

Date : October 01, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20I24-PTH02


**Customer identification** : Juniper Berry - J20109203R

**Type** : Essential oil

**Source** : *Juniperus communis*

**Customer** : Plant Therapy

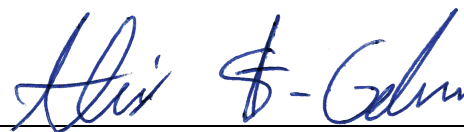
ANALYSIS

**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** : Fanny Charlier, B. Sc., chimiste à l'entraînement

**Analysis date** : September 29, 2020

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

**Physical aspect:** Clear liquid

**Refractive index:** 1.4769 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 8897:2010 - OIL OF JUNIPER BERRY

Compound	Min. %	Max. %	Observed %	Complies?
δ-Cadinene	1.0	3.5	1.2	Yes
Germacrene D	1.0	5.0	2.1	Yes
α-Humulene	1.0	4.0	1.2	Yes
β-Caryophyllene	1.5	5.0	4.6	Yes
Bornyl acetate		0.6	0.1	Yes
Terpinen-4-ol	1.0	6.0	3.0	Yes
Limonene	2.0	8.0	6.5	Yes
Myrcene	3.0	22.0	14.6	Yes
β-Pinene	1.0	12.0	3.3	Yes
Sabinene	4.0	20.0	8.7	Yes
α-Pinene	25.0	45.0	32.5	Yes
<b>Refractive index</b>	1.4700	1.4830	1.4769	Yes

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
3-Methylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
(2E)-Hexenal	0.01	Aliphatic aldehyde
Cyclofenchene	tr	Monoterpene
Santene	tr	Normonoterpene
Bornylene	tr	Monoterpene
Hashishene	0.02	Monoterpene
Tricyclene	0.07	Monoterpene
$\alpha$ -Thujene	1.14	Monoterpene
$\alpha$ -Pinene	32.47	Monoterpene
$\alpha$ -Fenchene	0.04	Monoterpene
Camphene	0.27	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Unknown	0.01	Monoterpene
meta-Cymene	0.02	Monoterpene
$\beta$ -Pinene	3.32	Monoterpene
Sabinene	8.68	Monoterpene
Unknown	0.01	Monoterpene
Octen-3-ol	0.22	Aliphatic alcohol
6-Methyl-5-hepten-2-one	0.03	Aliphatic ketone
Myrcene	14.56	Monoterpene
<i>trans</i> -Carane?	0.14	Monoterpene
2-Carene	0.14	Monoterpene
$\alpha$ -Phellandrene	0.56	Monoterpene
Menthatriene isomer I	0.02	Monoterpene
$\Delta^3$ -Carene	0.12	Monoterpene
$\alpha$ -Terpinene	0.49	Monoterpene
para-Cymene	2.05	Monoterpene
Limonene	6.49	Monoterpene
1,8-Cineole	0.29	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.02	Monoterpene
$\gamma$ -Terpinene	1.78	Monoterpene
<i>cis</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.05	Monoterpenic alcohol
Terpinolene	1.25	Monoterpene
para-Cymenene	0.04	Monoterpene
<i>trans</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.06	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	0.02	Monoterpenic alcohol
<i>cis</i> -para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol

