Date : August 08, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22G29-FEP02
Customer identification : Boswellia Serrata - India - 51038-02 - Steam Distilled
Type : Essential oil
Source : *Boswellia serrata*
Customer : Fern & Petal

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 : August 03, 2022

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4602 ± 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
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
(*E*)-2-Methyl-1,3-pentadiene	0.01	Alkene
3-Methyl-2-butanone	tr	Aliphatic ketone
Toluene	0.01	Simple phenolic
Unknown	0.02	Unknown
Hashishene	0.09	Monoterpene
Tricyclene	0.01	Monoterpene
α-Thujene	69.23	Monoterpene
α-Pinene	5.58	Monoterpene
α-Fenchene	tr	Monoterpene
Camphene	0.07	Monoterpene
Unknown	0.18	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.02	Monoterpene
β-Pinene	0.37	Monoterpene
Sabinene	5.82	Monoterpene
Pseudolimonene isomer	0.01	Monoterpene
Myrcene	0.89	Monoterpene
2-Carene	0.01	Monoterpene
α-Phellandrene	1.34	Monoterpene
Δ3-Carene	4.54	Monoterpene
α-Terpinene	0.11	Monoterpene
Carvomenthene	tr	Aliphatic alcohol
meta-Cymene	0.08	Monoterpene
para-Cymene	2.06	Monoterpene
Unknown	0.27	Unknown
1,8-Cineole	0.46*	Monoterpenic ether
β-Phellandrene	0.46*	Monoterpene
Limonene	1.90	Monoterpene
Unknown	0.01	Unknown
(*Z*)-β-Ocimene	0.54	Monoterpene
Unknown	0.07	Unknown
(*E*)-β-Ocimene	0.23	Monoterpene
Unknown	0.19	Unknown
γ-Terpinene	0.31	Monoterpene
cis-Sabinene hydrate	0.04	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Isoterpinolene	0.01	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.18	Monoterpene
α-Pinene oxide	0.01	Monoterpenic ether
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.09	Monoterpenic alcohol
α-Thujone	0.03	Monoterpenic ketone

Unknown	0.02	Monoterpenic alcohol
β-Thujone	0.20	Monoterpenic ketone
Unknown	tr	Oxygenated monoterpene
Dehydrosabinaketone	0.05	Normonoterpenic ketone
α-Campholenal	0.06	Monoterpenic aldehyde
Unknown	0.04	Unknown
allo-Ocimene	0.01	Monoterpene
trans-Pinocarveol	0.02	Monoterpenic alcohol
trans-Sabinol	0.03	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
trans-Verbenol	0.03	Monoterpenic alcohol
para-Menth-3-en-8-ol	0.03	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Pinocamphone	0.01	Monoterpenic ketone
Pinocarvone	0.02	Monoterpenic ketone
Borneol	0.03	Monoterpenic alcohol
α-Phellandren-8-ol	0.01	Monoterpenic alcohol
cis-Sabinol	0.06	Monoterpenic alcohol
Terpinen-4-ol	0.24	Monoterpenic alcohol
meta-Cymen-8-ol	0.05	Monoterpenic alcohol
Unknown	0.02	Unknown
para-Cymen-8-ol	0.04	Monoterpenic alcohol
α-Terpineol	0.03	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
Methylchavicol	1.21	Phenylpropanoid
cis-α-Phellandrene epoxide (iPr vs Me)	0.07	Monoterpenic ether
Verbenone	0.05	Monoterpenic ketone
trans-Carveol	0.02	Monoterpenic alcohol
Cuminal	0.02	Monoterpenic aldehyde
Carvone	0.01	Monoterpenic ketone
Carvotanacetone	0.02	Monoterpenic ketone
Unknown	0.07	Unknown
trans-Sabinene hydrate acetate	0.01	Monoterpenic ester
Linalyl acetate	0.04	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Bornyl acetate	0.03	Monoterpenic ester
Thymol	0.03	Monoterpenic alcohol
Carvacrol	0.02	Monoterpenic alcohol
para-Menth-5-en-1,2-diol isomer III	0.12	Monoterpenic alcohol
Unknown	0.01	Unknown
α-Terpinyl acetate	0.02	Monoterpenic ester
α-Cubebene	0.01	Sesquiterpene
α-Ylangene	0.03	Sesquiterpene
α-Copaene	0.10	Sesquiterpene
β-Bourbonene	0.35	Sesquiterpene
1,5-diepi-β-Bourbonene	0.04	Sesquiterpene
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.02	Sesquiterpene
Unknown	0.06	Unknown
Methyleugenol	0.06	Phenylpropanoid
α-Gurjunene	0.01	Sesquiterpene
β-Ylangene	0.04	Sesquiterpene

