

**Date :** February 26, 2018

**CERTIFICATE OF ANALYSIS - GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 18B21-HBN1-1-CC

**Customer identification :** Allspice - 69964

**Type :** Essential oil

**Source :** *Pimenta officinalis*

**Customer :** Health & Beauty Natural Oils

*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 :** Alexis St-Gelais, M. Sc., chimiste

**Analysis date :** February 23, 2018

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 liquid

**Refractive index:**  $1.5323 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
(3Z)-Hexenol	0.01	0.01	Aliphatic alcohol
Hexanol	tr	tr	Aliphatic alcohol
$\alpha$ -Thujene	0.04	0.04	Monoterpene
$\alpha$ -Pinene	0.07	0.07	Monoterpene
$\beta$ -Pinene	0.01	0.01	Monoterpene
Myrcene	0.07	0.07	Monoterpene
$\alpha$ -Phellandrene	0.17	0.17	Monoterpene
$\Delta^3$ -Carene	0.02	0.02	Monoterpene
$\alpha$ -Terpinene	0.03	0.04	Monoterpene
para-Cymene	0.17	0.18	Monoterpene
Limonene	0.48*	0.09	Monoterpene
1,8-Cineole	[0.48]*	0.41	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.02	0.02	Monoterpene
(E)- $\beta$ -Ocimene	0.29	0.30	Monoterpene
$\gamma$ -Terpinene	0.07	0.08	Monoterpene
Terpinolene	0.17	0.18	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.02	0.03	Monoterpenic alcohol
Linalool	0.06	0.07	Monoterpenic alcohol
Terpinen-4-ol	0.10	0.12	Monoterpenic alcohol
para-Cymen-8-ol	0.02	0.02	Monoterpenic alcohol
$\alpha$ -Terpineol	0.09	0.09	Monoterpenic alcohol
Methylchavicol	0.01	1.31*	Phenylpropanoid
Geraniol	0.01	0.02	Monoterpenic alcohol
Chavicol	0.04	0.07	Phenylpropanoid
Eugenol	78.82	78.67	Phenylpropanoid
$\alpha$ -Copaene	[78.82]	0.04	Sesquiterpene
$\beta$ -Elemene	0.34	5.20*	Sesquiterpene
$\alpha$ -Gurjunene	0.25	0.24	Sesquiterpene
Methyleugenol	5.71	5.74	Phenylpropanoid
$\beta$ -Caryophyllene	4.92	[5.20]*	Sesquiterpene
$\beta$ -Copaene	0.03	0.02	Sesquiterpene
Aromadendrene	0.16*	0.09	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	[0.16]*	[5.20]*	Sesquiterpene
$\alpha$ -Humulene	1.32	[1.31]*	Sesquiterpene
allo-Aromadendrene	0.51	0.47	Sesquiterpene
Selina-4,11-diene	0.34	0.32	Sesquiterpene
$\gamma$ -Muurolene	0.09	0.13	Sesquiterpene
$\beta$ -Selinene	0.74	0.77	Sesquiterpene
$\alpha$ -Amorphene	0.13	0.13	Sesquiterpene
$\alpha$ -Selinene	1.29*	0.97	Sesquiterpene
Viridiflorene	[1.29]*	0.34	Sesquiterpene
$\alpha$ -Muurolene	0.11	0.10	Sesquiterpene
$\gamma$ -Cadinene	0.12	0.13	Sesquiterpene
$\delta$ -Cadinene	0.42*	0.37	Sesquiterpene
<i>trans</i> -Calamenene	[0.42]*	0.03	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.02	0.02	Sesquiterpene
$\alpha$ -Cadinene	0.03	0.03	Sesquiterpene
$\alpha$ -Calacorene	0.02	0.03	Sesquiterpene

Spathulenol	0.03	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.09	0.08	Sesquiterpenic ether
Globulol	0.19	0.17	Sesquiterpenic alcohol
Viridiflorol	0.10	0.11	Sesquiterpenic alcohol
Cubeban-11-ol	0.13	0.13	Sesquiterpenic alcohol
Eudesm-5-en-11-ol	0.11	0.09	Sesquiterpenic alcohol
Methoxyeugenol	0.03	0.03	Phenylpropanoid
Unknown	0.17	0.15	Oxygenated sesquiterpene
Rosifoliol	0.09	0.08	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.13	0.13	Sesquiterpenic alcohol
$\tau$ -Muurolool	0.04	0.07	Sesquiterpenic alcohol
Selin-11-en-4 $\alpha$ -ol	0.43*	0.31	Sesquiterpenic alcohol
$\alpha$ -Cadinol	[0.43]*	0.10	Sesquiterpenic alcohol
<b>Total identified</b>	<b>98.72%</b>	<b>98.59%</b>	