$\alpha$ -Campholenal	0.05	Monoterpenic aldehyde
<i>trans</i> -Pinocarveol	0.04	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.03	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.07	Monoterpenic alcohol
Citronellal	0.02	Monoterpenic aldehyde
Borneol	0.03	Monoterpenic alcohol
Isopinocampone	0.01	Monoterpenic ketone
Terpinen-4-ol	2.98	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
$\alpha$ -Terpineol	0.17	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
<i>trans</i> -Isopiperitenol	0.04	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Unknown	0.02	Unknown
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
Citronellol	0.04	Monoterpenic alcohol
Thymol methyl ether	0.02	Monoterpenic ether
Carvacrol methyl ether	0.01	Monoterpenic ether
Piperitone	0.02	Monoterpenic ketone
Geraniol	0.02	Monoterpenic alcohol
Methyl citronellate	0.02	Monoterpenic ester
Geranial	0.02	Monoterpenic aldehyde
Decanol	0.01	Aliphatic alcohol
Bornyl acetate	0.14	Monoterpenic ester
2-Undecanone	0.02	Aliphatic ketone
Unknown	0.02	Monoterpenic ester
Thymol	0.03	Monoterpenic alcohol
Carvacrol	0.02	Monoterpenic alcohol
$\delta$ -Terpinyl acetate	0.01	Monoterpenic ester
Myrtenyl acetate	0.03	Monoterpenic ester
Bicycloelemene	0.05	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.23	Monoterpenic ester
$\alpha$ -Cubebene	0.26	Sesquiterpene
Citronellyl acetate	0.04	Monoterpenic ester
$\alpha$ -Ylangene	0.03	Sesquiterpene
$\alpha$ -Copaene	0.42	Sesquiterpene
<i>cis</i> - $\beta$ -Elemene	0.04	Sesquiterpene
$\beta$ -Cubebene	0.57	Sesquiterpene
$\beta$ -Elemene	0.68	Sesquiterpene
$\alpha$ -Funebrene	0.02	Sesquiterpene
Longifolene	0.14	Sesquiterpene
$\alpha$ -Gurjunene	0.04	Sesquiterpene
$\beta$ -Caryophyllene	4.59	Sesquiterpene
$\beta$ -Copaene	0.08	Sesquiterpene
$\gamma$ -Elemene	0.27	Sesquiterpene
Aromadendrene	0.05	Sesquiterpene
$\alpha$ -Himachalene	0.01	Sesquiterpene
<i>cis</i> - $\beta$ -Bergamotene?	0.01	Sesquiterpene
<i>trans</i> -Muurolo-3,5-diene	0.06	Sesquiterpene
$\alpha$ -Humulene	1.18	Sesquiterpene
allo-Aromadendrene	0.17	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.23	Sesquiterpene

<i>trans</i> -Cadina-1(6),4-diene	0.11	Sesquiterpene
$\gamma$ -Muurolene	0.15	Sesquiterpene
Germacrene D	2.07	Sesquiterpene
$\beta$ -Selinene	0.17	Sesquiterpene
$\gamma$ -Amorphene	0.10	Sesquiterpene
Bicyclogermacrene	0.48	Sesquiterpene
$\alpha$ -Selinene	0.20	Sesquiterpene
Cuparene	0.44	Sesquiterpene
$\alpha$ -Alaskene	0.06	Sesquiterpene
$\gamma$ -Cadinene	0.33	Sesquiterpene
Cubebol	0.24	Sesquiterpenic alcohol
<i>trans</i> -Calamenene	0.14	Sesquiterpene
$\delta$ -Cadinene	1.18	Sesquiterpene
Selina-4(15),7(11)-diene	0.16	Sesquiterpene
$\alpha$ -Cadinene	0.08	Sesquiterpene
Selina-3,7(11)-diene	0.10	Sesquiterpene
$\alpha$ -Elemol	0.04	Sesquiterpenic alcohol
Germacrene B	1.27	Sesquiterpene
Caryophyllenyl alcohol	0.01	Sesquiterpenic alcohol
Germacrene D-4-ol	0.02	Sesquiterpenic alcohol
Spathulenol	0.12	Sesquiterpenic alcohol
Caryophyllene oxide	0.15	Sesquiterpenic ether
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
allo-Cedrol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Humulene epoxide II	0.01	Sesquiterpenic ether
epi-Cedrol	0.04	Sesquiterpenic alcohol
$\beta$ -Acorenol	0.03	Sesquiterpenic alcohol
Unknown	0.01	Unknown
$\tau$ -Cadinol	0.04	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.08	Sesquiterpenic alcohol
$\alpha$ -Muurolol	0.01	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.03	Sesquiterpenic alcohol
Cedrenol analog	0.07	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	0.01	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Shyobunol	0.01	Sesquiterpenic alcohol
Mayurone?	0.01	Norsesquiterpenic ketone
Germacra-4(15),5,10(14)-trien-1 $\beta$ -ol?	0.03	Sesquiterpenic alcohol
Thujopsenal analog	0.01	Sesquiterpenic aldehyde
(2 <i>E</i> ,6 <i>E</i> )-Farnesyl acetate	0.01	Sesquiterpenic ester
meta-Camphorene	0.32	Diterpene
para-Camphorene	0.50	Diterpene
13-epi-Manoyl oxide	0.02	Diterpenic ether
Unknown	0.01	Unknown
Sandaracopimarinal?	0.14	Diterpenic aldehyde
<b>Consolidated total</b>	<b>96.67%</b>	

