Date : August 30, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21H17-ORA02
Customer identification : Spearmint - India - 3 years - OIL-SINGLE-2
Type : Essential oil
Source : *Mentha spicata*
Customer : Organic Aromas Inc.

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Seydou Ka, Ph. D.
Analysis date : August 24, 2021

Checked and approved by :

Alexis St-Gelais, M. Sc., 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

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Physicochemical data

Physical aspect: Faintly yellow liquid
Refractive index: 1.4911 ± 0.0003 (20 °C; method PC-MAT-016)

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	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
Hexanol	tr	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.02	Furan
Hashishene	0.03	Monoterpene
α-Thujene	0.02	Monoterpene
α-Pinene	0.57	Monoterpene
Camphene	0.01	Monoterpene
3-Methylcyclohexanone	tr	Aliphatic ketone
α-Fenchene	tr	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
β-Pinene	1.24	Monoterpene
Sabinene	0.49	Monoterpene
Octen-3-one	0.01	Aliphatic ketone
6-Methyl-5-hepten-2-one	tr	Aliphatic ketone
Octan-3-one	0.01	Aliphatic ketone
Myrcene	1.02	Monoterpene
Octan-3-ol	0.29	Aliphatic alcohol
Pseudolimonene	tr	Monoterpene
α-Phellandrene	0.03	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.07	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
para-Cymene	0.23	Monoterpene
Limonene	15.33	Monoterpene
1,8-Cineole	1.90	Monoterpenic ether
2-Ethylhexanol	tr	Aliphatic alcohol
(*Z*)-β-Ocimene	0.05	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	0.09	Monoterpene
cis-Sabinene hydrate	0.35	Monoterpenic alcohol
cis-Linalool oxide (fur.)	tr	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.04	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.55	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Isoamyl isovalerate	0.02	Aliphatic ester
cis-para-Menth-2-en-1-ol	0.04	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	tr	Monoterpenic alcohol
Octan-3-yl acetate	0.09	Aliphatic ester

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cis-Limonene oxide	0.02	Monoterpenic ether
trans-Pinocarveol	0.01	Monoterpenic alcohol
cis-para-Mentha-2,8-dien-1-ol	0.05	Monoterpenic alcohol
Isopulegol	0.01	Monoterpenic alcohol
Menthone	0.08	Monoterpenic ketone
Isomenthone	0.01	Monoterpenic ketone
Menthofuran	tr	Monoterpenic ether
neo-Menthol	0.07	Monoterpenic alcohol
Menthol	0.15	Monoterpenic alcohol
Terpinen-4-ol	0.66	Monoterpenic alcohol
Isomenthol	0.01	Monoterpenic alcohol
neoiso-Menthol	0.02	Monoterpenic alcohol
α-Terpineol	tr	Monoterpenic alcohol
cis-Piperitol	0.02	Monoterpenic alcohol
neo-Dihydrocarveol	0.58	Monoterpenic alcohol
cis-Dihydrocarvone	0.06	Monoterpenic ketone
Methylchavicol	tr	Phenylpropanoid
Dihydrocarveol	0.13	Monoterpenic alcohol
trans-Dihydrocarvone	0.09	Monoterpenic ketone
trans-Carveol	0.12	Monoterpenic alcohol
Pulegone	0.01	Monoterpenic ketone
Carvone	71.19	Monoterpenic ketone
Piperitone	0.24	Monoterpenic ketone
cis-Carveol	0.09	Monoterpenic alcohol
cis-Carvone oxide	0.10	Monoterpenic ketone
Isopiperitenone	0.04	Monoterpenic ketone
trans-Carvone oxide	0.04	Monoterpenic ketone
neo-Menthyl acetate	0.01	Monoterpenic ester
Decanol	0.01	Aliphatic alcohol
Dihydroedulan I	0.02	Terpenic ether
Menthyl acetate	0.02	Monoterpenic ester
Thymol	tr	Monoterpenic alcohol
Dihydrocarvyl acetate	0.10	Monoterpenic ester
Bicycloelemene	tr	Sesquiterpene
trans-Carvyl acetate	0.01	Monoterpenic ester
Menthofurolactone	0.01	Aliphatic alcohol
iso-Dihydrocarvyl acetate	0.08	Monoterpenic ester
cis-Carvyl acetate	0.13	Monoterpenic ester
α-Copaene	0.03	Sesquiterpene
1,5-diepi-β-Bourbonene	0.04	Sesquiterpene
β-Bourbonene	0.55	Sesquiterpene
β-Elemene	0.05	Sesquiterpene
(*Z*)-Jasmone	0.22	Jasmonate
Isocaryophyllene	0.02	Sesquiterpene
β-Caryophyllene	0.41	Sesquiterpene
β-Ylangene	0.01	Sesquiterpene
β-Copaene	0.06	Sesquiterpene
Isogermacrene D	0.06	Sesquiterpene
α-Humulene	0.03	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
Unknown	0.29	Sesquiterpene
Germacrene D	0.25	Sesquiterpene

