

Date : April 12, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19D11-PTH48-1-SCC

Customer identification : Bergamot (Bergapten Free) Organic - Italy - BQ0104811R

Type : Essential oil

Source : *Citrus bergamia*

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 : Benoit Roger, Ph. D.

Analysis date : April 12, 2019

Checked and approved by :

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

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This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4653 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Tricyclene	tr	tr	Monoterpene
α -Thujene	0.32	0.32	Monoterpene
α -Pinene	1.18	1.18	Monoterpene
Camphene	0.03	0.03	Monoterpene
β -Pinene	6.78*	5.73	Monoterpene
Sabinene	[6.78]*	1.04	Monoterpene
6-Methyl-5-hepten-2-one	0.01	0.02	Aliphatic ketone
Myrcene	1.08	1.09	Monoterpene
α -Phellandrene	0.05*	0.03	Monoterpene
Octanal	[0.05]*	0.04	Aliphatic aldehyde
α -Terpinene	0.15	0.15	Monoterpene
Hexyl acetate	0.01	0.34*	Aliphatic ester
ortho-Cymene	0.66	0.68	Monoterpene
Limonene	46.04*	45.81	Monoterpene
β -Phellandrene	[46.04]*	0.21*	Monoterpene
1,8-Cineole	[46.04]*	[0.21]*	Monoterpenic ether
(Z)- β -Ocimene	0.02	7.30*	Monoterpene
(E)- β -Ocimene	0.24	0.24	Monoterpene
γ -Terpinene	7.27	[7.30]*	Monoterpene
cis-Sabinene hydrate	0.04	0.05*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	0.01	Monoterpenic alcohol
Octanol	0.01	0.01	Aliphatic alcohol
trans-Linalool oxide (fur.)	0.34*	[0.05]*	Monoterpenic alcohol
Terpinolene	[0.34]*	[0.34]*	Monoterpene
Linalool	8.23	8.69	Monoterpenic alcohol
Nonanal	0.02	0.02	Aliphatic aldehyde
cis-Limonene oxide	0.02	0.02	Monoterpenic ether
trans-Limonene oxide	0.01	0.01	Monoterpenic ether
Camphor	0.01	0.01	Monoterpenic ketone
Epoxyterpinolene	0.01	0.01	Monoterpenic ether
Citronellal	0.02	0.02	Monoterpenic aldehyde
Terpinen-4-ol	0.04	0.03	Monoterpenic alcohol
α -Terpineol	0.20	0.25*	Monoterpenic alcohol
Decanal	0.04	0.04	Aliphatic aldehyde
Octyl acetate	0.10	0.10	Aliphatic ester
Nerol	0.06	0.07	Monoterpenic alcohol
Neral	0.25	0.25	Monoterpenic aldehyde
Geraniol	23.67*	0.08	Monoterpenic alcohol
Linalyl acetate	[23.67]*	22.92	Monoterpenic ester
Geranial	0.36	0.36	Monoterpenic aldehyde
Bornyl acetate	0.02	0.02	Monoterpenic ester
Linalyl propionate	0.03	0.03	Monoterpenic ester
α -Terpinyl acetate	0.14	0.17	Monoterpenic ester
Unknown	0.03		Monoterpenic ester
Neryl acetate	0.38	0.40	Monoterpenic ester
Geranyl acetate	0.37	0.36	Monoterpenic ester
Dodecanal	0.01	0.01	Aliphatic aldehyde
β -Caryophyllene	0.35*	0.56*	Sesquiterpene

<i>cis</i> - α -Bergamotene	[0.35]*	0.03	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.27	[0.56]*	Sesquiterpene
α -Humulene	0.03	0.02	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.05	0.04	Sesquiterpene
Germacrene D	0.05	[0.25]*	Sesquiterpene
Hodiendiol derivative II	0.03	0.01	Oxygenated monoterpene
β -Bisabolene	0.33	0.32	Sesquiterpene
(<i>E</i>)-Nerolidol	0.01	0.01	Sesquiterpenic alcohol
Total identified	99.34%	99.16%	

