Date : February 16, 2023

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 23B02-NSO03
Customer identification : Hyssop - HY22.338 - Hyssopus officinalis
Type : Essential oil
Source : *Hyssopus officinalis* ct. Pinocamphone
Customer : Natural Sourcing LLC

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 : Sylvain Mercier, M. Sc., Chimiste 2014-005
Analysis date : February 07, 2023

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.4781 ± 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
Isobutyral	0.01	Aliphatic aldehyde
Isovaleral	0.05	Aliphatic aldehyde
2-Methylbutyral	0.04	Aliphatic aldehyde
2-Ethylfuran	0.05	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl isovalerate	tr	Aliphatic ester
Methyl 2-methylbutyrate	0.01	Aliphatic ester
Hexanal	0.02	Aliphatic aldehyde
Octane	0.02	Alkane
(2*E*)-Hexenal	0.05	Aliphatic aldehyde
(3*Z*)-Hexenol	0.02	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Unknown	0.02	Unknown
Hashishene	0.07	Monoterpene
Tricyclene	0.01	Monoterpene
α-Thujene	0.26	Monoterpene
α-Pinene	0.69	Monoterpene
α-Fenchene	tr	Monoterpene
Camphene	0.14	Monoterpene
Thuja-2,4(10)-diene	0.03	Monoterpene
Benzaldehyde	0.01	Simple phenolic
β-Pinene	12.56	Monoterpene
Sabinene	1.55	Monoterpene
Octen-3-ol	0.15	Aliphatic alcohol
Octan-3-one	0.20	Aliphatic ketone
Myrcene	1.64	Monoterpene
α-Phellandrene	0.03	Monoterpene
α-Terpinene	0.13	Monoterpene
para-Cymene	0.09	Monoterpene
Limonene	0.97	Monoterpene
1,8-Cineole	3.31	Monoterpenic ether
(*Z*)-β-Ocimene	0.16	Monoterpene
(*E*)-β-Ocimene	0.57	Monoterpene
γ-Terpinene	0.22	Monoterpene
cis-Sabinene hydrate	0.09	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Fenchone	0.01	Monoterpenic ketone
Terpinolene	0.10	Monoterpene
trans-Sabinene hydrate	0.02	Monoterpenic alcohol
α-Thujone	0.15	Monoterpenic ketone
Linalool	0.89	Monoterpenic alcohol
β-Thujone	0.14	Monoterpenic ketone
cis-para-Menth-2-en-1-ol	0.06	Monoterpenic alcohol
Nopinone	0.06	Normonoterpenic ketone

trans-Pinocarveol	0.05	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.33	Monoterpenic alcohol
trans-Verbenol	0.02	Monoterpenic alcohol
Myrtenyl methyl ether	2.24	Monoterpenic ether
Pinocamphone	14.05	Monoterpenic ketone
Pinocarvone	1.31	Monoterpenic ketone
Borneol	0.03	Monoterpenic alcohol
Isopinocamphone	42.52	Monoterpenic ketone
Terpinen-4-ol	0.26	Monoterpenic alcohol
Cryptone	0.10	Normonoterpenic ketone
Myrtenal	0.38	Monoterpenic aldehyde
α-Terpineol	0.17	Monoterpenic alcohol
Methylchavicol	0.08	Phenylpropanoid
Myrtenol	0.95	Monoterpenic alcohol
Decanal	0.03	Aliphatic aldehyde
trans-Piperitol	0.01	Monoterpenic alcohol
Cuminal	0.05	Monoterpenic aldehyde
Neral	0.07	Monoterpenic aldehyde
Carvotanacetone	0.06	Monoterpenic ketone
trans-2-Hydroxypinocamphone	0.08	Monoterpenic alcohol
Geraniol	0.02	Monoterpenic alcohol
Linalyl acetate	0.04	Monoterpenic ester
Geranial	0.11	Monoterpenic aldehyde
Methyl myrtenate	0.05	Monoterpenic ester
Cuminol	0.02	Monoterpenic alcohol
Thymol	0.04	Monoterpenic alcohol
Myrtenyl acetate	0.22	Monoterpenic ester
Eugenol	0.02	Phenylpropanoid
Neryl acetate	0.02	Monoterpenic ester
α-Copaene	0.07	Sesquiterpene
Methyl para-anisate	0.04	Phenolic ester
β-Bourbonene	1.49	Sesquiterpene
1,5-diepi-β-Bourbonene	0.08	Sesquiterpene
β-Elemene	0.06	Sesquiterpene
α-Gurjunene	0.17	Sesquiterpene
Methyleugenol	0.11	Phenylpropanoid
β-Caryophyllene	1.23	Sesquiterpene
β-Copaene	0.15	Sesquiterpene
Isogermacrene D	0.11	Sesquiterpene
α-Humulene	0.18	Sesquiterpene
allo-Aromadendrene	1.38	Sesquiterpene
cis-Muurola-4(15),5-diene	0.19	Sesquiterpene
(*E*)-β-Farnesene	0.08	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	1.70	Sesquiterpene
allo-Aromadendr-9-ene	0.14	Sesquiterpene
Bicyclogermacrene	1.25	Sesquiterpene
Aromadendra-1(10),4(15)-diene	0.03	Sesquiterpene
γ-Cadinene	0.18	Sesquiterpene
trans-Calamenene	0.04	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
(2*Z*?,8*Z*?)-Matricaria ester	0.04	Polyyne ester

