

Date : April 12, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19D11-PTH47-1-SCC

Customer identification : Bergamot (Bergapten Free) - Italy - B3010787R

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Refractive index: 1.4636 ± 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	0.21	0.21	Monoterpene
α-Pinene	1.10	1.10	Monoterpene
Camphene	0.04*	0.03	Monoterpene
α-Fenchene	[0.04]*	tr	Monoterpene
β-Pinene	7.48*	6.56	Monoterpene
Sabinene	[7.48]*	0.93	Monoterpene
6-Methyl-5-hepten-2-one	tr	tr	Aliphatic ketone
Myrcene	1.07	1.07	Monoterpene
α-Phellandrene	0.03	0.02	Monoterpene
Octanal	0.07	0.05	Aliphatic aldehyde
Δ ³ -Carene	tr	0.01	Monoterpene
α-Terpinene	0.14	0.15	Monoterpene
Hexyl acetate	0.01	0.31*	Aliphatic ester
para-Cymene	0.32	0.33	Monoterpene
Limonene	38.37*	38.29	Monoterpene
β-Phellandrene	[38.37]*	0.16*	Monoterpene
1,8-Cineole	[38.37]*	[0.16]*	Monoterpenic ether
(Z)-β-Ocimene	0.09	7.12*	Monoterpene
(E)-β-Ocimene	0.20	0.20	Monoterpene
γ-Terpinene	7.02	[7.12]*	Monoterpene
cis-Sabinene hydrate	0.01	0.03*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	tr	tr	Monoterpenic alcohol
Octanol	0.01	0.02*	Aliphatic alcohol
trans-Linalool oxide (fur.)	0.30*	[0.03]*	Monoterpenic alcohol
Terpinolene	[0.30]*	[0.31]*	Monoterpene
trans-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Linalool	12.45*	13.18	Monoterpenic alcohol
Nonanal	[12.45]*	0.04	Aliphatic aldehyde
cis-Limonene oxide	0.02	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	0.01	Monoterpenic ether
Camphor	0.02		Monoterpenic ketone
Epoxyterpinolene	0.01	0.01	Monoterpenic ether
Citronellal	0.03	0.03	Monoterpenic aldehyde
Terpinen-4-ol	0.02	0.03	Monoterpenic alcohol
α-Terpineol	0.10	0.11	Monoterpenic alcohol
γ-Terpineol	0.01	0.02	Monoterpenic alcohol
Decanal	0.07	0.07	Aliphatic aldehyde
Octyl acetate	0.11	0.11	Aliphatic ester
Nerol	0.05	0.07	Monoterpenic alcohol
Neral	0.21	0.20	Monoterpenic aldehyde
Geraniol	27.95*	0.13	Monoterpenic alcohol
Linalyl acetate	[27.95]*	26.95	Monoterpenic ester
Geranial	0.35	0.30	Monoterpenic aldehyde
Bornyl acetate	0.02	[0.02]*	Monoterpenic ester
Unknown	0.01		Unknown
Linalyl propionate	0.04	0.04	Monoterpenic ester
α-Terpinyl acetate	0.17	0.17	Monoterpenic ester
Unknown	0.03		Monoterpenic ester

Neryl acetate	0.36	0.37	Monoterpenic ester
Geranyl acetate	0.31	0.32	Monoterpenic ester
Dodecanal	0.02	0.02	Aliphatic aldehyde
<i>cis</i> - α -Bergamotene	0.26*	0.03	Sesquiterpene
β -Caryophyllene	[0.26]*	0.33*	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.09	[0.33]*	Sesquiterpene
α -Humulene	0.01	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.01	0.01	Sesquiterpene
Germacrene D	0.01	0.01	Sesquiterpene
Hodiendiol derivative II	0.03	0.01	Oxygenated monoterpene
β -Bisabolene	0.13	0.11	Sesquiterpene
(<i>E</i>)-Nerolidol	0.01	0.02	Sesquiterpenic alcohol
Total identified	99.36%	99.30%	

