Date : August 24, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20H10-MRH01
Customer identification : Palo Santo - Ecuador - EO2875
Type : Essential oil
Source : *Bursera graveolens*
Customer : Mountain Rose Herbs

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 : August 20, 2020

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: 1.4763 ± 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-Methylbutyral	tr	Aliphatic aldehyde
Toluene	0.01	Simple phenolic
3-Methylcyclopentanone	0.08	Aliphatic ketone
(2*E*)-Hexenal	0.01	Aliphatic aldehyde
α-Thujene	0.01	Monoterpene
α-Pinene	0.11	Monoterpene
3-Methylcyclohexanone	0.03	Aliphatic ketone
Benzaldehyde	0.01	Simple phenolic
β-Pinene	0.01	Monoterpene
Sabinene	0.01	Monoterpene
Hexahydroacetophenone epimer II	0.11	Aliphatic ketone
Dehydro-1,8-cineole	0.11	Monoterpenic ether
Myrcene	0.27	Monoterpene
2-Carene	0.04	Monoterpene
Octan-3-ol	0.01	Aliphatic alcohol
Octanal	tr	Aliphatic aldehyde
Pseudolimonene	0.02	Monoterpene
α-Phellandrene	0.08	Monoterpene
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.01	Monoterpene
para-Cymene	0.82	Monoterpene
Limonene	72.77	Monoterpene
β-Phellandrene	0.16	Monoterpene
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.03	Monoterpene
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.02	Monoterpene
para-Cymenene	0.15	Monoterpene
Linalool	0.01	Monoterpenic alcohol
Hotrienol	0.05	Monoterpenic alcohol
Dehydrosabinaketone	0.01	Normonoterpenic ketone
trans-para-Mentha-2,8-dien-1-ol	0.18	Monoterpenic alcohol
Limona ketone	0.05	Normonoterpenic ketone
cis-para-Mentha-2,8-dien-1-ol	0.04	Monoterpenic alcohol
Camphor	0.07	Monoterpenic ketone
cis-β-Terpineol	0.16	Monoterpenic alcohol
Menthone	0.30	Monoterpenic ketone
Isomenthone	0.02	Monoterpenic ketone
Menthofuran	10.89	Monoterpenic ether
trans-β-Terpineol	0.16	Monoterpenic alcohol
neo-Menthol	0.04	Monoterpenic alcohol
trans-Isopulegone	0.05	Monoterpenic ketone

Unknown	0.05	Oxygenated monoterpene
Terpinen-4-ol	0.05	Monoterpenic alcohol
trans-para-Mentha-1(7),8-dien-2-ol	0.02	Monoterpenic alcohol
para-Cymen-8-ol	0.04	Monoterpenic alcohol
trans-Isocarveol	0.04	Monoterpenic alcohol
α-Terpineol	3.22	Monoterpenic alcohol
cis-Dihydrocarvone	0.15	Monoterpenic ketone
γ-Terpineol	0.07	Monoterpenic alcohol
Unknown	0.06	Unknown
trans-Isopiperitenol	0.04	Monoterpenic alcohol
trans-Dihydrocarvone	0.04	Monoterpenic ketone
4,7-Dimethylbenzofuran?	0.08	Furan
cis-Isopiperitenol	0.02	Monoterpenic alcohol
trans-Carveol	0.26	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.01	Monoterpenic alcohol
cis-Carveol	0.03	Monoterpenic alcohol
Pulegone	0.63	Monoterpenic ketone
Carvone	0.51	Monoterpenic ketone
Unknown	0.03	Unknown
Perillaldehyde	0.02	Monoterpenic aldehyde
Limonen-10-ol	0.01	Monoterpenic alcohol
Perillyl alcohol	0.02	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.12	Unknown
Menthofurolactone isomer I	0.09	Monoterpenic lactone
Menthofurolactone isomer II	0.10	Monoterpenic lactone
Evodone	0.11	Monoterpenic ketone
Menthofurolactone	0.37	Aliphatic alcohol
α-Ylangene	0.21	Sesquiterpene
α-Copaene	0.23	Sesquiterpene
β-Cubebene	0.05	Sesquiterpene
β-Elemene	0.27	Sesquiterpene
α-Cedrene	0.08	Sesquiterpene
β-Ylangene	0.10	Sesquiterpene
8-Hydroxycarvotanacetone	0.02	Monoterpenic alcohol
β-Copaene	0.17	Sesquiterpene
cis-Thujopsene	0.01	Sesquiterpene
Menthofurolactone isomer III	0.23	Monoterpenic lactone
β-Barbatene	0.10	Sesquiterpene
cis-β-Bergamotene?	0.10	Sesquiterpene
Unknown	0.11	Sesquiterpene
γ-Muurolene	0.42	Sesquiterpene
Germacrene D	0.83	Sesquiterpene
β-Selinene	0.09	Sesquiterpene
Menthalactone	0.03	Monoterpenic lactone
α-Selinene	0.31	Sesquiterpene
α-Muurolene	0.10	Sesquiterpene
Germacrene A	0.15	Sesquiterpene
γ-Cadinene	0.18	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.11	Sesquiterpene
Unknown	0.02	Sesquiterpene
trans-Calamenene	0.03	Sesquiterpene

