

Date : avril 29, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 21D23-PTH04


**Customer identification** : Sugi - Japan - SL31002011R

**Type** : Essential oil

**Source** : *Cryptomeria japonica*

**Customer** : Plant Therapy

ANALYSIS

**Method**: PC-MAT-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** : avril 27, 2021

Checked and approved by :



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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Light yellow liquid

**Refractive index:**  $1.4862 \pm 0.0003$  (20 °C; method PC-MAT-016)

#### 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	%	Class
Hexanal	tr	Aliphatic aldehyde
(2E)-Hexenal	tr	Aliphatic aldehyde
(3Z)-Hexenal	0.03	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Bornylene	0.01	Monoterpene
Tricyclene	0.35	Monoterpene
$\alpha$ -Thujene	0.98	Monoterpene
$\alpha$ -Pinene	20.35	Monoterpene
Camphene	2.09	Monoterpene
$\alpha$ -Fenchene	0.20	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
meta-Cymene	0.02	Monoterpene
$\beta$ -Pinene	1.02	Monoterpene
Sabinene	9.53	Monoterpene
Octen-3-ol	0.06	Aliphatic alcohol
Myrcene	3.25	Monoterpene
Octan-3-ol	0.02	Aliphatic alcohol
$\alpha$ -Phellandrene	0.08	Monoterpene
$\Delta^3$ -Carene	4.03	Monoterpene
$\alpha$ -Terpinene	0.91	Monoterpene
para-Cymene	0.59	Monoterpene
Limonene	4.49	Monoterpene
1,8-Cineole	0.57	Monoterpenic ether
(E)- $\beta$ -Ocimene	0.03	Monoterpene
$\gamma$ -Terpinene	1.57	Monoterpene
cis-Sabinene hydrate	0.08	Monoterpenic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.78	Monoterpene
para-Cymenene	0.08	Monoterpene
trans-Sabinene hydrate	0.05	Monoterpenic alcohol
Linalool	0.10	Monoterpenic alcohol
Unknown	0.03	Unknown
Octen-3-yl acetate	0.03	Aliphatic ester
(E)-4,8-Dimethyl-1,3,7-nonatriene	0.11	Monoterpene
cis-para-Menth-2-en-1-ol	0.07	Monoterpenic alcohol
Octan-3-yl acetate	0.02	Aliphatic ester
Cosmene	0.03	Monoterpene
Camphor	0.07	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.07	Monoterpenic alcohol
Isopulegol	0.02	Monoterpenic alcohol
Isomenthone	0.01	Monoterpenic ketone
Borneol	0.16	Monoterpenic alcohol
Isopinocampone	0.02	Monoterpenic ketone
Terpinen-4-ol	2.22	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol

