Date : June 17, 2020

Certificate of Analysis – GC Profiling

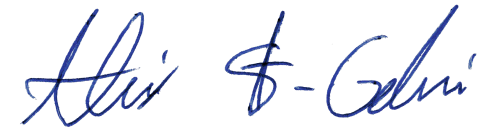
Sample identification

Internal code : 20F10-PTH10
Customer identification : Lavender - Bulgaria - L4011397R
Type : Essential oil
Source : *Lavandula angustifolia*
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc., chimiste à l'entraînement
Analysis date : June 12, 2020

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.4621 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3515:2004 - OIL OF CLONAL LAVENDER - BULGARIA

Compound	Min. %	Max. %	Observed %	Complies?
α-Terpineol	0.8	2.0	1.4	Yes
Lavandulyl acetate	2	5	3	Yes
Terpinen-4-ol	2	5	4	Yes
Lavandulol	0.3		1.1	Yes
Linalyl acetate	30	42	25	No
Linalool	22	34	32	Yes
Camphor		0.6	0.2	Yes
Octan-3-one	0.2	1.6	1.4	Yes
(E)-β-Ocimene	2	5	3	Yes
(Z)-β-Ocimene	3	9	6	Yes
β-Phellandrene		0.6	0.4	Yes
1,8-Cineole		2.0	1.1	Yes
Limonene		0.6	0.5	Yes
Refractive index	1.4590	1.4630	1.4621	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Isobutyral	tr	Aliphatic aldehyde
3-Buten-2-one	tr	Aliphatic ketone
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
Toluene	tr	Simple phenolic
Butyl acetate	0.02	Aliphatic ester
Methyl hexyl ether	0.12	Aliphatic ether
(3*Z*)-Hexenol	0.04	Aliphatic alcohol
Hexanol	0.10	Aliphatic alcohol
Tricyclene	0.03	Monoterpene
α-Thujene	0.13	Monoterpene
α-Pinene	0.25	Monoterpene
Camphene	0.21	Monoterpene
α-Fenchene	tr	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.01	Aliphatic lactone
Butyl isobutyrate	0.01	Aliphatic ester
β-Pinene	0.06	Monoterpene
Sabinene	0.07	Monoterpene
Octen-3-ol	0.35	Aliphatic alcohol
Octan-3-one	1.35	Aliphatic ketone
Myrcene	0.82	Monoterpene
trans-Dehydroxylinalool oxide	0.02	Monoterpenic ether
Butyl butyrate	0.11	Aliphatic ester
Octan-3-ol	0.21	Aliphatic alcohol
α-Phellandrene	0.06	Monoterpene
Pseudolimonene	0.02	Monoterpene
cis-Dehydroxylinalool oxide	0.01	Monoterpenic ether
Δ3-Carene	0.19	Monoterpene
α-Terpinene	0.06	Monoterpene
Hexyl acetate	0.62	Aliphatic ester
ortho-Cymene	0.05	Monoterpene
para-Cymene	0.16	Monoterpene
Limonene	0.48	Monoterpene
β-Phellandrene	0.40	Monoterpene
1,8-Cineole	1.13	Monoterpenic ether
(*Z*)-β-Ocimene	6.16	Monoterpene
(*E*)-β-Ocimene	2.82	Monoterpene
γ-Terpinene	0.20	Monoterpene
cis-Sabinene hydrate	0.07	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.11	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
α-Pinene oxide analog	0.03	Monoterpenic ether
trans-Linalool oxide (fur.)	0.08	Monoterpenic alcohol

