Date : 2024-02-27

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 24B09-NPA01
Customer Identification : Lavender - Bulgaria - NPS00129 - Lot# NP0357
Type : Essential Oil
Source : *Lavandula angustifolia*
Customer : Nature Packaged

Checked an approved by:

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

Notes: 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 from the first version issued on 2024-02-23 to format it for online publication.

Laboratoire PhytoChemia
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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 : Benoit Roger, Ph. D.
Date : 2024-02-23

Physicochemical data

Refractive index : 1.4617 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2024-02-12

Conclusion

No adulterant, contaminant or diluent has been detected using this method.

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Analysis Summary - Consolidated Contents

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

Identification	%	Class
Isobutyral	0.01	Aliphatic aldehyde
Methacrolein	0.01	Aliphatic aldehyde
3-Buten-2-one	0.03	Aliphatic ketone
2-Methyl-3-buten-2-ol	0.02	Aliphatic alcohol
Isovaleral	0.03	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Toluene	0.01	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
Butyl acetate	0.02	Aliphatic ester
Methyl hexyl ether	0.10	Aliphatic ether
(3*Z*)-Hexenol	0.04	Aliphatic alcohol
Hexanol	0.16	Aliphatic alcohol
Tricyclene	0.02	Monoterpene
α-Thujene	0.08	Monoterpene
α-Pinene	0.15	Monoterpene
Camphene	0.15	Monoterpene
α-Fenchene	tr	Monoterpene
Butyl isobutyrate	0.01	Aliphatic ester
Sabinene	0.04	Monoterpene
β-Pinene	0.04	Monoterpene
Octen-3-ol	0.24	Aliphatic alcohol
Octan-3-one	1.25	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	0.65	Monoterpene
Octan-3-ol	0.32	Aliphatic alcohol
Butyl butyrate	0.10	Aliphatic ester
α-Phellandrene	0.02	Monoterpene
Δ3-Carene	0.08	Monoterpene
α-Terpinene	0.01	Monoterpene
Hexyl acetate	0.57	Aliphatic ester
meta-Cymene	0.05	Monoterpene
para-Cymene	0.26	Monoterpene
Limonene	0.41	Monoterpene
1,8-Cineole	0.92	Monoterpenic ether
β-Phellandrene	0.25	Monoterpene
(*Z*)-β-Ocimene	2.22	Monoterpene
(*E*)-β-Ocimene	1.73	Monoterpene
γ-Terpinene	0.06	Monoterpene

cis-Sabinene hydrate	0.04	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.14	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
α-Pinene oxide analog	0.05	Monoterpenic ether
Terpinolene	0.15	Monoterpene
Rosefuran	0.04	Monoterpenic ether
Linalool	36.79	Monoterpenic alcohol
(*Z*)-6-Methyl-3,5-heptadien-2-one	0.05	Aliphatic ketone
β-Thujone	0.04	Monoterpenic ketone
Octen-3-yl acetate	0.68	Aliphatic ester
Unknown	0.04	Unknown
Octan-3-yl acetate	0.11	Aliphatic ester
allo-Ocimene	0.04	Monoterpene
(*Z*)-Myroxide	0.03	Monoterpenic ether
Camphor	0.29	Monoterpenic ketone
(*E*)-Myroxide	0.05	Monoterpenic ether
Hexyl isobutyrate	0.08	Aliphatic ester
Nerol oxide	0.02	Aliphatic ether
Borneol	0.68	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.02	Monoterpenic alcohol
Lavandulol	1.47	Monoterpenic alcohol
Terpinen-4-ol	3.46	Monoterpenic alcohol
Cryptone	0.32	Normonoterpenic ketone
meta-Cymen-8-ol	0.10	Monoterpenic alcohol
para-Cymen-8-ol	0.09	Monoterpenic alcohol
α-Terpineol	1.28	Monoterpenic alcohol
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	0.08	Monoterpenic alcohol
Hexyl butyrate	0.37	Aliphatic ester
Verbenone	0.04	Monoterpenic ketone
Unknown	0.02	Unknown
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.02	Monoterpenic alcohol
trans-Carveol	0.02	Monoterpenic alcohol
Bornyl formate	0.04	Monoterpenic ester
Nerol	0.20	Monoterpenic alcohol
Cuminal	0.05	Monoterpenic aldehyde
Hexyl 2-methylbutyrate	0.04	Aliphatic ester
Neral	0.04	Monoterpenic aldehyde
Carvone	0.07	Monoterpenic ketone
Hexyl isovalerate	0.02	Aliphatic ester
Linalyl acetate	26.69	Monoterpenic ester
Geraniol	0.51	Monoterpenic alcohol
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Geranial	0.06	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.02	Monoterpenic alcohol

