Date : June 18, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19F05-PTH10-1-SCC
Customer identification : Lavender Fine - France - LK010182R
Type : Essential oil
Source : *Lavandula angustifolia*
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 : Lindsay Girard, B. Sc.
Analysis date : June 12, 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: 1.4593 ± 0.0003 (20 °C)

ISO 3515:2004 - OIL OF SPONTANEOUS LAVENDER - FRANCE

Compound	Min. %	Max. %	Observed %	Complies?
α-Terpineol		1.0	0.7	Yes
Lavandulyl acetate	2.0		1.6	No
Terpinen-4-ol	2	6	2	Yes
Lavandulol	0.3		0.4	Yes
Linalyl acetate	25	45	39	Yes
Linalool	25	38	33	Yes
Camphor	tr	0.50	0.38	Yes
Octan-3-one	tr	2.0	1.2	Yes
(E)-β-Ocimene	1.5	6.0	1.6	Yes
(Z)-β-Ocimene	4	10	2	No
β-Phellandrene	tr	0.50	1.0*	Yes
1,8-Cineole		1.0		
Limonene		0.5	0.4	Yes
Refractive index	1.4580	1.4640	1.4593	Yes

*Coeluted on both columns.

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil does not comply with the ISO standard for spontaneous French lavender oil.

Analysis summary – Consolidated contents

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

Identification	%	Classe
3-Buten-2-one	tr	Aliphatic ketone
Isovaleral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Butyl acetate	0.03	Aliphatic ester
Methyl hexyl ether	0.05	Aliphatic ether
(3*Z*)-Hexenol	0.02	Aliphatic alcohol
Hexanol	0.04	Aliphatic alcohol
Tricyclene	0.02	Monoterpene
α-Thujene	0.06	Monoterpene
α-Pinene	0.20	Monoterpene
Camphene	0.19	Monoterpene
α-Fenchene	0.01	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.02	Aliphatic lactone
Butyl isobutyrate	0.01	Aliphatic ester
β-Pinene	0.06	Monoterpene
Sabinene	0.03	Monoterpene
Octen-3-ol	0.13	Aliphatic alcohol
Octan-3-one	1.24	Aliphatic ketone
Myrcene	0.42	Monoterpene
Octan-3-ol	0.07	Aliphatic alcohol
Butyl butyrate	0.14	Aliphatic ester
α-Phellandrene	0.03	Monoterpene
Δ3-Carene	0.11	Monoterpene
(3*Z*)-Hexenyl acetate	0.01	Aliphatic ester
α-Terpinene	0.02	Monoterpene
Hexyl acetate	0.40	Aliphatic ester
ortho-Cymene	0.03	Monoterpene
para-Cymene	0.12	Monoterpene
Limonene	0.43	Monoterpene
1,8-Cineole	0.99*	Monoterpenic ether
β-Phellandrene	[0.99]*	Monoterpene
(*Z*)-β-Ocimene	2.46	Monoterpene
(*E*)-β-Ocimene	1.57	Monoterpene
γ-Terpinene	0.07	Monoterpene
cis-Sabinene hydrate	0.05	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.09	Monoterpenic alcohol
Unknown	0.01	Unknown
Octanol	0.02	Aliphatic alcohol
α-Pinene oxide analog	0.01	Monoterpenic ether
Terpinolene	0.05	Monoterpene
trans-Linalool oxide (fur.)	0.12	Monoterpenic alcohol
Rosefuran	0.04	Monoterpenic ether
(*Z*)-6-Methyl-3,5-heptadien-2-one	32.60*	Aliphatic ketone
Linalool	[32.60]*	Monoterpenic alcohol
Phenylethyl alcohol	0.03	Simple phenolic
β-Thujone	0.02	Monoterpenic ketone

