

**Date :** March 22, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 19C11-PTH03-1-SCC

**Customer identification :** Orange Blood - Italy - O10108812R

**Type :** Essential oil

**Source :** *Citrus sinensis* cv. Sanguinelli

**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 :** March 13, 2019

Checked and approved by :

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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:** Bright orange yellow liquid

**Refractive index:**  $1.4700 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
α-Thujene	tr	tr	Monoterpene
α-Pinene	0.50	0.51	Monoterpene
Camphene	tr	tr	Monoterpene
β-Pinene	0.45*	0.07	Monoterpene
Sabinene	[0.45]*	0.39	Monoterpene
Myrcene	1.82	1.84	Monoterpene
α-Phellandrene	0.28*	0.04	Monoterpene
Octanal	[0.28]*	0.25	Aliphatic aldehyde
Δ <sup>3</sup> -Carene	0.13	0.13	Monoterpene
Limonene	94.13*	93.96	Monoterpene
1,8-Cineole	[94.13]*	0.26	Monoterpenic ether
(Z)-β-Ocimene	tr	0.01	Monoterpene
(E)-β-Ocimene	0.02	0.02	Monoterpene
γ-Terpinene	0.01	0.01	Monoterpene
Octanol	0.05	0.05	Aliphatic alcohol
Isoterpinolene	tr		Monoterpene
Terpinolene	0.04	0.04	Monoterpene
Linalool	0.52	0.54	Monoterpenic alcohol
Nonanal	0.07	0.06	Aliphatic aldehyde
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.02	0.01	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.02	0.02	Monoterpenic ether
<i>cis</i> -para-Mentha-2,8-dien-1-ol	0.01	0.01	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.02	0.02	Monoterpenic ether
Citronellal	0.06	0.06	Monoterpenic aldehyde
Terpinen-4-ol	0.02	0.01*	Monoterpenic alcohol
α-Terpineol	0.10	0.10	Monoterpenic alcohol
Decanal	0.29	0.27	Aliphatic aldehyde
Octyl acetate	0.01	0.04*	Aliphatic ester
<i>trans</i> -Carveol	0.02	0.02	Monoterpenic alcohol
Nerol	0.02	0.01	Monoterpenic alcohol
Neral	0.08	0.09*	Monoterpenic aldehyde
Geraniol	0.01	0.02	Monoterpenic alcohol
Perillaldehyde	0.01	0.01*	Monoterpenic aldehyde
Geranial	0.13	0.15	Monoterpenic aldehyde
Decanol	0.01	[0.01]*	Aliphatic alcohol
Limonen-10-ol	0.02	0.01	Monoterpenic alcohol
Undecanal	0.01	[0.01]*	Aliphatic aldehyde
α-Copaene	0.03	[0.04]*	Sesquiterpene
Geranyl acetate	0.01	0.04	Monoterpenic ester
β-Elementene	0.02	0.03*	Sesquiterpene
Dodecanal	0.04	0.03*	Aliphatic aldehyde
β-Caryophyllene	0.04	[0.03]*	Sesquiterpene
α-Humulene	0.01		Sesquiterpene
(E)-β-Farnesene	0.01	[0.09]*	Sesquiterpene
Germacrene D	0.03	0.03	Sesquiterpene
Valencene	0.04	0.03	Sesquiterpene
α-Murolene	0.01	[0.03]*	Sesquiterpene
γ-Cadinene	0.01	0.01	Sesquiterpene

δ-Cadinene	0.03	0.04	Sesquiterpene
Caryophyllene oxide	0.01		Sesquiterpenic ether
β-Sinensal	0.02	0.02	Sesquiterpenic aldehyde
α-Sinensal	0.02	0.01	Sesquiterpenic aldehyde
Myristic acid	0.01		Aliphatic acid
Palmitic acid	0.04		Aliphatic acid
Linoleic acid	0.01		Aliphatic acid
Oleic acid	0.01	0.02	Aliphatic acid
Tetramethoxyflavone isomer	0.02		Flavonoid
Tangeretin	0.03		Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.07		Flavonoid
Nobiletin	0.04		Flavonoid
<b>Total identified</b>	<b>99.48%</b>	<b>99.30%</b>	