Bornyl acetate	0.11	Monoterpenic ester
Lavandulyl acetate	2.93	Monoterpenic ester
Hexyl tiglate	0.05	Aliphatic ester
Hodiendiol derivative	0.02	Oxygenated monoterpene
Unknown	0.03	Oxygenated monoterpene
Unknown	0.03	Oxygenated monoterpene
Neryl acetate	0.33	Monoterpenic ester
β-Bourbonene	0.04	Sesquiterpene
Geranyl acetate	0.55	Monoterpenic ester
7-epi-Sesquithujene	0.13	Sesquiterpene
Hexyl hexanoate	0.11	Aliphatic ester
Isocaryophyllene	0.01	Sesquiterpene
cis-α-Bergamotene	0.05	Sesquiterpene
β-Caryophyllene	3.34	Sesquiterpene
α-Santalene	0.41	Sesquiterpene
Coumarin	0.12	Coumarin
trans-α-Bergamotene	0.14	Sesquiterpene
Sesquisabinene A	0.03	Sesquiterpene
cis-β-Bergamotene?	0.03	Sesquiterpene
α-Humulene	0.12	Sesquiterpene
Lavandulyl butyrate?	0.12	Monoterpenic ester
(*E*)-β-Farnesene	4.20	Sesquiterpene
Dauca-5,8-diene?	0.02	Sesquiterpene
Germacrene D	0.31	Sesquiterpene
trans-β-Bergamotene	0.06	Sesquiterpene
Isodaucene	0.02	Sesquiterpene
γ-Cadinene	0.14	Sesquiterpene
β-Bisabolene	0.03	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.04	Sesquiterpenic ether
(*E*)-Nerolidol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.08	Sesquiterpenic ether
Dendrolasin	0.04	Sesquiterpenic ether
Caryophyllene oxide	0.42	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
τ-Cadinol	0.08	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.01	Sesquiterpenic alcohol
Consolidated total	**98.70**	

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.