Terpinolene	0.13	Monoterpene
Rosefuran	0.04	Monoterpenic ether
Linalool	31.55	Monoterpenic alcohol
(*Z*)-6-Methyl-3,5-heptadien-2-one	0.05	Aliphatic ketone
Octen-3-yl acetate	0.85	Aliphatic ester
Unknown	0.07	Unknown
Octan-3-yl acetate	0.09	Aliphatic ester
allo-Ocimene	0.06	Monoterpene
(*Z*)-Myroxide	0.02	Monoterpenic ether
Camphor	0.19	Monoterpenic ketone
neo-allo-Ocimene	0.08	Monoterpene
(*E*)-Myroxide	0.02	Monoterpenic ether
trans-Verbenol	0.01	Monoterpenic alcohol
Hexyl isobutyrate	0.08	Aliphatic ester
Nerol oxide	0.02	Aliphatic ether
Borneol	0.68	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.03	Monoterpenic alcohol
Lavandulol	1.07	Monoterpenic alcohol
Terpinen-4-ol	4.44	Monoterpenic alcohol
(3*E*,5*Z*)-Undeca-1,3,5-triene	0.02	Alkene
Cryptone	0.24	Normonoterpenic ketone
para-Cymen-8-ol	0.09	Monoterpenic alcohol
α-Terpineol	1.42	Monoterpenic alcohol
Hodiendiol	0.09	Monoterpenic alcohol
Hexyl butyrate	0.37	Aliphatic ester
Verbenone	0.03	Monoterpenic ketone
Unknown	0.05	Unknown
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.07	Monoterpenic alcohol
trans-Carveol	0.02	Monoterpenic alcohol
Bornyl formate	0.04	Monoterpenic ester
Nerol	0.23	Monoterpenic alcohol
Cuminal	0.05	Monoterpenic aldehyde
Carvone	0.01	Monoterpenic ketone
Neral	0.09	Monoterpenic aldehyde
Geraniol	0.58	Monoterpenic alcohol
Linalyl acetate	25.31	Monoterpenic ester
Geranial	0.03	Monoterpenic aldehyde
Bornyl acetate	0.14	Monoterpenic ester
Lavandulyl acetate	3.34	Monoterpenic ester
Hexyl tiglate	0.05	Aliphatic ester
Hodiendiol derivative	0.01	Oxygenated monoterpene
Unknown	0.01	Oxygenated monoterpene
Unknown	0.01	Oxygenated monoterpene
Neryl acetate	0.38	Monoterpenic ester
α-Copaene	0.01	Sesquiterpene
β-Bourbonene	0.02	Sesquiterpene
Geranyl acetate	0.63	Monoterpenic ester
7-epi-Sesquithujene	0.09	Sesquiterpene
Hexyl hexanoate	0.01	Aliphatic ester
β-Caryophyllene	3.59	Sesquiterpene
α-Santalene	0.39	Sesquiterpene
Coumarin	0.01	Coumarin

trans-α-Bergamotene	0.14	Sesquiterpene
Sesquisabinene A	0.06	Sesquiterpene
cis-β-Bergamotene?	0.02	Sesquiterpene
α-Humulene	0.15	Sesquiterpene
Lavandulyl butyrate?	0.13	Monoterpenic ester
(*E*)-β-Farnesene	3.30	Sesquiterpene
Germacrene D	0.38	Sesquiterpene
trans-β-Bergamotene	0.06	Sesquiterpene
Isodaucene	0.02	Sesquiterpene
β-Bisabolene	0.03	Sesquiterpene
Lavandulyl isovalerate	0.01	Monoterpenic ester
γ-Cadinene	0.14	Sesquiterpene
Isocaryophyllene epoxide B	0.04	Sesquiterpenic ether
Caryophyllene oxide	0.21	Sesquiterpenic ether
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
τ-Cadinol	0.07	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.01	Sesquiterpenic alcohol
Herniarin	0.01	Coumarin
Consolidated total	**98.32%**	

