

Date : November 19, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20B17-PTH08

Customer identification : Juniper Berry - J2010796R

Type : Essential oil

Source : *Juniperus communis*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-007 - 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 : February 19, 2020

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

This report is an update of the version first issued on February 19, 2020 to indicatively present comparison to a standard.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4758 ± 0.0003 (20 °C)

ISO 8897:2010 - OIL OF JUNIPER BERRY

Compound	Min. %	Max. %	Observed %	Complies?
δ-Cadinene	1.0	3.5	0.4	No
Germacrene D	1.0	5.0	3.0	Yes
α-Humulene	1.0	4.0	2.4	Yes
β-Caryophyllene	1.5	5.0	4.8	Yes
Bornyl acetate		0.6	0.2	Yes
Terpinen-4-ol	1.0	6.0	3.3	Yes
Limonene	2.0	8.0	4.5	Yes
Myrcene	3.0	22.0	10.3	Yes
β-Pinene	1.0	12.0	8.2	Yes
Sabinene	4.0	20.0	11.4	Yes
α-Pinene	25.0	45.0	38.3	Yes
Refractive index	1.4700	1.4830	1.4758	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	%	Classe
Toluene	0.01	Simple phenolic
Santene	tr	Normonoterpene
Hashishene	tr	Monoterpene
Tricyclene	0.10	Monoterpene
α -Thujene	0.89	Monoterpene
α -Pinene	38.28	Monoterpene
α -Fenchene	0.04	Monoterpene
Camphene	0.42	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
Unknown	0.04	Monoterpene
Unknown	0.01	Monoterpene
meta-Cymene	0.02	Monoterpene
Sabinene	11.42	Monoterpene
β -Pinene	8.17	Monoterpene
Unknown	0.19	Monoterpene
Octen-3-ol	0.03	Aliphatic alcohol
cis-Carane	0.02	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	10.33	Monoterpene
2-Carene	0.14	Monoterpene
α -Phellandrene	0.47	Monoterpene
Menthatriene isomer I	tr	Monoterpene
Δ^3 -Carene	0.13	Monoterpene
α -Terpinene	0.33	Monoterpene
ortho-Cymene	0.02	Monoterpene
para-Cymene	1.84	Monoterpene
Limonene	4.47	Monoterpene
β -Phellandrene	0.16	Monoterpene
1,8-Cineole	0.01	Monoterpenic ether
(Z)- β -Ocimene	tr	Monoterpene
(E)- β -Ocimene	0.02	Monoterpene
γ -Terpinene	1.84	Monoterpene
cis-Sabinene hydrate	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
cis-Linalool oxide (fur.)	tr	Monoterpenic alcohol
meta-Cymenene	0.01	Monoterpene
Terpinolene	0.56	Monoterpene
para-Cymenene	tr	Monoterpene
α -Pinene oxide	0.03	Monoterpenic ether
6,7-Epoxymyrcene	0.01	Monoterpenic ether
trans-Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.08	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
α -Campholenal	0.01	Monoterpenic aldehyde
trans-Pinocarveol	0.08	Monoterpenic alcohol