Octen-3-yl acetate	0.45	Aliphatic ester
Unknown	0.03	Unknown
Octan-3-yl acetate	0.06	Aliphatic ester
allo-Ocimene	0.04	Monoterpene
(*Z*)-Myroxide	0.01	Monoterpenic ether
(*E*)-Myroxide	0.03	Monoterpenic ether
Unknown	0.01	Oxygenated monoterpene
Hexyl isobutyrate	0.13	Aliphatic ester
Nerol oxide	0.01	Aliphatic ether
Borneol	0.74	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Lavandulol	0.43	Monoterpenic alcohol
Terpinen-4-ol	2.09	Monoterpenic alcohol
Cryptone	0.10	Normonoterpenic ketone
para-Cymen-8-ol	0.04	Monoterpenic alcohol
Butyl hexanoate	0.04	Aliphatic ester
α-Terpineol	0.72	Monoterpenic alcohol
Hodiendiol	0.02	Monoterpenic alcohol
Hexyl butyrate	0.59	Aliphatic ester
Verbenone	0.01	Monoterpenic ketone
Unknown	0.04	Unknown
trans-Carveol	0.02	Monoterpenic alcohol
Bornyl formate	0.01	Monoterpenic ester
Nerol	0.14	Monoterpenic alcohol
Neral	0.04	Monoterpenic aldehyde
Hexyl isovalerate	0.08	Aliphatic ester
Linalyl acetate	39.44	Monoterpenic ester
Geraniol	0.27	Monoterpenic alcohol
Geranial	0.12	Monoterpenic aldehyde
Bornyl acetate	0.06	Monoterpenic ester
Cuminol	0.01	Monoterpenic alcohol
para-Cymen-7-ol	0.02	Monoterpenic alcohol
Lavandulyl acetate	1.59	Monoterpenic ester
Hexyl tiglate	0.09	Aliphatic ester
Hodiendiol derivative	0.04	Oxygenated monoterpene
Unknown	0.02	Oxygenated monoterpene
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.32	Monoterpenic ester
α-Copaene	0.02	Sesquiterpene
Daucene	0.01	Sesquiterpene
β-Bourbonene	0.03	Sesquiterpene
Geranyl acetate	0.55	Monoterpenic ester
7-epi-Sesquithujene	0.05	Sesquiterpene
Hexyl hexanoate	0.04	Aliphatic ester
Isocaryophyllene	0.03	Sesquiterpene
β-Caryophyllene	5.14	Sesquiterpene
α-Santalene	0.22	Sesquiterpene
Coumarin	0.08	Coumarin
trans-α-Bergamotene	0.07	Sesquiterpene
Lavandulyl butyrate?	0.07	Monoterpenic ester
α-Humulene	0.08	Sesquiterpene
(*E*)-β-Farnesene	1.07	Sesquiterpene

Germacrene D	0.23	Sesquiterpene
trans-β-Bergamotene	0.04	Sesquiterpene
γ-Cadinene	0.06	Sesquiterpene
β-Bisabolene	0.06	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.06	Sesquiterpenic ether
Caryophyllene oxide	0.21	Sesquiterpenic ether
τ-Cadinol	0.05	Sesquiterpenic alcohol
α-Bisabolol	0.05	Sesquiterpenic alcohol
Herniarin	0.01	Coumarin
Camphor	0.38	Monoterpenic ketone
Consolidated total	**98.56%**	

