

**Date :** January 11, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 19A10-PTH05-1-CC

**Customer identification :** Myrrh - Ethiopia - M4010787R

**Type :** Essential oil

**Source :** *Commiphora myrrha*

**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 :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** January 11, 2019

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Light yellow viscous liquid

**Refractive index:**  $1.5263 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.07	0.09	Aliphatic alcohol
$\alpha$ -Thujene	tr	tr	Monoterpene
$\alpha$ -Pinene	0.01	0.01	Monoterpene
Myrcene	tr	tr	Monoterpene
$\Delta^3$ -Carene	tr	tr	Monoterpene
para-Cymene	tr	tr	Monoterpene
Limonene	0.01	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.06	0.06	Monoterpene
$\delta$ -Elemene isomer	0.02	0.02*	Sesquiterpene
$\delta$ -Elemene	0.71	0.69	Sesquiterpene
$\alpha$ -Cubebene	0.03	[0.02]*	Sesquiterpene
$\alpha$ -Ylangene	0.01	0.01	Sesquiterpene
$\alpha$ -Copaene	0.08	0.08	Sesquiterpene
$\beta$ -Bourbonene	0.25	0.28	Sesquiterpene
cis- $\beta$ -Elemene	0.11	0.12	Sesquiterpene
$\beta$ -Elemene	3.28	3.65*	Sesquiterpene
$\beta$ -Caryophyllene	0.40	[3.65]*	Sesquiterpene
$\beta$ -Copaene	0.09	0.07	Sesquiterpene
$\gamma$ -Elemene	0.56	0.57	Sesquiterpene
Isogermacrene D	0.07	0.03	Sesquiterpene
$\alpha$ -Humulene	0.17	0.18	Sesquiterpene
4,5-diepi-Aristolochene	0.02	0.06*	Sesquiterpene
Unknown	0.03	[0.06]*	Sesquiterpene
trans-Cadina-1(6),4-diene	0.04	0.03	Sesquiterpene
Selina-4,11-diene	0.02	[0.06]*	Sesquiterpene
$\gamma$ -Muurolole	0.08	0.11*	Sesquiterpene
$\alpha$ -Amorphene	0.05	[0.11]*	Sesquiterpene
Germacrene D	1.10	1.10	Sesquiterpene
$\beta$ -Selinene	0.35	0.35	Sesquiterpene
$\delta$ -Selinene	0.03	0.03	Sesquiterpene
$\alpha$ -Selinene	0.38	0.42*	Sesquiterpene
Curzerene	18.95*	18.87	Sesquiterpenic ether
$\epsilon$ -Amorphene	[18.95]*	0.03	Sesquiterpene
$\delta$ -Amorphene	[18.95]	[0.42]*	Sesquiterpene
$\gamma$ -Cadinene	0.24	0.20	Sesquiterpene
$\delta$ -Cadinene	0.18	0.17	Sesquiterpene
Selina-4(15),7(11)-diene	0.06	0.05	Sesquiterpene
Selina-3,7(11)-diene	0.08	0.10	Sesquiterpene
$\alpha$ -Elemol	0.16	0.15	Sesquiterpenic alcohol
Germacrene B	2.67	2.72	Sesquiterpene
Furanoesudima-1,4-diene	0.55	0.56	Sesquiterpenic ether
$\beta$ -Elemenone	0.36	0.30	Sesquiterpenic ketone
Selin-6-en-4 $\alpha$ -ol	0.13	0.17	Sesquiterpenic alcohol
Furanoesudima-1,3-diene	33.13	44.66	Sesquiterpenic ether
Lindestrene	10.39	[44.66]	Sesquiterpenic ether
$\tau$ -Muurolol	0.68	0.63	Sesquiterpenic alcohol
Furanodiene	0.11		Sesquiterpenic ether
$\alpha$ -Eudesmol	0.50	0.64	Sesquiterpenic alcohol

Isofuranogermacrene	0.41		Sesquiterpenic ether
$\alpha$ -Elemyl acetate	1.37	1.25	Sesquiterpenic ester
Methoxyfuranodiene analog	8.45*	6.64	Sesquiterpenic ether
Germacrene	[8.45]*	0.21	Sesquiterpenic ketone
2-Methoxyfuranodiene	4.76	4.82	Sesquiterpenic ether
2-Acetoxyfuranodiene	0.96	0.43	Sesquiterpenic ester
Unknown	0.24	0.21	Unknown
Cembrenol	0.02	0.02	Diterpenic alcohol
<b>Total identified</b>	<b>92.21%</b>	<b>90.59%</b>	

