Date : July 30, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19G29-PTH02-1-SCC
Customer identification : Palo Santo - Peru - PJ010596R
Type : Essential oil
Source : *Bursera graveolens*
Customer : Plant Therapy

Analysis

Method: PC-PA-014 - 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
Analysis date : July 29, 2019

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4768 ± 0.0003 (20 °C)

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	%	Classe
Toluene	0.01	Simple phenolic
3-Methylcyclopentanone	0.04	Aliphatic ketone
α-Thujene	tr	Monoterpene
α-Pinene	0.06	Monoterpene
3-Methylcyclohexanone	0.01	Aliphatic ketone
Sabinene	0.01	Monoterpene
β-Pinene	0.01	Monoterpene
Hexahydroacetophenone epimer I	0.06	Aliphatic ketone
Hexahydroacetophenone epimer II	0.07	Aliphatic ketone
Dehydro-1,8-cineole	0.09	Monoterpenic ether
Myrcene	0.19	Monoterpene
Pseudolimonene	0.02	Monoterpene
α-Phellandrene	0.10	Monoterpene
Octanal	tr	Aliphatic aldehyde
Δ3-Carene	0.02	Monoterpene
α-Terpinene	0.01	Monoterpene
para-Cymene	0.74	Monoterpene
Limonene	68.49	Monoterpene
(*Z*)-β-Ocimene	0.06	Monoterpene
β-Phellandrene	0.14*	Monoterpene
1,8-Cineole	[0.14]*	Monoterpenic ether
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.02	Monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
para-Cymenene	0.09	Monoterpene
Terpinolene	0.04	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Linalool	0.08	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.15	Monoterpenic alcohol
Limona ketone	0.03	Normonoterpenic ketone
cis-Limonene oxide	0.05	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.14	Monoterpenic alcohol
trans-Limonene oxide	0.07	Monoterpenic ether
cis-β-Terpineol	0.12	Monoterpenic alcohol
Menthone	0.19	Monoterpenic ketone
trans-β-Terpineol	0.06	Monoterpenic alcohol
Isomenthone	0.18	Monoterpenic ketone
Menthofuran	10.35	Monoterpenic ether
neo-Menthol	0.05	Monoterpenic alcohol
Unknown	0.15	Oxygenated monoterpene
4-Methylacetophenone	0.02	Simple phenolic
trans-para-Mentha-1(7),8-dien-2-ol	tr	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
trans-Isocarveol	0.04	Monoterpenic alcohol
α-Terpineol	9.44	Monoterpenic alcohol
cis-Dihydrocarvone	0.16	Monoterpenic ketone

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Unknown	0.02	Unknown
trans-Isopiperitenol	0.14	Monoterpenic alcohol
4,7-Dimethylbenzofuran?	0.03	Furan
cis-Isopiperitenol	0.03	Monoterpenic alcohol
trans-Carveol	0.32	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.04	Monoterpenic alcohol
cis-Isocarveol	0.02	Monoterpenic alcohol
cis-Carveol	0.14	Monoterpenic alcohol
Pulegone	0.34	Monoterpenic ketone
Carvone	1.58	Monoterpenic ketone
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Perillaldehyde	0.02	Monoterpenic aldehyde
Limonen-10-ol	0.02	Monoterpenic alcohol
Perillyl alcohol	0.03	Monoterpenic alcohol
cis-para-Mentha-2,8-diene-1-hydroperoxide	0.01	Monoterpenic peroxide
Unknown	0.03	Unknown
Unknown	0.01	Unknown
Menthofurolactone isomer I	0.07	Monoterpenic lactone
Menthofurolactone isomer II	0.03	Monoterpenic lactone
α-Ylangene	0.04	Sesquiterpene
α-Copaene	0.08	Sesquiterpene
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.17	Sesquiterpene
α-Cedrene	0.04	Sesquiterpene
β-Ylangene	0.09	Sesquiterpene
cis-Thujopsene	0.01	Sesquiterpene
β-Copaene	0.09	Sesquiterpene
Menthofurolactone isomer III	0.18	Monoterpenic lactone
β-Humulene	0.08	Sesquiterpene
cis-β-Bergamotene?	0.03	Sesquiterpene
Unknown	0.14	Sesquiterpene
γ-Muurolene	0.32	Sesquiterpene
Germacrene D	0.83	Sesquiterpene
β-Selinene	0.15	Sesquiterpene
Unknown	0.03	Unknown
Menthalactone	0.20	Monoterpenic lactone
α-Selinene	0.11	Sesquiterpene
α-Muurolene	0.10	Sesquiterpene
γ-Cadinene	0.13	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.25	Sesquiterpene
Unknown	0.04	Sesquiterpene
trans-Calamenene	0.03	Sesquiterpene
δ-Cadinene	0.16	Sesquiterpene
Menthofurolactone analog	0.05	Monoterpenic lactone
α-Cadinene	0.03	Sesquiterpene
1,5-Epoxysalvial-4(14)-ene	0.04	Sesquiterpenic ether
Spathulenol	0.02	Sesquiterpenic alcohol
Globulol	0.01	Sesquiterpenic alcohol
Salvial-4(14)-en-1-one	0.03	Aliphatic alcohol
Unknown	0.02	Oxygenated sesquiterpene
Junenol	0.33	Sesquiterpenic alcohol