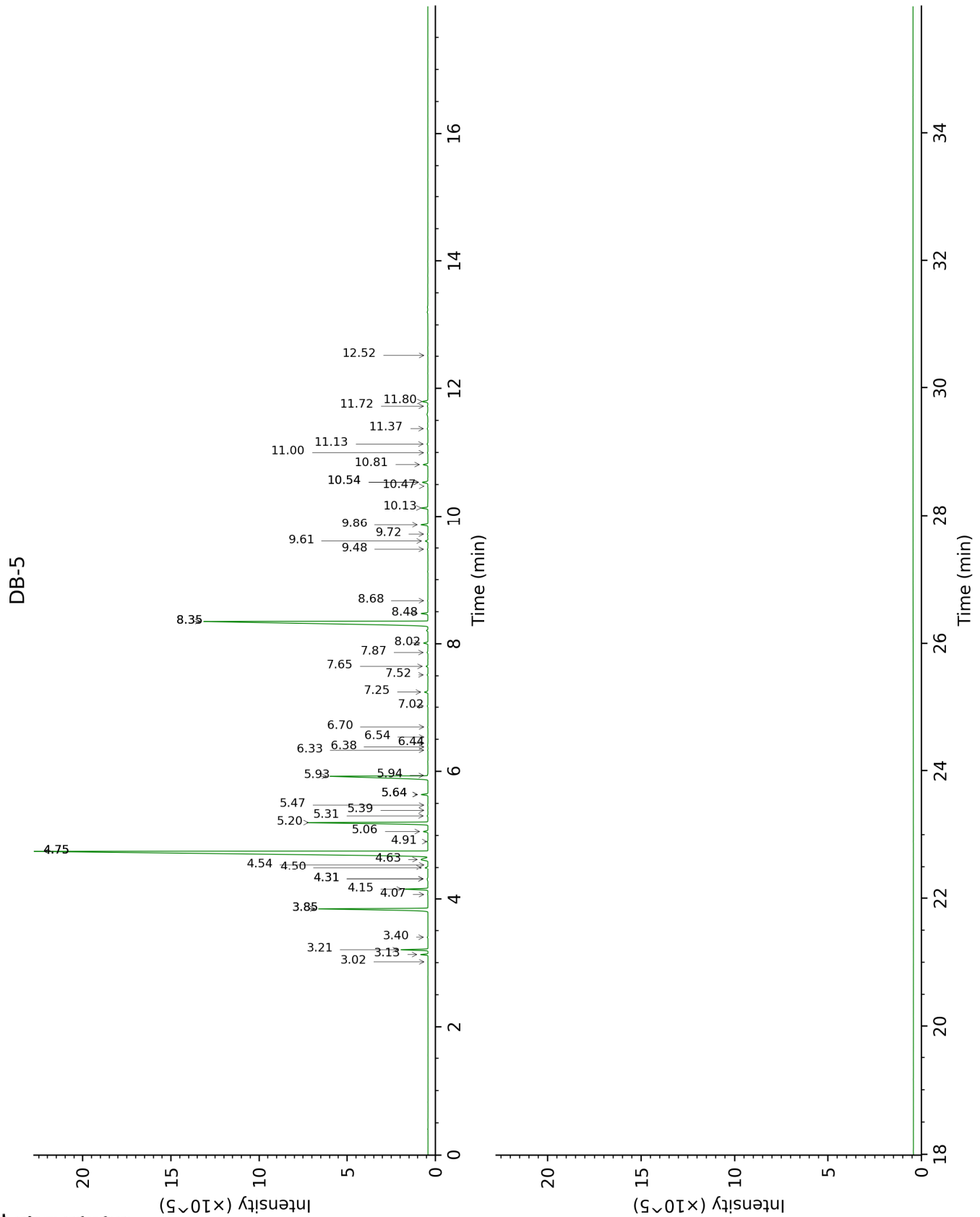
*: Two or more compounds are coeluting on this column