*: 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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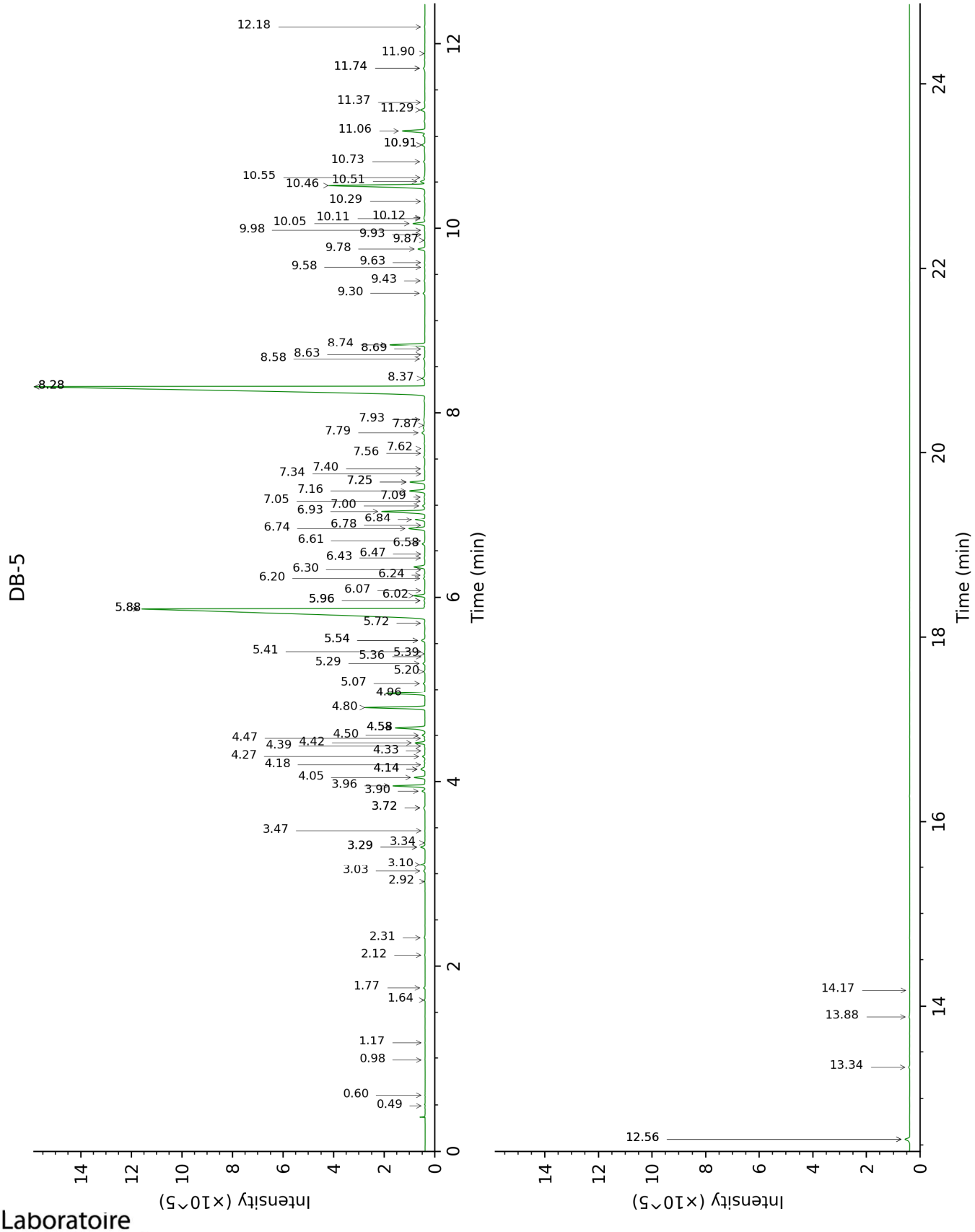
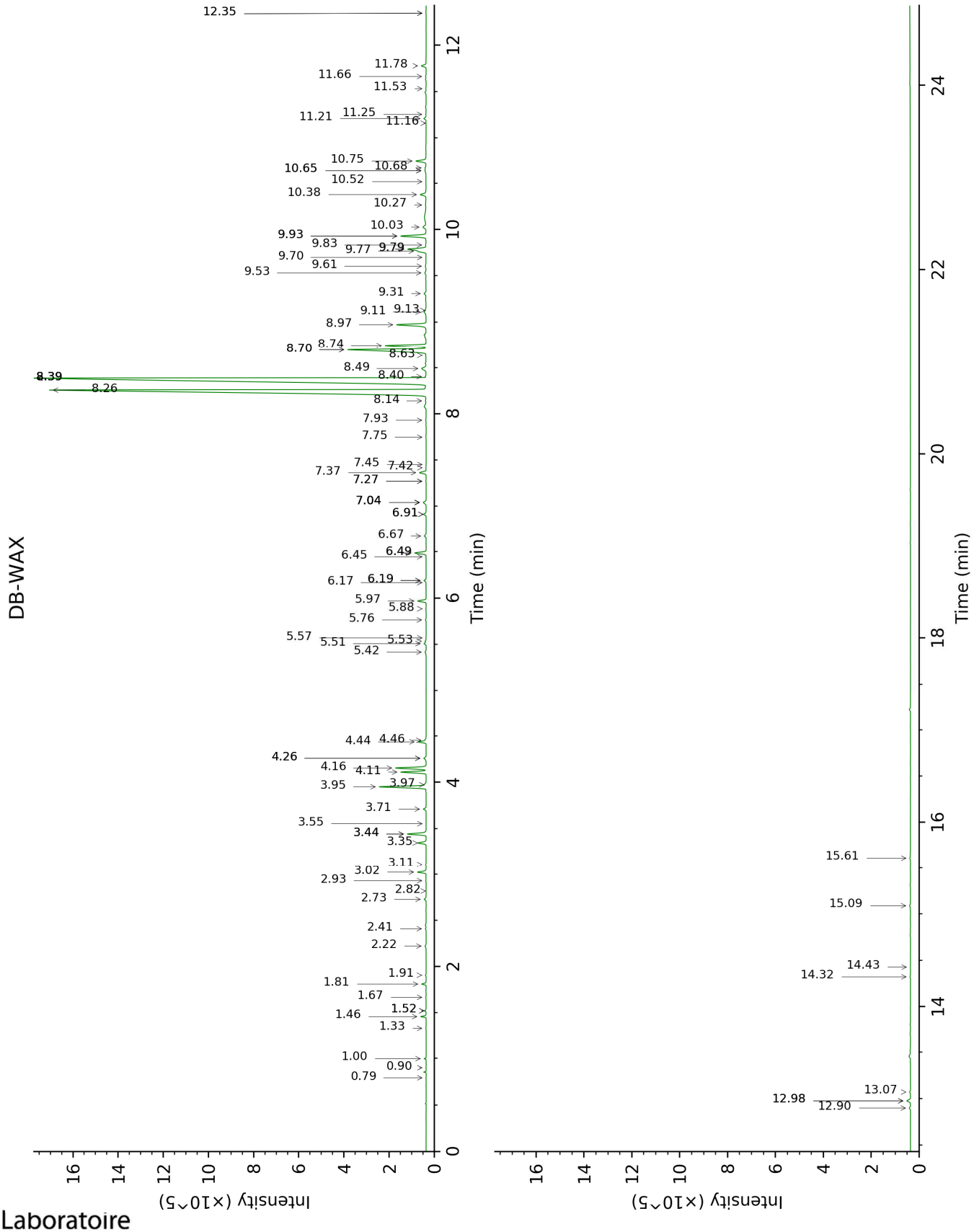