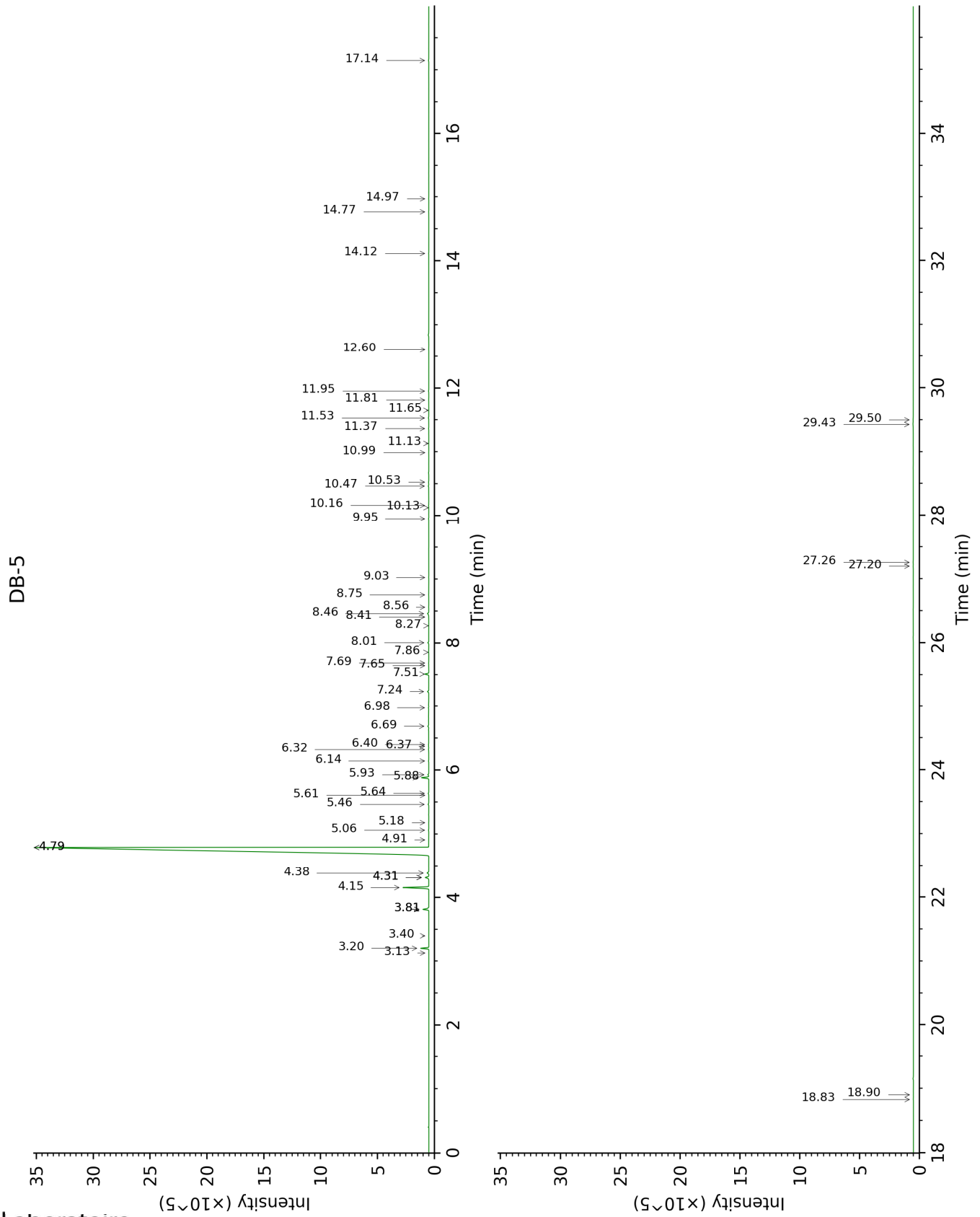
\*: Two or more compounds are coeluting on this column

