

Date : May 04, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18D26-BUB1-1-CC

Customer identification : Lavender Oil - Bulgaria - Lot # 06002

Type : Essential oil

Source : *Lavandula angustifolia*

Customer : Buhbli Organics

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : May 03, 2018

Checked and approved by :

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4598 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Methacrolein	tr	tr	Aliphatic aldehyde
3-Buten-2-one	tr	tr	Aliphatic ketone
2-Methyl-3-buten-2-ol	0.02	0.01	Aliphatic alcohol
Isovaleral	0.01	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	0.01*	Aliphatic alcohol
Toluene	tr	0.11*	Simple phenolic
Prenal	0.01	tr	Aliphatic aldehyde
Hexanal	tr	tr	Aliphatic aldehyde
Butyl acetate	0.02	0.02	Aliphatic ester
Methyl hexyl ether	0.15	0.16	Aliphatic ether
(3Z)-Hexenol	0.02	0.86*	Aliphatic alcohol
Hexanol	0.09	0.10	Aliphatic alcohol
Tricyclene	0.02	0.03	Monoterpene
α -Thujene	0.11	[0.11]*	Monoterpene
α -Pinene	0.25	0.26	Monoterpene
α -Fenchene	0.17*	tr	Monoterpene
Camphene	[0.17]*	0.16	Monoterpene
5,5-Dimethyl-2(5H)-furanone	0.03	0.01	Aliphatic lactone
Butyl isobutyrate	0.02	0.01	Aliphatic ester
β -Pinene	0.13*	0.10	Monoterpene
Sabinene	[0.13]*	0.03	Monoterpene
Octen-3-ol	0.20	0.22	Aliphatic alcohol
Octan-3-one	1.72*	4.45*	Aliphatic ketone
6-Methyl-5-hepten-2-one	[1.72]*	0.01	Aliphatic ketone
Myrcene	0.71*	0.70	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	[0.71]*	[0.01]*	Monoterpenic ether
Octan-3-ol	0.43*	0.33	Aliphatic alcohol
Butyl butyrate	[0.43]*	0.11	Aliphatic ester
α -Phellandrene	0.04*	0.04	Monoterpene
Pseudolimonene	[0.04]*	0.01	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.13*	0.01	Monoterpenic ether
Δ^3 -Carene	[0.13]*	0.12	Monoterpene
(3Z)-Hexenyl acetate	0.01	0.01	Aliphatic ester
α -Terpinene	0.06	0.05	Monoterpene
Hexyl acetate	0.67	0.79*	Aliphatic ester
ortho-Cymene	0.03	0.03	Simple phenolic
para-Cymene	0.15	0.16	Monoterpene
Limonene	0.42	0.42	Monoterpene
β -Phellandrene	1.66*	0.31	Monoterpene
1,8-Cineole	[1.66]*	1.33	Monoterpenic ether
(Z)- β -Ocimene	3.90	4.04	Monoterpene
(E)- β -Ocimene	2.72	[4.45]*	Monoterpene
γ -Terpinene	0.17	0.11	Monoterpene
<i>cis</i> -Sabinene hydrate	0.06	0.16*	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.14	0.14	Monoterpenic alcohol
Octanol	0.02	28.14*	Aliphatic alcohol
α -Pinene oxide analog	0.01	0.01	Monoterpenic ether

