

**Date :** March 24, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 20C11-PSC05

**Customer identification :** Lavender Maillette - France - 0519/1

**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 :

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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Faintly yellow liquid

**Refractive index:** 1.4594 ± 0.0003 (20 °C)

#### ISO 3515:2004 - OIL OF CLONAL LAVENDER - FRANCE "MAILLETTE"

Compound	Min. %	Max. %	Observed %	Complies?
α-Terpineol	0.5	1.5	1.0	Yes
Lavandulyl acetate		1.3	0.9	Yes
Terpinen-4-ol		1.5	0.8	Yes
Lavandulol		0.5	0.3	Yes
Linalyl acetate	33	46	32	No
Linalool	30	45	40	Yes
Camphor		1.2	0.7	Yes
Octan-3-one	1.0	2.5	1.0	Yes
(E)-β-Ocimene		2.0	0.9	Yes
(Z)-β-Ocimene		2.5	0.9	Yes
β-Phellandrene		0.2	0	Yes
1,8-Cineole		0.5	0.1	Yes
Limonene		0.3	0.2	Yes
<b>Refractive index</b>	1.4550	1.4600	1.4594	Yes

#### CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for French "Maillette" 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
Ethanol	tr	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
3-Buten-2-one	tr	Aliphatic ketone
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	0.01	Simple phenolic
Prenal	0.01	Aliphatic aldehyde
Hexanal	0.01	Aliphatic aldehyde
Butyl acetate	tr	Aliphatic ester
Methyl hexyl ether	0.06	Aliphatic ether
(3Z)-Hexenol	0.16	Aliphatic alcohol
Hexanol	0.25	Aliphatic alcohol
Tricyclene	0.04	Monoterpene
$\alpha$ -Thujene	0.02	Monoterpene
$\alpha$ -Pinene	0.13	Monoterpene
Camphene	0.40	Monoterpene
$\alpha$ -Fenchene	tr	Monoterpene
Thujadiene isomer	0.01	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.01	Aliphatic lactone
Butyl isobutyrate	0.01	Aliphatic ester
$\beta$ -Pinene	0.09	Monoterpene
Sabinene	0.03	Monoterpene
Octen-3-ol	0.47	Aliphatic alcohol
Octan-3-one	1.00	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Myrcene	0.45	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.04	Monoterpenic ether
Butyl butyrate	0.07	Aliphatic ester
Octan-3-ol	0.20	Aliphatic alcohol
$\alpha$ -Phellandrene	0.01	Monoterpene
Pseudolimonene	tr	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
$\Delta^3$ -Carene	0.16	Monoterpene
(3Z)-Hexenyl acetate	0.03	Aliphatic ester
$\alpha$ -Terpinene	0.02	Monoterpene
Hexyl acetate	0.23	Aliphatic ester
ortho-Cymene	0.11	Monoterpene
para-Cymene	0.20	Monoterpene
1,8-Cineole	0.09	Monoterpenic ether
Limonene	0.22	Monoterpene
$\beta$ -Phellandrene	0.01	Monoterpene
Lavender lactone	0.02	Aliphatic lactone
(Z)- $\beta$ -Ocimene	0.88	Monoterpene

