

Date : March 24, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20C11-PSC04

Customer identification : Lavender Bulgarian - Bulgaria - PH2019

Type : Essential oil

Source : *Lavandula angustifolia*

Customer : Pacha Soap Co.

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : March 23, 2020

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4628 ± 0.0003 (20 °C)

ISO 3515:2004 - OIL OF CLONAL LAVENDER - BULGARIA

Compound	Min. %	Max. %	Observed %	Complies?
α-Terpineol	0.8	2.0	1.2	Yes
Lavandulyl acetate	2	5	3	Yes
Terpinen-4-ol	2	5	5	Yes
Lavandulol	0.3		1.1	Yes
Linalyl acetate	30	42	24	No
Linalool	22	34	31	Yes
Camphor		0.6	0.3	Yes
Octan-3-one	0.2	1.6	1.4	Yes
(E)-β-Ocimene	2	5	3	Yes
(Z)-β-Ocimene	3	9	6	Yes
β-Phellandrene		0.6	0.6	Yes
1,8-Cineole		2.0	1.2	Yes
Limonene		0.6	0.6	Yes
Refractive index	1.4590	1.4630	1.4628	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil does not comply with the ISO standard for Bulgarian lavender oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Classe
Acetone	0.01	Aliphatic ketone
Isobutyral	tr	Aliphatic aldehyde
Methacrolein	tr	Aliphatic aldehyde
3-Buten-2-one	tr	Aliphatic ketone
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
Toluene	0.01	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
Butyl acetate	0.01	Aliphatic ester
Methyl hexyl ether	0.13	Aliphatic ether
Hexanol	0.08	Aliphatic alcohol
Hashishene	0.01	Monoterpene
Tricyclene	0.03	Monoterpene
α -Thujene	0.16	Monoterpene
α -Pinene	0.35	Monoterpene
Camphene	0.27	Monoterpene
α -Fenchene	0.01	Monoterpene
Thujadiene isomer	0.01	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.01	Aliphatic lactone
Butyl isobutyrate	0.01	Aliphatic ester
Sabinene	0.08	Monoterpene
β -Pinene	0.08	Monoterpene
Octen-3-ol	0.36	Aliphatic alcohol
Octan-3-one	1.43	Aliphatic ketone
Dehydro-1,8-cineole	0.01	Monoterpenic ether
Myrcene	0.92	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
Octan-3-ol	0.28	Aliphatic alcohol
Butyl butyrate	0.11	Aliphatic ester
Pseudolimonene	0.03	Monoterpene
α -Phellandrene	0.09	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
Δ^3 -Carene	0.39	Monoterpene
(3Z)-Hexenyl acetate	0.03	Aliphatic ester
α -Terpinene	0.08	Monoterpene
Hexyl acetate	0.60	Aliphatic ester
ortho-Cymene	0.07	Monoterpene
para-Cymene	0.22	Monoterpene
Limonene	0.57	Monoterpene
β -Phellandrene	0.56	Monoterpene
1,8-Cineole	1.15	Monoterpenic ether
(Z)- β -Ocimene	6.30	Monoterpene
(E)- β -Ocimene	3.30	Monoterpene
γ -Terpinene	0.23	Monoterpene
<i>cis</i> -Sabinene hydrate	0.07	Monoterpenic alcohol