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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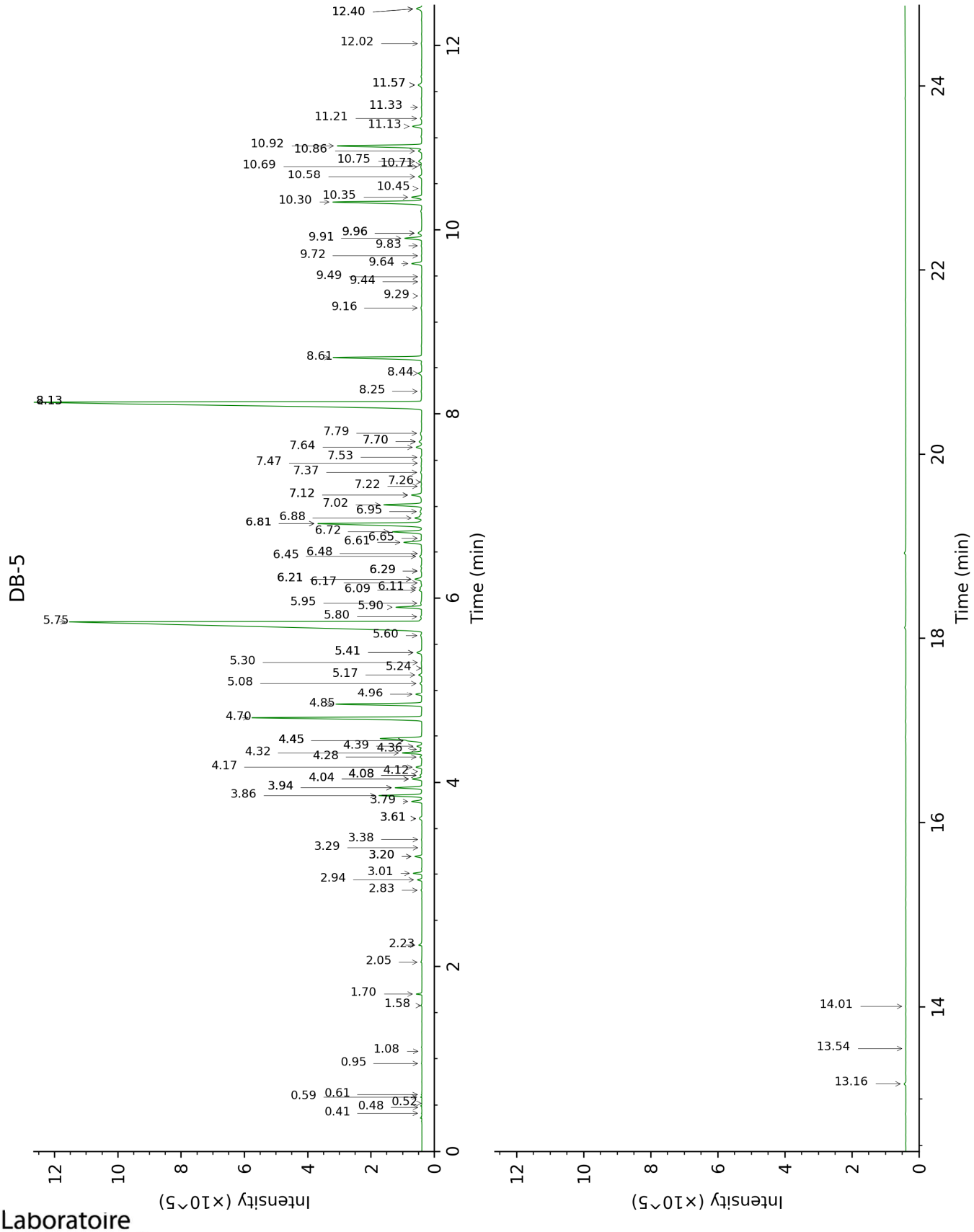
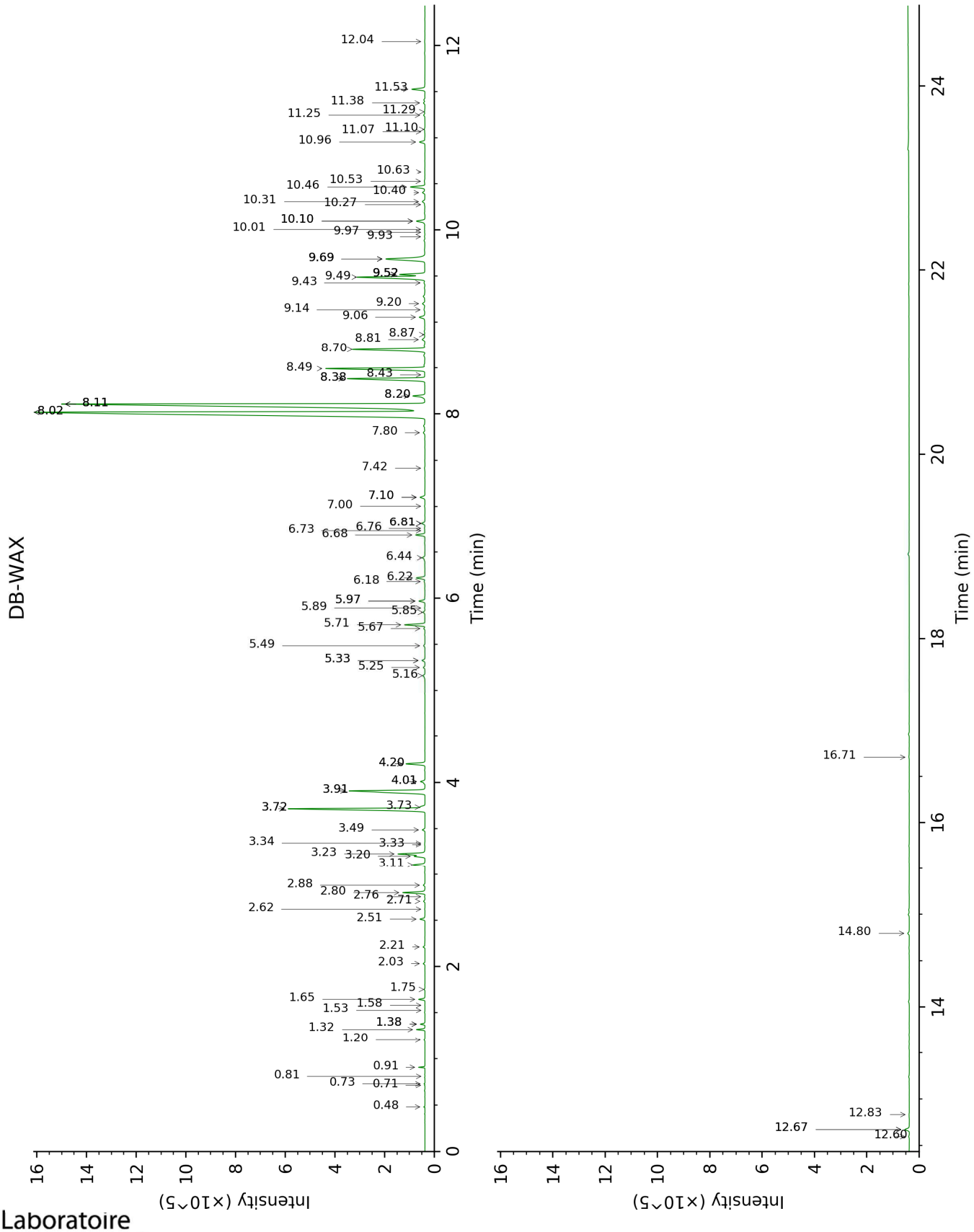

