Date : October 18, 2018

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 18J05-PTH3-1-CC
Customer identification : Ylang Complete Organic - Madagascar - Y8010586R
Type : Essential oil
Source : *Cananga odorata* var. *genuina (Ylang-ylang)*
Customer : Plant Therapy

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 : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : October 16, 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: 1.4985 ± 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
Ethyl acetate	0.04	0.03	Aliphatic ester
Isovaleral	tr	tr	Aliphatic aldehyde
Isobutyl acetate	tr	tr	Aliphatic ester
Octane	0.01	0.01	Alkane
Butyl acetate	0.01	0.01	Aliphatic ester
Isoamyl acetate	0.01	0.01	Aliphatic ester
2-Methylbutyl acetate	0.01	0.01	Aliphatic ester
3-Methyl-3-butenyl acetate	0.07	0.07	Aliphatic ester
Prenyl acetate	0.19	0.21*	Aliphatic ester
α-Pinene	0.30	0.31	Monoterpene
Camphene	0.01	0.01	Monoterpene
Benzaldehyde	0.01	0.01	Simple phenolic
β-Pinene	0.09*	0.09	Monoterpene
Sabinene	[0.09]*	0.01	Monoterpene
Octan-3-one	tr	0.02	Aliphatic ketone
Myrcene	0.13	0.14	Monoterpene
(3*Z*)-Hexenyl acetate	0.04	0.04	Aliphatic ester
Hexyl acetate	0.03	0.05	Aliphatic ester
meta-Methylanisole	2.86	2.87	Simple phenolic
Limonene	0.18*	0.04	Monoterpene
1,8-Cineole	[0.18]*	0.13	Monoterpenic ether
(*Z*)-β-Ocimene	0.01	0.01	Monoterpene
(*E*)-β-Ocimene	0.03	[0.21]*	Monoterpene
cis-Linalool oxide (fur.)	0.01	0.02	Monoterpenic alcohol
para-Cresol	0.02	0.03	Simple phenolic
Methyl benzoate	1.73	1.74	Phenolic ester
Linalool	9.12	9.05	Monoterpenic alcohol
Camphor	0.01	tr	Monoterpenic ketone
ortho-Dimethoxybenzene	0.01		Simple phenolic
Unknown	0.01	0.01	Phenylpropanoid
Benzyl acetate	1.55	1.62	Phenolic ester
para-Cresyl acetate	0.05		Phenolic ester
Ethyl benzoate	0.05	0.08	Phenolic ester
Terpinen-4-ol	0.01	tr	Monoterpenic alcohol
α-Terpineol	0.04	24.36*	Monoterpenic alcohol
Methyl salicylate	0.13	6.75*	Phenolic ester
Methylchavicol	0.09	0.08	Phenylpropanoid
Nerol	0.03	0.02	Monoterpenic alcohol