(E)-β-Ocimene	0.88	Monoterpene
γ-Terpinene	0.03	Monoterpene
cis-Sabinene hydrate	0.03	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.42	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
α-Pinene oxide analog	0.02	Monoterpenic ether
para-Cymenene	0.02	Monoterpene
Terpinolene	0.08	Monoterpene
trans-Linalool oxide (fur.)	0.33	Monoterpenic alcohol
α-Pinene oxide	tr	Monoterpenic ether
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	39.72	Monoterpenic alcohol
(Z)-6-Methyl-3,5-heptadien-2-one	0.09	Aliphatic ketone
Octen-3-yl acetate	0.56	Aliphatic ester
Unknown	0.01	Unknown
α-Campholenal	tr	Monoterpenic aldehyde
Octan-3-yl acetate	0.07	Aliphatic ester
allo-Ocimene	0.02	Monoterpene
(Z)-Myroxide	0.03	Monoterpenic ether
Camphor	0.67	Monoterpenic ketone
trans-Verbenol	0.03	Monoterpenic alcohol
(E)-Myroxide	0.02	Monoterpenic ether
Nerol oxide	0.02	Aliphatic ether
Hexyl isobutyrate	0.06	Aliphatic ester
Borneol	2.40	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.02	Monoterpenic alcohol
Lavandulol	0.32	Monoterpenic alcohol
Terpinen-4-ol	0.76	Monoterpenic alcohol
(3E,5Z)-Undeca-1,3,5-triene	0.04	Alkene
meta-Cymen-8-ol	0.15	Monoterpenic alcohol
trans-Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Cryptone	0.05	Normoterpenic ketone
para-Cymen-8-ol	0.14	Monoterpenic alcohol
Myrtenal	0.04	Monoterpenic aldehyde
α-Terpineol	1.05	Monoterpenic alcohol
Hodiendiol	0.01	Monoterpenic alcohol
Hexyl butyrate	0.38	Aliphatic ester
Unknown	0.03	Unknown
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.02	Monoterpenic alcohol
Octyl acetate	0.02	Aliphatic ester
trans-Carveol	0.03	Monoterpenic alcohol
Bornyl formate	0.08	Monoterpenic ester
Nerol	0.23	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.03	Aliphatic ester
Carvone	0.02	Monoterpenic ketone
Neral	0.05	Monoterpenic aldehyde
Hexyl isovalerate	0.01	Aliphatic ester
Geraniol	0.63	Monoterpenic alcohol
Linalyl acetate	31.79	Monoterpenic ester
Geranial	0.01	Monoterpenic aldehyde
Bornyl acetate	0.15	Monoterpenic ester
Lavandulyl acetate	0.91	Monoterpenic ester

Hexyl tiglate	0.09	Aliphatic ester
Hodiendiol derivative	0.03	Oxygenated monoterpene
Unknown	0.07	Oxygenated monoterpene
Eugenol	0.10	Phenylpropanoid
Hodiendiol derivative III	0.01	Oxygenated monoterpene
Neryl acetate	0.36	Monoterpenic ester
7-Cubebene	0.01	Sesquiterpene
$\beta$ -Bourbonene	0.02	Sesquiterpene
Geranyl acetate	0.70	Monoterpenic ester
7-epi-Sesquithujene	0.04	Sesquiterpene
Hexyl hexanoate	0.05	Aliphatic ester
Isocaryophyllene	0.01	Sesquiterpene
$\beta$ -Caryophyllene	3.04	Sesquiterpene
$\alpha$ -Santalene	0.64	Sesquiterpene
Coumarin	0.12	Coumarin
<i>trans</i> - $\alpha$ -Bergamotene	0.19	Sesquiterpene
Sesquisabinene A	0.01	Sesquiterpene
<i>cis</i> - $\beta$ -Bergamotene?	0.06	Sesquiterpene
$\alpha$ -Humulene	0.10	Sesquiterpene
Lavandulyl butyrate?	0.11	Monoterpenic ester
$\beta$ -Santalene	0.01	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	1.41	Sesquiterpene
Dauca-5,8-diene?	0.02	Sesquiterpene
Germacrene D	0.17	Sesquiterpene
ar-Curcumene	0.06	Sesquiterpene
<i>trans</i> - $\beta$ -Bergamotene	0.04	Sesquiterpene
Hodiendiol derivative II	0.01	Oxygenated monoterpene
$\beta$ -Bisabolene	0.07	Sesquiterpene
$\gamma$ -Cadinene	0.05	Sesquiterpene
Unknown	0.13	Oxygenated sesquiterpene
$\beta$ -Sesquiphellandrene	0.01	Sesquiterpene
$\alpha$ -Elemol	0.05	Sesquiterpenic alcohol
Isocaryophyllene epoxide B	0.03	Sesquiterpenic ether
( <i>E</i> )-Nerolidol	0.01	Sesquiterpenic alcohol
Dendrolasin	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.54	Sesquiterpenic ether
Caryophyllene oxide isomer	0.07	Sesquiterpenic ether
Humulene epoxide II	0.02	Sesquiterpenic ether
$\tau$ -Cadinol	0.06	Sesquiterpenic alcohol
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	0.04	Sesquiterpenic alcohol
<i>cis</i> -14-nor-Muurool-5-en-4-one?	0.01	Norsesquiterpenic ketone
<b>Consolidated total</b>	<b>96.64%</b>	