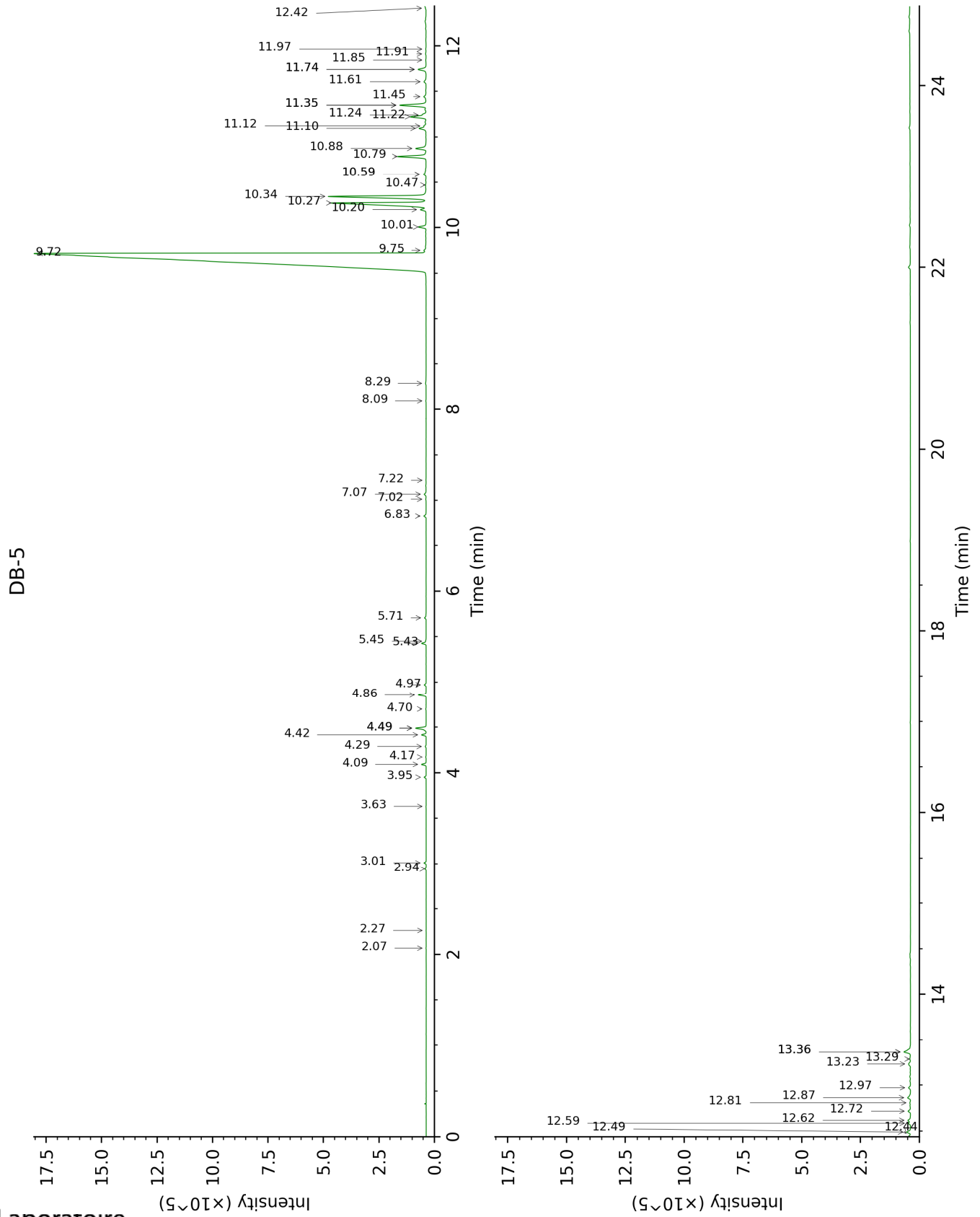
\*: Two or more compounds are coeluting on this column

