

**Date :** February 23, 2018

**CERTIFICATE OF ANALYSIS - GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 18B20-PLG7-1-CC

**Customer identification :** Rosemary

**Type :** Essential oil

**Source :** *Rosmarinus officinalis* ct. 1,8-Cineole

**Customer :** Plant Guru

*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:** Clear liquid

**Refractive index:**  $1.4663 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
(3Z)-Hexenol	tr	0.01	Aliphatic alcohol
Hexanol	tr	0.01	Aliphatic alcohol
Hashishene	0.01	11.13*	Monoterpene
Tricyclene	0.06	0.07	Monoterpene
$\alpha$ -Thujene	0.05	0.05	Monoterpene
$\alpha$ -Pinene	11.11	[11.13]*	Monoterpene
Camphene	4.70*	4.27	Monoterpene
$\alpha$ -Fenchene	[4.70]*	0.45	Monoterpene
Thuja-2,4(10)-diene	0.02	0.04*	Monoterpene
$\beta$ -Pinene	6.98*	6.96	Monoterpene
Sabinene	[6.98]*	[0.04]*	Monoterpene
Octen-3-ol	0.06*	0.05*	Aliphatic alcohol
Octan-3-one	[0.06]*	0.04*	Aliphatic ketone
Myrcene	1.83	1.84	Monoterpene
$\alpha$ -Phellandrene	0.44*	0.36	Monoterpene
Pseudolimonene	[0.44]*	0.07	Monoterpene
$\Delta^3$ -Carene	0.06	0.05	Monoterpene
$\alpha$ -Terpinene	0.14	0.15	Monoterpene
1,8-Cineole	50.47*	43.58	Monoterpenic ether
Limonene	[50.47]*	3.66	Monoterpene
para-Cymene	[50.47]*	3.15	Monoterpene
(Z)- $\beta$ -Ocimene	0.04	0.04	Monoterpene
(E)- $\beta$ -Ocimene	0.02	[0.04]*	Monoterpene
$\gamma$ -Terpinene	0.90	0.93	Monoterpene
cis-Sabinene hydrate	0.01	0.02	Monoterpenic alcohol
Terpinolene	0.06	0.06	Monoterpene
para-Cymenene	0.02	0.01	Monoterpene
trans-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Linalool	0.24	0.24	Monoterpenic alcohol
endo-Fenchol	0.03	0.04	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	0.02	Monoterpenic alcohol
Camphor	9.85*	9.86	Monoterpenic ketone
trans-Pinocarveol	[9.85]*	0.02	Monoterpenic alcohol
Camphene hydrate	0.05	3.05*	Monoterpenic alcohol
Isoborneol	0.11	0.11	Monoterpenic alcohol
Pinocarvone	0.01	0.01	Monoterpenic ketone
Borneol	4.92	6.51*	Monoterpenic alcohol
Terpinen-4-ol	0.21	0.23	Monoterpenic alcohol
para-Cymen-8-ol	0.01	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	1.73	[6.51]*	Monoterpenic alcohol
Verbenone	0.01	0.01*	Monoterpenic ketone
Bornyl acetate	1.68	1.67	Monoterpenic ester
$\alpha$ -Cubebene	0.01	[0.05]*	Sesquiterpene
$\alpha$ -Ylangene	0.03	0.03	Sesquiterpene
$\alpha$ -Copaene	0.09	0.09	Sesquiterpene
Methyleugenol	0.02	0.01	Phenylpropanoid
$\beta$ -Caryophyllene	3.08	[3.05]*	Sesquiterpene
Aromadendrene	0.02	0.02	Sesquiterpene

$\alpha$ -Humulene	0.10	0.10	Sesquiterpene
$\gamma$ -Muurolene	0.06	0.06	Sesquiterpene
$\alpha$ -Amorphene	0.01	[0.01]*	Sesquiterpene
$\beta$ -Selinene	0.01	0.01	Sesquiterpene
$\alpha$ -Muurolene	0.02	0.02	Sesquiterpene
$\beta$ -Bisabolene	0.06	0.02	Sesquiterpene
$\gamma$ -Cadinene	[0.06]	0.03	Sesquiterpene
$\delta$ -Cadinene	0.08*	0.06	Sesquiterpene
<i>trans</i> -Calamenene	[0.08]*	0.01	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	0.01	Sesquiterpene
$\alpha$ -Calacorene	0.01	0.01	Sesquiterpene
Caryophyllene oxide	0.06*	0.05	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.06]*	0.01	Sesquiterpenic ether
<b>Total identified</b>	<b>99.50%</b>	<b>99.32%</b>	