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1-epi-Cubenol	0.01	Sesquiterpenic alcohol
Cubenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
τ-Muurolol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.02	Sesquiterpenic alcohol
Unknown	0.12	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1α-ol	0.01	Sesquiterpenic alcohol
Consolidated total	**98.62%**	

*: 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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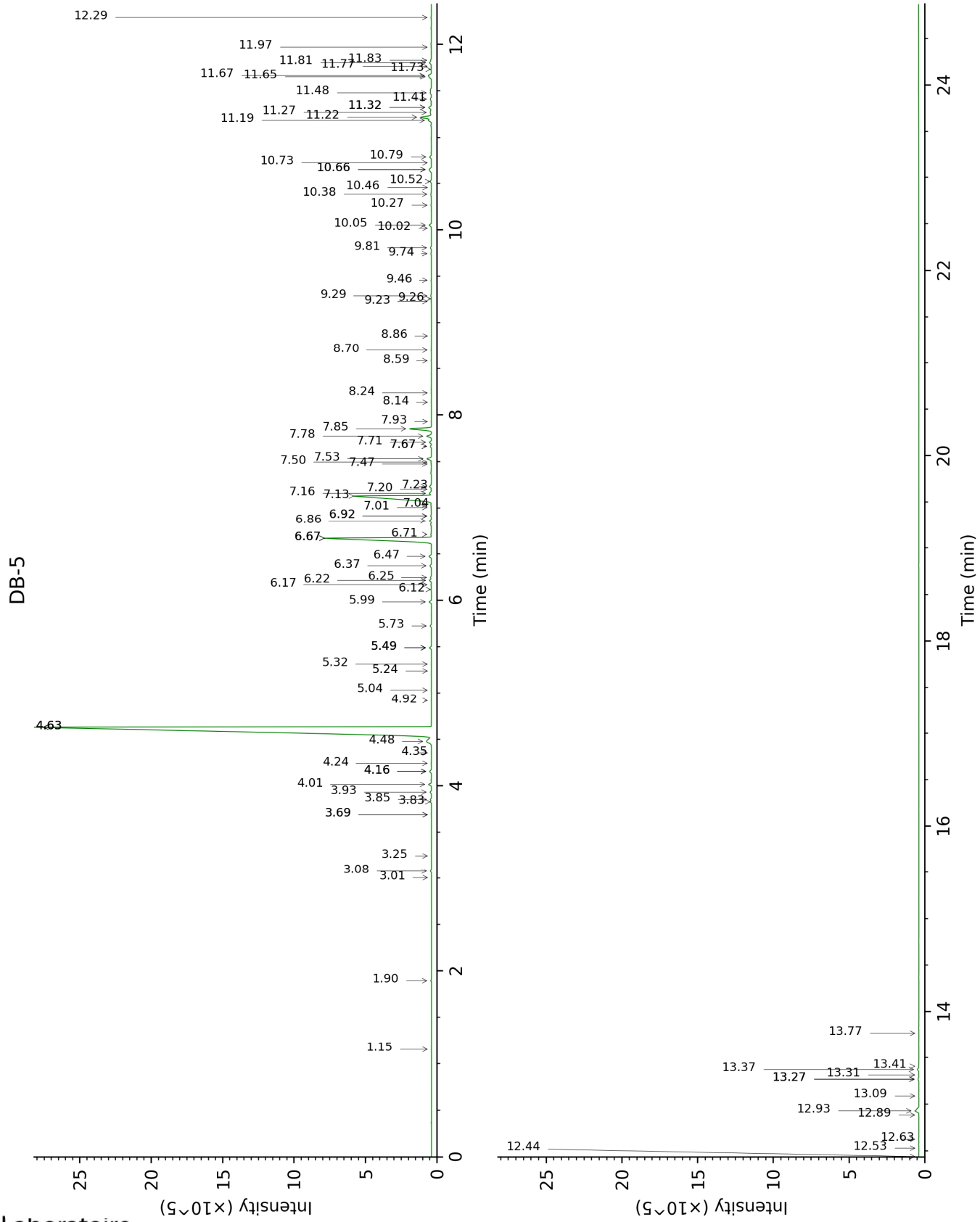
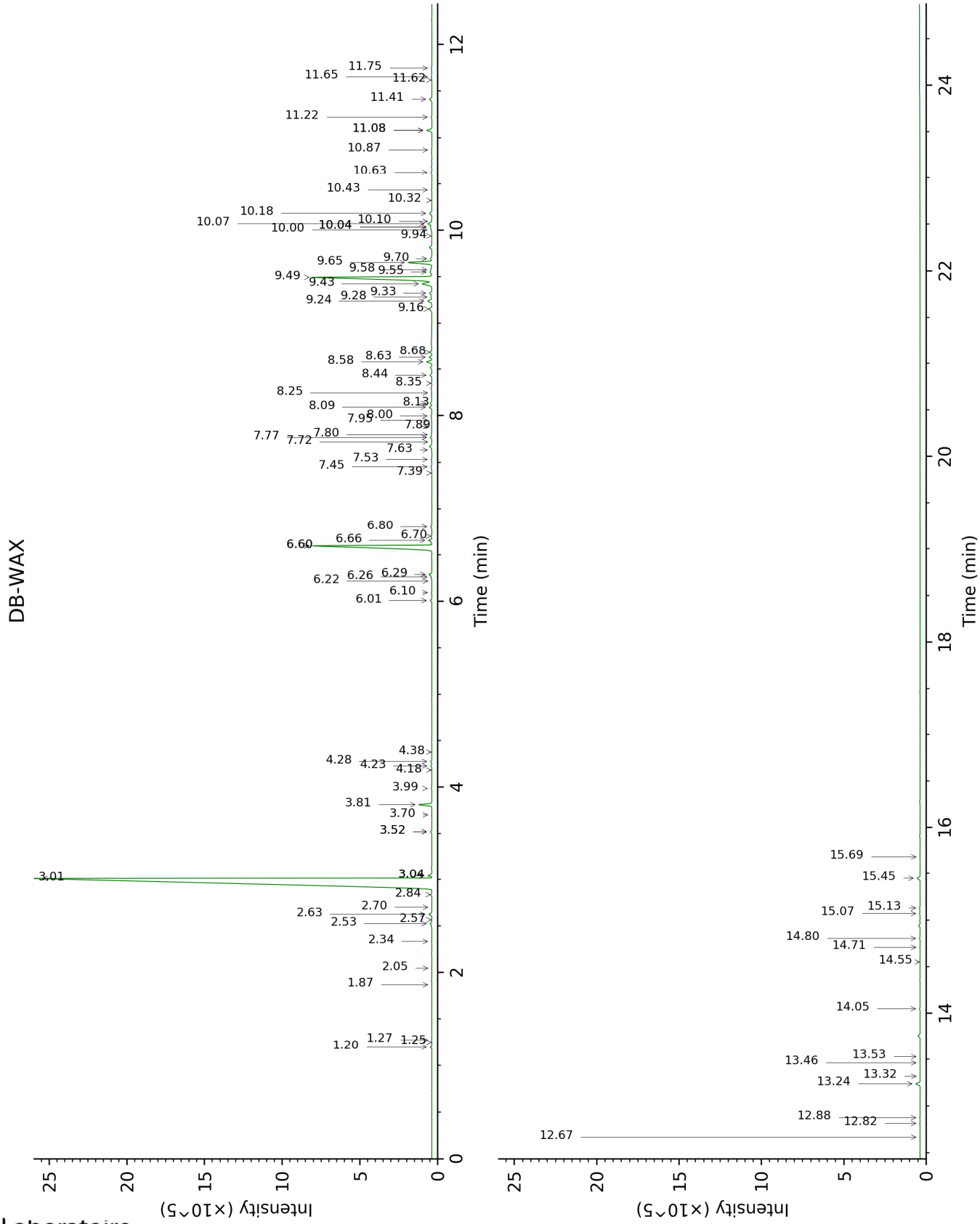

