Date : 2023-11-24

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 23K17-PTH04
Customer Identification : Organic Spearmint - India - S40108R
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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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 : Alexis St-Gelais, Ph. D., Chimiste 2013-174
Date : 2023-11-24

Physicochemical data

Refractive index : 1.4895 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2023-11-20

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	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl 2-methylbutyrate	tr	Aliphatic ester
Ethyl isovalerate	0.01	Aliphatic ester
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.07	Furan
Hashishene	0.07	Monoterpene
α-Thujene	0.04	Monoterpene
α-Pinene	0.82	Monoterpene
3-Methylcyclohexanone	0.09	Aliphatic ketone
α-Fenchene	tr	Monoterpene
Camphene	0.02	Monoterpene
Benzaldehyde	0.01	Simple phenolic
β-Pinene	1.09	Monoterpene
Sabinene	0.39	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Unknown	0.01	Monoterpene
Octan-3-one	0.12	Aliphatic ketone
Myrcene	1.64	Monoterpene
Pseudolimonene	0.02	Monoterpene
Octan-3-ol	0.31	Aliphatic alcohol
α-Phellandrene	0.06	Monoterpene
Δ3-Carene	0.02	Monoterpene
α-Terpinene	0.09	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
para-Cymene	0.29	Monoterpene
Limonene	18.78	Monoterpene
1,8-Cineole	1.67	Monoterpenic ether
2-Ethylhexanol	0.02	Aliphatic alcohol
(*Z*)-β-Ocimene	0.05	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	0.11	Monoterpene
cis-Sabinene hydrate	0.17	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
para-Cymenene	0.03	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.05	Monoterpene
trans-Sabinene hydrate	0.02	Monoterpenic alcohol

Linalool	0.04	Monoterpenic alcohol
Isoamyl isovalerate	0.03	Aliphatic ester
Octen-3-yl acetate	0.01	Aliphatic ester
trans-para-Mentha-2,8-dien-1-ol	0.05	Monoterpenic alcohol
Octan-3-yl acetate	0.07	Aliphatic ester
cis-Limonene oxide	0.02	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.08	Monoterpenic alcohol
trans-Limonene oxide	0.03	Monoterpenic ether
Isopulegol	0.02	Monoterpenic alcohol
Menthone	0.11	Monoterpenic ketone
Isomenthone	0.05	Monoterpenic ketone
Menthofuran	0.02	Monoterpenic ether
Menthol	0.70	Monoterpenic alcohol
Terpinen-4-ol	0.44	Monoterpenic alcohol
Isomenthol	0.01	Monoterpenic alcohol
α-Terpineol	0.16	Monoterpenic alcohol
cis-Dihydrocarvone	1.66	Monoterpenic ketone
neo-Dihydrocarveol	0.17	Monoterpenic alcohol
Methylchavicol	0.04	Phenylpropanoid
Dihydrocarveol	0.10	Monoterpenic alcohol
trans-Dihydrocarvone	0.32	Monoterpenic ketone
iso-Dihydrocarveol ?	0.02	Monoterpenic alcohol
trans-Carveol	0.61	Monoterpenic alcohol
Pulegone	0.01	Monoterpenic ketone
(3*Z*)-Hexenyl isovalerate	0.01	Aliphatic ester
Carvone	61.72	Monoterpenic ketone
cis-Carveol	0.26	Monoterpenic alcohol
Piperitone	0.64	Monoterpenic ketone
Isopiperitenone	0.04	Monoterpenic ketone
trans-Carvone oxide	0.05	Monoterpenic ketone
Decanol	0.41	Aliphatic alcohol
Dihydroedulan I	0.02	Terpenic ether
Menthyl acetate	0.06	Monoterpenic ester
Dihydroedulan II	0.01	Terpenic ether
Isomenthyl acetate	0.01	Monoterpenic alcohol
Dihydrocarvyl acetate	0.11	Monoterpenic ester
Bicycloelemene	0.04	Sesquiterpene
trans-Carvyl acetate	0.01	Monoterpenic ester
α-Cubebene	0.01	Sesquiterpene
iso-Dihydrocarvyl acetate	0.02	Monoterpenic ester
cis-Carvyl acetate	0.14	Monoterpenic ester
α-Copaene	0.05	Sesquiterpene
β-Bourbonene	1.07	Sesquiterpene
1,5-diepi-β-Bourbonene	0.07	Sesquiterpene
β-Elemene	0.30	Sesquiterpene