DB-5
Time (min)
Intensity (×10^5)
12.40
12.02
11.57
11.33
11.21
11.13
10.92
10.86
10.75
10.71
10.69
10.58
10.45
10.30
10.35
9.96
9.91
9.83
9.72
9.64
9.49
9.44
9.29
9.16
8.61
8.44
8.25
8.13
7.79
7.70
7.64
7.53
7.47
7.37
7.26
7.22
7.12
7.02
6.95
6.88
6.81
6.72
6.65
6.61
6.48
6.45
6.29
6.21
6.17
6.11
6.09
5.95
5.90
5.80
5.75
5.60
5.41
5.30
5.24
5.17
5.08
4.96
4.85
4.70
4.45
4.39
4.36
4.32
4.28
4.17
4.12
4.08
4.04
3.94
3.86
3.79
3.61
3.38
3.29
3.20
3.01
2.94
2.83
2.23
2.05
1.70
1.58
1.08
0.95
0.61
0.59
0.52
0.48
0.41
14.01
13.54
13.16


DB-WAX
Time (min)
Intensity (×10^5)
12.04
11.53
11.38
11.25
11.29
11.07
11.10
10.96
10.63
10.46
10.53
10.40
10.31
10.27
10.10
10.01
9.97
9.93
9.69
9.52
9.43
9.49
9.20
9.14
9.06
8.81
8.87
8.70
8.49
8.38
8.43
8.20
8.11
8.02
7.80
7.42
7.10
7.00
6.81
6.73
6.76
6.68
6.44
6.18
6.22
5.97
5.89
5.85
5.71
5.67
5.49
5.33
5.25
5.16
4.20
4.01
3.91
3.72
3.73
3.49
3.34
3.33
3.23
3.20
3.11
2.88
2.80
2.76
2.71
2.62
2.51
2.21
2.03
1.75
1.65
1.58
1.53
1.38
1.32
1.20
0.91
0.81
0.73
0.71
0.48
16.71
14.80
12.83
12.67
12.60