δ-Cadinene	0.19	Sesquiterpene
Menthofurolactone analog	0.07	Monoterpenic lactone
α-Cadinene	0.03	Sesquiterpene
1,5-Epoxysalvial-4(14)-ene	0.01	Sesquiterpenic ether
7α-Hydroxymintlactone	0.02	Monoterpenic alcohol
Spathulenol	0.01	Sesquiterpenic alcohol
Salvial-4(14)-en-1-one	0.02	Aliphatic alcohol
Unknown	0.02	Oxygenated sesquiterpene
Junenol	0.14	Sesquiterpenic alcohol
10-epi-γ-Eudesmol	0.05	Sesquiterpenic alcohol
1-epi-Cubenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
τ-Muurolol	0.04	Sesquiterpenic alcohol
Unknown	0.02	Sesquiterpenic alcohol
α-Cadinol	0.04	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1α-ol	0.02	Sesquiterpenic alcohol
Consolidated total	**97.81%**	

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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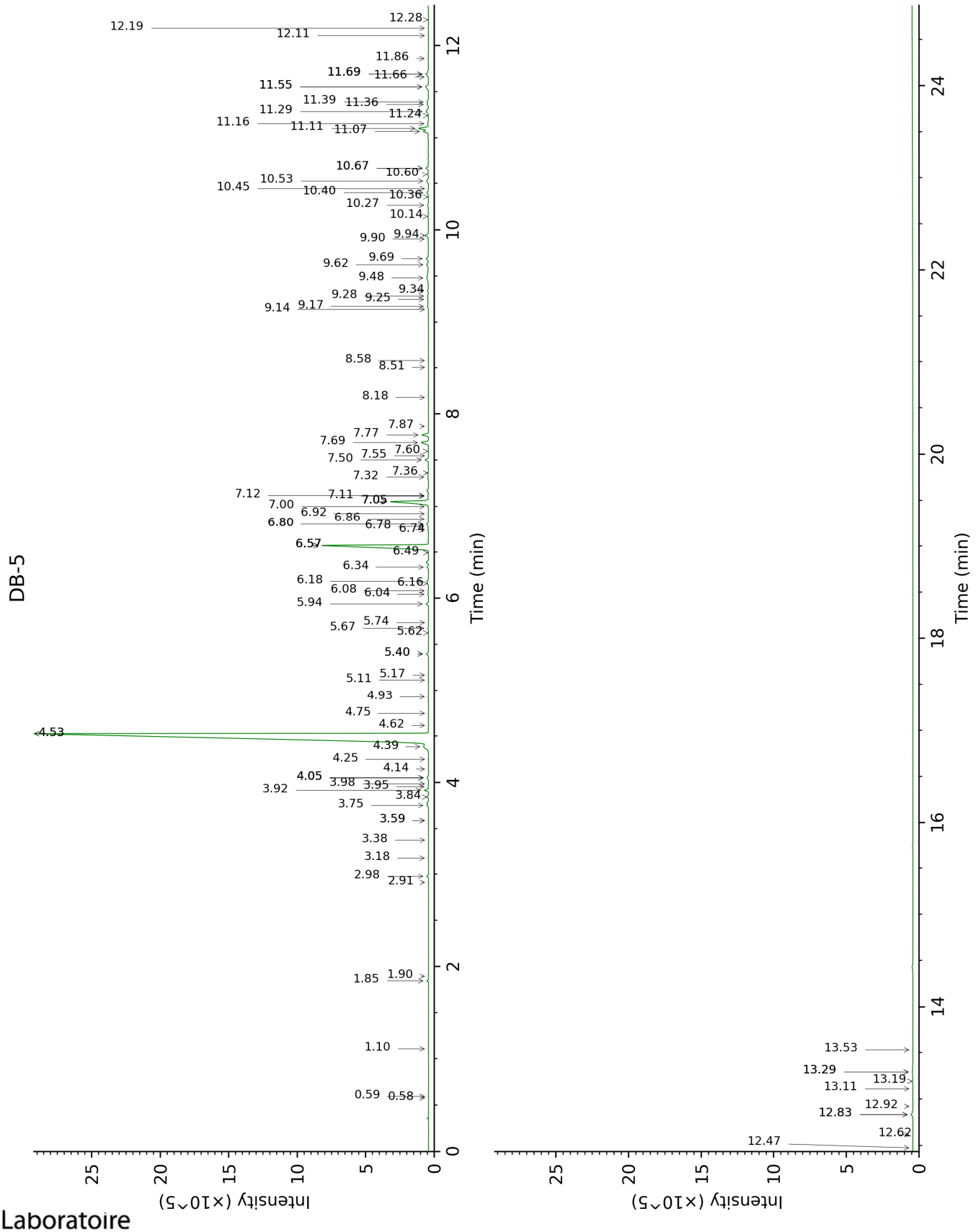
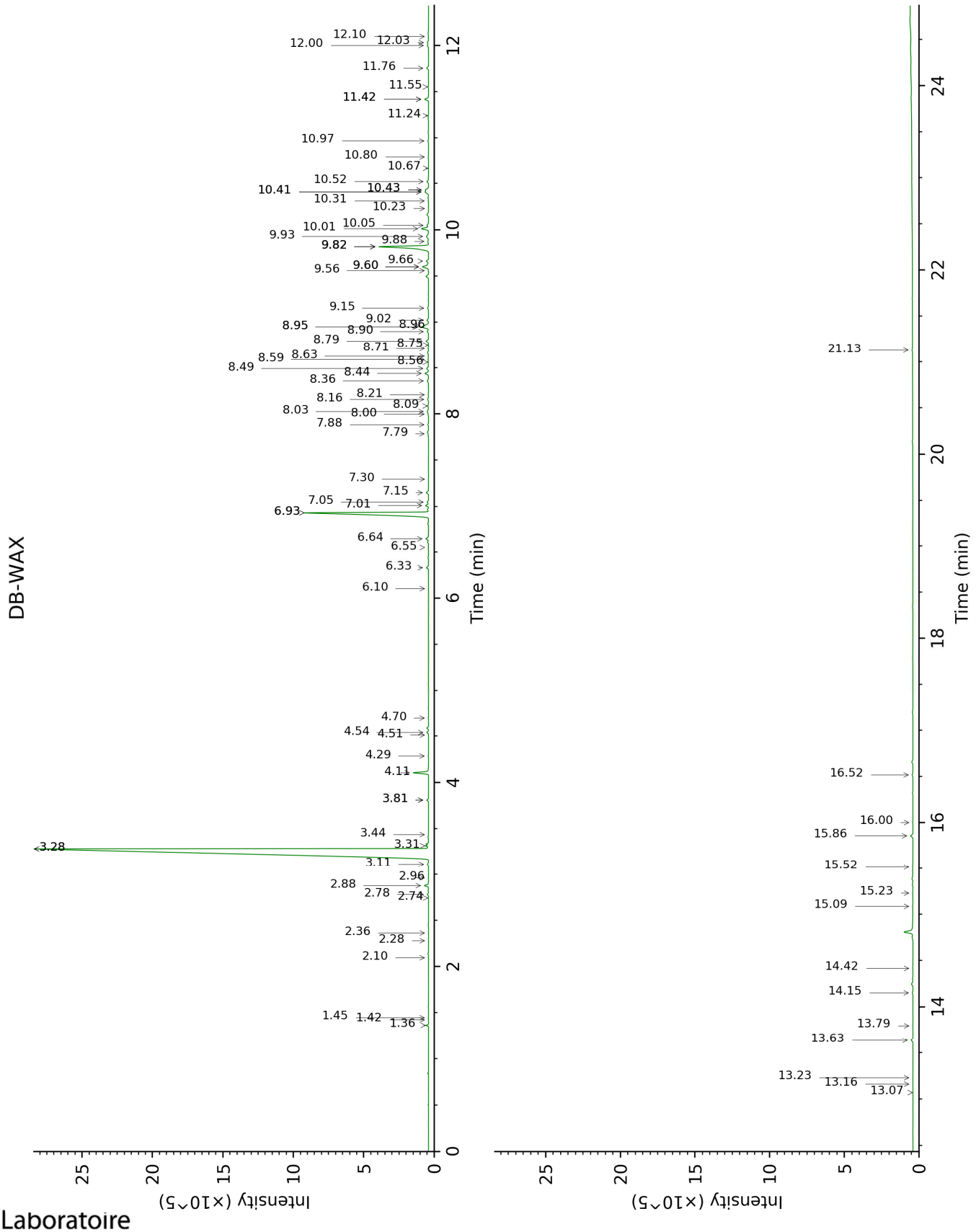

