Date : July 15, 2020

Certificate of Analysis – GC Profiling & Carrier oil determination

Sample identification

Internal code : 19L30-PTH02
Customer identification : Ylang Ylang Extra - Madagascar - Y2010496R
Type : Essential oil
Source : *Cananga odorata* var. *genuina (Ylang-ylang)*
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. Carrier oil determination by derivatization of the sample to obtain fatty acid methyl esters, then quantitated by GC-FID against an internal standard of tridecanoic acid.
Analyst : Sylvain Mercier, M. Sc., Chimiste
Analysis date : January 07, 2020

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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. The results only describe the samples that were submitted to the assays.

This report is an update of the version first issued on January 13, 2020 for a minor correction.

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Physicochemical data

Physical aspect: Light yellow liquid
Refractive index: 1.4992 ± 0.0003 (20 °C)

Carrier oil determination

After derivatization, no fatty acids were detected. The oil is therefore undiluted with a carrier oil and pure.

ISO 3063:2005 - Oil of ylang-ylang - Fraction "Extra", Madagascar

Compound	Min. %	Max. %	Observed %	Complies?
Benzyl salicylate	1.2	4.0	3.6	Yes
(2E,6E)-Farnesyl acetate	0.5	3.0	0.9	Yes
Benzyl benzoate	3.5	8.0	7.9	Yes
(2E,6E)-Farnesol	0.5	3.0	1.0	Yes
(3E,6E)-α-Farnesene	1.0	5.0	4.5	Yes
Germacrene D	5.0	15.0	8.9	Yes
β-Caryophyllene	2.5	8.5	7.5	Yes
(E)-Cinnamyl acetate	0.5	3.0	2.3	Yes
Geranyl acetate	7.0	14.0	6.7	No
Geraniol	1.3	3.0	2.2	Yes
Benzyl acetate	5.5	14.0	6.9	Yes
Linalool	15.0	24.0	17.8	Yes
Methyl benzoate	4.5	9.0	6.1	Yes
para-Methylanisole	7.0	16.0	7.0	Yes
Prenyl acetate	0.6	2.2	0.8	Yes
Refractive index	1.4930	1.5090	1.4992	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	%	Classe
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
2-Methylbutyl acetate	0.02	Aliphatic ester
3-Methyl-3-butenyl acetate	tr	Aliphatic ester
Amyl acetate	0.03	Aliphatic ester
Prenyl acetate	0.77	Aliphatic ester
α-Pinene	0.05	Monoterpene
Benzaldehyde	0.02	Simple phenolic
β-Pinene	0.02	Monoterpene
Myrcene	0.03	Monoterpene
ortho-Methylanisole	tr	Simple phenolic
(3*Z*)-Hexenyl acetate	0.01	Aliphatic ester
para-Methylanisole	7.02	Simple phenolic
para-Cymene	tr	Monoterpene
meta-Methylanisole	0.01	Simple phenolic
Limonene	0.02	Monoterpene
1,8-Cineole	0.02	Monoterpenic ether
β-Phellandrene	tr	Monoterpene
Benzyl alcohol	0.02	Simple phenolic
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	tr	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Terpinolene	0.03	Monoterpene
trans-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Methyl benzoate	6.12	Phenolic ester
Linalool	17.75	Monoterpenic alcohol
Benzyl acetate	6.86	Phenolic ester
Ethyl benzoate	0.02	Phenolic ester
α-Terpineol	0.04	Monoterpenic alcohol
Methylchavicol	0.02	Phenylpropanoid
Nerol	0.02	Monoterpenic alcohol
Phenylethyl acetate	0.02	Phenolic ester
Geraniol	2.23	Monoterpenic alcohol
Chavicol	0.02	Phenylpropanoid
Geranial	0.03	Monoterpenic aldehyde
(*E*)-Anethole	0.05	Phenylpropanoid
1-Nitro-2-phenylethane	0.01	Simple phenolic
4-Vinylguaiacol	0.01	Simple phenolic
Bicycloelemene	0.02	Sesquiterpene
Benzyl butyrate	0.06	Phenolic ester
α-Cubebene	0.10	Sesquiterpene
Eugenol	0.27	Phenylpropanoid
Neryl acetate	0.05	Monoterpenic ester
α-Ylangene	0.10	Sesquiterpene
α-Copaene	0.60	Sesquiterpene
β-Bourbonene	0.01	Sesquiterpene