Neral	0.02	0.03	Monoterpenic aldehyde
Phenylethyl acetate	0.06	0.07	Phenolic ester
Geraniol	1.28	1.36	Monoterpenic alcohol
Linalyl acetate	0.16	0.10	Monoterpenic ester
Geranial	0.14*	0.06	Monoterpenic aldehyde
Chavicol	[0.14]*	0.02	Phenylpropanoid
(*E*)-Anethole	0.04	0.05*	Phenylpropanoid
1-Nitro-2-phenylethane	0.06	0.08	Simple phenolic
4-Vinylguaiacol	0.03	0.02	Simple phenolic
Bicycloelemene	0.06	0.07	Sesquiterpene

α-Cubebene	0.15	0.12	Sesquiterpene
Eugenol	0.46	0.47	Phenylpropanoid
Neryl acetate	0.02	0.02	Monoterpenic ester
α-Ylangene	0.08	0.83*	Sesquiterpene
α-Copaene	0.89	[0.83]*	Sesquiterpene
Geranyl acetate	8.15*	7.83	Monoterpenic ester
β-Cubebene	[8.15]*	0.19	Sesquiterpene
β-Elemene	0.46	[14.55]*	Sesquiterpene
Isocaryophyllene	0.01	0.01	Sesquiterpene
Methyleugenol	14.45	0.68	Phenylpropanoid
β-Caryophyllene	[14.45]	[14.55]*	Sesquiterpene
β-Copaene	0.26*	14.55	Sesquiterpene
Caryophylla-4(12),8(13)-diene	[0.26]*	0.01	Sesquiterpene
Aromadendrene	0.04	0.03	Sesquiterpene
α-Guaiene	0.02	0.03	Sesquiterpene
9-epi-Isocaryophyllene	4.56*	0.01	Sesquiterpene
trans-Muurola-3,5-diene	[4.56]*	0.05	Sesquiterpene
(*E*)-Cinnamyl acetate	[4.56]*	0.60	Phenylpropanoid ester
α-Humulene	[4.56]*	3.73	Sesquiterpene
(*E*)-Isoeugenol	0.34	0.27	Phenylpropanoid
cis-Cadina-1(6),4-diene	0.18*	0.04	Sesquiterpene
cis-Muurola-4(15),5-diene	[0.18]*	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.12	0.18	Sesquiterpene
γ-Muurolene	24.74*	1.08*	Sesquiterpene
α-Amorphene	[24.74]*	[1.08]*	Sesquiterpene
Germacrene D	[24.74]*	[24.36]*	Sesquiterpene
γ-Amorphene	0.64*	0.37*	Sesquiterpene
Prenyl benzoate	[0.64]*	0.55	Phenolic ester
trans-Muurola-4(15),5-diene	[0.64]*	0.23	Sesquiterpene
Bicyclogermacrene	0.95*	0.49	Sesquiterpene
epi-Cubebol	[0.95]*	0.04	Sesquiterpenic alcohol
α-Muurolene	0.04	0.04	Sesquiterpene
(3*Z*,6*E*)-α-Farnesene	0.43*	0.05	Sesquiterpene
Methyl (*E*)-isoeugenol	[0.43]*	0.43*	Phenylpropanoid
Unknown	1.45*		Sesquiterpene
δ-Amorphene	[1.45]*	0.52	Sesquiterpene
δ-Guaiene	[1.45]*	0.03	Sesquiterpene
γ-Cadinene	7.44*	2.61*	Sesquiterpene