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

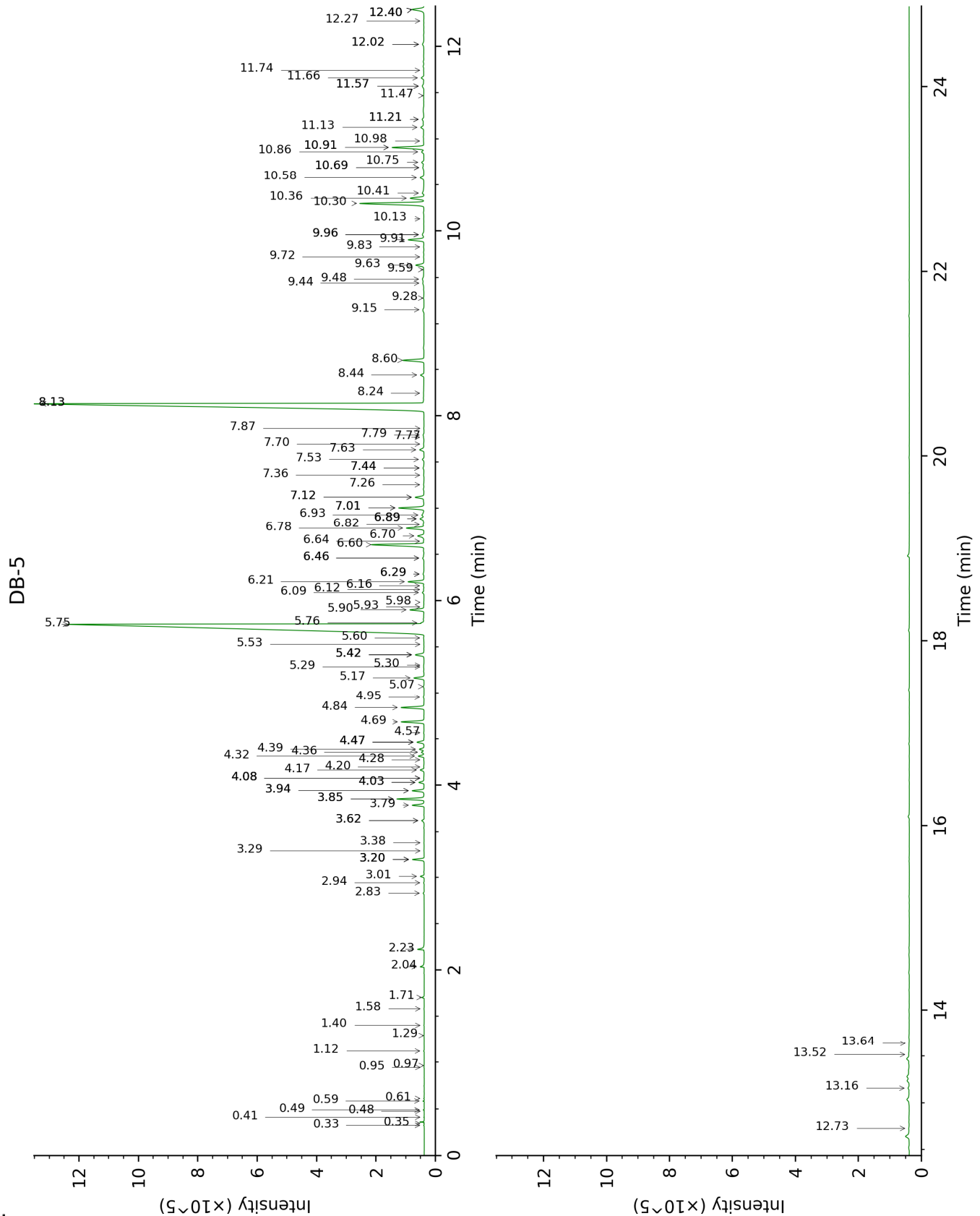
Note: no correction factor was applied