<i>cis</i> -Verbenol	0.03	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.05	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.01	Monoterpenic alcohol
Citronellal	0.01	Monoterpenic aldehyde
Pinocarvone	0.01	Monoterpenic ketone
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	3.30	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α -Terpineol	0.06	Monoterpenic alcohol
Myrtenal	0.03	Monoterpenic aldehyde
Myrtenol	0.05	Monoterpenic alcohol
Methylchavicol	tr	Phenylpropanoid
<i>trans</i> -Isopiperitenol	tr	Monoterpenic alcohol
Verbenone	0.02	Monoterpenic ketone
Decanal	0.01	Aliphatic aldehyde
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
<i>cis</i> -Carveol	tr	Monoterpenic alcohol
Citronellol	0.01	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Neral	tr	Monoterpenic aldehyde
Piperitone	0.03	Monoterpenic ketone
<i>trans</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Geranial	0.01	Monoterpenic aldehyde
Bornyl acetate	0.20	Monoterpenic ester
2-Undecanone	0.01	Aliphatic ketone
Thymol	0.01	Monoterpenic alcohol
δ -Terpinyl acetate	tr	Monoterpenic ester
α -Cubebene	0.14	Sesquiterpene
α -Terpinyl acetate	0.06	Monoterpenic ester
Citronellyl acetate	0.02	Monoterpenic ester
α -Ylangene	0.01	Sesquiterpene
α -Copaene	0.15	Sesquiterpene
<i>cis</i> - β -Elemene	0.01	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β -Cubebene	0.02	Sesquiterpene
β -Elemene	0.38	Sesquiterpene
α -Gurjunene	0.01	Sesquiterpene
β -Caryophyllene	4.77	Sesquiterpene
β -Ylangene	tr	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
<i>cis</i> -Thujopsene	0.01	Sesquiterpene
γ -Elemene	0.12	Sesquiterpene
<i>trans</i> -Muurolo-3,5-diene	0.05	Sesquiterpene
α -Humulene	2.41	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.12	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.04	Sesquiterpene
Germacrene D	2.96	Sesquiterpene
γ -Muurolole	0.05	Sesquiterpene
β -Selinene	0.09	Sesquiterpene
γ -Amorphene	0.02	Sesquiterpene
α -Selinene	0.11	Sesquiterpene

Bicyclogermacrene	0.07	Sesquiterpene
Germacrene A	0.09	Sesquiterpene
Cuparene	tr	Sesquiterpene
α -Muurolene	0.12	Sesquiterpene
1,2-Dihydrocuparene	0.02	Sesquiterpene
γ -Cadinene	0.16	Sesquiterpene
<i>trans</i> -Calamenene	0.03	Sesquiterpene
δ -Cadinene	0.40	Sesquiterpene
Selina-4(15),7(11)-diene	0.06	Sesquiterpene
α -Cadinene	0.04	Sesquiterpene
α -Calacorene	0.01	Sesquiterpene
Selina-3,7(11)-diene	0.02	Sesquiterpene
α -Elemol	0.04	Sesquiterpenic alcohol
Salviadienol?	0.01	Sesquiterpenic alcohol
Germacrene B	0.51	Sesquiterpene
Caryophyllenyl alcohol	0.01	Sesquiterpenic alcohol
Spathulenol	0.06	Sesquiterpenic alcohol
Caryophyllene oxide	0.17	Sesquiterpenic ether
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
Unknown	0.02	Oxygenated sesquiterpene
Humulene epoxide I	0.01	Sesquiterpenic ether
α -Cedrol	tr	Sesquiterpenic alcohol
Humulene epoxide II	0.09	Sesquiterpenic ether
epi-Cedrol	0.02	Sesquiterpenic alcohol
Junenol	0.02	Sesquiterpenic alcohol
1,10-diepi-Cubenol	0.01	Sesquiterpenic alcohol
β -Acorenol	0.03	Sesquiterpenic alcohol
Unknown	0.12	Unknown
τ -Cadinol	0.02	Sesquiterpenic alcohol
τ -Muurolol	0.04	Sesquiterpenic alcohol
α -Muurolol	0.02	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
α -Cadinol	0.06	Sesquiterpenic alcohol
Cedrenol analog	0.01	Sesquiterpenic alcohol
(3 <i>Z</i>)-Caryophylla-3,8(13)-dien-5 β -ol	0.02	Sesquiterpenic alcohol
Shyobunol	0.01	Sesquiterpenic alcohol
Juniper camphor	0.01	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1 β -ol?	0.01	Sesquiterpenic alcohol
Mayurone?	0.01	Norsesquiterpenic ketone
Thujopsenal	0.02	Sesquiterpenic aldehyde
β -Turmerone	0.01	Sesquiterpenic ketone
Cedryl acetate	0.04	Sesquiterpenic ester
Biformene?	tr	Diterpene
meta-Camphorene	0.31	Diterpene
Trachylobane?	0.02	Diterpene
para-Camphorene	0.12	Diterpene
ar-Abietatriene	tr	Diterpene
Sandaracopimarinal?	0.04	Diterpenic aldehyde
Consolidated total	98.87%	

