Date : June 09, 2023

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 23F02-PTH02
Customer identification : Neroli - Egypt - N10111R
Type : Essential oil
Source : *Citrus aurantium* subsp. *amara*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - 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 2014-005
Analysis date : June 07, 2023

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid
Refractive index: 1.4671 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

Analysis summary – Consolidated contents

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

Identification	%	Class
Ethanol	0.02	Aliphatic alcohol
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Hexanol	0.03	Aliphatic alcohol
α-Thujene	0.02	Monoterpene
α-Pinene	0.39	Monoterpene
Camphene	0.02	Monoterpene
α-Fenchene	tr	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.50	Monoterpene
β-Pinene	5.31	Monoterpene
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Myrcene	1.91	Monoterpene
α-Phellandrene	0.01	Monoterpene
Pseudolimonene	0.01	Monoterpene
Δ3-Carene	0.03	Monoterpene
(3*Z*)-Hexenyl acetate	0.01	Aliphatic ester
α-Terpinene	0.05	Monoterpene
meta-Cymene	0.02	Monoterpene
para-Cymene	0.05	Monoterpene
Limonene	8.86	Monoterpene
β-Phellandrene	0.11	Monoterpene
(*Z*)-β-Ocimene	0.78	Monoterpene
(*E*)-β-Ocimene	4.69	Monoterpene
γ-Terpinene	0.10	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.17	Monoterpenic alcohol
α-Pinene oxide analog	0.01	Monoterpenic ether
Terpinolene	0.37	Monoterpene
trans-Linalool oxide (fur.)	0.08	Monoterpenic alcohol
α-Pinene oxide	0.01	Monoterpenic ether
Rosefuran	0.01	Monoterpenic ether
Linalool	46.24	Monoterpenic alcohol
(*Z*)-6-Methyl-3,5-heptadien-2-one	0.05	Aliphatic ketone
Phenylethyl alcohol	0.04	Simple phenolic
cis-para-Menth-2-en-1-ol	0.05	Monoterpenic alcohol
allo-Ocimene	0.02	Monoterpene
(*Z*)-Myroxide	0.01	Monoterpenic ether
Benzeneacetonitrile	0.14	Simple phenolic
neo-allo-Ocimene	0.02	Monoterpene
(*E*)-Myroxide	0.02	Monoterpenic ether
Lilac aldehyde A	0.02	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.23	Monoterpenic alcohol

para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	5.12	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	0.04	Monoterpenic alcohol
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.04	Monoterpenic alcohol
Nerol	1.13	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Citronellol	0.01	Monoterpenic alcohol
6,7-Dihydro-7-hydroxylinalool	0.01	Monoterpenic alcohol
Neral	0.04	Monoterpenic aldehyde
Phenylethyl acetate	0.08	Phenolic ester
Linalyl acetate	9.54	Monoterpenic ester
Geraniol	3.13	Monoterpenic alcohol
Geranial	0.06	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.01	Monoterpenic alcohol
Bornyl acetate	0.02	Monoterpenic ester
1-Nitro-2-phenylethane	0.01	Simple phenolic
Indole	0.08	Indole
Methyl anthranilate	0.12	Phenolic ester
Linalyl propionate	0.03	Monoterpenic ester
Hodiendiol derivative	0.01	Oxygenated monoterpene
α-Terpinyl acetate	0.08	Monoterpenic ester
Eugenol	0.02	Phenylpropanoid
Neryl acetate	1.60	Monoterpenic ester
Geranyl acetate	3.09	Monoterpenic ester
β-Elemene	0.03	Sesquiterpene
(*Z*)-Jasmone	0.03	Jasmonate
Dimethyl anthranilate	0.01	Phenolic ester
β-Caryophyllene	0.59	Sesquiterpene
Aromadendrene	0.01	Sesquiterpene
α-Humulene	0.07	Sesquiterpene
Geranylacetone	0.03	Monoterpenic ketone
allo-Aromadendrene	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.08	Sesquiterpene
Germacrene D	0.07	Sesquiterpene
Bicyclogermacrene	0.20	Sesquiterpene
(3*Z*,6*E*)-α-Farnesene	0.02	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.01	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
trans-Calamenene	0.01	Sesquiterpene
(*E*)-Nerolidol	1.47	Sesquiterpenic alcohol
Spathulenol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Viridiflorol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
(8*Z*)-Heptadecene	0.03	Alkene
2,3-Dihydrofarnesol	0.01	Sesquiterpenic alcohol
(2*E*,6*Z*)-Farnesol	0.03	Sesquiterpenic alcohol
Heptadecane	0.01	Alkane