Cubebol	[7.44]*	0.04	Sesquiterpenic alcohol
(3*E*,6*E*)-α-Farnesene	[7.44]*	[6.75]*	Sesquiterpene
(*Z*)-γ-Bisabolene	[7.44]*	[0.37]*	Sesquiterpene
δ-Cadinene	2.21*	[6.75]*	Sesquiterpene
trans-Calamenene	[2.21]*	0.04	Sesquiterpene
Zonarene	[2.21]*	[2.61]*	Sesquiterpene
trans-Cadina-1,4-diene	0.18	0.14	Sesquiterpene
α-Cadinene	0.14*	0.13	Sesquiterpene
Guaiacylacetone	[0.14]*	0.02	Phenylpropanoid
α-Elemol	0.09	0.15*	Sesquiterpenic alcohol
Germacrene B	0.01	[0.05]*	Sesquiterpene
(*E*)-Nerolidol	0.04*	0.01	Sesquiterpenic alcohol
β-Calacorene	[0.04]*	0.04*	Sesquiterpene
(3*Z*)-Hexenyl benzoate	0.02	0.04	Phenolic ester

Spathulenol	0.03	0.01	Sesquiterpenic alcohol
10-epi-Junenol	0.11*	[0.04]*	Sesquiterpenic alcohol
Caryophyllene oxide	[0.11]*	0.05	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.11]*	0.04	Sesquiterpenic ether
Unknown	0.13*	0.03	Sesquiterpenic alcohol
Unknown	[0.13]*	0.03	Oxygenated sesquiterpene
Viridiflorol	0.06	[0.15]*	Sesquiterpenic alcohol
Guaiol	0.08	0.07	Sesquiterpenic alcohol
Copaborneol	0.04	0.02	Sesquiterpenic alcohol
Junenol	0.20*	0.15	Sesquiterpenic alcohol
10-epi-Cubenol	[0.20]*	0.13	Sesquiterpenic alcohol
(*E*)-Isoeugenyl acetate	0.05	0.10	Phenylpropanoid ester
1-epi-Cubenol	0.15	0.11	Sesquiterpenic alcohol
Cubenol	0.09	0.04	Sesquiterpenic alcohol
τ-Cadinol	0.75*	0.28	Sesquiterpenic alcohol
τ-Muurolol	[0.75]*	[0.43]*	Sesquiterpenic alcohol
α-Muurolol	0.20	[0.26]	Sesquiterpenic alcohol
Unknown	0.14	0.26	Sesquiterpenic alcohol
α-Cadinol	0.84	0.82	Sesquiterpenic alcohol
(3*E*,5*E*)-7-Hydroxyfarnesene	0.04	0.06	Sesquiterpenic alcohol
Unknown	0.05	0.07	Oxygenated sesquiterpene
(2*E*,6*Z*)-Farnesol	0.01	0.01	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesol	0.66	1.26	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesal	0.02	0.02	Sesquiterpenic aldehyde
Benzyl benzoate	5.65	5.59	Phenolic ester
(2*E*,6*E*)-Farnesyl acetate	1.14	1.10	Sesquiterpenic ester
Benzyl salicylate	1.60	1.58	Phenolic ester
Geranyl benzoate	0.11	0.14	Phenolic ester
Total identified	**99.25%**	**98.14%**	

