Date : September 16, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20I09-PTH05
Customer identification : Balsam Fir - BN01061911R
Type : Essential oil
Source : *Abies balsamea* ct. Eastern / Low thymol
Customer : Plant Therapy

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 : Fanny Charlier, B. Sc., chimiste à l'entraînement
Analysis date : September 14, 2020

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: Clear liquid
Refractive index: 1.4746 ± 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	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Toluene	0.01	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
Octane	tr	Alkane
Ethyl 2-methylbutyrate	0.01	Aliphatic ester
(3*Z*)-Hexenol	0.09	Aliphatic alcohol
Hexanol	0.03	Aliphatic alcohol
Santene	1.99	Normonoterpene
Unknown	0.02	Normonoterpene
Bornylene	0.01	Monoterpene
Tricyclene	0.94	Monoterpene
α-Thujene	0.16	Monoterpene
α-Pinene	11.72	Monoterpene
Camphene	6.44	Monoterpene
α-Fenchene	0.08	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
meta-Cymene	0.05	Monoterpene
β-Pinene	30.77	Monoterpene
Sabinene	0.09	Monoterpene
Unknown	0.02	Monoterpene
Myrcene	1.43	Monoterpene
2-Carene	0.02	Monoterpene
α-Phellandrene	0.18	Monoterpene
Pseudolimonene	0.02	Monoterpene
(3*Z*)-Hexenyl acetate	0.04	Aliphatic ester
Δ3-Carene	17.52	Monoterpene
α-Terpinene	0.16	Monoterpene
Carvomenthene	0.03	Aliphatic alcohol
Hexyl acetate	0.09	Aliphatic ester
para-Cymene	0.24	Monoterpene
Limonene	7.48	Monoterpene
β-Phellandrene	5.12	Monoterpene
(*Z*)-β-Ocimene	0.02	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.30	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Fenchone	0.16	Monoterpenic ketone
γ-Campholenal	0.12	Aliphatic alcohol
Terpinolene	1.22	Monoterpene
para-Cymenene	0.07	Monoterpene
α-Pinene oxide	0.01	Monoterpenic ether
Unknown	0.02	Unknown
Linalool	0.15	Monoterpenic alcohol
β-Thujone	0.01	Monoterpenic ketone

endo-Fenchol	0.08	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
α-Campholenal	0.01	Monoterpenic aldehyde
cis-Limonene oxide	0.02	Monoterpenic ether
trans-Pinocarveol	0.08	Monoterpenic alcohol
Camphor	0.48	Monoterpenic ketone
Camphene hydrate	0.13	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.01	Monoterpenic alcohol
Isoborneol	0.04	Monoterpenic alcohol
Pinocarvone	0.01	Monoterpenic ketone
Borneol	1.05	Monoterpenic alcohol
α-Phellandren-8-ol	0.01	Monoterpenic alcohol
Isopinocamphone	0.03	Monoterpenic ketone
Terpinen-4-ol	0.25	Monoterpenic alcohol
Cryptone	0.03	Normonoterpenic ketone
para-Cymen-8-ol	0.04	Monoterpenic alcohol
α-Terpineol	0.52	Monoterpenic alcohol
Myrtenal	0.04	Monoterpenic aldehyde
Myrtenol	0.04	Monoterpenic alcohol
Methylchavicol	0.02	Phenylpropanoid
Verbenone	0.03	Monoterpenic ketone
endo-Fenchyl acetate	0.04	Monoterpenic ester
trans-Carveol	0.01	Monoterpenic alcohol
3-Methyl-3-butenyl 4-methylvalerate	0.03	Aliphatic ester
Citronellol	0.01	Monoterpenic alcohol
Thymol methyl ether	0.06	Monoterpenic ether
Piperitone	0.15	Monoterpenic ketone
Phellandral	0.03	Monoterpenic aldehyde
Isopulegyl acetate	0.02	Monoterpenic ester
Bornyl acetate	6.88	Monoterpenic ester
Isobornyl acetate	0.03	Monoterpenic ester
2-Undecanone	0.03	Aliphatic ketone
Thymol	0.02	Monoterpenic alcohol
Myrtenyl acetate	0.01	Monoterpenic ester
Unknown	0.01	Unknown
α-Longipinene	0.06	Sesquiterpene
Citronellyl acetate	0.01	Monoterpenic ester
Longicyclene	0.03	Sesquiterpene
α-Ylangene	0.03	Sesquiterpene
α-Copaene	0.02	Sesquiterpene
β-Bourbonene	0.02	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
β-Longipinene	0.01	Sesquiterpene
Longifolene	0.02	Sesquiterpene
Sibirene	0.01	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
β-Caryophyllene	0.29	Sesquiterpene
trans-α-Bergamotene	0.04	Sesquiterpene
α-Humulene	0.13	Sesquiterpene
(*E*)-β-Farnesene	0.04	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
β-Selinene	0.07	Sesquiterpene