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

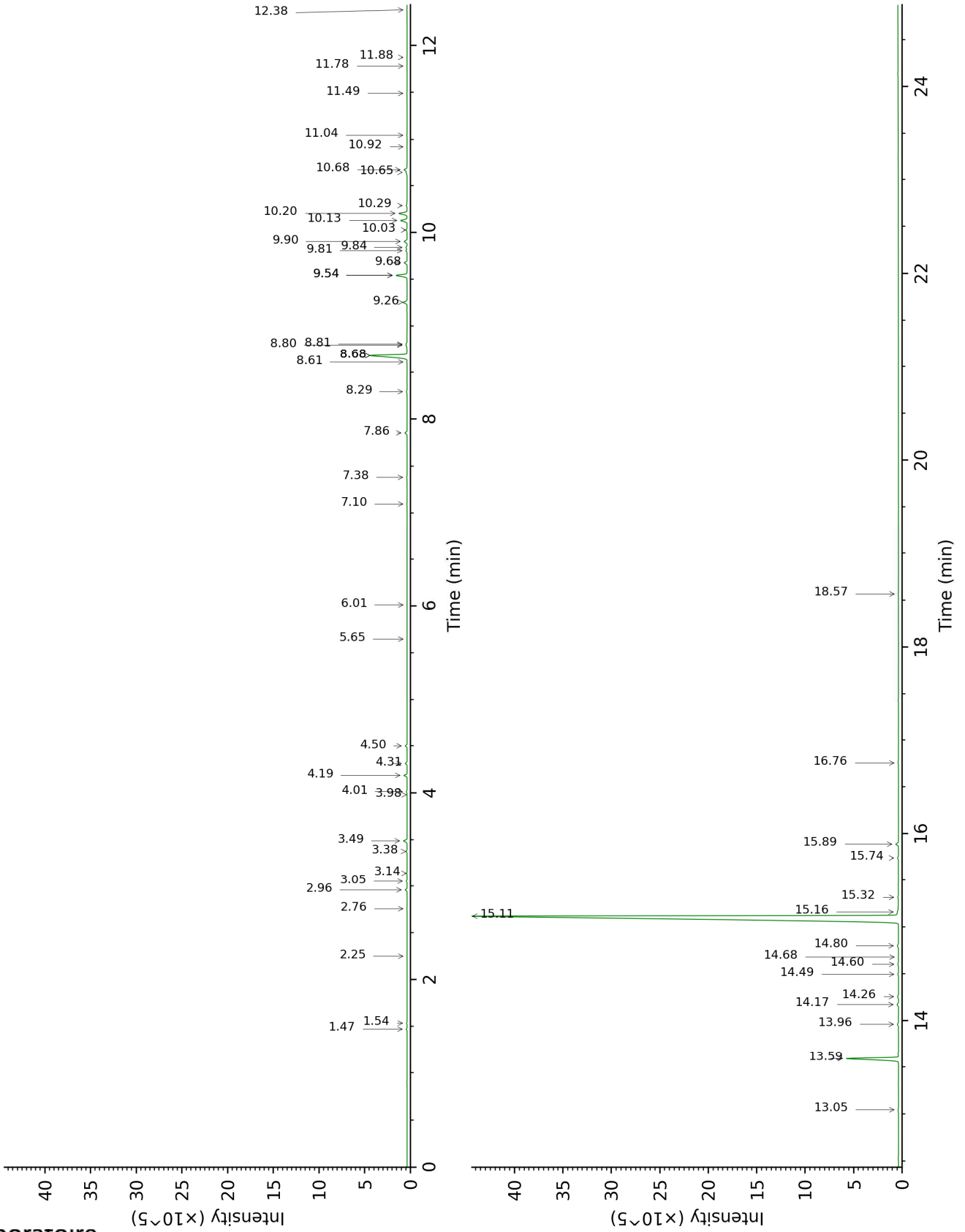
tr: The compound has been detected below 0.005% of total signal.

