

**Date :** July 30, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 19G29-PTH01-1-SCC

**Customer identification :** Saro - Madagascar - SZ010193R

**Type :** Essential oil

**Source :** *Cinnamosma fragrans*

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

**Analysis date :** July 29, 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:** Clear liquid

**Refractive index:**  $1.4671 \pm 0.0003$  (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
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Methyl isovalerate	tr	Aliphatic ester
Ethyl isovalerate	tr	Aliphatic ester
(3Z)-Hexenol	0.01	Aliphatic alcohol
(2E)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Isoamyl acetate	0.01	Aliphatic ester
$\alpha$ -Thujene	0.36	Monoterpene
$\alpha$ -Pinene	3.75	Monoterpene
Camphene	0.07	Monoterpene
$\alpha$ -Fenchene	0.01	Monoterpene
$\beta$ -Pinene	5.88	Monoterpene
Sabinene	7.88	Monoterpene
Myrcene	2.47	Monoterpene
Pseudolimonene	0.16	Monoterpene
$\alpha$ -Phellandrene	0.08	Monoterpene
$\Delta^3$ -Carene	0.01	Monoterpene
$\alpha$ -Terpinene	0.67	Monoterpene
para-Cymene	0.40	Monoterpene
Limonene	14.43	Monoterpene
1,8-Cineole	41.44	Monoterpenic ether
(Z)- $\beta$ -Ocimene	1.07	Monoterpene
(E)- $\beta$ -Ocimene	0.88	Monoterpene
$\gamma$ -Terpinene	1.30	Monoterpene
cis-Sabinene hydrate	0.05	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	0.35	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	7.04	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.10	Monoterpenic alcohol
allo-Ocimene	0.03	Monoterpene
cis-Limonene oxide	0.01	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.06	Monoterpenic alcohol
Epoxyterpinolene	0.01	Monoterpenic ether
Unknown	0.01	Unknown
Prenyl isovalerate	0.02	Aliphatic ester
Borneol	0.02	Monoterpenic alcohol
$\delta$ -Terpineol	0.26	Monoterpenic alcohol
Terpinen-4-ol	2.26	Monoterpenic alcohol
Cryptone	0.02	Normoterpenic ketone

para-Cymen-8-ol	0.02	Monoterpenic alcohol
$\alpha$ -Terpineol	1.94	Monoterpenic alcohol
cis-Piperitol	0.03	Monoterpenic alcohol
trans-Isopiperitenol	0.01	Monoterpenic alcohol
trans-Piperitol	0.03	Monoterpenic alcohol
trans-Carveol	0.01	Monoterpenic alcohol
Nerol	0.04	Monoterpenic alcohol
cis-Carveol	0.02	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Neral	0.03	Monoterpenic aldehyde
Carvone	0.03	Monoterpenic ketone
Geraniol	0.04	Monoterpenic alcohol
Linalyl acetate	0.05	Monoterpenic ester
Geranial	0.08	Monoterpenic aldehyde
Bornyl acetate	0.05	Monoterpenic ester
Terpinen-4-yl acetate	0.01	Monoterpenic ester
$\delta$ -Terpinyl acetate	0.12	Monoterpenic ester
Unknown	0.01	Unknown
exo-2-Hydroxycineole acetate	0.06	Monoterpenic ester
$\alpha$ -Terpinyl acetate	1.00	Monoterpenic ester
$\alpha$ -Cubebene	0.15	Sesquiterpene
Geranic acid	0.81	Aliphatic acid
$\alpha$ -Copaene	0.09	Sesquiterpene
Geranyl acetate	0.04	Monoterpenic ester
$\beta$ -Cubebene	0.04	Sesquiterpene
$\beta$ -Elemene	0.06	Sesquiterpene
$\beta$ -Caryophyllene	1.15	Sesquiterpene
trans- $\alpha$ -Bergamotene	0.03	Sesquiterpene
$\alpha$ -Humulene	0.40	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.05	Sesquiterpene
Germacrene D	0.16	Sesquiterpene
$\gamma$ -Muurolene	0.03	Sesquiterpene
$\beta$ -Selinene	0.06	Sesquiterpene
trans-Muurola-4(15),5-diene	0.10	Sesquiterpene
epi-Cubebol	0.08	Sesquiterpenic alcohol
$\alpha$ -Muurolene	0.01	Sesquiterpene
$\gamma$ -Cadinene	0.04	Sesquiterpene
Cubebol	0.03	Sesquiterpenic alcohol
(3E,6E)- $\alpha$ -Farnesene	0.02	Sesquiterpene
trans-Calamenene	0.10	Sesquiterpene
$\delta$ -Cadinene	0.26	Sesquiterpene
trans-Cadina-1,4-diene	0.05	Sesquiterpene
Isocaryophyllene epoxide B	0.03	Sesquiterpenic ether
$\alpha$ -Elemol	0.04	Sesquiterpenic alcohol
(E)-Nerolidol	0.05	Sesquiterpenic alcohol
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.20	Sesquiterpenic ether
(3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	0.02	Terpene derivative
10-epi- $\gamma$ -Eudesmol	0.02	Sesquiterpenic alcohol
1,10-diepi-Cubenol	0.04	Sesquiterpenic alcohol

