Date : September 21, 2018

Certificate of Analysis – GC Profiling

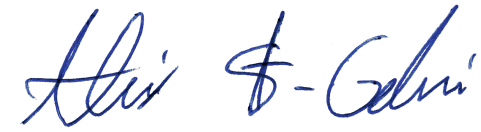
Sample identification

Internal code : 18I13-VIS1-1-CC
Customer identification : Lavender - D1
Type : Essential oil
Source : *Lavandula angustifolia*
Customer : Visagenics

Analysis

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Lindsay Girard, B. Sc.
Analysis date : September 14, 2018

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: 1.4605 ± 0.0003 (20 °C)

CONCLUSION

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

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
2-Methyl-3-buten-2-ol	0.02	0.01	Aliphatic alcohol
Isovaleral	0.01	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	0.02	Aliphatic alcohol
Toluene	tr	0.10*	Simple phenolic
Prenal	0.01	tr	Aliphatic aldehyde
Butyl acetate	0.02	0.02	Aliphatic ester
Methyl hexyl ether	0.12	0.12	Aliphatic ether
(3*Z*)-Hexenol	0.03	0.02	Aliphatic alcohol
Hexanol	0.09	0.09	Aliphatic alcohol
Tricyclene	0.02	0.02	Monoterpene
α-Thujene	0.10	[0.10]*	Monoterpene
α-Pinene	0.21	0.21	Monoterpene
Camphene	0.16	0.14	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.01	3.36*	Aliphatic lactone
Butyl isobutyrate	0.02	0.01	Aliphatic ester
Sabinene	0.12*	0.05	Monoterpene
β-Pinene	[0.12]*	0.08	Monoterpene
Octen-3-ol	0.20	0.23*	Aliphatic alcohol
Octan-3-one	1.51	1.52	Aliphatic ketone
Myrcene	0.59	0.57	Monoterpene
Butyl butyrate	0.08	0.12	Aliphatic ester
Pseudolimonene	0.38*	0.01	Monoterpene
Octan-3-ol	[0.38]*	0.31	Aliphatic alcohol
α-Phellandrene	[0.38]*	0.04	Monoterpene
Δ3-Carene	0.12	0.12	Monoterpene
α-Terpinene	0.04	0.05	Monoterpene
Hexyl acetate	0.62	0.73*	Aliphatic ester
ortho-Cymene	0.03	0.04	Simple phenolic
para-Cymene	0.16	0.15	Monoterpene
Limonene	1.78*	0.36	Monoterpene
β-Phellandrene	[1.78]*	1.40*	Monoterpene
1,8-Cineole	[1.78]*	[1.40]*	Monoterpenic ether
Lavender lactone	0.02	0.03*	Aliphatic lactone
(*Z*)-β-Ocimene	3.59	3.60	Monoterpene
(*E*)-β-Ocimene	2.34	2.32	Monoterpene
γ-Terpinene	0.15	0.14	Monoterpene
cis-Sabinene hydrate	0.07	0.22*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.16	0.20*	Monoterpenic alcohol
Octanol	0.05	29.17*	Aliphatic alcohol
trans-Linalool oxide (fur.)	0.23*	[0.22]*	Monoterpenic alcohol
Terpinolene	[0.23]*	[0.73]*	Monoterpene
Rosefuran	0.02	0.02	Monoterpenic ether
Linalool	33.18	33.45	Monoterpenic alcohol
(*Z*)-6-Methyl-3,5-heptadien-2-one	0.01	[29.17]*	Aliphatic ketone
Octen-3-yl acetate	0.87	0.86	Aliphatic ester
Unknown	0.02	0.02	Unknown
Octan-3-yl acetate	0.15	0.16	Aliphatic ester
allo-Ocimene	0.06	0.05	Monoterpene

