Date : 2023-07-18

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 23G11-PTH02
Customer Identification : Spearmint - USA - S30112R
Type : Essential Oil
Source : *Mentha spicata*
Customer : Plant Therapy

Checked an approved by:

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Méthode certifiée ISO 17025:2017 Certified method

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 : Amélie Simard, Analyste
Date : 2023-07-17

Physicochemical data

Refractive index : 1.4891 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2023-07-17

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
Isovaleral	0.04	Aliphatic aldehyde
2-Methylbutyral	0.03	Aliphatic aldehyde
Valeral	tr	Aliphatic aldehyde
2-Ethylfuran	0.01	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl 2-methylbutyrate	0.01	Aliphatic ester
Hexanal	tr	Aliphatic aldehyde
Ethyl 2-methylbutyrate	0.04	Aliphatic ester
(3*Z*)-Hexenol	0.02	Aliphatic alcohol
(2*E*)-Hexenol	0.03	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.06	Furan
Hashishene	0.10	Monoterpene
α-Thujene	0.05	Monoterpene
α-Pinene	0.60	Monoterpene
Camphene	0.02	Monoterpene
α-Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.37	Monoterpene
β-Pinene	0.65	Monoterpene
Octen-3-one	0.01	Aliphatic ketone
Octen-3-ol	0.02	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
Myrcene	1.97	Monoterpene
Octan-3-ol	0.76	Aliphatic alcohol
Pseudolimonene	0.03	Monoterpene
α-Phellandrene	0.02	Monoterpene
Octanal	0.02	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.22	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
para-Cymene	0.18	Monoterpene
Limonene	13.49	Monoterpene
1,8-Cineole	1.54	Monoterpenic ether
β-Phellandrene	0.05	Monoterpene
2-Ethylhexanol	0.01	Aliphatic alcohol
(*Z*)-β-Ocimene	0.17	Monoterpene
(*E*)-β-Ocimene	0.08	Monoterpene

γ-Terpinene	0.37	Monoterpene
cis-Sabinene hydrate	0.73	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
Terpinolene	0.11	Monoterpene
para-Cymenene	0.02	Monoterpene
trans-Sabinene hydrate	0.07	Monoterpenic alcohol
Isoamyl 2-methylbutyrate	0.02	Aliphatic ester
Linalool	0.08	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.03	Aliphatic ester
Isoamyl isovalerate	0.01	Aliphatic ester
Nonanal	0.01	Aliphatic aldehyde
Octen-3-yl acetate	0.02	Aliphatic ester
trans-para-Mentha-2,8-dien-1-ol	0.09	Monoterpenic alcohol
Octan-3-yl acetate	0.26	Aliphatic ester
cis-Limonene oxide	0.03	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.10	Monoterpenic alcohol
Camphor	0.06	Monoterpenic ketone
Isopulegol	0.03	Monoterpenic alcohol
Menthone	0.67	Monoterpenic ketone
Isomenthone	0.03	Monoterpenic ketone
Menthofuran	0.04	Monoterpenic ether
neo-Menthol	0.17	Monoterpenic alcohol
Menthol	0.54	Monoterpenic alcohol
Terpinen-4-ol	0.77	Monoterpenic alcohol
Isomenthol	0.01	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.13	Monoterpenic alcohol
cis-Dihydrocarvone	1.37	Monoterpenic ketone
neo-Dihydrocarveol	0.14	Monoterpenic alcohol
Dihydrocarveol	0.18	Monoterpenic alcohol
trans-Dihydrocarvone	0.16	Monoterpenic ketone
trans-Piperitol	0.01	Monoterpenic alcohol
iso-Dihydrocarveol ?	0.01	Monoterpenic alcohol
trans-Carveol	0.30	Monoterpenic alcohol
Carvone	64.12	Monoterpenic ketone
cis-Carveol	0.22	Monoterpenic alcohol
Piperitone	0.27	Monoterpenic ketone
cis-Carvone oxide	tr	Monoterpenic ketone
Isopiperitenone	0.06	Monoterpenic ketone
trans-Carvone oxide	0.02	Monoterpenic ketone
Dihydroedulan I	0.13	Terpenic ether
Menthyl acetate	0.02	Monoterpenic ester
Dihydroedulan II	0.02	Terpenic ether
Isomenthyl acetate	tr	Monoterpenic alcohol