*: 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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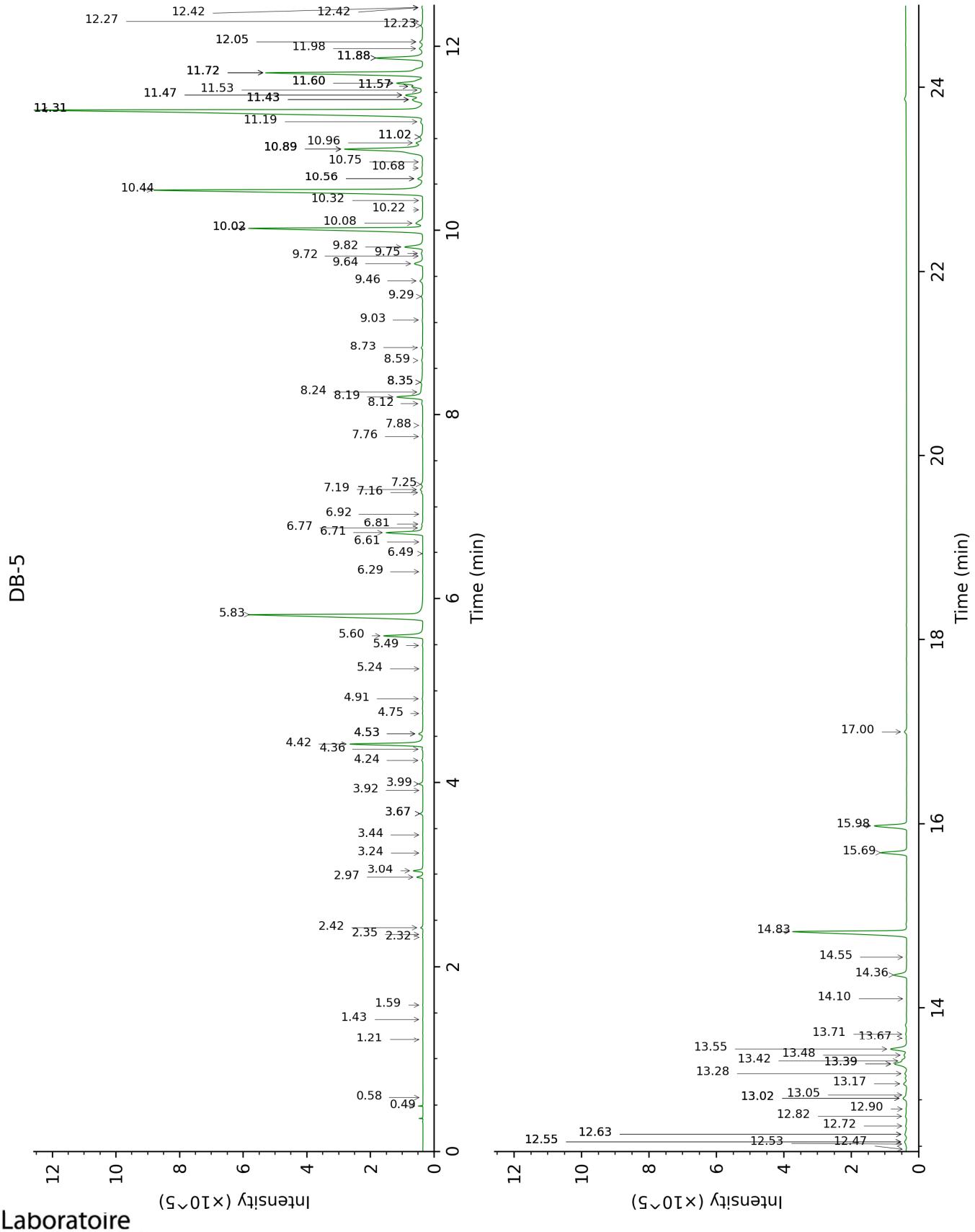
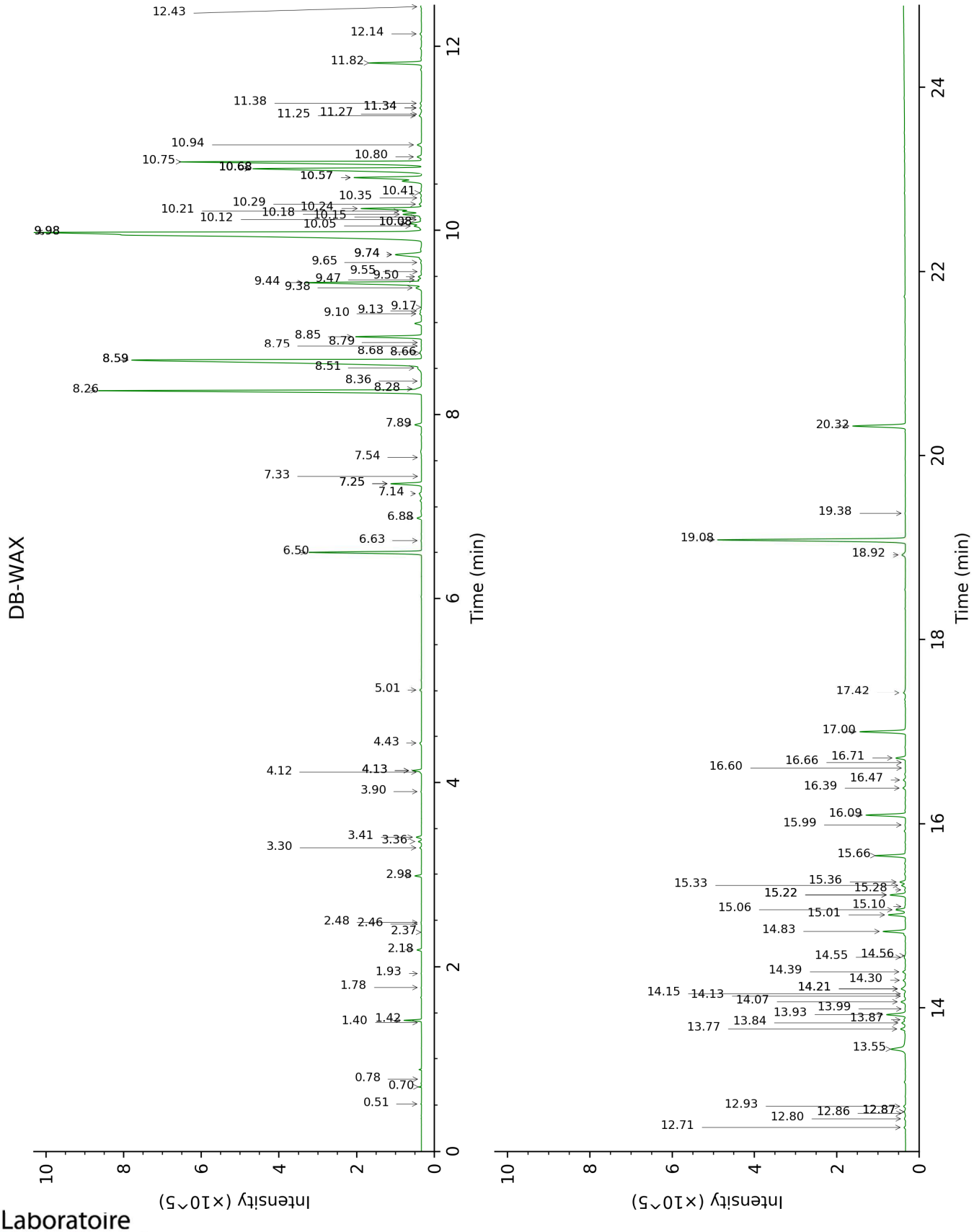

DB-5
Intensity (×10^5)
Time (min)
12.42
12.27
12.23
12.05
11.98
11.88
11.72
11.60
11.57
11.47
11.53
11.43
11.31
11.19
11.02
10.89
10.96
10.75
10.68
10.56
10.44
10.32
10.22
10.02
10.08
9.82
9.72
9.75
9.64
9.46
9.29
9.03
8.73
8.59
8.35
8.24
8.19
8.12
7.88
7.76
7.25
7.19
7.16
6.92
6.77
6.81
6.71
6.61
6.49
6.29
5.83
5.60
5.49
5.24
4.91
4.75
4.53
4.42
4.36
4.24
3.99
3.92
3.67
3.44
3.24
3.04
2.97
2.42
2.35
2.32
1.59
1.43
1.21
0.58
0.49
17.00
15.98
15.69
14.83
14.55
14.36
14.10
13.71
13.67
13.55
13.48
13.42
13.39
13.28
13.17
13.05
13.02
12.90
12.82
12.72
12.63
12.55
12.53
12.47


DB-WAX
Time (min)
Intensity (×10^5)
12.43
12.14
11.82
11.38
11.25
11.27
11.34
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10.75
10.80
10.68
10.57
10.35
10.41
10.21
10.29
10.24
10.18
10.15
10.12
10.05
10.08
9.98
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9.65
9.55
9.50
9.47
9.44
9.38
9.10
9.13
9.17
8.85
8.79
8.75
8.68
8.66
8.59
8.51
8.36
8.28
8.26
7.89
7.54
7.33
7.25
7.14
6.88
6.63
6.50
5.01
4.43
4.12
4.13
3.90
3.41
3.36
3.30
2.98
2.48
2.46
2.37
2.18
1.93
1.78
1.40
1.42
0.78
0.70
0.51
20.32
19.38
19.08
18.92
17.42
17.00
16.71
16.66
16.60
16.47
16.39
16.09
15.99
15.66
15.36
15.33
15.28
15.22
15.10
15.06
15.01
14.83
14.56
14.55
14.39
14.30
14.21
14.15
14.13
14.07
13.99
13.93
13.87
13.84
13.77
13.55
12.93
12.86
12.87
12.80
12.71

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethyl acetate	0.49	603	0.04	0.70	858	0.03
Isovaleral	0.58	638	tr	0.78	885	tr
Isobutyl acetate	1.21	767	tr	1.40	988	tr
Octane	1.43	799	0.01	0.51	780	0.01
Butyl acetate	1.59	816	0.01	1.93	1042	0.01
Isoamyl acetate	2.32	876	0.01	2.48	1095	0.01
2-Methylbutyl acetate	2.35	879	0.01	2.46	1093	0.01
3-Methyl-3-butenyl acetate	2.42	885	0.07	3.36	1164	0.07
Prenyl acetate	2.97	925	0.19	4.13*	1223	0.21
α-Pinene	3.04	930	0.30	1.42	992	0.31