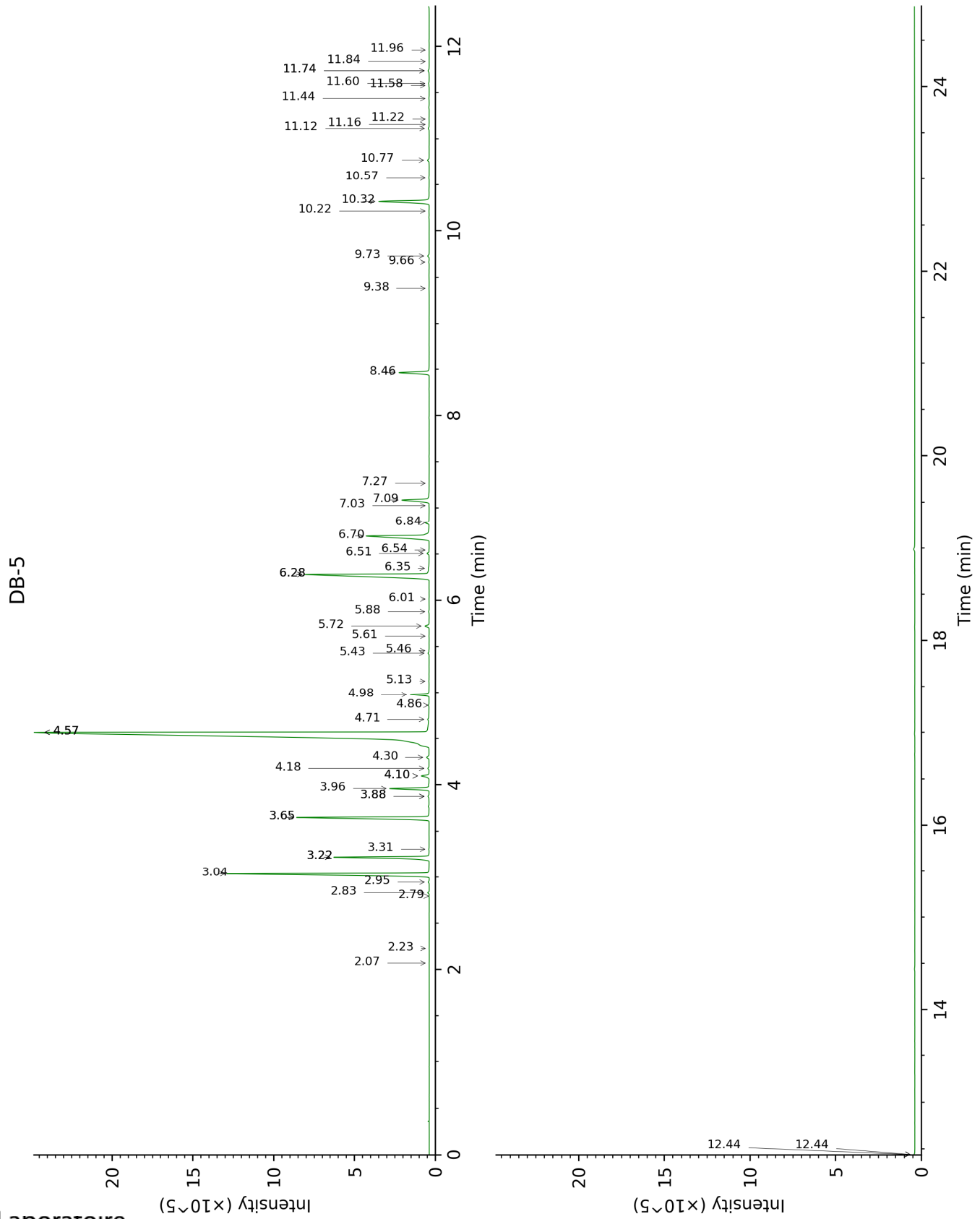
\*: Two or more compounds are coeluting on this column