neo-Dihydrocarvyl acetate	0.01	Monoterpenic ester
Dihydrocarvyl acetate	0.19	Monoterpenic ester
Bicycloelemene	0.02	Sesquiterpene
trans-Carvyl acetate	0.02	Monoterpenic ester
α-Cubebene	0.02	Sesquiterpene
Evodone	0.03	Monoterpenic ketone
iso-Dihydrocarvyl acetate	0.05	Monoterpenic ester
cis-Carvyl acetate	0.31	Monoterpenic ester
α-Copaene	0.06	Sesquiterpene
β-Bourbonene	1.22	Sesquiterpene
1,5-diepi-β-Bourbonene	0.08	Sesquiterpene
β-Elemene	0.10	Sesquiterpene
(*Z*)-Jasmone	0.30	Jasmonate
Unknown	0.03	Sesquiterpene
Isocaryophyllene	0.05	Sesquiterpene
β-Caryophyllene	1.25	Sesquiterpene
β-Copaene	0.15	Sesquiterpene
Isogermacrene D	0.14	Sesquiterpene
α-Humulene	0.10	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
(*E*)-β-Farnesene	0.64	Sesquiterpene
Unknown	0.09	Sesquiterpene
γ-Muurolene	0.01	Sesquiterpene
Germacrene D	0.90	Sesquiterpene
Viridiflorene	0.03	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.06	Sesquiterpene
α-Cadinene	tr	Sesquiterpene
1,5-Epoxysalvial-4(14)-ene	0.01	Sesquiterpenic ether
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Viridiflorol	0.22	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
τ-Muurolol	tr	Sesquiterpenic alcohol
α-Muurolol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.01	Sesquiterpenic alcohol
meta-Camphorene	0.02	Diterpene
para-Camphorene	0.01	Diterpene
Consolidated total	**98.49**	

