

Date : 2024-01-22

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 24A15-PTH07

**Customer Identification** : Lavender - Greece - L40120R

**Type** : Essential Oil

**Source** : *Lavandula angustifolia*

**Customer** : Plant Therapy

Checked and approved by:

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Alexis St-Gelais, Ph. D., Chimiste 2013-174

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## GAS CHROMATOGRAPHIC ANALYSIS

**Method :** PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

**\*ISO**

**Results :** See analysis summary (next page)

**Analyst :** Alexis St-Gelais, Ph. D., Chimiste 2013-174

**Date :** 2024-01-22

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4611 \pm 0.0003$  (20 °C)

**Method :** PC-MAT-016 - Measure of the refractive index of a liquid.

**Analyst :** Cindy Caron B. Sc.

**Date :** 2024-01-16

## 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
Butyral	tr	Aliphatic aldehyde
Acetic acid	tr	Aliphatic acid
Ethyl acetate	0.01	Aliphatic ester
Isovaleral	0.01	Aliphatic aldehyde
3-Methyl-2-butanone	tr	Aliphatic ketone
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Prenal	tr	Aliphatic aldehyde
Hexanal	0.01	Aliphatic aldehyde
Butyl acetate	0.03	Aliphatic ester
Methyl hexyl ether	0.14	Aliphatic ether
(3Z)-Hexenol	0.03	Aliphatic alcohol
Hexanol	0.12	Aliphatic alcohol
Tricyclene	0.02	Monoterpene
$\alpha$ -Thujene	0.11	Monoterpene
$\alpha$ -Pinene	0.21	Monoterpene
Camphene	0.15	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.06	Monoterpene
$\beta$ -Pinene	0.04	Monoterpene
Octen-3-ol	0.19	Aliphatic alcohol
Octan-3-one	1.56	Aliphatic ketone
Myrcene	0.62	Monoterpene
Butyl butyrate	0.11	Aliphatic ester
Octan-3-ol	0.28	Aliphatic alcohol
Pseudolimonene	tr	Monoterpene
$\alpha$ -Phellandrene	0.03	Monoterpene
$\Delta^3$ -Carene	0.10	Monoterpene
$\alpha$ -Terpinene	0.04	Monoterpene
Hexyl acetate	0.67	Aliphatic ester
<i>meta</i> -Cymene	0.04	Monoterpene
<i>para</i> -Cymene	0.15	Monoterpene
Limonene	0.38	Monoterpene
$\beta$ -Phellandrene	0.39	Monoterpene
1,8-Cineole	0.72	Monoterpenic ether
(Z)- $\beta$ -Ocimene	4.28	Monoterpene
(E)- $\beta$ -Ocimene	3.10	Monoterpene

$\gamma$ -Terpinene	0.15	Monoterpene
<i>cis</i> -Sabinene hydrate	0.07	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.13	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
$\alpha$ -Pinene oxide analog	0.04	Monoterpenic ether
<i>trans</i> -Linalool oxide (fur.)	0.09	Monoterpenic alcohol
Terpinolene	0.08	Monoterpene
Rosefuran	0.02	Monoterpenic ether
<i>trans</i> -Sabinene hydrate	0.05	Monoterpenic alcohol
Linalool	32.21	Monoterpenic alcohol
( <i>Z</i> )-6-Methyl-3,5-heptadien-2-one	0.04	Aliphatic ketone
Hotrienol	0.04	Monoterpenic alcohol
Hexyl propionate	0.04	Aliphatic ester
Octen-3-yl acetate	0.77	Aliphatic ester
Unknown	0.02	Unknown
Octan-3-yl acetate	0.13	Aliphatic ester
allo-Ocimene	0.07	Monoterpene
( <i>Z</i> )-Myroxide	0.02	Monoterpenic ether
Camphor	0.25	Monoterpenic ketone
( <i>E</i> )-Myroxide	0.03	Monoterpenic ether
Unknown	0.02	Unknown
Hexyl isobutyrate	0.08	Aliphatic ester
Nerol oxide	0.01	Aliphatic ether
Borneol	0.52	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Lavandulol	0.95	Monoterpenic alcohol
(3 <i>E</i> ,5 <i>Z</i> )-Undeca-1,3,5-triene	0.09	Alkene
Terpinen-4-ol	3.63	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Cryptone	0.23	Normonoterpenic ketone
<i>meta</i> -Cymen-8-ol	0.06	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.06	Monoterpenic alcohol
$\alpha$ -Terpineol	0.85	Monoterpenic alcohol
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	0.04	Monoterpenic alcohol
Hexyl butyrate	0.40	Aliphatic ester
Verbenone	0.02	Monoterpenic ketone
Unknown	0.01	Unknown
(3 <i>E</i> ,5 <i>E</i> )-2,6-Dimethylocta-3,5,7-trien-2-ol	0.02	Monoterpenic alcohol
Octyl acetate	0.02	Aliphatic ester
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
Bornyl formate	0.04	Monoterpenic ester
Nerol	0.14	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.05	Aliphatic ester
Cuminal	0.05	Monoterpenic aldehyde