**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.

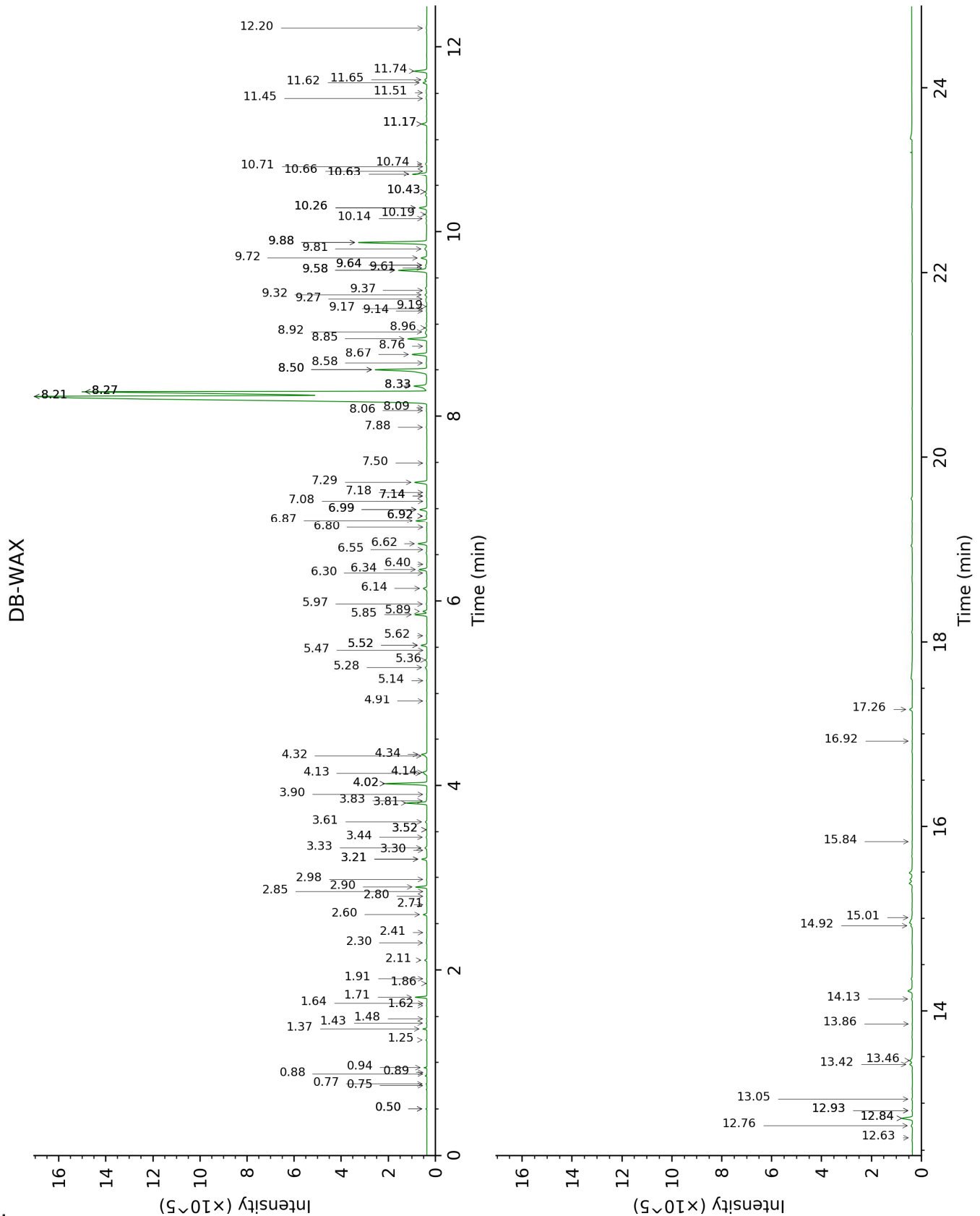
**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.