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

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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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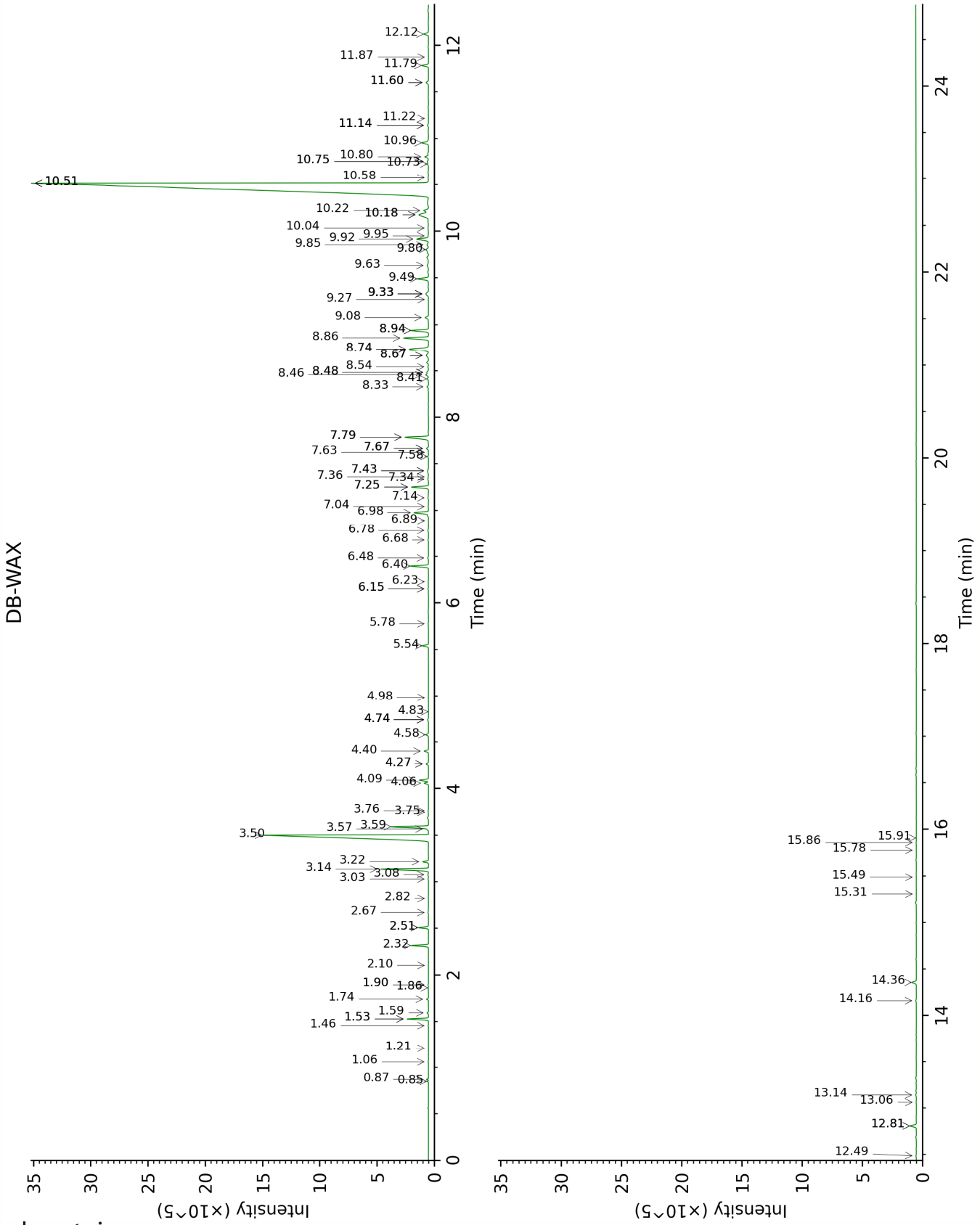
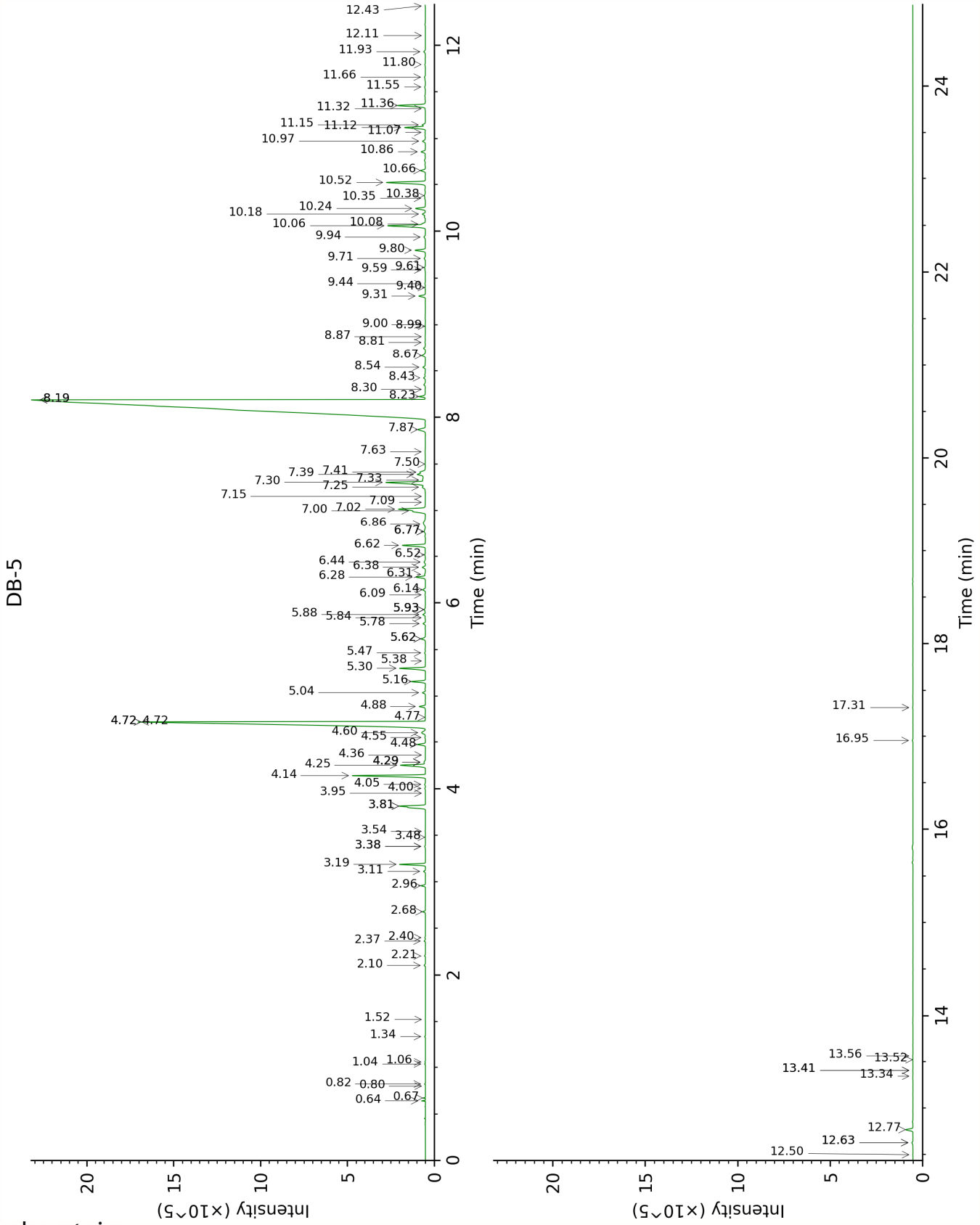