DB-5
Intensity (×10^5)
Time (min)
12.29
11.97
11.81
11.77
11.83
11.73
11.67
11.65
11.48
11.41
11.32
11.27
11.22
11.19
10.73
10.79
10.66
10.52
10.38
10.46
10.27
10.05
10.02
9.81
9.74
9.46
9.29
9.23
9.26
8.86
8.70
8.59
8.24
8.14
7.93
7.85
7.78
7.71
7.67
7.50
7.53
7.47
7.16
7.13
7.20
7.23
7.04
7.01
6.86
6.92
6.67
6.71
6.47
6.37
6.17
6.22
6.25
6.12
5.99
5.73
5.49
5.32
5.24
5.04
4.92
4.63
4.48
4.35
4.24
4.16
4.01
3.93
3.85
3.83
3.69
3.25
3.08
3.01
1.90
1.15
13.77
13.37
13.41
13.31
13.27
13.09
12.93
12.89
12.63
12.53
12.44


DB-WAX
Intensity (×10^5)
Time (min)
0
5
10
15
20
25
2
4
6
8
10
12
14
16
18
20
22
24
12.67
12.88
12.82
13.46
13.53
13.24
13.32
14.05
14.80
14.71
14.55
15.07
15.13
15.69
15.45
1.20
1.27
1.25
1.87
2.05
2.34
2.63
2.53
2.70
2.57
2.84
3.01
3.04
3.52
3.81
3.70
3.99
4.28
4.23
4.38
4.18
6.22
6.26
6.29
6.01
6.10
6.60
6.66
6.80
6.70
7.77
7.72
7.80
7.45
7.53
7.63
7.39
7.95
8.00
7.89
8.09
8.25
8.13
8.58
8.63
8.68
8.44
8.35
9.49
9.65
9.58
9.55
9.70
9.43
9.24
9.28
9.33
9.16
10.07
10.00
10.04
10.18
10.10
9.94
10.43
10.32
10.63
10.87
11.22
11.08
11.41
11.65
11.75
11.62