Isoterpinolene	0.01	0.01	Monoterpene
Terpinolene	0.16	[0.79]*	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.07	[0.16]*	Monoterpenic alcohol
Rosefuran	0.02	0.02	Monoterpenic ether
Linalool	32.98	33.49	Monoterpenic alcohol
(<i>Z</i>)-6-Methyl-3,5-heptadien-2-one	0.05	[28.14]*	Aliphatic ketone
Octen-3-yl acetate	0.85	[0.86]*	Aliphatic ester
Unknown	0.05*	0.86*	Unknown
α -Campholenal	[0.05]*	0.01*	Monoterpenic aldehyde
Octan-3-yl acetate	0.23	0.21	Aliphatic ester
(<i>Z</i>)-Myroxide	0.07	[0.16]*	Monoterpenic ether
Camphor	0.85	0.83	Monoterpenic ketone
(<i>E</i>)-Myroxide	0.03	0.02	Monoterpenic ether
Unknown	0.01	[0.01]*	Oxygenated monoterpene
Hexyl isobutyrate	0.10	0.08	Aliphatic ester
Nerol oxide	0.01	0.01	Aliphatic ether
Borneol	0.76	2.25*	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (pyr.)	0.03	0.02	Monoterpenic alcohol
Lavandulol	0.86	[0.86]*	Monoterpenic alcohol
Terpinen-4-ol	3.62*	3.55	Monoterpenic alcohol
(3 <i>E</i> ,5 <i>E</i>)-Undeca-1,3,5-triene	[3.62]*	0.07	Alkene
meta-Cymen-8-ol	0.20*	[0.10]	Monoterpenic alcohol
Cryptone	[0.20]*	0.17*	Normoterpenic ketone
para-Cymen-8-ol	0.06	0.10	Monoterpenic alcohol
α -Terpineol	1.07	[2.25]*	Monoterpenic alcohol
Hexyl butyrate	0.53*	0.47	Aliphatic ester
Hodiendiol	[0.53]*	0.20*	Monoterpenic alcohol
Unknown	0.03		Unknown
Bornyl formate	0.05		Monoterpenic ester
Nerol	0.18	0.20*	Monoterpenic alcohol
Cuminal	0.08*	0.03	Monoterpenic aldehyde
Hexyl 2-methylbutyrate	[0.08]*	0.05	Aliphatic ester
Neral	0.08*	0.02	Monoterpenic aldehyde
Carvone	[0.08]*	0.02	Monoterpenic ketone
Hexyl isovalerate	0.01	0.02	Aliphatic ester
Linalyl acetate	28.83*	[28.14]*	Monoterpenic ester
Geraniol	[28.83]*	0.42	Monoterpenic alcohol
Geranial	0.03	0.06*	Monoterpenic aldehyde
Bornyl acetate	0.12	0.47*	Monoterpenic ester
Lavandulyl acetate	2.98	2.98	Monoterpenic ester
Hexyl tiglate	0.07	0.06	Aliphatic ester
Hodiendiol derivative	0.02	0.03	Oxygenated monoterpene
Unknown	0.02	[0.20]*	Oxygenated monoterpene
Unknown	0.02	0.02	Oxygenated monoterpene
Neryl acetate	0.29	0.29	Monoterpenic ester
7-Cubebene	0.01	0.02	Sesquiterpene
β -Bourbonene	0.08	0.06	Sesquiterpene
Geranyl acetate	0.49	0.56*	Monoterpenic ester
7-epi-Sesquithujene	0.18*	0.09*	Sesquiterpene
Hexyl hexanoate	[0.18]*	0.11	Aliphatic ester
α -Funebrene	0.01	[0.09]*	Sesquiterpene
Isocaryophyllene	0.01	[28.14]*	Sesquiterpene