Caryophylladienol II	0.01	Sesquiterpenic alcohol
Cubenol	0.05	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.03	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.04	Sesquiterpenic alcohol
Neryl acetate	0.06	Monoterpenic ester
<b>Consolidated total</b>	<b>99.24%</b>	

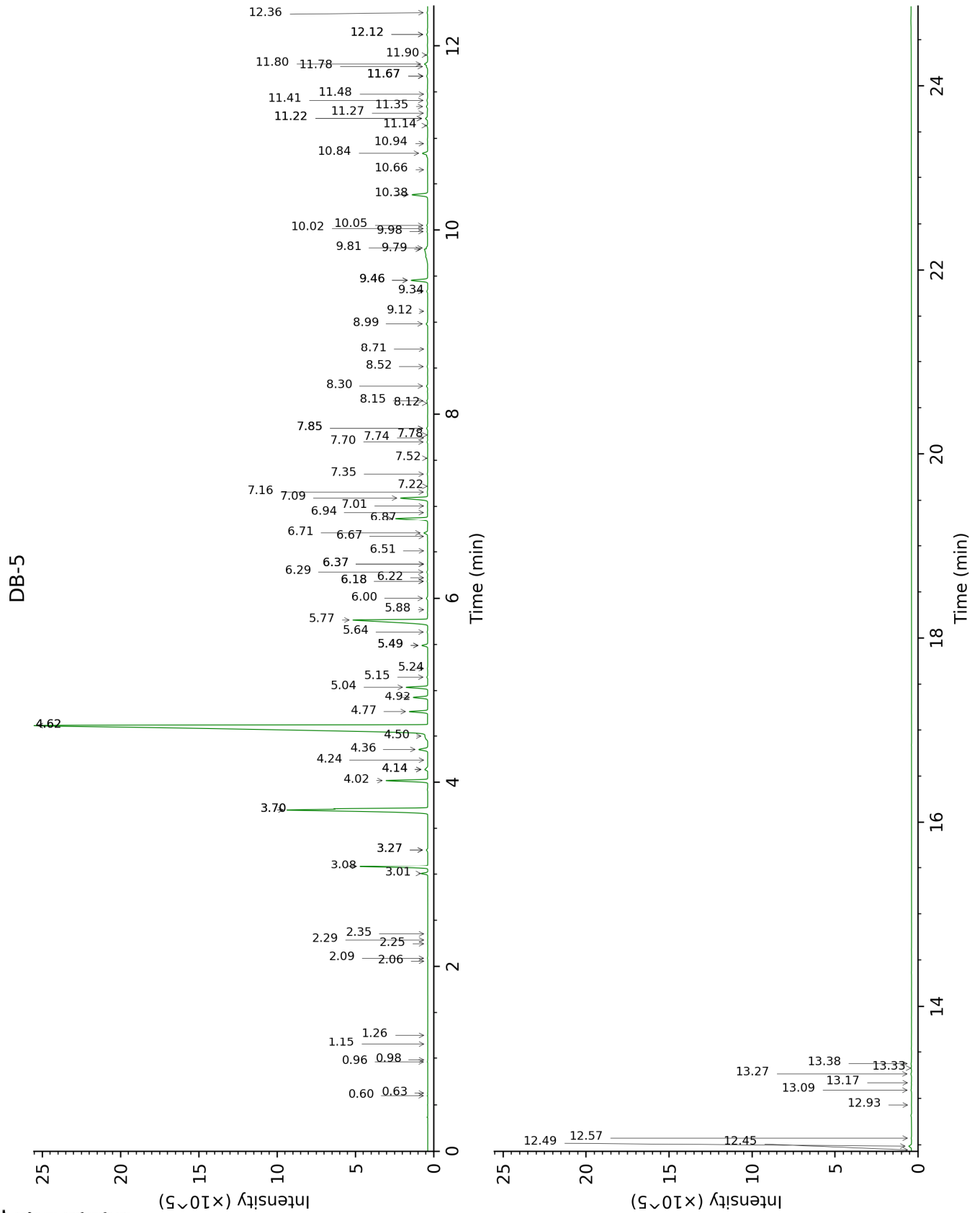
tr: The compound has been detected below 0.005% of total signal.