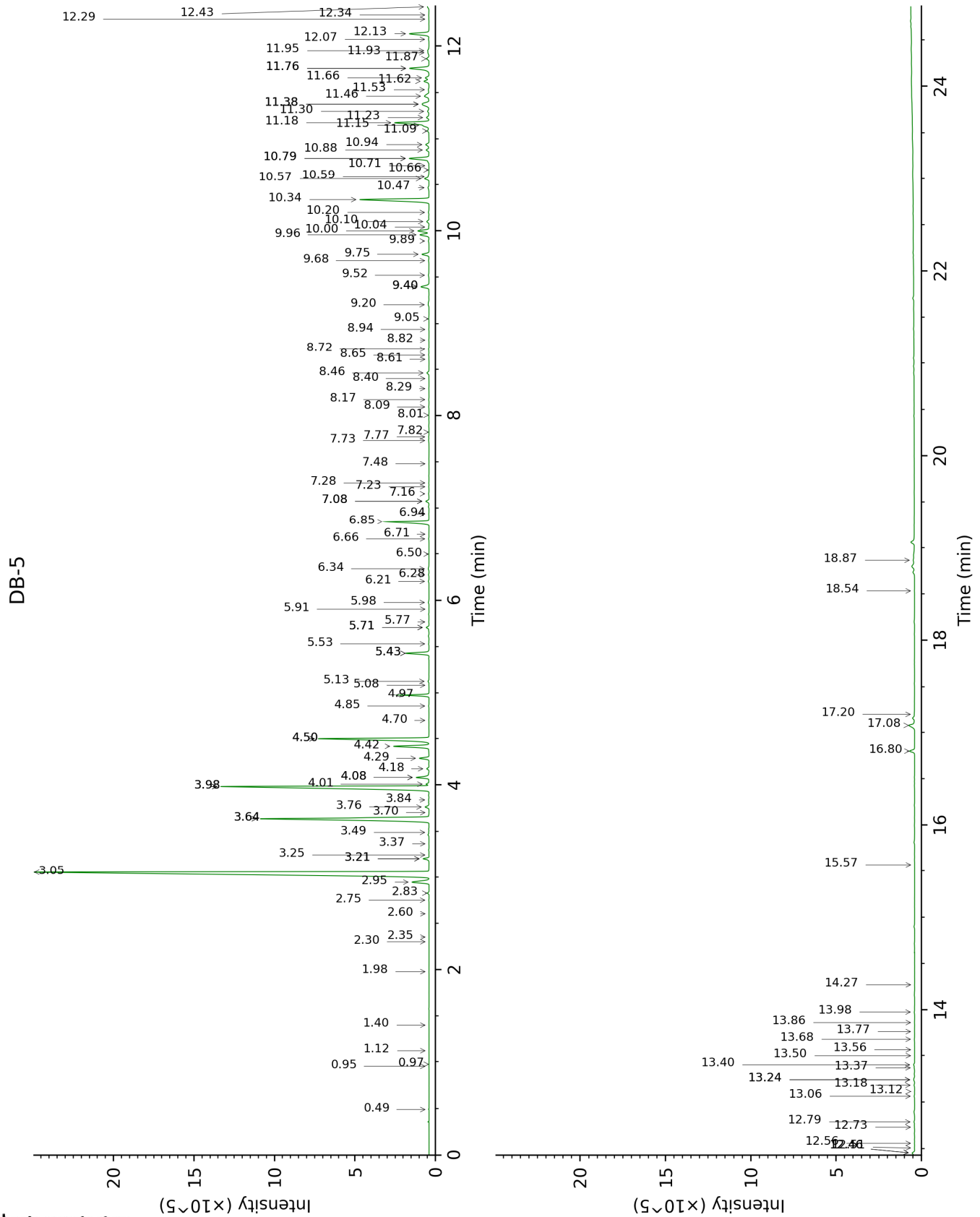
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