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Viridiflorene	0.01	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
1,5-Epoxysalvial-4(14)-ene	tr	Sesquiterpenic ether
Spathulenol	tr	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Viridiflorol	0.07	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
meta-Camphorene	0.01	Diterpene
para-Camphorene	tr	Diterpene
Consolidated total	**99.12%**	

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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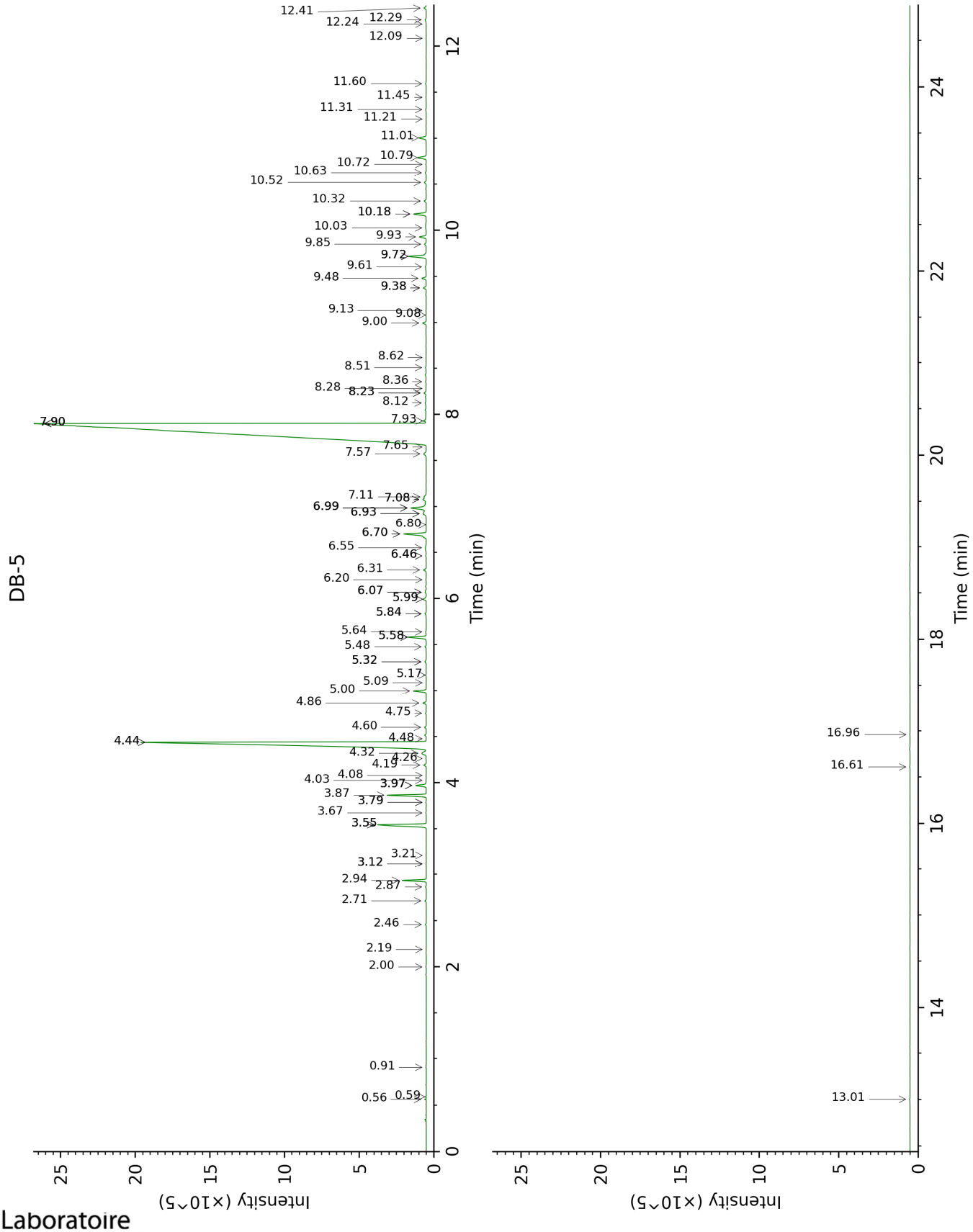
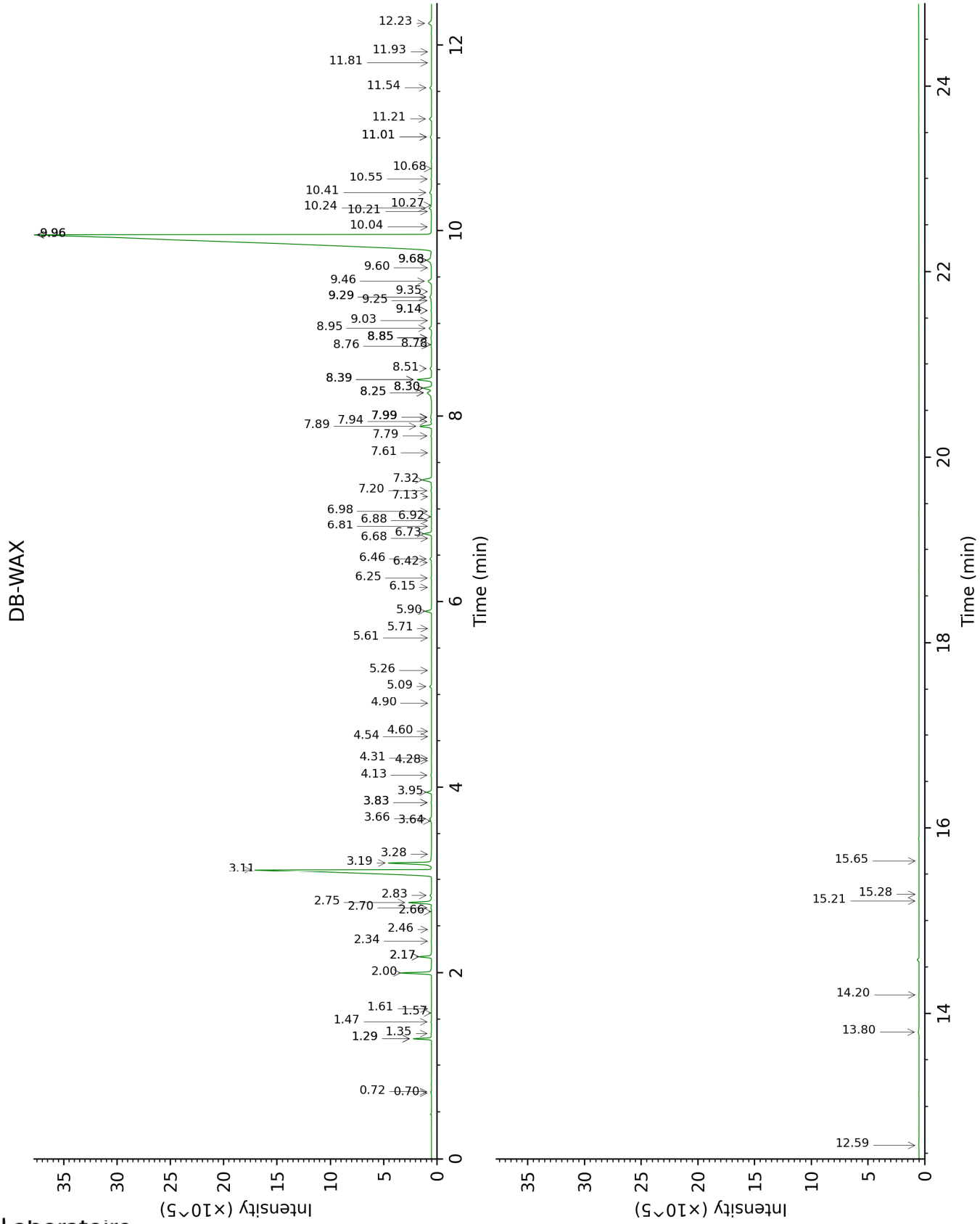

