

Date : August 06, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19H05-PTH15-1-DM

Customer identification : Thyme Thymol (Red) Org- Morocco- TO010194R

Type : Essential oil

Source : *Thymus vulgaris* ct. Thymol

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014 - 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 : August 06, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow liquid

Refractive index: 1.5014 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Classe
Acetone	0.01	Aliphatic ketone
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl 2-methylbutyrate	0.01	Aliphatic ester
Unknown	tr	Unknown
(3Z)-Hexenol	0.02	Aliphatic alcohol
Hashishene	0.01	Monoterpene
Tricyclene	0.02	Monoterpene
α -Thujene	0.96	Monoterpene
α -Pinene	1.09	Monoterpene
Camphene	0.28	Monoterpene
α -Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	0.40	Monoterpene
Sabinene	0.01	Monoterpene
Octen-3-ol	0.05	Aliphatic alcohol
Octan-3-one	0.08	Aliphatic ketone
Myrcene	1.68	Monoterpene
Octan-3-ol	0.03	Aliphatic alcohol
α -Phellandrene	0.20	Monoterpene
Δ^3 -Carene	0.10	Monoterpene
α -Terpinene	1.37	Monoterpene
para-Cymene	19.15	Monoterpene
Limonene	0.43	Monoterpene
1,8-Cineole	0.35*	Monoterpenic ether
β -Phellandrene	[0.35]*	Monoterpene
Cymene analog	0.01	Monoterpene
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.06	Monoterpene
γ -Terpinene	9.39	Monoterpene
2-Methylbutyl butyrate	0.01	Aliphatic ester
cis-Sabinene hydrate	0.18	Monoterpenic alcohol
3-Methyl-3-butenyl butyrate?	0.02	Aliphatic ester
cis-Linalool oxide (fur.)	0.04	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.14	Monoterpene
trans-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
para-Cymenene	0.06	Monoterpene
Unknown	0.02	Monoterpene
Unknown	0.01	Unknown
trans-Sabinene hydrate	0.07	Monoterpenic alcohol
Linalool	4.38	Monoterpenic alcohol
Nonanal	0.06	Aliphatic aldehyde
Hotrienol	0.02	Monoterpenic alcohol
endo-Fenchol	0.03	Monoterpenic alcohol

Unknown	0.01	Oxygenated monoterpene
Unknown	0.05	Unknown
<i>cis</i> -para-Menth-2-en-1-ol	0.06	Monoterpenic alcohol
Camphor	0.05	Monoterpenic ketone
<i>trans</i> -para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.02	Monoterpenic alcohol
Camphene hydrate	0.09	Monoterpenic alcohol
Isoborneol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Borneol	0.47	Monoterpenic alcohol
Terpinen-4-ol	0.81	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α -Terpineol	0.05	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.11	Monoterpenic ketone
<i>trans</i> -Piperitol	0.02	Monoterpenic alcohol
Bornyl formate	0.04	Monoterpenic ester
Thymol methyl ether	0.03	Monoterpenic ether
Neral	0.05	Monoterpenic aldehyde
Carvacrol methyl ether	0.20	Monoterpenic ether
Geranial	0.01	Monoterpenic aldehyde
Thymol analogue I	0.07	Monoterpenic alcohol
Carvacrol	3.99	Monoterpenic alcohol
Thymol	49.06	Monoterpenic alcohol
Thymyl acetate	0.05	Monoterpenic ester
Eugenol	0.03	Phenylpropanoid
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
Unknown	0.04	Unknown
Isocaryophyllene	0.01	Sesquiterpene
β -Caryophyllene	1.21	Sesquiterpene
Aromadendrene	0.10	Sesquiterpene
Unknown	0.15	Oxygenated monoterpene
α -Humulene	0.09	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.11	Sesquiterpene
γ -Muurolene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
β -Selinene	0.02	Sesquiterpene
allo-Aromadendr-9-ene	0.01	Sesquiterpene
Viridiflorene	0.07	Sesquiterpene
α -Muurolene	0.02	Sesquiterpene
γ -Cadinene	0.05	Sesquiterpene
δ -Cadinene	0.08	Sesquiterpene
Caryophyllenyl alcohol	0.05	Sesquiterpenic alcohol
Spathulenol	0.06	Sesquiterpenic alcohol
Caryophyllene oxide	0.13	Sesquiterpenic ether
Unknown	0.02	Oxygenated sesquiterpene
Humulene epoxide II	0.01	Sesquiterpenic ether
Geranyl isovalerate	0.02	Monoterpenic ester
10-epi- γ -Eudesmol	0.02	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.01	Sesquiterpenic alcohol