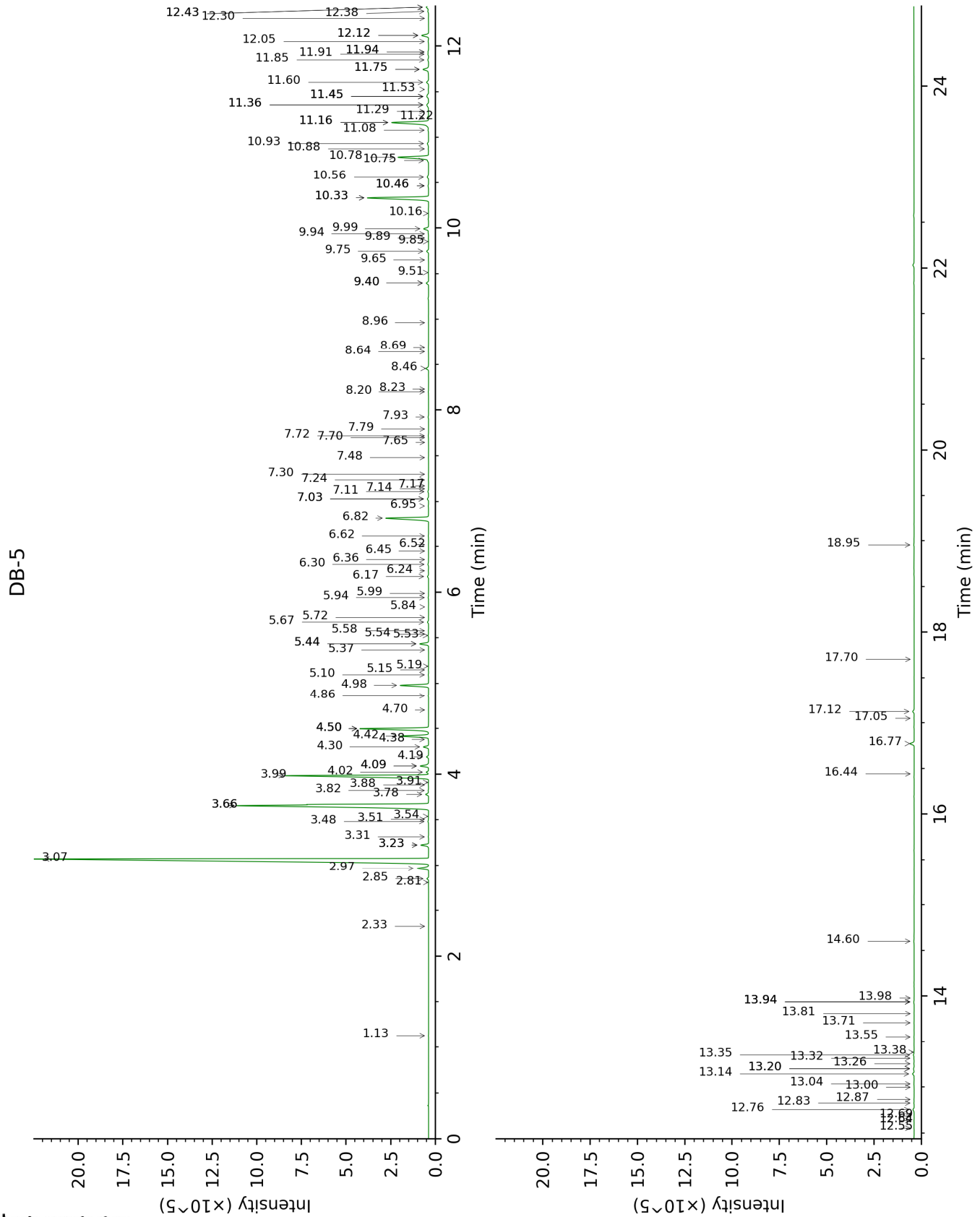
tr: The compound has been detected below 0.005% of total signal.