Carvone	0.03	Monoterpenic ketone
Neral	0.02	Monoterpenic aldehyde
Hexyl isovalerate	0.01	Aliphatic ester
Geraniol	0.33	Monoterpenic alcohol
Linalyl acetate	29.69	Monoterpenic ester
Geranial	0.03	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.02	Monoterpenic alcohol
Bornyl acetate	0.10	Monoterpenic ester
Lavandulyl acetate	3.22	Monoterpenic ester
Hexyl tiglate	0.05	Aliphatic ester
Hodiendiol derivative	0.02	Oxygenated monoterpene
$\alpha$ -Terpinyl acetate	0.01	Monoterpenic ester
Unknown	0.03	Oxygenated monoterpene
Unknown	0.03	Oxygenated monoterpene
Hodiendiol derivative III	0.01	Oxygenated monoterpene
Neryl acetate	0.23	Monoterpenic ester
$\alpha$ -Copaene	0.01	Sesquiterpene
$\beta$ -Bourbonene	0.04	Sesquiterpene
Geranyl acetate	0.36	Monoterpenic ester
7-epi-Sesquithujene	0.11	Sesquiterpene
Hexyl hexanoate	0.10	Aliphatic ester
Sesquithujene	0.04	Sesquiterpene
$\beta$ -Caryophyllene	3.58	Sesquiterpene
$\alpha$ -Santalene	0.40	Sesquiterpene
Coumarin	0.01	Coumarin
<i>trans</i> - $\alpha$ -Bergamotene	0.13	Sesquiterpene
Sesquisabinene A	0.03	Sesquiterpene
epi- $\beta$ -Santalene	0.02	Sesquiterpene
$\alpha$ -Humulene	0.12	Sesquiterpene
$\beta$ -Santalene	0.12	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	4.05	Sesquiterpene
Dauca-5,8-diene?	0.02	Sesquiterpene
Germacrene D	0.56	Sesquiterpene
<i>trans</i> - $\beta$ -Bergamotene	0.05	Sesquiterpene
Isodaucene	0.02	Sesquiterpene
Hodiendiol derivative II	0.01	Oxygenated monoterpene
$\beta$ -Bisabolene	0.02	Sesquiterpene
$\gamma$ -Cadinene	0.11	Sesquiterpene
Lavandulyl isovalerate	0.01	Monoterpenic ester
Photosantalol	0.03	Sesquiterpenic alcohol
$\delta$ -Cadinene	0.01	Sesquiterpene
$\beta$ -Sesquiphellandrene	0.02	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
( <i>E</i> )-Nerolidol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether

Caryophyllene oxide	0.21	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene
Caryophylladienol II	0.01	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.05	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	0.01	Sesquiterpenic alcohol
<b>Consolidated total</b>	<b>99.47</b>	