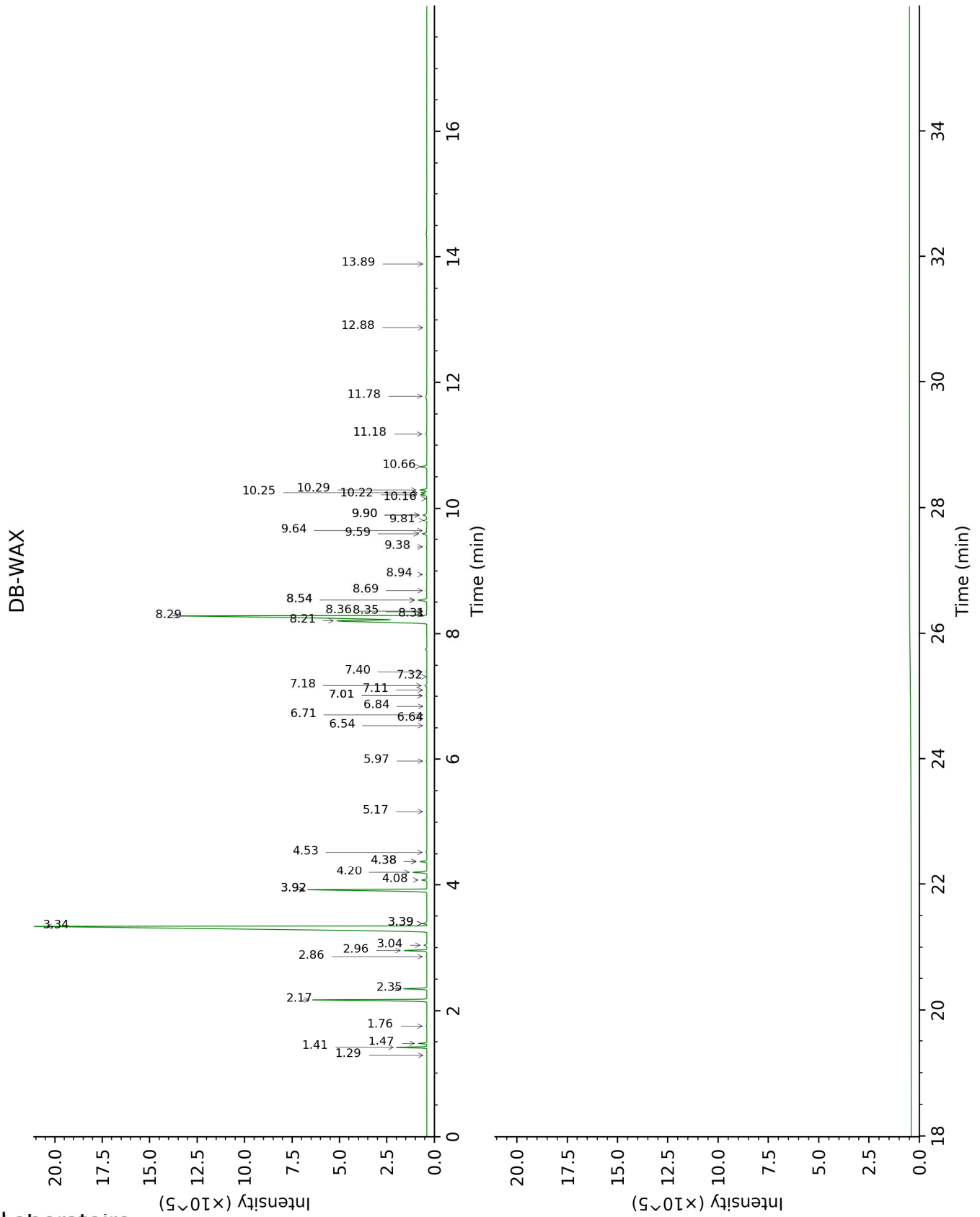
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Tricyclene	3.02	917	tr	1.29	970	tr
α-Thujene	3.13	924	0.32	1.47	997	0.32
α-Pinene	3.21	929	1.18	1.41	990	1.18
Camphene	3.40	942	0.03	1.76	1025	0.03
β-Pinene	3.84*	971	6.78	2.18	1066	5.73
Sabinene	3.84*	971	[6.78]	2.35	1083	1.04
6-Methyl-5-hepten-2-one	4.07	986	0.01	5.17	1295	0.02
Myrcene	4.15	992	1.08	2.96	1132	1.09
α-Phellandrene	4.31*	1002	0.05	2.86	1124	0.03
Octanal	4.31*	1002	[0.05]	4.53	1249	0.04
α-Terpinene	4.50	1014	0.15	3.04	1138	0.15
Hexyl acetate	4.54	1017	0.01	4.38*	1238	0.34
ortho-Cymene	4.63	1022	0.66	4.20	1225	0.68
Limonene	4.75*	1030	46.04	3.34	1162	45.81
β-Phellandrene	4.75*	1030	[46.04]	3.39*	1165	0.21
1,8-Cineole	4.75*	1030	[46.04]	3.39*	1165	[0.21]
(Z)-β-Ocimene	4.91	1040	0.02	3.92*	1205	7.30
(E)-β-Ocimene	5.06	1050	0.24	4.08	1216	0.24
γ-Terpinene	5.20	1058	7.27	3.92*	1205	[7.30]
cis-Sabinene hydrate	5.31	1065	0.04	7.01*	1428	0.05
cis-Linalool oxide (fur.)	5.39	1070	0.01	6.64	1401	0.01
Octanol	5.48	1076	0.01	8.31	1525	0.01
trans-Linalool oxide (fur.)	5.64*	1086	0.34	7.01*	1428	[0.05]
Terpinolene	5.64*	1086	[0.34]	4.38*	1238	[0.34]
Linalool	5.93	1104	8.23	8.21	1517	8.69
Nonanal	5.94	1105	0.02	5.97	1352	0.02
cis-Limonene oxide	6.33	1130	0.02	6.54	1393	0.02
trans-Limonene oxide	6.38	1134	0.01	6.71	1405	0.01
Camphor	6.44	1137	0.01	7.32	1451	0.01
Epoxyterpinolene	6.54	1144	0.01	6.84	1415	0.01
Citronellal	6.70	1154	0.02	7.11	1435	0.02
Terpinen-4-ol	7.02	1175	0.04	8.69	1554	0.03
α-Terpineol	7.25	1190	0.20	9.90*	1650	0.25
Decanal	7.52	1207	0.04	7.40	1456	0.04
Octyl acetate	7.65	1216	0.10	7.18	1440	0.10
Nerol	7.87	1231	0.06	11.18	1756	0.07
Neral	8.02	1241	0.25	9.59	1625	0.25
Geraniol	8.35*	1264	23.67	11.78	1808	0.08
Linalyl acetate	8.35*	1264	[23.67]	8.29	1523	22.92
Geranial	8.48	1272	0.36	10.22	1676	0.36
Bornyl acetate	8.68	1286	0.02	8.36	1529	0.02
Linalyl	9.48	1337	0.03	8.94	1574	0.03

