

Date : 2023-10-19

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 23J12-PTH01

**Customer Identification :** Bergamot - Italy - B30113R

**Type :** Essential Oil

**Source :** *Citrus aurantium var. bergamia*

**Customer :** Plant Therapy

Checked and approved by:

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Alexis St-Gelais, Ph. D., Chimiste 2013-174

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## GAS CHROMATOGRAPHIC ANALYSIS

**Method :** PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

**\*ISO**

**Results :** See analysis summary (next page)

**Analyst :** Sylvain Mercier, M. Sc., Chimiste 2014-005

**Date :** 2023-10-16

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4646 \pm 0.0003$  (20 °C)

**Method :** PC-MAT-016 - Measure of the refractive index of a liquid.

**Analyst :** Cindy Caron B. Sc.

**Date :** 2023-10-12

## 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	%	Class
$\alpha$ -Thujene	0.02	Monoterpene
$\alpha$ -Pinene	1.33	Monoterpene
$\alpha$ -Fenchene	tr	Monoterpene
Camphene	0.02	Monoterpene
Sabinene	1.01	Monoterpene
$\beta$ -Pinene	6.55	Monoterpene
Myrcene	0.92	Monoterpene
$\alpha$ -Phellandrene	0.02	Monoterpene
Octanal	0.05	Aliphatic aldehyde
$\Delta^3$ -Carene	0.07	Monoterpene
$\alpha$ -Terpinene	0.01	Monoterpene
<i>para</i> -Cymene	0.34	Monoterpene
1,8-Cineole	tr	Monoterpenic ether
Limonene	41.43	Monoterpene
$\beta$ -Phellandrene	0.12	Monoterpene
( <i>Z</i> )- $\beta$ -Ocimene	0.10	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.20	Monoterpene
$\gamma$ -Terpinene	6.89	Monoterpene
<i>cis</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.02	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Linalool	12.27	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	tr	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.02	Monoterpenic ether
<i>trans</i> -Limonene oxide	0.01	Monoterpenic ether
Camphor	0.02	Monoterpenic ketone
Borneol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.15	Monoterpenic alcohol
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Neral	0.26	Monoterpenic aldehyde
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	0.09	Monoterpenic ester
Linalyl acetate	25.64	Monoterpenic ester
Geranial	0.47	Monoterpenic aldehyde
Bornyl acetate	0.02	Monoterpenic ester

Hodiendiol derivative	0.01	Oxygenated monoterpene
$\alpha$ -Terpinyl acetate	0.09	Monoterpenic ester
Unknown	0.02	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.27	Monoterpenic ester
Geranyl acetate	0.20	Monoterpenic ester
$\beta$ -Caryophyllene	0.24	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.19	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.01	Sesquiterpene
$\beta$ -Bisabolene	0.46	Sesquiterpene
$\beta$ -Sesquiphellandrene	0.03	Sesquiterpene
( <i>E</i> )- $\alpha$ -Bisabolene	0.01	Sesquiterpene
<b>Consolidated total</b>	<b>99.71</b>	