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

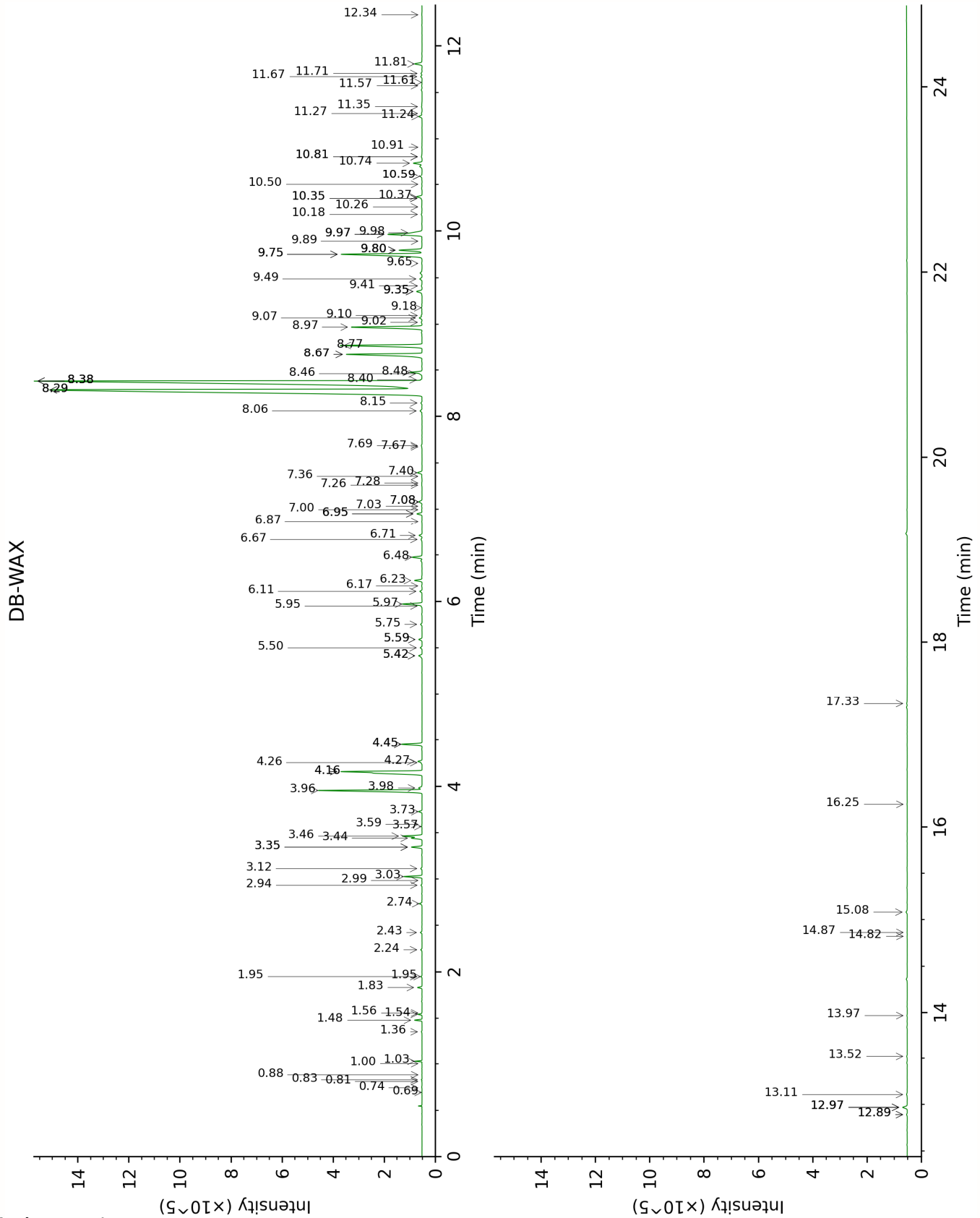
Note: no correction factor was applied

**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.

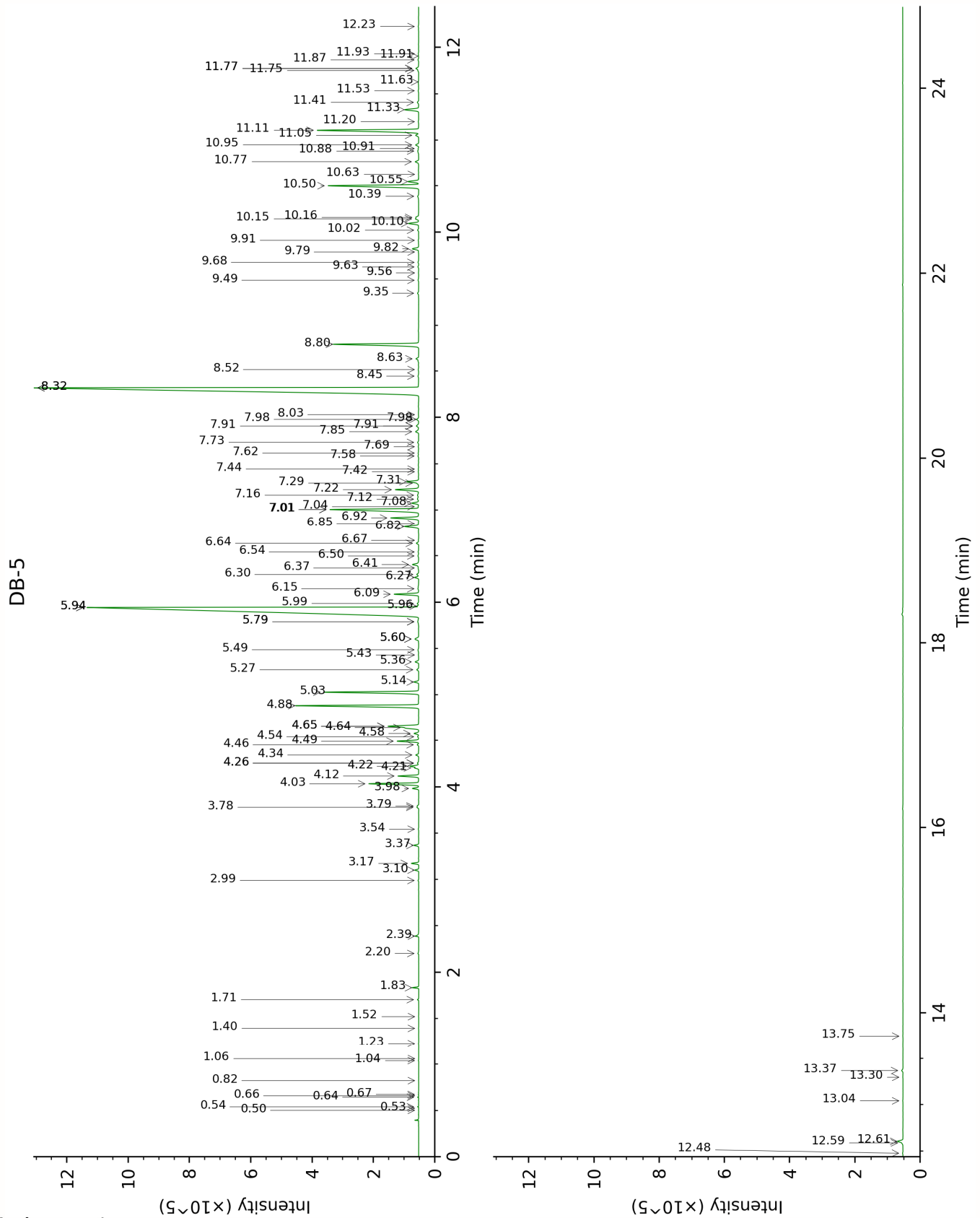
**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

**Bracketed value (xx):** A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

This page was intentionally left blank. The following pages present the complete data of the analysis.