Camphene	3.24	943	0.01	1.78	1028	0.01
Benzaldehyde	3.44	955	0.01	7.54	1467	0.01
β-Pinene	3.67*	970	0.09	2.18	1067	0.09
Sabinene	3.67*	970	[0.09]	2.37	1085	0.01
Octan-3-one	3.92	987	tr	4.12	1222	0.02
Myrcene	3.99	992	0.13	2.98	1134	0.14
(3*Z*)-Hexenyl acetate	4.24	1008	0.04	5.01	1289	0.04
Hexyl acetate	4.36	1015	0.03	4.43	1245	0.05
meta-Methylanisole	4.42	1019	2.86	6.50	1391	2.87
Limonene	4.53*	1026	0.18	3.30	1159	0.04
1,8-Cineole	4.53*	1026	[0.18]	3.41	1168	0.13
(*Z*)-β-Ocimene	4.75	1039	0.01	3.90	1206	0.01
(*E*)-β-Ocimene	4.91	1049	0.03	4.13*	1223	[0.21]
cis-Linalool oxide (fur.)	5.24	1070	0.01	6.63	1400	0.02
para-Cresol	5.49	1085	0.02	14.13	2020	0.03
Methyl benzoate	5.60	1092	1.73	8.85	1567	1.74
Linalool	5.83	1106	9.12	8.26	1521	9.05
Camphor	6.29	1135	0.01	7.33	1452	tr
ortho-Dimethoxybenzene	6.49	1147	0.01			
Unknown [m/z 133, 77 (86), 105 (75), 79 (68), 134 (48)]	6.61	1155	0.01	12.86	1902	0.01
Benzyl acetate	6.72	1162	1.55	10.24	1677	1.62
para-Cresyl acetate	6.77	1165	0.05			
Ethyl benzoate	6.81	1168	0.05	9.47	1615	0.08
Terpinen-4-ol	6.92	1175	0.01	8.75	1559	tr
α-Terpineol	7.16	1190	0.04	9.98*	1656	24.36
Methyl salicylate	7.19	1192	0.13	10.68*	1713	6.75
Methylchavicol	7.25	1195	0.09	9.50	1618	0.08
Nerol	7.76	1229	0.03	11.27	1763	0.02
Neral	7.88	1237	0.02	9.65	1630	0.03
Phenylethyl	8.12	1253	0.06	11.25	1761	0.07

acetate						
Geraniol	8.19	1258	1.28	11.82	1810	1.36
Linalyl acetate	8.24	1261	0.16	8.28	1523	0.10
Geranial	8.35*	1268	0.14	10.28	1681	0.06
Chavicol	8.35*	1268	[0.14]	16.66	2272	0.02
(*E*)-Anethole	8.59	1284	0.04	11.34*	1768	0.05
1-Nitro-2-phenylethane	8.73	1293	0.06	14.39	2045	0.08
4-Vinylguaiacol	9.03	1316	0.03	15.28	2131	0.02
Bicycloelemene	9.29	1333	0.06	7.14	1438	0.07
α-Cubebene	9.46	1345	0.15	6.88	1419	0.12
Eugenol	9.64	1358	0.46	15.01	2104	0.47
Neryl acetate	9.72	1363	0.02	10.35	1686	0.02
α-Ylangene	9.75	1365	0.08	7.25*	1446	0.83
α-Copaene	9.82	1370	0.89	7.25*	1446	[0.83]
Geranyl acetate	10.02*	1384	8.15	10.75	1719	7.83
β-Cubebene	10.02*	1384	[8.15]	7.89	1493	0.19