α -Cadinol	0.01	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	0.01	Sesquiterpenic alcohol
Unknown	0.02	Unknown
Unknown	0.05	Unknown
Unknown	0.07	Unknown
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.06	Unknown
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Consolidated total	98.87%	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered [xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

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

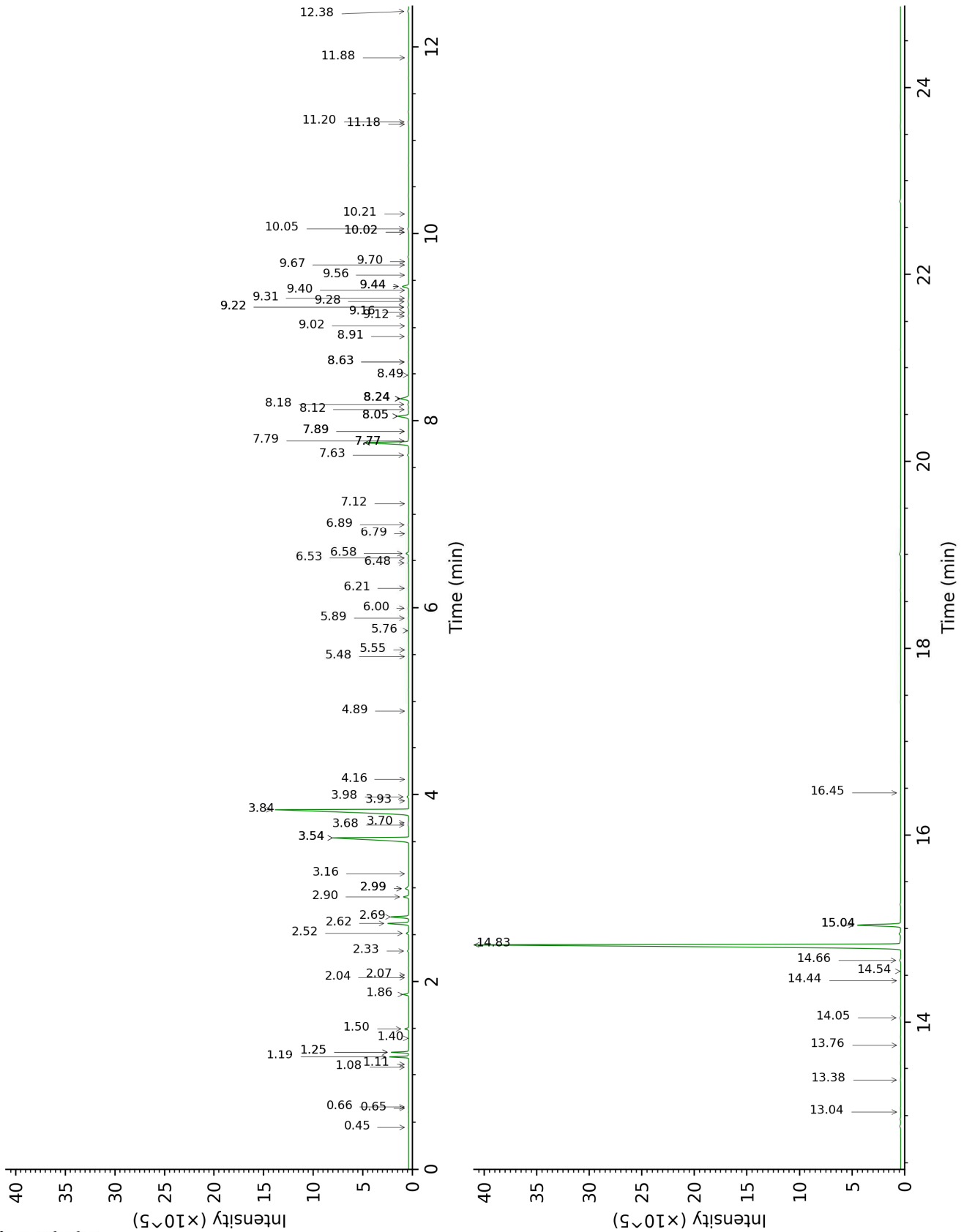
Note: no correction factor was applied

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.

DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetone	0.33	517	0.01	0.44	788	tr
Isovaleral	0.60	639	0.01	0.66	887	0.01
2-Methylbutyral	0.63	650	0.01	0.65	880	0.01
2-Ethylfuran	0.77	704	tr			
2-Methylbutanol	0.98	737	0.01	3.16	1178	0.01
Methyl 2-methylbutyrate	1.26	775	0.01	1.11	977	0.01
Unknown [m/z 81, 69 (80), 41 (65), 83 (52), 109 (48), 55 (47)...]	1.70	824	tr			
(3Z)-Hexenol	2.09	855	0.02	5.48	1350	0.02
Hashishene	2.85	915	0.01	1.25*	1000	0.98
Tricyclene	2.89	918	0.02	1.08	971	0.01
α -Thujene	3.01	925	0.96	1.25*	1000	[0.98]
α -Pinene	3.08	930	1.09	1.19	991	1.12
Camphene	3.27*	942	0.29	1.50	1026	0.28
α -Fenchene	3.27*	942	[0.29]	1.40	1016	0.01
Thuja-2,4(10)-diene	3.36	948	0.01	2.04	1084	0.02
β -Pinene	3.69†	970	0.40	1.86	1065	0.40
Sabinene	3.73†	973	[0.40]	2.07	1087	0.01
Octen-3-ol	3.85	980	0.05	6.48	1423	0.06
Octan-3-one	3.92	985	0.08	3.68	1218	0.06
Myrcene	4.02	992	1.68	2.62	1134	1.70
Octan-3-ol	4.10	997	0.03	5.76	1370	0.03
α -Phellandrene	4.15	1000	0.20	2.52	1126	0.19
Δ^3 -Carene	4.24	1006	0.10	2.33	1110	0.09
α -Terpinene	4.35	1013	1.37	2.69	1140	1.39
para-Cymene	4.50	1023	19.15	3.84	1231	19.30
Limonene	4.55*	1026	0.78	2.90	1157	0.43
1,8-Cineole	4.55*	1026	[0.78]	2.99*	1164	0.36
β -Phellandrene	4.55*	1026	[0.78]	2.99*	1164	[0.36]
Cymene analog	4.70	1035	0.01	4.16	1255	0.01
(Z)- β -Ocimene	4.76	1039	0.01	3.54*	1208	9.44
(E)- β -Ocimene	4.92	1049	0.06	3.70	1220	0.06
γ -Terpinene	5.06	1058	9.39	3.54*	1208	[9.44]
2-Methylbutyl butyrate	5.08	1059	0.01	3.93	1238	0.01
cis-Sabinene hydrate	5.14	1063	0.18	6.58	1430	0.23
3-Methyl-3-butenyl butyrate?	5.20	1067	0.02	4.89	1307	0.01
cis-Linalool oxide (fur.)	5.24	1069	0.04	6.21	1403	0.03
Octanol	5.31	1074	0.01	7.89*	1529	0.03
Terpinolene	5.49*	1085	0.23	3.98	1241	0.14

<i>trans</i> -Linalool oxide (fur.)	5.49*	1085	[0.23]	6.53	1427	0.05
para-Cymenene	5.49*	1085	[0.23]	6.00	1387	0.06
Unknown [m/z 105, 77 (62), 136 (37), 123 (29), 81 (29), 51 (20)]	5.54	1089	0.02			
Unknown [m/z 123, 81 (78), 79 (39), 41 (31), 67 (28), 150 (27)...]	5.59	1092	0.01			
<i>trans</i> -Sabinene hydrate	5.63	1094	0.07	7.63	1510	0.11
Linalool	5.75	1102	4.38	7.77*	1520	4.38
Nonanal	5.78	1104	0.06	5.55	1355	0.01
Hotrienol	5.80	1105	0.02	8.49	1576	0.02
endo-Fenchol	5.87	1109	0.03	8.12	1548	0.05
Unknown [m/z 109, 91 (57), 93 (47), 81 (44), 77 (40)... 154 (1)]	5.94	1114	0.01			
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	6.00*	1118	0.08	5.89	1380	0.05
<i>cis</i> -para-Menth-2-en-1-ol	6.00*	1118	[0.08]	7.79	1522	0.06
Camphor	6.24	1133	0.05	6.89	1454	0.06
<i>trans</i> -para-Menth-2-en-1-ol	6.28	1136	0.03	8.63*	1587	0.05
<i>trans</i> -Verbenol	6.35	1141	0.02	9.16	1630	0.02
Camphene hydrate	6.41	1144	0.09	8.18	1552	0.08
Isoborneol	6.51	1151	0.01	9.02	1618	0.01
Unknown [m/z 123, 81 (46), 43 (45), 95 (34), 166 (30)]	6.62	1158	0.01	8.63*	1587	[0.05]
Borneol	6.67	1161	0.47	9.44*	1652	0.67
Terpinen-4-ol	6.86	1174	0.81	8.24*	1556	0.98
para-Cymen-8-ol	6.99	1183	0.02	11.18	1798	0.02
α-Terpineol	7.07	1188	0.05	9.44*	1652	[0.67]
<i>cis</i> -Dihydrocarvone	7.14	1192	0.11	8.24*	1556	[0.98]
<i>trans</i> -Piperitol	7.31	1203	0.02	10.02*	1700	0.03
Bornyl formate	7.55	1220	0.04	7.77*	1520	[4.38]
Thymol methyl ether	7.76	1234	0.03	8.05*	1542	1.14
Neral	7.80	1237	0.05	9.12	1627	0.06
Carvacrol methyl ether	7.92	1245	0.20	8.24*	1556	[0.98]
Geranial	8.30	1272	0.01	9.70	1674	0.01