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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetone	0.32	521	0.01	0.50*	779	0.02
Ethanol	0.35	521	tr	0.88	906	0.01
Isobutyral	0.41	529	tr	0.50*	779	[0.02]
3-Buten-2-one	0.48	575	tr	0.89	908	tr
2-Methyl-3-buten-2-ol	0.49	586	0.01	1.62	1015	0.01
Isovaleral	0.59	639	0.02	0.77	886	0.02
2-Methylbutyral	0.61	651	0.01	0.75	879	0.01
Isoamyl alcohol	0.95	737	tr	3.52*	1180	0.01
2-Methylbutanol	0.97	740	tr	3.52*	1180	[0.01]
Toluene	1.12	762	0.01	1.48	1000	0.02
Prenal	1.29	786	0.01	3.21*	1155	0.23
Hexanal	1.40	801	0.01	1.91	1044	0.01
Butyl acetate	1.58	818	tr	1.86	1039	0.01
Methyl hexyl ether	1.71	828	0.06	0.94	917	0.07
(3Z)-Hexenol	2.04	856	0.16	5.89	1350	0.17
Hexanol	2.22	871	0.25	5.52*	1324	0.25
Tricyclene	2.83	918	0.04	1.25	968	0.03
α-Thujene	2.94	925	0.02	1.43	996	0.01
α-Pinene	3.01	930	0.13	1.37	988	0.12
Camphene	3.20*	942	0.42	1.71	1024	0.40
α-Fenchene	3.20*	942	[0.42]	1.64	1017	tr
Thujadiene isomer	3.20*	942	[0.42]	2.41	1093	0.01
5,5-Dimethyl-2(5H)-furanone	3.29	948	0.01	8.58	1550	0.08
Butyl isobutyrate	3.38	954	0.01	2.71	1116	0.01
β-Pinene	3.62*	970	0.11	2.11	1064	0.09
Sabinene	3.62*	970	[0.11]	2.30	1082	0.03
Octen-3-ol	3.79	981	0.47	6.87	1422	0.49
Octan-3-one	3.85*	985	1.01	4.02*	1216	1.90
6-Methyl-5-hepten-2-one	3.85*	985	[1.01]	5.14	1297	0.02
Myrcene	3.94*	991	0.47	2.90	1131	0.45
<i>trans</i> -Dehydroxylinalool oxide	3.94*	991	[0.47]	3.44	1174	0.04
Butyl butyrate	4.03*	997	0.22	3.61	1186	0.07
Octan-3-ol	4.03*	997	[0.22]	6.14	1368	0.20
α-Phellandrene	4.08*	1000	0.03	2.80	1124	0.01
Pseudolimonene	4.08*	1000	[0.03]	2.85	1128	tr
<i>cis</i> -Dehydroxylinalool oxide	4.08*	1000	[0.03]	3.90	1208	0.02
Δ3-Carene	4.17	1006	0.16	2.60	1108	0.14
(3Z)-Hexenyl acetate	4.20	1008	0.03	4.91	1280	0.02
α-Terpinene	4.28	1013	0.02	2.98	1138	0.01
Hexyl acetate	4.32	1015	0.23	4.34†	1239	[0.31]