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

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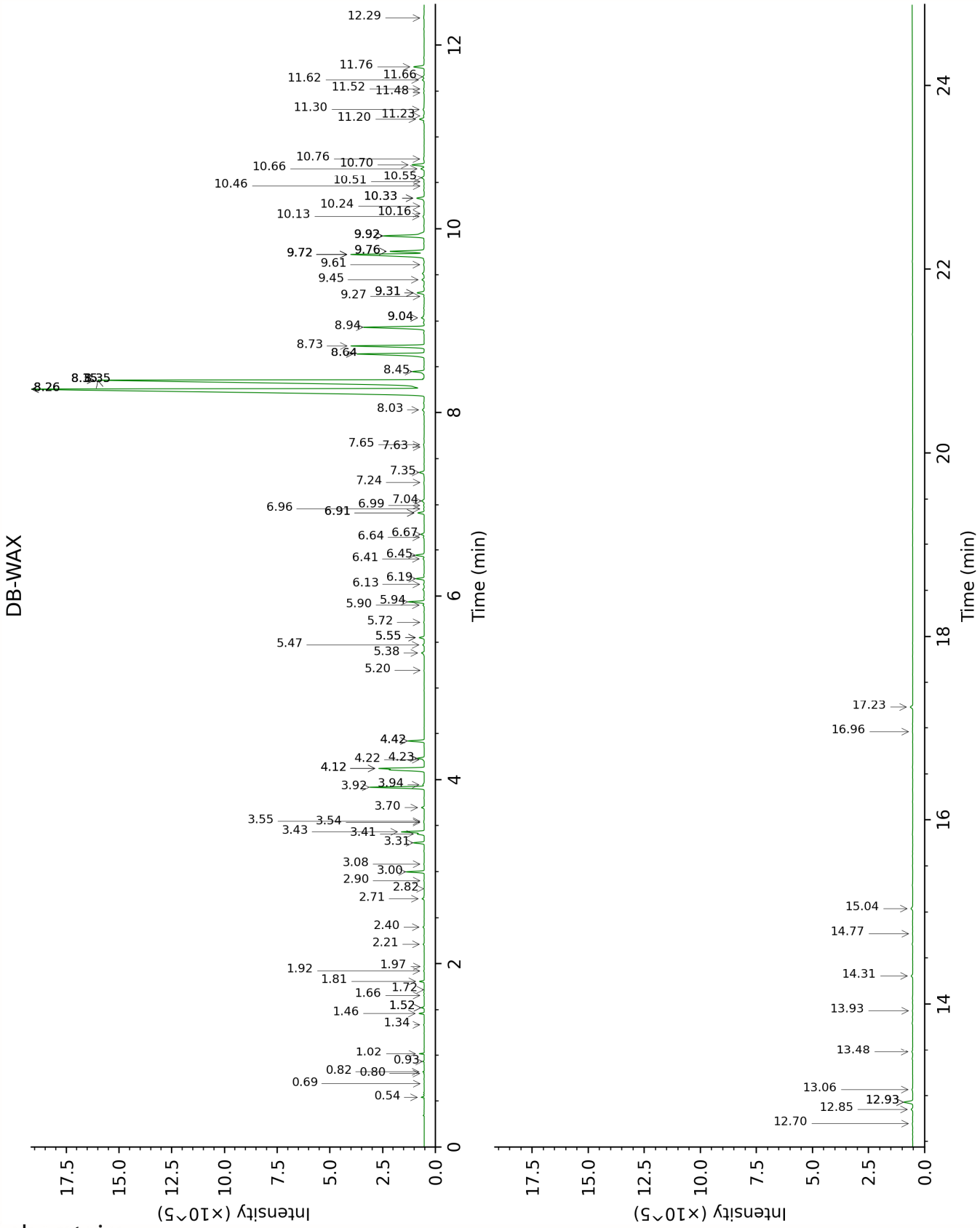
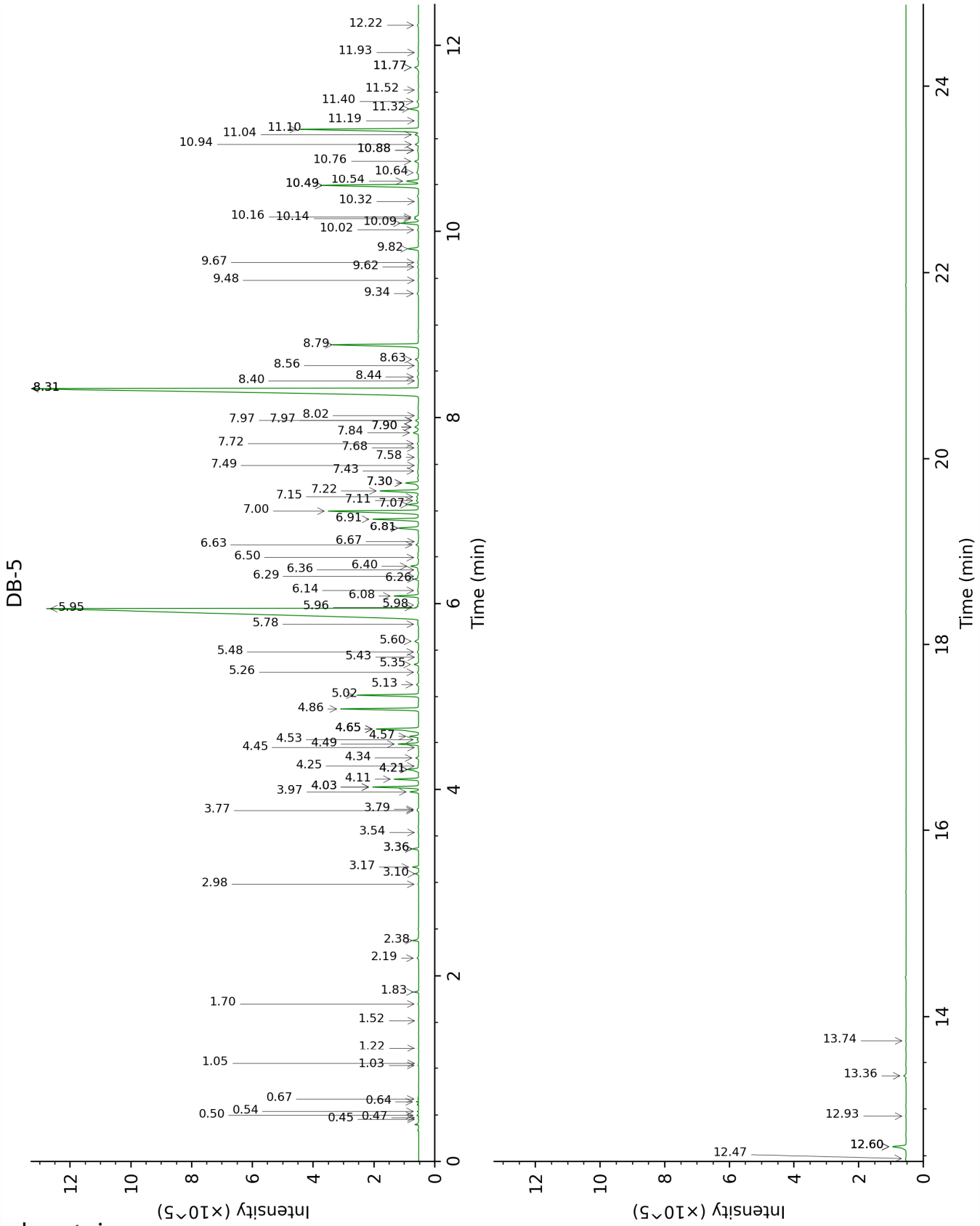

