

Date : September 27, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18I20-PTH1-1-CC

Customer identification : Mandarin Green Organic - Brazil - MI010288R

Type : Essential oil

Source : *Citrus reticulata* cv. Mandarine

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 : Lindsay Girard, B. Sc.

Analysis date : September 22, 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Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: Dark brown green liquid

Refractive index: 1.4745 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
α-Thujene	0.59	0.61	Monoterpene
α-Pinene	1.71	1.72	Monoterpene
Camphene	0.02*	0.01	Monoterpene
α-Fenchene	[0.02]*	tr	Monoterpene
Sabinene	1.47*	0.22	Monoterpene
β-Pinene	[1.47]*	1.26	Monoterpene
Myrcene	1.74	1.77	Monoterpene
α-Phellandrene	0.05	0.06	Monoterpene
Octanal	0.07	0.06	Aliphatic aldehyde
α-Terpinene	0.29	0.29	Monoterpene
para-Cymene	72.14	0.59	Monoterpene
Limonene	[72.14]*	72.40*	Monoterpene
1,8-Cineole	[72.14]*	[72.40]*	Monoterpenic ether
β-Phellandrene	[72.14]*	[72.40]*	Monoterpene
(Z)-β-Ocimene	tr	tr	Monoterpene
(E)-β-Ocimene	0.02	0.02	Monoterpene
γ-Terpinene	16.45	16.67	Monoterpene
cis-Sabinene hydrate	0.04	0.04	Monoterpenic alcohol
Octanol	0.02	0.02	Aliphatic alcohol
Terpinolene	0.74	0.75	Monoterpene
trans-Sabinene hydrate	0.06	0.07	Monoterpenic alcohol
Linalool	0.11	0.12	Monoterpenic alcohol
Nonanal	0.02	0.02	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.01	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	0.01	Monoterpenic ether
Epoxyterpinolene	0.01	0.01	Monoterpenic ether
Citronellal	0.03	0.03	Monoterpenic aldehyde
Terpinen-4-ol	0.10	0.08	Monoterpenic alcohol
para-Cymen-8-ol	0.01	0.01	Monoterpenic alcohol
α-Terpineol	0.32	0.33	Monoterpenic alcohol
Decanal	0.09	0.09	Aliphatic aldehyde
trans-Carveol	0.01	0.01	Monoterpenic alcohol
Nerol	0.02	0.03	Monoterpenic alcohol
Geraniol	0.01	tr	Monoterpenic alcohol
Geranial	0.01	0.01	Monoterpenic aldehyde
Thymol	0.12	0.12	Monoterpenic alcohol
Undecanal	0.02	0.01	Aliphatic aldehyde
Dimethyl anthranilate	0.40	0.41	Phenolic ester
Dodecanal	0.03	0.02	Aliphatic aldehyde
β-Caryophyllene	0.12	0.14	Sesquiterpene
α-Humulene	0.02	0.01	Sesquiterpene
(2E)-Dodecenal	0.01	0.01	Aliphatic aldehyde
Germacrene D	tr	0.01	Sesquiterpene
α-Selinene	0.07	0.07	Sesquiterpene
(3E,6E)-α-Farnesene	0.21	0.22	Sesquiterpene
δ-Cadinene	0.02	0.02	Sesquiterpene
α-Sinensal	0.42	0.42	Sesquiterpenic aldehyde

Myristic acid	0.09		Aliphatic acid
Palmitic acid	0.14		Aliphatic acid
Linoleic acid	0.06		Aliphatic acid
Oleic acid	0.06		Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.02		Aliphatic acid
Stearic acid	0.08		Aliphatic acid
Tangeretin	0.33		Flavonoid
Nobiletin	0.06		Flavonoid
Total identified	98.46%	98.78%	