DB-5
Intensity (×10^5)
Time (min)
12.41
12.24
12.29
12.09
11.60
11.45
11.31
11.21
11.01
10.79
10.72
10.63
10.52
10.32
10.18
10.03
9.93
9.85
9.72
9.61
9.48
9.38
9.13
9.08
9.00
8.62
8.51
8.36
8.28
8.23
8.12
7.90
7.93
7.65
7.57
7.11
7.08
6.99
6.93
6.80
6.70
6.55
6.46
6.31
6.20
6.07
5.99
5.84
5.64
5.58
5.48
5.32
5.17
5.09
5.00
4.86
4.75
4.60
4.48
4.44
4.32
4.26
4.19
4.08
4.03
3.97
3.87
3.79
3.67
3.55
3.21
3.12
2.94
2.87
2.71
2.46
2.19
2.00
0.91
0.56
0.59
16.96
16.61
13.01


DB-WAX
Intensity (x10^5)
Time (min)
12.23
11.93
11.81
11.54
11.21
11.01
10.68
10.55
10.41
10.24
10.21
10.27
10.04
9.96
9.68
9.60
9.46
9.35
9.29
9.25
9.14
9.03
8.95
8.85
8.76
8.78
8.51
8.39
8.30
8.25
7.99
7.94
7.89
7.79
7.61
7.32
7.20
7.13
6.98
6.92
6.88
6.81
6.73
6.68
6.46
6.42
6.25
6.15
5.90
5.71
5.61
5.26
5.09
4.90
4.60
4.54
4.31
4.28
4.13
3.95
3.83
3.66
3.64
3.28
3.19
3.11
2.83
2.75
2.70
2.66
2.46
2.34
2.17
2.00
1.61
1.57
1.47
1.35
1.29
0.72
0.70
15.65
15.28
15.21
14.20
13.80
12.59