<i>cis</i> -Linalool oxide (fur.)	0.10	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
<i>trans</i> -Linalool oxide (fur.)	0.08	Monoterpenic alcohol
Terpinolene	0.12	Monoterpene
para-Cymenene	0.02	Monoterpene
<i>trans</i> -Sabinene hydrate	0.06	Monoterpenic alcohol
Linalool	30.58	Monoterpenic alcohol
(<i>Z</i>)-6-Methyl-3,5-heptadien-2-one	0.06	Aliphatic ketone
Octen-3-yl acetate	0.97	Aliphatic ester
Unknown	0.05	Unknown
α -Campholenal	0.02	Monoterpenic aldehyde
Octan-3-yl acetate	0.08	Aliphatic ester
allo-Ocimene	0.07	Monoterpene
(<i>Z</i>)-Myroxide	0.03	Monoterpenic ether
Camphor	0.25	Monoterpenic ketone
(<i>E</i>)-Myroxide	0.05	Monoterpenic ether
Hexyl isobutyrate	0.08	Aliphatic ester
Nerol oxide	0.02	Aliphatic ether
Borneol	0.76	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (pyr.)	0.03	Monoterpenic alcohol
Lavandulol	1.07	Monoterpenic alcohol
Terpinen-4-ol	4.62	Monoterpenic alcohol
meta-Cymen-8-ol	0.07	Monoterpenic alcohol
Cryptone	0.25	Normonoterpenic ketone
para-Cymen-8-ol	0.08	Monoterpenic alcohol
Myrtenal	0.03	Monoterpenic aldehyde
α -Terpineol	1.21	Monoterpenic alcohol
Hexyl butyrate	0.35	Aliphatic ester
Hodiendiol	0.02	Monoterpenic alcohol
Verbenone	0.03	Monoterpenic ketone
Unknown	0.02	Unknown
(3 <i>E</i> ,5 <i>E</i>)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.03	Monoterpenic alcohol
Octyl acetate	0.01	Aliphatic ester
<i>trans</i> -Carveol	0.03	Monoterpenic alcohol
Bornyl formate	0.01	Monoterpenic ester
exo-2-Hydroxycineole	0.03	Monoterpenic alcohol
Nerol	0.21	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.11	Aliphatic ester
Carvone	0.05	Monoterpenic ketone
Neral	0.04	Monoterpenic aldehyde
Hexyl isovalerate	0.01	Aliphatic ester
Linalyl acetate	23.54	Monoterpenic ester
Geraniol	0.51	Monoterpenic alcohol
Geranial	0.07	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.02	Monoterpenic alcohol
Bornyl acetate	0.17	Monoterpenic ester
Cuminol	0.04	Monoterpenic alcohol
Lavandulyl acetate	3.38	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Hexyl tiglate	0.05	Aliphatic ester
Hodiendiol derivative	0.02	Oxygenated monoterpene
Unknown	0.05	Oxygenated monoterpene

Unknown	0.05	Oxygenated monoterpene
Hodiendiol derivative III	0.02	Oxygenated monoterpene
Neryl acetate	0.38	Monoterpenic ester
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.04	Sesquiterpene
Geranyl acetate	0.60	Monoterpenic ester
7-epi-Sesquithujene	0.08	Sesquiterpene
Hexyl hexanoate	0.10	Aliphatic ester
Isocaryophyllene	0.01	Sesquiterpene
β -Caryophyllene	3.45	Sesquiterpene
α -Santalene	0.44	Sesquiterpene
Coumarin	0.02	Coumarin
<i>trans</i> - α -Bergamotene	0.13	Sesquiterpene
Sesquisabinene A	0.01	Sesquiterpene
<i>cis</i> - β -Bergamotene?	0.07	Sesquiterpene
α -Humulene	0.11	Sesquiterpene
Lavandulyl butyrate?	0.11	Monoterpenic ester
β -Santalene	0.02	Sesquiterpene
(<i>E</i>)- β -Farnesene	3.46	Sesquiterpene
Germacrene D	0.38	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.06	Sesquiterpene
Isodaucene	0.02	Sesquiterpene
β -Bisabolene	0.01	Sesquiterpene
Lavandulyl isovalerate	0.04	Monoterpenic ester
γ -Cadinene	0.23	Sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
β -Sesquiphellandrene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.05	Sesquiterpenic ether
(<i>E</i>)-Nerolidol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.32	Sesquiterpenic ether
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
τ -Cadinol	0.20	Sesquiterpenic alcohol
(3 <i>Z</i>)-Caryophylla-3,8(13)-dien-5 β -ol	0.02	Sesquiterpenic alcohol
Hexahydrofarnesyl acetone	0.01	Terpene derivative
9-(15,16-Dihydro-15-methylenegeranyl)- α -terpinene	0.06	Homoditerpene
Consolidated total	98.36%	