β-Caryophyllene	0.05	Sesquiterpene
β-Copaene	0.06	Sesquiterpene
trans-α-Bergamotene	0.04	Sesquiterpene
α-Humulene	0.01	Sesquiterpene
allo-Aromadendrene	0.05	Sesquiterpene
cis-Muurola-4(15),5-diene	0.01	Sesquiterpene
γ-Muurolene	0.03	Sesquiterpene
Germacrene D	0.09	Sesquiterpene
Unknown	0.10	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
β-Bisabolene	0.01	Sesquiterpene
δ-Cadinene	0.11	Sesquiterpene
Elemicin	0.01	Phenylpropanoid
4,10-diepi-Guaiol	0.01	Sesquiterpenic alcohol
α-Phellandrene dimer II	0.03	Diterpene
(3*E*)-Cembrene A	0.01	Diterpene
Verticilla-4(20),7,11-triene	0.02	Diterpene
Cembrenol	0.01	Diterpenic alcohol
Serratol	0.04	Diterpenic alcohol
Consolidated total	**99.16%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[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

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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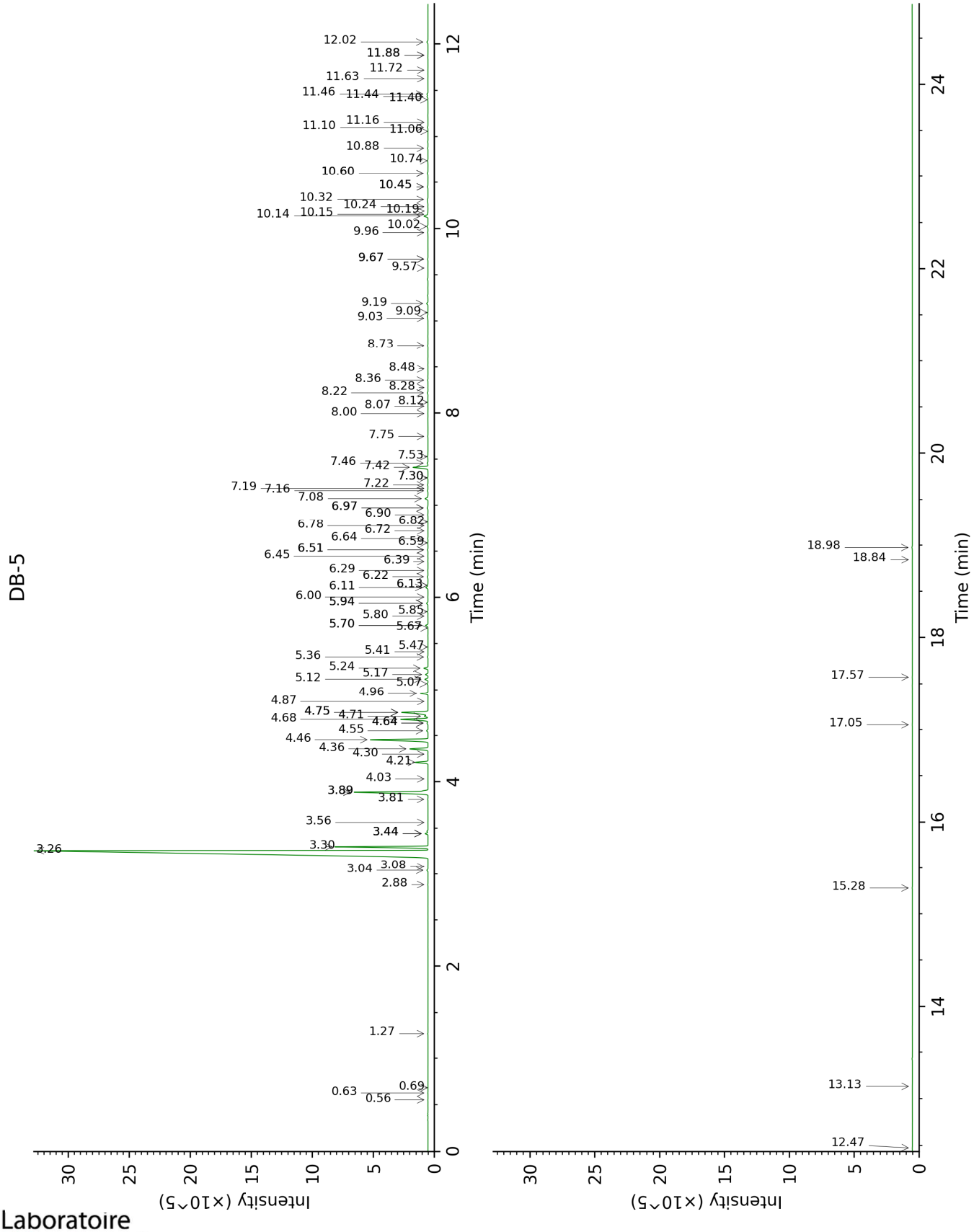
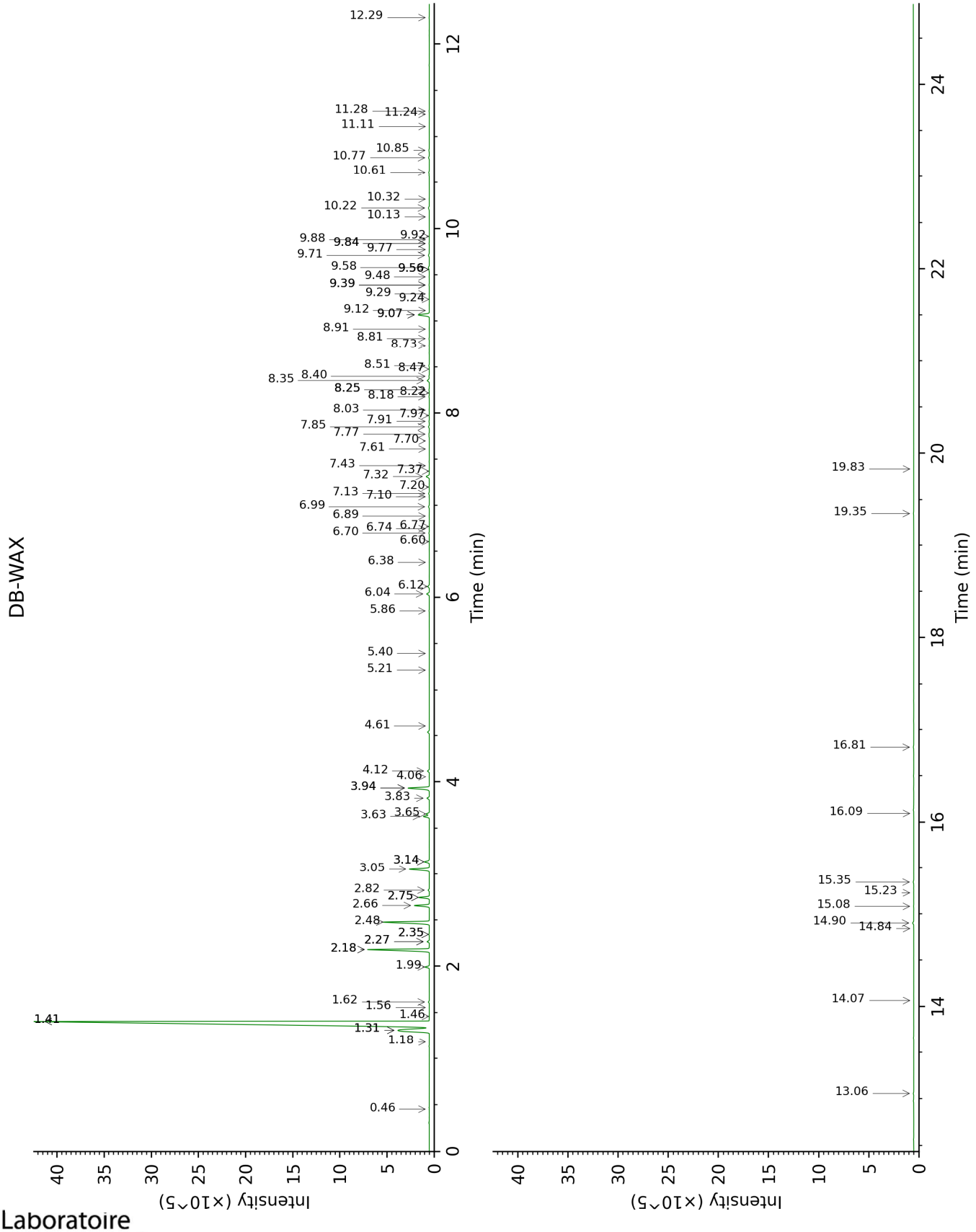