(2*E*,6*Z*)-Farnesal	0.02	Sesquiterpenic aldehyde
(2*E*,6*E*)-Farnesol	0.95	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesal	0.02	Sesquiterpenic aldehyde
(2*E*,6*E*)-Farnesyl acetate	0.03	Sesquiterpenic ester
Unknown	0.07	Unknown
Tricosane	0.05	Alkane
Pentacosane	0.03	Alkane
Heptacosane	0.02	Alkane
Squalene	0.01	Triterpene
Consolidated total	**98.87%**	

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

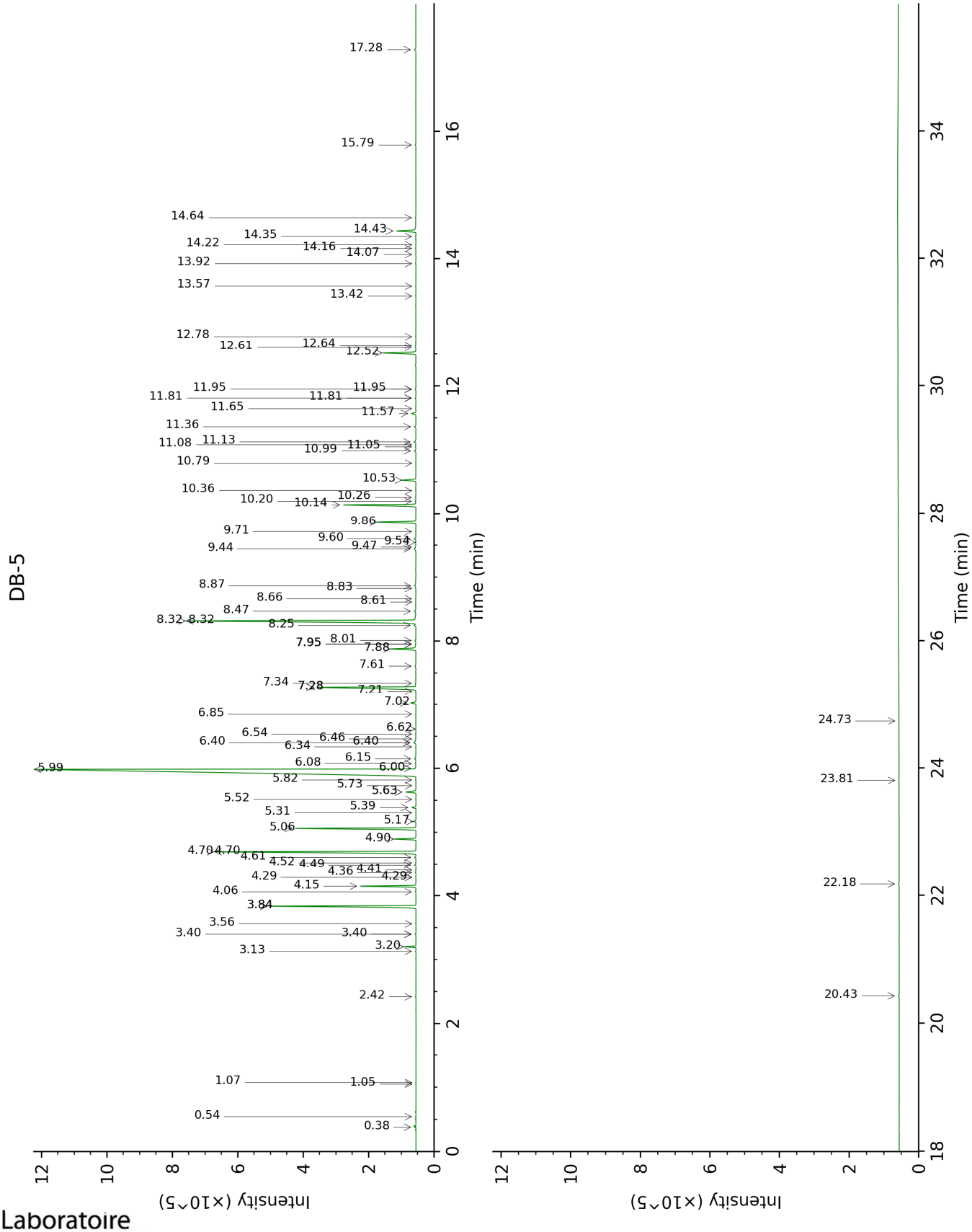
Note: no correction factor was applied

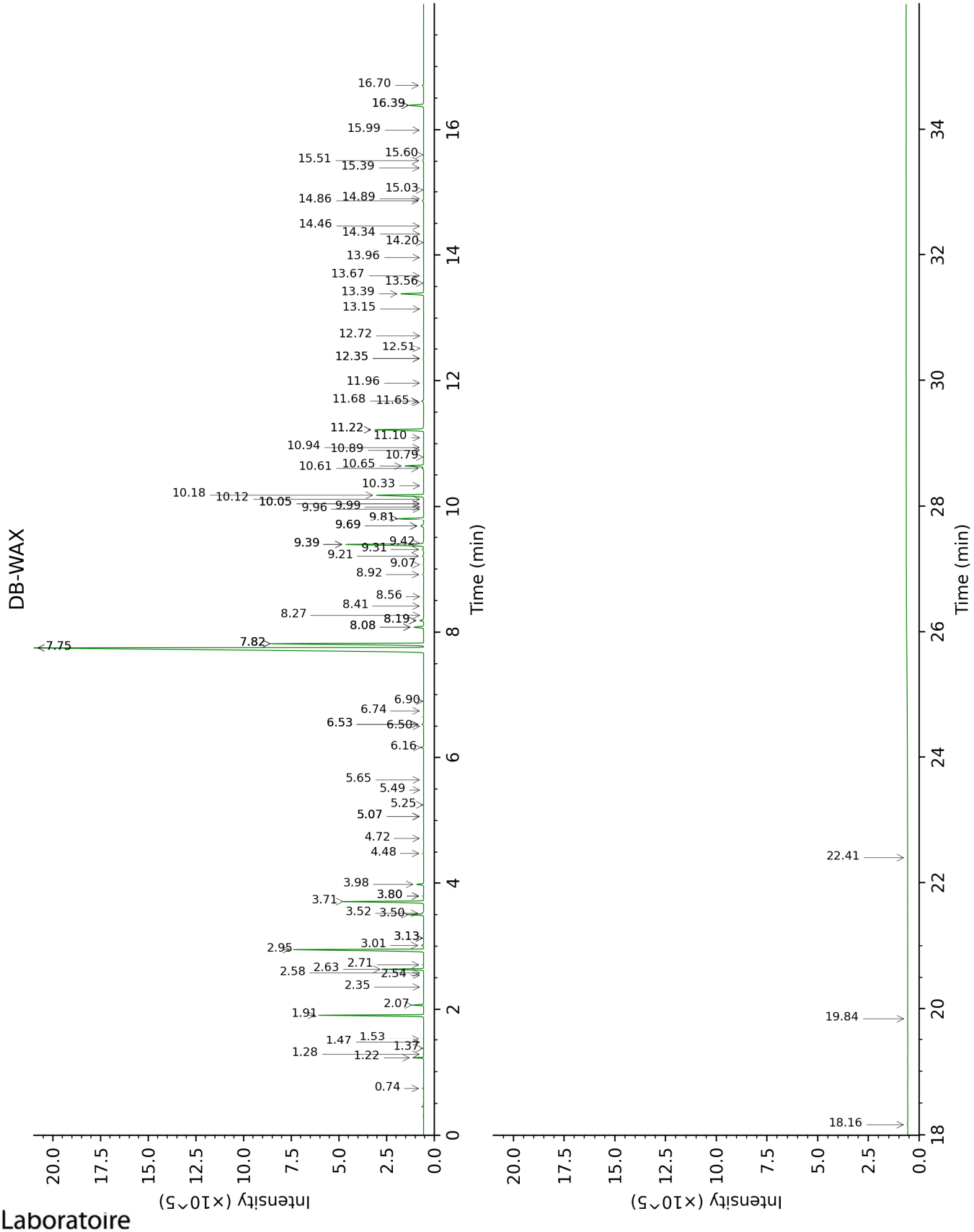
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Intensity (×10^5)
Time (min)
17.28
15.79
14.64
14.43
14.35
14.22
14.16
14.07
13.92
13.57
13.42
12.78
12.61
12.64
12.52
11.95
11.81
11.65
11.57
11.36
11.08
11.13
10.99
11.05
10.79
10.53
10.36
10.20
10.14
10.26
9.86
9.71
9.60
9.47
9.54
9.44
8.87
8.83
8.66
8.61
8.47
8.32
8.25
7.95
8.01
7.88
7.61
7.34
7.28
7.21
7.02
6.85
6.62
6.54
6.46
6.40
6.34
6.15
6.08
6.00
5.99
5.82
5.73
5.63
5.52
5.39
5.31
5.17
5.06
4.90
4.70
4.61
4.52
4.49
4.36
4.41
4.29
4.15
4.06
3.84
3.56
3.40
3.20
3.13
2.42
1.07
1.05
0.54
0.38
24.73
23.81
22.18
20.43