(*Z*)-Myroxide	0.03	[0.22]*	Monoterpenic ether
Camphor	0.72	0.69	Monoterpenic ketone
(*E*)-Myroxide	0.04	0.03	Monoterpenic ether
Hexyl isobutyrate	0.09	0.08	Aliphatic ester
Nerol oxide	0.02	0.01	Aliphatic ether
Borneol	0.74	1.78*	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.02	0.01	Monoterpenic alcohol
Lavandulol	0.93	3.78*	Monoterpenic alcohol
Terpinen-4-ol	3.99	3.90	Monoterpenic alcohol
Cryptone	0.16*	0.16*	Normonoterpenic ketone
meta-Cymen-8-ol	[0.16]*	0.05	Monoterpenic alcohol
para-Cymen-8-ol	0.06	0.05	Monoterpenic alcohol
Butyl hexanoate	0.06	0.04	Aliphatic ester
α-Terpineol	1.06	[1.78]*	Monoterpenic alcohol
Hexyl butyrate	0.56*	0.47	Aliphatic ester
Hodiendiol	[0.56]*	0.34*	Monoterpenic alcohol
Verbenone	0.01	[3.78]*	Monoterpenic ketone
Unknown	0.02	0.01	Unknown
trans-Carveol	0.02	0.02	Monoterpenic alcohol
Bornyl formate	0.04	[33.45]	Monoterpenic ester
Nerol	0.17	0.16	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.07	[0.20]*	Aliphatic ester
Carvone	0.07*	0.04	Monoterpenic ketone
Neral	[0.07]*	0.02	Monoterpenic aldehyde
Hexyl isovalerate	0.02	[0.23]*	Aliphatic ester
Linalyl acetate	29.63*	[29.17]*	Monoterpenic ester
Geraniol	[29.63]*	0.40	Monoterpenic alcohol
Geranial	0.03	0.04	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.02	0.01	Monoterpenic alcohol
Bornyl acetate	0.15	0.53*	Monoterpenic ester
Lavandulyl acetate	3.17	3.20	Monoterpenic ester
Hexyl tiglate	0.07	0.17*	Aliphatic ester
Hodiendiol derivative	0.05	0.06	Oxygenated monoterpene
Unknown	0.05	0.05	Oxygenated monoterpene
Unknown	0.04	0.05	Oxygenated monoterpene
Neryl acetate	0.31	0.33*	Monoterpenic ester
β-Bourbonene	0.06	0.06	Sesquiterpene
Geranyl acetate	0.50	0.51*	Monoterpenic ester
Hexyl hexanoate	0.20	[0.17]*	Aliphatic ester
Isocaryophyllene	0.04	0.03	Sesquiterpene
β-Caryophyllene	3.31	[3.36]*	Sesquiterpene
α-Santalene	0.38	[0.53]*	Sesquiterpene
Coumarin	0.03	0.03	Coumarin
trans-α-Bergamotene	0.13	[3.36]*	Sesquiterpene
Sesquisabinene A	0.06	[0.16]*	Sesquiterpene
α-Humulene	0.11	0.10	Sesquiterpene
Lavandulyl butyrate?	0.10	[0.51]*	Monoterpenic ester
(*E*)-β-Farnesene	2.93*	[3.78]*	Sesquiterpene
β-Santalene	[2.93]*	[0.03]*	Sesquiterpene
Germacrene D	0.38	0.37	Sesquiterpene
trans-β-Bergamotene	0.05	0.06	Sesquiterpene
β-Bisabolene	0.17	[0.33]*	Sesquiterpene