α -Cedrene	0.04	0.04	Sesquiterpene
β -Caryophyllene	3.30	3.35*	Sesquiterpene
α -Santalene	0.34	[0.47]*	Sesquiterpene
Coumarin	0.01		Coumarin
<i>trans</i> - α -Bergamotene	0.13	[3.35]*	Sesquiterpene
Isogermacrene D	0.06*	0.04	Sesquiterpene
Sesquisabinene A	[0.06]*	0.02	Sesquiterpene
α -Humulene	0.11	0.10	Sesquiterpene
Lavandulyl butyrate?	0.10	[0.56]*	Monoterpenic ester
(<i>E</i>)- β -Farnesene	2.93*	2.98	Sesquiterpene
β -Santalene	[2.93]*	[0.17]*	Sesquiterpene
Germacrene D	0.46	[2.25]*	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.05*	0.03	Sesquiterpene
ar-Curcumene	[0.05]*	0.02	Sesquiterpene
Valencene	0.01	0.02	Sesquiterpene
Isodaucene	0.03	0.03	Sesquiterpene
β -Bisabolene	0.15*	[0.06]*	Sesquiterpene
Lavandulyl isovalerate	[0.15]*	0.01	Monoterpenic ester
γ -Cadinene	[0.15]*	0.10	Sesquiterpene
δ -Cadinene	0.01	0.01	Sesquiterpene
β -Sesquiphellandrene	0.03	0.03	Sesquiterpene
Isocaryophyllene epoxide B	0.04	0.03	Sesquiterpenic ether
Caryophyllene oxide	0.24*	[0.20]*	Sesquiterpenic ether
Dendrolasin	[0.24]*	0.02	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.24]*	0.03	Sesquiterpenic ether
τ -Cadinol	0.05	0.05	Sesquiterpenic alcohol
α -Bisabolol	0.04	0.04	Sesquiterpenic alcohol
Total identified	98.63%	98.39%	

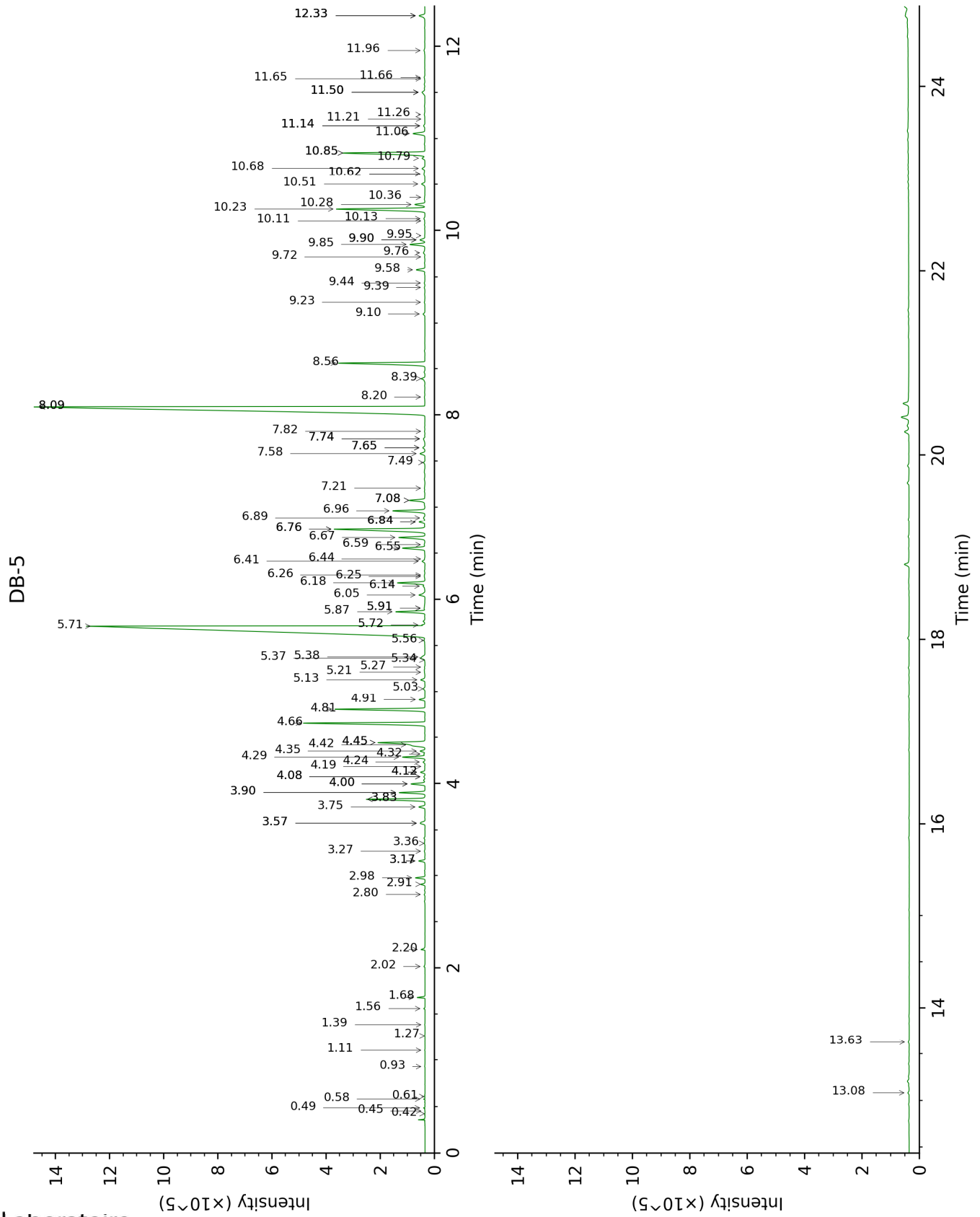
*: Two or more compounds are coeluting on this column