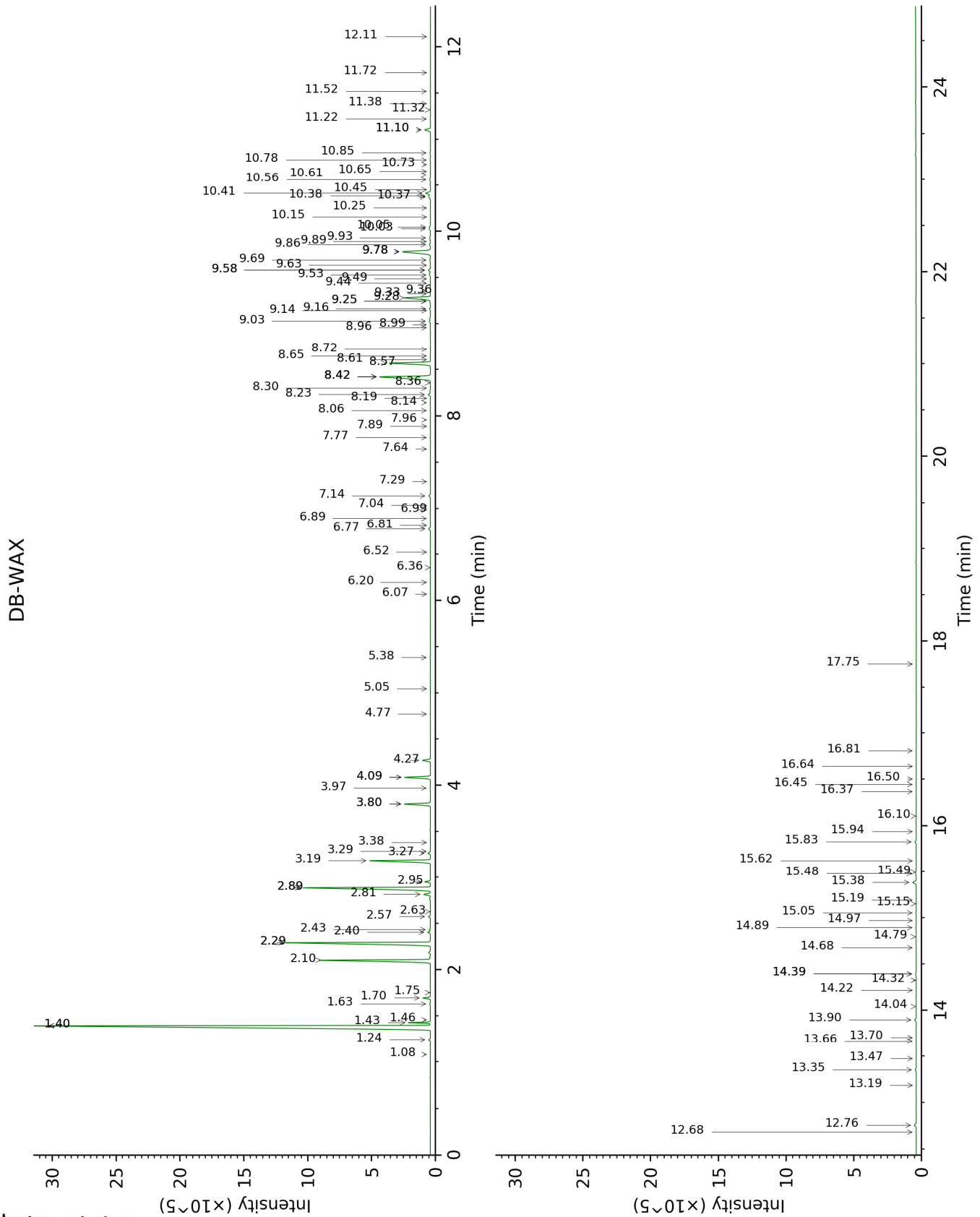
Note: no correction factor was applied

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	%
Toluene	1.13	761	0.01	1.46	1003	0.01
Santene	2.33	878	tr	1.08	944	tr
Hashishene	2.81	915	tr	1.40*	996	38.29
Tricyclene	2.85	918	0.10	1.24	971	0.10
α -Thujene	2.97	926	0.89	1.43	1000	0.93
α -Pinene	3.07	933	38.28	1.40*	996	[38.29]
α -Fenchene	3.22*	943	0.47	1.63	1020	0.04
Camphene	3.22*	943	[0.47]	1.70	1026	0.42
Thuja-2,4(10)-diene	3.32	949	0.02	2.29*	1085	11.45
Unknown [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]	3.48	960	0.04			
Unknown [m/z 91, 119 (60), 77 (36), 92 (31), 93 (31)... 134 (23)]	3.51	961	0.01	2.63	1114	0.01
meta-Cymene	3.54	963	0.02	2.89*	1134	10.40
Sabinene	3.66*	971	19.59	2.29*	1085	[11.45]
β -Pinene	3.66*	971	[19.59]	2.10	1066	8.17
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.78	979	0.19	2.43	1098	0.07
Octen-3-ol	3.82	982	0.03	6.81	1422	0.01
cis-Carane	3.88	986	0.02	1.75	1032	tr
6-Methyl-5-hepten-2-one	3.91	988	0.01	5.05	1294	tr
Myrcene	3.99	993	10.33	2.89*	1134	[10.40]
2-Carene	4.02	996	0.14	2.40	1096	0.16
α -Phellandrene	4.09*	1000	0.55	2.81	1128	0.47
Menthatriene isomer I	4.09*	1000	[0.55]	3.38	1172	tr
Δ 3-Carene	4.19	1007	0.13	2.57	1110	0.13
α -Terpinene	4.30	1013	0.33	2.95	1139	0.33
ortho-Cymene	4.38	1019	0.02	4.09*	1225	1.85
para-Cymene	4.42	1021	1.84	4.09*	1225	[1.85]
Limonene	4.50*	1026	4.60	3.18	1157	4.47
β -Phellandrene	4.50*	1026	[4.60]	3.27	1163	0.16
1,8-Cineole	4.50*	1026	[4.60]	3.29	1165	0.01
(Z)- β -Ocimene	4.70	1039	tr	3.80*	1204	1.86
(E)- β -Ocimene	4.86	1049	0.02	3.97	1216	0.03
γ -Terpinene	4.98	1056	1.84	3.80*	1204	[1.86]
cis-Sabinene hydrate	5.10	1064	0.02	6.89	1428	0.02
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152	5.15	1067	0.01	4.77	1274	0.02