Lavandulyl isovalerate	[0.17]*	0.01	Monoterpenic ester
γ-Cadinene	[0.17]*	0.09*	Sesquiterpene
δ-Cadinene	0.03	[0.09]*	Sesquiterpene
Isocaryophyllene epoxide B	0.04	0.03	Sesquiterpenic ether
Caryophyllene oxide	0.40*	[0.34]*	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.40]*	0.05	Sesquiterpenic ether
τ-Cadinol	0.05	0.07	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.01	0.01	Sesquiterpenic alcohol
α-Bisabolol	0.03	0.03	Sesquiterpenic alcohol
Total identified	**98.70%**	**97.92%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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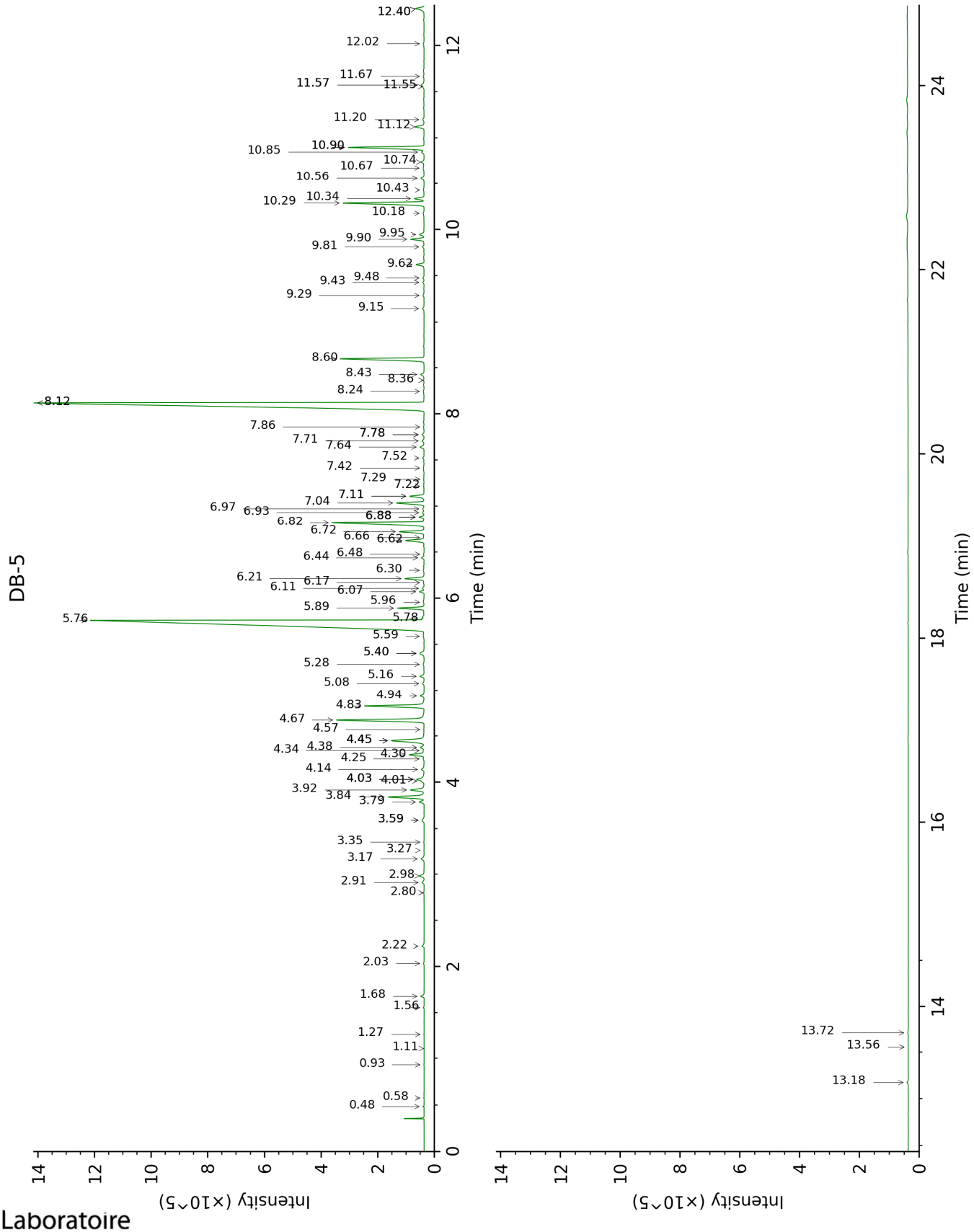
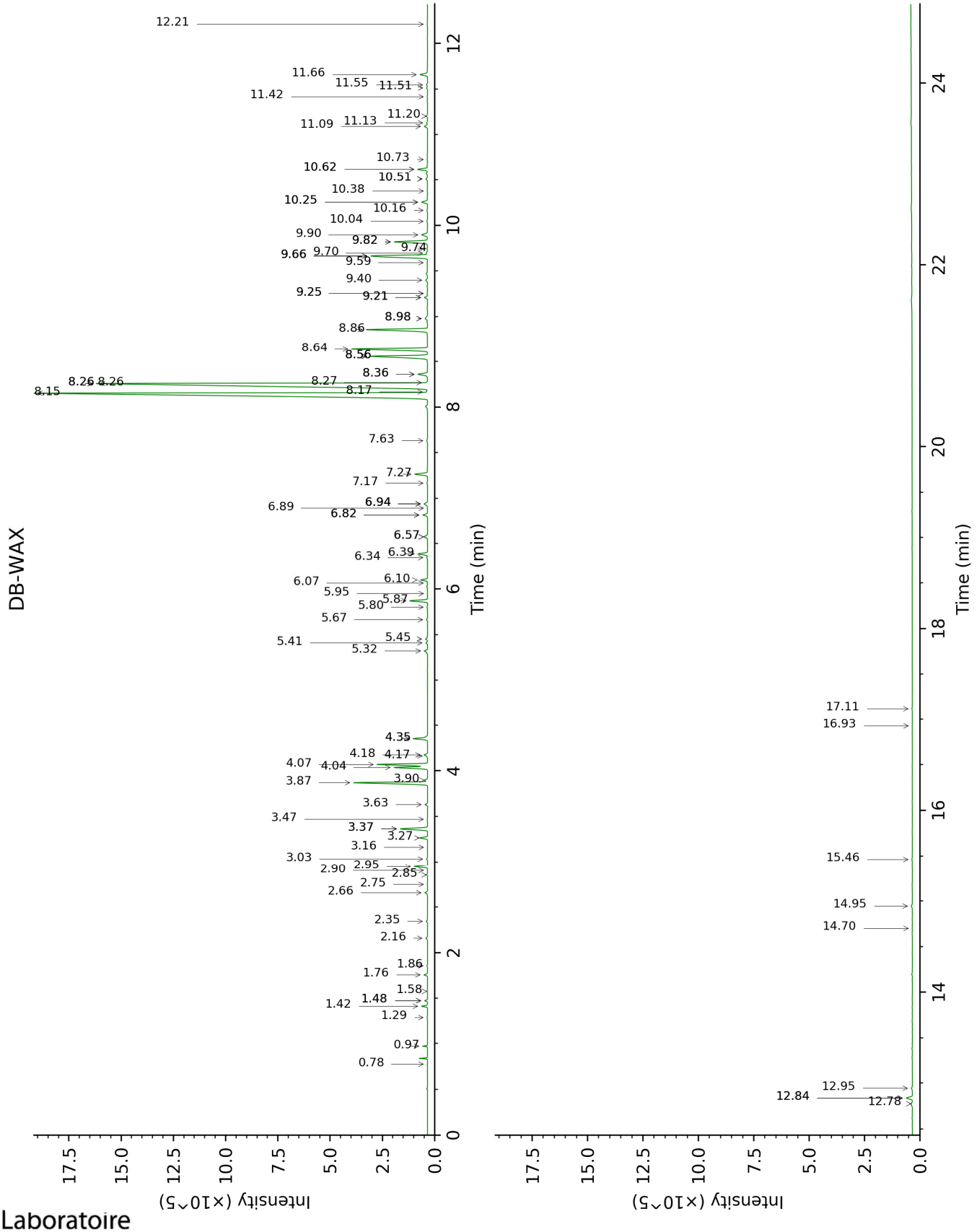