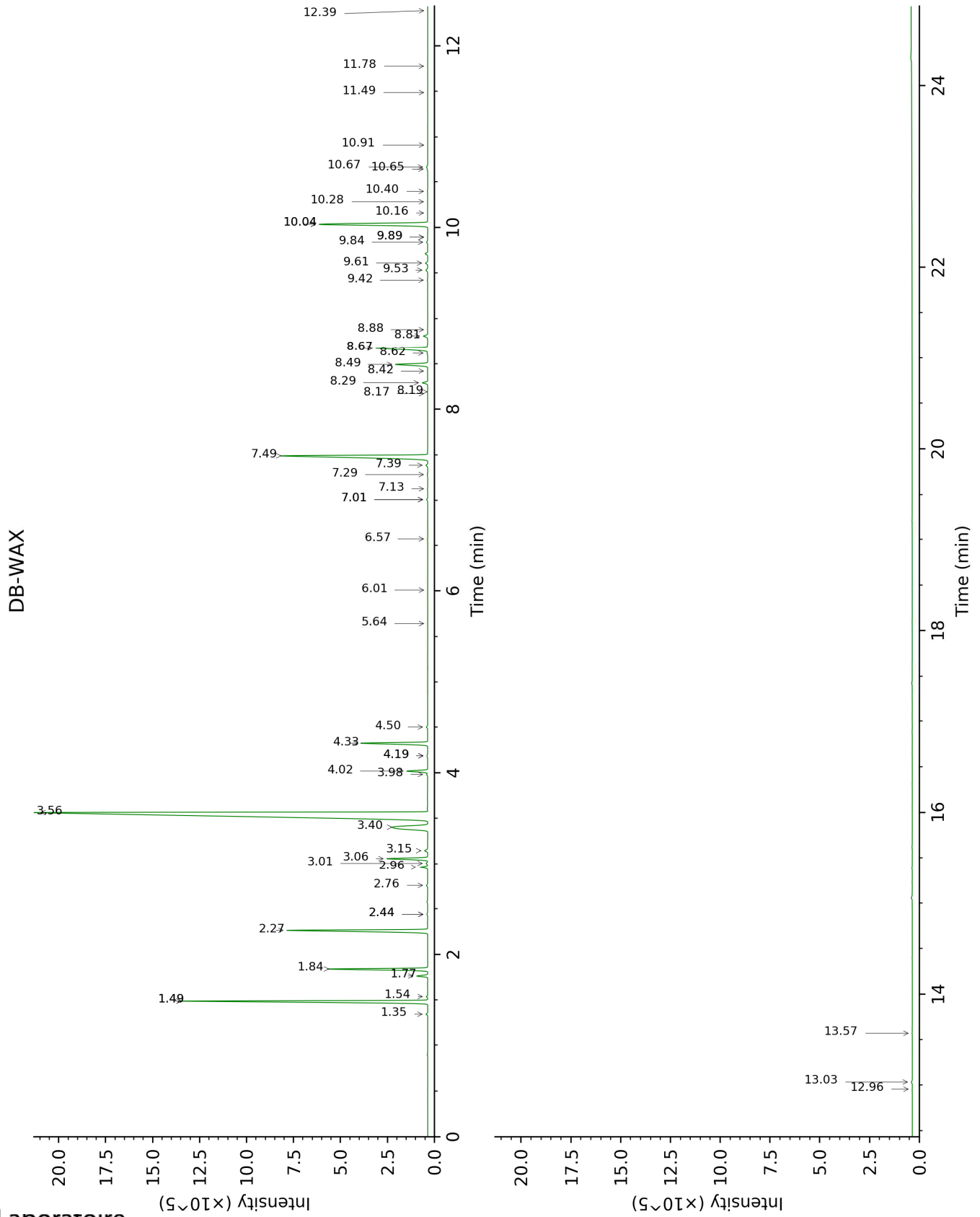
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
(3Z)-Hexenol	2.07	852	tr	6.01	1348	0.01
Hexanol	2.23	866	tr	5.64	1322	0.01
Hashishene	2.79	911	0.01	1.49*	997	11.13
Tricyclene	2.83	913	0.06	1.35	975	0.07
$\alpha$ -Thujene	2.95	921	0.05	1.54	1002	0.05
$\alpha$ -Pinene	3.04	927	11.11	1.49*	997	[11.13]
Camphene	3.22*	939	4.70	1.84	1031	4.27
$\alpha$ -Fenchene	3.22*	939	[4.70]	1.77	1024	0.45
Thuja-2,4(10)-diene	3.31	945	0.02	2.44*	1086	0.04
$\beta$ -Pinene	3.65*	968	6.98	2.27	1070	6.96
Sabinene	3.65*	968	[6.98]	2.44*	1086	[0.04]
Octen-3-ol	3.88*	983	0.06	7.01*	1421	0.05
Octan-3-one	3.88*	983	[0.06]	4.19*	1219	0.04
Myrcene	3.96	988	1.83	3.06	1135	1.84
$\alpha$ -Phellandrene	4.10*	997	0.44	2.96	1128	0.36
Pseudolimonene	4.10*	997	[0.44]	3.01	1131	0.07
$\Delta^3$ -Carene	4.18	1003	0.06	2.76	1112	0.05
$\alpha$ -Terpinene	4.30	1010	0.14	3.15	1142	0.15
1,8-Cineole	4.57*	1027	50.47	3.56	1173	43.58
Limonene	4.57*	1027	[50.47]	3.40	1161	3.66
para-Cymene	4.57*	1027	[50.47]	4.33	1229	3.15
(Z)- $\beta$ -Ocimene	4.71	1036	0.04	3.98	1204	0.04
(E)- $\beta$ -Ocimene	4.86	1045	0.02	4.19*	1219	[0.04]
$\gamma$ -Terpinene	4.98	1053	0.90	4.02	1207	0.93
cis-Sabinene hydrate	5.13	1062	0.01	7.13	1429	0.02
Terpinolene	5.43	1081	0.06	4.50	1241	0.06
para-Cymenene	5.46	1083	0.02	6.57	1388	0.01
trans-Sabinene hydrate	5.61	1093	0.01	8.19	1508	0.01
Linalool	5.72	1099	0.24	8.29	1516	0.24
endo-Fenchol	5.88	1109	0.03	8.62	1541	0.04
cis-para-Menth-2-en-1-ol	6.01	1118	0.02	8.42	1526	0.02
Camphor	6.28*	1135	9.85	7.49	1456	9.86
trans-Pinocarveol	6.28*	1135	[9.85]	9.42	1604	0.02
Camphene hydrate	6.35	1139	0.05	8.67*	1545	3.05
Isoborneol	6.51	1150	0.11	9.61	1619	0.11
Pinocarpone	6.54	1152	0.01	8.17	1507	0.01
Borneol	6.70	1162	4.92	10.04*	1653	6.51
Terpinen-4-ol	6.84	1171	0.21	8.81	1556	0.23
para-Cymen-8-ol	7.03	1183	0.01	11.78	1798	0.01
$\alpha$ -Terpineol	7.09	1187	1.73	10.04*	1653	[6.51]
Verbenone	7.27	1198	0.01	9.90*	1642	0.01
Bornyl acetate	8.46	1278	1.68	8.49	1532	1.67