DB-WAX
Time (min)
Intensity (×10^5)
12.29
11.76
11.66
11.62
11.52
11.48
11.30
11.23
11.20
10.76
10.70
10.66
10.55
10.51
10.46
10.33
10.24
10.16
10.13
9.92
9.76
9.72
9.61
9.45
9.31
9.27
9.04
8.94
8.73
8.64
8.45
8.26
8.03
7.65
7.63
7.35
7.24
7.04
6.99
6.96
6.91
6.67
6.64
6.45
6.41
6.19
6.13
5.94
5.90
5.72
5.55
5.47
5.38
5.20
4.42
4.23
4.22
4.12
3.94
3.92
3.70
3.54
3.55
3.43
3.41
3.31
3.08
3.00
2.90
2.82
2.71
2.40
2.21
1.97
1.92
1.81
1.72
1.66
1.52
1.46
1.34
1.02
0.93
0.82
0.80
0.69
0.54
17.23
16.96
15.04
14.77
14.31
13.93
13.48
13.06
12.93
12.85
12.70


DB-5
Time (min)
Intensity (×10^5)
12.22
11.93
11.77
11.52
11.40
11.32
11.19
11.10
11.04
10.94
10.88
10.76
10.64
10.54
10.49
10.32
10.16
10.14
10.09
10.02
9.82
9.67
9.62
9.48
9.34
8.79
8.63
8.56
8.44
8.40
8.31
8.02
7.97
7.97
7.90
7.84
7.72
7.68
7.58
7.49
7.43
7.30
7.22
7.15
7.11
7.07
7.00
6.91
6.81
6.67
6.63
6.50
6.40
6.36
6.29
6.26
6.14
6.08
5.98
5.96
5.95
5.78
5.60
5.48
5.43
5.35
5.26
5.13
5.02
4.86
4.65
4.57
4.53
4.49
4.45
4.34
4.25
4.21
4.11
4.03
3.97
3.79
3.77
3.54
3.36
3.17
3.10
2.98
2.38
2.19
1.83
1.70
1.52
1.22
1.05
1.03
0.67
0.64
0.54
0.50
0.47
0.45
13.74
13.36
12.93
12.60
12.47

FULL ANALYSIS DATA

Isobutyral	Column DB-WAX			Column DB-5		
	0.54	778.1	0.08	0.45	537.4	0.01
Methacrolein	0.69	842.7	tr	0.47	551.9	0.01
3-Buten-2-one	0.93	912.7	0.03	0.50	572.5	0.03
2-Methyl-3-buten-2-ol	1.66	1014.6	0.01	0.54	606.5	0.02
Isovaleral	0.82	885.6	0.03	0.64	641.2	0.03
2-Methylbutyral	0.80	879.2	0.01	0.67	651.3	0.01
Isoamyl alcohol	3.54	1174.7	0.01	1.03	732.9	0.01
2-Methylbutanol	3.55	1175.7	0.02	1.05	736.0	0.01
Toluene	1.52*	1001.4	[0.09]	1.22	759.2	0.01
Hexanal	1.97	1044.2	0.01	1.52	800.0	0.01
Butyl acetate	1.92	1039.7	0.02	1.70	817.0	0.02
Methyl hexyl ether	1.02	925.3	0.10	1.83	827.5	0.10
(3*Z*)-Hexenol	5.90	1345.1	0.05	2.19	857.3	0.04
Hexanol	5.55*	1319.7	[0.20]	2.38	872.8	0.16
Tricyclene	1.34	973.5	0.02	2.98	919.0	0.02
α-Thujene	1.52*	1001.4	[0.09]	3.10	926.4	0.08
α-Pinene	1.46	992.0	0.15	3.17	931.1	0.15
Camphene	1.81	1029.0	0.15	3.36*	944.0	[0.16]
α-Fenchene	1.72	1020.4	tr	3.36*	944.0	[0.16]
Butyl isobutyrate	2.82	1119.8	0.01	3.54	955.5	0.01
Sabinene	2.40	1084.6	0.05	3.77	971.0	0.04
β-Pinene	2.21	1067.0	0.04	3.79	971.9	0.04
Octen-3-ol	6.91*	1418.5	[0.27]	3.97	984.2	0.24
Octan-3-one	4.12*	1218.5	[2.99]	4.03*	987.6	[1.26]
6-Methyl-5-hepten-2-one	5.20	1295.6	0.01	4.03*	987.6	[1.26]
Myrcene	3.00	1133.8	0.65	4.11	993.2	0.65
Octan-3-ol	6.19	1365.9	0.32	4.21*	1000.0	[0.41]
Butyl butyrate	3.70	1187.1	0.10	4.21*	1000.0	[0.41]
α-Phellandrene	2.90	1126.5	0.02	4.25	1002.4	0.02
Δ3-Carene	2.71	1111.6	0.08	4.34	1008.0	0.08
α-Terpinene	3.08	1140.2	0.02	4.45	1015.0	0.01
Hexyl acetate	4.42*	1239.9	[0.64]	4.49	1017.3	0.57
meta-Cymene	4.22*†	1225.3	[0.03]	4.53	1020.3	0.05
para-Cymene	4.23*†	1226.4	[0.27]	4.57	1022.5	0.26
Limonene	3.32	1157.9	0.41	4.65*	1027.4	[1.59]
1,8-Cineole	3.43	1167.0	0.92	4.65*	1027.4	[1.59]
β-Phellandrene	3.41	1165.2	0.25	4.65*	1027.4	[1.59]
(*Z*)-β-Ocimene	3.92	1203.9	2.23	4.86	1040.9	2.22
(*E*)-β-Ocimene	4.12*	1218.5	[2.99]	5.02	1050.6	1.73
γ-Terpinene	3.94	1205.8	0.07	5.13	1057.7	0.06