(*Z*)-Jasmone	0.11	Jasmonate
Longifolene	0.06	Sesquiterpene
Isocaryophyllene	0.05	Sesquiterpene
β-Ylangene	0.37	Sesquiterpene
β-Caryophyllene	1.14	Sesquiterpene
β-Copaene	0.11	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
Isogermacrene D	0.07	Sesquiterpene
α-Humulene	0.04	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.25	Sesquiterpene
Unknown	0.06	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	0.28	Sesquiterpene
Phenylethyl 2-methylbutyrate	0.01	Phenolic ester
Bicyclogermacrene	0.02	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.05	Sesquiterpene
1,5-Epoxysalvial-4(14)-ene	0.01	Sesquiterpenic ether
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.06	Sesquiterpenic ether
Viridiflorol	0.06	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ-Muurolol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	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	**98.97**	

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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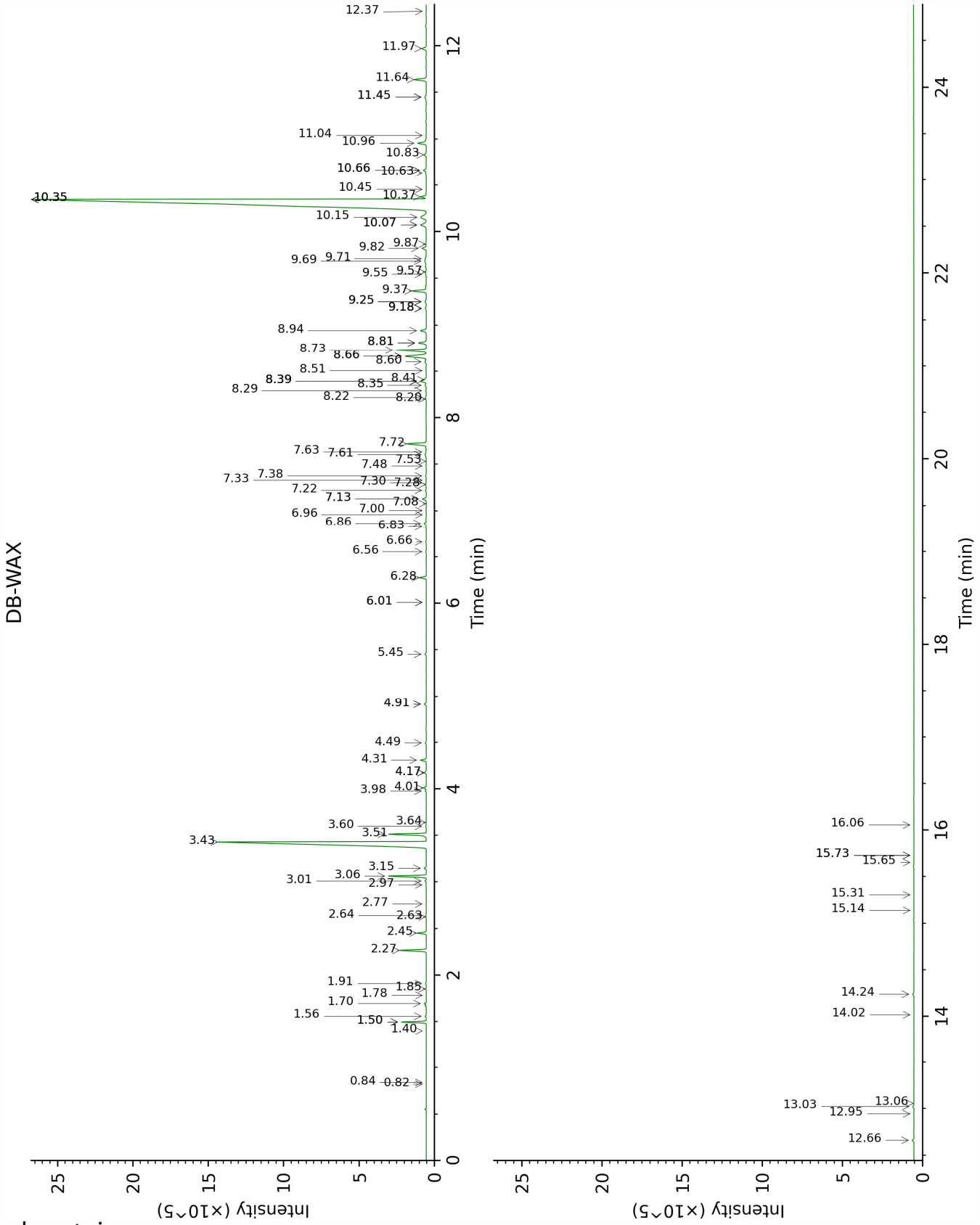
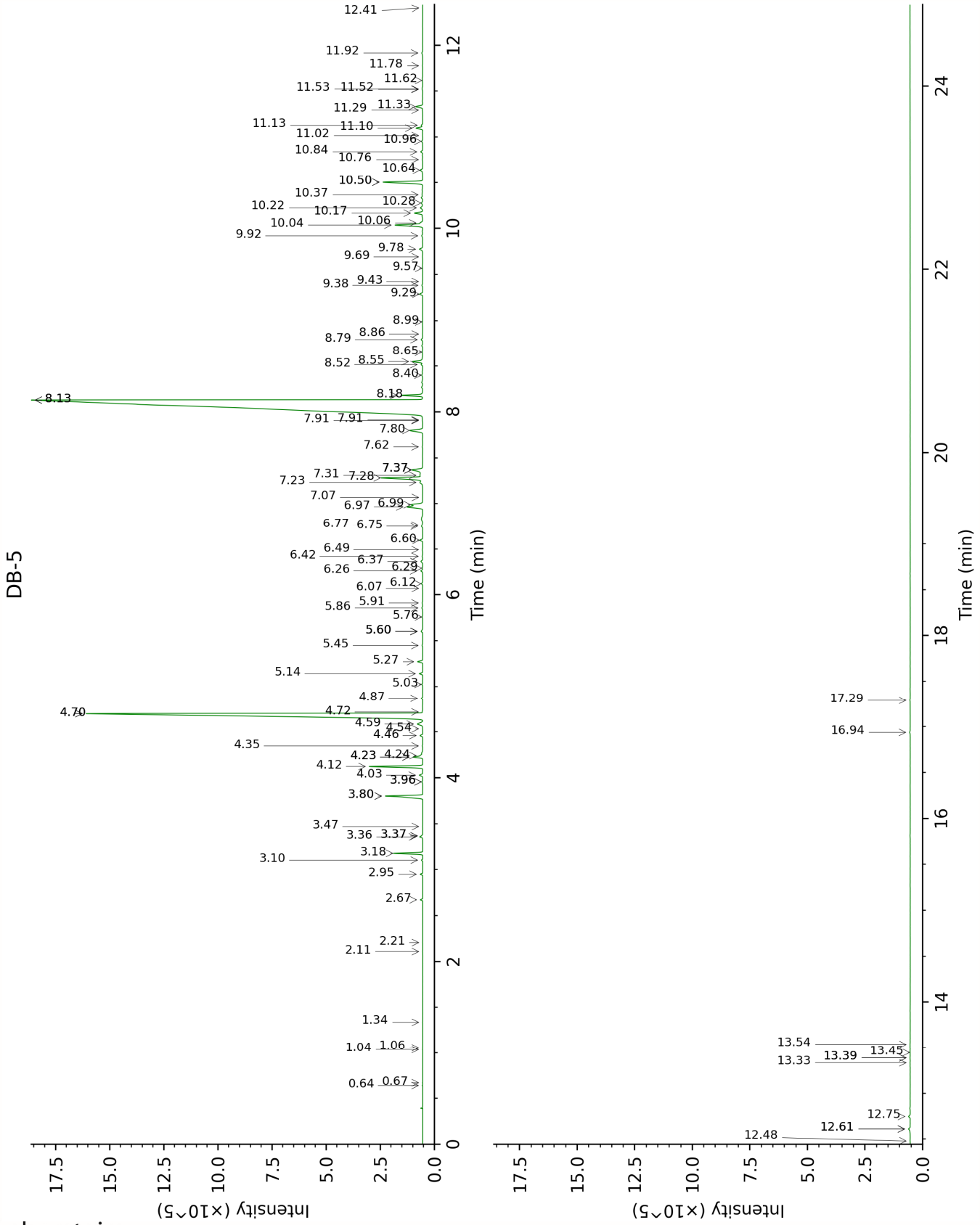