Geranyl acetate	6.66	Monoterpenic ester
β-Cubebene	0.07	Sesquiterpene
β-Elemene	0.13	Sesquiterpene
Cyperene	0.03	Sesquiterpene
β-Caryophyllene	7.50	Sesquiterpene
β-Copaene	0.09	Sesquiterpene
Caryophylla-4(12),8(13)-diene	tr	Sesquiterpene
Aromadendrene	0.04	Sesquiterpene
α-Guaiene	0.01	Sesquiterpene
(*E*)-Cinnamyl acetate	2.32	Phenylpropanoid ester
α-Humulene	1.90	Sesquiterpene
(*E*)-Isoeugenol	0.02	Phenylpropanoid
allo-Aromadendrene	0.01	Sesquiterpene
cis-Cadina-1(6),4-diene	0.06	Sesquiterpene
cis-Muurola-4(15),5-diene	0.07	Sesquiterpene
trans-Cadina-1(6),4-diene	0.15	Sesquiterpene
γ-Muurolene	1.18	Sesquiterpene
Germacrene D	8.93	Sesquiterpene
trans-Muurola-4(15),5-diene	0.20	Sesquiterpene
Bicyclogermacrene	0.56	Sesquiterpene
epi-Cubebol	0.02	Sesquiterpenic alcohol
Prenyl benzoate	0.04	Phenolic ester
α-Muurolene	0.59	Sesquiterpene
(3*Z*,6*E*)-α-Farnesene	0.02	Sesquiterpene
Unknown	1.04	Sesquiterpene
δ-Amorphene	0.32	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	4.54	Sesquiterpene
Cubebol	0.02	Sesquiterpenic alcohol
γ-Cadinene	0.44	Sesquiterpene
δ-Cadinene	1.86	Sesquiterpene
trans-Calamenene	0.03	Sesquiterpene
Zonarene	0.17	Sesquiterpene
trans-Cadina-1,4-diene	0.14	Sesquiterpene
α-Cadinene	0.16	Sesquiterpene
α-Calacorene	0.02	Sesquiterpene
cis-Dracunculifoliol	0.01	Sesquiterpenic alcohol
α-Elemol	0.04	Sesquiterpenic alcohol
Germacrene B	0.02	Sesquiterpene
(*E*)-Nerolidol	0.09	Sesquiterpenic alcohol
(3*Z*)-Hexenyl benzoate	0.05	Phenolic ester
Caryophyllene oxide isomer	0.05	Sesquiterpenic ether
Caryophyllene oxide	0.01	Sesquiterpenic ether
Unknown	0.03	Sesquiterpenic alcohol
trans-Dracunculifoliol	0.02	Sesquiterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
Viridiflorol	0.02	Sesquiterpenic alcohol
Guaiol	0.03	Sesquiterpenic alcohol
Copaborneol	0.04	Sesquiterpenic alcohol
Humulene epoxide II	0.01	Sesquiterpenic ether
Junenol	0.09	Sesquiterpenic alcohol
(*E*)-Isoeugenyl acetate	tr	Phenylpropanoid ester
10-epi-Cubenol	0.13	Sesquiterpenic alcohol

1-epi-Cubenol	0.14	Sesquiterpenic alcohol
γ-Eudesmol	0.08	Sesquiterpenic alcohol
τ-Cadinol	0.18	Sesquiterpenic alcohol
Cubenol	0.05	Sesquiterpenic alcohol
τ-Muurolol	0.46	Sesquiterpenic alcohol
α-Muurolol	0.22	Sesquiterpenic alcohol
Unknown	0.15	Sesquiterpenic alcohol
α-Cadinol	0.88	Sesquiterpenic alcohol
cis-Calamenen-10-ol	0.01	Sesquiterpenic alcohol
trans-Calamenen-10-ol	0.01	Sesquiterpenic alcohol
Unknown	0.10	Oxygenated sesquiterpene
(2*E*,6*Z*)-Farnesol	0.01	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesol	0.99	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesal	0.01	Sesquiterpenic aldehyde
Benzyl benzoate	7.88	Phenolic ester
(2*E*,6*E*)-Farnesyl acetate	0.91	Sesquiterpenic ester
Benzyl salicylate	3.62	Phenolic ester
Geranyl benzoate	0.07	Phenolic ester
Unknown	0.03	Unknown
Consolidated total	**98.46%**	

