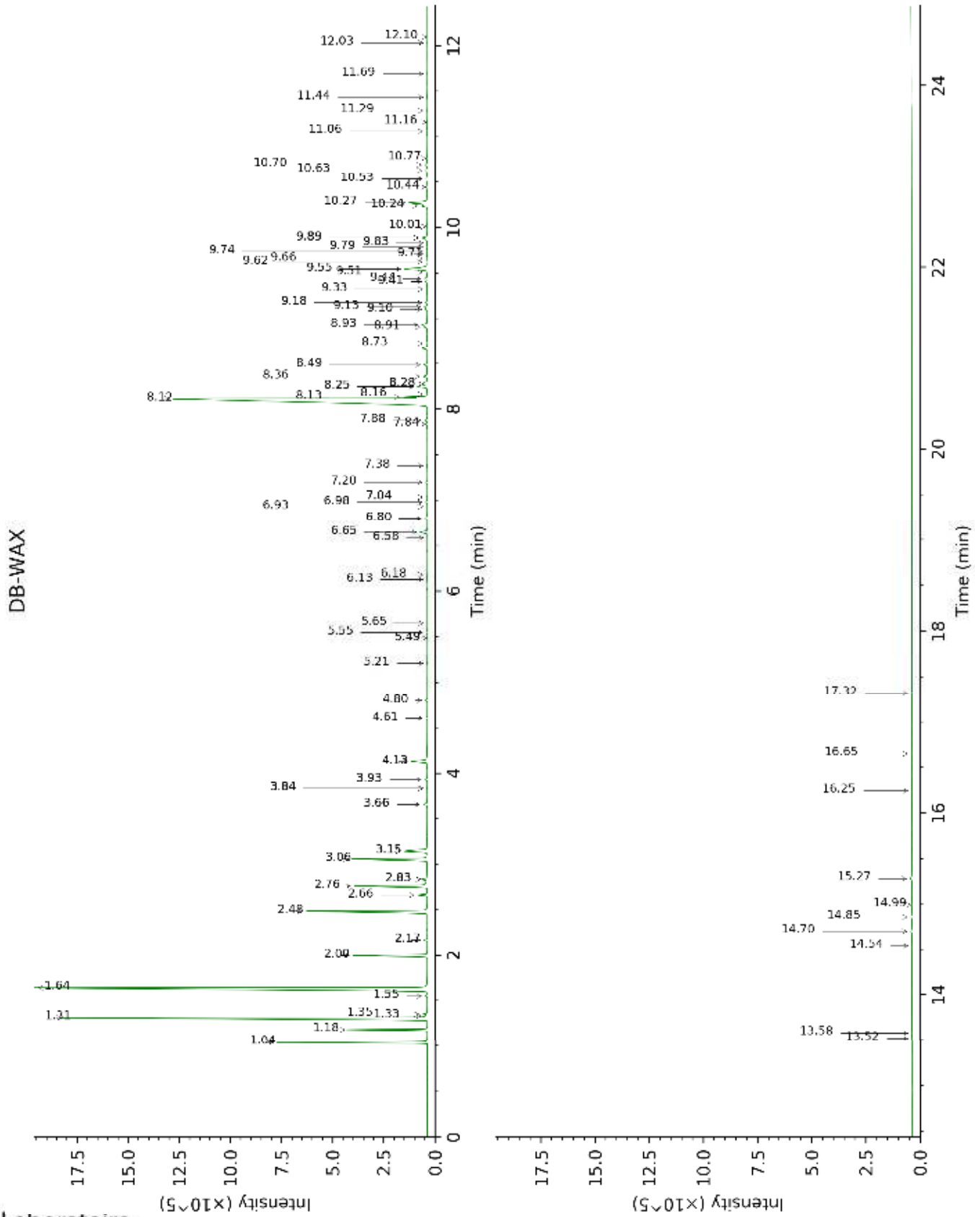
Note: no correction factor was applied

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.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetic acid	0.50	594	0.01	6.58	1416	0.01
Isovaleral	0.60	642	tr			
Toluene	1.14	760	tr	1.35	1002	0.12
(3Z)-Hexenol	2.08	855	0.07	5.55*	1342	0.08
Hexanol	2.28	872	0.02	5.21	1317	0.02
Santene	2.40	882	3.87	1.04*	950	3.97
Unknown [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.59*	897	0.03	1.33	999	0.07
Bornylene	2.59*	897	[0.03]	1.04*	950	[3.97]
Tricyclene	2.87	917	2.45	1.18	974	2.42
α -Pinene	3.08	930	15.94	1.31	996	16.27
Camphene	3.28*	944	21.94	1.64	1031	22.29
α -Fenchene	3.28*	944	[21.94]	1.55	1022	0.09
Thuja-2,4(10)-diene	3.34	948	0.02	2.17*	1083	0.11
meta-Cymene	3.58	964	0.01	2.83*	1140	0.36
Sabinene	3.67*	970	2.77	2.17*	1083	[0.11]
β -Pinene	3.67*	970	[2.77]	2.00	1066	2.73
Myrcene	3.99	991	3.25	2.76	1134	3.11
α -Phellandrene	4.12	1000	0.38	2.66	1126	0.37
Δ^3 -Carene	4.22	1007	5.48	2.48	1112	5.56
α -Terpinene	4.32	1013	0.21	2.83*	1140	[0.36]
ortho-Cymene	4.40	1018	0.01	3.84*	1220	0.02
para-Cymene	4.44	1020	0.13	3.93	1228	0.12
Limonene	4.52*	1025	4.89	3.06	1159	3.47
1,8-Cineole	4.52*	1025	[4.89]	3.15*	1166	1.49
β -Phellandrene	4.52*	1025	[4.89]	3.15*	1166	[1.49]
(Z)- β -Ocimene	4.73	1038	0.02	3.66*	1207	0.22
(E)- β -Ocimene	4.88	1048	0.02	3.84*	1220	[0.02]
γ -Terpinene	5.00	1056	0.20	3.66*	1207	[0.22]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.17	1067	0.06	4.60	1279	0.05
meta-Cymenene	5.34	1078	0.01	6.18	1387	0.02
Fenchone	5.44	1084	0.11	5.55*	1342	[0.08]
γ -Campholenal	5.46*	1085	1.02	4.80	1294	0.09
Terpinolene	5.46*	1085	[1.02]	4.13	1243	0.90
para-Cymenene	5.46*	1085	[1.02]	6.13	1383	0.06
Unknown [m/z 79, 94 (87), 77 (25), 91 (21), 93 (16), 95 (12), 138 (8)]	5.64	1097	0.01			