$\alpha$ -Cubebene	9.38	1341	0.01	7.01*	1421	[0.05]
$\alpha$ -Ylangene	9.66	1361	0.03	7.28	1441	0.03
$\alpha$ -Copaene	9.73	1366	0.09	7.39	1448	0.09
Methyleugenol	10.22	1400	0.02	13.57	1959	0.01
$\beta$ -Caryophyllene	10.32	1408	3.08	8.67*	1545	[3.05]
Aromadendrene	10.58	1426	0.02	8.88	1561	0.02
$\alpha$ -Humulene	10.77	1441	0.10	9.53	1612	0.10
$\gamma$ -Muuroolene	11.12	1467	0.06	9.84	1637	0.06
$\alpha$ -Amorphene	11.16	1470	0.01	9.90*	1642	[0.01]
$\beta$ -Selinene	11.22	1474	0.01	10.16	1663	0.01
$\alpha$ -Muuroolene	11.44	1491	0.02	10.28	1673	0.02
$\beta$ -Bisabolene	11.58†	1501	0.06	10.40	1682	0.02
$\gamma$ -Cadinene	11.60†	1503	[0.06]	10.65	1703	0.03
$\delta$ -Cadinene	11.74*	1514	0.08	10.67	1705	0.06
<i>trans</i> - Calamenene	11.74*	1514	[0.08]	11.49	1773	0.01
<i>trans</i> -Cadina- 1,4-diene	11.84	1521	0.01	10.91	1725	0.01
$\alpha$ -Calacorene	11.96	1531	0.01	12.39	1852	0.01
Caryophyllene oxide	12.44*	1568	0.06	13.03	1910	0.05
Caryophyllene oxide isomer	12.44*	1568	[0.06]	12.96	1902	0.01
<b>Total identified</b>	<b>99.50%</b>			<b>99.32%</b>		
<b>Total reported</b>	<b>99.50%</b>			<b>99.32%</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