α-Cadinene	0.01	Sesquiterpene
α-Elemol	0.39	Sesquiterpenic alcohol
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Spathulenol	0.24	Sesquiterpenic alcohol
Caryophyllene oxide	0.22	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Unknown	0.05	Oxygenated sesquiterpene
Ledol	0.08	Sesquiterpenic alcohol
10-epi-Cubenol	0.02	Sesquiterpenic alcohol
10-epi-γ-Eudesmol	0.01	Sesquiterpenic alcohol
γ-Eudesmol	0.07	Sesquiterpenic alcohol
Isospathulenol	0.04	Sesquiterpenic alcohol
τ-Cadinol	0.06	Sesquiterpenic alcohol
β-Eudesmol	0.09	Sesquiterpenic alcohol
α-Eudesmol	0.07	Sesquiterpenic alcohol
Phytone	0.04	Terpenic ketone
Consolidated total	**98.16%**	

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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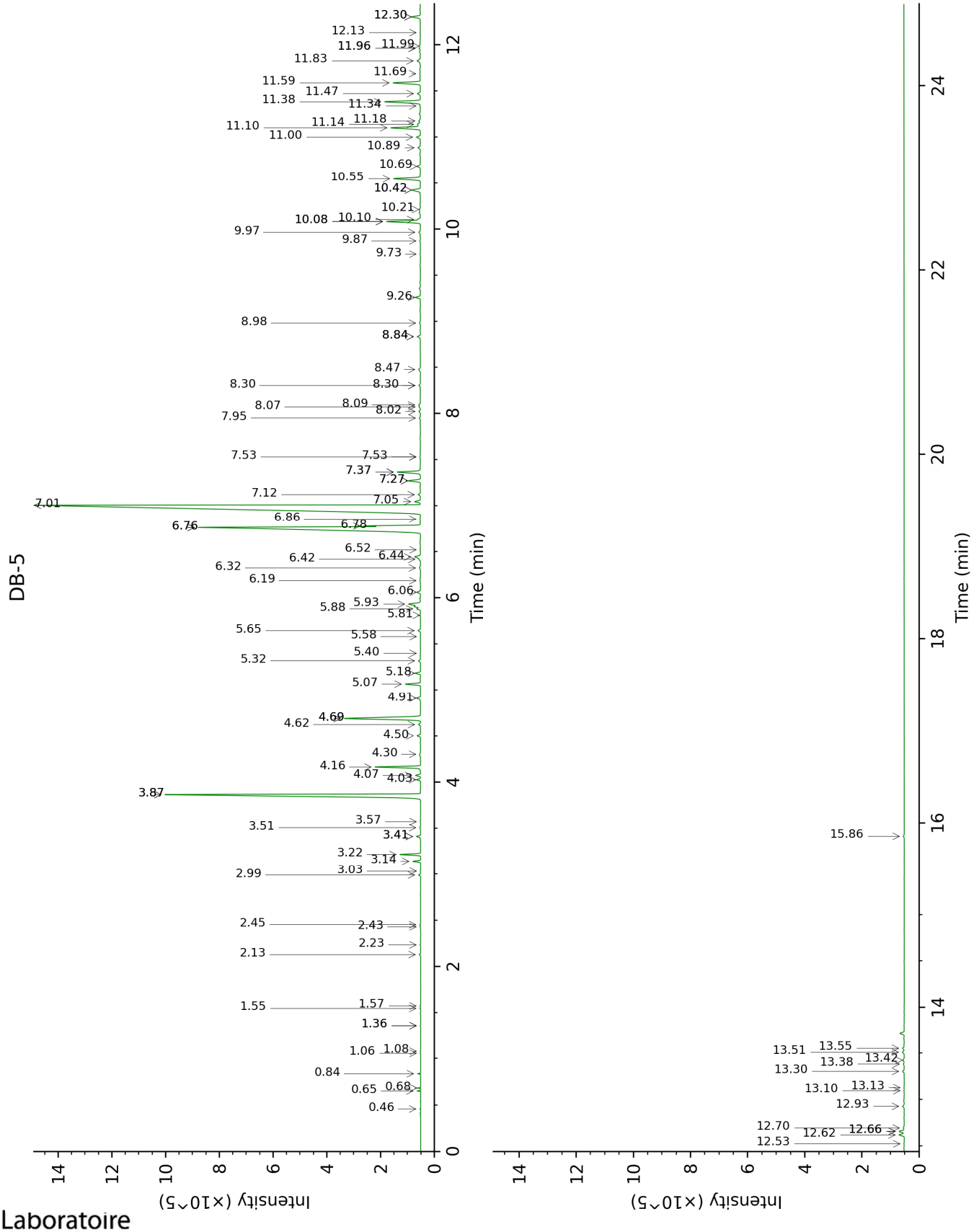
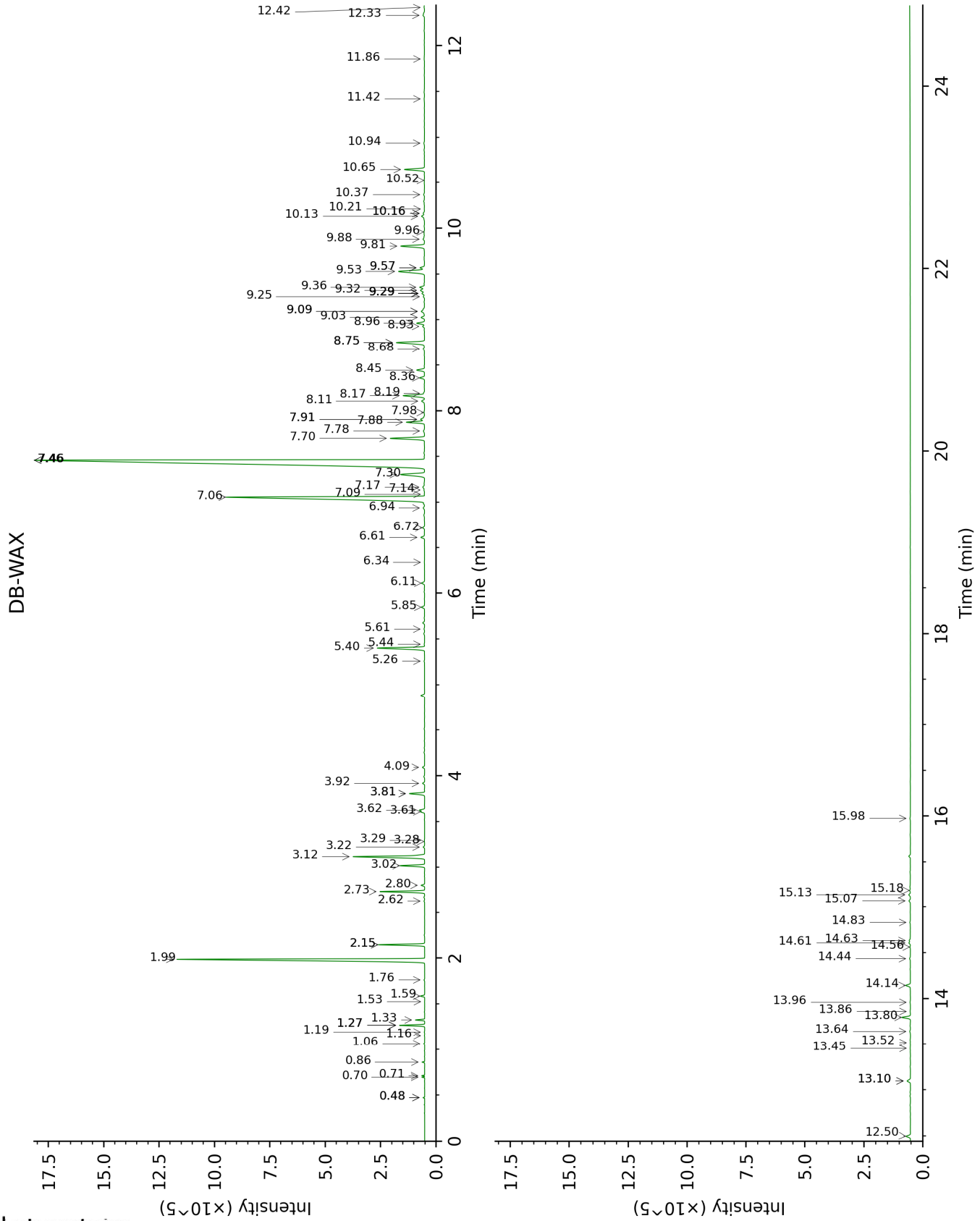