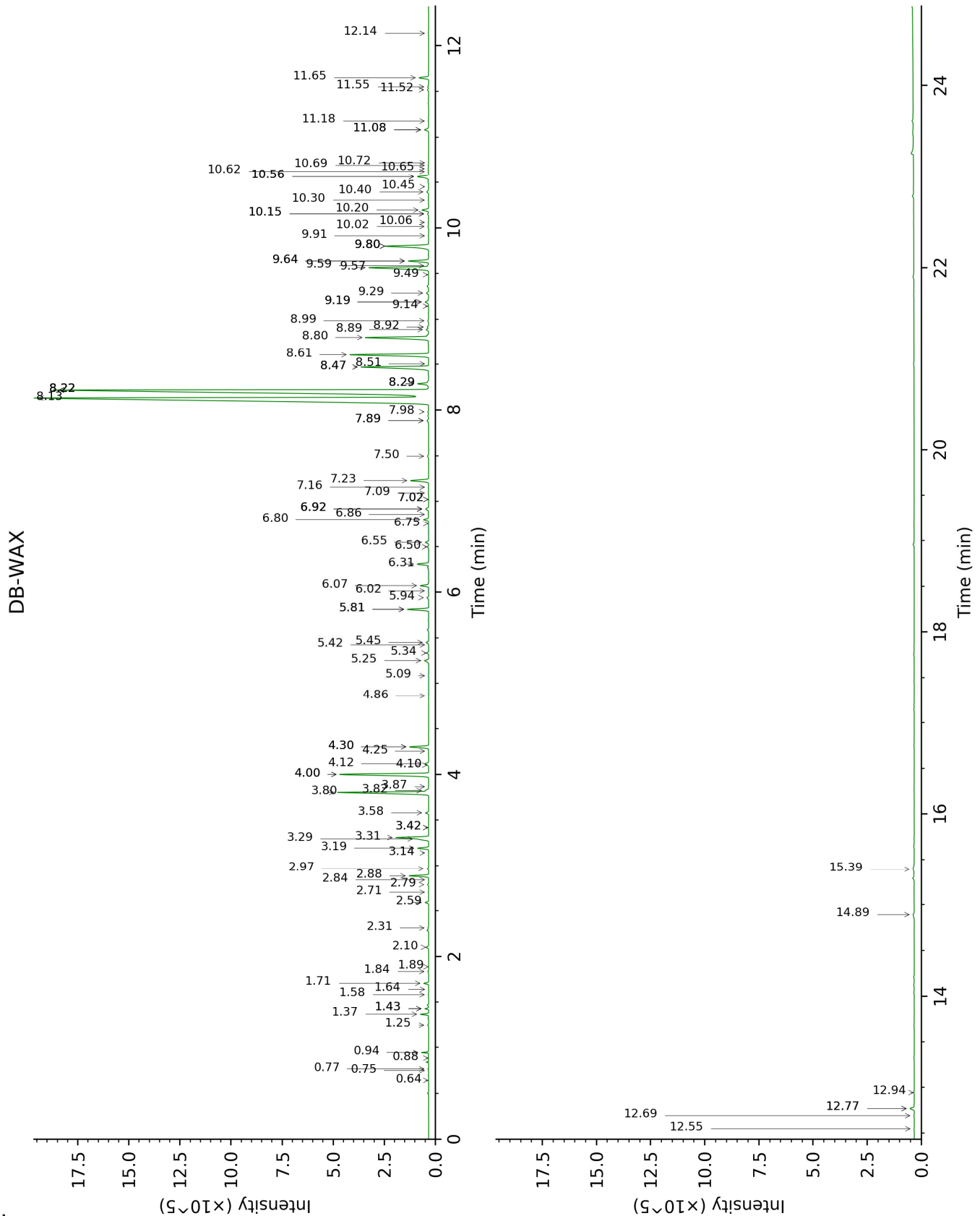
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Methacrolein	0.42	550	tr	0.64	839	tr
3-Buten-2-one	0.45	578	tr	0.88	912	tr
2-Methyl-3-buten-2-ol	0.49	604	0.02	1.58	1016	0.01
Isovaleral	0.58	637	0.01	0.77	886	0.01
2-Methylbutyral	0.61	647	0.01	0.75	879	0.01
Isoamyl alcohol	0.93	726	0.01	3.42*	1176	0.01
Toluene	1.11	752	tr	1.43*	1001	0.11
Prenal	1.27	776	0.01	3.14	1155	tr
Hexanal	1.39	794	tr	1.89	1047	tr
Butyl acetate	1.56	812	0.02	1.84	1042	0.02
Methyl hexyl ether	1.68	822	0.15	0.94	922	0.16
(3Z)-Hexenol	2.02	851	0.02	5.81*	1350	0.86
Hexanol	2.20	866	0.09	5.45	1324	0.10
Tricyclene	2.80	914	0.02	1.25	973	0.03
α-Thujene	2.91	921	0.11	1.43*	1001	[0.11]
α-Pinene	2.98	926	0.25	1.37	992	0.26
α-Fenchene	3.17*	939	0.17	1.64	1022	tr
Camphene	3.17*	939	[0.17]	1.71	1029	0.16
5,5-Dimethyl-2(5H)-furanone	3.27	946	0.03	8.51	1550	0.01
Butyl isobutyrate	3.36	952	0.02	2.70	1121	0.01