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.15	760	0.01	1.28	1003	0.01
3-Methylcyclopentanone	1.90	840	0.04	3.04*	1168	0.20
α-Thujene	3.01	925	tr	1.25	1001	tr
α-Pinene	3.08	930	0.06	1.20	992	0.06
3-Methylcyclohexanone	3.24	941	0.01	4.38	1271	0.01
Sabinene	3.69*	970	0.02	2.05	1084	0.01
β-Pinene	3.69*	970	[0.02]	1.87	1066	0.01
Hexahydroacetophenone epimer I	3.83	979	0.06	4.23	1260	0.06
Hexahydroacetophenone epimer II	3.85	981	0.07	4.28	1264	0.07
Dehydro-1,8-cineole	3.93	986	0.09	2.84	1152	0.07
Myrcene	4.02	992	0.19	2.63	1135	0.18
Pseudolimonene	4.16*	1001	0.14	2.57	1130	0.02
α-Phellandrene	4.16*	1001	[0.14]	2.53	1126	0.10
Octanal	4.16*	1001	[0.14]	4.18	1256	tr
Δ3-Carene	4.24	1006	0.02	2.34	1111	0.02
α-Terpinene	4.35	1013	0.01	2.70	1141	0.01
para-Cymene	4.48	1021	0.74	3.81	1229	0.72
Limonene	4.63*	1031	68.69	3.01	1166	68.49
(*Z*)-β-Ocimene	4.63*	1031	[68.69]	3.52*	1207	0.08
β-Phellandrene	4.63*	1031	[68.69]	3.04*	1168	[0.20]
1,8-Cineole	4.63*	1031	[68.69]	3.04*	1168	[0.20]
(*E*)-β-Ocimene	4.92	1049	0.01	3.70	1220	0.01
γ-Terpinene	5.04	1056	0.02	3.52*	1207	[0.08]
cis-Linalool oxide (fur.)	5.24	1069	0.01	6.22	1404	0.01
Octanol	5.32	1074	0.01	7.89	1529	0.02
para-Cymenene	5.49*	1085	0.14	6.01	1388	0.09
Terpinolene	5.49*	1085	[0.14]	3.99	1242	0.04
trans-Linalool oxide (fur.)	5.49*	1085	[0.14]	6.60*	1432	10.27
Linalool	5.73	1100	0.08	7.77	1520	0.08
trans-para-Mentha-2,8-dien-1-ol	5.98	1117	0.15	8.63	1587	0.17
Limona ketone	6.12	1126	0.03	7.53	1502	0.04
cis-Limonene oxide	6.17	1129	0.05	6.10	1395	0.04
cis-para-Mentha-2,8-dien-1-ol	6.22	1132	0.14	9.16	1629	0.22
trans-Limonene oxide	6.25	1134	0.07	6.26	1407	0.05
cis-β-Terpineol	6.37	1142	0.12	8.68	1591	0.12
Menthone	6.48	1149	0.19	6.29	1409	0.18
trans-β-Terpineol	6.67*	1162	10.59	9.28	1640	0.06
Isomenthone	6.67*	1162	[10.59]	6.66	1436	0.18
Menthofuran	6.67*	1162	[10.59]	6.60*	1432	[10.27]
neo-Menthol	6.71	1164	0.05	8.25	1557	0.03
Unknown [m/z 69, 84 (62), 41 (30), 123 (26), 97 (24), 109 (23)...]	6.86	1174	0.15	9.33	1643	0.17
4-Methylacetophenone	6.92*	1178	0.05	10.10	1706	0.02

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trans-para-Mentha-1(7),8-dien-2-ol	6.92*	1178	[0.05]	11.08*	1790	0.32
para-Cymen-8-ol	7.01	1184	0.03	11.22	1802	0.05
trans-Isocarveol	7.04	1186	0.04	10.63	1751	0.06
α-Terpineol	7.13	1192	9.44	9.50	1657	9.35
cis-Dihydrocarvone	7.16	1194	0.16	8.13	1549	0.12
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.20	1196	0.02	7.72	1516	0.02
trans-Isopiperitenol	7.23	1198	0.14	10.04*	1701	0.14
4,7-Dimethylbenzofuran?	7.48	1215	0.03			
cis-Isopiperitenol	7.50	1216	0.03	10.00	1698	0.04
trans-Carveol	7.53	1219	0.32	11.08*	1790	[0.32]
cis-para-Mentha-1(7),8-dien-2-ol	7.67*	1228	0.07	11.66	1841	0.04
cis-Isocarveol	7.67*	1228	[0.07]	11.62	1838	0.02
cis-Carveol	7.71	1231	0.14	11.41	1819	0.17
Pulegone	7.78	1235	0.34	8.58	1583	0.35
Carvone	7.85	1241	1.58	9.66	1670	1.58
Unknown [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25)...]	7.93	1246	0.01	9.94	1693	0.02
Unknown [m/z 112, 70 (63), 43 (59), 59 (51), 97 (45), 84 (22)...]	8.14	1261	0.02			
Perillaldehyde	8.24	1268	0.02	10.32	1725	0.01
Limonen-10-ol	8.59	1292	0.02	12.82	1946	0.02
Perillyl alcohol	8.70	1300	0.03	12.88	1951	0.03
cis-para-Mentha-2,8-diene-1-hydroperoxide	8.86	1305	0.01			
Unknown [m/z 124, 123 (43), 121 (35), 166 (30), 93 (30), 136 (17)...]	9.23	1332	0.03			
Unknown [m/z 150, 71 (67), 107 (54), 43 (44), 109 (42)...]	9.26	1334	0.01			
Menthofurolactone isomer I	9.29	1336	0.07			
Menthofurolactone isomer II	9.46	1348	0.03			
α-Ylangene	9.74	1368	0.04	6.70	1440	0.05
α-Copaene	9.81	1372	0.08	6.80	1447	0.06
β-Cubebene	10.02	1387	0.02	7.39	1491	0.01
β-Elemene	10.05	1390	0.17	8.09	1545	0.17
α-Cedrene	10.27	1405	0.04	7.63	1510	0.03
β-Ylangene	10.38	1414	0.09	7.80	1522	0.05
cis-Thujopsene	10.46	1419	0.01	8.35	1565	0.02
β-Copaene	10.52	1424	0.09	8.00	1538	0.08
Menthofurolactone isomer III	10.66*	1434	0.26			
β-Humulene	10.66*	1434	[0.26]	7.45	1496	0.08
cis-β-Bergamotene?	10.73	1440	0.03			