Unknown	0.01	Unknown
$\alpha$ -Terpineol	0.14	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.03	Monoterpenic alcohol
Methylchavicol	0.02	Phenylpropanoid
Unknown	0.02	Unknown
<i>trans</i> -Piperitol	0.04	Monoterpenic alcohol
endo-Fenchyl acetate	0.01	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Carvacrol methyl ether	0.09	Monoterpenic ether
Linalyl acetate	0.18	Monoterpenic ester
Bornyl acetate	1.28	Monoterpenic ester
( <i>E</i> )-Anethole	0.01	Phenylpropanoid
<i>trans</i> -Sabinyl acetate	0.07	Monoterpenic ester
Methyl myrtenate	0.02	Monoterpenic ester
Methyl decadienoate isomer I	0.01	Aliphatic ester
Methyl decanoate	0.01	Aliphatic ester
<i>trans</i> -Carvyl acetate	0.06	Monoterpenic ester
$\alpha$ -Terpinyl acetate	0.24	Monoterpenic ester
$\alpha$ -Cubebene	0.07	Sesquiterpene
$\alpha$ -Ylangene	0.01	Sesquiterpene
$\alpha$ -Copaene	0.09	Sesquiterpene
$\beta$ -Bourbonene	0.01	Sesquiterpene
$\beta$ -Cubebene	0.08	Sesquiterpene
$\beta$ -Elemene	0.28	Sesquiterpene
Longifolene	0.10*	Sesquiterpene
$\alpha$ -Chamipinene	[0.10]*	Sesquiterpene
$\alpha$ -Cedrene	0.04	Sesquiterpene
$\beta$ -Cedrene	0.23	Sesquiterpene
$\beta$ -Caryophyllene	0.16	Sesquiterpene
$\beta$ -Copaene	0.15	Sesquiterpene
<i>cis</i> -Thujopsene	0.24	Sesquiterpene
Cadina-3,5-diene isomer I?	0.05	Sesquiterpene
Cadina-3,5-diene?	0.12	Sesquiterpene
$\alpha$ -Humulene	0.16	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.47	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.14	Sesquiterpene
10-epi- $\beta$ -Acoradiene	0.01	Sesquiterpene
Selina-4,11-diene	0.07	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.18	Sesquiterpene
$\gamma$ -Muurolole	0.31	Sesquiterpene
Germacrene D	1.54	Sesquiterpene
$\beta$ -Selinene	0.14	Sesquiterpene
<i>trans</i> -Muurolo-4(15),5-diene	0.33	Sesquiterpene
epi-Cubebol	0.13	Sesquiterpenic alcohol
$\alpha$ -Selinene	0.15	Sesquiterpene
$\beta$ -Himachalene	0.14	Sesquiterpene
$\alpha$ -Muurolole	0.68	Sesquiterpene
Cuparene	0.02	Sesquiterpene
$\beta$ -Bisabolene	0.12	Sesquiterpene
$\gamma$ -Cadinene	0.67	Sesquiterpene
Cubebol	0.16	Sesquiterpenic alcohol
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.07	Sesquiterpene

<i>trans</i> -Calamenene	0.11	Sesquiterpene
Zonarene	0.07	Sesquiterpene
$\delta$ -Cadinene	2.66	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.15	Sesquiterpene
$\alpha$ -Cadinene	0.18	Sesquiterpene
$\alpha$ -Calacorene	0.04	Sesquiterpene
$\alpha$ -Elemol	6.71	Sesquiterpenic alcohol
Germacrene B	0.51	Sesquiterpene
( <i>E</i> )-Nerolidol	0.25	Sesquiterpenic alcohol
Germacrene D-4-ol	0.19	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Unknown	0.02	Oxygenated sesquiterpene
Gleenol	0.08	Sesquiterpenic alcohol
$\alpha$ -Cedrol	0.28	Sesquiterpenic alcohol
Unknown	0.27	Oxygenated sesquiterpene
Junenol	0.10	Sesquiterpenic alcohol
10- <i>epi</i> - $\gamma$ -Eudesmol	0.27	Sesquiterpenic alcohol
Eremoligenol?	0.75	Sesquiterpenic alcohol
$\gamma$ -Eudesmol	2.67	Sesquiterpenic alcohol
Agarospinol?	0.19	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.17	Sesquiterpenic alcohol
$\tau$ -Muurolol	0.54	Sesquiterpenic alcohol
$\beta$ -Eudesmol	3.80	Sesquiterpenic alcohol
Neointermedeol	0.12	Sesquiterpenic alcohol
Unknown	0.05	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	3.44	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.68	Sesquiterpenic alcohol
Unknown	0.08	Oxygenated sesquiterpene
Unknown	1.58	Unknown
Juniper camphor	0.02	Sesquiterpenic alcohol
Cryptomerione	0.14	Sesquiterpenic ketone
Unknown	0.02	Sesquiterpenic ester
Cryptomeridiol	0.03	Sesquiterpenic alcohol
Oplopanonyl acetate	0.02	Sesquiterpenic ester
Rimuene	0.04	Diterpene
Isopimara-9(11),15-diene	0.01	Diterpene
Biformene?	0.17	Diterpene
Sandaracopimaradiene?	0.05	Diterpene
Pimaradiene	0.11	Diterpene
Sclarene?	0.02	Diterpene
Unknown	0.09	Oxygenated diterpene
Trachylobane?	0.05	Diterpene
Kaur-16-ene	7.53	Diterpene
<i>ar</i> -Abietatriene	0.04	Diterpene
Nezukol	0.20	Diterpenic alcohol
Sandaracopimarinal?	0.04	Diterpenic aldehyde
Phyllocladanol	0.01	Diterpenic alcohol
Isopimaral	0.03	Diterpenic aldehyde
Sandaracopimarinal?	0.01	Diterpenic alcohol
Ferruginol	0.02	Diterpenic alcohol
Unknown	0.66	Unknown
<b>Consolidated total</b>	<b>98.87%</b>	