DB-5
Time (min)
Intensity (×10^5)
12.02
11.88
11.72
11.63
11.46
11.44
11.40
11.16
11.10
11.06
10.88
10.74
10.60
10.45
10.32
10.24
10.19
10.14
10.15
10.02
9.96
9.67
9.57
9.19
9.09
9.03
8.73
8.48
8.36
8.28
8.22
8.12
8.07
8.00
7.75
7.53
7.46
7.42
7.30
7.22
7.19
7.16
7.08
6.97
6.90
6.82
6.78
6.72
6.64
6.59
6.51
6.45
6.39
6.29
6.22
6.13
6.11
6.00
5.94
5.85
5.80
5.70
5.67
5.47
5.41
5.36
5.24
5.17
5.12
5.07
4.96
4.87
4.75
4.71
4.68
4.64
4.55
4.46
4.36
4.30
4.21
4.03
3.89
3.81
3.56
3.44
3.30
3.26
3.08
3.04
2.88
1.27
0.69
0.63
0.56
18.98
18.84
17.57
17.05
15.28
13.13
12.47


DB-WAX
Time (min)
Intensity (×10^5)
12.29
11.28
11.24
11.11
10.85
10.77
10.61
10.32
10.22
10.13
9.92
9.88
9.84
9.77
9.71
9.58
9.56
9.48
9.39
9.29
9.24
9.12
9.07
8.91
8.81
8.73
8.51
8.47
8.35
8.40
8.25
8.18
8.22
8.03
7.97
7.91
7.85
7.77
7.70
7.61
7.43
7.37
7.32
7.20
7.13
7.10
6.99
6.89
6.74
6.77
6.70
6.60
6.38
6.12
6.04
5.86
5.40
5.21
4.61
4.12
4.06
3.94
3.83
3.63
3.65
3.14
3.05
2.82
2.75
2.66
2.48
2.35
2.27
2.18
1.99
1.62
1.56
1.46
1.41
1.31
1.18
0.46
19.83
19.35
16.81
16.09
15.35
15.23
15.08
14.90
14.84
14.07
13.06

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
2-Methyl-3-buten-2-ol	0.56	607	tr	1.46	1014	tr
(*E*)-2-Methyl-1,3-pentadiene	0.63	631	0.01	0.46	769	tr
3-Methyl-2-butanone	0.69	649	tr			
Toluene	1.27	760	0.01	1.40*	1009	69.29
Unknown [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20),107 (20), 41 (18), 136 (17), 92 (17)]	2.88	907	0.02			
Hashishene	3.04	917	0.09	1.31*	996	5.56
Tricyclene	3.08	920	0.01	1.18	974	0.01
α-Thujene	3.26	931	69.23	1.40*	1009	[69.29]
α-Pinene	3.30	934	5.58	1.31*	996	[5.56]
α-Fenchene	3.44*†	943	0.26	1.56	1024	tr
Camphene	3.44*†	943	[0.26]	1.62	1030	0.07
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.44*†	943	[0.26]	2.27*	1095	0.19
Thuja-2,4(10)-diene	3.56	951	0.01	2.18*	1086	5.84
3,7,7-Trimethylcyclohepta-1,3,5-triene	3.81	967	0.02	2.75*	1134	0.92
β-Pinene	3.89*†	972	6.19	1.99	1067	0.37
Sabinene	3.89*†	972	[6.19]	2.18*	1086	[5.84]
Pseudolimonene isomer	4.03	982	0.01	2.35*	1102	0.04
Myrcene	4.21	994	0.89	2.75*	1134	[0.92]
2-Carene	4.30	999	0.01	2.27*	1095	[0.19]
α-Phellandrene	4.36	1003	1.34	2.66	1128	1.34
Δ3-Carene	4.46	1009	4.54	2.48	1114	4.54
α-Terpinene	4.55	1015	0.11	2.82	1141	0.11
Carvomenthene	4.64*	1020	0.09	2.35*	1102	[0.04]
meta-Cymene	4.64*	1020	[0.09]	3.94*	1227	2.15
para-Cymene	4.68	1023	2.06	3.94*	1227	[2.15]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.71	1025	0.27	6.04	1378	0.28
1,8-Cineole	4.75*	1028	2.36	3.14*	1166	0.48
β-Phellandrene	4.75*	1028	[2.36]	3.14*	1166	[0.48]
Limonene	4.75*	1028	[2.36]	3.05	1159	1.90
Unknown [m/z 67, 93 (70), 82 (70), 121 (42), 107 (39), 91 (33), 79 (28)...]	4.87	1035	0.01			
(*Z*)-β-Ocimene	4.96	1040	0.54	3.63	1204	0.55
Unknown [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22),	5.07	1047	0.07	7.13	1460	0.07