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Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.79	1444	0.14	8.44	1572	0.12
γ-Muurolene	11.19†	1474	1.12	9.24	1636	0.32
Germacrene D	11.22†	1476	[1.12]	9.42	1651	0.83
β-Selinene	11.27	1480	0.15	9.55	1662	0.14
Unknown [m/z 149, 161 (51), 93 (43), 91 (42), 164 (42), 105 (37)...204? (11)]	11.32*	1484	0.23	7.95	1534	0.03
Menthalactone	11.32*	1484	[0.23]	15.45	2202	0.20
α-Selinene	11.41	1491	0.11	9.58	1664	0.09
α-Muurolene	11.48	1496	0.10	9.70	1673	0.09
γ-Cadinene	11.66	1509	0.13	10.04*	1701	[0.14]
(3*E*,6*E*)-α-Farnesene	11.67	1510	0.25	10.18	1713	0.16
Unknown [m/z 161, 81 (93), 105 (66), 93 (60), 119 (60), 204 (54)...]	11.74	1515	0.04			
trans-Calamenene	11.77	1518	0.03	10.87	1772	0.03
δ-Cadinene	11.81	1521	0.16	10.07	1704	0.29
Menthofurolactone analog	11.83	1523	0.05			
α-Cadinene	11.97	1534	0.03	10.43	1735	0.03
1,5-Epoxysalvial-4(14)-ene	12.29	1559	0.04	11.75	1849	0.04
Spathulenol	12.44	1571	0.02	14.05	2062	0.05
Globulol	12.53	1578	0.01	13.53	2012	0.01
Salvial-4(14)-en-1-one	12.63	1586	0.03	12.67	1932	0.02
Unknown [m/z 43, 93 (88), 91 (76), 79 (73), 69 (64), 41 (63), 95 (53).. 220 (3)]	12.89	1606	0.02			
Junenol	12.93	1610	0.33	13.24	1985	0.28
1-epi-Cubenol	13.09	1623	0.01	13.46	2006	0.02
Cubenol	13.27*	1638	0.08	13.32	1992	0.01
τ-Cadinol	13.27*	1638	[0.08]	14.55	2111	0.02
τ-Muurolol	13.27*	1638	[0.08]	14.71	2127	0.02
β-Eudesmol	13.32	1642	0.02	15.07	2163	0.05
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.37	1646	0.12	14.80	2137	0.04
α-Cadinol	13.41	1649	0.02	15.13	2169	0.04
Germacra-4(15),5,10(14)-trien-1α-ol	13.77	1679	0.01	15.69	2226	0.01
Total identified		**98.12%**			**97.35%**	
Total reported		**98.69%**			**97.75%**	

*: 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)

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R.I.: Retention index

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