ortho-Cymene	4.36	1018	0.11	4.13	1224	0.09
para-Cymene	4.39	1020	0.20	4.14	1225	0.20
1,8-Cineole	4.47*†	1025	0.33	3.33	1165	0.09
Limonene	4.47*†	1025	[0.33]	3.21*	1155	[0.23]
β-Phellandrene	4.47*†	1025	[0.33]	3.30	1163	0.01
Lavender lactone	4.57	1031	0.02	9.37	1611	0.02
(Z)-β-Ocimene	4.69	1038	0.88	3.81†	1201	0.92
(E)-β-Ocimene	4.84	1048	0.88	4.02*	1216	[1.90]
γ-Terpinene	4.95	1055	0.03	3.84†	1203	[0.92]
cis-Sabinene hydrate	5.07	1063	0.03	6.99*	1430	0.36
cis-Linalool oxide (fur.)	5.17	1069	0.42	6.62	1403	0.42
Octanol	5.28	1076	0.02	8.27*†	1526	[71.62]
α-Pinene oxide analog	5.30	1078	0.02	5.47	1320	tr
para-Cymenene	5.42*	1085	0.41	6.40	1386	0.02
Terpinolene	5.42*	1085	[0.41]	4.32†	1238	0.31
trans-Linalool oxide (fur.)	5.42*	1085	[0.41]	6.99*	1430	[0.36]
α-Pinene oxide	5.53	1092	tr	5.52*	1324	[0.25]
trans-Sabinene hydrate	5.60	1096	0.03	8.09	1512	0.03
Linalool	5.75	1106	39.72	8.22*†	1522	71.62
(Z)-6-Methyl-3,5-heptadien-2-one	5.76	1106	0.09	8.27*†	1526	[71.62]
Octen-3-yl acetate	5.90	1116	0.56	5.85	1348	0.55
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	5.93	1118	0.01	9.64*†	1633	[0.10]
α-Campholenal	5.98	1121	tr	7.08	1437	0.02
Octan-3-yl acetate	6.09	1128	0.07	5.28	1307	0.09
allo-Ocimene	6.12	1130	0.02	5.62	1331	0.02
(Z)-Myroxide	6.16	1132	0.03	6.92*	1425	0.05
Camphor	6.20	1135	0.67	7.29	1452	0.65
trans-Verbenol	6.29*	1141	0.05	9.61†	1631	0.10
(E)-Myroxide	6.29*	1141	[0.05]	7.14*	1441	0.04
Nerol oxide	6.46*	1152	0.08	6.92*	1425	[0.05]
Hexyl isobutyrate	6.46*	1152	[0.08]	5.36	1313	0.06
Borneol	6.60	1161	2.40	9.88*	1653	3.45
cis-Linalool oxide (pyr.)	6.64	1164	0.02	10.43*	1697	0.07
Lavandulol	6.70	1168	0.32	9.72	1639	0.27
Terpinen-4-ol	6.78	1173	0.76	8.67	1557	0.73
(3E,5Z)-Undeca-1,3,5-triene	6.82	1176	0.04	5.97	1356	0.04
meta-Cymen-8-ol	6.89*	1180	0.22	11.62†	1796	0.29
trans-Linalool oxide (pyr.)	6.89*	1180	[0.22]	10.71	1720	0.01
Cryptone	6.89*	1180	[0.22]	9.27	1604	0.05
para-Cymen-8-ol	6.93	1183	0.14	11.65†	1799	[0.29]
Myrtenal	7.01*	1188	1.11	8.76	1564	0.04