DB-5
Time (min)
Intensity (×10^5)
12.40
12.02
11.67
11.57
11.55
11.20
11.12
10.85
10.90
10.74
10.67
10.56
10.43
10.29
10.34
10.18
9.95
9.90
9.81
9.62
9.48
9.43
9.29
9.15
8.60
8.43
8.36
8.24
8.12
7.86
7.78
7.71
7.64
7.52
7.42
7.29
7.22
7.11
7.04
6.97
6.93
6.88
6.82
6.72
6.66
6.62
6.48
6.44
6.30
6.21
6.17
6.11
6.07
5.96
5.89
5.78
5.76
5.59
5.40
5.28
5.16
5.08
4.94
4.83
4.67
4.57
4.45
4.38
4.34
4.30
4.25
4.14
4.03
4.01
3.92
3.84
3.79
3.59
3.35
3.27
3.17
2.98
2.91
2.80
2.22
2.03
1.68
1.56
1.27
1.11
0.93
0.58
0.48
13.72
13.56
13.18


DB-WAX
Time (min)
Intensity (×10^5)
12.21
11.66
11.55
11.51
11.42
11.09
11.13
11.20
10.73
10.62
10.51
10.38
10.25
10.16
10.04
9.90
9.82
9.74
9.66
9.70
9.59
9.40
9.25
9.21
8.98
8.86
8.64
8.56
8.36
8.26
8.26
8.27
8.15
8.17
7.63
7.27
7.17
6.94
6.89
6.82
6.57
6.34
6.39
6.10
6.07
5.95
5.87
5.80
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5.45
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5.32
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4.17
4.07
4.04
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3.47
3.37
3.27
3.16
3.03
2.95
2.90
2.85
2.75
2.66
2.35
2.16
1.86
1.76
1.58
1.48
1.42
1.29
0.97
0.78
17.11
16.93
15.46
14.95
14.70
12.95
12.84
12.78