α-Selinene	0.02	Sesquiterpene
β-Himachalene	0.04	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
(*Z*)-α-Bisabolene	0.04	Sesquiterpene
β-Bisabolene	0.53	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
α-Calacorene	0.01	Sesquiterpene
(*E*)-α-Bisabolene	0.05	Sesquiterpene
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Biformene?	0.01	Diterpene
meta-Camphorene	0.02	Diterpene
Manoyl oxide	0.01	Diterpenic ether
Trachylobane?	0.01	Diterpene
Abieta-8,12-diene	0.01	Diterpene
Unknown	0.01	Unknown
Consolidated total	**98.80%**	

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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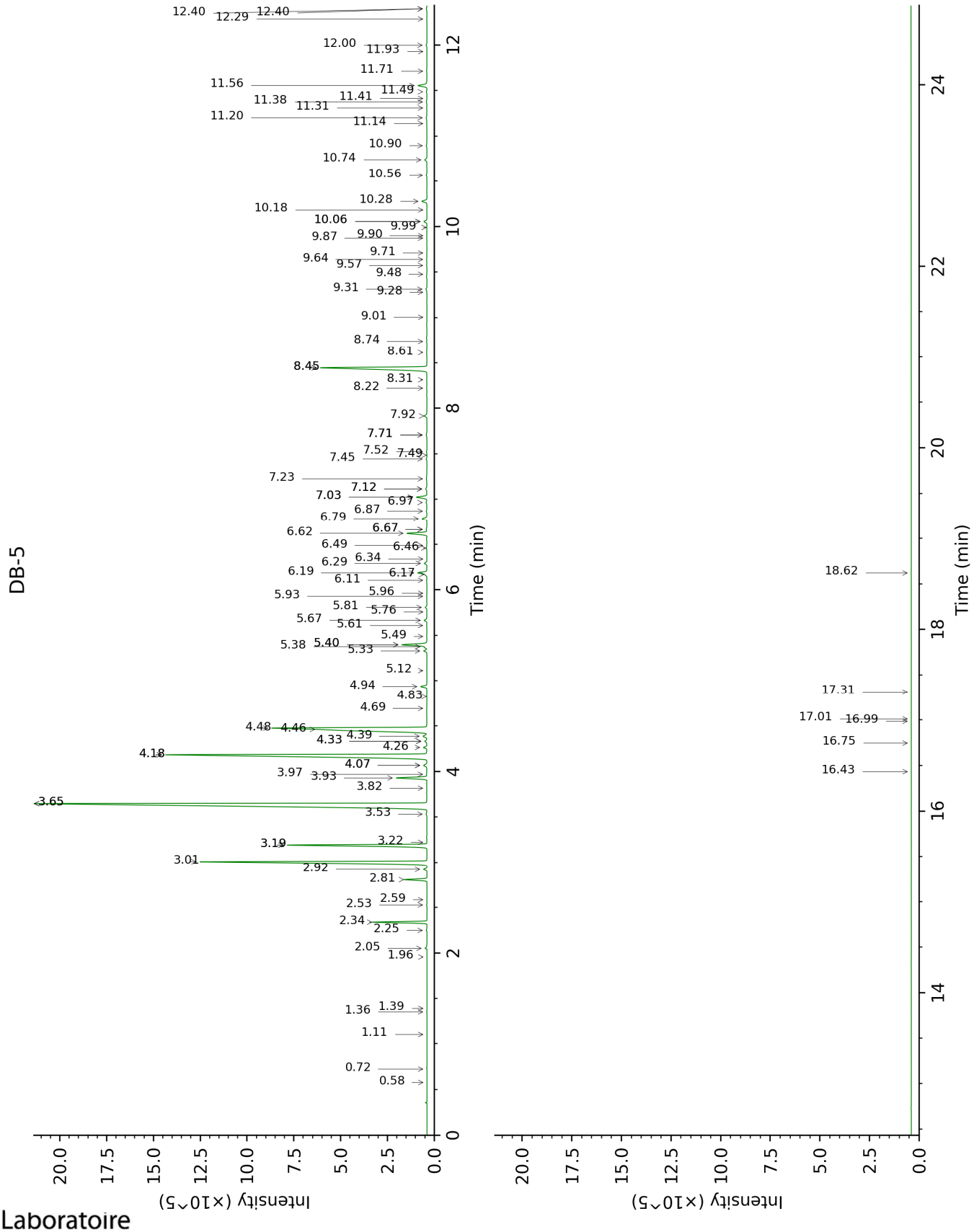
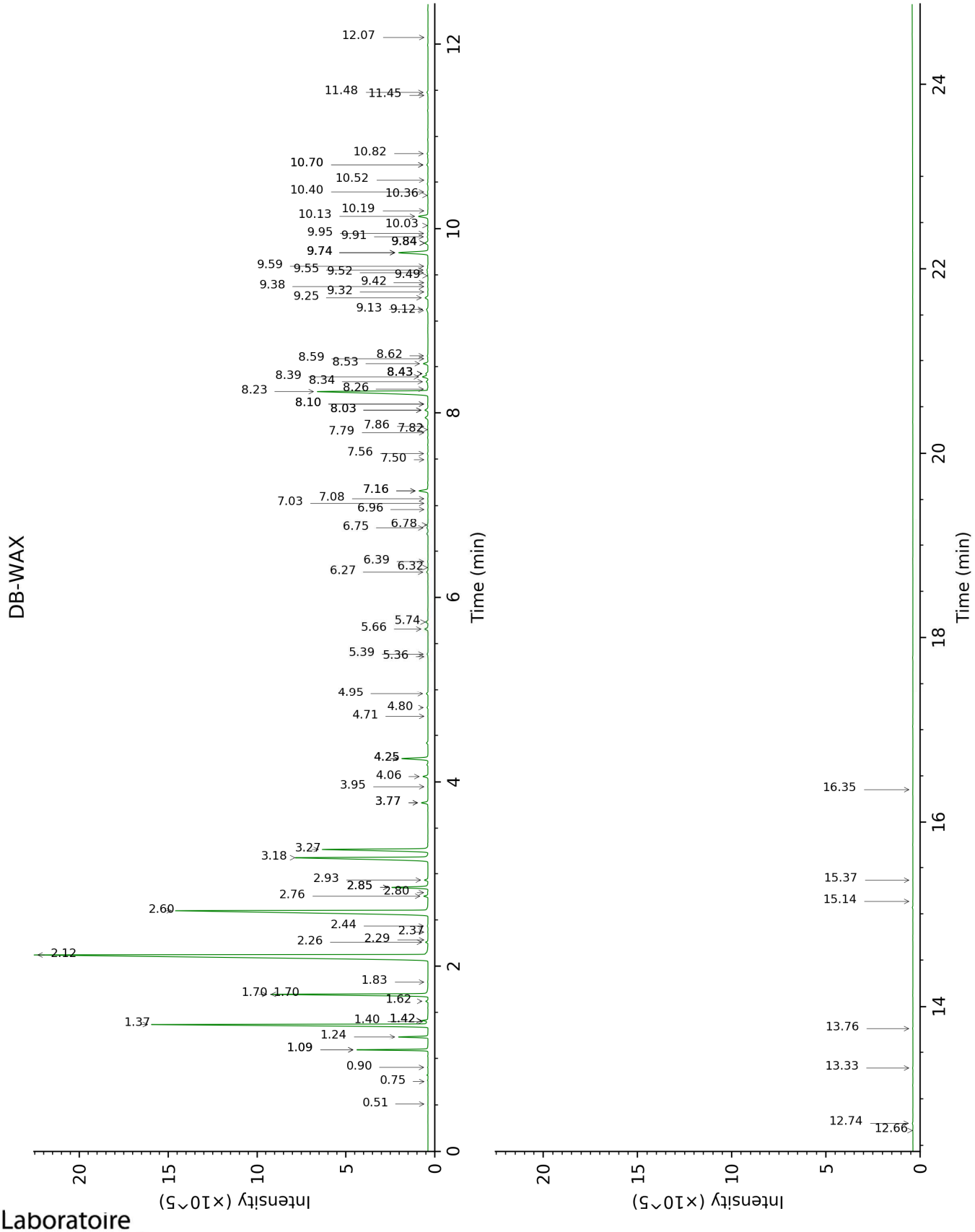