β-Pinene	3.57*	966	0.13	2.10	1068	0.10
Sabinene	3.57*	966	[0.13]	2.31	1089	0.03
Octen-3-ol	3.75	978	0.20	6.80	1421	0.22
Octan-3-one	3.83*	984	1.72	4.00*	1219	4.45
6-Methyl-5-hepten-2-one	3.83*	984	[1.72]	5.09	1296	0.01
Myrcene	3.90*	989	0.71	2.88	1135	0.70
<i>trans</i> -Dehydroxylinalool oxide	3.90*	989	[0.71]	3.42*	1176	[0.01]
Octan-3-ol	4.00*	995	0.43	6.07	1368	0.33
Butyl butyrate	4.00*	995	[0.43]	3.58	1189	0.11
α-Phellandrene	4.08*	1000	0.04	2.79	1128	0.04
Pseudolimonene	4.08*	1000	[0.04]	2.84	1132	0.01
<i>cis</i> -Dehydroxylinalool oxide	4.12*	1004	0.13	3.87	1210	0.01
Δ3-Carene	4.12*	1004	[0.13]	2.59	1113	0.12
(3Z)-Hexenyl acetate	4.19	1007	0.01	4.86	1280	0.01
α-Terpinene	4.24	1010	0.06	2.97	1142	0.05
Hexyl acetate	4.29	1014	0.67	4.30*	1241	0.79
ortho-Cymene	4.32	1016	0.03	4.10	1227	0.03
para-Cymene	4.35	1018	0.15	4.12	1228	0.16
Limonene	4.42	1022	0.42	3.19	1159	0.42
β-Phellandrene	4.44*	1024	1.66	3.30	1167	0.31