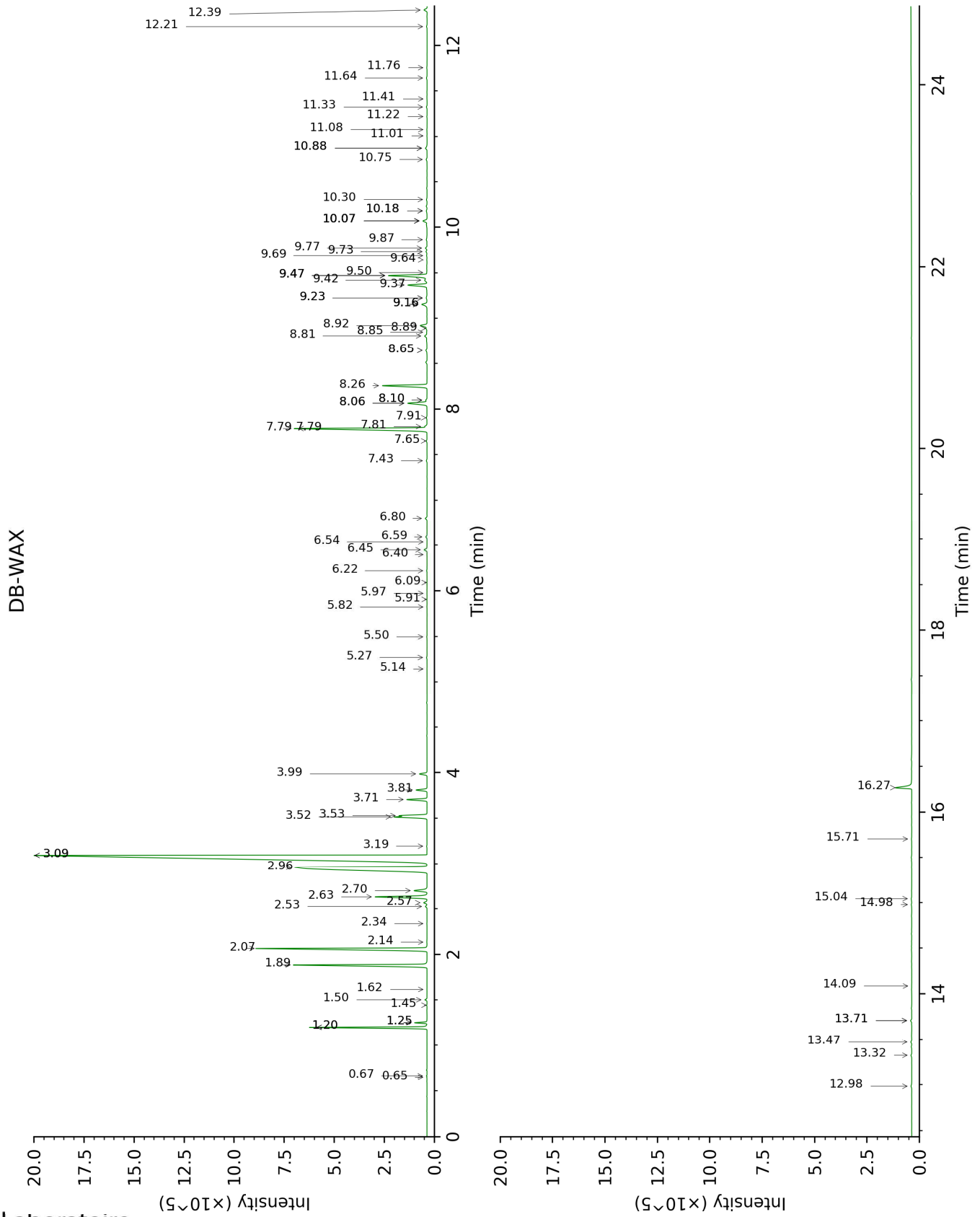
Note: no correction factor was applied

**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.







FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.60	640	0.01	0.66	888	0.01
2-Methylbutyral	0.63	651	tr	0.65	882	tr
Isoamyl alcohol	0.96	734	0.01	3.20	1181	0.02
2-Methylbutanol	0.98	737	tr	3.09*	1173	41.45
Toluene	1.15	761	tr	1.25*	1001	0.37
Methyl isovalerate	1.26	775	tr	1.20*	993	3.79
Ethyl isovalerate	2.06	853	tr	1.62	1039	tr
(3Z)-Hexenol	2.09	855	0.01	5.50	1351	0.02
(2E)-Hexenol	2.25	868	0.01	5.82	1375	0.01
Hexanol	2.29	872	0.01	5.14	1326	tr
Isoamyl acetate	2.35	877	0.01	2.14	1094	0.01
α-Thujene	3.01	925	0.36	1.25*	1001	[0.37]
α-Pinene	3.08	930	3.75	1.20*	993	[3.79]
Camphene	3.27*	942	0.09	1.50	1027	0.07
α-Fenchene	3.27*	942	[0.09]	1.44	1021	0.01
β-Pinene	3.70*	971	13.67	1.89	1067	5.88
Sabinene	3.70*	971	[13.67]	2.07	1086	7.88
Myrcene	4.02	992	2.47	2.63	1135	2.48
Pseudolimonene	4.14*	1000	0.24	2.57	1130	0.16