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

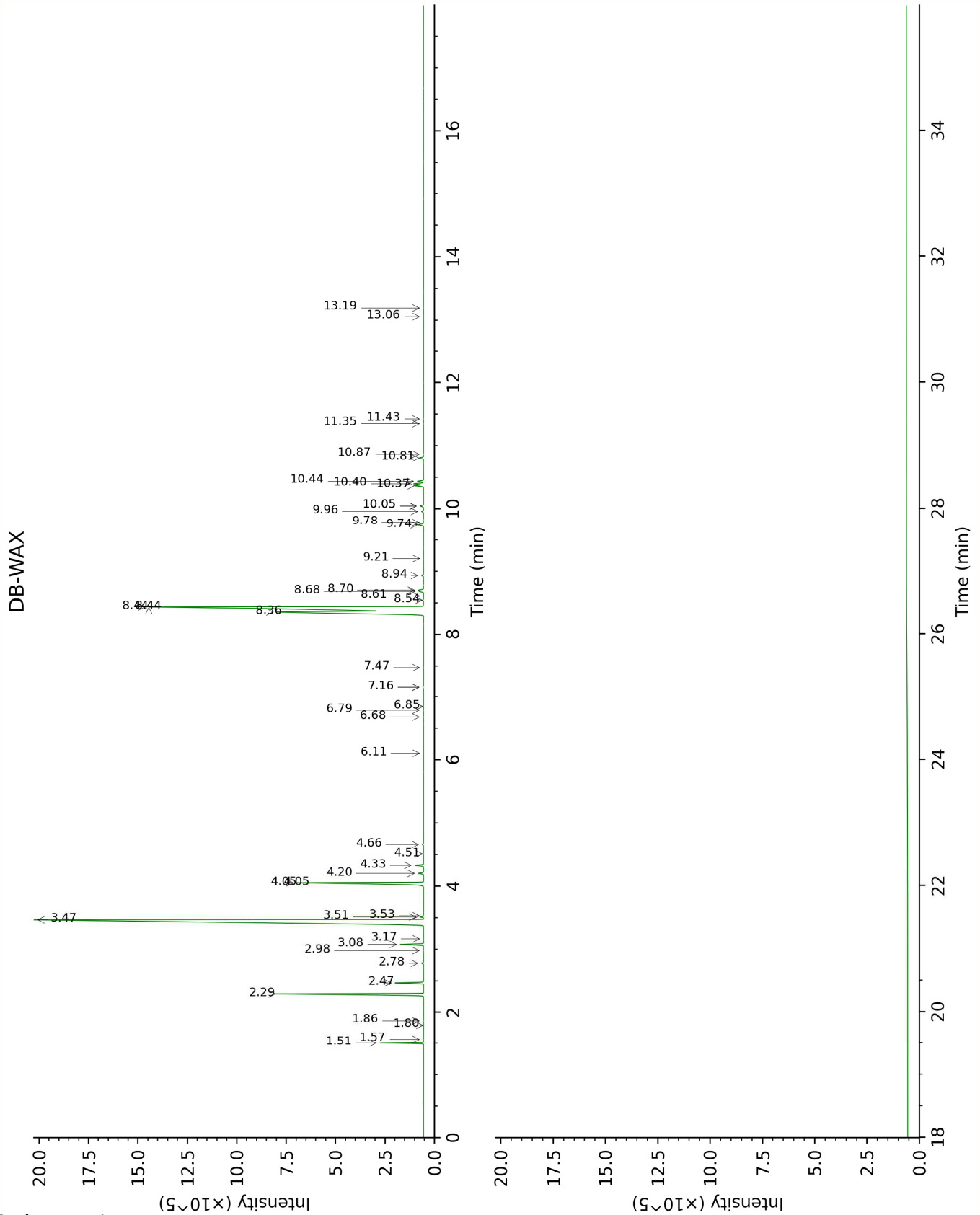
Note: no correction