Linalool	5.70	1101	0.16	7.88	1513	0.12
Nonanal	5.75	1104	0.01	5.65	1349	0.01

endo-Fenchol	5.83	1109	0.03	8.16	1535	0.03
3-Methyl-3-butenyl isovalerate	5.91	1115	0.01	5.49	1337	0.01
α -Campholenal	6.01	1121	0.15	6.80*	1432	0.17
<i>trans</i> -Pinocarveol	6.19	1133	0.09	9.10	1609	0.09
Camphor	6.24	1136	0.09	6.98	1446	0.07
Camphene hydrate	6.33	1142	0.51	8.25*	1542	0.47
Isoborneol	6.48	1153	0.13	9.18*	1615	0.10
Citronellal	6.50*	1154	0.06	6.80*	1432	[0.17]
Pinocamphone	6.50*	1154	[0.06]	7.04*	1450	0.05
Borneol	6.64*	1163	1.11	9.55*	1645	1.39
Unknown [m/z 109, 108 (48), 67 (41), 81 (40), 41 (28)...]	6.64*	1163	[1.11]	7.20	1462	0.07
Isopinocamphone	6.68	1166	0.04	7.38	1476	0.04
Terpinen-4-ol	6.82	1175	0.22	8.36	1551	0.19
para-Cymen-8-ol	6.97	1185	0.02	11.29	1792	0.02
α -Terpineol	7.05	1190	0.36	9.55*	1645	[1.39]
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.26	1204	0.03	10.77	1747	0.06
endo-Fenchyl acetate	7.50	1221	0.39	6.65	1421	0.36
Citronellol	7.73	1233	0.09	10.63	1736	0.15
Thymol methyl ether	7.68	1234	0.01	8.25*	1542	[0.47]
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.74	1234	0.04	11.16	1781	0.04
Carvone	7.82	1239	0.02	9.83	1669	0.02
Piperitone	7.96	1249	0.04	9.74	1661	0.03
Geraniol	8.12	1259	0.04	11.44	1805	0.04
Geranial	8.30	1271	0.01	10.01*	1684	0.05
Unknown [m/z 43, 119 (72), 81 (66), 54 (48), 41 (47), 58 (44)...]	8.38	1277	0.03			
Bornyl acetate	8.54*	1287	27.84	8.12	1531	26.19
Isobornyl acetate	8.54*	1287	[27.84]	8.13	1533	0.76
<i>cis</i> -Verbenyl acetate	8.54*	1287	[27.84]	8.49	1561	0.16
Unknown [m/z 107, 43 (76), 150 (42), 91 (28), 108 (23)]	8.66	1295	0.18	8.91	1594	0.13
<i>trans</i> -Pinocarvyl acetate	8.69	1297	0.15	8.93	1596	0.29
Myrtenyl acetate	9.06	1323	0.02	9.51	1642	0.04
Terpinyl acetate	9.22	1334	0.10	9.41	1634	0.11