(18)]						
<i>cis</i> -Linalool oxide (fur.)	5.19	1070	tr	6.52	1400	0.01
meta-Cymenene	5.37	1081	0.01	6.20	1376	0.01
Terpinolene	5.44*	1085	0.59	4.27	1238	0.56
para-Cymenene	5.44*	1085	[0.59]	6.36	1388	tr
α -Pinene oxide	5.53	1091	0.03	5.38	1318	0.03
6,7-Epoxyborneol	5.54	1092	0.01	6.07	1367	tr
<i>trans</i> -Sabinene hydrate	5.58	1094	0.02	7.96	1507	0.03
Linalool	5.67	1100	0.08	8.06	1515	0.02
Nonanal	5.72	1104	0.01			
endo-Fenchol	5.84	1111	0.01	8.42*	1543	5.16
<i>cis</i> -para-Menth-2-en-1-ol	5.94	1118	0.02	8.14	1521	0.01
α -Campholenal	5.99	1121	0.01	7.04	1438	0.01
<i>trans</i> -Pinocarveol	6.17	1133	0.08	9.16	1600	0.07
<i>cis</i> -Verbenol	6.24	1137	0.03	9.25*	1607	0.04
<i>trans</i> -Verbenol	6.30	1142	0.05	9.53	1630	0.03
meta-Mentha-4,6-dien-8-ol	6.36	1145	0.01	9.33	1614	0.01
Citronellal	6.45	1151	0.01	6.99	1434	0.01
Pinocarvone	6.52	1156	0.01	7.89	1502	0.01
Borneol	6.62	1162	0.02	9.78*	1650	3.03
Terpinen-4-ol	6.82	1175	3.30	8.57	1554	3.29
para-Cymen-8-ol	6.95	1184	0.02	11.52	1795	0.02
α -Terpineol	7.03*	1189	0.09	9.78*	1650	[3.03]
Myrtenal	7.03*	1189	[0.09]	8.65	1560	0.03
Myrtenol	7.11	1194	0.05	10.85	1739	0.05
Methylchavicol	7.14	1196	tr	9.36	1616	tr
<i>trans</i> -Isopiperitenol	7.17	1198	tr	10.45	1705	0.01
Verbenone	7.24	1203	0.02	9.63	1638	0.02
Decanal	7.30	1207	0.01	7.29	1457	tr
<i>trans</i> -Carveol	7.48	1219	0.01	11.38	1784	0.01
<i>cis</i> -Carveol	7.65	1231	tr	11.72	1812	0.01
Citronellol	7.70	1234	0.01	10.73	1728	0.01
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.72	1236	0.02	11.32	1778	0.02
Neral	7.79	1241	tr	9.49	1626	tr
Piperitone	7.93	1250	0.03	9.89	1659	0.03
<i>trans</i> -Ascaridole glycol	8.20	1269	0.02	14.22	2041	0.01
Geranial	8.23	1271	0.01	10.16	1680	tr
Bornyl acetate	8.46	1287	0.20	8.23	1528	0.17
2-Undecanone	8.64	1300	0.01	8.61	1557	0.01
Thymol	8.69	1304	0.01	15.15	2132	0.01
δ -Terpinyl acetate	8.96	1317	tr	9.14	1599	0.01
α -Cubebene	9.40*	1348	0.17	6.77	1419	0.14
α -Terpinyl acetate	9.40*	1348	[0.17]	9.69	1643	0.06
Citronellyl acetate	9.51	1356	0.02	9.44	1623	0.02

α -Ylangene	9.65	1366	0.01			