propionate						
α -Terpinyl acetate	9.61	1346	0.14	9.81	1643	0.17
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.72	1354	0.03			
Neryl acetate	9.86	1364	0.38	10.30	1682	0.40
Geranyl acetate	10.14	1384	0.37	10.66	1713	0.36
Dodecanal	10.47	1408	0.01	10.16	1671	0.01
β -Caryophyllene	10.54*	1413	0.35	8.54*	1542	0.56
<i>cis</i> - α -Bergamotene	10.54*	1413	[0.35]	8.35	1528	0.03
<i>trans</i> - α -Bergamotene	10.81	1433	0.27	8.54*	1542	[0.56]
α -Humulene	11.00	1447	0.03	9.38	1608	0.02
(<i>E</i>)- β -Farnesene	11.13	1457	0.05	9.64	1629	0.04
Germacrene D	11.37	1475	0.05	9.90*	1650	[0.25]
Hodiendiol derivative II	11.72	1501	0.03	12.88	1905	0.01
β -Bisabolene	11.80	1507	0.33	10.25	1678	0.32
(<i>E</i>)-Nerolidol	12.52	1564	0.01	13.89	1998	0.01
Total identified		99.34%			99.16%	
Total reported		99.37%			99.16%	

*: 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

R.T.: Retention time (minutes)

R.I.: Retention index