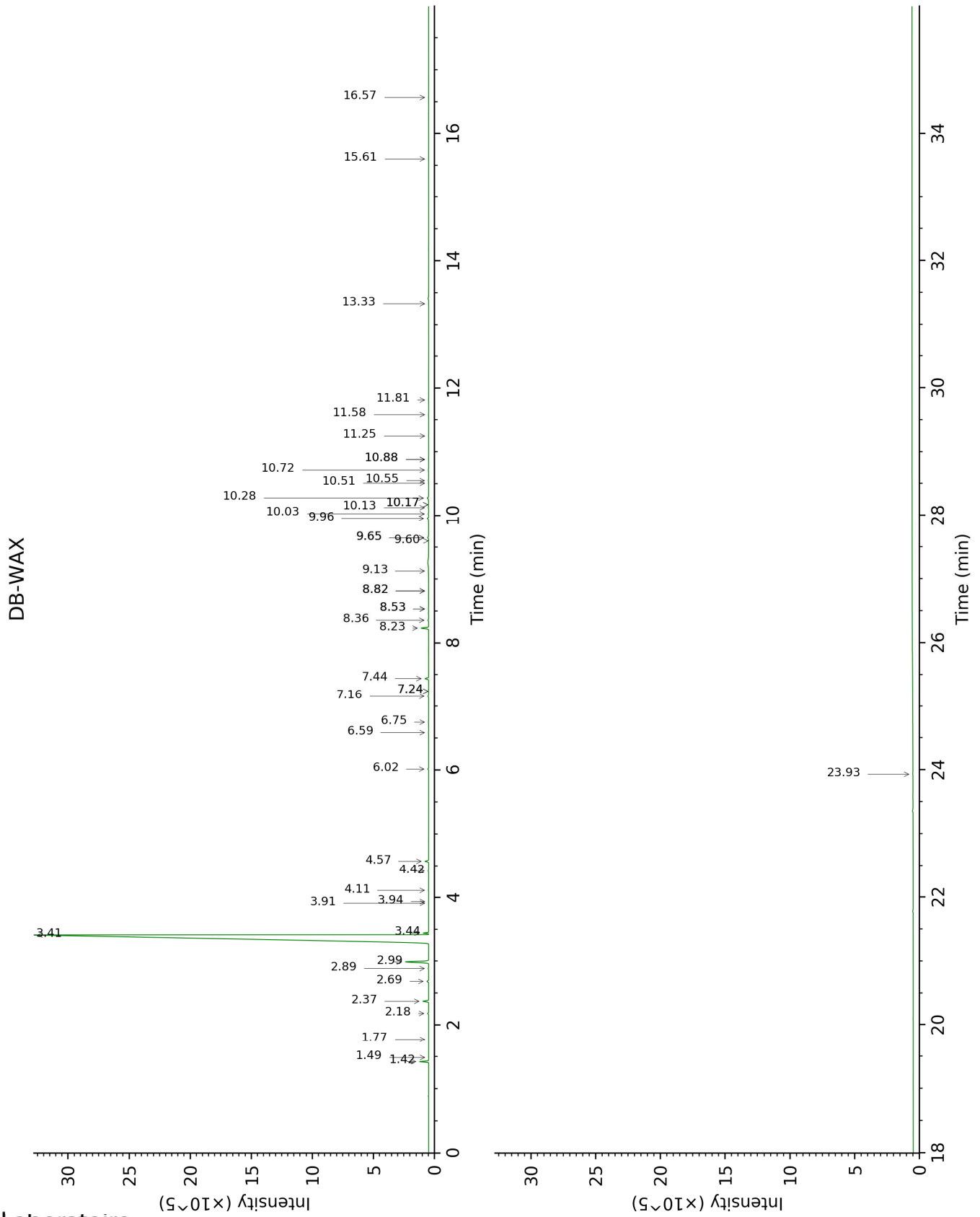
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
α-Thujene	3.13	924	tr	1.49	999	tr
α-Pinene	3.20	929	0.50	1.42	992	0.51
Camphene	3.40	942	tr	1.77	1027	tr
β-Pinene	3.81*	969	0.45	2.18	1067	0.07
Sabinene	3.81*	969	[0.45]	2.37	1085	0.39
Myrcene	4.15	992	1.82	2.99	1135	1.84
α-Phellandrene	4.31*	1002	0.28	2.89	1126	0.04
Octanal	4.31*	1002	[0.28]	4.57	1252	0.25
Δ <sup>3</sup> -Carene	4.38	1007	0.13	2.69	1111	0.13
Limonene	4.79*	1032	94.13	3.41	1167	93.96
1,8-Cineole	4.79*	1032	[94.13]	3.44	1169	0.26
(Z)-β-Ocimene	4.91	1040	tr	3.91	1204	0.01
(E)-β-Ocimene	5.06	1050	0.02	4.11	1219	0.02
γ-Terpinene	5.18	1057	0.01	3.94	1206	0.01
Octanol	5.46	1075	0.05	8.36	1529	0.05
Isoterpinolene	5.61	1084	tr			
Terpinolene	5.64	1086	0.04	4.42	1241	0.04
Linalool	5.88	1101	0.52	8.23	1519	0.54
Nonanal	5.93	1104	0.07	6.02	1356	0.06
<i>trans</i> -para-Mentha-2,8-dien-1-ol	6.14	1118	0.02	9.13	1588	0.01
<i>cis</i> -Limonene oxide	6.32	1130	0.02	6.59	1396	0.02
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.37	1133	0.01	9.60	1626	0.01
<i>trans</i> -Limonene oxide	6.40	1135	0.02	6.75	1409	0.02
Citronellal	6.69	1153	0.06	7.16	1439	0.06
Terpinen-4-ol	6.98	1172	0.02	8.82*	1564	0.01
α-Terpineol	7.24	1189	0.10	9.96	1655	0.10
Decanal	7.51	1207	0.29	7.44	1460	0.27
Octyl acetate	7.65	1216	0.01	7.24*	1445	0.04
<i>trans</i> -Carveol	7.69	1219	0.02	11.58	1790	0.02
Nerol	7.86	1230	0.02	11.25	1762	0.01