α-Phellandrene	4.14*	1000	[0.24]	2.53	1126	0.08
Δ3-Carene	4.24	1006	0.01	2.34	1111	0.01
α-Terpinene	4.36	1014	0.67	2.70	1141	0.67
para-Cymene	4.50	1023	0.40	3.81	1229	0.48
Limonene	4.62*	1030	55.90	2.96	1162	14.43
1,8-Cineole	4.62*	1030	[55.90]	3.09*	1173	[41.45]
(Z)-β-Ocimene	4.77	1039	1.07	3.53	1208	0.95
(E)-β-Ocimene	4.92	1049	0.88	3.71	1221	0.87
γ-Terpinene	5.04	1056	1.30	3.52	1206	1.39
cis-Sabinene hydrate	5.15	1063	0.05	6.59	1432	0.06
cis-Linalool oxide (fur.)	5.24	1069	0.02	6.22	1404	0.02
Terpinolene	5.49*	1085	0.36	3.99	1242	0.35
para-Cymenene	5.49*	1085	[0.36]	5.97	1386	0.01
trans-Sabinene hydrate	5.64	1094	0.04	7.65	1511	0.04
Linalool	5.77	1103	7.04	7.79*†	1522	7.05
endo-Fenchol	5.88	1110	0.01	8.06*†	1543	1.16
cis-para-Menth-2- en-1-ol	6.00	1118	0.10	7.81†	1523	[7.05]
allo-Ocimene	6.18*	1130	0.03	5.27	1335	0.03
cis-Limonene oxide	6.18*	1130	[0.03]	6.09	1394	0.01
cis-para-Mentha- 2,8-dien-1-ol	6.22	1132	0.03	9.16*	1629	0.32
trans-para-Menth- 2-en-1-ol	6.28	1136	0.06	8.65*	1588	0.07