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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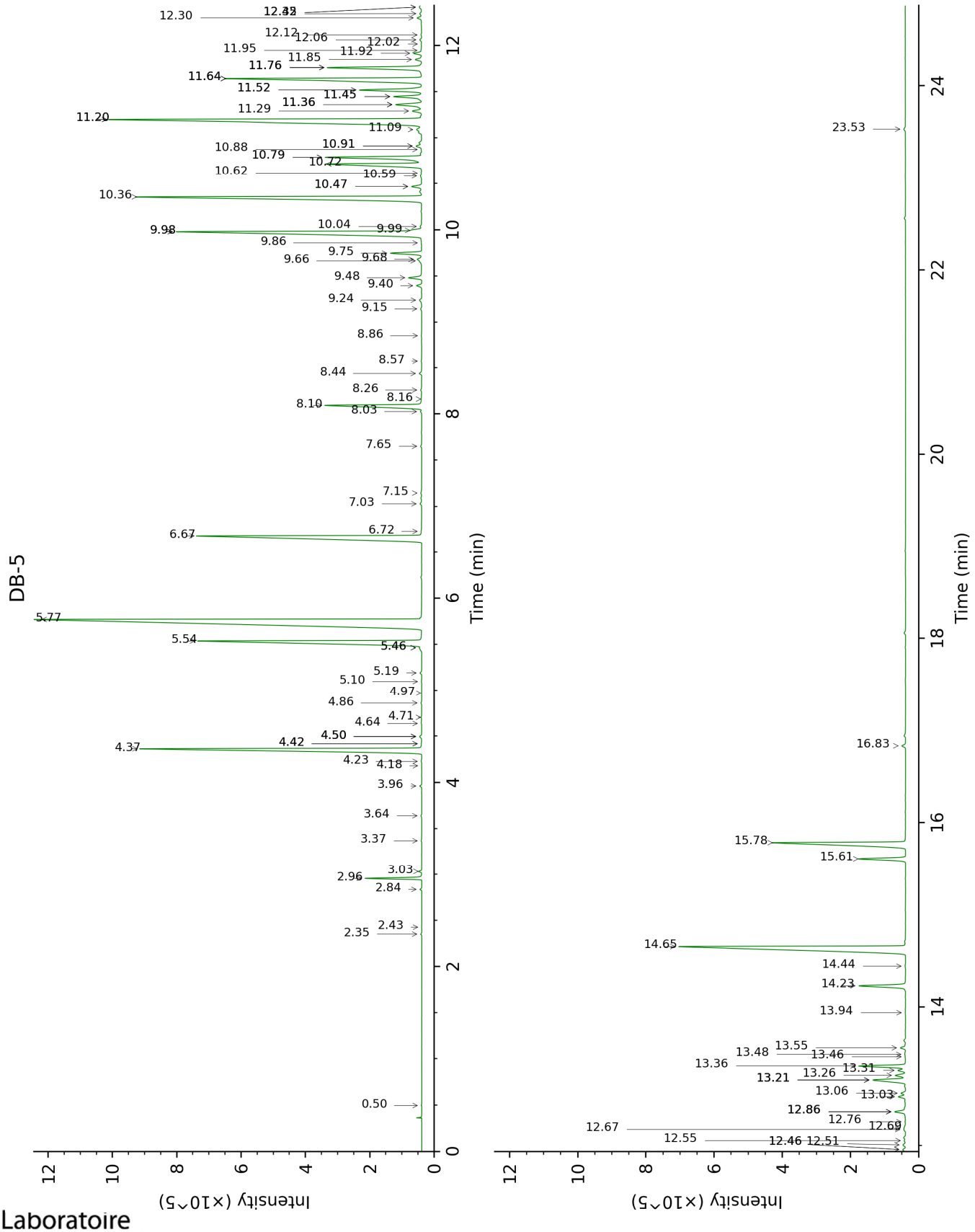
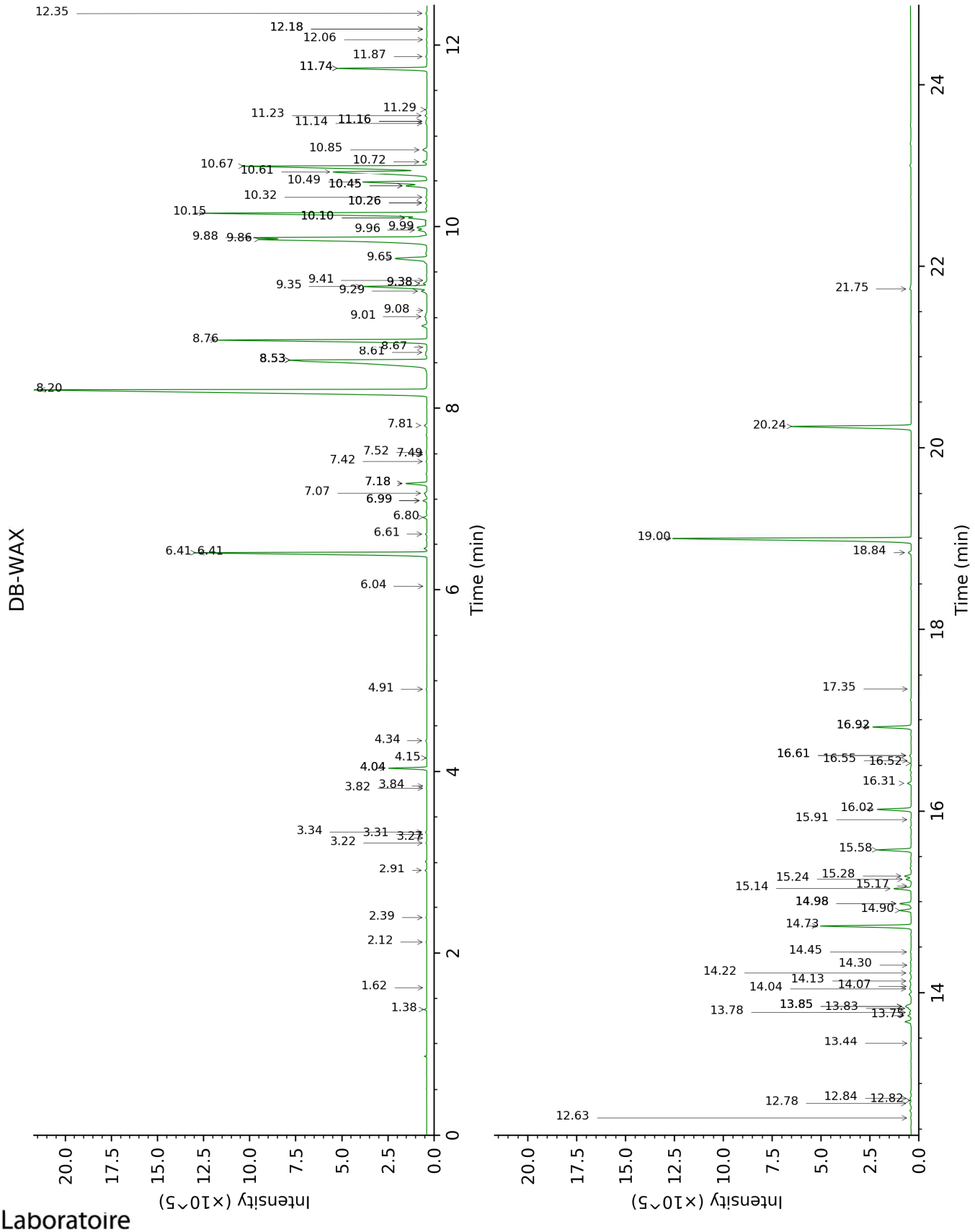