β-Elemene	10.08	1388	0.46	8.59*†	1547	[14.55]
Isocaryophyllene	10.22	1398	0.01	8.36	1529	0.01
Methyleugenol	10.32†	1405	14.45	13.55	1965	0.68
β-Caryophyllene	10.44†	1413	[14.45]	8.59*†	1547	[14.55]
β-Copaene	10.56*	1422	0.26	8.50†	1540	14.55
Caryophylla-4(12),8(13)-diene	10.56*	1422	[0.26]	8.79	1562	0.01
Aromadendrene	10.68	1431	0.04	8.66	1552	0.03
α-Guaiene	10.75	1436	0.02	8.68	1553	0.03
9-epi-Isocaryophyllene	10.89*	1446	4.56	9.17	1591	0.01
trans-Muurola-3,5-diene	10.89*	1446	[4.56]	9.10	1586	0.05
(*E*)-Cinnamyl acetate	10.89*	1446	[4.56]	14.83	2086	0.60
α-Humulene	10.89*	1446	[4.56]	9.44	1612	3.73
(*E*)-Isoeugenol	10.96	1451	0.34	16.71	2277	0.27
cis-Cadina-1(6),4-diene	11.02*	1456	0.18	9.13	1588	0.04
cis-Muurola-4(15),5-diene	11.02*	1456	[0.18]	9.56	1622	0.02
trans-Cadina-1(6),4-diene	11.18	1468	0.12	9.38	1608	0.18
γ-Muurolene	11.31*	1477	24.74	9.74*	1637	1.08
α-Amorphene	11.31*	1477	[24.74]	9.74*	1637	[1.08]
Germacrene D	11.31*	1477	[24.74]	9.98*	1656	[24.36]
γ-Amorphene	11.42*	1486	0.64	10.08*	1664	0.37
Prenyl benzoate	11.42*	1486	[0.64]	13.93	2000	0.55
trans-Muurola-4(15),5-diene	11.42*	1486	[0.64]	10.05	1662	0.23
Bicyclogermacrene	11.47*	1489	0.95	10.21	1675	0.49
epi-Cubebol	11.47*	1489	[0.95]	12.14	1838	0.04
α-Muurolene	11.53	1493	0.04	10.15	1670	0.04
(3*Z*,6*E*)-α-Farnesene	11.57*	1496	0.43	10.41	1691	0.05

Methyl (*E*)-isoeugenol	11.57*	1496	[0.43]	15.22*	2126	0.43
Unknown [m/z 119, 41 (95), 123 (53), 80 (49), 161 (44), 105 (42)... 204 (2)]	11.60*	1499	1.45			
δ-Amorphene	11.60*	1499	[1.45]	10.18	1672	0.52
δ-Guaiene	11.60*	1499	[1.45]	10.12	1667	0.03
γ-Cadinene	11.72*	1507	7.44	10.57*†	1704	2.61
Cubebol	11.72*	1507	[7.44]	12.70	1888	0.04
(3*E*,6*E*)-α-Farnesene	11.72*	1507	[7.44]	10.68*	1713	[6.75]
(*Z*)-γ-Bisabolene	11.72*	1507	[7.44]	10.08*	1664	[0.37]
δ-Cadinene	11.88*	1520	2.21	10.68*	1713	[6.75]
trans-Calamenene	11.88*	1520	[2.21]	11.38	1773	0.04
Zonarene	11.88*	1520	[2.21]	10.57*†	1704	[2.61]
trans-Cadina-1,4-diene	11.98	1528	0.18	10.80	1724	0.14
α-Cadinene	12.05*	1533	0.14	10.94	1735	0.13