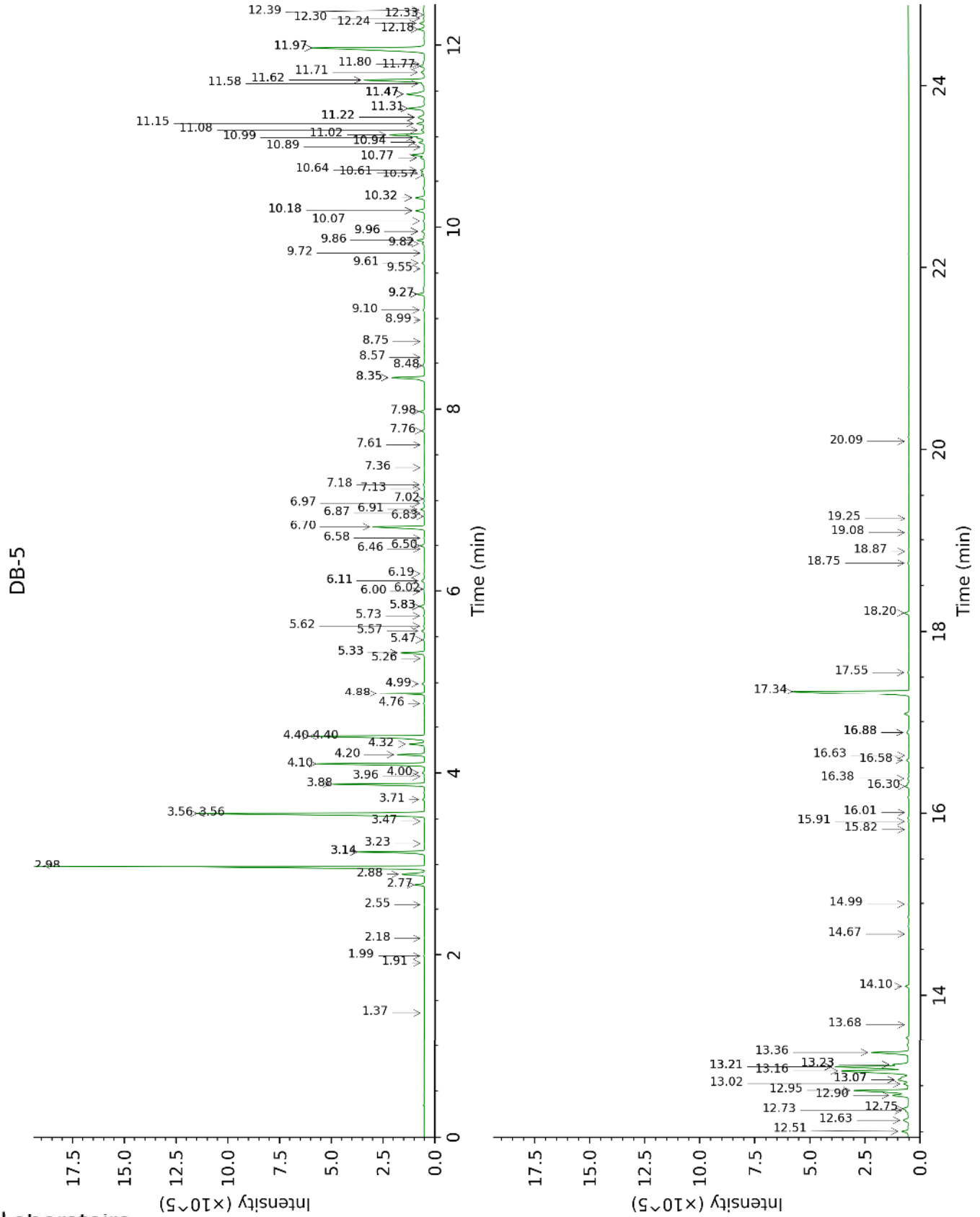
\*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered  
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total  
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