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.56	642	0.02	0.72	886	0.02
2-Methylbutyral	0.59	652	0.01	0.70	880	0.01
Isoamyl alcohol	0.91	731	0.01	3.28	1176	0.01
(3*Z*)-Hexenol	2.00	857	0.01	5.61	1345	0.02
Hexanol	2.19	874	tr	5.26	1320	0.01
trans-2,5-Diethyltetrahydrofuran	2.46	897	0.02	1.47	1012	0.02
Hashishene	2.71	916	0.03	1.29*	991	0.60
α-Thujene	2.86	926	0.02	1.35	999	0.02
α-Pinene	2.94	931	0.57	1.29*	991	[0.60]
Camphene	3.12*	943	0.01	1.61	1026	0.01
3-Methylcyclohexanone	3.12*	943	[0.01]	4.54	1273	tr
α-Fenchene	3.12*	943	[0.01]	1.57	1022	tr
Thuja-2,4(10)-diene	3.21	949	tr	2.17*	1084	0.49
β-Pinene	3.55*	972	1.74	2.00	1066	1.24
Sabinene	3.55*	972	[1.74]	2.17*	1084	[0.49]
Octen-3-one	3.67	980	0.01	4.31	1255	0.01
6-Methyl-5-hepten-2-one	3.79*	988	0.01	4.90	1300	tr
Octan-3-one	3.79*	988	[0.01]	3.84*	1219	0.03
Myrcene	3.87	994	1.02	2.75	1133	1.02
Octan-3-ol	3.97*	1001	0.33	5.90	1366	0.29
Pseudolimonene	3.97*	1001	[0.33]	2.66	1126	tr
α-Phellandrene	3.97*	1001	[0.33]	2.70	1129	0.03
Octanal	4.03	1004	0.01	4.28	1253	0.01
Δ3-Carene	4.08	1008	0.01	2.46	1110	tr
α-Terpinene	4.19	1015	0.07	2.83	1139	0.07
Carvomenthene	4.26	1019	0.01	2.34	1100	0.02
para-Cymene	4.32	1023	0.23	3.95	1228	0.23
Limonene	4.44*	1030	17.24	3.11	1162	15.33
1,8-Cineole	4.44*	1030	[17.24]	3.19	1168	1.90
2-Ethylhexanol	4.48	1033	tr	7.14	1458	0.01
(*Z*)-β-Ocimene	4.60	1041	0.05	3.64	1204	0.04
(*E*)-β-Ocimene	4.75	1050	0.02	3.84*	1219	[0.03]
γ-Terpinene	4.86	1057	0.09	3.66	1206	0.10
cis-Sabinene hydrate	5.00	1066	0.35	6.73	1427	0.36
cis-Linalool oxide (fur.)	5.09	1072	tr	6.42	1404	0.02
Octanol	5.17	1077	0.01	7.99*	1522	0.08
Terpinolene	5.32*	1086	0.04	4.13	1241	0.04
para-Cymenene	5.32*	1086	[0.04]	6.15	1385	0.01
trans-Sabinene hydrate	5.48	1096	0.03	7.79	1507	0.04
Linalool	5.58*	1103	0.55	7.89	1515	0.55
Nonanal	5.58*	1103	[0.55]	5.71	1353	0.01
Isoamyl isovalerate	5.64	1106	0.02	4.60	1277	tr
cis-para-Menth-2-en-1-ol	5.84*	1119	0.04	7.94	1519	0.04