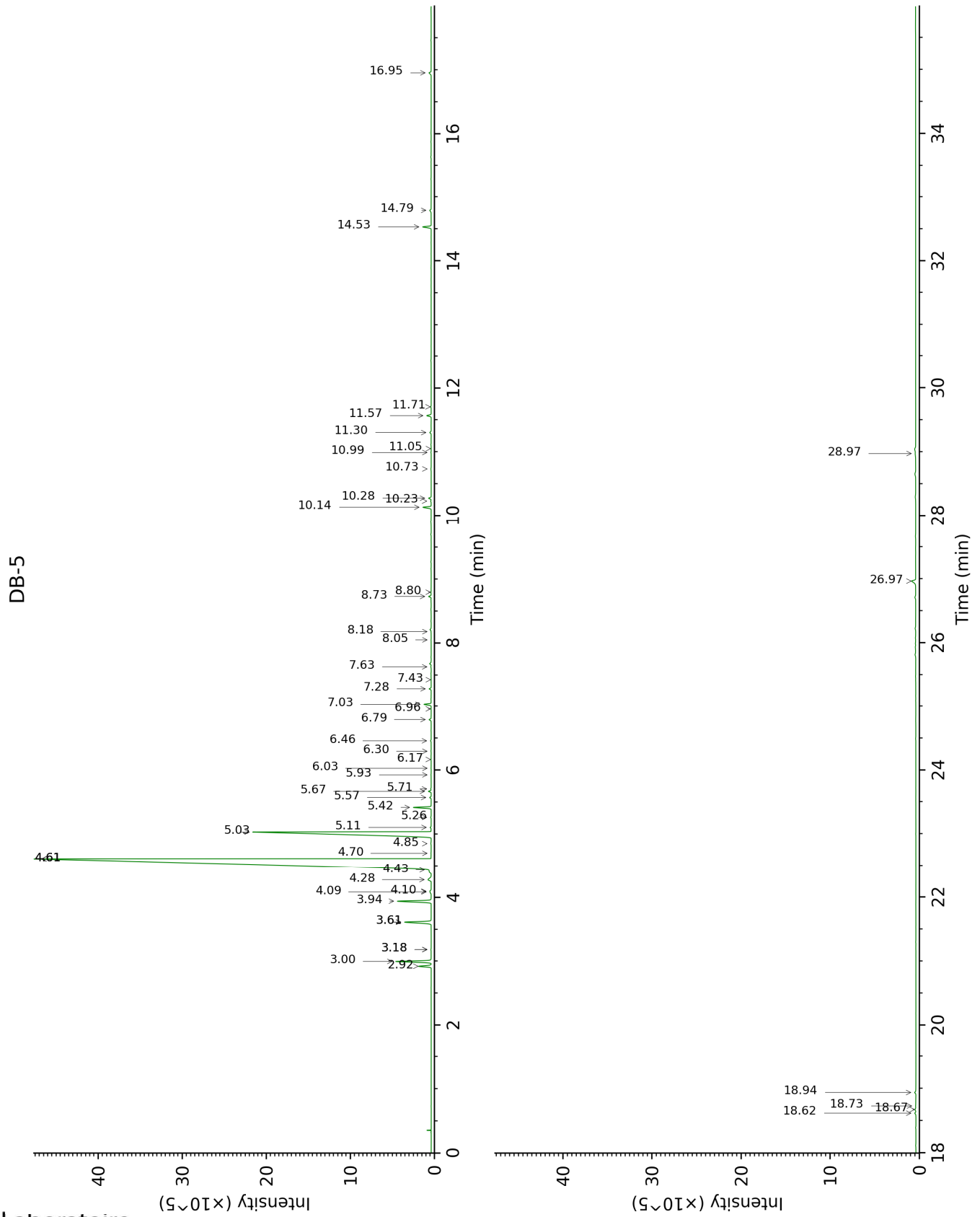
*: Two or more compounds are coeluting on this column