DB-WAX
Time (min)
Intensity (×10^5)
12.12
11.87
11.79
11.60
11.22
11.14
10.96
10.80
10.75
10.73
10.58
10.51
10.22
10.18
10.04
9.95
9.92
9.85
9.80
9.63
9.49
9.33
9.27
9.08
8.94
8.86
8.74
8.67
8.54
8.48
8.46
8.41
8.33
7.79
7.67
7.63
7.58
7.43
7.36
7.34
7.25
7.14
7.04
6.98
6.89
6.78
6.68
6.48
6.40
6.23
6.15
5.78
5.54
4.98
4.83
4.74
4.58
4.40
4.27
4.09
4.06
3.76
3.75
3.59
3.57
3.50
3.22
3.14
3.08
3.03
2.82
2.67
2.51
2.32
2.10
1.90
1.86
1.74
1.59
1.53
1.46
1.21
1.06
0.87
0.85
15.91
15.86
15.78
15.49
15.31
14.36
14.16
13.14
13.06
12.81
12.49


DB-5
Time (min)
Intensity (×10^5)
12.43
12.11
11.93
11.80
11.66
11.55
11.32
11.36
11.15
11.12
11.07
10.97
10.86
10.66
10.52
10.35
10.38
10.18
10.24
10.06
10.08
9.94
9.80
9.71
9.59
9.61
9.44
9.40
9.31
9.00
8.99
8.87
8.81
8.67
8.54
8.43
8.30
8.23
8.19
7.87
7.63
7.50
7.39
7.41
7.30
7.33
7.25
7.15
7.09
7.00
7.02
6.86
6.77
6.62
6.52
6.44
6.38
6.28
6.31
6.09
6.14
5.88
5.84
5.93
5.78
5.62
5.47
5.38
5.30
5.16
5.04
4.88
4.77
4.72
4.72
4.60
4.55
4.48
4.36
4.29
4.25
4.14
4.05
4.00
3.95
3.81
3.54
3.48
3.38
3.19
3.11
2.96
2.68
2.37
2.40
2.21
2.10
1.52
1.34
1.04
1.06
0.82
0.80
0.64
0.67
17.31
16.95
13.56
13.52
13.41
13.34
12.77
12.63
12.50