Neral	8.00	1240	0.08	9.65*	1630	0.09
Geraniol	8.27	1258	0.01	11.81	1810	0.02
Perillaldehyde	8.41	1268	0.01	10.88*	1731	0.01
Geranial	8.46	1271	0.13	10.28	1680	0.15
Decanol	8.56	1278	0.01	10.88*	1731	[0.01]
Limonen-10-ol	8.75	1291	0.02	13.33	1946	0.01
Undecanal	9.02	1305	0.01	8.82*	1564	[0.01]
α-Copaene	9.95	1371	0.03	7.24*	1445	[0.04]
Geranyl acetate	10.13	1383	0.01	10.72	1717	0.04
β-Elemene	10.16	1386	0.02	8.53*	1542	0.03
Dodecanal	10.47	1408	0.04	10.17*	1672	0.03
β-Caryophyllene	10.53	1412	0.04	8.53*	1542	[0.03]
α-Humulene	10.99	1446	0.01			
(E)-β-Farnesene	11.13	1457	0.01	9.65*	1630	[0.09]
Germacrene D	11.37	1475	0.03	10.03	1660	0.03
Valencene	11.53	1487	0.04	10.13	1668	0.03



α-Muurolene	11.65	1496	0.01	10.17*	1672	[0.03]
γ-Cadinene	11.81	1508	0.01	10.51	1700	0.01
δ-Cadinene	11.95	1519	0.03	10.55	1703	0.04
Caryophyllene oxide	12.60	1570	0.01			
β-Sinensal	14.12	1694	0.02	15.60	2166	0.02
α-Sinensal	14.77	1750	0.02	16.57	2265	0.01
Myristic acid	14.97	1768	0.01			
Palmitic acid	17.14	1966	0.04			
Linoleic acid	18.83	2133	0.01			
Oleic acid	18.90	2141	0.01	23.93	3164	0.02
Tetramethoxyflavone isomer	27.20	3134	0.02			
Tangeretin	27.26	3140	0.03			
3,3',4',5,6,7,8-Heptamethoxyflavone	29.43	3321	0.07			
Nobiletin	29.50	3326	0.04			
<b>Total identified</b>		<b>99.48%</b>			<b>99.30%</b>	
<b>Total reported</b>		<b>99.48%</b>			<b>99.30%</b>	

\*: 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