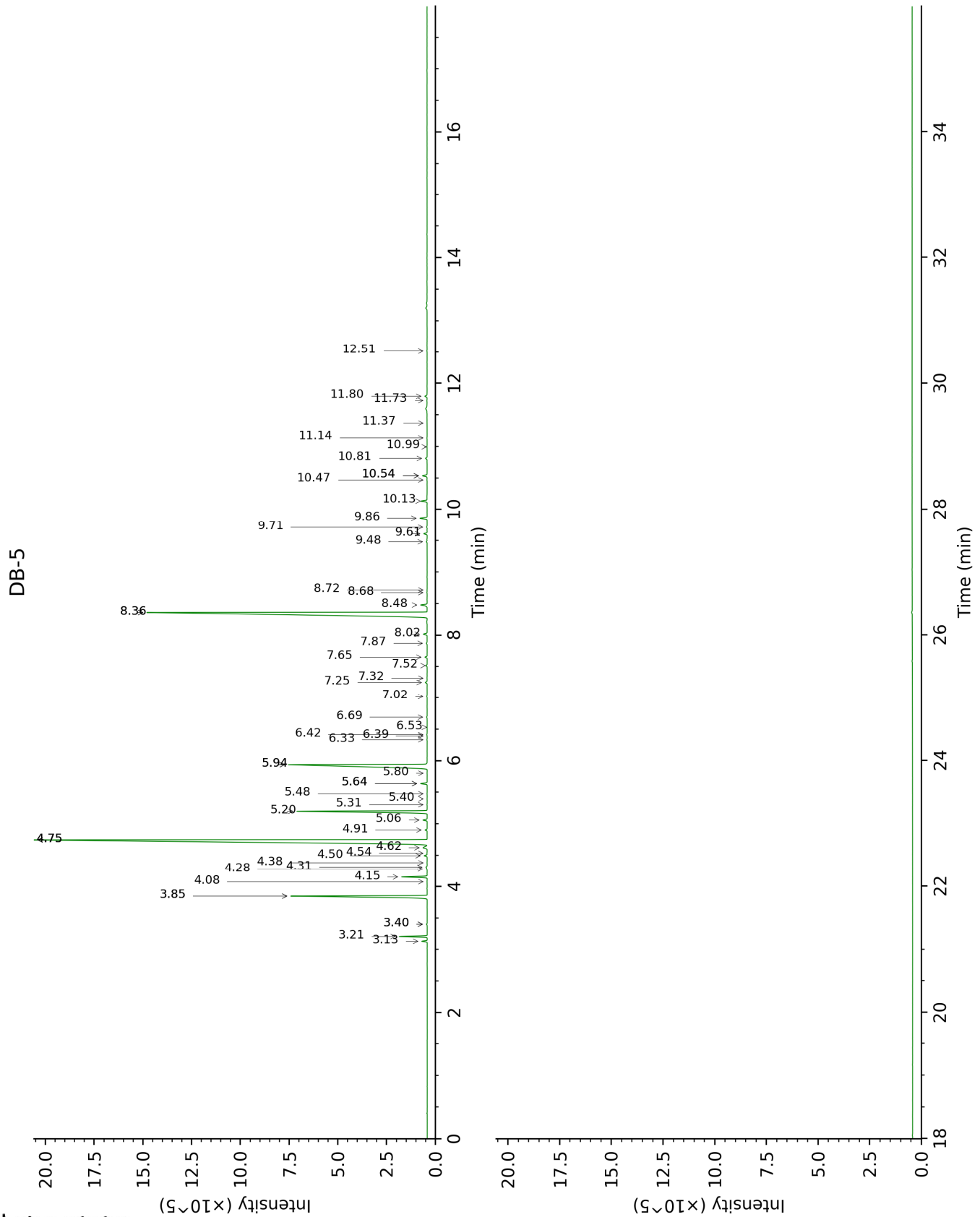
*: Two or more compounds are coeluting on this column