FULL ANALYSIS DATA

Butyral	Column DB-WAX			Column DB-5		
	0.69	839.3	tr	0.50	577.6	tr
Acetic acid	6.87	1412.2	0.01	0.52	596.2	tr
Ethyl acetate	0.74	856.0	tr	0.54	606.9	0.01
Isovaleral	0.83	884.9	0.01	0.64	641.6	0.01
3-Methyl-2-butanone	0.88	901.6	tr	0.66	646.9	tr
2-Methylbutyral	0.81	878.8	0.01	0.67	651.7	0.01
2-Ethylfuran	1.00	919.8	tr	0.82	701.8	tr
Isoamyl alcohol	3.59	1175.1	tr	1.04	733.6	0.01
2-Methylbutanol	3.57	1173.4	0.01	1.06	736.5	tr
Toluene	1.56	1002.0	tr	1.23	759.6	tr
Prenal	3.35*	1156.5	[0.38]	1.40	782.4	tr
Hexanal	1.95*	1038.9	[0.03]	1.52	799.8	0.01
Butyl acetate	1.95*	1038.9	[0.03]	1.70	817.0	0.03
Methyl hexyl ether	1.03	923.7	0.15	1.83	827.6	0.14
(3Z)-Hexenol	5.95	1346.2	0.03	2.20	857.8	0.03
Hexanol	5.59*	1320.5	[0.13]	2.39	873.2	0.12
Tricyclene	1.36	972.7	0.02	2.99	919.0	0.02
$\alpha$ -Thujene	1.54	1000.6	0.11	3.10	926.3	0.11
$\alpha$ -Pinene	1.48	991.5	0.21	3.18	931.1	0.21
Camphene	1.83	1027.8	0.14	3.37	943.9	0.15
Benzaldehyde				3.54	955.4	0.01
Sabinene	2.43	1083.8	0.05	3.78	970.9	0.06
$\beta$ -Pinene	2.24	1066.2	0.05	3.79	971.8	0.04
Octen-3-ol	6.95*	1418.4	[0.21]	3.98	984.3	0.19
Octan-3-one	4.16*	1217.1	[4.65]	4.03	987.6	1.56
Myrcene	3.03	1132.4	0.61	4.12	993.1	0.62
Butyl butyrate	3.73	1185.6	0.12	4.20	998.8	0.11
Octan-3-ol	6.23	1365.9	0.29	4.22	1000.0	0.28
Pseudolimonene	2.99	1129.3	tr	4.26*	1002.2	[0.05]
$\alpha$ -Phellandrene	2.94	1125.4	0.03	4.26*	1002.2	[0.05]
$\Delta$ 3-Carene	2.74	1110.3	0.09	4.34	1007.9	0.10
$\alpha$ -Terpinene	3.12	1139.0	0.04	4.46	1014.8	0.04
Hexyl acetate	4.45*	1238.0	[0.76]	4.49	1017.2	0.67
<i>meta</i> -Cymene	4.26	1223.9	0.03	4.54	1020.2	0.04
<i>para</i> -Cymene	4.27	1224.8	0.15	4.58	1022.4	0.15
Limonene	3.35*	1156.5	[0.38]	4.64*†	1026.4	[0.38]
$\beta$ -Phellandrene	3.44	1163.9	0.39	4.65*†	1027.2	[1.11]
1,8-Cineole	3.46	1165.6	0.72	4.65*†	1027.2	[1.11]
(Z)- $\beta$ -Ocimene	3.96	1202.6	4.29	4.88	1041.1	4.28
(E)- $\beta$ -Ocimene	4.16*	1217.1	[4.65]	5.03	1050.7	3.10
$\gamma$ -Terpinene	3.98	1204.5	0.15	5.14	1057.6	0.15
<i>cis</i> -Sabinene	7.08*	1427.8	[0.16]	5.27	1065.9	0.07