factor was applied

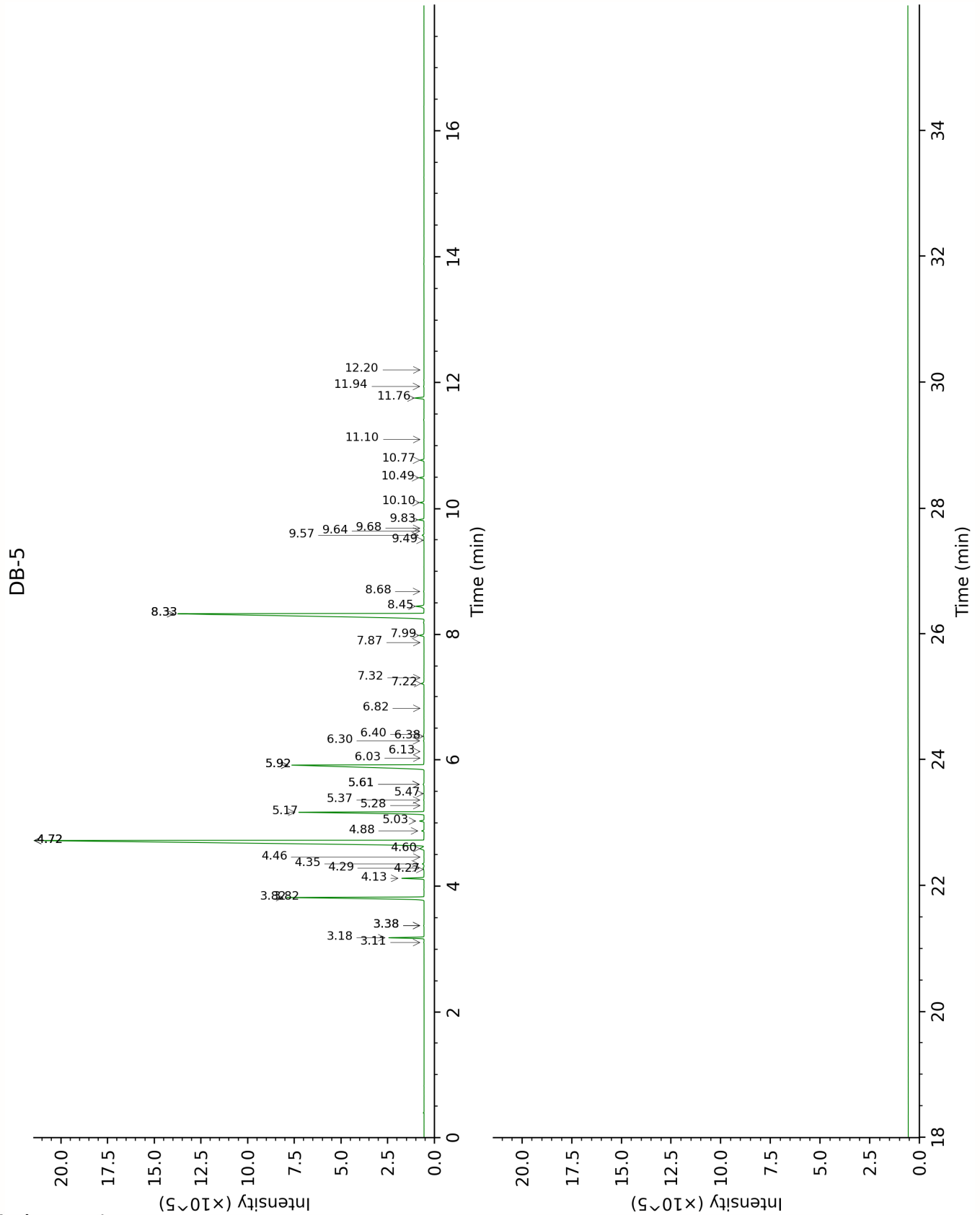
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