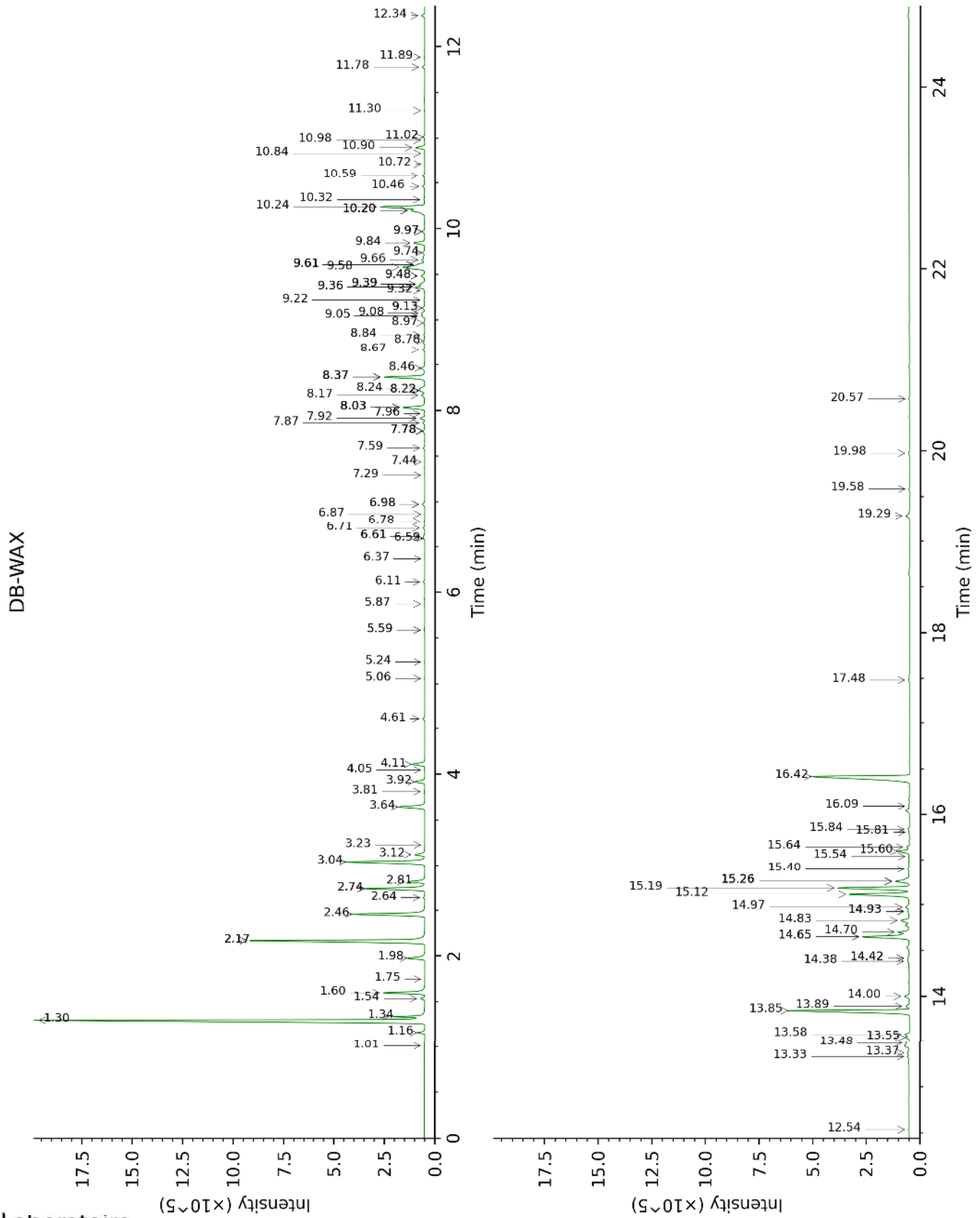
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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	%
Hexanal	1.37	802	tr	1.75	1042	0.01
(2E)-Hexenal	1.91	850	tr	3.23	1172	0.01
(3Z)-Hexenol	1.99	857	0.03	5.59*	1346	0.05
Hexanol	2.18	874	0.01	5.24	1321	0.02
Bornylene	2.55	905	0.01	1.01	945	0.01
Tricyclene	2.77	920	0.35	1.16	972	0.35
$\alpha$ -Thujene	2.88	928	0.98	1.34†	1001	[21.48]
$\alpha$ -Pinene	2.98	934	20.35	1.30†	995	21.48
Camphene	3.14*	945	2.27	1.60	1027	2.09
$\alpha$ -Fenchene	3.14*	945	[2.27]	1.54	1020	0.20
Thuja-2,4(10)-diene	3.23	951	0.01	2.17*	1085	9.61
meta-Cymene	3.47	968	0.02	2.74*	1133	3.26
$\beta$ -Pinene	3.56*	974	10.56	1.98	1065	1.02
Sabinene	3.56*	974	[10.56]	2.17*	1085	[9.61]
Octen-3-ol	3.71	984	0.06	6.59†	1419	0.15
Myrcene	3.88	995	3.25	2.74*	1133	[3.26]
Octan-3-ol	3.96	1001	0.02	5.87	1367	0.02
$\alpha$ -Phellandrene	4.00	1004	0.08	2.64	1125	0.09
$\Delta^3$ -Carene	4.10	1010	4.03	2.46	1111	4.06
$\alpha$ -Terpinene	4.20	1016	0.91	2.81	1139	0.95
para-Cymene	4.32	1024	0.59	3.92	1226	0.58
Limonene	4.40*	1029	5.02	3.04	1158	4.49
1,8-Cineole	4.40*	1029	[5.02]	3.12	1164	0.57
(E)- $\beta$ -Ocimene	4.76	1052	0.03	3.81	1218	0.05
$\gamma$ -Terpinene	4.88	1059	1.57	3.64	1205	1.58
cis-Sabinene hydrate	4.99	1066	0.08	6.70	1428	0.08
Isoterpinolene	5.26	1084	0.01	4.05	1235	0.02
Terpinolene	5.33*	1088	0.84	4.11	1240	0.78
para-Cymenene	5.33*	1088	[0.84]	6.11	1384	0.08
trans-Sabinene hydrate	5.47	1096	0.05	7.78*	1508	0.15
Linalool	5.57	1103	0.10	7.86	1515	0.12
Unknown [m/z 43, 59 (37), 79 (33), 91 (32), 119 (31)...]	5.62	1106	0.03	8.84	1592	0.06
Octen-3-yl acetate	5.73	1113	0.03	5.59*	1346	[0.05]
(E)-4,8-Dimethyl-1,3,7- nonatriene	5.83*	1120	0.21	4.60	1277	0.11
cis-para-Menth-2-en-1- ol	5.83*	1120	[0.21]	7.96	1523	0.07
Octan-3-yl acetate	6.00	1130	0.02	5.06	1308	0.01
Cosmene	6.02	1132	0.03	6.37	1402	0.01
Camphor	6.11*	1138	0.14	6.98*	1448	0.16
trans-para-Menth-2-en- 1-ol	6.11*	1138	[0.14]	8.78	1586	0.07
Isopulegol	6.19	1143	0.02	8.03*	1528	1.32
Isomenthone	6.46	1160	0.01	6.78	1434	0.06
Borneol	6.50	1162	0.16	9.61*†	1654	[2.14]
Isopinocampone	6.58	1168	0.02	7.44	1483	0.01