DB-WAX
Time (min)
Intensity (×10^5)
16.70
16.39
15.99
15.60
15.51
15.39
15.03
14.86
14.89
14.46
14.34
14.20
13.96
13.67
13.56
13.39
13.15
12.72
12.51
12.35
11.96
11.68
11.65
11.22
11.10
10.94
10.89
10.79
10.61
10.65
10.33
10.18
10.12
10.05
9.96
9.99
9.81
9.69
9.39
9.42
9.31
9.21
9.07
8.92
8.56
8.41
8.27
8.19
8.08
7.82
7.75
6.90
6.74
6.53
6.50
6.16
5.65
5.49
5.25
5.07
4.72
4.48
3.98
3.80
3.71
3.52
3.50
3.13
3.01
2.95
2.71
2.63
2.58
2.54
2.35
2.07
1.91
1.53
1.47
1.37
1.28
1.22
0.74
22.41
19.84
18.16

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.38	499	0.02	0.74	909	0.02
2-Methyl-3-buten-2-ol	0.54	606	0.01	1.37	1013	0.01
Isoamyl alcohol	1.05	733	0.01	3.13*	1176	0.04
2-Methylbutanol	1.07	736	tr	3.13*	1176	[0.04]
Hexanol	2.42	873	0.03	5.07*	1320	0.03
α-Thujene	3.13	926	0.02	1.28	1002	0.02
α-Pinene	3.20	931	0.39	1.22	992	0.38
Camphene	3.40*	944	0.04	1.53	1029	0.02
α-Fenchene	3.40*	944	[0.04]	1.47	1023	tr
Benzaldehyde	3.56	954	0.01	6.90	1455	0.02
Sabinene	3.84*	972	5.84	2.07	1084	0.50
β-Pinene	3.84*	972	[5.84]	1.91	1068	5.31
6-Methyl-5-hepten-2-one	4.06	987	0.02	4.72	1302	0.03
Myrcene	4.15	993	1.91	2.64	1135	1.90
α-Phellandrene	4.29*	1002	0.02	2.54	1127	0.01
Pseudolimonene	4.29*	1002	[0.02]	2.58	1130	0.01
Δ3-Carene	4.36	1007	0.03	2.35	1112	0.01
(3*Z*)-Hexenyl acetate	4.40	1009	0.01	4.48	1283	0.05
α-Terpinene	4.49	1014	0.05	2.71	1141	0.05
meta-Cymene	4.52	1017	0.02	3.80*	1229	0.05
para-Cymene	4.61	1022	0.05	3.80*	1229	[0.05]
Limonene	4.70*	1028	8.98	2.95	1161	8.86
β-Phellandrene	4.70*	1028	[8.98]	3.01	1166	0.11
(*Z*)-β-Ocimene	4.90	1040	0.78	3.50†	1207	0.89
(*E*)-β-Ocimene	5.06	1051	4.69	3.71	1223	4.70
γ-Terpinene	5.17	1057	0.10	3.52†	1208	[0.89]
cis-Sabinene hydrate	5.31	1066	0.01	6.53*	1428	0.10
cis-Linalool oxide (fur.)	5.39	1071	0.17	6.16	1400	0.17
α-Pinene oxide analog	5.52	1079	0.01	5.07*	1320	[0.03]
Terpinolene	5.63*	1086	0.45	3.98	1244	0.37
trans-Linalool oxide (fur.)	5.63*	1086	[0.45]	6.53*	1428	[0.10]
α-Pinene oxide	5.73	1092	0.01	5.07*	1320	[0.03]
Rosefuran	5.82	1098	0.01	5.65	1362	0.02
Linalool	5.99	1108	46.24	7.75*†	1520	55.90
(*Z*)-6-Methyl-3,5-heptadien-2-one	6.00	1109	0.05	7.82*†	1526	[55.90]