cis-Sabinene hydrate	7.04	1428.2	0.13	5.26	1065.9	0.04
cis-Linalool oxide (fur.)	6.67	1400.6	0.14	5.35	1071.2	0.14
Octanol	8.35*	1527.0	[26.55]	5.43	1076.0	0.01
α-Pinene oxide analog	5.55*	1319.7	[0.20]	5.48	1079.5	0.05
Terpinolene	4.42*	1239.9	[0.64]	5.60	1086.7	0.15
Rosefuran	6.13	1361.4	0.03	5.78	1098.2	0.04
Linalool	8.26*	1519.4	[36.74]	5.95	1108.7	36.79
(*Z*)-6-Methyl-3,5-heptadien-2-one	8.35*	1527.0	[26.55]	5.96	1109.5	0.05
β-Thujone	6.41	1381.4	0.04	5.98	1111.1	0.04
Octen-3-yl acetate	5.94	1347.7	0.67	6.08	1117.3	0.68
Unknown LAAN I [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	9.76*	1637.5	[1.50]	6.14	1121.1	0.04
Octan-3-yl acetate	5.38	1307.7	0.11	6.26	1128.9	0.11
allo-Ocimene	5.72	1331.6	0.02	6.29	1130.8	0.04
(*Z*)-Myroxide	6.99	1424.5	0.03	6.36	1135.2	0.03
Camphor	7.35	1451.3	0.23	6.40	1137.7	0.29
(*E*)-Myroxide	7.24	1443.1	0.03	6.50	1143.6	0.05
Hexyl isobutyrate	5.47	1314.0	0.06	6.63	1152.4	0.08
Nerol oxide	6.96	1421.8	0.03	6.66	1154.5	0.02
Borneol	9.92*	1651.1	[2.24]	6.81*	1163.7	[0.70]
cis-Linalool oxide (pyr.)	10.46	1695.0	0.02	6.81*	1163.7	[0.70]
Lavandulol	9.76*	1637.5	[1.50]	6.91	1170.3	1.47
Terpinen-4-ol	8.73	1556.5	3.37	7.00	1175.9	3.46
Cryptone	9.31*	1601.1	[0.35]	7.07	1180.3	0.32
meta-Cymen-8-ol	11.62	1793.2	0.08	7.11	1183.1	0.10
para-Cymen-8-ol	11.66	1796.0	0.07	7.15	1185.7	0.09
α-Terpineol	9.92*	1651.1	[2.24]	7.22	1189.7	1.28
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	12.93*	1908.9	[0.45]	7.30*	1195.1	[0.45]
Hexyl butyrate	6.45	1384.2	0.37	7.30*	1195.1	[0.45]
Verbenone	9.72*	1634.8	[4.24]	7.43	1203.3	0.04
Unknown SASC	7.63	1471.8	0.01	7.49	1207.2	0.02