DB-5
Time (min)
Intensity (×10^5)
12.40
12.29
12.40
12.00
11.93
11.71
11.56
11.49
11.38
11.41
11.31
11.20
11.14
10.90
10.74
10.56
10.28
10.18
10.06
9.99
9.87
9.90
9.71
9.64
9.57
9.48
9.31
9.28
9.01
8.74
8.61
8.45
8.31
8.22
7.92
7.71
7.52
7.45
7.49
7.23
7.12
7.03
6.97
6.87
6.79
6.67
6.62
6.49
6.46
6.34
6.29
6.19
6.17
6.11
5.96
5.93
5.81
5.76
5.67
5.61
5.49
5.40
5.38
5.33
5.12
4.94
4.83
4.69
4.48
4.46
4.39
4.33
4.26
4.18
4.07
3.97
3.93
3.82
3.65
3.53
3.22
3.19
3.01
2.92
2.81
2.59
2.53
2.34
2.25
2.05
1.96
1.39
1.36
1.11
0.72
0.58
18.62
17.31
17.01
16.99
16.75
16.43


DB-WAX
Time (min)
Intensity (×10^5)
12.07
11.48
11.45
10.82
10.70
10.52
10.40
10.36
10.19
10.13
10.03
9.95
9.91
9.84
9.74
9.59
9.55
9.52
9.49
9.42
9.38
9.32
9.25
9.13
9.12
8.62
8.59
8.53
8.43
8.39
8.34
8.26
8.23
8.10
8.03
7.86
7.82
7.79
7.56
7.50
7.16
7.08
7.03
6.96
6.78
6.75
6.39
6.32
6.27
5.74
5.66
5.39
5.36
4.95
4.80
4.71
4.25
4.06
3.95
3.77
3.27
3.18
2.93
2.85
2.80
2.76
2.60
2.44
2.37
2.29
2.26
2.12
1.83
1.70
1.70
1.62
1.40
1.42
1.37
1.24
1.09
0.90
0.75
0.51
16.35
15.37
15.14
13.76
13.33
12.74
12.66