α-Terpineol	7.01*	1188	[1.11]	9.88*	1653	[3.45]
Hodiendiol	7.12*	1195	0.39	12.92*	1912	0.02
Hexyl butyrate	7.12*	1195	[0.39]	6.34	1382	0.38
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.26	1204	0.03	6.30	1380	0.03
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.36	1211	0.02	11.44	1782	0.05
Octyl acetate	7.44*	1217	0.06	7.18	1444	0.02
<i>trans</i> -Carveol	7.44*	1217	[0.06]	11.51	1787	0.03
Bornyl formate	7.53	1223	0.08	8.06	1510	0.03
Nerol	7.64	1230	0.23	11.17*	1759	0.26
Hexyl 2-methylbutyrate	7.70	1234	0.03	6.55	1398	0.02
Carvone	7.77	1239	0.02	10.14	1673	0.03
Neral	7.79	1241	0.05	9.58*	1629	1.46
Hexyl isovalerate	7.87	1246	0.01	6.80	1416	0.01
Geraniol	8.13*	1264	33.15	11.74	1808	0.63
Linalyl acetate	8.13*	1264	[33.15]	8.27*†	1526	[71.62]
Geranial	8.24	1272	0.01	10.26*	1683	0.40
Bornyl acetate	8.44	1286	0.15	8.33*	1530	0.90
Lavandulyl acetate	8.60	1297	0.91	8.84	1570	0.95
Hexyl tiglate	9.15	1331	0.09	8.96	1579	0.05
Hodiendiol derivative	9.28	1340	0.03	13.05	1923	0.03
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.44	1351	0.07	11.17*	1759	[0.26]
Eugenol	9.48	1354	0.10	14.92	2099	0.09
Hodiendiol derivative III	9.58	1361	0.01	12.84*	1905	0.55
Neryl acetate	9.63	1365	0.36	10.26*	1683	[0.40]
7-Cubebene	9.72	1371	0.01	7.14*	1441	[0.04]
β-Bourbonene	9.83	1379	0.02	7.50	1467	0.02
Geranyl acetate	9.91	1384	0.70	10.63*	1714	0.74
7-epi-Sesquithujene	9.96*	1388	0.11	7.88	1496	0.04
Hexyl hexanoate	9.96*	1388	[0.11]	8.92	1576	0.05
Isocaryophyllene	10.13	1400	0.01	8.22*†	1522	[71.62]
β-Caryophyllene	10.30	1412	3.04	8.50*	1544	3.16
α-Santalene	10.36	1416	0.64	8.33*	1530	[0.90]
Coumarin	10.41	1421	0.12	17.26	2337	0.15
<i>trans</i> -α-Bergamotene	10.58	1433	0.19	8.50*	1544	[3.16]
Sesquisabinene A	10.69*	1442	0.07	9.19	1597	0.01
<i>cis</i> -β-Bergamotene?	10.69*	1442	[0.07]			
α-Humulene	10.75	1446	0.10	9.32	1607	0.09
Lavandulyl butyrate?	10.86	1454	0.11	10.63*	1714	[0.74]
β-Santalene	10.91*	1458	1.45	9.17	1596	0.01

(E)-β-Farnesene	10.91*	1458	[1.45]	9.58*	1629	[1.46]
Dauca-5,8-diene?	10.98	1463	0.02	9.14	1593	0.02
Germacrene D	11.13	1474	0.17	9.81	1647	0.12
ar-Curcumene	11.21*	1480	0.10	10.74	1723	0.06
trans-β-Bergamotene	11.21*	1480	[0.10]	9.64*†	1633	[0.10]
Hodiendiol derivative II	11.47	1500	0.01	12.92*	1912	[0.02]
β-Bisabolene	11.57*	1507	0.13	10.19	1677	0.07
γ-Cadinene	11.57*	1507	[0.13]	10.43*	1697	[0.07]
Unknown [m/z 121, 93 (56), 91 (12), 94 (11), 122 (10)...220]	11.66	1514	0.13	13.42	1957	0.14
β-Sesquiphellandrene	11.74	1521	0.01	10.66	1716	0.01
α-Elemol	12.02*	1543	0.11	14.13	2024	0.05
Isocaryophyllene epoxide B	12.02*	1543	[0.11]	12.20	1848	0.03
(E)-Nerolidol	12.27	1563	0.01	13.86	1998	0.01
Dendrolasin	12.40*	1572	0.64	12.63	1886	0.01
Caryophyllene oxide	12.40*	1572	[0.64]	12.84*	1905	[0.55]
Caryophyllene oxide isomer	12.40*	1572	[0.64]	12.76	1897	0.07
Humulene epoxide II	12.73	1598	0.02	13.46	1961	0.17
τ-Cadinol	13.16	1634	0.06	15.01	2108	0.04
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	13.52	1663	0.04	16.92	2301	0.02
cis-14-nor-Muurool-5-en-4-one?	13.64	1674	0.01	15.84	2190	0.01
<b>Total identified</b>		<b>97.20%</b>			<b>96.50%</b>	
<b>Total reported</b>		<b>97.44%</b>			<b>96.66%</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