DB-5
Time (min)
Intensity (×10^5)
12.30
12.12
12.06
12.02
11.95
11.92
11.85
11.76
11.64
11.52
11.45
11.36
11.29
11.20
11.09
10.91
10.88
10.79
10.72
10.62
10.59
10.47
10.36
10.04
9.99
9.98
9.86
9.75
9.68
9.66
9.48
9.40
9.24
9.15
8.86
8.57
8.44
8.26
8.16
8.10
8.03
7.65
7.15
7.03
6.72
6.67
5.77
5.54
5.46
5.19
5.10
4.97
4.86
4.71
4.64
4.50
4.42
4.37
4.23
4.18
3.96
3.64
3.37
3.03
2.96
2.84
2.43
2.35
0.50
23.53
16.83
15.78
15.61
14.65
14.44
14.23
13.94
13.55
13.48
13.46
13.36
13.31
13.26
13.21
13.06
13.03
12.86
12.76
12.69
12.67
12.55
12.51
12.46


DB-WAX
Time (min)
Intensity (×10^5)
12.35
12.18
12.06
11.87
11.74
11.29
11.23
11.14
11.16
10.85
10.72
10.67
10.61
10.49
10.45
10.32
10.26
10.15
10.10
9.96
9.99
9.88
9.86
9.65
9.41
9.38
9.35
9.29
9.08
9.01
8.76
8.67
8.61
8.53
8.20
7.81
7.52
7.49
7.42
7.18
7.07
6.99
6.80
6.61
6.41
6.41
6.04
4.91
4.34
4.15
4.04
3.84
3.82
3.34
3.31
3.27
3.22
2.91
2.39
2.12
1.62
1.38
21.75
20.24
19.00
18.84
17.35
16.92
16.61
16.55
16.52
16.31
16.02
15.91
15.58
15.28
15.24
15.14
15.17
14.98
14.90
14.73
14.45
14.30
14.22
14.13
14.07
14.04
13.85
13.83
13.78
13.75
13.44
12.84
12.82
12.78
12.63

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
2-Methyl-3-buten-2-ol	0.50	590	tr	1.62	1014	tr
2-Methylbutyl acetate	2.35	879	0.02	2.39	1091	0.02
3-Methyl-3-butenyl acetate	2.43	885	tr	3.27	1160	tr
Amyl acetate	2.84	916	0.03			
Prenyl acetate	2.96	924	0.77	4.04*	1218	0.81
α-Pinene	3.03	928	0.05	1.38	989	0.04
Benzaldehyde	3.37	951	0.02	7.42	1462	0.02
β-Pinene	3.64	969	0.02	2.12	1064	0.01
Myrcene	3.96	990	0.03	2.91	1132	0.03
ortho-Methylanisole	4.18	1005	tr	6.04	1361	tr
(3*Z*)-Hexenyl acetate	4.23	1008	0.01	4.91	1281	0.02
para-Methylanisole	4.36	1016	7.02	6.41*	1388	7.00
para-Cymene	4.42*	1020	0.01	4.15	1226	tr
meta-Methylanisole	4.42*	1020	[0.01]	6.41*	1388	[7.00]
Limonene	4.50*	1025	0.05	3.22	1156	0.02
1,8-Cineole	4.50*	1025	[0.05]	3.34	1165	0.02
β-Phellandrene	4.50*	1025	[0.05]	3.31	1163	tr
Benzyl alcohol	4.64	1034	0.02	11.87	1821	0.03
(*Z*)-β-Ocimene	4.70	1038	0.01	3.82	1202	0.01
(*E*)-β-Ocimene	4.86	1048	0.02	4.04*	1218	[0.81]
γ-Terpinene	4.97	1055	tr	3.84	1204	tr
cis-Sabinene hydrate	5.10	1063	0.01	6.99*	1430	0.10
cis-Linalool oxide (fur.)	5.19	1069	0.03	6.61	1403	0.03
Terpinolene	5.46*	1087	0.07	4.34	1240	0.03
trans-Linalool oxide (fur.)	5.46*	1087	[0.07]	6.99*	1430	[0.10]
Methyl benzoate	5.54	1092	6.12	8.76	1564	6.12
Linalool	5.77	1107	17.75	8.20	1522	17.89
Benzyl acetate	6.67	1166	6.86	10.15†	1675	[7.61]
Ethyl benzoate	6.72	1170	0.02	9.38*	1613	0.10
α-Terpineol	7.03	1190	0.04	9.88†	1653	[10.02]
Methylchavicol	7.15	1198	0.02	9.41	1616	0.01
Nerol	7.65	1233	0.02	11.16*	1760	0.03
Phenylethyl acetate	8.03	1254	0.02	11.14	1758	0.03
Geraniol	8.10	1259	2.23	11.74*	1809	2.30
Chavicol	8.16	1264	0.02	16.61*	2272	0.05
Geranial	8.26	1270	0.03	10.26*	1684	0.05
(*E*)-Anethole	8.44	1282	0.05	11.23	1765	0.05