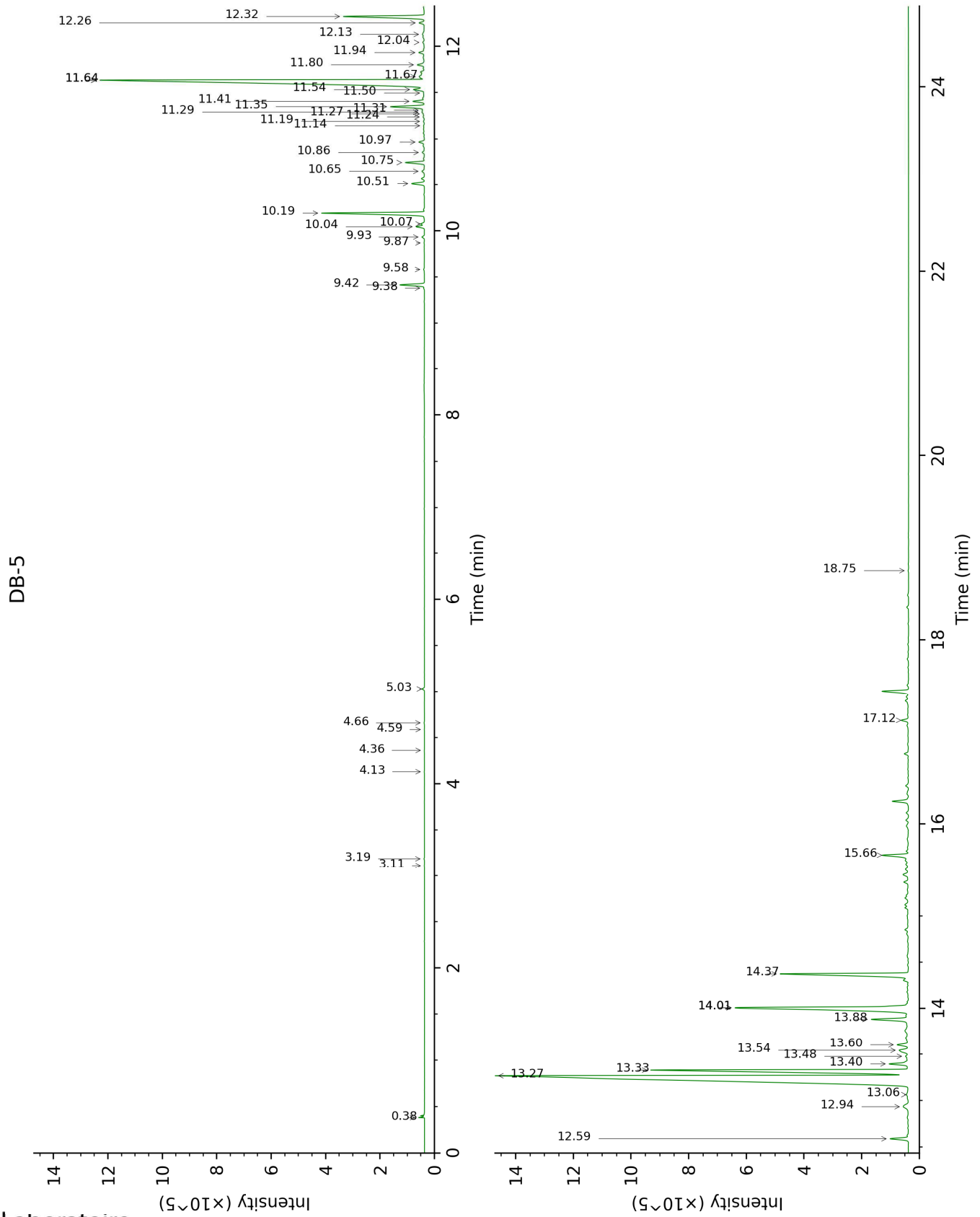
\*: Two or more compounds are coeluting on this column