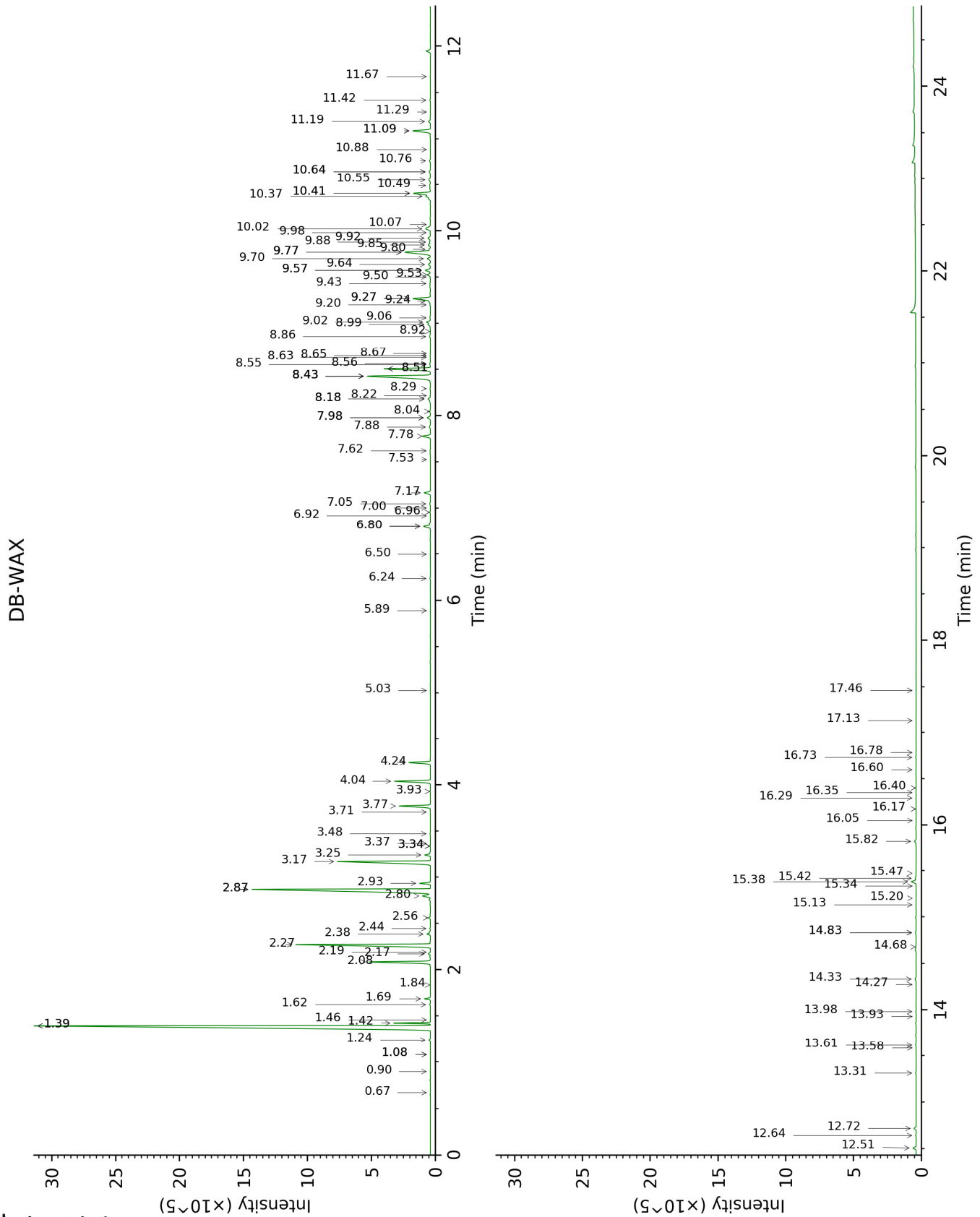
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
3-Methylfuran	0.49	606	tr	0.67	854	tr
Isoamyl alcohol	0.95	735	tr	3.34*	1171	0.02
2-Methylbutanol	0.98	738	tr	3.34*	1171	[0.02]
Toluene	1.12	760	tr	1.46	1004	0.01
Hexanal	1.40	802	tr	1.84	1042	tr
(2E)-Hexenal	1.98	852	0.01	3.37	1173	0.01
Cyclofenchene	2.30	879	tr	0.90	916	0.01
Santene	2.35	883	tr	1.08*	946	tr
Bornylene	2.60	904	tr	1.08*	946	[tr]
Hashishene	2.75	914	0.02	1.39*†	998	33.89
Tricyclene	2.83	919	0.07	1.24	972	0.08
α-Thujene	2.95	927	1.14	1.42†	1001	[33.89]
α-Pinene	3.05	934	32.47	1.39*†	998	[33.89]
α-Fenchene	3.20*	944	0.29	1.62	1020	0.04
Camphene	3.20*	944	[0.29]	1.69	1027	0.27
Thuja-2,4(10)-diene	3.25	947	0.01	2.19	1076	0.01
Unknown [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]	3.37	955	0.01			
meta-Cymene	3.49	963	0.02	2.87*	1134	14.83
β-Pinene	3.64*	973	11.95	2.08	1066	3.32
Sabinene	3.64*	973	[11.95]	2.27	1085	8.68
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.70	978	0.01	2.44	1101	0.03
Octen-3-ol	3.76	982	0.22	6.80*	1421	0.48
6-Methyl-5-hepten-2-one	3.84	987	0.03	5.03	1295	0.01
Myrcene	3.98*	996	14.70	2.87*	1134	[14.83]
trans-Carane?	3.98*	996	[14.70]	2.17	1075	0.14
2-Carene	4.01	998	0.14	2.38	1096	0.17
α-Phellandrene	4.08*	1003	0.71	2.80	1128	0.56
Menthatriene isomer I	4.08*	1003	[0.71]	3.48	1181	0.02
Δ3-Carene	4.18	1009	0.12	2.56	1110	0.11
α-Terpinene	4.29	1016	0.49	2.93	1139	0.48
para-Cymene	4.42	1024	2.05	4.04	1223	2.07
Limonene	4.50*	1029	6.75	3.18	1158	6.49
1,8-Cineole	4.50*	1029	[6.75]	3.25	1163	0.29
(Z)-β-Ocimene	4.70	1041	0.01	3.71	1199	0.01
(E)-β-Ocimene	4.85	1051	0.02	3.93	1215	0.02
γ-Terpinene	4.98	1059	1.78	3.77	1204	1.81
cis-Sabinene hydrate	5.08	1066	0.01	6.92	1430	0.01
cis-Linalool oxide (fur.)	5.13	1068	0.05	6.50	1399	0.02
Terpinolene	5.43*	1087	1.27	4.24	1238	1.25