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trans-para-Mentha-2,8-dien-1-ol	5.84*	1119	[0.04]	8.85*	1589	0.05
Octan-3-yl acetate	5.99*	1129	0.11	5.09	1307	0.09
cis-Limonene oxide	5.99*	1129	[0.11]	6.25	1392	0.02
trans-Pinocarveol	6.07*	1134	0.03	9.03	1604	0.01
cis-para-Mentha-2,8-dien-1-ol	6.07*	1134	[0.03]	9.25	1621	0.05
Isopulegol	6.20	1143	0.01	7.99*	1522	[0.08]
Menthone	6.31	1150	0.08	6.46	1407	0.08
Isomenthone	6.46*	1159	0.02	6.81	1433	0.01
Menthofuran	6.46*	1159	[0.02]	6.68	1424	tr
neo-Menthol	6.55	1165	0.07	8.39*	1554	0.72
Menthol	6.70*	1174	0.83	8.95	1597	0.15
Terpinen-4-ol	6.70*	1174	[0.83]	8.39*	1554	[0.72]
Isomenthol	6.80	1181	0.01	8.76	1582	0.02
neoiso-Menthol	6.93*	1189	0.20	9.29*	1624	0.12
α-Terpineol	6.93*	1189	[0.20]	9.60	1650	tr
cis-Piperitol	6.99*	1193	0.65	9.34	1629	0.02
neo-Dihydrocarveol	6.99*	1193	[0.65]	9.96*	1679	71.79
cis-Dihydrocarvone	6.99*	1193	[0.65]	8.30*	1547	0.45
Methylchavicol	7.08*	1199	0.15	9.14*	1613	0.03
Dihydrocarveol	7.08*	1199	[0.15]	10.24	1702	0.13
trans-Dihydrocarvone	7.11	1201	0.09	8.51	1563	0.08
trans-Carveol	7.57	1232	0.12	11.21	1784	0.11
Pulegone	7.65	1237	0.01	8.78	1584	0.01
Carvone	7.90*	1254	71.53	9.96*	1679	[71.79]
Piperitone	7.90*	1254	[71.53]	9.68*	1657	0.49
cis-Carveol	7.90*	1254	[71.53]	11.54	1814	0.09
cis-Carvone oxide	7.93	1256	0.10	10.68	1739	0.01
Isopiperitenone	8.12	1269	0.04	11.01*	1768	0.08
trans-Carvone oxide	8.23*	1276	0.07	11.01*	1768	[0.08]
neo-Menthyl acetate	8.23*	1276	[0.07]	7.61	1493	0.01
Decanol	8.28	1279	0.01	10.55	1729	0.03
Dihydroedulan I	8.36	1284	0.02	6.88	1438	0.01
Menthyl acetate	8.51	1294	0.02	7.99*	1522	[0.08]
Thymol	8.62	1302	tr			
Dihydrocarvyl acetate	9.00	1329	0.10	9.29*	1624	[0.12]
Bicycloelemene	9.08	1335	tr	6.92	1442	0.01
trans-Carvyl acetate	9.13	1338	0.01	10.04	1686	0.02
Menthofurolactone	9.38*	1356	0.09	11.81	1837	0.01
iso-Dihydrocarvyl acetate	9.38*	1356	[0.09]			
cis-Carvyl acetate	9.48	1363	0.13	10.41	1716	0.15
α-Copaene	9.60	1372	0.03	6.98	1446	0.02
1,5-diepi-β-Bourbonene	9.72*	1380	0.61	7.20	1462	0.04
β-Bourbonene	9.72*	1380	[0.61]	7.32	1471	0.55
β-Elemene	9.85	1389	0.05	8.25*	1543	0.35
(*Z*)-Jasmone	9.93	1395	0.22	12.23	1875	0.22
Isocaryophyllene	10.03	1402	0.02	7.99*	1522	[0.08]
β-Caryophyllene	10.18*	1413	0.42	8.30*	1547	[0.45]
β-Ylangene	10.18*	1413	[0.42]	7.99*	1522	[0.08]

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β-Copaene	10.32	1423	0.06	8.25*	1543	[0.35]
Isogermacrene D	10.52	1438	0.06	8.85*	1589	[0.05]
α-Humulene	10.63	1446	0.03	9.14*	1613	[0.03]
allo-Aromadendrene	10.72	1453	0.01	8.85*	1589	[0.05]
Unknown [m/z 161, 105 (56), 91 (50), 93 (36), 119 (33), 79 (31)...204 (5)]	10.79	1459	0.29			
Germacrene D	11.01	1475	0.25	9.68*	1657	[0.49]
Viridiflorene	11.21	1490	0.01	9.46	1638	0.26
α-Muurolene	11.32	1498	0.02	9.96*	1679	[71.79]
γ-Cadinene	11.45	1508	0.01	10.21	1699	0.03
δ-Cadinene	11.60	1519	0.02	10.27	1705	0.02
1,5-Epoxysalvial-4(14)-ene	12.08	1558	tr	11.93	1848	tr
Spathulenol	12.24	1570	tr	14.20	2059	0.01
Caryophyllene oxide	12.29	1574	0.04	12.59	1907	0.03
Viridiflorol	12.41	1584	0.07	13.80	2020	0.06
Isospathulenol	13.00	1632	0.01	15.28	2165	0.01
meta-Camphorene	16.61	1950	0.01	15.21	2158	0.01
para-Camphorene	16.96	1983	tr	15.65	2202	tr
Total identified		**99.07%**			**99.17%**	
Total reported		**99.35%**			**99.17%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
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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