FULL ANALYSIS DATA

Isovaleral	Column DB-WAX			Column DB-5		
	0.87	890.3	0.04	0.64	640.5	0.04
2-Methylbutyral	0.85	883.1	0.03	0.67	650.6	0.03
Valeral	1.21	942.1	tr	0.80	693.4	tr
2-Ethylfuran	1.06	919.5	0.01	0.82	701.0	0.01
Isoamyl alcohol	3.76	1182.2	0.02	1.04	732.5	0.01
2-Methylbutanol	3.75	1180.9	0.01	1.06	735.6	0.01
Methyl 2-methylbutyrate	1.46	979.1	0.01	1.34	774.0	0.01
Hexanal	2.10	1045.2	0.01	1.52	799.2	tr
Ethyl 2-methylbutyrate	1.90*	1025.2	[0.01]	2.10	848.7	0.04
(3*Z*)-Hexenol	6.15*	1350.9	[0.02]	2.21	857.0	0.02
(2*E*)-Hexenol	6.48	1374.6	0.04	2.37	870.2	0.03
Hexanol	5.78	1323.9	0.02	2.40	873.2	0.01
trans-2,5-Diethyltetrahydrofuran	1.74	1010.7	0.06	2.68	895.9	0.06
Hashishene	1.53*	990.1	[0.70]	2.96	915.9	0.10
α-Thujene	1.60	996.7	0.04	3.11	926.0	0.05
α-Pinene	1.53*	990.1	[0.70]	3.19	930.9	0.60
Camphene	1.90*	1025.2	[0.01]	3.38*	943.6	[0.03]
α-Fenchene	1.86	1022.2	0.01	3.38*	943.6	[0.03]
Thuja-2,4(10)-diene	2.51*	1083.9	[0.38]	3.48	950.1	0.01
Benzaldehyde	7.63	1458.6	0.01	3.54	954.2	0.01
Sabinene	2.51*	1083.9	[0.38]	3.81*	972.0	[1.02]
β-Pinene	2.32	1065.5	0.65	3.81*	972.0	[1.02]
Octen-3-one	4.83	1260.4	tr	3.95	981.1	0.01
Octen-3-ol	7.14	1422.5	0.04	4.00	984.5	0.02
Octan-3-one	4.27*	1219.5	[0.09]	4.05	987.4	0.03
Myrcene	3.14	1133.7	1.98	4.14	993.5	1.97
Octan-3-ol	6.40	1368.4	0.75	4.25	1000.9	0.76
Pseudolimonene	3.08	1129.2	0.03	4.28*	1003.0	[0.06]
α-Phellandrene	3.03	1125.5	0.02	4.28*	1003.0	[0.06]
Octanal	4.74*	1254.1	[0.04]	4.28*	1003.0	[0.06]
Δ3-Carene	2.82	1109.4	0.01	4.36	1007.8	0.01
α-Terpinene	3.22	1139.9	0.22	4.48	1014.9	0.22
Carvomenthene	2.67	1097.8	0.02	4.55	1019.6	0.02
para-Cymene	4.40	1229.5	0.17	4.60	1022.8	0.18
Limonene	3.50	1161.9	13.49	4.72*	1030.0	[15.01]
1,8-Cineole	3.59	1168.9	1.54	4.72*	1030.0	[15.01]
β-Phellandrene	3.57	1167.1	0.05	4.72*	1030.0	[15.01]
2-Ethylhexanol	7.67*	1461.7	[0.09]	4.77	1033.1	0.01
(*Z*)-β-Ocimene	4.06	1204.4	0.16	4.88	1040.4	0.17
(*E*)-β-Ocimene	4.27*	1219.5	[0.09]	5.04	1050.1	0.08
γ-Terpinene	4.09	1206.8	0.37	5.16	1057.6	0.37