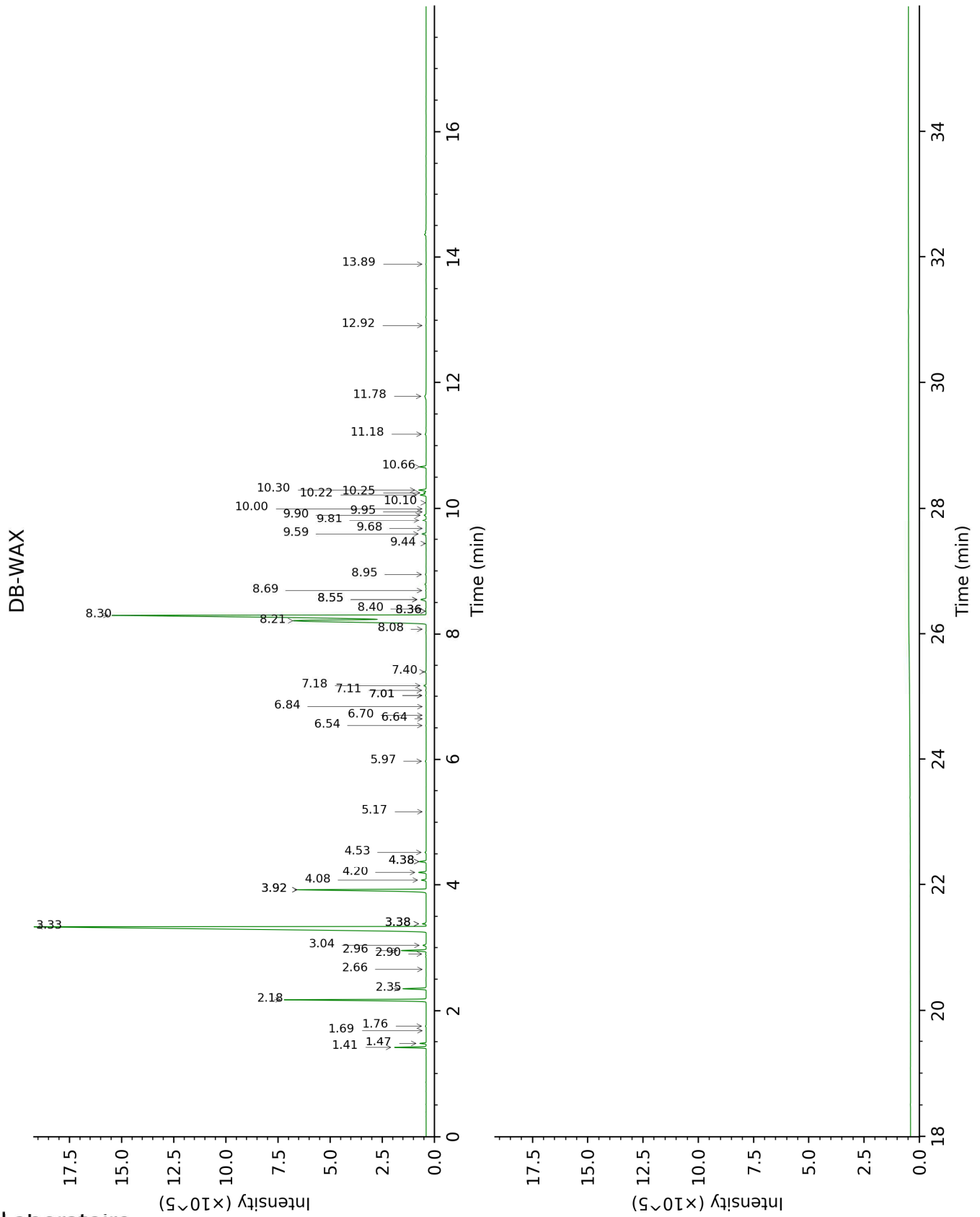
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	3.13	924	0.21	1.47	997	0.21
α-Pinene	3.21	929	1.10	1.41	990	1.10
Camphene	3.40*	942	0.04	1.76	1025	0.03
α-Fenchene	3.40*	942	[0.04]	1.69	1018	tr
β-Pinene	3.85*	972	7.48	2.18	1066	6.56
Sabinene	3.85*	972	[7.48]	2.35	1083	0.93
6-Methyl-5-hepten-2-one	4.08	987	tr	5.17	1295	tr
Myrcene	4.15	992	1.07	2.96	1132	1.07
α-Phellandrene	4.28	1000	0.03	2.90	1128	0.02
Octanal	4.31	1002	0.07	4.53	1249	0.05
Δ3-Carene	4.38	1007	tr	2.66	1109	0.01
α-Terpinene	4.50	1014	0.14	3.04	1138	0.15
Hexyl acetate	4.54	1016	0.01	4.38*	1238	0.31
para-Cymene	4.62	1022	0.32	4.20	1225	0.33
Limonene	4.75*	1030	38.37	3.34	1161	38.29
β-Phellandrene	4.75*	1030	[38.37]	3.38*	1165	0.16
1,8-Cineole	4.75*	1030	[38.37]	3.38*	1165	[0.16]
(Z)-β-Ocimene	4.90	1040	0.09	3.92*	1205	7.12
(E)-β-Ocimene	5.06	1050	0.20	4.08	1216	0.20
γ-Terpinene	5.20	1058	7.02	3.92*	1205	[7.12]
cis-Sabinene hydrate	5.31	1065	0.01	7.02*	1428	0.03
cis-Linalool oxide (fur.)	5.40	1071	tr	6.64	1401	tr
Octanol	5.48	1076	0.01	8.36*	1529	0.02
trans-Linalool oxide (fur.)	5.64*	1086	0.30	7.02*	1428	[0.03]
Terpinolene	5.64*	1086	[0.30]	4.38*	1238	[0.31]
trans-Sabinene hydrate	5.80	1096	0.01	8.08	1507	0.01
Linalool	5.94*	1105	12.45	8.21	1518	13.18
Nonanal	5.94*	1105	[12.45]	5.97	1352	0.04
cis-Limonene oxide	6.33	1130	0.02	6.54	1393	0.01
trans-Limonene oxide	6.39	1134	0.01	6.70	1405	0.01
Camphor	6.42	1136	0.02			
Epoxyterpinolene	6.53	1143	0.01	6.84	1415	0.01
Citronellal	6.69	1154	0.03	7.11	1435	0.03
Terpinen-4-ol	7.02	1175	0.02	8.69	1554	0.03
α-Terpineol	7.25	1190	0.10	9.90	1650	0.11
γ-Terpineol	7.32	1194	0.01	10.00	1658	0.02
Decanal	7.52	1207	0.07	7.40	1456	0.07
Octyl acetate	7.65	1216	0.11	7.18	1440	0.11
Nerol	7.87	1231	0.05	11.18	1756	0.07
Neral	8.02	1241	0.21	9.59	1625	0.20
Geraniol	8.36*	1264	27.95	11.78	1808	0.13