para-Cymenene	5.43*	1087	[1.27]	6.24	1380	0.04
<i>trans</i> -Sabinene hydrate	5.53	1094	0.02	7.98*	1510	0.22
Linalool	5.71*	1105	0.15	8.04	1515	0.06
Nonanal	5.71*	1105	[0.15]	5.89	1354	0.01
endo-Fenchol	5.77	1109	0.02	8.42*	1544	5.39
<i>cis</i> -para-Menth-2-en-1-ol	5.90	1117	0.01	8.18*	1525	0.24
$\alpha$ -Campholenal	5.98	1122	0.05	6.96	1433	0.04
<i>trans</i> -Pinocarveol	6.20	1136	0.04	9.20	1605	0.04
<i>trans</i> -Verbenol	6.28	1141	0.03	9.50	1630	0.02
meta-Mentha-4,6-dien-8-ol	6.34	1145	0.07	9.27*	1611	1.25
Citronellal	6.50	1155	0.02	7.00	1436	0.01
Borneol	6.66	1166	0.03	9.77*	1651	2.27
Isopinocampone	6.71	1169	0.01	7.53	1475	0.01
Terpinen-4-ol	6.85	1178	2.98	8.50*	1551	3.05
para-Cymen-8-ol	6.94	1183	0.02	11.42	1789	0.04
$\alpha$ -Terpineol	7.08*	1192	0.19	9.77*	1651	[2.27]
Myrtenal	7.08*	1192	[0.19]	8.63	1560	0.02
<i>trans</i> -Isopiperitenol	7.16	1197	0.04	10.41*	1703	1.21
Verbenone	7.23	1202	0.01	9.53	1632	0.23
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.28	1205	0.02	10.88	1744	0.01
<i>trans</i> -Carveol	7.48	1218	0.01	11.29	1778	0.01
Citronellol	7.73	1235	0.04	10.64*	1724	0.12
Thymol methyl ether	7.77	1238	0.02	8.50*	1551	[3.05]
Carvacrol methyl ether	7.82	1241	0.01	8.65	1562	0.01
Piperitone	8.00	1253	0.02	9.85†	1658	[0.23]
Geraniol	8.09	1259	0.02	11.67	1811	0.02
Methyl citronellate	8.17	1264	0.02	8.22	1528	0.02
Geranial	8.29	1272	0.02	10.07	1676	0.02
Decanol	8.40	1280	0.01	10.64*	1724	[0.12]
Bornyl acetate	8.46	1284	0.14	8.18*	1525	[0.24]
2-Undecanone	8.61	1293	0.02	8.56	1555	0.03
Unknown [m/z 121, 93 (97), 43 (81), 136 (48), 107 (47), 108 (44)...]	8.66	1296	0.02	8.67	1563	0.01
Thymol	8.72	1300	0.03	15.13	2134	0.02
Carvacrol	8.82	1307	0.02	15.34	2154	0.01
$\delta$ -Terpinyl acetate	8.94	1315	0.01	9.06	1594	0.02
Myrtenyl acetate	9.05	1323	0.03	9.64	1640	0.15
Bicycloelemene	9.20	1334	0.05	7.05	1440	0.06
$\alpha$ -Terpinyl acetate	9.40*	1348	0.55	9.70	1646	0.23
$\alpha$ -Cubebene	9.40*	1348	[0.55]	6.80*	1421	[0.48]
Citronellyl acetate	9.52	1356	0.04	9.43	1624	0.05
$\alpha$ -Ylangene	9.68	1368	0.03			
$\alpha$ -Copaene	9.75	1372	0.42	7.17	1449	0.43