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cis-Sabinene hydrate	7.25*	1431.1	[0.74]	5.30	1066.5	0.73
cis-Linalool oxide (fur.)	6.89	1404.2	tr	5.38	1071.3	0.01
Octanol	8.54	1528.0	0.03	5.47	1076.7	0.03
Terpinolene	4.58	1242.4	0.11	5.62*	1086.2	[0.14]
para-Cymenene	6.68	1388.5	0.02	5.62*	1086.2	[0.14]
trans-Sabinene hydrate	8.33	1511.5	0.07	5.78	1096.4	0.07
Isoamyl 2-methylbutyrate	4.74*	1254.1	[0.04]	5.84	1100.3	0.02
Linalool	8.41	1518.1	0.07	5.88	1102.4	0.08
2-Methylbutyl 2-methylbutyrate	4.74*	1254.1	[0.04]	5.93*	1105.8	[0.05]
Isoamyl isovalerate	4.98	1271.9	0.01	5.93*	1105.8	[0.05]
Nonanal	6.23	1356.4	0.01	5.93*	1105.8	[0.05]
Octen-3-yl acetate	6.15*	1350.9	[0.02]	6.09	1115.9	0.02
trans-para-Mentha-2,8-dien-1-ol	9.33*	1588.7	[0.21]	6.14	1119.4	0.09
Octan-3-yl acetate	5.54	1307.1	0.25	6.28	1128.1	0.26
cis-Limonene oxide	6.78	1396.1	0.03	6.31	1129.9	0.03
cis-para-Mentha-2,8-dien-1-ol	9.85	1630.8	0.10	6.38	1134.7	0.10
Camphor	7.58	1455.3	0.03	6.44	1138.3	0.06
Isopulegol	8.48*	1523.5	[0.09]	6.52	1143.3	0.03
Menthone	6.98	1410.7	0.67	6.62	1149.8	0.67
Isomenthone	7.34	1437.3	0.03	6.77*	1159.2	[0.07]
Menthofuran	7.25*	1431.1	[0.74]	6.77*	1159.2	[0.07]
neo-Menthol	8.94*	1558.6	[0.78]	6.86†	1164.8	0.06
Menthol	9.49	1601.6	0.54	7.00*†	1173.9	[0.40]
Terpinen-4-ol	8.94*	1558.6	[0.78]	7.02*†	1175.0	[0.91]
Isomenthol	9.27	1584.0	0.01	7.09	1179.6	0.01
para-Cymen-8-ol	11.87	1797.9	tr	7.15	1183.7	0.01
α-Terpineol	10.18*	1656.6	[0.90]	7.25	1190.0	0.13
cis-Dihydrocarvone	8.86	1552.3	1.21	7.30	1193.3	1.37
neo-Dihydrocarveol	10.51*	1683.6	[64.78]	7.33	1194.9	0.14
Dihydrocarveol	10.80	1707.9	0.18	7.39*†	1198.8	[0.36]
trans-Dihydrocarvone	9.08	1569.2	0.16	7.41*†	1200.2	[0.21]
trans-Piperitol	10.75*	1703.6	[0.06]	7.50	1205.9	0.01
iso-Dihydrocarveol ?	11.14*	1736.2	[0.05]	7.63	1214.7	0.01
trans-Carveol	11.79	1790.2	0.30	7.87	1230.6	0.30
Carvone	10.51*	1683.6	[64.78]	8.19*†	1251.9	[64.46]
cis-Carveol	12.12	1819.6	0.22	8.19*†	1251.9	[64.46]
Piperitone	10.22	1660.3	0.27	8.23*†	1254.3	[0.15]
cis-Carvone oxide	11.22	1742.4	tr	8.30	1259.4	tr
Isopiperitenone	11.60*	1774.6	[0.13]	8.43	1267.7	0.06
trans-Carvone oxide	11.60*	1774.6	[0.13]	8.57	1277.2	0.02