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.58	640	tr	0.75	884	tr
2-Ethylfuran	0.72	696	tr	0.90	917	0.01
Toluene	1.11	758	0.01	1.42*†	1000	[11.83]
Hexanal	1.36	795	0.01	1.83	1041	0.02
Octane	1.39	800	tr	0.51	790	tr
Ethyl 2-methylbutyrate	1.96	850	0.01	1.70*	1028	6.45
(3*Z*)-Hexenol	2.05	858	0.09	5.74	1343	0.11
Hexanol	2.25	874	0.03	5.39	1318	0.04
Santene	2.34	882	1.99	1.09*	948	1.99
Unknown [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.53	898	0.02	1.40†	998	[11.83]
Bornylene	2.59	903	0.01	1.09*	948	[1.99]
Tricyclene	2.81	918	0.94	1.24	972	0.96
α-Thujene	2.92	925	0.16	1.42*†	1000	[11.83]
α-Pinene	3.01	931	11.72	1.37†	994	11.83
Camphene	3.19*	944	6.53	1.70*	1028	[6.45]
α-Fenchene	3.19*	944	[6.53]	1.62	1020	0.08
Thuja-2,4(10)-diene	3.22	946	0.01	2.29	1086	0.01
meta-Cymene	3.53	966	0.05	2.85*	1133	1.48
β-Pinene	3.65*	974	31.20	2.12	1070	30.77
Sabinene	3.65*	974	[31.20]	2.26	1084	0.09
Unknown [m/z 91, 119 (65), 109 (51), 134 (47)]	3.82	985	0.02			
Myrcene	3.93	993	1.43	2.85*	1133	[1.48]
2-Carene	3.97	995	0.02	2.37	1094	0.01
α-Phellandrene	4.07*	1002	0.20	2.76	1125	0.18
Pseudolimonene	4.07*	1002	[0.20]	2.80	1128	0.02
(3*Z*)-Hexenyl acetate	4.18*	1009	17.61	4.80	1278	0.04
Δ3-Carene	4.18*	1009	[17.61]	2.60	1113	17.52
α-Terpinene	4.26	1014	0.16	2.93	1139	0.16
Carvomenthene	4.33*	1018	0.12	2.44	1100	0.03
Hexyl acetate	4.33*	1018	[0.12]	4.25*	1239	1.22
para-Cymene	4.39	1022	0.24	4.06	1225	0.23
Limonene	4.46†	1027	12.63	3.18	1158	7.48
β-Phellandrene	4.48†	1028	[12.63]	3.27	1165	5.12
(*Z*)-β-Ocimene	4.69	1041	0.02	3.78*	1204	0.31
(*E*)-β-Ocimene	4.82	1049	0.01	3.95	1217	0.01
γ-Terpinene	4.94	1057	0.30	3.78*	1204	[0.31]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91	5.12	1068	0.01	4.71	1272	0.01

(20), 152 (18)]						
Fenchone	5.33	1081	0.16	5.66	1338	0.18
γ-Campholenal	5.38	1084	0.12	4.95	1289	0.08
Terpinolene	5.40*	1085	1.29	4.25*	1239	[1.22]
para-Cymenene	5.40*	1085	[1.29]	6.27	1382	0.07
α-Pinene oxide	5.49	1091	0.01	5.36	1316	0.01
Unknown [m/z 79, 94 (87), 77 (25), 91 (21), 93 (16), 95 (12), 138 (8)]	5.61	1099	0.02			
Linalool	5.67	1102	0.15	8.03*	1514	0.17
β-Thujone	5.76	1108	0.01	6.32	1386	0.01
endo-Fenchol	5.81	1111	0.08	8.34	1538	0.08
cis-para-Menth-2-en-1-ol	5.93	1119	0.02	8.10*	1519	0.03
α-Campholenal	5.96	1121	0.01	6.96	1433	0.01
cis-Limonene oxide	6.11	1130	0.02	6.39	1391	0.02
trans-Pinocarveol	6.17	1134	0.08	9.13	1599	0.08
Camphor	6.19	1135	0.48	7.16*	1448	0.48
Camphene hydrate	6.29	1142	0.13	8.43*†	1544	[0.44]
meta-Mentha-4,6-dien-8-ol	6.34	1145	0.01	9.32	1614	0.02
Isoborneol	6.46	1153	0.04	9.42	1623	0.02
Pinocarvone	6.49	1154	0.01	7.86	1500	0.03
Borneol	6.62	1163	1.05	9.74*	1649	1.68
α-Phellandren-8-ol	6.66*	1166	0.05	10.19	1686	0.01
Isopinocamphone	6.66*	1166	[0.05]	7.56	1478	0.03
Terpinen-4-ol	6.79	1173	0.25	8.53	1553	0.23
Cryptone	6.87	1179	0.03	9.12	1598	0.03
para-Cymen-8-ol	6.97	1185	0.04	11.48	1794	0.05
α-Terpineol	7.02*	1189	0.57	9.74*	1649	[1.68]
Myrtenal	7.02*	1189	[0.57]	8.62	1559	0.04
Myrtenol	7.12*	1194	0.08	10.82	1738	0.04
Methylchavicol	7.12*	1194	[0.08]	9.38	1619	0.02
Verbenone	7.23	1201	0.03	9.59	1637	0.02
endo-Fenchyl acetate	7.44	1216	0.04	6.78	1420	0.04
trans-Carveol	7.49	1219	0.01	11.45	1792	0.01
3-Methyl-3-butenyl 4-methylvalerate	7.52	1221	0.03			
Citronellol	7.71*	1233	0.07	10.70*	1728	0.06
Thymol methyl ether	7.71*	1233	[0.07]	8.43*†	1544	[0.44]
Piperitone	7.92	1247	0.15	9.84*	1657	0.18
Phellandral	8.22	1268	0.03	9.95	1666	0.02
Isopulegyl acetate	8.31	1274	0.02	8.10*	1519	[0.03]