Terpinen-4-ol	6.70	1176	2.22	8.37*	1554	2.32
para-Cymen-8-ol	6.83	1184	0.02	11.30	1797	0.02
Unknown [m/z 43, 135 (73), 59 (46), 93 (39), 91 (35), 81 (32)...]	6.87	1186	0.01			
α-Terpineol	6.91	1189	0.14	9.61*†	1654	[2.14]
cis-Piperitol	6.97	1193	0.03	9.36*†	1634	0.82
Methylchavicol	7.02	1196	0.02	9.13*	1615	0.16
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.13	1203	0.02	10.72	1746	0.01
trans-Piperitol	7.18	1206	0.04	10.20*†	1702	0.95
endo-Fenchyl acetate	7.36	1219	0.01	6.61*†	1421	[0.15]
Unknown [m/z 85, 43 (48), 119 (42), 41 (26), 134 (25)...]	7.61	1236	0.01	8.03*	1528	[1.32]
Carvacrol methyl ether	7.76	1246	0.09	8.37*	1554	[2.32]
Linalyl acetate	7.98	1260	0.18	7.92	1519	0.26
Bornyl acetate	8.34*	1285	1.44	8.03*	1528	[1.32]
(E)-Anethole	8.34*	1285	[1.44]	10.98	1769	0.01
trans-Sabinyl acetate	8.48	1294	0.07	8.97	1602	0.08
Methyl myrtenate	8.57	1300	0.02	9.32	1631	0.05
Methyl decadienoate isomer I	8.75	1313	0.01	9.48*	1644	0.25
Methyl decanoate	8.99	1329	0.01	8.37*	1554	[2.32]
trans-Carvyl acetate	9.10	1337	0.06	9.97*	1683	0.18
α-Terpinyl acetate	9.27*	1349	0.28	9.48*	1644	[0.25]
α-Cubebene	9.27*	1349	[0.28]	6.61*†	1421	[0.15]
α-Ylangene	9.55	1369	0.01	6.87	1440	0.01
α-Copaene	9.61	1373	0.09	6.98*	1448	[0.16]
β-Bourbonene	9.72	1381	0.01	7.29	1472	0.01
β-Cubebene	9.82	1388	0.08	7.59	1494	0.09
β-Elementene	9.86	1391	0.28	8.22*†	1543	0.60
Longifolene	9.96*	1398	0.10	7.78*	1508	[0.15]
α-Champinene	9.96*	1398	[0.10]	7.78*	1508	[0.15]
α-Cedrene	10.07	1406	0.04	7.78*	1508	[0.15]
β-Cedrene	10.18*	1414	0.39	8.17	1539	0.23
β-Caryophyllene	10.18*	1414	[0.39]	8.24†	1544	[0.60]
β-Copaene	10.32*	1425	0.39	8.22*†	1543	[0.60]
cis-Thujopsene	10.32*	1425	[0.39]	8.46	1562	0.24
Cadina-3,5-diene isomer I?	10.57	1443	0.05			
Cadina-3,5-diene?	10.61	1446	0.12	8.67	1578	0.13
α-Humulene	10.64	1448	0.16	9.05†	1608	0.38
(E)-β-Farnesene	10.77*†	1458	0.67	9.39*†	1636	[0.82]
cis-Muurolo-4(15),5-diene	10.77*†	1458	[0.67]	9.13*	1615	[0.16]
10-epi-β-Acoradiene	10.89	1467	0.01	9.36*†	1634	[0.82]
Selina-4,11-diene	10.94*	1471	0.25	9.22	1622	0.07
trans-Cadina-1(6),4-diene	10.94*	1471	[0.25]	9.08†	1610	[0.38]
γ-Muurolole	10.99	1475	0.31	9.39*†	1636	[0.82]