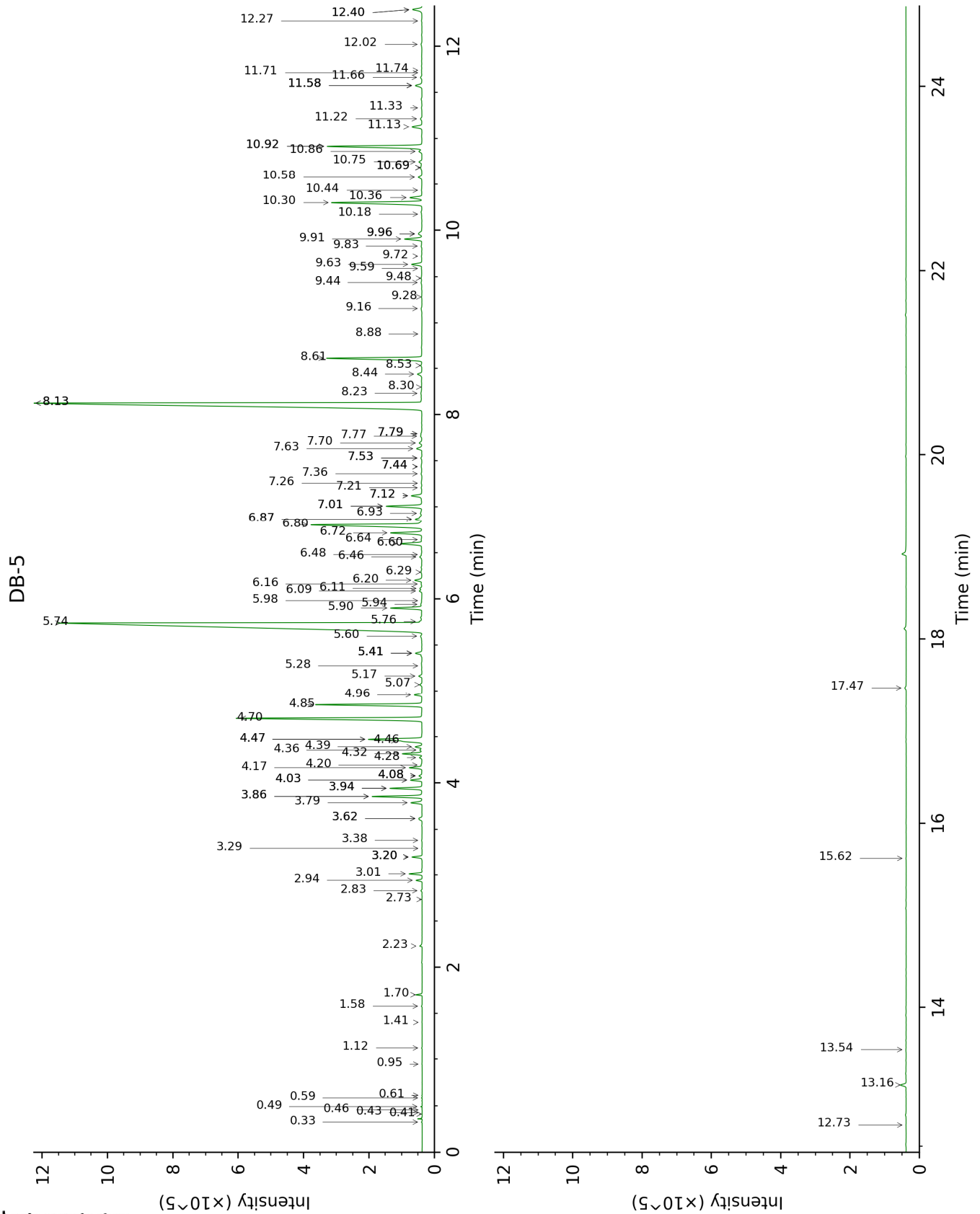
tr: The compound has been detected below 0.005% of total signal.