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

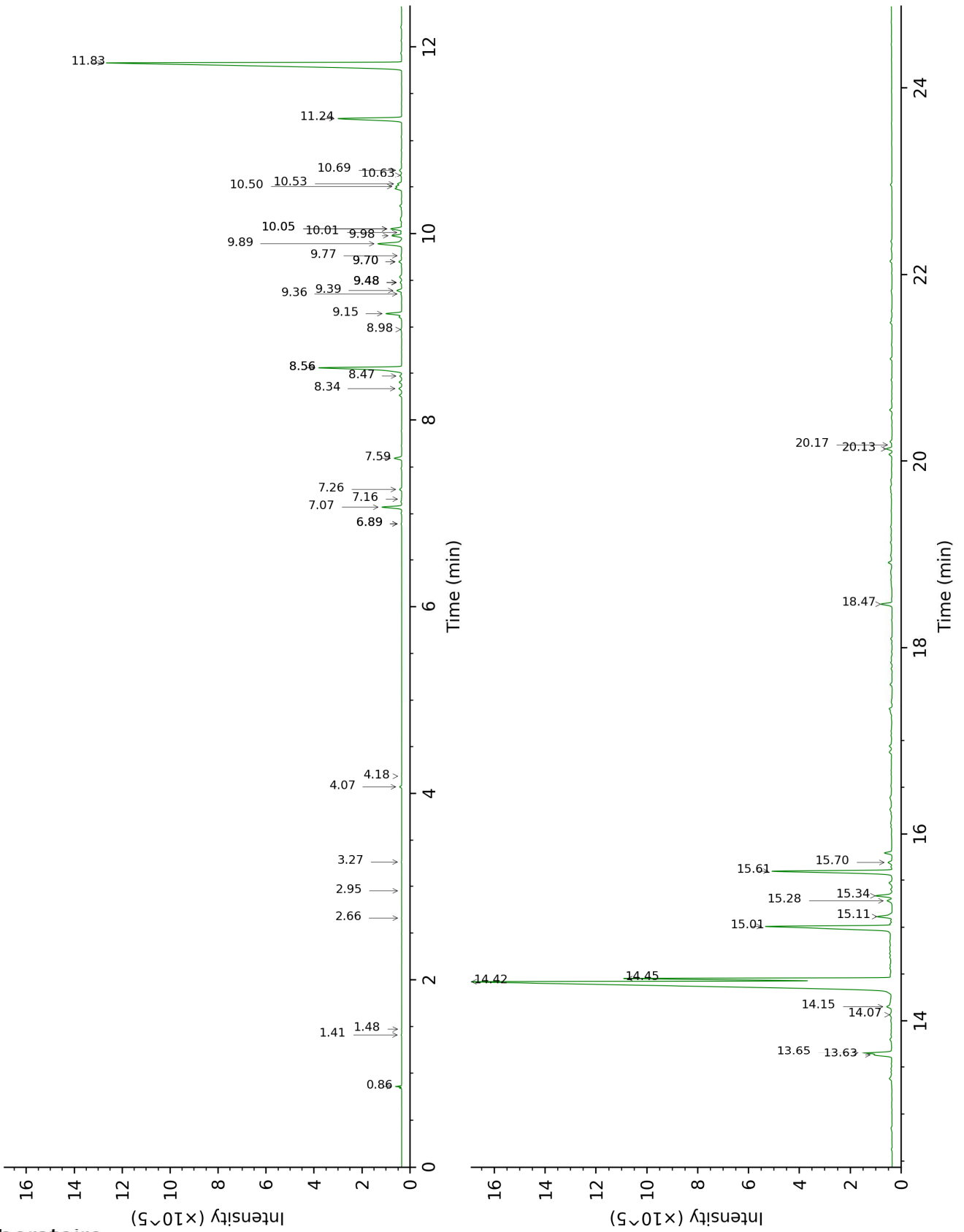
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.38	513	0.07	0.86	913	0.09
$\alpha$ -Thujene	3.11	924	tr	1.48	1003	tr
$\alpha$ -Pinene	3.19	929	0.01	1.41	993	0.01
Myrcene	4.13	991	tr	2.95	1135	tr
$\Delta^3$ -Carene	4.36	1006	tr	2.66	1112	tr
para-Cymene	4.59	1020	tr	4.18	1232	tr
Limonene	4.66	1025	0.01	3.27	1160	0.01
(E)- $\beta$ -Ocimene	5.03	1048	0.06	4.07	1223	0.06
$\delta$ -Elemene isomer	9.38	1333	0.02	6.89*	1423	0.02
$\delta$ -Elemene	9.42	1336	0.71	7.07	1437	0.69
$\alpha$ -Cubebene	9.58	1347	0.03	6.89*	1423	[0.02]
$\alpha$ -Ylangene	9.87	1368	0.01	7.16	1443	0.01
$\alpha$ -Copaene	9.93	1372	0.08	7.26	1451	0.08
$\beta$ -Bourbonene	10.04	1380	0.25	7.59	1476	0.28
cis- $\beta$ -Elemene	10.08	1382	0.11	8.34	1533	0.12
$\beta$ -Elemene	10.19	1391	3.28	8.56*	1550	3.65
$\beta$ -Caryophyllene	10.51	1414	0.40	8.56*	1550	[3.65]
$\beta$ -Copaene	10.65	1424	0.09	8.47	1543	0.07
$\gamma$ -Elemene	10.75	1431	0.56	9.15	1596	0.57
Isogermacrene D	10.86	1440	0.07	8.98	1583	0.03
$\alpha$ -Humulene	10.97	1448	0.17	9.39	1616	0.18
4,5-diepi-Aristolochene	11.14	1461	0.02	9.48*	1623	0.06
Unknown [m/z 119, 91 (85), 93 (77), 105 (76), 79 (61), 134 (60), 94 (49), 204 (46)]	11.19	1465	0.03	9.48*	1623	[0.06]
trans-Cadina-1(6),4-diene	11.24	1468	0.04	9.36	1613	0.03
Selina-4,11-diene	11.27	1471	0.02	9.48*	1623	[0.06]
$\gamma$ -Murolene	11.29	1472	0.08	9.70*	1641	0.11
$\alpha$ -Amorphene	11.31	1474	0.05	9.70*	1641	[0.11]
Germacrene D	11.35	1476	1.10	9.89	1657	1.10
$\beta$ -Selinene	11.41	1481	0.35	9.98	1664	0.35
$\delta$ -Selinene	11.50	1488	0.03	9.76	1646	0.03
$\alpha$ -Selinene	11.54	1490	0.38	10.05*	1670	0.42
Curzerene	11.64*†	1498	18.95	11.83	1821	18.87
$\epsilon$ -Amorphene	11.64*†	1498	[18.95]	10.01	1667	0.03
$\delta$ -Amorphene	11.67†	1501	[18.95]	10.05*	1670	[0.42]
$\gamma$ -Cadinene	11.80	1511	0.24	10.50	1707	0.20
$\delta$ -Cadinene	11.94	1521	0.18	10.53	1709	0.17
Selina-4(15),7(11)-diene	12.04	1530	0.06	10.63	1718	0.05
Selina-3,7(11)-diene	12.13	1537	0.08	10.68	1722	0.10
$\alpha$ -Elemol	12.26	1546	0.16	14.07	2026	0.15
Germacrene B	12.32	1552	2.67	11.24	1770	2.72
Furanoedesma-1,4-diene	12.59	1573	0.55	13.63	1985	0.56