DB-5
Time (min)
Intensity (×10^5)
12.18
11.90
11.74
11.37
11.29
11.06
10.91
10.73
10.55
10.46
10.51
10.29
9.98
10.05
10.11
10.12
9.93
9.87
9.78
9.58
9.63
9.43
9.30
8.74
8.69
8.58
8.63
8.37
8.28
7.93
7.87
7.79
7.56
7.62
7.34
7.40
7.25
7.16
7.09
7.05
6.93
7.00
6.84
6.74
6.78
6.61
6.58
6.43
6.47
6.20
6.30
6.24
6.07
6.02
5.96
5.88
5.72
5.54
5.41
5.36
5.39
5.29
5.20
5.07
4.96
4.80
4.58
4.47
4.50
4.39
4.42
4.33
4.27
4.18
4.14
4.05
3.96
3.90
3.72
3.47
3.29
3.34
3.10
3.03
2.92
2.31
2.12
1.77
1.64
1.17
0.98
0.60
0.49
14.17
13.88
13.34
12.56


DB-WAX
Time (min)
Intensity (×10^5)
12.35
11.78
11.66
11.53
11.21
11.25
11.16
10.75
10.65
10.68
10.52
10.38
10.27
10.03
9.93
9.83
9.77
9.79
9.70
9.61
9.53
9.31
9.11
9.13
8.97
8.70
8.74
8.63
8.49
8.40
8.39
8.26
8.14
7.93
7.75
7.45
7.37
7.42
7.27
7.04
6.91
6.67
6.45
6.49
6.17
6.19
5.97
5.88
5.76
5.57
5.51
5.53
5.42
4.44
4.46
4.26
4.16
4.11
3.95
3.97
3.71
3.55
3.44
3.35
3.11
3.02
2.93
2.82
2.73
2.41
2.22
1.91
1.81
1.67
1.52
1.46
1.33
1.00
0.90
0.79
15.61
15.09
14.43
14.32
13.07
12.98
12.90