Germacrene D	11.02	1477	1.54	9.58†	1652	2.14
β-Selinene	11.08	1481	0.14	9.66	1658	0.19
<i>trans</i> -Muurolo-4(15),5-diene	11.15	1486	0.33	9.61*†	1654	[2.14]
epi-Cubebol	11.22*	1492	0.42	11.78	1839	0.13
α-Selinene	11.22*	1492	[0.42]	9.74	1664	0.15
β-Himachalene	11.22*	1492	[0.42]	9.61*†	1654	[2.14]
α-Muurolole	11.31*	1499	0.80	9.84	1673	0.68
Cuparene	11.31*	1499	[0.80]	10.84	1757	0.02
β-Bisabolene	11.47*	1511	1.02	9.97*	1683	[0.18]
γ-Cadinene	11.47*	1511	[1.02]	10.20*†	1702	[0.95]
Cubebol	11.47*	1511	[1.02]	12.34	1889	0.16
(3 <i>E</i> ,6 <i>E</i> )-α-Farnesene	11.47*	1511	[1.02]	10.32	1712	0.07
<i>trans</i> -Calamenene	11.58	1520	0.11	11.02	1772	0.08
Zonarene	11.62*	1523	2.73	10.20*†	1702	[0.95]
δ-Cadinene	11.62*	1523	[2.73]	10.24	1706	2.66
<i>trans</i> -Cadina-1,4-diene	11.71	1529	0.15	10.46	1725	0.13
α-Cadinene	11.77	1535	0.18	10.59	1735	0.18
α-Calacorene	11.80	1536	0.04	11.89	1848	0.04
α-Elemol	11.97*	1550	6.99	13.85	2029	6.71
Germacrene B	11.97*	1550	[6.99]	10.90	1762	0.51
( <i>E</i> )-Nerolidol	12.18	1566	0.25	13.58†	2004	[0.43]
Germacrene D-4-ol	12.24	1572	0.19	13.48	1995	0.17
Caryophyllene oxide	12.30	1576	0.03	12.54	1906	0.03
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.33	1579	0.02			
Gleenol	12.39	1583	0.08	13.33	1980	0.08
α-Cedrol	12.51	1592	0.28	14.00	2044	0.28
Unknown [m/z 177, 43 (97), 109 (65), 67 (57), 96 (51)... 220 (13)]	12.63	1602	0.27	13.55†	2001	0.43
Junenol	12.73	1610	0.10	13.37	1984	0.09
10-epi-γ-Eudesmol	12.75	1612	0.27	13.89	2034	0.20
Eremoligenol?	12.90	1624	0.75	14.70	2113	0.58
γ-Eudesmol	12.95	1629	2.67	14.65*	2108	2.85
Agarospinol?	13.02	1634	0.19	14.98	2140	0.28
τ-Cadinol	13.07*†	1638	0.86	14.65*	2108	[2.85]
τ-Muurolol	13.07*†	1638	[0.86]	14.83	2126	0.54
β-Eudesmol	13.16	1646	3.80	15.18	2162	3.82
Neointermedeol	13.21*†	1650	4.03	15.40	2183	0.12
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.21*†	1650	[4.03]	14.93*	2136	0.10
α-Eudesmol	13.21*†	1650	[4.03]	15.12	2155	3.44
α-Cadinol	13.23*†	1652	[4.03]	15.26*	2169	0.96
Unknown [m/z 161, 59 (67), 95 (45), 93 (40), 105	13.23*†	1652	[4.03]	14.42*	2085	0.09