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
2-Methyl-3-buten-2-ol	0.48	604	0.02	1.58	1012	0.01
Isovaleral	0.58	638	0.01	0.78	886	0.01
Isoamyl alcohol	0.93	729	0.01	3.47	1178	0.02
Toluene	1.11	755	tr	1.48*	1002	0.10
Prenal	1.27	779	0.01	3.16	1155	tr
Butyl acetate	1.56	813	0.02	1.86	1040	0.02
Methyl hexyl ether	1.68	824	0.12	0.97	923	0.12
(3*Z*)-Hexenol	2.03	854	0.03	5.80	1346	0.02
Hexanol	2.22	870	0.09	5.45	1321	0.09
Tricyclene	2.80	916	0.02	1.29	975	0.02
α-Thujene	2.91	923	0.10	1.48*	1002	[0.10]
α-Pinene	2.98	928	0.21	1.42	995	0.21
Camphene	3.17	941	0.16	1.76	1030	0.14
5,5-Dimethyl-2(5H)-furanone	3.27	947	0.01	8.56*	1550	3.36
Butyl isobutyrate	3.35	953	0.02	2.75	1123	0.01
Sabinene	3.59*	969	0.12	2.34	1088	0.05
β-Pinene	3.59*	969	[0.12]	2.16	1070	0.08
Octen-3-ol	3.79	982	0.20	6.82*	1419	0.23
Octan-3-one	3.84	986	1.51	4.04	1220	1.52
Myrcene	3.92	991	0.59	2.95	1138	0.57
Butyl butyrate	4.02	997	0.08	3.63	1191	0.12
Pseudolimonene	4.03*	999	0.38	2.90	1135	0.01
Octan-3-ol	4.03*	999	[0.38]	6.10	1367	0.31
α-Phellandrene	4.03*	999	[0.38]	2.86	1131	0.04
Δ3-Carene	4.14	1006	0.12	2.66	1116	0.12
α-Terpinene	4.25	1013	0.04	3.03	1145	0.05
Hexyl acetate	4.30	1016	0.62	4.35*†	1243	0.73
ortho-Cymene	4.34	1018	0.03	4.16	1229	0.04
para-Cymene	4.38	1021	0.16	4.18	1230	0.15
Limonene	4.45*	1025	1.78	3.27	1163	0.36
β-Phellandrene	4.45*	1025	[1.78]	3.37*	1170	1.40
1,8-Cineole	4.45*	1025	[1.78]	3.37*	1170	[1.40]
Lavender lactone	4.57	1033	0.02	9.25*	1604	0.03
(*Z*)-β-Ocimene	4.68	1039	3.59	3.87	1208	3.60
(*E*)-β-Ocimene	4.83	1049	2.34	4.07	1222	2.32
γ-Terpinene	4.94	1056	0.15	3.90	1210	0.14
cis-Sabinene hydrate	5.08	1065	0.07	6.94*	1428	0.22
cis-Linalool oxide (fur.)	5.16	1070	0.16	6.57*	1401	0.20
Octanol	5.28	1078	0.05	8.26*	1527	29.17
trans-Linalool oxide (fur.)	5.40*	1085	0.23	6.94*	1428	[0.22]
Terpinolene	5.40*	1085	[0.23]	4.35*†	1243	[0.73]