77 (21), 137 (21), 41 (17), 79 (14)...]						
(*E*)-β-Ocimene	5.12	1050	0.23	3.82	1219	0.23
Unknown [m/z 109 , 45 (67), 41 (40), 67 (39), 81 (33), 79 (27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...]	5.17	1054	0.19			
γ-Terpinene	5.24	1058	0.31	3.66	1207	0.30
cis-Sabinene hydrate	5.36	1065	0.04	6.70	1427	0.04
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.41	1069	0.01	4.60	1277	0.01
cis-Linalool oxide (fur.)	5.47	1072	0.01	6.38	1403	0.01
Isoterpinolene	5.67	1085	0.01	4.06	1236	0.02
trans-Linalool oxide (fur.)	5.70*	1086	0.19	6.74	1430	0.01
Terpinolene	5.70*	1086	[0.19]	4.12	1241	0.18
α-Pinene oxide	5.80	1093	0.01	5.22	1317	0.02
trans-Sabinene hydrate	5.85	1096	0.04	7.77	1508	0.05
Linalool	5.94*	1101	0.13	7.85	1515	0.09
α-Thujone	5.94*	1101	[0.13]	5.86	1364	0.03
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	6.00	1106	0.02	8.22†	1544	0.06
β-Thujone	6.11	1112	0.20	6.12	1384	0.17
Unknown [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)... 154 (1)]	6.13*	1114	0.05			
Dehydrosabinaketone	6.13*	1114	[0.05]	8.40	1558	0.05
α-Campholenal	6.22	1120	0.06	6.77	1432	0.01
Unknown [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...]	6.29	1124	0.04			
allo-Ocimene	6.39	1130	0.01	5.40	1331	0.01
trans-Pinocarveol	6.45	1134	0.02	8.91	1598	0.03
trans-Sabinol	6.52*	1138	0.05	9.56*†	1651	0.16
trans-para-Menth-2-en-1-ol	6.52*	1138	[0.05]	8.73	1584	0.02
trans-Verbenol	6.59	1143	0.03	9.30	1630	0.02
para-Menth-3-en-8-ol	6.64	1146	0.03	8.51	1567	0.05
Unknown [m/z 109, 81 (39), 41 (38), 95 (24)... 152 (1)]	6.72	1151	0.01			
Pinocamphone	6.78	1155	0.01	7.10	1457	0.02
Pinocarvone	6.82	1157	0.02	7.70	1503	0.01
Borneol	6.90	1163	0.03	9.56*†	1651	[0.16]