α -Copaene	9.75	1372	0.15	7.14	1446	0.14
<i>cis</i> - β -Elemene	9.85	1380	0.01	8.30	1533	0.01
Geranyl acetate	9.89	1383	0.02	10.61	1718	0.02
β -Cubebene	9.94	1386	0.02	7.77	1492	0.02
β -Elemene	9.99	1390	0.38	8.42*	1543	[5.16]
α -Gurjunene	10.16	1402	0.01	7.64	1483	0.02
β -Caryophyllene	10.33*	1414	4.90	8.42*	1543	[5.16]
β -Ylangene	10.33*	1414	[4.90]	8.19	1525	tr
β -Copaene	10.46*	1424	0.05	8.36	1538	0.02
<i>cis</i> -Thujopsene	10.46*	1424	[0.05]	8.72	1566	0.01
γ -Elemene	10.56	1431	0.12	9.03	1590	0.10
<i>trans</i> -Muurolo-3,5-diene	10.75	1445	0.05	8.96	1584	0.02
α -Humulene	10.78	1448	2.41	9.28	1610	2.34
allo-Aromadendrene	10.88	1455	0.02	8.99	1587	0.02
(<i>E</i>)- β -Farnesene	10.93	1459	0.12	9.58*	1634	0.17
<i>trans</i> -Cadina-1(6),4-diene	11.08	1470	0.04	9.25*	1607	[0.04]
Germacrene D	11.16*	1476	3.13	9.78*	1650	[3.03]
γ -Muurolene	11.16*	1476	[3.13]	9.58*	1634	[0.17]
β -Selinene	11.22	1480	0.09	9.93	1662	0.08
γ -Amorphene	11.29	1485	0.02	9.86	1656	0.09
α -Selinene	11.36*	1491	0.20	10.03	1670	0.11
Bicyclogermacrene	11.36*	1491	[0.20]	10.05	1672	0.07
Germacrene A	11.45*	1498	0.20	10.37	1698	0.09
Cuparene	11.45*	1498	[0.20]	11.10*	1760	0.50
α -Muurolene	11.45*	1498	[0.20]			
1,2-Dihydrocuparene	11.53	1503	0.02	10.25	1688	0.01
γ -Cadinene	11.60	1509	0.16	10.38	1699	0.15
<i>trans</i> -Calamenene	11.75*	1520	0.47	11.22	1770	0.03
δ -Cadinene	11.75*	1520	[0.47]	10.41	1702	0.40
Selina-4(15),7(11)-diene	11.85	1529	0.06	10.56	1714	0.09
α -Cadinene	11.91	1534	0.04	10.78	1732	0.03
α -Calacorene	11.94*	1535	0.05	12.11	1847	0.01
Selina-3,7(11)-diene	11.94*	1535	[0.05]	10.65	1722	0.02
α -Elemol	12.05	1544	0.04	14.04	2024	0.01
Salviadienol?	12.12*	1550	0.52	14.39*	2058	0.07
Germacrene B	12.12*	1550	[0.52]	11.10*	1760	[0.50]
Caryophyllenyl alcohol	12.30	1564	0.01	13.70	1992	0.01
Spathulenol	12.38	1570	0.06	14.39*	2058	[0.07]
Caryophyllene oxide	12.43*	1574	0.21	12.76	1904	0.17
Caryophyllene oxide isomer	12.43*	1574	[0.21]	12.68	1898	0.03
Unknown [m/z 159, 83 (88), 55 (53), 93 (50), 121 (48)... 220 (9)]	12.56	1584	0.02			
Humulene epoxide I	12.64	1591	0.01	13.19	1944	0.01