DB-5
12.19
12.28
12.11
11.86
11.69
11.66
11.55
11.39
11.36
11.29
11.24
11.16
11.11
11.07
10.67
10.60
10.53
10.45
10.40
10.36
10.27
10.14
9.90
9.94
9.62
9.69
9.48
9.34
9.28
9.25
9.14
9.17
8.58
8.51
8.18
7.87
7.77
7.69
7.60
7.55
7.50
7.36
7.32
7.12
7.11
7.05
7.00
6.92
6.86
6.80
6.78
6.74
6.57
6.49
6.34
6.18
6.16
6.08
6.04
5.94
5.74
5.67
5.62
5.40
5.17
5.11
4.93
4.75
4.62
4.53
4.39
4.25
4.14
4.05
3.98
3.95
3.92
3.84
3.75
3.59
3.38
3.18
2.98
2.91
1.90
1.85
1.10
0.59
0.58
Time (min)
Intensity (×10^5)
13.53
13.29
13.19
13.11
12.92
12.83
12.62
12.47
Time (min)
Intensity (×10^5)


DB-WAX
Time (min)
Intensity (×10^5)
12.10
12.00
12.03
11.76
11.55
11.42
11.24
10.97
10.80
10.67
10.52
10.41
10.43
10.31
10.23
10.05
10.01
9.93
9.88
9.82
9.66
9.60
9.56
9.15
9.02
8.95
8.96
8.90
8.79
8.75
8.71
8.63
8.59
8.56
8.49
8.44
8.36
8.21
8.16
8.09
8.03
8.00
7.88
7.79
7.30
7.15
7.05
7.01
6.93
6.64
6.55
6.33
6.10
4.70
4.54
4.51
4.29
4.11
3.81
3.44
3.31
3.28
3.11
2.96
2.88
2.78
2.74
2.36
2.28
2.10
1.45
1.42
1.36
21.13
16.52
16.00
15.86
15.52
15.23
15.09
14.42
14.15
13.79
13.63
13.23
13.16
13.07