<i>cis</i> -β-Elemene	9.89	1382	0.04	8.29	1534	0.03
β-Cubebene	9.96	1387	0.57	7.78	1494	0.56
β-Elemene	10.00	1390	0.68	8.42*	1544	[5.39]
α-Funebrene	10.04	1393	0.02	7.88	1502	0.10
Longifolene	10.10	1397	0.14	7.98*	1510	[0.22]
α-Gurjunene	10.20	1404	0.04	7.62	1482	0.03
β-Caryophyllene	10.34	1415	4.59	8.42*	1544	[5.39]
β-Copaene	10.47	1424	0.08	8.42*	1544	[5.39]
γ-Elemene	10.57	1432	0.27	9.02	1590	0.27
Aromadendrene	10.59	1433	0.05	8.55	1554	0.04
α-Himachalene	10.66	1439	0.01	8.92	1582	0.01
<i>cis</i> -β-Bergamotene?	10.71	1442	0.01			
<i>trans</i> -Muurolo-3,5-diene	10.79*	1448	1.27	8.86	1578	0.06
α-Humulene	10.79*	1448	[1.27]	9.27*	1611	[1.25]
allo-Aromadendrene	10.88	1455	0.17	8.99	1588	0.18
( <i>E</i> )-β-Farnesene	10.94	1460	0.23	9.58*	1635	0.38
<i>trans</i> -Cadina-1(6),4-diene	11.09	1470	0.11	9.24	1608	0.09
γ-Muurolole	11.15†	1475	2.57	9.58*	1635	[0.38]
Germacrene D	11.18†	1477	[2.57]	9.77*	1651	[2.27]
β-Selinene	11.23	1481	0.17	9.88†	1660	0.23
γ-Amorphene	11.30	1486	0.10	9.80	1654	0.08
Bicyclogermacrene	11.38*	1492	0.73	10.02	1672	0.48
α-Selinene	11.38*	1492	[0.73]	9.92	1664	0.20
Cuparene	11.46	1498	0.44	11.09*	1761	1.26
α-Alaskene	11.53	1504	0.06	9.98	1668	0.03
γ-Cadinene	11.62	1511	0.33	10.37	1700	0.43
Cubebol	11.66	1514	0.24	12.51	1885	0.22
<i>trans</i> -Calamenene	11.76*	1522	1.37	11.19	1770	0.14
δ-Cadinene	11.76*	1522	[1.37]	10.41*	1703	[1.21]
Selina-4(15),7(11)-diene	11.86	1530	0.16	10.55	1716	0.15
α-Cadinene	11.93	1535	0.08	10.76	1734	0.07
Selina-3,7(11)-diene	11.95	1537	0.10	10.49	1710	0.08
α-Elemol	12.07	1546	0.04	13.98	2022	0.02
Germacrene B	12.14	1551	1.27	11.09*	1761	[1.26]
Caryophyllenyl alcohol	12.29	1564	0.01	13.58	1984	0.01
Germacrene D-4-ol	12.34	1567	0.02	13.61	1986	0.05
Spathulenol	12.43	1574	0.12	14.33	2055	0.09
Caryophyllene oxide	12.46*	1576	0.15	12.72	1904	0.15
Caryophyllene oxide isomer	12.46*	1576	[0.15]	12.64	1897	0.03
allo-Cedrol	12.51	1581	0.02	14.27	2050	0.01
Unknown [m/z 159, 83 (88), 55 (53), 93 (50), 121 (48)... 220 (9)]	12.56	1585	0.01			
Humulene epoxide II	12.73	1598	0.01	13.31	1959	0.05
epi-Cedrol	12.79	1603	0.04	14.68	2088	0.04
β-Acorenol	13.06	1626	0.03	14.83*	2104	0.06