Linalyl acetate	8.36*	1264	[27.95]	8.30	1524	26.95
Geranial	8.48	1272	0.35	10.22	1676	0.30
Bornyl acetate	8.68	1286	0.02	8.36*	1529	[0.02]
Unknown [m/z 43, 121 (74), 93 (42), 95 (38), 107 (29), 41 (29), 136 (28)...]	8.72	1289	0.01			
Linalyl propionate	9.48	1337	0.04	8.95	1574	0.04
α -Terpinyl acetate	9.61	1346	0.17	9.81	1643	0.17
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.71	1354	0.03			
Neryl acetate	9.86	1364	0.36	10.30	1682	0.37
Geranyl acetate	10.14	1384	0.31	10.66	1713	0.32
Dodecanal	10.47	1408	0.02	10.10	1666	0.02
<i>cis</i> - α - Bergamotene	10.54*	1413	0.26	8.40	1532	0.03
β -Caryophyllene	10.54*	1413	[0.26]	8.55*	1543	0.33
<i>trans</i> - α - Bergamotene	10.81	1433	0.09	8.55*	1543	[0.33]
α -Humulene	11.00	1447	0.01	9.44	1613	0.01
(<i>E</i>)- β -Farnesene	11.14	1458	0.01	9.68	1632	0.01
Germacrene D	11.37	1475	0.01	9.95	1654	0.01
Hodiendiol derivative II	11.73	1502	0.03	12.92	1909	0.01
β -Bisabolene	11.80	1507	0.13	10.25	1678	0.11
(<i>E</i>)-Nerolidol	12.51	1564	0.01	13.89	1998	0.02
Total identified		99.36%			99.30%	
Total reported		99.40%			99.30%	

*: 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