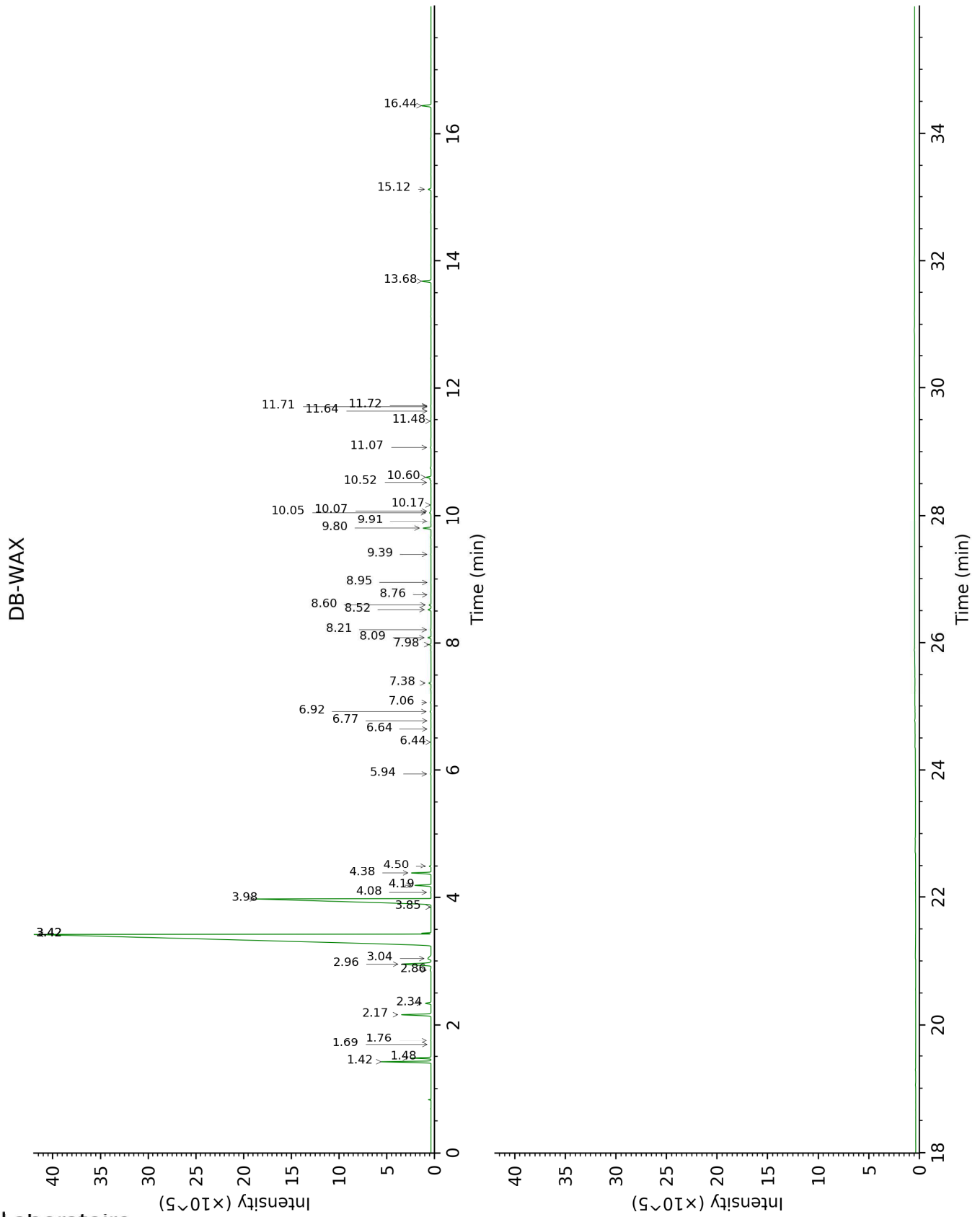
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
α-Thujene	2.92	924	0.59	1.48	1002	0.61
α-Pinene	3.00	929	1.71	1.42	996	1.72
Camphene	3.18*	942	0.02	1.76	1030	0.01
α-Fenchene	3.18*	942	[0.02]	1.69	1023	tr
Sabinene	3.61*	970	1.47	2.34	1088	0.22
β-Pinene	3.61*	970	[1.47]	2.16	1070	1.26
Myrcene	3.94	992	1.74	2.96	1139	1.77
α-Phellandrene	4.09	1002	0.05	2.86	1132	0.06
Octanal	4.10	1003	0.07	4.50	1253	0.06
α-Terpinene	4.28	1014	0.29	3.04	1146	0.29
para-Cymene	4.43†	1024	72.14	4.19	1231	0.59
Limonene	4.61*†	1035	[72.14]	3.42*†	1174	72.40
1,8-Cineole	4.61*†	1035	[72.14]	3.42*†	1174	[72.40]
β-Phellandrene	4.61*†	1035	[72.14]	3.42*†	1174	[72.40]
(Z)-β-Ocimene	4.70	1041	tr	3.85	1207	tr
(E)-β-Ocimene	4.85	1050	0.02	4.08	1223	0.02
γ-Terpinene	5.03	1062	16.45	3.98	1216	16.67
cis-Sabinene hydrate	5.11	1066	0.04	6.92	1426	0.04
Octanol	5.26	1076	0.02	8.21	1523	0.02
Terpinolene	5.42	1086	0.74	4.38	1245	0.75
trans-Sabinene hydrate	5.57	1096	0.06	7.98	1505	0.07
Linalool	5.67	1102	0.11	8.08	1513	0.12
Nonanal	5.71	1104	0.02	5.94	1356	0.02
trans-para-Mentha-2,8-dien-1-ol	5.93	1119	0.01	8.95	1580	0.01
cis-Limonene oxide	6.03	1125	0.01	6.44	1391	0.01
trans-Limonene oxide	6.17	1134	0.01	6.64	1406	0.01
Epoxyterpinolene	6.30	1142	0.01	6.77	1416	0.01