DB-WAX
Time (min)
Intensity (×10^5)
12.37
11.97
11.64
11.45
11.04
10.96
10.83
10.66
10.63
10.45
10.37
10.35
10.15
10.07
9.87
9.82
9.71
9.69
9.57
9.55
9.37
9.25
9.18
8.94
8.81
8.73
8.66
8.60
8.51
8.41
8.39
8.35
8.29
8.22
8.20
7.72
7.63
7.61
7.53
7.48
7.38
7.33
7.30
7.28
7.22
7.13
7.08
7.00
6.96
6.86
6.83
6.66
6.56
6.28
6.01
5.45
4.91
4.49
4.31
4.17
4.01
3.98
3.64
3.60
3.51
3.43
3.15
3.06
3.01
2.97
2.77
2.64
2.63
2.45
2.27
1.91
1.85
1.78
1.70
1.56
1.50
1.40
0.84
0.82
16.06
15.73
15.65
15.31
15.14
14.24
14.02
13.06
13.03
12.95
12.66


DB-5
Time (min)
Intensity (×10^5)
12.41
11.92
11.78
11.62
11.53
11.52
11.29
11.33
11.13
11.10
11.02
10.96
10.84
10.76
10.64
10.50
10.37
10.28
10.22
10.17
10.06
10.04
9.92
9.78
9.69
9.57
9.43
9.38
9.29
8.99
8.86
8.79
8.65
8.55
8.52
8.40
8.18
8.13
7.91
7.80
7.62
7.37
7.31
7.28
7.23
7.07
6.99
6.97
6.77
6.75
6.60
6.49
6.42
6.37
6.29
6.26
6.12
6.07
5.91
5.86
5.76
5.60
5.45
5.27
5.14
5.03
4.87
4.72
4.70
4.59
4.54
4.46
4.35
4.24
4.23
4.12
4.03
3.96
3.80
3.47
3.37
3.36
3.18
3.10
2.95
2.67
2.21
2.11
1.34
1.06
1.04
0.67
0.64
17.29
16.94
13.54
13.45
13.39
13.33
12.75
12.61
12.48

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Isovaleral	0.84	886.9	0.01	0.64	642.2	0.01
2-Methylbutyral	0.82	880.5	tr	0.67	652.5	tr
Isoamyl alcohol	3.64	1176.9	0.01	1.04	734.1	0.01
2-Methylbutanol	3.60	1173.8	0.04	1.06	737.0	0.01
Methyl 2-methylbutyrate	1.40	978.1	tr	1.34	775.4	tr
Ethyl isovalerate	1.91	1033.6	0.03	2.11	850.7	0.01
(3*Z*)-Hexenol	6.01*	1349.0	[0.01]	2.21	858.7	0.01
trans-2,5-Diethyltetrahydrofuran	1.70	1013.4	0.07	2.67	896.8	0.07
Hashishene	1.50*	992.5	[0.89]	2.95	916.8	0.07
α-Thujene	1.56	1000.6	0.04	3.10	926.8	0.04
α-Pinene	1.50*	992.5	[0.89]	3.18	931.7	0.82
3-Methylcyclohexanone	4.91*	1268.0	[0.10]	3.36	943.5	0.09
α-Fenchene	1.78	1021.6	tr	3.37*	944.2	[0.03]
Camphene	1.85	1028.1	0.02	3.37*	944.2	[0.03]
Benzaldehyde	7.53	1458.9	0.01	3.47	950.9	0.01
β-Pinene	2.27	1067.2	1.09	3.80*	972.6	[1.48]
Sabinene	2.45	1084.7	0.39	3.80*	972.6	[1.48]
Octen-3-ol	7.00	1420.1	0.02	3.96*	982.8	[0.03]
Unknown ORVU I [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	2.63	1100.4	0.01	3.96*	982.8	[0.03]
Octan-3-one	4.17*	1215.9	[0.10]	4.03	987.6	0.12
Myrcene	3.06	1133.4	1.63	4.12	993.8	1.64
Pseudolimonene	2.97	1126.3	0.02	4.23*	1000.5	[0.33]
Octan-3-ol	6.28	1367.8	0.31	4.23*	1000.5	[0.33]
α-Phellandrene	3.01	1129.4	0.06	4.24	1001.6	0.06
Δ3-Carene	2.76	1110.8	0.02	4.35	1008.3	0.02
α-Terpinene	3.15	1139.8	0.09	4.46	1015.4	0.09
Carvomenthene	2.64	1101.4	0.02	4.54	1020.0	0.01
para-Cymene	4.31	1225.4	0.27	4.59	1023.2	0.29
Limonene	3.43	1161.0	18.78	4.70*	1030.3	[20.60]
1,8-Cineole	3.51	1167.4	1.67	4.70*	1030.3	[20.60]
2-Ethylhexanol	7.48	1455.2	0.02	4.72	1031.4	0.02
(*Z*)-β-Ocimene	3.98	1202.0	0.05	4.87	1040.9	0.05
(*E*)-β-Ocimene	4.17*	1215.9	[0.10]	5.03	1050.5	0.03
γ-Terpinene	4.01	1204.4	0.13	5.14	1057.9	0.11
cis-Sabinene hydrate	7.13*	1429.1	[0.20]	5.27	1066.0	0.17
Octanol	8.41	1524.4	0.07	5.45	1077.0	0.03
para-Cymenene	6.56	1387.6	0.03	5.60*	1086.6	[0.08]
trans-Linalool oxide	7.08	1425.5	0.01	5.60*	1086.6	[0.08]