α-Phellandren-8-ol	6.98*	1167	0.09	9.92	1681	0.01
cis-Sabinol	6.98*	1167	[0.09]	10.61	1740	0.06
Terpinen-4-ol	7.08	1174	0.24	8.35	1554	0.25
meta-Cymen-8-ol	7.16	1179	0.05	11.24	1794	0.01
Unknown [m/z 69, 41 (65), 109 (36), 67 (16), 84 (11), 43 (10), 55 (9)...]	7.19	1181	0.02			
para-Cymen-8-ol	7.22	1183	0.04	11.28	1797	0.03
α-Terpineol	7.30*	1188	0.04	9.56*†	1651	[0.16]
Myrtenal	7.30*	1188	[0.04]	8.48	1564	0.02
Methylchavicol	7.42	1195	1.21	9.07*	1611	1.24
cis-α-Phellandrene epoxide (iPr vs Me)	7.46	1198	0.07	10.77	1753	0.09
Verbenone	7.53	1203	0.05	9.39*†	1637	0.05
trans-Carveol	7.75	1217	0.02	11.11	1782	0.01
Cuminal	8.00	1234	0.02	10.32	1714	0.01
Carvone	8.08	1239	0.01	9.77	1669	0.02
Carvotanacetone	8.12	1242	0.02	9.24	1625	0.01
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	8.22	1249	0.07	10.85	1760	0.07
trans-Sabinene hydrate acetate	8.28	1252	0.01	7.43	1482	0.01
Linalyl acetate	8.36	1258	0.04	7.97	1524	0.04
Unknown [m/z 109, 41 (22), 81 (14), 43 (11)... 152 (4)]	8.48	1266	0.01			
Bornyl acetate	8.74	1283	0.03	8.03	1529	0.03
Thymol	9.03	1303	0.03	14.84	2131	0.01
Carvacrol	9.09	1307	0.02	15.08	2155	0.03
para-Menth-5-en-1,2-diol isomer III	9.19	1314	0.12	14.90	2137	0.13
Unknown [m/z 133, 105 (45), 91 (38), 119 (36)... 150 (3)]	9.57	1341	0.01			
α-Terpinyl acetate	9.67*	1348	0.04	9.48	1645	0.02
α-Cubebene	9.67*	1348	[0.04]	6.60	1420	0.01
α-Ylangene	9.96	1368	0.03	6.89	1441	0.02
α-Copaene	10.02	1373	0.10	6.99	1449	0.09
β-Bourbonene	10.14	1381	0.35	7.32	1474	0.37
1,5-diepi-β-Bourbonene	10.16	1382	0.04	7.20	1465	0.03
β-Cubebene	10.19	1384	0.02	7.61	1496	0.01
β-Elemene	10.24	1388	0.02	8.25*†	1546	[0.06]
Unknown [m/z 71, 100 (92), 111 (79), 69 (46), 109 (45)...]	10.32	1393	0.06	16.81	2335	0.05
Methyleugenol	10.45*	1403	0.07	13.06	1958	0.06
α-Gurjunene	10.45*	1403	[0.07]	7.37	1478	0.01
β-Ylangene	10.60*	1414	0.09	7.91	1519	0.04
β-Caryophyllene	10.60*	1414	[0.09]	8.25*†	1546	[0.06]

β-Copaene	10.74	1424	0.06	8.18	1540	0.04
trans-α-Bergamotene	10.88	1434	0.04	8.25*†	1546	[0.06]
α-Humulene	11.06	1448	0.01	9.07*	1611	[1.24]
allo-Aromadendrene	11.10	1451	0.05	8.81	1590	0.04
cis-Muurola-4(15),5-diene	11.16	1455	0.01	9.12	1615	0.01
γ-Muurolene	11.40	1473	0.03	9.39*†	1637	[0.05]
Germacrene D	11.44	1476	0.09	9.58†	1653	[0.16]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.46	1478	0.10	9.71	1664	0.11
Bicyclogermacrene	11.63	1490	0.01	9.84*	1674	0.03
α-Muurolene	11.72	1497	0.01	9.84*	1674	[0.03]
γ-Cadinene	11.88*	1509	0.02	10.13	1698	0.02
β-Bisabolene	11.88*	1509	[0.02]	9.88	1678	0.01
δ-Cadinene	12.02	1520	0.11	10.22	1706	0.12
Elemicin	12.47	1556	0.01	15.23	2170	0.02
4,10-diepi-Guaiol	13.13	1608	0.01	14.07	2054	0.01
α-Phellandrene dimer II	15.28	1789	0.03	12.29	1887	0.03
(3*E*)-Cembrene A	17.05	1951	0.01	15.35	2182	0.06
Verticilla-4(20),7,11-triene	17.57	2000	0.02	16.09	2259	0.02
Cembrenol	18.84	2127	0.01	19.83	2681	0.01
Serratol	18.98	2141	0.04	19.35	2623	0.04
Total identified		**98.31%**			**98.07%**	
Total reported		**99.19%**			**98.70%**	

*: 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