Epoxyterpinolene	6.37*	1142	0.02	6.40	1417	0.01
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.37*	1142	[0.02]	6.54	1427	0.01
Prenyl isovalerate	6.51	1151	0.02	5.91	1381	0.01
Borneol	6.67	1162	0.02	9.47*	1655	2.00
δ-Terpineol	6.71	1164	0.26	9.16*	1629	[0.32]
Terpinen-4-ol	6.87	1175	2.26	8.26	1558	2.19
Cryptone	6.94	1179	0.02	8.85	1605	0.02
para-Cymen-8-ol	7.01	1184	0.02	11.22	1802	0.02
α-Terpineol	7.09	1189	1.94	9.47*	1655	[2.00]
cis-Piperitol	7.16	1194	0.03	9.23*	1635	0.06
trans-Isopiperitenol	7.22	1198	0.01	10.07*†	1704	0.29
trans-Piperitol	7.35	1206	0.03	10.07*†	1704	[0.29]
trans-Carveol	7.52	1218	0.01	11.08	1790	0.01
Nerol	7.70	1230	0.04	10.75	1762	0.06
cis-Carveol	7.74	1233	0.02	11.42	1819	0.01
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.78	1236	0.02	11.01	1784	0.01
Neral	7.85*	1240	0.08	9.16*	1629	[0.32]
Carvone	7.85*	1240	[0.08]	9.69	1673	0.03
Geraniol	8.12†	1259	0.09	11.33	1811	0.04
Linalyl acetate	8.15†	1261	[0.09]	7.79*†	1522	[7.05]
Geranial	8.30	1272	0.08	9.77	1680	0.08
Bornyl acetate	8.52	1287	0.05	7.91	1531	0.03
Terpinen-4-yl acetate	8.70	1300	0.01			
δ-Terpinyl acetate	8.99	1314	0.12	8.81	1601	0.16
Unknown [m/z 69, 41 (58), 114 (29), 43 (25), 83 (24), 123 (20)...]	9.12	1324	0.01			
exo-2-Hydroxycineole acetate	9.34	1339	0.06	9.73	1676	0.05
α-Terpinyl acetate	9.46*	1348	1.15	9.37	1647	1.00
α-Cubebene	9.46*	1348	[1.15]	6.45	1421	0.15
Geranic acid	9.79	1372	0.81	16.27	2287	0.95
α-Copaene	9.81	1372	0.09	6.80	1447	0.09
Geranyl acetate	9.98	1385	0.04	10.18*	1713	0.05
β-Cubebene	10.02	1387	0.04	7.44	1494	0.04
β-Elemene	10.05	1390	0.06	8.10*†	1546	[1.16]
β-Caryophyllene	10.38	1414	1.15	8.06*†	1543	[1.16]
trans-α-Bergamotene	10.66	1434	0.03	8.10*†	1546	[1.16]
α-Humulene	10.84	1448	0.40	8.92	1611	0.37
allo-Aromadendrene	10.94	1456	0.02	8.65*	1588	[0.07]

<i>trans</i> -Cadina-1(6),4-diene	11.14	1470	0.05	8.89	1608	0.04
Germacrene D	11.22*	1476	0.20	9.42	1651	0.16
$\gamma$ -Muurolene	11.22*	1476	[0.20]	9.23*	1635	[0.06]
$\beta$ -Selinene	11.27	1480	0.06	9.50	1658	0.02
<i>trans</i> -Muurola-4(15),5-diene	11.34	1486	0.10	9.47*	1655	[2.00]
epi-Cubebol	11.41	1491	0.08	11.64	1840	0.04
$\alpha$ -Muurolene	11.48	1496	0.01	9.64	1669	0.01
$\gamma$ -Cadinene	11.67*	1510	0.10	10.07*†	1704	[0.29]
Cubebol	11.67*	1510	[0.10]	12.21	1890	0.03
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	11.67*	1510	[0.10]	10.18*	1713	[0.05]
<i>trans</i> -Calamenene	11.78	1519	0.10	10.88*	1772	0.11
$\delta$ -Cadinene	11.80	1521	0.26	10.07*†	1704	[0.29]
<i>trans</i> -Cadina-1,4-diene	11.90	1528	0.05	10.30	1724	0.03
Isocaryophyllene epoxide B	12.12*	1546	0.08	11.76	1850	0.03
$\alpha$ -Elemol	12.12*	1546	[0.08]	13.71*	2029	0.06
( <i>E</i> )-Nerolidol	12.36	1565	0.05	13.47	2006	0.05
Spathulenol	12.45	1571	0.01	14.09	2066	0.01
Caryophyllene oxide	12.49	1575	0.20	12.39	1906	0.18
(3 <i>E</i> ,7 <i>E</i> )-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	12.58	1582	0.02	10.88*	1772	[0.11]
10-epi- $\gamma$ -Eudesmol	12.93	1610	0.02	13.71*	2029	[0.06]
1,10-diepi-Cubenol	13.09	1623	0.04	12.98	1961	0.05
Caryophylladienol II	13.17	1630	0.01	15.71	2228	0.02
Cubenol	13.26	1637	0.05	13.32	1992	0.04
$\beta$ -Eudesmol	13.33	1643	0.03	15.04	2161	0.04
$\alpha$ -Eudesmol	13.38	1647	0.04	14.98	2154	0.03
Neryl acetate				9.86	1687	0.06
<b>Total identified</b>		<b>99.16%</b>			<b>98.90%</b>	
<b>Total reported</b>		<b>99.19%</b>			<b>98.92%</b>	

\*: 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