(fur.)						
Terpinolene	4.49	1238.5	0.05	5.60*	1086.6	[0.08]
trans-Sabinene hydrate	8.20	1508.4	0.02	5.76	1096.4	0.02
Linalool	8.29	1515.3	0.03	5.86	1102.5	0.04
Isoamyl isovalerate	4.91*	1268.0	[0.10]	5.91	1105.9	0.03
Octen-3-yl acetate	6.01*	1349.0	[0.01]	6.07	1116.1	0.01
trans-para-Mentha-2,8-dien-1-ol	9.18*	1583.3	[0.06]	6.12	1119.2	0.05
Octan-3-yl acetate	5.45	1309.6	0.06	6.26	1128.1	0.07
cis-Limonene oxide	6.66	1395.0	0.03	6.29	1130.1	0.02
cis-para-Mentha-2,8-dien-1-ol	9.71	1625.4	0.07	6.36	1134.7	0.08
trans-Limonene oxide	6.83	1407.1	0.03	6.42	1138.2	0.03
Isopulegol	8.39*	1523.0	[0.35]	6.49	1142.8	0.02
Menthone	6.86	1409.8	0.11	6.60	1149.4	0.11
Isomenthone	7.22	1436.0	0.04	6.75	1159.3	0.05
Menthofuran	7.13*	1429.1	[0.20]	6.77	1160.3	0.02
Menthol	9.37	1597.8	0.76	6.97	1173.0	0.70
Terpinen-4-ol	8.81*	1555.0	[0.41]	6.99	1174.5	0.44
Isomenthol	9.18*	1583.3	[0.06]	7.07	1179.5	0.01
α-Terpineol	10.07*	1654.4	[0.47]	7.23	1189.9	0.16
cis-Dihydrocarvone	8.73	1548.9	1.58	7.28	1193.1	1.66
neo-Dihydrocarveol	10.37	1678.5	0.32	7.31	1194.9	0.17
Methylchavicol	9.55	1612.1	0.04	7.37*	1198.6	[0.56]
Dihydrocarveol	10.66*	1702.3	[0.16]	7.37*	1198.6	[0.56]
trans-Dihydrocarvone	8.94	1565.1	0.32	7.37*	1198.6	[0.56]
iso-Dihydrocarveol ?	11.04	1733.8	0.02	7.62	1215.1	0.02
trans-Carveol	11.64	1784.1	0.62	7.80	1227.0	0.61
Pulegone	9.18*	1583.3	[0.06]	7.91	1234.2	0.01
(3*Z*)-Hexenyl isovalerate	7.33	1444.0	0.02	7.91	1234.6	0.01
Carvone	10.35*	1676.3	[61.39]	8.13*	1249.0	[61.98]
cis-Carveol	11.97	1813.1	0.26	8.13*	1249.0	[61.98]
Piperitone	10.15	1661.0	0.60	8.18	1252.5	0.64
Isopiperitenone	11.45*	1768.3	[0.13]	8.40	1267.2	0.04
trans-Carvone oxide	11.45*	1768.3	[0.13]	8.52	1274.9	0.05
Decanol	10.96	1726.8	0.50	8.55	1277.1	0.41
Dihydroedulan I	7.30	1442.0	0.02	8.65	1283.9	0.02
Menthyl acetate	8.35	1519.7	0.08	8.80	1293.4	0.06
Dihydroedulan II	7.63	1466.2	0.04	8.86	1297.5	0.01
Isomenthyl acetate	8.51	1531.8	0.02	8.99	1306.3	0.01
Dihydrocarvyl acetate	9.69	1623.4	0.14	9.29	1327.6	0.11
Bicycloelemene	7.28	1440.6	0.02	9.38	1334.3	0.04
trans-Carvyl acetate	10.45	1685.0	0.01	9.43	1337.2	0.01