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.41	530	tr	0.48	782	0.02
3-Buten-2-one	0.48	576	tr	0.81	908	tr
2-Methyl-3-buten-2-ol	0.52	608	tr	1.53	1015	tr
Isovaleral	0.59	640	0.01	0.73	885	0.02
2-Methylbutyral	0.61	652	0.01	0.71	879	0.01
Isoamyl alcohol	0.95	738	0.01	3.34	1175	0.01
Toluene	1.08	756	tr	1.38*	1000	0.13
Butyl acetate	1.58	819	0.02	1.75	1037	0.02
Methyl hexyl ether	1.70	829	0.12	0.91	923	0.13
(3*Z*)-Hexenol	2.05	857	0.04	5.67	1343	0.05
Hexanol	2.23	872	0.10	5.33*	1318	0.12
Tricyclene	2.83	918	0.03	1.20	971	0.02
α-Thujene	2.94	925	0.13	1.38*	1000	[0.13]
α-Pinene	3.01	930	0.25	1.32	990	0.25
Camphene	3.20*	942	0.22	1.65	1026	0.21
α-Fenchene	3.20*	942	[0.22]	1.58	1020	tr
5,5-Dimethyl-2(5H)-furanone	3.29	949	0.01	8.42	1549	0.01
Butyl isobutyrate	3.38	954	0.01	2.62	1118	0.01
β-Pinene	3.61*	969	0.12	2.03	1065	0.06
Sabinene	3.61*	969	[0.12]	2.21	1083	0.07
Octen-3-ol	3.80	982	0.35	6.68	1417	0.37
Octan-3-one	3.86	986	1.35	3.91*	1219	4.17
Myrcene	3.94*	992	0.83	2.80	1132	0.82
trans-Dehydroxylinalool oxide	3.94*	992	[0.83]	3.33	1174	0.02
Butyl butyrate	4.04*	998	0.33	3.49	1187	0.11
Octan-3-ol	4.04*	998	[0.33]	5.97*	1365	0.25
α-Phellandrene	4.08*	1000	0.07	2.71	1125	0.06
Pseudolimonene	4.08*	1000	[0.07]	2.76	1129	0.02
cis-Dehydroxylinalool oxide	4.12	1003	0.01	3.72*	1205	6.21
Δ3-Carene	4.17	1006	0.19	2.51	1110	0.19
α-Terpinene	4.28	1013	0.06	2.88	1139	0.07
Hexyl acetate	4.32	1016	0.62	4.20*	1241	0.79
ortho-Cymene	4.36	1018	0.05	4.01*	1226	0.22
para-Cymene	4.39	1020	0.16	4.01*	1226	[0.22]
Limonene	4.45*†	1024	1.97	3.11	1157	0.48
β-Phellandrene	4.45*†	1024	[1.97]	3.20	1164	0.40
1,8-Cineole	4.45*†	1024	[1.97]	3.23	1166	1.13
(*Z*)-β-Ocimene	4.70	1040	6.16	3.72*	1205	[6.21]
(*E*)-β-Ocimene	4.85	1049	2.82	3.91*	1219	[4.17]
γ-Terpinene	4.96	1056	0.20	3.73	1206	0.15
cis-Sabinene	5.08	1064	0.07	6.81*	1427	0.15

hydrate						
cis-Linalool oxide (fur.)	5.17	1069	0.11	6.44	1399	0.11
Octanol	5.24	1074	0.01	8.11*†	1525	[56.96]
α-Pinene oxide analog	5.30	1078	0.03	5.33*	1318	[0.12]
trans-Linalool oxide (fur.)	5.41*	1085	0.21	6.81*	1427	[0.15]
Terpinolene	5.41*	1085	[0.21]	4.20*	1241	[0.79]
Rosefuran	5.60	1096	0.04	5.97*	1365	[0.25]
Linalool	5.74	1106	31.55	8.02*†	1518	56.96
(*Z*)-6-Methyl-3,5-heptadien-2-one	5.80	1109	0.05	8.11*†	1525	[56.96]
Octen-3-yl acetate	5.90	1116	0.85	5.71	1346	0.84
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	5.95	1119	0.07	9.52*†	1636	[4.36]
Octan-3-yl acetate	6.09	1128	0.09	5.16	1306	0.09
allo-Ocimene	6.11	1130	0.06	5.49	1330	0.06
(*Z*)-Myroxide	6.17	1133	0.02	6.76	1423	0.02
Camphor	6.21*	1136	0.27	7.10*	1448	0.23
neo-allo-Ocimene	6.21*	1136	[0.27]	5.85	1356	0.08
(*E*)-Myroxide	6.30*	1142	0.03	7.00	1441	0.02
trans-Verbenol	6.30*	1142	[0.03]	9.52*†	1636	[4.36]
Hexyl isobutyrate	6.45	1152	0.08	5.25	1313	0.07
Nerol oxide	6.48	1154	0.02	6.73	1421	0.02
Borneol	6.60	1162	0.68	9.69*	1650	2.46
cis-Linalool oxide (pyr.)	6.65	1164	0.03	10.27	1698	0.02
Lavandulol	6.72	1169	1.07	9.52*†	1636	[4.36]
Terpinen-4-ol	6.81*	1175	4.54	8.49	1555	4.44
(3*E*,5*Z*)-Undeca-1,3,5-triene	6.81*	1175	[4.54]	5.90	1359	0.02
Cryptone	6.88	1179	0.24	9.06	1598	0.28
para-Cymen-8-ol	6.95	1184	0.09	11.38	1792	0.06
α-Terpineol	7.02	1189	1.42	9.69*	1650	[2.46]
Hodiendiol	7.12*	1196	0.46	12.67*	1906	0.22
Hexyl butyrate	7.12*	1196	[0.46]	6.22	1383	0.37
Verbenone	7.22	1202	0.03	9.52*†	1636	[4.36]
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.26	1205	0.05	6.18	1380	0.05
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.37	1212	0.07	11.25	1780	0.06
trans-Carveol	7.47	1219	0.02	11.29	1783	0.03
Bornyl formate	7.53	1223	0.04	8.02*†	1518	[56.96]
Nerol	7.64	1231	0.23	10.96	1756	0.24
Cuminal	7.70*	1235	0.12	10.53	1719	0.05
Carvone	7.70*	1235	[0.12]	9.97	1673	0.01
Neral	7.79	1241	0.09	9.43	1629	0.04