(40), 149 (39), 81 (39), 43 (38), 204 (37)... 220 (5)] Unknown, not seen in MS	13.36	1663	1.58			
Juniper camphor	13.68	1689	0.02	15.81	2225	0.02
Cryptomerione	14.10	1724	0.14	15.64	2208	0.14
Unknown [m/z 161, 189 (59), 204 (54), 43 (50), 107 (28), 149 (24), 122 (24)...]	14.67	1774	0.02			
Cryptomeridiol	15.00	1802	0.03	19.58	2647	0.03
Oplopanonyl acetate	15.82	1878	0.02			
Rimuene	15.91	1886	0.04	14.38	2082	0.09
Isopimara-9(11),15-diene	16.01	1895	0.01	14.42*	2085	[0.09]
Biformene?	16.30	1922	0.17	15.26*	2169	[0.96]
Sandaracopimaradiene?	16.38	1930	0.05	14.93*	2136	[0.10]
Pimaradiene	16.58	1949	0.11	15.26*	2169	[0.96]
Sclarene?	16.63	1954	0.02	15.54	2198	0.02
Unknown [m/z 105, 91 (100), 81 (89), 79 (86), 109 (86), 257 (83)... 275 (12)...]	16.88*	1978	0.12	15.84	2229	0.09
Trachylobane?	16.88*	1978	[0.12]	16.09	2255	0.05
Kaur-16-ene	17.34	2022	7.53	16.42	2289	7.62
ar-Abietatriene	17.55	2043	0.04	17.48	2404	0.05
Nezukol	18.20	2108	0.20	19.29	2611	0.21
Sandaracopimarinal?	18.75	2164	0.04	19.98	2694	0.04
Phyllocladanol	18.87	2177	0.01			
Isopimaral	19.08	2199	0.03	20.57	2767	0.02
Sandaracopimarinal?	19.25	2216	0.01			
Ferruginol	20.09	2308	0.02			
Unknown, not seen in MS				15.60	2203	0.66
<b>Total identified</b>		<b>96.02%</b>			<b>96.37%</b>	
<b>Total reported</b>		<b>97.99%</b>			<b>97.63%</b>	

\*: 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