β-Elemenone	12.94	1600	0.36	14.15	2035	0.30
Selin-6-en-4α-ol	13.06	1610	0.13	15.70	2188	0.17
Furanoedesma-1,3-diene	13.27	1627	33.13	14.42†	2061	44.66
Lindstrene	13.33	1632	10.39	14.45†	2064	[44.66]
τ-Muurolol	13.40	1638	0.68	15.11	2129	0.63
Furanodiene	13.48	1645	0.11			
α-Eudesmol	13.54	1650	0.50	15.34	2151	0.64
Isofuranogermacrene	13.60	1655	0.41			
α-Elemyl acetate	13.88	1678	1.37	13.66	1987	1.25
Methoxyfuranodiene analog	14.01*	1689	8.45	15.01	2118	6.64
Germacrene	14.01*	1689	[8.45]	15.28	2146	0.21
2-Methoxyfuranodiene	14.37	1720	4.76	15.61	2178	4.82
2-Acetoxyfuranodiene	15.66	1833	0.96	18.47	2486	0.43
Unknown [m/z 197, 108 (83), 212 (50), 43 (42), 169 (38), 183 (31), 155 (30), 79 (26), 105 (26)]	17.12	1969	0.24	20.13	2681	0.21
Cembrenol	18.75	2129	0.02	20.17	2686	0.02
<b>Total identified</b>		<b>92.21%</b>			<b>90.59%</b>	
<b>Total reported</b>		<b>92.47%</b>			<b>90.81%</b>	

\*: 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