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
3-Buten-2-one	0.49	579	tr	0.90	910	0.01
Isovaleral	0.60	639	tr	0.79	888	0.01
Isoamyl alcohol	0.98	735	tr	3.55	1178	0.01
Toluene	1.17	760	tr	1.52*	1002	0.06
Butyl acetate	1.64	816	0.03	1.91	1039	0.02
Methyl hexyl ether	1.77	827	0.05	1.00	925	0.05
(3*Z*)-Hexenol	2.12	856	0.02	5.88	1342	0.02
Hexanol	2.31	871	0.04	5.53	1316	0.04
Tricyclene	2.92	917	0.02	1.33	976	0.01
α-Thujene	3.03	924	0.06	1.52*	1002	[0.06]
α-Pinene	3.10	929	0.20	1.46	996	0.19
Camphene	3.30*	942	0.20	1.81	1030	0.19
α-Fenchene	3.30*	942	[0.20]	1.67	1016	0.01
5,5-Dimethyl-2(5H)-furanone	3.34	945	0.02	8.63	1548	0.01
Butyl isobutyrate	3.47	953	0.01	2.82	1121	0.01
β-Pinene	3.72*	970	0.08	2.22	1069	0.06
Sabinene	3.72*	970	[0.08]	2.41	1087	0.03
Octen-3-ol	3.90	982	0.13	6.91*	1417	0.15
Octan-3-one	3.96	985	1.24	4.11	1221	1.22
Myrcene	4.05	991	0.42	3.02	1137	0.41
Octan-3-ol	4.14*	997	0.25	6.19*	1364	0.11
Butyl butyrate	4.14*	997	[0.25]	3.71	1191	0.14
α-Phellandrene	4.18	1000	0.03	2.93	1130	0.02
Δ3-Carene	4.27	1006	0.11	2.73	1114	0.10
(3*Z*)-Hexenyl acetate	4.33	1010	0.01			
α-Terpinene	4.39	1013	0.02	3.11	1144	0.02
Hexyl acetate	4.42	1015	0.40	4.44	1245	0.40
ortho-Cymene	4.47	1018	0.03	4.26*	1232	0.14
para-Cymene	4.50	1020	0.12	4.26*	1232	[0.14]
Limonene	4.58*	1025	1.42	3.34	1162	0.43
1,8-Cineole	4.58*	1025	[1.42]	3.44*	1170	0.99
β-Phellandrene	4.58*	1025	[1.42]	3.44*	1170	[0.99]
(*Z*)-β-Ocimene	4.80	1039	2.46	3.95	1209	2.45
(*E*)-β-Ocimene	4.96	1049	1.57	4.16	1224	1.56
γ-Terpinene	5.07	1056	0.07	3.97	1211	0.07
cis-Sabinene hydrate	5.20	1064	0.05	7.04*	1427	0.19
cis-Linalool oxide (fur.)	5.29	1069	0.09	6.67	1399	0.11
Unknown [m/z 56, 55 (94), 41 (85), 69 (74), 43 (65), 70 (63)...]	5.36	1074	0.01			
Octanol	5.39	1076	0.02	8.40	1530	0.02
α-Pinene oxide	5.41	1077	0.01	5.57	1319	0.01

analog						
Terpinolene	5.54*	1085	0.18	4.46	1247	0.05
trans-Linalool oxide (fur.)	5.54*	1085	[0.18]	7.04*	1427	[0.19]
Rosefuran	5.72	1097	0.04	6.19*	1364	[0.11]
(*Z*)-6-Methyl-3,5-heptadien-2-one	5.88*	1106	32.60	8.39*†	1529	[72.24]
Linalool	5.88*	1106	[32.60]	8.26†	1519	72.24
Phenylethyl alcohol	5.96*	1112	0.05	12.35*	1858	0.02
β-Thujone	5.96*	1112	[0.05]	6.45	1383	0.02
Octen-3-yl acetate	6.02	1116	0.45	5.97	1348	0.44
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	6.07	1119	0.03	9.83	1644	0.03
Octan-3-yl acetate	6.20	1128	0.06	5.42	1308	0.06
allo-Ocimene	6.24	1130	0.04	5.76	1333	0.03
(*Z*)-Myroxide	6.30	1134	0.01	7.04*	1427	[0.19]
(*E*)-Myroxide	6.43	1142	0.03	7.27*	1444	0.02
Unknown [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)]	6.47	1145	0.01	7.27*	1444	[0.02]
Hexyl isobutyrate	6.58	1152	0.13	5.51	1314	0.11
Nerol oxide	6.61	1154	0.01	7.04*	1427	[0.19]
Borneol	6.74	1162	0.74	9.93*	1652	1.44
cis-Linalool oxide (pyr.)	6.78	1165	0.01	10.52	1700	0.02
Lavandulol	6.84	1169	0.43	9.79*†	1640	[1.47]
Terpinen-4-ol	6.94	1175	2.09	8.74	1557	2.07
Cryptone	7.00	1179	0.10	9.31	1601	0.11
para-Cymen-8-ol	7.05	1182	0.04	11.66	1797	0.03
Butyl hexanoate	7.09	1185	0.04	6.49*	1386	0.63
α-Terpineol	7.16	1189	0.72	9.93*	1652	[1.44]
Hodiendiol	7.25*	1195	0.67	12.98*	1914	0.23
Hexyl butyrate	7.25*	1195	[0.67]	6.49*	1386	[0.63]
Verbenone	7.34	1201	0.01	9.70	1633	0.01
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.40	1205	0.04	6.17	1362	0.01
trans-Carveol	7.56	1216	0.02	11.53	1786	0.02
Bornyl formate	7.62	1220	0.01	8.14	1510	0.04
Nerol	7.78	1231	0.14	11.21	1758	0.12
Neral	7.87	1237	0.04	9.60	1625	0.05
Hexyl isovalerate	7.93	1241	0.08	6.91*	1417	[0.15]
Linalyl acetate	8.28*	1265	39.71	8.39*†	1529	[72.24]
Geraniol	8.28*	1265	[39.71]	11.78	1807	0.27