**Bracketed value (xx):** A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

<b><math>\alpha</math>-Thujene</b>	<b>Column DB-WAX</b>			<b>Column DB-5</b>		
	1.57	1001.6	0.01	3.11	927.1	0.02
$\alpha$ -Pinene	1.51	994.0	1.33	3.18	932.0	1.33
$\alpha$ -Fenchene	1.80	1022.8	tr	3.38*	944.7	[0.02]
Camphene	1.86	1029.3	0.02	3.38*	944.7	[0.02]
Sabinene	2.47	1086.2	1.01	3.82*	973.8	[7.56]
$\beta$ -Pinene	2.29	1069.8	6.55	3.82*	973.8	[7.56]
Myrcene	3.08	1134.5	0.93	4.13	993.9	0.92
$\alpha$ -Phellandrene	2.98	1127.1	0.02	4.27	1003.0	0.02
Octanal	4.66	1250.3	0.06	4.29	1004.4	0.05
$\Delta$ 3-Carene	2.78	1111.9	0.07	4.35	1008.7	0.07
$\alpha$ -Terpinene	3.17	1141.2	0.01	4.46	1015.4	0.01
<i>para</i> -Cymene	4.33	1227.0	0.34	4.60	1023.7	0.34
1,8-Cineole	3.53	1168.7	tr	4.72*	1031.7	[41.60]
Limonene	3.47	1163.9	41.43	4.72*	1031.7	[41.60]
$\beta$ -Phellandrene	3.51	1167.3	0.12	4.72*	1031.7	[41.60]
( <i>Z</i> )- $\beta$ -Ocimene	4.06*	1207.5	[6.99]	4.88	1041.2	0.10
( <i>E</i> )- $\beta$ -Ocimene	4.20	1218.0	0.20	5.03	1051.0	0.20
$\gamma$ -Terpinene	4.06*	1207.5	[6.99]	5.17	1059.7	6.89
<i>cis</i> -Sabinene hydrate	7.16*	1431.8	[0.04]	5.28	1066.3	0.01
<i>cis</i> -Linalool oxide (fur.)	6.79	1404.4	0.02	5.37	1071.8	0.02
Octanol	8.44*†	1526.4	[24.83]	5.47	1078.1	0.01
Terpinolene	4.51	1239.8	0.02	5.61*	1087.2	[0.05]
<i>trans</i> -Linalool oxide (fur.)	7.16*	1431.8	[0.04]	5.61*	1087.2	[0.05]
Nonanal	6.11	1355.8	0.01	5.92*	1106.3	[12.28]
Linalool	8.36*†	1520.4	[13.14]	5.92*	1106.3	[12.28]
endo-Fenchol	8.61	1539.7	0.01	6.03	1113.3	0.01
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.21	1585.3	0.01	6.14	1120.0	tr
<i>cis</i> -Limonene oxide	6.68	1396.4	0.02	6.30	1130.7	0.02
<i>trans</i> -Limonene oxide	6.85	1408.7	0.01	6.38	1135.3	0.01
Camphor	7.48	1454.6	0.01	6.40	1137.2	0.02
Borneol	10.05*	1652.3	[0.16]	6.82	1163.6	0.01
$\alpha$ -Terpineol	10.05*	1652.3	[0.16]	7.22	1189.3	0.15
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	13.06	1909.0	0.01	7.32	1195.1	0.01
Nerol	11.35	1760.0	0.01	7.87	1231.9	0.01
Neral	9.74	1627.7	0.27	7.99	1239.4	0.26
( <i>trans</i> ?) -Linalool	8.94	1564.6	0.09	8.33*	1262.3	[25.73]



oxide acetate (fur.)?						
Linalyl acetate	8.44*†	1526.4	[24.83]	8.33*	1262.3	[25.73]
Geranial	10.40	1680.6	0.46	8.45	1270.2	0.47
Bornyl acetate	8.54	1534.6	0.04	8.68	1285.8	0.02
Hodiendiol derivative	13.19	1921.7	0.01	9.49	1341.9	0.01
α-Terpinyl acetate	9.96	1645.4	0.10	9.57	1347.5	0.09
Unknown MISC VII [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]				9.64	1352.1	0.02
Unknown SASC III [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	11.43	1766.3	0.02	9.68	1355.3	0.02
Neryl acetate	10.44	1683.8	0.28	9.83	1365.6	0.27
Geranyl acetate	10.81	1714.3	0.21	10.10	1384.7	0.20
β-Caryophyllene	8.70*†	1546.8	[0.22]	10.50	1412.9	0.24
<i>trans</i> -α-Bergamotene	8.68*†	1545.3	[0.20]	10.77	1433.6	0.19
( <i>E</i> )-β-Farnesene	9.78	1630.9	0.01	11.10	1457.9	0.01
β-Bisabolene	10.37	1678.2	0.39	11.76	1506.8	0.46
β-Sesquiphellandrene	10.87	1719.4	0.02	11.94	1521.2	0.03
( <i>E</i> )-α-Bisabolene				12.20	1541.7	0.01
Total reported		99.68%			99.78%	

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

[xx]: Duplicate percentage due to coelutions, only the first one is 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