1,8-Cineole	4.44*	1024	[1.66]	3.31	1168	1.33
(Z)-β-Ocimene	4.66	1037	3.90	3.80	1206	4.04
(E)-β-Ocimene	4.81	1047	2.72	4.00*	1219	[4.45]
γ-Terpinene	4.91	1053	0.17	3.82	1207	0.11
cis-Sabinene hydrate	5.03	1061	0.06	6.92*	1430	0.16
cis-Linalool oxide (fur.)	5.13	1067	0.14	6.55	1402	0.14
Octanol	5.21	1072	0.02	8.22*	1528	28.14
α-Pinene oxide analog	5.27	1076	0.01	5.42	1322	0.01
Isoterpinolene	5.34	1081	0.01	4.26	1237	0.01
Terpinolene	5.37	1082	0.16	4.30*	1241	[0.79]
trans-Linalool oxide (fur.)	5.38	1083	0.07	6.92*	1430	[0.16]
Rosefuran	5.56	1094	0.02	6.02	1364	0.02
Linalool	5.71	1104	32.98	8.13	1521	33.49
(Z)-6-Methyl-3,5-heptadien-2-one	5.72	1105	0.05	8.22*	1528	[28.14]
Octen-3-yl acetate	5.87	1114	0.85	5.81*	1350	[0.86]
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	5.90*	1116	0.05	9.64*	1640	0.86
α-Campholenal	5.90*	1116	[0.05]	7.02*	1438	0.01
Octan-3-yl acetate	6.05	1126	0.23	5.25	1309	0.21
(Z)-Myroxide	6.14	1132	0.07	6.92*	1430	[0.16]
Camphor	6.18	1134	0.85	7.23	1453	0.83
(E)-Myroxide	6.25	1139	0.03	7.09	1443	0.02
Unknown [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)]	6.26	1140	0.01	7.02*	1438	[0.01]
Hexyl isobutyrate	6.41	1149	0.10	5.34	1315	0.08
Nerol oxide	6.44	1151	0.01	6.86	1426	0.01
Borneol	6.55	1158	0.76	9.80*	1653	2.25
cis-Linalool oxide (pyr.)	6.59	1161	0.03	10.30	1694	0.02
Lavandulol	6.67	1166	0.86	9.64*	1640	[0.86]
Terpinen-4-ol	6.76*	1171	3.62	8.61	1558	3.55
(3E,5E)-Undeca-1,3,5-triene	6.76*	1171	[3.62]	5.94	1359	0.07
meta-Cymen-8-ol	6.84*	1176	0.20	11.55†	1799	[0.10]
Cryptone	6.84*	1176	[0.20]	9.19*	1603	0.17
para-Cymen-8-ol	6.89	1180	0.06	11.52†	1796	0.10
α-Terpineol	6.96	1185	1.07	9.80*	1653	[2.25]
Hexyl butyrate	7.08*	1192	0.53	6.31	1385	0.47
Hodiendiol	7.08*	1192	[0.53]	12.77*	1908	0.20
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.21	1200	0.03			
Bornyl formate	7.49	1219	0.05			
Nerol	7.58	1226	0.18	11.08*	1759	0.20