Thymol analogue I	8.65	1296	0.07	14.66	2122	0.10
Carvacrol	8.90	1308	3.99	15.04*†	2160	4.05
Thymol	8.83	1309	49.06	14.83	2139	48.97
Thymyl acetate	9.52	1352	0.05	11.20	1800	0.06
Eugenol	9.57	1356	0.03	14.44	2101	0.02
α-Copaene	9.77	1370	0.02	6.79	1446	0.01
β-Bourbonene	9.92	1380	0.01	7.12	1471	0.01
Geranyl acetate	9.98	1385	0.01	10.21	1716	0.01
Unknown [m/z 148, 133 (66), 105 (46), 43 (33), 77 (15)...]	10.02	1388	0.04			
Isocaryophyllene	10.26	1405	0.01	7.89*	1529	[0.03]
β-Caryophyllene	10.38	1414	1.21	8.05*	1542	[1.14]
Aromadendrene	10.64	1433	0.10	8.24*	1556	[0.98]
Unknown [m/z 151, 166 (40), 105 (26)...]	10.80	1445	0.15			
α-Humulene	10.83	1448	0.09	8.91	1609	0.04
(E)-β-Farnesene	10.96	1457	0.11	9.22*	1634	0.10
γ-Murolene	11.14	1471	0.01	9.31	1642	0.02
Germacrene D	11.18	1473	0.02	9.40	1649	0.01
β-Selinene	11.22	1476	0.02	9.56	1662	0.02
allo-Aromadendr-9-ene	11.30	1482	0.01	9.22*	1634	[0.10]
Viridiflorene	11.41	1490	0.07	9.28	1639	0.09
α-Murolene	11.50	1497	0.02	9.67	1671	0.02
γ-Cadinene	11.66	1509	0.05	10.02*	1700	[0.03]
δ-Cadinene	11.80	1520	0.08	10.05	1702	0.10
Caryophyllenyl alcohol	12.33	1562	0.05	13.38	1998	0.04
Spathulenol	12.43	1570	0.06	14.05	2062	0.07
Caryophyllene oxide	12.48	1574	0.13	12.38	1905	0.12
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.51	1577	0.02			
Humulene epoxide II	12.75	1595	0.01	13.04	1966	0.01
Geranyl isovalerate	12.86	1604	0.02	11.88	1861	0.04
10-epi-γ-Eudesmol	12.94	1611	0.02	13.76	2034	0.02
Isospathulenol	13.20	1632	0.01	15.04*†	2160	[4.05]
τ-Cadinol	13.24	1636	0.01	14.54	2111	0.01
α-Cadinol	13.40	1649	0.01			
(3Z)-	13.60	1665	0.01	16.45	2306	0.02

Caryophylla-3,8(13)-dien-5β-ol			
Unknown [m/z 81, 136 (68), 135 (58), 150 (44), 93 (34), 121 (30)...]	15.59	1838	0.02
Unknown [m/z 81, 136 (62), 135 (56), 150 (39), 93 (33), 121 (24)...]	16.07	1881	0.05
Unknown [m/z 136, 81 (96), 135 (76), 93 (48), 150 (47), 121 (43), 137 (28)...]	16.26	1899	0.07
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.53	1924	0.01
Unknown [m/z 201, 159 (37), 148 (27), 173 (22), 41 (20)... 284 (16)]	17.04	1972	0.02
Unknown [m/z 135, 150 (61), 81 (45), 69 (37), 41 (24), 136 (21), 93 (19)...]	17.10	1977	0.01
Unknown [m/z 135, 150 (66), 43 (38), 109 (27), 93 (25), 137 (20)...]	17.56	2022	0.02
Unknown [m/z 135, 43 (51), 150 (36), 109 (30), 93 (27), 95 (21)...]	17.72	2038	0.01
Unknown [m/z 173, 159 (29), 216 (27), 286 (15)]	17.94	2060	0.01
Unknown [m/z 267, 282 (24), 268 (21), 117 (16), 126 (11)...]	19.01	2168	0.06
Unknown [m/z 175, 163 (78), 161 (33), 41 (32)... 286 (18)]	19.28	2196	0.02
Unknown [m/z 135, 81 (77), 150	20.07	2281	0.01

(74), 95 (73), 109 (65), 149 (59)...		
Total identified	98.25%	98.29%
Total reported	98.81%	98.34%

*: 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