1-Nitro-2-phenylethane	8.57	1291	0.01	14.30	2042	0.01
4-Vinylguaiacol	8.86	1310	0.01	15.17	2126	0.01
Bicycloelemene	9.15	1330	0.02	7.18*	1444	0.58
Benzyl butyrate	9.24	1337	0.06	11.74*	1809	[2.30]
α-Cubebene	9.40	1348	0.10	6.80	1417	0.09
Eugenol	9.48	1354	0.27	14.90	2100	0.28
Neryl acetate	9.66	1366	0.05	10.32	1689	0.03
α-Ylangene	9.68	1368	0.10	7.07	1436	0.11
α-Copaene	9.75	1372	0.60	7.18*	1444	[0.58]
β-Bourbonene	9.86	1380	0.01	7.49	1468	0.01
Geranyl acetate	9.98*	1388	6.88	10.67	1718	6.66
β-Cubebene	9.98*	1388	[6.88]	7.81	1491	0.07
β-Elemene	9.99	1390	0.13	8.53*	1547	7.73
Cyperene	10.04	1392	0.03	7.52	1470	0.03
β-Caryophyllene	10.36	1416	7.50	8.53*	1547	[7.73]
β-Copaene	10.47*	1424	0.21	8.53*	1547	[7.73]
Caryophylla-4(12),8(13)-diene	10.47*	1424	[0.21]	8.67	1558	tr
Aromadendrene	10.59	1432	0.04	8.61	1553	0.03
α-Guaiene	10.62	1435	0.01	8.53*	1547	[7.73]
(*E*)-Cinnamyl acetate	10.72	1442	2.32	14.73	2083	2.37
α-Humulene	10.79*	1448	2.12	9.34	1610	1.90
(*E*)-Isoeugenol	10.79*	1448	[2.12]	16.61*	2272	[0.05]
allo-Aromadendrene	10.88	1454	0.01	9.08	1589	tr
cis-Cadina-1(6),4-diene	10.91*	1457	0.12	9.01	1584	0.06
cis-Muurola-4(15),5-diene	10.91*	1457	[0.12]	9.38*	1613	[0.10]
trans-Cadina-1(6),4-diene	11.09	1470	0.15	9.29	1606	0.17
γ-Muurolene	11.20*	1478	10.12	9.65	1635	1.18
Germacrene D	11.20*	1478	[10.12]	9.86†	1652	10.02
trans-Muurola-4(15),5-diene	11.29	1485	0.20	9.96	1660	0.27
Bicyclogermacrene	11.36*	1490	0.63	10.10*†	1671	7.61
epi-Cubebol	11.36*	1490	[0.63]	12.06	1837	0.02
Prenyl benzoate	11.36*	1490	[0.63]	13.83	1997	0.04
α-Muurolene	11.45*	1496	0.61	10.10*†	1671	[7.61]
(3*Z*,6*E*)-α-Farnesene	11.45*	1496	[0.61]	10.26*	1684	[0.05]
Unknown [m/z 119, 41 (95), 123 (53), 80 (49), 161 (44), 105 (42)... 204 (2)]	11.52*	1502	1.36			
δ-Amorphene	11.52*	1502	[1.36]	9.99	1662	0.32
(3*E*,6*E*)-α-Farnesene	11.64*	1511	5.00	10.61	1713	4.54
Cubebol	11.64*	1511	[5.00]	12.63	1886	0.02