hydrate						
<i>cis</i> -Linalool oxide (fur.)	6.71	1400.6	0.12	5.36	1071.1	0.13
Octanol	8.38*†	1525.2	[29.42]	5.43	1075.8	0.01
$\alpha$ -Pinene oxide analog	5.59*	1320.5	[0.13]	5.49	1079.3	0.04
<i>trans</i> -Linalool oxide (fur.)	7.08*	1427.8	[0.16]	5.60*	1086.5	[0.18]
Terpinolene	4.45*	1238.0	[0.76]	5.60*	1086.5	[0.18]
Rosefuran	6.17	1361.7	0.02	5.79*	1098.2	[0.07]
<i>trans</i> -Sabinene hydrate	8.15	1507.0	0.05	5.79*	1098.2	[0.07]
Linalool	8.29*†	1517.9	[32.29]	5.94*	1107.9	[32.25]
( <i>Z</i> )-6-Methyl-3,5-heptadien-2-one	8.40	1526.2	0.04	5.94*	1107.9	[32.25]
Hotrienol	9.02	1574.5	0.04	5.96	1108.8	0.04
Hexyl propionate	5.42*	1308.0	[0.16]	5.99	1110.6	0.04
Octen-3-yl acetate	5.97	1347.7	0.77	6.09	1117.0	0.77
Unknown LAAN I [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	9.80*	1635.9	[0.99]	6.15	1120.8	0.02
Octan-3-yl acetate	5.42*	1308.0	[0.16]	6.27	1128.5	0.13
allo-Ocimene	5.75	1332.1	0.06	6.30	1130.6	0.07
( <i>Z</i> )-Myroxide	7.00	1421.6	0.02	6.37	1135.1	0.02
Camphor	7.40	1451.1	0.21	6.41	1137.4	0.25
( <i>E</i> )-Myroxide	7.26	1441.2	0.02	6.50	1143.3	0.03
Unknown CIGL I [m/z 81, 138 (33), 96 (27), 67 (20), 79 (19), 95 (16)...]				6.54	1146.1	0.02
Hexyl isobutyrate	5.50	1314.1	0.07	6.64	1152.1	0.08
Nerol oxide	7.03	1424.4	0.02	6.67	1154.1	0.01
Borneol	9.97*†	1649.6	[1.64]	6.82	1163.6	0.52
<i>cis</i> -Linalool oxide (pyr.)	10.50	1693.0	0.01	6.85	1165.9	0.01
Lavandulol	9.80*	1635.9	[0.99]	6.92	1169.9	0.95
(3 <i>E</i> ,5 <i>Z</i> )-Undeca-1,3,5-triene	6.11	1357.5	0.09	7.01*	1175.7	[3.73]
Terpinen-4-ol	8.77	1555.3	3.63	7.01*	1175.7	[3.73]
<i>trans</i> -Linalool oxide (pyr.)	10.81*	1718.5	[0.04]	7.04	1177.7	0.01
Cryptone	9.35*	1600.1	[0.28]	7.08	1180.1	0.23
<i>meta</i> -Cymen-8-ol	11.67	1791.3	0.06	7.12	1182.9	0.06
<i>para</i> -Cymen-8-ol	11.71	1794.2	0.05	7.16	1185.6	0.06

$\alpha$ -Terpineol	9.97*†	1649.6	[1.64]	7.22	1189.4	0.85
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	12.97*	1906.2	[0.22]	7.29	1193.9	0.04
Hexyl butyrate	6.48	1383.8	0.40	7.31	1194.9	0.40
Verbenone	9.75*	1632.3	[4.07]	7.42	1201.7	0.02
Unknown SASC VII [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.67	1471.7	0.01	7.44	1203.5	0.01
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	11.57	1783.1	0.02	7.58	1212.9	0.02
Octyl acetate	7.28	1442.9	0.01	7.62	1215.1	0.02
trans-Carveol	11.61	1786.1	0.01	7.69	1219.6	0.02
Bornyl formate	8.29*†	1517.9	[32.29]	7.73	1222.8	0.04
Nerol	11.24	1755.1	0.14	7.85	1230.5	0.14
Hexyl 2-methylbutyrate	6.67	1397.5	0.05	7.91*	1234.6	[0.11]
Cuminal				7.91*	1234.6	[0.11]
Carvone	10.18	1666.9	0.03	7.98*	1239.3	[0.08]
Neral	9.66	1624.4	0.02	7.98*	1239.3	[0.08]
Hexyl isovalerate	6.95*	1418.4	[0.21]	8.03	1242.7	0.01
Geraniol	11.81	1803.2	0.33	8.32*	1262.1	[30.02]
Linalyl acetate	8.38*†	1525.2	[29.42]	8.32*	1262.1	[30.02]
Geranial	10.35*	1680.8	[0.03]	8.45	1270.5	0.03
2,6-Dimethyl-1,7-octadiene-3,6-diol	14.86	2084.0	0.01	8.52	1275.3	0.02
Bornyl acetate	8.46	1531.3	0.07	8.63	1283.0	0.10
Lavandulyl acetate	8.97	1570.6	3.21	8.80	1294.0	3.22
Hexyl tiglate	9.10	1580.1	0.04	9.35	1332.0	0.05
Hodiendiol derivative	13.11	1918.9	0.04	9.49	1341.8	0.02
$\alpha$ -Terpinyl acetate	9.89	1643.7	0.01	9.56	1347.4	0.01
Unknown SASC II [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	11.27	1757.8	0.03	9.63	1351.9	0.03
Unknown SASC III [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	11.35	1764.0	0.03	9.68	1355.4	0.03
Hodiendiol derivative III	12.89*	1899.0	[0.03]	9.79	1363.3	0.01
Neryl acetate	10.37	1682.2	0.23	9.82	1365.7	0.23