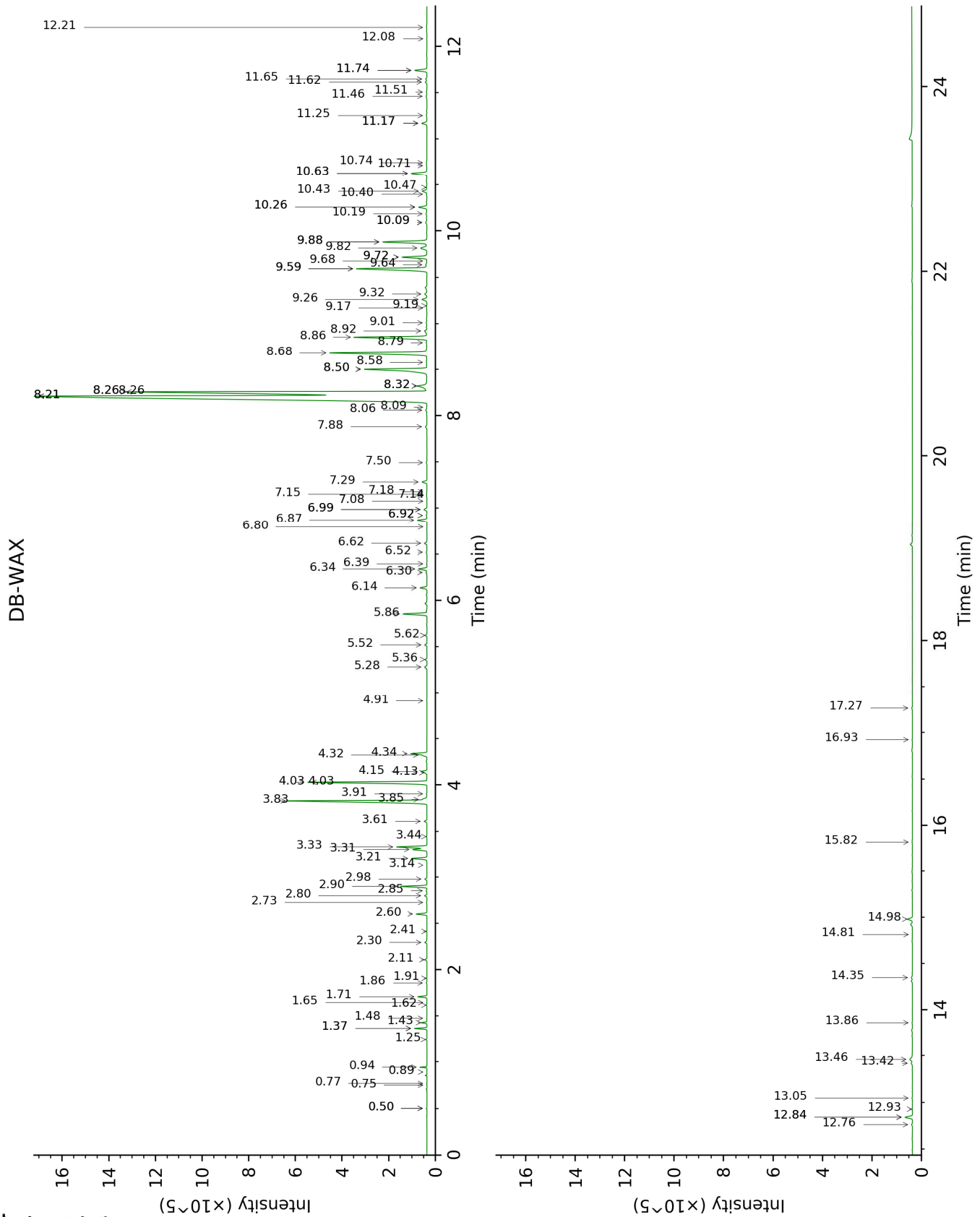
Note: no correction factor was applied

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	%
Acetone	0.33	521	0.01	0.50*	780	0.01
Isobutyral	0.41	529	tr	0.50*	780	[0.01]
Methacrolein	0.43	540	tr			
3-Buten-2-one	0.46	561	tr	0.89	908	tr
2-Methyl-3-buten-2-ol	0.49	588	0.01	1.62	1015	0.01
Isovaleral	0.59	639	0.01	0.77	886	0.01
2-Methylbutyral	0.61	651	tr	0.75	879	tr
Isoamyl alcohol	0.95	738	tr			
Toluene	1.12	762	0.01	1.48	1000	0.01
Hexanal	1.41	802	tr	1.91	1044	tr
Butyl acetate	1.58	818	0.01	1.86	1039	0.02
Methyl hexyl ether	1.70	828	0.13	0.94	917	0.13
Hexanol	2.23	872	0.08	5.52	1324	0.08
Hashishene	2.74	912	0.01	1.37*	989	0.34
Tricyclene	2.83	918	0.03	1.25	968	0.03
α -Thujene	2.94	925	0.16	1.43	996	0.15
α -Pinene	3.01	930	0.35	1.37*	989	[0.34]
Camphene	3.20*	942	0.29	1.71	1024	0.27
α -Fenchene	3.20*	942	[0.29]	1.65	1017	0.01
Thujadiene isomer	3.20*	942	[0.29]	2.41	1094	0.01