Unknown [m/z 43, 93 (89), 91 (88), 79 (87), 123 (76), 81 (75)...]	13.12	1630	0.01	13.93	2016	0.01
$\tau$ -Cadinol	13.18	1635	0.04	14.83*	2104	[0.06]
$\beta$ -Eudesmol	13.24*	1640	0.08	15.42	2162	0.08
$\alpha$ -Muurolol	13.24*	1640	[0.08]	15.20	2141	0.01
$\alpha$ -Cadinol	13.37	1651	0.03	15.47	2167	0.02
Cedrenol analog	13.40	1653	0.07	16.35	2258	0.02
Unknown [m/z 205, 93 (93), 43 (58), 79 (510), 91 (48), 119 (45)... 220 (3)]	13.50	1662	0.01	16.17	2239	0.01
(3Z)-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	13.56	1667	0.01	16.78	2303	0.02
Unknown [m/z 109, 91 (67), 79 (57), 81 (49), 107 (48)... 220 (7)]	13.68	1677	0.03	16.73	2297	0.03
Shyobunol	13.77	1684	0.01	16.29	2251	0.02
Mayurone?	13.86	1692	0.01	17.13	2340	0.01
Germacra-4(15),5,10(14)-trien-1 $\beta$ -ol?	13.98	1701	0.03	16.60	2283	0.02
Thujopsenal analog	14.27	1727	0.01	17.46	2375	0.01
(2E,6E)-Farnesyl acetate	15.57	1842	0.01	16.05	2226	0.01
meta-Camphorene	16.80	1956	0.32	15.38	2158	0.34
para-Camphorene	17.08	1983	0.50	15.82	2203	0.13
13-epi-Manoyl oxide	17.20	1994	0.02	16.40	2263	0.01
Unknown [m/z 93, 81 (88), 79 (69), 107 (65), 95 (61)...]	18.54	2129	0.01			
Sandaracopimarinal?	18.87	2164	0.14			
<b>Total identified</b>		<b>97.17%</b>			<b>96.79%</b>	
<b>Total reported</b>		<b>97.29%</b>			<b>96.89%</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