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	%
(3Z)-Hexenol	2.07	852	0.01	6.01	1349	0.01
Hexanol	2.26	869	tr	5.65	1323	tr
$\alpha$ -Thujene	2.94	920	0.04	1.54	1002	0.04
$\alpha$ -Pinene	3.01	925	0.07	1.47	995	0.07
$\beta$ -Pinene	3.63	966	0.01	2.25	1069	0.01
Myrcene	3.95	988	0.07	3.05	1134	0.07
$\alpha$ -Phellandrene	4.09	997	0.17	2.96	1127	0.17
$\Delta^3$ -Carene	4.17	1002	0.02	2.76	1112	0.02
$\alpha$ -Terpinene	4.29	1010	0.03	3.14	1141	0.04
para-Cymene	4.42	1018	0.17	4.31	1228	0.18
Limonene	4.49*	1022	0.48	3.38	1159	0.09
1,8-Cineole	4.49*	1022	[0.48]	3.49	1168	0.41
(Z)- $\beta$ -Ocimene	4.70	1035	0.02	3.98	1204	0.02
(E)- $\beta$ -Ocimene	4.86	1045	0.29	4.19	1219	0.30
$\gamma$ -Terpinene	4.97	1052	0.07	4.01	1206	0.08
Terpinolene	5.43	1081	0.17	4.50	1241	0.18
<i>trans</i> -Linalool oxide (fur.)	5.45	1082	0.02	7.10	1427	0.03
Linalool	5.71	1098	0.06	8.30	1516	0.07
Terpinen-4-ol	6.83	1170	0.10	8.80	1555	0.12
para-Cymen-8-ol	7.02	1182	0.02	11.78	1799	0.02
$\alpha$ -Terpineol	7.07	1186	0.09	10.03	1652	0.09
Methylchavicol	7.22	1195	0.01	9.54*	1613	1.31
Geraniol	8.09	1253	0.01	11.88	1807	0.02
Chavicol	8.29	1266	0.04	16.76	2273	0.07
Eugenol	9.72†	1365	78.82	15.11	2106	78.67
$\alpha$ -Copaene	9.75†	1367	[78.82]	7.38	1448	0.04
$\beta$ -Elemene	10.01	1385	0.34	8.68*	1546	5.20
$\alpha$ -Gurjunene	10.20	1399	0.25	7.86	1483	0.24
Methyleugenol	10.27	1404	5.71	13.59	1961	5.74
$\beta$ -Caryophyllene	10.34	1409	4.92	8.68*	1546	[5.20]
$\beta$ -Copaene	10.47	1419	0.03	8.61	1541	0.02
Aromadendrene	10.59*	1428	0.16	8.81	1556	0.09
<i>trans</i> - $\alpha$ - Bergamotene	10.59*	1428	[0.16]	8.68*	1546	[5.20]
$\alpha$ -Humulene	10.79	1442	1.32	9.54*	1613	[1.31]
allo- Aromadendrene	10.88	1449	0.51	9.26	1590	0.47
Selina-4,11- diene	11.10	1465	0.34	9.68	1624	0.32
$\gamma$ -Muuroolene	11.12	1467	0.09	9.84	1637	0.13
$\beta$ -Selinene	11.22	1475	0.74	10.13	1660	0.77
$\alpha$ -Amorphene	11.24	1476	0.13	9.81	1634	0.13
$\alpha$ -Selinene	11.35*	1484	1.29	10.20	1666	0.97
Viridiflorene	11.35*	1484	[1.29]	9.90	1642	0.34
$\alpha$ -Muuroolene	11.44	1491	0.11	10.29	1673	0.10
$\gamma$ -Cadinene	11.61	1503	0.12	10.65	1703	0.13
$\delta$ -Cadinene	11.74*	1514	0.42	10.68	1705	0.37



<i>trans</i> -Calamenene	11.74*	1514	[0.42]	11.49	1774	0.03
<i>trans</i> -Cadina-1,4-diene	11.85	1522	0.02	10.92	1726	0.02
$\alpha$ -Cadinene	11.91	1527	0.03	11.04	1736	0.03
$\alpha$ -Calacorene	11.97	1531	0.02	12.38	1852	0.03
Spathulenol	12.42	1567	0.03	14.68	2064	0.04
Caryophyllene oxide	12.44	1569	0.09	13.05	1911	0.08
Globulol	12.49	1572	0.19	14.17	2015	0.17
Viridiflorol	12.59	1580	0.10	14.26	2023	0.11
Cubeban-11-ol	12.62	1582	0.13	13.96	1995	0.13
Eudesm-5-en-11-ol	12.72	1590	0.11	14.60	2056	0.09
Methoxyeugenol	12.81	1597	0.03	18.57	2470	0.03
Unknown [m/z 43, 81 (97), 135 (71), 95 (62), 204 (61), 71 (59), 207 (56)... 222 (3)]	12.86	1602	0.17	14.80	2075	0.15
Rosifoliol	12.97	1611	0.09	14.50	2046	0.08
$\tau$ -Cadinol	13.23	1632	0.13	15.16	2111	0.13
$\tau$ -Muurolool	13.29	1636	0.04	15.32	2126	0.07
Selin-11-en-4 $\alpha$ -ol	13.36*	1643	0.43	15.89	2183	0.31
$\alpha$ -Cadinol	13.36*	1643	[0.43]	15.74	2169	0.10
<b>Total identified</b>		<b>98.72%</b>			<b>98.59%</b>	
<b>Total reported</b>		<b>98.89%</b>			<b>98.74%</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