5,5-Dimethyl-2(5H)-furanone	3.30	948	0.01	8.58	1550	0.01
Butyl isobutyrate	3.38	954	0.01	2.73	1118	0.01
Sabinene	3.62*	970	0.15	2.30	1082	0.08
β -Pinene	3.62*	970	[0.15]	2.11	1064	0.08
Octen-3-ol	3.79	981	0.36	6.87	1422	0.38
Octan-3-one	3.86*	985	1.46	4.03*	1217	4.73
Dehydro-1,8-cineole	3.86*	985	[1.46]	3.14	1150	0.01
Myrcene	3.94*	991	0.94	2.90	1132	0.92
<i>trans</i> -Dehydroxylinalool oxide	3.94*	991	[0.94]	3.44	1174	0.02
Octan-3-ol	4.03*	997	0.35	6.14	1368	0.28
Butyl butyrate	4.03*	997	[0.35]	3.61	1187	0.11
Pseudolimonene	4.08*	1000	0.11	2.85	1128	0.03
α -Phellandrene	4.08*	1000	[0.11]	2.80	1124	0.09
<i>cis</i> -Dehydroxylinalool oxide	4.08*	1000	[0.11]	3.91	1208	0.02
Δ 3-Carene	4.17	1006	0.39	2.60	1108	0.38
(3Z)-Hexenyl acetate	4.20	1008	0.03	4.91	1279	0.01
α -Terpinene	4.28	1013	0.08	2.98	1138	0.08
Hexyl acetate	4.32	1015	0.60	4.34	1239	0.64
ortho-Cymene	4.36	1018	0.07	4.13	1224	0.05
para-Cymene	4.39	1020	0.22	4.15	1225	0.22