α-Cubebene	6.96	1416.7	0.01	9.57	1347.3	0.01
iso-Dihydrocarvyl acetate				9.69	1356.0	0.02
cis-Carvyl acetate	10.83	1716.3	0.12	9.78	1361.9	0.14
α-Copaene	7.38	1447.3	0.04	9.92	1372.1	0.05
β-Bourbonene	7.72	1472.6	1.06	10.04	1380.2	1.07
1,5-diepi-β-Bourbonene	7.60	1464.1	0.08	10.06	1381.9	0.07
β-Elemene	8.66*	1543.8	[1.45]	10.17	1389.4	0.30
(*Z*)-Jasmone	12.66	1873.6	0.09	10.22	1393.4	0.11
Longifolene	8.22	1509.6	0.05	10.28	1397.1	0.06
Isocaryophyllene	8.39*	1523.0	[0.35]	10.37	1403.4	0.05
β-Ylangene	8.39*	1523.0	[0.35]	10.50*	1413.6	[1.51]
β-Caryophyllene	8.66*	1543.8	[1.45]	10.50*	1413.6	[1.51]
β-Copaene	8.60	1539.1	0.10	10.64	1423.7	0.11
Aromadendrene	8.81*	1555.0	[0.41]	10.76	1432.2	0.02
Isogermacrene D	9.25*	1588.9	[0.09]	10.84	1438.6	0.07
α-Humulene	9.57	1614.1	0.04	10.96	1447.1	0.04
allo-Aromadendrene	9.25*	1588.9	[0.09]	11.02	1451.7	0.01
(*E*)-β-Farnesene	9.82	1634.4	0.25	11.10	1457.7	0.25
Unknown MISC XLIX [m/z 161, 105 (56), 91 (50), 93 (36), 119 (33), 79 (31)...204 (5)]				11.13	1460.0	0.06
γ-Muurolene	9.87	1637.9	0.03	11.30	1472.3	0.02
Germacrene D	10.07*	1654.4	[0.47]	11.33	1475.1	0.28
Phenylethyl 2-methylbutyrate	13.06	1909.2	0.01	11.52	1489.1	0.01
Bicyclogermacrene	10.35*	1676.3	[61.39]	11.52	1489.4	0.02
α-Muurolene	10.35*	1676.3	[61.39]	11.62	1496.3	0.02
γ-Cadinene	10.64	1699.8	0.04	11.78	1508.4	0.02
δ-Cadinene	10.66*	1702.3	[0.16]	11.92	1519.3	0.05
1,5-Epoxysalvial-4(14)-ene	12.37	1848.2	0.02	12.41	1557.9	0.01
(*E*)-Nerolidol	14.02	1997.5	0.01	12.48	1563.3	0.01
Caryophyllene oxide isomer	12.95	1898.9	0.02	12.61*	1573.6	[0.08]
Caryophyllene oxide	13.02	1906.1	0.06	12.61*	1573.6	[0.08]
Viridiflorol	14.24	2018.6	0.07	12.75	1584.3	0.06
Isospathulenol	15.73*	2164.3	[0.01]	13.33	1631.6	0.01
τ-Muurolol	15.31	2122.1	0.01	13.39*	1636.0	[0.01]
τ-Cadinol	15.14	2105.4	0.01	13.39*	1636.0	[0.01]
α-Muurolol				13.45	1640.9	0.01
α-Cadinol	15.73*	2164.3	[0.01]	13.54	1648.4	0.01
meta-Camphorene	15.65	2156.7	0.01	16.94	1948.8	0.02

para-Camphorene	16.06	2197.3	0.01	17.29	1982.3	0.01
Total reported		98.67%			99.21%	

*: 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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