Geranial	8.37	1271	0.12			
Bornyl acetate	8.58	1286	0.06	8.39*†	1529	[72.24]
Cuminol	8.63	1289	0.01	14.43	2050	0.01
para-Cymen-7-ol	8.69	1293	0.02	14.32	2040	0.03
Lavandulyl acetate	8.74	1297	1.59	8.97	1574	1.67
Hexyl tiglate	9.30	1331	0.09	9.11	1585	0.13
Hodiendiol derivative	9.43	1340	0.04	13.07	1923	0.04
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.58	1351	0.02	11.16	1754	0.01
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.63	1354	0.02	11.25	1762	0.03
Neryl acetate	9.78	1364	0.32	10.38	1688	0.36
α-Copaene	9.87	1371	0.02	7.42	1455	0.02
Daucene	9.93	1375	0.01	7.45	1458	0.01
β-Bourbonene	9.98	1379	0.03	7.75	1480	0.03
Geranyl acetate	10.05	1384	0.55	10.75	1719	0.61
7-epi-Sesquithujene	10.11	1388	0.05	7.93	1493	0.03
Hexyl hexanoate	10.12	1388	0.04	9.13	1586	0.03
Isocaryophyllene	10.29	1401	0.03	8.39*†	1529	[72.24]
β-Caryophyllene	10.46	1413	5.14	8.70*	1553	5.08
α-Santalene	10.51	1416	0.22	8.49	1537	0.34
Coumarin	10.55	1420	0.08			
trans-α-Bergamotene	10.73	1433	0.07	8.70*	1553	[5.08]
Lavandulyl butyrate?	10.91*	1446	0.15	10.68	1713	0.07
α-Humulene	10.91*	1446	[0.15]	9.53	1619	0.08
(*E*)-β-Farnesene	11.06	1457	1.07	9.79*†	1640	[1.47]
Germacrene D	11.29	1474	0.23	10.03	1660	0.24
trans-β-Bergamotene	11.37	1480	0.04	9.77†	1638	1.47
γ-Cadinene	11.74*	1508	0.12	10.65*	1710	0.10
β-Bisabolene	11.74*	1508	[0.12]	10.27	1679	0.06
δ-Cadinene	11.90	1520	0.01	10.65*	1710	[0.10]
Isocaryophyllene epoxide B	12.18	1543	0.03	12.35*	1858	[0.02]
Caryophyllene oxide isomer	12.56*	1572	0.27	12.90	1907	0.06
Caryophyllene oxide	12.56*	1572	[0.27]	12.98*	1914	[0.23]
τ-Cadinol	13.34	1634	0.05	15.09	2115	0.06
α-Bisabolol	13.88	1679	0.05	15.61	2167	0.05
Herniarin	14.17	1703	0.01			

Camphor		7.36	1451	0.38
Total identified	**98.17%**		**98.28%**	
Total reported	**98.30%**		**98.36%**	

*: 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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