Limonene	4.46†	1024	2.30	3.21	1156	0.57
β-Phellandrene	4.48*†	1025	[2.30]	3.31	1163	0.56
1,8-Cineole	4.48*†	1025	[2.30]	3.33	1165	1.15
(Z)-β-Ocimene	4.70	1040	6.30	3.83†	1203	6.50
(E)-β-Ocimene	4.85	1049	3.30	4.03*	1217	[4.73]
γ-Terpinene	4.96	1056	0.23	3.84†	1204	[6.50]
cis-Sabinene hydrate	5.07	1063	0.07	6.99*	1430	0.15
cis-Linalool oxide (fur.)	5.17	1069	0.10	6.62	1403	0.10
Octanol	5.28	1076	0.01	8.26*†	1525	[54.20]
trans-Linalool oxide (fur.)	5.41*	1084	0.23	6.99*	1430	[0.15]
Terpinolene	5.41*	1084	[0.23]	4.32	1238	0.12
para-Cymenene	5.41*	1084	[0.23]	6.40	1386	0.02
trans-Sabinene hydrate	5.60	1096	0.06	8.06	1510	0.05
Linalool	5.74	1105	30.58	8.21*†	1522	54.20
(Z)-6-Methyl-3,5-heptadien-2-one	5.76	1106	0.06	8.21*†	1522	[54.20]
Octen-3-yl acetate	5.90	1116	0.97	5.86	1348	0.96
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	5.94	1118	0.05	9.72*	1640	1.07
α-Campholenal	5.98	1121	0.02	7.08	1437	0.01
Octan-3-yl acetate	6.09	1128	0.08	5.28	1307	0.11
allo-Ocimene	6.11	1130	0.07	5.62	1331	0.06
(Z)-Myroxide	6.16	1133	0.03	6.92*	1425	0.04
Camphor	6.20	1135	0.25	7.29	1452	0.22
(E)-Myroxide	6.29	1141	0.05	7.14	1441	0.02
Hexyl isobutyrate	6.46	1152	0.08	5.36	1312	0.07
Nerol oxide	6.48	1153	0.02	6.92*	1425	[0.04]
Borneol	6.60	1161	0.76	9.88*	1653	1.99
cis-Linalool oxide (pyr.)	6.64	1164	0.03	10.40	1694	0.02
Lavandulol	6.72	1169	1.07	9.72*	1640	[1.07]
Terpinen-4-ol	6.80	1174	4.62	8.68	1557	4.50
meta-Cymen-8-ol	6.87*†	1179	0.30	11.62	1796	0.07
Cryptone	6.87*†	1179	[0.30]	9.26	1603	0.25
para-Cymen-8-ol	6.93	1183	0.08	11.65	1800	0.06
Myrtenal	7.01*	1188	1.23	8.80	1566	0.03
α-Terpineol	7.01*	1188	[1.23]	9.88*	1653	[1.99]
Hexyl butyrate	7.12*	1195	0.40	6.34	1382	0.35
Hodiendiol	7.12*	1195	[0.40]	12.93	1912	0.02
Verbenone	7.21	1201	0.03	9.68	1636	0.02
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.26	1204	0.02	6.30	1380	0.04
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.36	1211	0.03	11.46	1783	0.04
Octyl acetate	7.44*	1217	0.05	7.18	1444	0.01