Bornyl acetate	8.44*	1282	6.74	8.23	1529	6.88
Isobornyl acetate	8.44*	1282	[6.74]	8.26	1532	0.03
2-Undecanone	8.61	1294	0.03	8.59	1557	0.02
Thymol	8.74	1302	0.02	15.14	2134	0.01
Myrtenyl acetate	9.01	1320	0.01	9.55	1634	0.07
Unknown [m/z 121, 93 (84), 43 (81), 79 (48), 117 (40), 56 (37)...]	9.28	1340	0.01			
α-Longipinene	9.32	1342	0.06	6.75	1418	0.06
Citronellyl acetate	9.48	1353	0.01	9.49	1629	0.01
Longicyclene	9.58	1360	0.03	7.08	1442	0.02
α-Ylangene	9.64	1365	0.03	7.02	1438	0.01
α-Copaene	9.71	1370	0.02	7.16*	1448	[0.48]
β-Bourbonene	9.87	1381	0.02	7.50	1473	0.02
Geranyl acetate	9.90	1383	0.01	10.52	1713	0.01
β-Longipinene	9.99	1390	0.01	7.82	1497	0.01
Longifolene	10.06*	1394	0.17	8.03*	1514	[0.17]
Sibirene	10.06*	1394	[0.17]	7.79	1495	0.01
Methyleugenol	10.18	1403	0.02	13.33	1961	0.02
β-Caryophyllene	10.28	1410	0.29	8.39†	1542	0.44
trans-α-Bergamotene	10.56	1432	0.04	8.43*†	1544	[0.44]
α-Humulene	10.74	1445	0.13	9.25	1609	0.16
(*E*)-β-Farnesene	10.90	1456	0.04	9.52	1631	0.05
Germacrene D	11.14	1474	0.01	9.74*	1649	[1.68]
β-Selinene	11.20	1479	0.07	9.84*	1657	[0.18]
α-Selinene	11.31	1487	0.02	9.91	1663	0.04
β-Himachalene	11.38	1492	0.04	9.84*	1657	[0.18]
α-Muurolene	11.41	1495	0.01	10.03	1673	0.02
(*Z*)-α-Bisabolene	11.49	1500	0.04	10.36	1699	0.03
β-Bisabolene	11.56	1506	0.53	10.13	1681	0.54
δ-Cadinene	11.71	1518	0.02	10.40	1702	0.03
α-Calacorene	11.93	1535	0.01	12.07	1847	0.01
(*E*)-α-Bisabolene	12.00	1540	0.05	10.70*	1728	[0.06]
(*E*)-Nerolidol	12.29	1563	0.01	13.76	2000	0.02
Caryophyllene oxide	12.40*	1572	0.04	12.74	1906	0.03
Caryophyllene oxide isomer	12.40*	1572	[0.04]	12.66	1899	0.01
Biformene?	16.43	1921	0.01			
meta-Camphorene	16.75	1951	0.02	15.37	2157	0.01
Manoyl oxide	16.99	1974	0.01			
Trachylobane?	17.01	1977	0.01	16.35	2258	0.01
Abieta-8,12-diene	17.31	2006	0.01			
Unknown [m/z 177, 81 (90), 95 (85), 67 (77), 69 (61)...]	18.62	2138	0.01			
Total identified		**99.13%**			**98.51%**	

Total reported	**99.22%**	**98.52%**

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not 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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