Cuminal	7.65*	1230	0.08	10.65	1723	0.03
Hexyl 2-methylbutyrate	7.65*	1230	[0.08]	6.50	1399	0.05
Neral	7.74*	1236	0.08	9.49	1627	0.02
Carvone	7.74*	1236	[0.08]	10.06	1674	0.02
Hexyl isovalerate	7.82	1242	0.01	6.75	1418	0.02
Linalyl acetate	8.09*	1260	28.83	8.22*	1528	[28.14]
Geraniol	8.09*	1260	[28.83]	11.65	1808	0.42
Geranial	8.20	1267	0.03	10.16*	1681	0.06
Bornyl acetate	8.39	1280	0.12	8.29*	1533	0.47
Lavandulyl acetate	8.56	1291	2.98	8.80	1573	2.98
Hexyl tiglate	9.10	1329	0.07	8.92	1582	0.06
Hodiendiol derivative	9.23	1338	0.02	12.94	1924	0.03
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.39	1349	0.02	11.08*	1759	[0.20]
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.44	1353	0.02	11.18	1768	0.02
Neryl acetate	9.58	1363	0.29	10.20	1685	0.29
7-Cubebene	9.72	1373	0.01	7.16	1448	0.02
β-Bourbonene	9.76	1376	0.08	7.50	1473	0.06
Geranyl acetate	9.85	1382	0.49	10.56*	1715	0.56
7-epi-Sesquithujene	9.90*	1386	0.18	7.89*	1502	0.09
Hexyl hexanoate	9.90*	1386	[0.18]	8.89	1580	0.11
α-Funebrene	9.95	1389	0.01	7.89*	1502	[0.09]
Isocaryophyllene	10.11	1400	0.01	8.22*	1528	[28.14]
α-Cedrene	10.13	1402	0.04	7.98	1509	0.04
β-Caryophyllene	10.23	1410	3.30	8.47*	1547	3.35
α-Santalene	10.28	1413	0.34	8.29*	1533	[0.47]
Coumarin	10.36	1419	0.01			
<i>trans</i> -α-Bergamotene	10.50	1430	0.13	8.47*	1547	[3.35]
Isogermacrene D	10.62*	1438	0.06	8.99	1587	0.04
Sesquisabinene A	10.62*	1438	[0.06]	9.14	1600	0.02
α-Humulene	10.68	1443	0.11	9.29	1611	0.10
Lavandulyl butyrate?	10.79	1451	0.10	10.56*	1715	[0.56]
(<i>E</i>)-β-Farnesene	10.85*	1456	2.93	9.57	1634	2.98
β-Santalene	10.85*	1456	[2.93]	9.19*	1603	[0.17]
Germacrene D	11.06	1471	0.46	9.80*	1653	[2.25]
<i>trans</i> -β-Bergamotene	11.14*	1478	0.05	9.59	1635	0.03
ar-Curcumene	11.14*	1478	[0.05]	10.69	1726	0.02
Valencene	11.21	1483	0.01	9.92	1662	0.02
Isodaucene	11.26	1487	0.03	10.02	1670	0.03
β-Bisabolene	11.50*	1505	0.15	10.16*	1681	[0.06]
Lavandulyl	11.50*	1505	[0.15]	10.72	1729	0.01

isovalerate						
γ-Cadinene	11.50*	1505	[0.15]	10.40	1701	0.10
δ-Cadinene	11.65	1516	0.01	10.45	1706	0.01
β-Sesquiphellandrene	11.66	1517	0.03	10.62	1720	0.03
Isocaryophyllene epoxide B	11.96	1540	0.04	12.14	1851	0.03
Caryophyllene oxide	12.33*	1570	0.24	12.77*	1908	[0.20]
Dendrolasin	12.33*	1570	[0.24]	12.55	1888	0.02
Caryophyllene oxide isomer	12.33*	1570	[0.24]	12.69	1901	0.03
τ-Cadinol	13.08	1631	0.05	14.89	2109	0.05
α-Bisabolol	13.63	1676	0.04	15.39	2160	0.04
Total identified		98.63%			98.39%	
Total reported		98.72%			98.42%	

*: 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