$\alpha$ -Copaene	7.36	1448.2	0.02	9.92	1372.1	0.01
$\beta$ -Bourbonene	7.69	1472.7	0.04	10.02	1379.8	0.04
Geranyl acetate	10.74	1712.6	0.37	10.10	1384.9	0.36
7-epi-Sesquithujene	8.06	1500.4	0.10	10.15	1388.3	0.11
Hexyl hexanoate	9.07	1578.1	0.12	10.16	1389.4	0.10
Sesquithujene	8.38*†	1525.2	[29.42]	10.39	1405.5	0.04
$\beta$ -Caryophyllene	8.67*	1547.4	[3.65]	10.50	1413.9	3.58
$\alpha$ -Santalene	8.48	1532.4	0.45	10.55	1417.2	0.40
Coumarin	17.33	2336.9	0.03	10.63	1423.5	0.01
<i>trans</i> - $\alpha$ -Bergamotene	8.67*	1547.4	[3.65]	10.77	1433.7	0.13
Sesquisabinene A	9.41	1604.9	0.03	10.88	1442.3	0.03
epi- $\beta$ -Santalene	9.18	1586.6	0.03	10.91	1444.2	0.02
$\alpha$ -Humulene	9.49	1611.0	0.11	10.95	1447.2	0.12
$\beta$ -Santalene	9.35*	1600.1	[0.28]	11.05	1454.9	0.12
( <i>E</i> )- $\beta$ -Farnesene	9.75*	1632.3	[4.07]	11.11	1458.9	4.05
Dauca-5,8-diene?	9.35*	1600.1	[0.28]	11.20	1465.8	0.02
Germacrene D	9.98*†	1651.0	[0.25]	11.33	1475.4	0.56
<i>trans</i> - $\beta$ -Bergamotene	9.80*	1635.9	[0.99]	11.41	1481.3	0.05
Isodaucene	10.26	1673.4	0.02	11.53	1490.7	0.02
Hodiendiol derivative II	12.97*	1906.2	[0.22]	11.63	1497.7	0.01
$\beta$ -Bisabolene	10.35*	1680.8	[0.03]	11.75	1507.0	0.02
$\gamma$ -Cadinene	10.59*	1700.3	[0.10]	11.77*	1508.7	[0.12]
Lavandulyl isovalerate	10.91	1727.1	0.01	11.77*	1508.7	[0.12]
Photosantalol	13.52	1956.8	0.02	11.87	1516.0	0.03
$\delta$ -Cadinene	10.59*	1700.3	[0.10]	11.91	1519.2	0.01
$\beta$ -Sesquiphellandrene	10.81*	1718.5	[0.04]	11.93	1521.1	0.02
Isocaryophyllene epoxide B	12.34	1849.8	0.02	12.23	1544.2	0.02
( <i>E</i> )-Nerolidol	13.97	1998.1	0.01	12.48	1563.8	0.02
Caryophyllene oxide isomer	12.89*	1899.0	[0.03]	12.59	1572.6	0.04
Caryophyllene oxide	12.97*	1906.2	[0.22]	12.61	1573.9	0.21
Unknown MECA V [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	14.82	2080.0	0.01	13.04	1608.4	0.01
Caryophylladienol II	16.25	2222.5	0.01	13.30	1629.4	0.01

$\tau$ -Cadinol	15.08	2105.4	0.06	13.37	1635.4	0.05
(3Z)-Caryophylla- 3,8(13)-dien-5 $\beta$ -ol				13.75	1666.6	0.01
Total reported		98.72%			99.52%	

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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