Phenylethyl alcohol	6.08	1114	0.04	11.65	1846	0.02
cis-para-Menth-2-en-1-ol	6.15	1119	0.05	7.75*†	1520	[55.90]
allo-Ocimene	6.34	1131	0.02	5.25	1333	0.01
(*Z*)-Myroxide	6.40*	1135	0.15	6.50	1425	0.01

Benzeneacetonitrile	6.40*	1135	[0.15]	11.68	1848	0.14
neo-allo-Ocimene	6.46	1138	0.02	5.49	1350	0.01
(*E*)-Myroxide	6.54	1143	0.02	6.74	1444	0.02
Lilac aldehyde A	6.62	1148	0.02			
Borneol	6.85	1163	0.01	9.39*†	1652	5.20
Terpinen-4-ol	7.02	1174	0.23	8.19*	1555	0.24
para-Cymen-8-ol	7.21	1186	0.01	11.10	1796	0.02
α-Terpineol	7.28*	1190	5.15	9.39*†	1652	[5.20]
Myrtenal	7.28*	1190	[5.15]	8.27	1561	0.01
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	7.34	1194	0.04	12.35*	1909	0.06
(3*E*,5*E*)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.61	1212	0.04	10.94	1783	0.04
Nerol	7.88	1230	1.13	10.65	1758	1.16
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.95*	1235	0.03	10.90	1779	0.02
Citronellol	7.95*	1235	[0.03]	10.33	1730	0.01
6,7-Dihydro-7-hydroxylinalool	7.95*	1235	[0.03]	12.72	1943	0.01
Neral	8.01	1239	0.04	9.07	1625	0.05
Phenylethyl acetate	8.25	1254	0.08	10.61	1754	0.09
Linalyl acetate	8.32*	1259	13.08	7.82*†	1526	[55.90]
Geraniol	8.32*	1259	[13.08]	11.22*	1807	3.15
Geranial	8.47	1269	0.06	9.68*	1676	0.24
2,6-Dimethyl-1,7-octadiene-3,6-diol	8.61	1279	0.01	14.20	2085	0.01
Bornyl acetate	8.66	1282	0.02	7.82*†	1526	[55.90]
1-Nitro-2-phenylethane	8.83	1293	0.01	13.67	2034	0.02
Indole	8.87	1296	0.08	16.70	2345	0.09
Methyl anthranilate	9.44	1336	0.12	14.86	2152	0.10
Linalyl propionate	9.47	1338	0.03	8.42	1573	0.03
Hodiendiol derivative	9.54	1343	0.01	12.51	1924	0.01
α-Terpinyl acetate	9.60	1347	0.08	9.31	1645	0.09
Eugenol	9.71	1355	0.02	14.34	2098	0.01
Neryl acetate	9.86	1365	1.60	9.81*	1686	1.60
Geranyl acetate	10.14	1385	3.09	10.18	1718	3.10
β-Elemene	10.20	1389	0.03	8.08*	1546	0.61
(*Z*)-Jasmone	10.26	1393	0.03	11.96	1874	0.02
Dimethyl anthranilate	10.36	1401	0.01	13.15	1983	0.01
β-Caryophyllene	10.53	1413	0.59	8.08*	1546	[0.61]
Aromadendrene	10.79	1432	0.01	8.19*	1555	[0.24]
α-Humulene	10.99	1447	0.07	8.92	1612	0.06
Geranylacetone	11.05	1452	0.03	11.22*	1807	[3.15]
allo-Aromadendrene	11.08	1454	0.01	8.56	1585	0.01