Dihydroedulan I	7.43*	1444.0	[0.08]	8.67	1283.7	0.13
Menthyl acetate	8.48*	1523.5	[0.09]	8.81	1293.5	0.02
Dihydroedulan II	7.79*	1470.6	[1.25]	8.87	1297.6	0.02
Isomenthyl acetate	8.67*	1537.5	[0.17]	8.99	1305.2	tr
neo-Dihydrocarvyl acetate	9.33*	1588.7	[0.21]	9.00	1306.3	0.01
Dihydrocarvyl acetate	9.80	1626.7	0.16	9.31	1327.9	0.19
Bicycloelemene	7.36	1439.2	0.01	9.40	1334.3	0.02
trans-Carvyl acetate	10.58	1688.7	0.02	9.44	1337.2	0.02
α-Cubebene	7.04	1415.5	0.02	9.59	1347.6	0.02
Evodone	12.81*	1879.4	[0.30]	9.61	1349.4	0.03
iso-Dihydrocarvyl acetate				9.71	1356.2	0.05
cis-Carvyl acetate	10.96	1720.5	0.34	9.80	1362.4	0.31
α-Copaene	7.43*	1444.0	[0.08]	9.94	1372.2	0.06
β-Bourbonene	7.79*	1470.6	[1.25]	10.06	1380.8	1.22
1,5-diepi-β-Bourbonene	7.67*	1461.7	[0.09]	10.08	1382.0	0.08
β-Elemene	8.74*	1543.0	[1.20]	10.18	1389.6	0.10
(*Z*)-Jasmone	12.81*	1879.4	[0.30]	10.24	1393.8	0.30
Unknown MEPI VIII [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]				10.35	1401.5	0.03
Isocaryophyllene	8.46	1521.5	0.15	10.38	1403.5	0.05
β-Caryophyllene	8.74*	1543.0	[1.20]	10.52	1413.9	1.25
β-Copaene	8.67*	1537.5	[0.17]	10.66	1424.0	0.15
Isogermacrene D	9.33*	1588.7	[0.21]	10.86	1438.9	0.14
α-Humulene	9.63	1613.1	0.10	10.97	1447.4	0.10
allo-Aromadendrene	9.33*	1588.7	[0.21]	11.07	1454.4	0.02
(*E*)-β-Farnesene	9.92	1635.8	0.64	11.12*†	1458.3	[0.63]
Unknown MISC XLIX [m/z 161, 105 (56), 91 (50), 93 (36), 119 (33), 79 (31)...204 (5)]				11.15*†	1460.4	[0.10]
γ-Muurolene	9.95	1638.5	0.02	11.32	1473.3	0.01
Germacrene D	10.18*	1656.6	[0.90]	11.36	1475.8	0.90
Viridiflorene	10.04	1645.2	0.04	11.55	1490.6	0.03
α-Muurolene	10.51*	1683.6	[64.78]	11.66	1498.4	0.03
γ-Cadinene	10.73	1701.4	0.04	11.80	1508.8	0.02
δ-Cadinene	10.75*	1703.6	[0.06]	11.93	1519.5	0.06
α-Cadinene	11.14*	1736.2	[0.05]	12.11	1533.1	tr
1,5-Epoxysalvial-4(14)-ene	12.49	1851.4	0.02	12.43	1558.3	0.01
(*E*)-Nerolidol	14.16	2002.8	0.03	12.50	1563.9	0.01

Caryophyllene oxide	13.14	1909.4	0.03	12.63*	1574.1	[0.04]
Caryophyllene oxide isomer	13.06	1902.3	0.01	12.63*	1574.1	[0.04]
Viridiflorol	14.36	2021.3	0.22	12.77	1585.0	0.22
Isospathulenol	15.86	2166.0	0.01	13.34	1631.4	0.01
τ-Cadinol	15.31	2111.8	0.01	13.41*	1636.5	[0.01]
τ-Muurolol	15.49	2129.5	tr	13.41*	1636.5	[0.01]
α-Muurolol				13.52	1646.0	0.01
α-Cadinol	15.91	2170.7	0.01	13.56	1649.3	0.01
meta-Camphorene	15.78	2157.8	0.01	16.96	1949.1	0.02
para-Camphorene				17.31	1982.7	0.01
Total reported		98.11%			98.70%	

*: 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