Geraniol	8.13*	1264	26.21	11.53	1804	0.58
Linalyl acetate	8.13*	1264	[26.21]	8.11*†	1525	[56.96]
Geranial	8.25	1272	0.03	10.01	1676	0.02
Bornyl acetate	8.44	1286	0.14	8.20*	1532	0.55
Lavandulyl acetate	8.61	1298	3.34	8.70	1571	3.31
Hexyl tiglate	9.16	1332	0.05	8.81	1580	0.14
Hodiendiol derivative	9.29	1341	0.01	12.83	1921	0.01
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.44	1352	0.01	11.07	1765	0.01
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.49	1356	0.01	11.10	1767	0.03
Neryl acetate	9.64	1366	0.38	10.10*	1683	0.42
α-Copaene	9.72	1372	0.01	7.10*	1448	[0.23]
β-Bourbonene	9.83	1379	0.02	7.42	1472	0.03
Geranyl acetate	9.91	1385	0.63	10.46	1714	0.64
7-epi-Sesquithujene	9.96*	1389	0.19	7.80	1501	0.09
Hexyl hexanoate	9.96*	1389	[0.19]	8.87	1584	0.01
β-Caryophyllene	10.30	1413	3.59	8.38*	1546	3.66
α-Santalene	10.35	1417	0.39	8.20*	1532	[0.55]
Coumarin	10.45	1424	0.01			
trans-α-Bergamotene	10.58	1434	0.14	8.38*	1546	[3.66]
Sesquisabinene A	10.69	1442	0.06	9.14	1605	0.06
cis-β-Bergamotene?	10.71	1444	0.02			
α-Humulene	10.75	1446	0.15	9.20	1610	0.12
Lavandulyl butyrate?	10.86	1455	0.13	10.40	1708	0.13
(*E*)-β-Farnesene	10.92	1459	3.30	9.49†	1634	4.36
Germacrene D	11.13	1475	0.38	9.69*	1650	[2.46]
trans-β-Bergamotene	11.21	1481	0.06	9.52*†	1636	[4.36]
Isodaucene	11.33	1490	0.02	9.93	1669	0.02
β-Bisabolene	11.58*	1508	0.18	10.10*	1683	[0.42]
Lavandulyl isovalerate	11.58*	1508	[0.18]	10.63	1728	0.01
γ-Cadinene	11.58*	1508	[0.18]	10.31	1700	0.14
Isocaryophyllene epoxide B	12.02	1543	0.04	12.04	1850	0.03
Caryophyllene oxide	12.40*	1573	0.24	12.67*	1906	[0.22]
Caryophyllene oxide isomer	12.40*	1573	[0.24]	12.60	1899	0.03
τ-Cadinol	13.16	1634	0.07	14.80	2107	0.08
(3*Z*)-Caryophylla-	13.54	1666	0.01	16.71	2303	0.03

3,8(13)-dien-5β-ol				
Herniarin	14.01	1704	0.01	
Total identified		**98.70%**		**98.00%**
Total reported		**98.85%**		**98.09%**

*: 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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