Rosefuran	5.59	1097	0.02	6.07	1365	0.02
Linalool	5.76	1108	33.18	8.15†	1518	33.45
(*Z*)-6-Methyl-3,5-heptadien-2-one	5.78	1109	0.01	8.26*	1527	[29.17]
Octen-3-yl acetate	5.89	1116	0.87	5.87	1351	0.86
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	5.96	1120	0.02	9.74	1643	0.02
Octan-3-yl acetate	6.07	1128	0.15	5.32	1312	0.16
allo-Ocimene	6.11	1130	0.06	5.66	1336	0.05
(*Z*)-Myroxide	6.17	1134	0.03	6.94*	1428	[0.22]
Camphor	6.21	1137	0.72	7.27	1452	0.69
(*E*)-Myroxide	6.30	1143	0.04	7.17	1445	0.03
Hexyl isobutyrate	6.44	1151	0.09	5.41	1318	0.08
Nerol oxide	6.48	1154	0.02	6.90	1425	0.01
Borneol	6.62	1163	0.74	9.82*	1650	1.78
cis-Linalool oxide (pyr.)	6.66	1165	0.02	10.38	1695	0.01
Lavandulol	6.72	1169	0.93	9.66*	1637	3.78
Terpinen-4-ol	6.82	1176	3.99	8.64	1556	3.90
Cryptone	6.88*	1180	0.16	9.21*	1600	0.16
meta-Cymen-8-ol	6.88*	1180	[0.16]	11.51	1791	0.05
para-Cymen-8-ol	6.93	1183	0.06	11.55	1794	0.05
Butyl hexanoate	6.97	1186	0.06	6.34	1384	0.04
α-Terpineol	7.04	1190	1.06	9.82*	1650	[1.78]
Hexyl butyrate	7.11*	1194	0.56	6.39	1387	0.47
Hodiendiol	7.11*	1194	[0.56]	12.84*	1908	0.34
Verbenone	7.22	1201	0.01	9.66*	1637	[3.78]
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.29	1206	0.02	5.95	1356	0.01
trans-Carveol	7.42	1214	0.02	11.42	1783	0.02
Bornyl formate	7.52	1222	0.04	8.17†	1520	[33.45]
Nerol	7.64	1230	0.17	11.09	1755	0.16
Hexyl 2-methylbutyrate	7.71	1234	0.07	6.57*	1401	[0.20]
Carvone	7.78*	1239	0.07	10.04	1668	0.04
Neral	7.78*	1239	[0.07]	9.59	1631	0.02
Hexyl isovalerate	7.86	1244	0.02	6.82*	1419	[0.23]
Linalyl acetate	8.12*	1262	29.63	8.26*	1527	[29.17]
Geraniol	8.12*	1262	[29.63]	11.66	1804	0.40
Geranial	8.24	1270	0.03	10.16	1678	0.04
2,6-Dimethyl-1,7-octadiene-3,6-diol	8.36	1278	0.02	14.70	2084	0.01
Bornyl acetate	8.43	1282	0.15	8.36*	1534	0.53

Lavandulyl acetate	8.60	1294	3.17	8.86	1573	3.20
Hexyl tiglate	9.15	1332	0.07	8.98*	1582	0.17
Hodiendiol derivative	9.29	1342	0.05	12.95	1918	0.06
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.43	1352	0.05	11.13	1758	0.05
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.48	1356	0.04	11.20	1765	0.05
Neryl acetate	9.62	1366	0.31	10.25*	1685	0.33
β-Bourbonene	9.82	1379	0.06	7.63	1479	0.06
Geranyl acetate	9.90	1385	0.50	10.62*	1715	0.51
Hexyl hexanoate	9.95	1389	0.20	8.98*	1582	[0.17]
Isocaryophyllene	10.18	1405	0.04	8.27	1528	0.03
β-Caryophyllene	10.29	1413	3.31	8.56*	1550	[3.36]
α-Santalene	10.34	1417	0.38	8.36*	1534	[0.53]
Coumarin	10.43	1424	0.03	17.11	2332	0.03
trans-α-Bergamotene	10.56	1433	0.13	8.56*	1550	[3.36]
Sesquisabinene A	10.67	1442	0.06	9.21*	1600	[0.16]
α-Humulene	10.74	1447	0.11	9.40	1616	0.10
Lavandulyl butyrate?	10.85	1455	0.10	10.62*	1715	[0.51]
(*E*)-β-Farnesene	10.90*	1459	2.93	9.66*	1637	[3.78]
β-Santalene	10.90*	1459	[2.93]	9.25*	1604	[0.03]
Germacrene D	11.12	1475	0.38	9.90	1656	0.37
trans-β-Bergamotene	11.20	1481	0.05	9.70	1640	0.06
β-Bisabolene	11.55†	1508	0.17	10.25*	1685	[0.33]
Lavandulyl isovalerate	11.57*†	1509	[0.17]	10.73	1724	0.01
γ-Cadinene	11.57*†	1509	[0.17]	10.51*	1706	0.09
δ-Cadinene	11.67	1517	0.03	10.51*	1706	[0.09]
Isocaryophyllene epoxide B	12.02	1544	0.04	12.21	1852	0.03
Caryophyllene oxide	12.40*	1574	0.40	12.84*	1908	[0.34]
Caryophyllene oxide isomer	12.40*	1574	[0.40]	12.78	1903	0.05
τ-Cadinol	13.18	1637	0.05	14.94	2108	0.07
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.56	1668	0.01	16.93	2312	0.01
α-Bisabolol	13.72	1682	0.03	15.46	2160	0.03

Total identified	**98.70%**	**97.92%**
Total reported	**98.83%**	**98.05%**

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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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