Citronellal	6.46	1153	0.03	7.06	1437	0.03
Terpinen-4-ol	6.79	1174	0.10	8.60	1553	0.08
para-Cymen-8-ol	6.96	1185	0.01	11.64	1802	0.01
α-Terpineol	7.03	1189	0.32	9.80	1648	0.33
Decanal	7.28	1206	0.09	7.38	1460	0.09
trans-Carveol	7.43	1215	0.01	11.48	1788	0.01
Nerol	7.63	1229	0.02	11.07	1753	0.03
Geraniol	8.05	1257	0.01	11.71	1808	tr
Geranial	8.18	1266	0.01	10.17	1678	0.01
Thymol	8.73	1303	0.12	15.12	2126	0.12
Undecanal	8.80	1307	0.02	8.76	1565	0.01
Dimethyl anthranilate	10.14	1402	0.40	13.68	1986	0.41
Dodecanal	10.23	1409	0.03	10.08	1670	0.02
β-Caryophyllene	10.28	1412	0.12	8.52	1547	0.14

α-Humulene	10.74	1447	0.02	9.39	1615	0.01
(2E)-Dodecenal	10.99	1466	0.01	11.72	1809	0.01
Germacrene D	11.05	1470	tr	9.91	1657	0.01
α-Selinene	11.30	1489	0.07	10.05	1668	0.07
(3E,6E)-α-Farnesene	11.57	1509	0.21	10.60	1714	0.22
δ-Cadinene	11.71	1520	0.02	10.52	1707	0.02
α-Sinensal	14.53	1752	0.42	16.44	2260	0.42
Myristic acid	14.79	1774	0.09			
Palmitic acid	16.95	1972	0.14			
Linoleic acid	18.62	2138	0.06			
Oleic acid	18.67	2144	0.06			
cis-Vaccenic acid?	18.73	2149	0.02			
Stearic acid	18.94	2171	0.08			
Tangeretin	26.97	3152	0.33			
Nobiletin	28.97	3334	0.06			
Total identified		98.46%			98.78%	
Total reported		98.46%			98.78%	

*: 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