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.58	642	tr			
2-Methylbutyral	0.59	648	tr			
Toluene	1.10	759	0.01	1.45	1003	0.01
3-Methylcyclopentanone	1.85	841	0.08	3.28*	1167	72.85
(2*E*)-Hexenal	1.90	846	0.01	3.44	1179	0.01
α-Thujene	2.91	926	0.01	1.42	1001	tr
α-Pinene	2.98	930	0.11	1.36	993	0.10
3-Methylcyclohexanone	3.18	944	0.03	4.70	1272	0.02
Benzaldehyde	3.38	957	0.01	7.30	1458	0.02
β-Pinene	3.59*	971	0.02	2.10	1068	0.01
Sabinene	3.59*	971	[0.02]	2.28	1086	0.01
Hexahydroacetophenone epimer II	3.75	982	0.11	4.54	1261	0.11
Dehydro-1,8-cineole	3.84	988	0.11	3.11	1154	0.08
Myrcene	3.92	993	0.27	2.88	1136	0.27
2-Carene	3.95	996	0.04	2.36	1095	0.01
Octan-3-ol	3.98	998	0.01	6.10	1371	0.01
Octanal	4.05*	1002	0.14	4.51	1259	tr
Pseudolimonene	4.05*	1002	[0.14]	2.74	1125	0.02
α-Phellandrene	4.05*	1002	[0.14]	2.78	1128	0.08
Δ3-Carene	4.14	1008	0.01			
α-Terpinene	4.25	1015	0.01	2.96	1142	0.01
para-Cymene	4.39	1024	0.82	4.10	1229	0.96
Limonene	4.53*	1032	72.95	3.28*	1167	[72.85]
β-Phellandrene	4.53*	1032	[72.95]	3.32	1170	0.16
(*Z*)-β-Ocimene	4.62	1038	0.01	3.81*	1208	0.12
(*E*)-β-Ocimene	4.75	1046	0.01			
γ-Terpinene	4.93	1058	0.03	3.81*	1208	[0.12]
cis-Linalool oxide (fur.)	5.11	1070	0.02	6.55	1403	0.01
Octanol	5.17	1073	0.01	8.21	1527	0.03
Terpinolene	5.40*	1087	0.18	4.29	1242	0.02
para-Cymenene	5.40*	1087	[0.18]	6.33	1387	0.15
Linalool	5.62	1102	0.01	8.00	1511	0.03
Hotrienol	5.68	1105	0.05	8.80	1572	0.18
Dehydrosabinaketone	5.74	1109	0.01	8.63	1559	0.03
trans-para-Mentha-2,8-dien-1-ol	5.94	1122	0.18	8.96†	1585	[0.75]
Limona ketone	6.04	1128	0.05	7.88	1502	0.05
cis-para-Mentha-2,8-dien-1-ol	6.08	1131	0.04	9.56	1633	0.02
Camphor	6.16	1136	0.07	7.15	1447	0.17
cis-β-Terpineol	6.18	1138	0.16	9.02	1590	0.13
Menthone	6.34	1147	0.30	6.64	1410	0.20
Isomenthone	6.49	1157	0.02	6.93*	1431	11.09
Menthofuran	6.57*	1162	11.08	6.93*	1431	[11.09]
trans-β-Terpineol	6.57*	1162	[11.08]	9.66	1641	0.16
neo-Menthol	6.57*	1162	[11.08]	8.59	1556	0.04
trans-Isopulegone	6.74	1173	0.05	8.95*†	1584	0.75

Unknown [m/z 69, 84 (62), 41 (30), 123 (26), 97 (24), 109 (23)...]	6.78	1176	0.05	9.60*	1636	0.55
Terpinen-4-ol	6.80*	1177	0.16	8.56	1554	0.05
trans-para-Mentha-1(7),8-dien-2-ol	6.80*	1177	[0.16]	11.42*	1787	0.28
para-Cymen-8-ol	6.86	1181	0.04	11.55	1799	0.04
trans-Isocarveol	6.92	1185	0.04	10.97	1749	0.06
α-Terpineol	7.00†	1190	3.49	9.82*	1654	4.14
cis-Dihydrocarvone	7.05*†	1194	[3.49]	8.49	1549	0.15
γ-Terpineol	7.05*†	1194	[3.49]	9.88	1658	0.07
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.05*†	1194	[3.49]	8.09	1518	0.06
trans-Isopiperitenol	7.11	1197	0.04	10.43*	1704	0.23
trans-Dihydrocarvone	7.12	1198	0.04	8.71	1566	0.03
4,7-Dimethylbenzofuran?	7.32	1211	0.08			
cis-Isopiperitenol	7.36	1214	0.02	10.31	1694	0.03
trans-Carveol	7.50	1223	0.26	11.42*	1787	[0.28]
cis-para-Mentha-1(7),8-dien-2-ol	7.55	1226	0.01	12.00	1838	0.11
cis-Carveol	7.60	1230	0.03	11.76	1816	0.13
Pulegone	7.69	1236	0.63	8.95*†	1584	[0.75]
Carvone	7.77	1242	0.51	10.01	1669	0.53
Unknown [m/z 112, 43 (70), 70 (63), 59 (53), 97 (46), 84 (25)...]	7.87	1248	0.03	10.23	1687	0.02
Perillaldehyde	8.18	1269	0.02	10.67	1724	0.02
Limonen-10-ol	8.50	1291	0.01	13.16	1942	0.02
Perillyl alcohol	8.58	1296	0.02	13.23	1948	0.02
Unknown [m/z 124, 123 (43), 121 (35), 166 (30), 93 (30), 136 (17)...]	9.14	1332	0.01			
Unknown [m/z 150, 71 (67), 107 (54), 43 (44), 109 (42)...]	9.17	1334	0.12			
Menthofurolactone isomer I	9.25	1340	0.09			
Menthofurolactone isomer II	9.28	1342	0.10			
Evodone	9.34	1346	0.11			
Menthofurolactone	9.48	1356	0.37	12.03	1841	0.10
α-Ylangene	9.62	1366	0.21	7.01	1437	0.19
α-Copaene	9.69	1371	0.23	7.05	1440	0.10
β-Cubebene	9.90	1386	0.05	7.79	1494	0.03
β-Elemene	9.94	1389	0.27	8.44	1545	0.28
α-Cedrene	10.14	1403	0.08	8.03	1513	0.12
β-Ylangene	10.27	1412	0.10	8.16	1523	0.07
8-Hydroxycarvotanacetone	10.36	1419	0.02	16.52	2272	0.07
β-Copaene	10.40	1422	0.17	8.36	1539	0.12
cis-Thujopsene	10.45	1426	0.01	8.75	1569	0.01