<i>trans</i> -Carveol	7.44*	1217	[0.05]	11.51	1787	0.03
Bornyl formate	7.53*	1223	0.04	8.09	1512	0.01
exo-2-Hydroxycineole	7.53*	1223	[0.04]	11.74*	1808	0.54
Nerol	7.63	1230	0.21	11.17*	1759	0.24
Hexyl 2-methylbutyrate	7.70	1234	0.11	6.52	1396	0.03
Carvone	7.77†	1239	0.09	10.09*	1669	0.07
Neral	7.80*†	1241	[0.09]	9.59*	1630	3.51
Hexyl isovalerate	7.80*†	1241	[0.09]	6.80	1416	0.01
Linalyl acetate	8.13*	1264	24.41	8.26*†	1525	[54.20]
Geraniol	8.13*	1264	[24.41]	11.74*	1808	[0.54]
Geranial	8.23	1271	0.07	10.19	1677	0.05
2,6-Dimethyl-1,7-octadiene-3,6-diol	8.30	1276	0.02	14.82	2088	tr
Bornyl acetate	8.44	1286	0.17	8.32*	1530	0.64
Cuminol	8.53	1292	0.04	14.35	2044	0.06
Lavandulyl acetate	8.61	1298	3.38	8.86	1571	3.36
Unknown [m/z 150, 107 (98), 91 (79), 108 (61)]	8.88	1312	0.01	12.08	1837	0.01
Hexyl tiglate	9.16	1331	0.05	9.01	1583	0.03
Hodiendiol derivative	9.28	1340	0.02	13.05	1923	0.02
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.44	1351	0.05	11.17*	1759	[0.24]
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.48	1354	0.05	11.25	1766	0.03
Hodiendiol derivative III	9.59	1362	0.02	12.84*	1905	0.34
Neryl acetate	9.63	1365	0.38	10.26*	1683	0.39
α-Copaene	9.72	1371	0.02	7.15	1442	0.01
β-Bourbonene	9.83	1379	0.04	7.50	1467	0.03
Geranyl acetate	9.91	1384	0.60	10.63*	1714	0.75
7-epi-Sesquithujene	9.96*	1388	0.19	7.88	1496	0.08
Hexyl hexanoate	9.96*	1388	[0.19]	8.92	1576	0.10
Isocaryophyllene	10.18	1403	0.01	8.26*†	1525	[54.20]
β-Caryophyllene	10.30	1412	3.45	8.50*	1544	3.48
α-Santalene	10.36	1417	0.44	8.32*	1530	[0.64]
Coumarin	10.44	1422	0.02	17.27	2337	0.04
<i>trans</i> -α-Bergamotene	10.58	1433	0.13	8.50*	1544	[3.48]
Sesquisabinene A	10.69*	1441	0.07	9.19	1597	0.01
<i>cis</i> -β-Bergamotene?	10.69*	1441	[0.07]			
α-Humulene	10.75	1446	0.11	9.32	1608	0.10
Lavandulyl butyrate?	10.86	1454	0.11	10.63*	1714	[0.75]

β-Santalene	10.92*	1458	3.48	9.17	1596	0.02
(E)-β-Farnesene	10.92*	1458	[3.48]	9.59*	1630	[3.51]
Germacrene D	11.13	1474	0.38	9.82	1647	0.38
<i>trans</i> -β-Bergamotene	11.22	1481	0.06	9.64	1633	0.06
Isodaucene	11.33	1490	0.02	10.09*	1669	[0.07]
β-Bisabolene	11.58*	1508	0.28	10.26*	1683	[0.39]
Lavandulyl isovalerate	11.58*	1508	[0.28]	10.74	1723	0.04
γ-Cadinene	11.58*	1508	[0.28]	10.43	1697	0.23
Unknown [m/z 121, 93 (56), 91 (12), 94 (11), 122 (10)...220]	11.66	1515	0.06	13.42	1957	0.07
δ-Cadinene	11.71	1519	0.02	10.47	1700	0.02
β-Sesquiphellandrene	11.74	1521	0.01	10.71	1721	0.02
Isocaryophyllene epoxide B	12.02	1543	0.05	12.20	1848	0.04
(E)-Nerolidol	12.27	1563	0.02	13.86	1998	0.02
Caryophyllene oxide	12.40*	1572	0.41	12.84*	1905	[0.34]
Caryophyllene oxide isomer	12.40*	1572	[0.41]	12.76	1897	0.04
Humulene epoxide II	12.73	1598	0.01	13.46	1961	0.20
τ-Cadinol	13.16	1634	0.20	14.98	2105	0.24
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	13.54	1665	0.02	16.92	2301	0.02
Hexahydrofarnesyl acetone	15.62	1846	0.01			
9-(15,16-Dihydro-15-methylenegeranyl)-α-terpinene	17.47	2020	0.06	15.82	2188	0.03
Total identified		98.53%			97.87%	
Total reported		98.78%			98.01%	

*: 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