DB-5
Intensity (×10^5)
Time (min)
12.30
12.13
11.96
11.99
11.83
11.69
11.59
11.47
11.38
11.34
11.10
11.14
11.18
11.00
10.89
10.69
10.55
10.42
10.21
10.08
10.10
9.97
9.87
9.73
9.26
8.98
8.84
8.47
8.30
8.30
8.07
8.09
8.02
7.95
7.53
7.53
7.37
7.27
7.12
7.05
7.01
6.86
6.76
6.78
6.52
6.42
6.44
6.32
6.19
6.06
5.88
5.93
5.81
5.65
5.58
5.32
5.40
5.18
5.07
4.91
4.62
4.69
4.50
4.30
4.16
4.07
4.03
3.87
3.51
3.57
3.41
3.22
3.14
2.99
3.03
2.45
2.43
2.23
2.13
1.55
1.57
1.36
1.06
1.08
0.84
0.65
0.68
0.46
15.86
13.51
13.55
13.38
13.42
13.30
13.10
13.13
12.93
12.70
12.62
12.66
12.53


DB-WAX
Time (min)
Intensity (×10^5)
12.42
12.33
11.86
11.42
10.94
10.65
10.52
10.37
10.21
10.16
10.13
9.96
9.88
9.81
9.57
9.53
9.36
9.32
9.29
9.25
9.09
9.03
8.96
8.93
8.75
8.68
8.45
8.36
8.19
8.17
8.11
7.98
7.91
7.88
7.78
7.70
7.46
7.30
7.17
7.14
7.09
7.06
6.94
6.72
6.61
6.34
6.11
5.85
5.61
5.44
5.40
5.26
4.09
3.92
3.81
3.62
3.61
3.29
3.28
3.22
3.12
3.02
2.80
2.73
2.62
2.15
1.99
1.76
1.59
1.53
1.33
1.27
1.19
1.16
1.06
0.86
0.71
0.70
0.48
15.98
15.18
15.13
15.07
14.83
14.63
14.61
14.56
14.44
14.14
13.96
13.86
13.80
13.64
13.52
13.45
13.10
12.50