α -Cedrol	12.69	1595	tr	14.32	2051	0.01
Humulene epoxide II	12.76	1600	0.09	13.35	1959	0.08
epi-Cedrol	12.83	1606	0.02	14.79	2096	0.01
Junenol	12.87	1609	0.02	13.66	1988	0.02
1,10-diepi-Cubenol	13.00	1620	0.01	13.47	1970	0.01
β -Acorenol	13.04	1623	0.03	14.89	2106	0.04
Unknown [m/z 43, 93 (89), 91 (88), 79 (87), 123 (76), 81 (75)...]	13.14	1632	0.12	13.90	2010	0.13
τ -Cadinol	13.20*	1636	0.06	14.97	2114	0.02
τ -Muurolol	13.20*	1636	[0.06]	15.05	2122	0.04
α -Muurolol	13.26	1641	0.02	15.19	2136	0.02
Unknown [m/z 41, 91 (96), 79 (88), 69 (82), 123 (80), 93 (80)... 220 (8)]	13.32	1646	0.03			
α -Cadinol	13.35	1649	0.06	15.48	2164	0.07
Cedrenol analog	13.38	1651	0.01	16.50	2269	0.01
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	13.55	1666	0.02	16.81	2301	0.03
Shyobunol	13.71	1678	0.01	16.37	2255	0.01
Juniper camphor	13.81	1687	0.01	16.10	2228	tr
Germacra-4(15),5,10(14)-trien-1 β -ol?	13.94*	1697	0.04	16.64	2283	0.01
Mayurone?	13.94*	1697	[0.04]			
Thujopsenal	13.94*	1697	[0.04]	15.94	2210	0.02
β -Turmerone	13.98	1701	0.01	15.62	2178	0.01
Cedryl acetate	14.60	1754	0.04	14.68	2085	0.02
Biformene?	16.44	1919	tr	15.49	2166	0.03
meta-Camphorene	16.77	1951	0.31	15.38	2154	0.30
Trachylobane?	17.05	1977	0.02	16.45	2263	0.02
para-Camphorene	17.12	1984	0.12	15.83	2199	0.11
ar-Abietatriene	17.70	2040	tr	17.75	2403	0.01
Sandaracopimarinal?	18.96	2167	0.04			
Total identified		98.79%			98.09%	
Total reported		99.24%			98.33%	

*: Two or more compounds are coeluting on this column

[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

R.T.: Retention time (minutes)

R.I.: Retention index