analog <i>trans</i> -Carvyl acetate	9.27	1337	0.05	10.01*	1684	[0.05]
exo-2- Hydroxycineole acetate	9.30	1340	0.04	9.89*	1673	0.33
α -Terpinyl acetate	9.42	1348	0.08	9.62	1652	0.09
Citronellyl acetate	9.53	1356	0.09	9.33	1627	0.03
Longicyclene	9.64	1363	0.01	6.93	1442	0.01
Unknown [m/z 93, 121 (68), 43 (67), 67 (44), 136 (36), 107 (34)... 180 (4)]	9.67	1365	0.03	9.89*	1673	[0.33]
α -Copaene	9.77	1372	0.04	7.04*	1450	[0.05]
Geranyl acetate	9.95	1385	0.24	10.44	1719	0.16
β -Elemene	10.01	1390	0.13	8.28*†	1544	0.30
Longifolene	10.12	1397	0.07	7.84	1510	0.06
β -Caryophyllene	10.34	1413	0.19	8.28*†	1544	[0.30]
<i>trans</i> -Muurolo-3,5- diene	10.72	1442	0.03	8.73	1580	0.10
α -Humulene	10.80	1447	0.05	9.13	1611	0.14
<i>trans</i> -Cadina- 1(6),4-diene	11.10	1469	0.10	9.18*	1615	[0.10]
γ -Muurolole	11.14	1472	0.13	9.44	1637	0.14
Germacrene D	11.18	1475	0.07	9.66	1655	0.04
β -Selinene	11.24	1479	0.04	9.79	1665	0.03
<i>trans</i> -Muurolo- 4(15),5-diene	11.26	1481	0.01	9.71	1659	0.02
α -Selinene	11.36	1489	0.06	9.89*	1673	[0.33]
α -Muurolole	11.47	1496	0.32	9.89*	1673	[0.33]
γ -Cadinene	11.62	1508	0.32	10.24	1702	0.32
<i>trans</i> -Calamenene	11.77*	1520	1.24	11.06	1773	0.07
δ -Cadinene	11.77*	1520	[1.24]	10.27	1705	1.12
<i>trans</i> -Cadina-1,4- diene	11.86	1527	0.04	10.53*	1727	0.19
α -Cadinene	11.93	1532	0.07	10.70	1741	0.11
α -Calacorene	11.97	1536	0.01	12.03*	1858	0.01
(<i>E</i>)- α -Bisabolene	12.05	1542	0.12	10.53*	1727	[0.19]
Unknown [m/z 95, 81 (70), 109 (68), 93 (59), 67 (53), 41 (49), 139 (40)... 220 (3)]	12.11	1546	0.02	12.10	1864	0.01
Unknown [m/z 93, 135 (9), 107 (72), 177 (72), 81 (57), 149 (53)... 220 (25)]	12.29	1560	0.01	12.03*	1858	[0.01]
Germacrene D-4-ol	12.40	1569	0.01	13.52	1995	0.01
Globulol	12.49	1576	0.01			
Unknown0 [m/z 108, 43 (56), 109 (33), 93 (26), 119	12.89	1608	0.02	14.54	2094	0.01

(24)... 212 (2)]						
1-epi-Cubenol	13.05	1621	0.02	13.58	2001	0.01
τ -Muurolol	13.22*	1635	0.14	14.85	2125	0.06
τ -Cadinol	13.22*	1635	[0.14]	14.70	2109	0.06
α -Muurolol	13.28	1640	0.02	14.99	2138	0.02
α -Cadinol	13.37	1647	0.13	15.27	2167	0.11
<i>cis</i> -Calamennen-10-ol	13.50	1658	0.01	16.25	2268	0.01
(1,8Z,11Z,14Z)-Heptadecatetraene	13.65	1671	0.02	11.69	1828	0.01
Amorpha-4,9-dien-2-ol	13.92	1692	0.01	16.65	2311	0.01
Unknown [m/z 159, 220 (92), 93 (88), 177 (63), 91 (57), 107 (55)]	14.25	1721	0.01			
Unknown [m/z 159, 132 (79), 135 (37), 91 (35), 177 (33)... 220 (16)]	14.33	1728	0.03	17.32	2384	0.03
Unknown [m/z 43, 147 (93), 159 (76), 187 (76), 81 (64), 93 (56), 121 (56), 220 (51)]	14.76	1765	0.01			
Palmitic acid	16.98	1968	0.01			
Stearic acid	18.97	2168	0.03			
Total identified		98.52%			98.47%	
Total reported		99.00%			98.95%	

*: 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