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.46	540	0.01	0.48*	788	0.03
Isovaleral	0.65	641	0.05	0.71	889	0.05
2-Methylbutyral	0.68	652	0.04	0.70	883	0.05
2-Ethylfuran	0.84	703	0.05	0.86	919	0.05
Isoamyl alcohol	1.06	733	0.01	3.28	1180	0.01
2-Methylbutanol	1.08	736	0.01	3.30	1181	0.01
Methyl isovalerate	1.36*	774	0.01	1.27*	991	0.76
Methyl 2-methylbutyrate	1.36*	774	[0.01]	1.19	978	0.01
Hexanal	1.55	800	0.02	1.76	1044	0.02
Octane	1.57	804	0.02	0.48*	788	[0.03]
(2*E*)-Hexenal	2.13	849	0.05	3.22	1175	0.05
(3*Z*)-Hexenol	2.23	858	0.02	5.61	1351	0.03
Hexanol	2.43	874	0.01	5.26	1326	0.02
Unknown [m/z 79, 78 (45), 91 (28), 77 (28), 41 (13), 80 (12), 107 (11)... 122 (1)]	2.45	875	0.02	1.06	955	0.02
Hashishene	2.99	916	0.07	1.27*	991	[0.76]
Tricyclene	3.03	919	0.01	1.16	971	0.01
α-Thujene	3.14	926	0.26	1.33	999	0.26
α-Pinene	3.22	931	0.69	1.27*	991	[0.76]
α-Fenchene	3.41*	944	0.15	1.53	1019	tr
Camphene	3.41*	944	[0.15]	1.59	1026	0.14
Thuja-2,4(10)-diene	3.51	950	0.03	2.15*	1084	1.63
Benzaldehyde	3.57	954	0.01	7.09	1460	0.01
β-Pinene	3.87*	974	14.11	1.99	1068	12.56
Sabinene	3.87*	974	[14.11]	2.15*	1084	[1.63]
Octen-3-ol	4.03	984	0.15	6.61	1424	0.16
Octan-3-one	4.07	987	0.20	3.81*	1221	0.65
Myrcene	4.16	993	1.64	2.73	1134	1.66
α-Phellandrene	4.30	1002	0.03	2.62	1126	0.02
α-Terpinene	4.50	1015	0.13	2.80	1140	0.13
para-Cymene	4.62	1022	0.09	3.92	1230	0.08
Limonene	4.69*	1026	4.27	3.02	1158	0.97
1,8-Cineole	4.69*	1026	[4.27]	3.12	1166	3.31
(*Z*)-β-Ocimene	4.91	1040	0.16	3.61†	1206	0.37
(*E*)-β-Ocimene	5.07	1050	0.57	3.81*	1221	[0.65]
γ-Terpinene	5.18	1058	0.22	3.62†	1207	[0.37]
cis-Sabinene hydrate	5.32	1066	0.09	6.72	1432	0.08
cis-Linalool oxide (fur.)	5.40	1071	0.01	6.34	1404	0.01
Fenchone	5.58	1082	0.01	5.44	1339	0.01
Terpinolene	5.65	1086	0.10	4.09	1243	0.09
trans-Sabinene hydrate	5.81	1097	0.02	7.78	1512	0.07
α-Thujone	5.88	1101	0.15	5.85	1368	0.14
Linalool	5.93	1104	0.89	7.88†	1519	1.05
β-Thujone	6.06	1112	0.14	6.11	1387	0.15