(*E*)-β-Farnesene	11.13	1457	0.08	9.21	1637	0.09
Germacrene D	11.36	1475	0.07	9.42†	1654	[5.20]
Bicyclogermacrene	11.57	1490	0.20	9.68*	1676	[0.24]
(3*Z*,6*E*)-α-Farnesene	11.65	1496	0.02	9.81*	1686	[1.60]
γ-Cadinene	11.81*	1508	0.04	9.96	1699	0.01
(3*E*,6*E*)-α-Farnesene	11.81*	1508	[0.04]	10.12	1712	0.01
δ-Cadinene	11.95*	1519	0.04	10.05*	1706	0.04
trans-Calamenene	11.95*	1519	[0.04]	10.79	1770	0.01
(*E*)-Nerolidol	12.52	1564	1.47	13.39	2006	1.45
Spathulenol	12.61	1571	0.03	13.96	2062	0.02
Caryophyllene oxide	12.64	1574	0.03	12.35*	1909	[0.06]
Viridiflorol	12.78	1584	0.02	13.56	2022	0.01
τ-Cadinol	13.42	1636	0.02	14.46	2111	0.02
α-Cadinol	13.57	1649	0.02	15.03	2169	0.02
(8*Z*)-Heptadecene	13.92	1678	0.03	10.05*	1706	[0.04]
2,3-Dihydrofarnesol	14.07	1690	0.01	15.60	2228	0.02
(2*E*,6*Z*)-Farnesol	14.16	1697	0.03	15.99	2269	0.03
Heptadecane	14.22	1702	0.01	10.00	1702	0.01
(2*E*,6*Z*)-Farnesal	14.35	1713	0.02	14.89	2155	0.02
(2*E*,6*E*)-Farnesol	14.43	1720	0.95	16.39*	2311	1.04
(2*E*,6*E*)-Farnesal	14.64	1738	0.02	15.40	2206	0.03
(2*E*,6*E*)-Farnesyl acetate	15.79	1839	0.03	15.51	2218	0.10
Unknown [m/z 107, 93 (75), 161 (73), 69 (68), 41 (67), 105 (65)...]	17.28	1978	0.07			
Tricosane	20.43	2301	0.05	16.39*	2311	[1.04]
Pentacosane	22.18	2500	0.03	18.16	2509	0.03
Heptacosane	23.81	2700	0.02	19.84	2710	0.02
Squalene	24.74	2820	0.01	22.41	3045	0.01
Total identified		**99.31%**			**98.86%**	
Total reported		**99.38%**			**98.87%**	

*: 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