Guaiacylacetone	12.05*	1533	[0.14]	19.38	2572	0.02
α-Elemol	12.23	1547	0.09	14.21*	2027	0.15
Germacrene B	12.27	1550	0.01	11.34*	1768	[0.05]
(*E*)-Nerolidol	12.42*	1562	0.04	13.99	2006	0.01
β-Calacorene	12.42*	1562	[0.04]	12.87*	1903	0.04
(3*Z*)-Hexenyl benzoate	12.47	1565	0.02	14.55	2060	0.04
Spathulenol	12.53	1570	0.03	14.56	2061	0.01
10-epi-Junenol	12.55*	1572	0.11	12.87*	1903	[0.04]
Caryophyllene oxide	12.55*	1572	[0.11]	12.93	1909	0.05
Caryophyllene oxide isomer	12.55*	1572	[0.11]	12.80	1896	0.04
Unknown cadinol or muurolol analog [m/z 161, 119 (77), 120 (76), 105 (73), 93 (57)... 204 (36)]	12.63*	1578	0.13	12.43	1864	0.03
Unknown [m/z 161, 105 (84), 43 (80), 119 (72), 93 (62), 121 (54)... 204 (38), 222 (2)]	12.63*	1578	[0.13]	14.15	2022	0.03
Viridiflorol	12.72	1585	0.06	14.21*	2027	[0.15]
Guaiol	12.82	1593	0.08	14.30	2036	0.07
Copaborneol	12.90	1599	0.04	15.10	2113	0.02
Junenol	13.02*	1608	0.20	13.77	1986	0.15
10-epi-Cubenol	13.02*	1608	[0.20]	14.07	2014	0.13
(*E*)-Isoeugenyl acetate	13.05	1611	0.05	17.42	2353	0.10
1-epi-Cubenol	13.17	1621	0.15	13.84	1992	0.11
Cubenol	13.28	1630	0.09	13.87	1995	0.04
τ-Cadinol	13.39*	1639	0.75	15.06	2110	0.28
τ-Muurolol	13.39*	1639	[0.75]	15.22*	2126	[0.43]

α-Muurolol	13.42	1641	0.20	15.36†	2140	[0.26]
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.48	1646	0.14	15.33†	2136	0.26
α-Cadinol	13.55	1652	0.84	15.66	2169	0.82
(3*E*,5*E*)-7-Hydroxyfarnesene	13.67	1662	0.04	16.47	2252	0.06
Unknown [m/z 123, 95 (31), 81 (29), 105 (27)... 222 (5)]	13.72	1665	0.05	16.39	2244	0.07
(2*E*,6*Z*)-Farnesol	14.10	1697	0.01	16.60	2266	0.01
(2*E*,6*E*)-Farnesol	14.36	1719	0.66	17.00	2307	1.26
(2*E*,6*E*)-Farnesal	14.55	1735	0.02	15.99	2202	0.02
Benzyl benzoate	14.83	1759	5.65	19.08	2538	5.59
(2*E*,6*E*)-Farnesyl acetate	15.69	1835	1.14	16.10	2213	1.10
Benzyl salicylate	15.98	1861	1.60	20.32	2685	1.58
Geranyl benzoate	17.00	1955	0.11	18.92	2520	0.14
Total identified		**99.25%**			**98.14%**	
Total reported		**99.45%**			**98.39%**	

*: 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