cis-para-Menth-2-en-1-ol	6.19	1120	0.06	7.91*†	1521	[1.05]
Nopinone	6.32	1129	0.06	7.98	1527	0.04
trans-Pinocarveol	6.42	1135	0.05	8.96	1604	0.37
trans-para-Menth-2-en-1-ol	6.44	1137	0.33	8.75*	1587	1.50
trans-Verbenol	6.52	1142	0.02	9.29*†	1630	0.38
Myrtenyl methyl ether	6.76*	1157	16.67	5.40	1336	2.24
Pinocamphone	6.76*	1157	[16.67]	7.06	1457	14.05
Pinocarvone	6.78	1158	1.31	7.70	1505	1.63
Borneol	6.86	1163	0.03	9.57*	1653	0.22
Isopinocamphone	7.01	1172	42.52	7.46*	1487	42.69
Terpinen-4-ol	7.05	1175	0.26	8.36	1556	0.23
Cryptone	7.12	1180	0.10	8.93	1601	0.09
Myrtenal	7.27*	1189	0.55	8.44	1563	0.38
α-Terpineol	7.27*	1189	[0.55]	9.57*	1653	[0.22]
Methylchavicol	7.37*	1195	1.07	9.09*†	1614	0.27
Myrtenol	7.37*	1195	[1.07]	10.65	1742	0.95
Decanal	7.53*	1206	0.05	7.14	1463	0.03
trans-Piperitol	7.53*	1206	[0.05]	10.21	1705	0.01
Cuminal	7.95	1234	0.05	10.37	1719	0.05
Neral	8.02	1239	0.07	9.29*†	1630	[0.38]
Carvotanacetone	8.07	1242	0.06	9.25	1627	0.06
trans-2-Hydroxypinocamphone	8.09	1243	0.08	12.33	1889	0.08
Geraniol	8.30*	1257	0.07	11.42	1808	0.02
Linalyl acetate	8.30*	1257	[0.07]	7.91*†	1521	[1.05]
Geranial	8.48	1269	0.11	9.88	1678	0.07
Methyl myrtenate	8.84*	1293	0.14	9.29*†	1630	[0.38]
Cuminol	8.84*	1293	[0.14]	13.96	2042	0.02
Thymol	8.98	1303	0.04	14.83	2127	0.02
Myrtenyl acetate	9.26	1322	0.22	9.36	1636	0.23
Eugenol	9.73	1355	0.02	14.56	2100	0.02
Neryl acetate	9.87	1365	0.02	9.96	1684	0.02
α-Copaene	9.97	1372	0.07	6.94	1448	0.07
Methyl para-anisate	10.08*	1380	1.53	13.64	2011	0.04
β-Bourbonene	10.08*	1380	[1.53]	7.30	1476	1.49
1,5-diepi-β-Bourbonene	10.10	1382	0.08	7.17	1465	0.11
β-Elemene	10.21	1389	0.06	8.19	1543	0.04
α-Gurjunene	10.42*	1404	0.46	7.46*	1487	[42.69]
Methyleugenol	10.42*	1404	[0.46]	13.10*	1960	0.19
β-Caryophyllene	10.55	1413	1.23	8.17	1541	1.11
β-Copaene	10.69	1424	0.15	8.11	1537	0.17
Isogermacrene D	10.89	1439	0.11	8.68	1582	0.08
α-Humulene	11.00	1447	0.18	9.03	1609	0.17
allo-Aromadendrene	11.10	1455	1.38	8.75*	1587	[1.50]
cis-Muurola-4(15),5-diene	11.14	1457	0.19	9.09*†	1614	[0.27]
(*E*)-β-Farnesene	11.18	1460	0.08	9.32†	1633	[0.38]
γ-Muurolene	11.34	1472	0.02	9.29*†	1630	[0.38]
Germacrene D	11.38	1476	1.70	9.53	1650	1.72

allo-Aromadendr-9-ene	11.47	1482	0.14	9.29*†	1630	[0.38]
Bicyclogermacrene	11.59	1491	1.25	9.81	1672	1.21
Aromadendra-1(10),4(15)-diene	11.69	1498	0.03	10.16*	1701	0.07
γ-Cadinene	11.83	1509	0.18	10.13	1699	0.19
trans-Calamenene	11.96*	1519	0.05	10.94	1767	0.04
δ-Cadinene	11.96*	1519	[0.05]	10.16*	1701	[0.07]
(2*Z*?,8*Z*?)-Matricaria ester	11.99	1521	0.04	15.98	2244	0.03
α-Cadinene	12.13	1533	0.01	10.52	1732	0.02
α-Elemol	12.30*	1546	0.41	13.80	2026	0.39
Isocaryophyllene epoxide B	12.30*	1546	[0.41]	11.86	1847	0.02
(*E*)-Nerolidol	12.52	1563	0.01	13.52	1999	0.01
Spathulenol	12.62	1571	0.24	14.14	2059	0.22
Caryophyllene oxide	12.66*	1574	0.24	12.50	1904	0.22
Caryophyllene oxide isomer	12.66*	1574	[0.24]	12.42	1897	0.02
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.70	1577	0.05			
Ledol	12.93	1595	0.08	13.10*	1960	[0.19]
10-epi-Cubenol	13.10	1608	0.02	13.45	1993	0.02
10-epi-γ-Eudesmol	13.13	1611	0.01	13.86	2032	0.02
γ-Eudesmol	13.30	1626	0.07	14.64	2107	0.05
Isospathulenol	13.38	1632	0.04	15.18	2162	0.03
τ-Cadinol	13.42	1635	0.06	14.61	2104	0.07
β-Eudesmol	13.51	1642	0.09	15.13	2157	0.07
α-Eudesmol	13.55	1646	0.07	15.07	2150	0.07
Phytone	15.86	1844	0.04	14.44	2087	0.05
Total identified		**98.76%**			**98.35%**	
Total reported		**98.84%**			**98.37%**	

*: 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