Menthofurolactone isomer III	10.53	1432	0.23			
β-Barbatene	10.60	1438	0.10	9.15	1600	0.08
cis-β-Bergamotene?	10.67*	1443	0.21			
Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.67*	1443	[0.21]	8.90	1580	0.11
γ-Muurolene	11.07	1473	0.42	9.60*	1636	[0.55]
Germacrene D	11.10	1475	0.83	9.82*	1654	[4.14]
β-Selinene	11.16	1479	0.09	9.82*	1654	[4.14]
Menthalactone	11.24	1485	0.03	15.86	2203	0.18
α-Selinene	11.29	1489	0.31	9.93	1663	0.25
α-Muurolene	11.36	1494	0.10	10.05	1672	0.13
Germacrene A	11.39	1496	0.15	10.41*	1702	0.33
γ-Cadinene	11.55*	1509	0.37	10.41*	1702	[0.33]
(3*E*,6*E*)-α-Farnesene	11.55*	1509	[0.37]	10.52	1711	0.11
Unknown [m/z 161, 81 (93), 105 (66), 93 (60), 119 (60), 204 (54)...]	11.66	1517	0.02			
trans-Calamenene	11.69*	1520	0.30	11.24	1772	0.03
δ-Cadinene	11.69*	1520	[0.30]	10.43*	1704	[0.23]
Menthofurolactone analog	11.69*	1520	[0.30]			
α-Cadinene	11.86	1533	0.03	10.80	1734	0.05
1,5-Epoxysalvial-4(14)-ene	12.11	1553	0.01	12.10	1847	0.02
7α-Hydroxymintlactone	12.19	1559	0.02	21.13	2802	0.02
Spathulenol	12.28	1566	0.01	14.42	2060	0.03
Salvial-4(14)-en-1-one	12.48	1582	0.02	13.07	1934	0.01
Unknown [m/z 43, 93 (88), 91 (76), 79 (73), 69 (64), 41 (63), 95 (53).. 220 (3)]	12.62	1593	0.02			
Junenol	12.83*	1610	0.18	13.63	1986	0.14
10-epi-γ-Eudesmol	12.83*	1610	[0.18]	14.15	2035	0.05
1-epi-Cubenol	12.92	1617	0.01	13.79	2001	0.02
τ-Cadinol	13.11	1633	0.01			
τ-Muurolol	13.19	1640	0.04	15.09	2126	0.02
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.29*	1648	0.09	15.23	2140	0.02
α-Cadinol	13.29*	1648	[0.09]	15.52	2169	0.04
Germacra-4(15),5,10(14)-trien-1α-ol	13.53	1668	0.02	16.00	2218	0.02
Total identified		**97.83%**			**96.98%**	
Total reported		**98.07%**			**97.18%**	

*: 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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