VII [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]						
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	11.48	1781.3	0.03	7.58	1213.1	0.02
trans-Carveol	11.52	1784.8	0.03	7.68	1219.8	0.02
Bornyl formate	8.26*	1519.4	[36.74]	7.72	1222.8	0.04
Nerol	11.20	1757.0	0.22	7.84	1230.6	0.20
Cuminal	10.76	1720.2	0.05	7.90*	1234.7	[0.14]
Hexyl 2-methylbutyrate	6.64	1398.3	0.04	7.90*	1234.7	[0.14]
Neral	9.61	1625.8	0.04	7.97*	1239.4	[0.10]
Carvone	10.13	1668.2	0.07	7.97*	1239.4	[0.10]
Hexyl isovalerate	6.91*	1418.5	[0.27]	8.02	1242.9	0.02
Linalyl acetate	8.35*	1527.0	[26.55]	8.31*	1262.3	[27.19]
Geraniol	11.76	1805.4	0.51	8.31*	1262.3	[27.19]
trans-Ascaridole glycol	14.31	2037.9	0.08	8.40	1267.8	0.01
Geranial	10.24	1677.3	0.05	8.44	1270.6	0.06
2,6-Dimethyl-1,7-octadiene-3,6-diol	14.77	2082.0	0.02	8.56	1278.8	0.02
Bornyl acetate	8.35*	1527.0	[26.55]	8.63	1283.2	0.11
Lavandulyl acetate	8.94	1572.2	2.89	8.79	1294.2	2.93
Hexyl tiglate	9.04*	1580.1	[0.17]	9.34	1332.2	0.05
Hodiendiol derivative	13.06	1921.6	0.04	9.48	1342.1	0.02
Unknown SASC II [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	11.23	1760.0	0.04	9.62	1352.1	0.03
Unknown SASC III [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	11.30	1765.9	0.08	9.67	1355.6	0.03
Neryl acetate	10.33*	1684.3	[0.38]	9.82	1365.8	0.33
β-Bourbonene	7.65	1473.8	0.03	10.02	1380.0	0.04
Geranyl acetate	10.70	1714.8	0.55	10.09	1385.1	0.55
7-epi-Sesquithujene	8.03	1501.9	0.10	10.14	1388.6	0.13
Hexyl hexanoate	9.04*	1580.1	[0.17]	10.16	1389.7	0.11

Isocaryophyllene	8.26*	1519.4	[36.74]	10.32	1401.4	0.01
cis-α-Bergamotene	8.35*	1527.0	[26.55]	10.49*	1414.0	[3.39]
β-Caryophyllene	8.64*	1549.1	[3.47]	10.49*	1414.0	[3.39]
α-Santalene	8.45	1534.2	0.54	10.54	1417.4	0.41
Coumarin	17.23	2333.9	0.13	10.64	1424.7	0.12
trans-α-Bergamotene	8.64*	1549.1	[3.47]	10.76	1433.7	0.14
Sesquisabinene A	9.31*	1601.1	[0.35]	10.88*	1442.5	[0.06]
cis-β-Bergamotene?				10.88*	1442.5	[0.06]
α-Humulene	9.45	1612.6	0.11	10.94	1447.2	0.12
Lavandulyl butyrate?	10.66	1711.1	0.16	11.04	1455.0	0.12
(*E*)-β-Farnesene	9.72*	1634.8	[4.24]	11.10	1459.3	4.20
Dauca-5,8-diene?	9.27	1598.1	0.02	11.19	1466.1	0.02
Germacrene D	9.92*	1651.1	[2.24]	11.32	1475.5	0.31
trans-β-Bergamotene	9.72*	1634.8	[4.24]	11.40	1481.5	0.06
Isodaucene	10.16	1670.8	0.01	11.52	1490.6	0.02
γ-Cadinene	10.55	1702.3	0.14	11.76*	1508.7	[0.17]
β-Bisabolene	10.33*	1684.3	[0.38]	11.76*	1508.7	[0.17]
δ-Cadinene	10.51	1698.8	0.02	11.93	1521.3	0.01
Isocaryophyllene epoxide B	12.29	1852.4	0.03	12.22	1544.3	0.04
(*E*)-Nerolidol	13.93	2001.5	0.02	12.47	1564.0	0.03
Caryophyllene oxide isomer	12.85	1901.6	0.08	12.60*	1574.1	[0.54]
Dendrolasin	12.70	1887.9	0.04	12.60*	1574.1	[0.54]
Caryophyllene oxide	12.93*	1908.9	[0.45]	12.60*	1574.1	[0.54]
Humulene epoxide II	13.48	1959.7	0.04	12.93	1599.8	0.01
τ-Cadinol	15.04	2108.5	0.11	13.36	1635.2	0.08
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	16.96	2305.0	0.02	13.74	1666.8	0.01
Total reported		98.20%			98.74%	

*: 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

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