γ-Cadinene	11.64*	1511	[5.00]	10.45*	1700	0.63
δ-Cadinene	11.76*	1521	2.06	10.49	1703	1.86
trans-Calamenene	11.76*	1521	[2.06]	11.29	1770	0.03
Zonarene	11.76*	1521	[2.06]	10.45*	1700	[0.63]
trans-Cadina-1,4-diene	11.85	1527	0.14	10.72	1722	0.13
α-Cadinene	11.92	1533	0.16	10.85	1733	0.14
α-Calacorene	11.95	1535	0.02	12.18*	1847	0.02
cis-Dracunculifoliol	12.02	1540	0.01	12.18*	1847	[0.02]
α-Elemol	12.06	1544	0.04	14.13	2026	0.05
Germacrene B	12.12	1548	0.02	11.16*	1760	[0.03]
(*E*)-Nerolidol	12.30	1563	0.09	13.85*	1999	0.23
(3*Z*)-Hexenyl benzoate	12.35	1566	0.05	14.45	2056	0.02
Caryophyllene oxide isomer	12.42*	1572	0.07	12.78	1901	0.05
Caryophyllene oxide	12.42*	1572	[0.07]	12.84†	1906	[0.04]
Unknown cadinol or muurolol analog [m/z 161, 119 (77), 120 (76), 105 (73), 93 (57)... 204 (36)]	12.46*	1575	0.06	12.35	1862	0.03
trans-Dracunculifoliol	12.46*	1575	[0.06]	12.82†	1904	0.04
Unknown [m/z 161, 105 (84), 43 (80), 119 (72), 93 (62), 121 (54)... 204 (38), 222 (2)]	12.51	1579	0.06	14.04	2017	0.04
Viridiflorol	12.55	1583	0.02	14.07	2020	0.03
Guaiol	12.67	1592	0.03	14.22	2034	0.04
Copaborneol	12.69	1593	0.04	14.98*	2107	0.31
Humulene epoxide II	12.76	1598	0.01	13.44	1961	0.01
Junenol	12.86*	1607	0.23	13.75	1989	0.09
(*E*)-Isoeugenyl acetate	12.86*	1607	[0.23]	17.35	2350	tr
10-epi-Cubenol	12.86*	1607	[0.23]	13.85*	1999	[0.23]
1-epi-Cubenol	13.02	1620	0.14	13.85*	1999	[0.23]
γ-Eudesmol	13.06	1623	0.08	14.98*	2107	[0.31]
τ-Cadinol	13.20*	1635	0.82	14.98*	2107	[0.31]
Cubenol	13.20*	1635	[0.82]	13.78	1993	0.05
τ-Muurolol	13.20*	1635	[0.82]	15.14	2124	0.46
α-Muurolol	13.26	1639	0.22	15.28	2137	0.17
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.31	1644	0.15	15.24	2134	0.13

α-Cadinol	13.36	1648	0.88	15.58	2166	0.87
cis-Calamenen-10-ol	13.46	1656	0.01	16.56	2266	tr
trans-Calamenen-10-ol	13.48	1658	0.01	16.92*	2305	0.99
Unknown [m/z 123, 95 (31), 81 (29), 105 (27)... 222 (5)]	13.55	1664	0.10	16.31	2241	0.10
(2*E*,6*Z*)-Farnesol	13.94	1696	0.01	16.52	2263	0.01
(2*E*,6*E*)-Farnesol	14.23	1720	0.99	16.92*	2305	[0.99]
(2*E*,6*E*)-Farnesal	14.44	1739	0.01	15.91	2200	0.02
Benzyl benzoate	14.65	1757	7.88	19.00	2533	7.88
(2*E*,6*E*)-Farnesyl acetate	15.61	1842	0.91	16.02	2211	0.92
Benzyl salicylate	15.78	1858	3.62	20.24	2677	3.57
Geranyl benzoate	16.83	1956	0.07	18.84	2515	0.09
Unknown [m/z 69, 83 (59), 81 (56), 137 (48), 41 (29), 139 (28)...]	23.53	2706	0.03	21.75	2864	0.06
Total identified		**98.74%**			**97.68%**	
Total reported		**99.07%**			**98.03%**	

*: 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