

Date : 2023-09-28

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 23I21-PTH01

**Customer Identification** : Organic Spearmint - India - S40107R

**Type** : Essential Oil

**Source** : *Mentha spicata*

**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 :** Benoit Roger, Ph. D.

**Date :** 2023-09-28

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.489 \pm 0.0003$  (20 °C)

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

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

**Date :** 2023-09-22

## 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
(3Z)-Hexenol	0.03	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.05	Furan
Hashishene	0.06	Monoterpene
$\alpha$ -Thujene	0.03	Monoterpene
$\alpha$ -Pinene	0.89	Monoterpene
Camphene	0.03	Monoterpene
3-Methylcyclohexanone	0.08	Aliphatic ketone
Sabinene	0.47	Monoterpene
$\beta$ -Pinene	1.01	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Octan-3-one	0.04	Aliphatic ketone
Myrcene	1.53	Monoterpene
Octan-3-ol	0.26	Aliphatic alcohol
$\alpha$ -Phellandrene	0.03	Monoterpene
$\alpha$ -Terpinene	0.04	Monoterpene
Carvomenthene	0.12	Aliphatic alcohol
<i>para</i> -Cymene	0.32	Monoterpene
1,8-Cineole	1.75	Monoterpenic ether
Limonene	20.78	Monoterpene
2-Ethylhexanol	0.10	Aliphatic alcohol
(Z)- $\beta$ -Ocimene	0.04	Monoterpene
(E)- $\beta$ -Ocimene	0.03	Monoterpene
$\gamma$ -Terpinene	0.08	Monoterpene
<i>cis</i> -Sabinene hydrate	0.12	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
<i>para</i> -Cymenene	0.03	Monoterpene
Terpinolene	0.04	Monoterpene
<i>trans</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.05	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.04	Monoterpenic alcohol
Octan-3-yl acetate	0.05	Aliphatic ester
<i>cis-para</i> -Mentha-2,8-dien-1-ol	0.08	Monoterpenic alcohol
Isopulegol	0.02	Monoterpenic alcohol
Menthone	0.10	Monoterpenic ketone
Isomenthone	0.06	Monoterpenic ketone
neo-Menthol	0.07	Monoterpenic alcohol
Menthol	0.62	Monoterpenic alcohol
Terpinen-4-ol	0.27	Monoterpenic alcohol
$\alpha$ -Terpineol	0.27	Monoterpenic alcohol

<i>cis</i> -Dihydrocarvone	1.60	Monoterpenic ketone
Dihydrocarveol	0.19	Monoterpenic alcohol
neo-Dihydrocarveol	0.21	Monoterpenic alcohol
<i>trans</i> -Dihydrocarvone	0.34	Monoterpenic ketone
iso-Dihydrocarveol ?	0.02	Monoterpenic alcohol
<i>trans</i> -Carveol	0.29	Monoterpenic alcohol
Pulegone	0.06	Monoterpenic ketone
Carvone	60.37	Monoterpenic ketone
<i>cis</i> -Carveol	0.18	Monoterpenic alcohol
Piperitone	0.65	Monoterpenic ketone
Isopiperitenone	0.04	Monoterpenic ketone
<i>trans</i> -Carvone oxide	0.05	Monoterpenic ketone
Decanol	0.50	Aliphatic alcohol
Dihydroedulan I	0.02	Terpenic ether
Menthyl acetate	0.18	Monoterpenic ester
Isomenthyl acetate	0.06	Monoterpenic alcohol
Dihydrocarvyl acetate	0.07	Monoterpenic ester
Bicycloelemene	0.07	Sesquiterpene
iso-Dihydrocarvyl acetate	0.02	Monoterpenic ester
<i>cis</i> -Carvyl acetate	0.09	Monoterpenic ester
$\alpha$ -Copaene	0.15	Sesquiterpene
$\beta$ -Bourbonene	1.24	Sesquiterpene
1,5-diepi- $\beta$ -Bourbonene	0.10	Sesquiterpene
$\beta$ -Elemene	0.20	Sesquiterpene
( <i>Z</i> )-Jasmone	0.10	Jasmonate
Unknown	0.03	Sesquiterpene
$\beta$ -Ylangene	0.20	Sesquiterpene
$\beta$ -Caryophyllene	1.22	Sesquiterpene
$\beta$ -Copaene	0.08	Sesquiterpene
Isogermaacrene D	0.06	Sesquiterpene
$\alpha$ -Humulene	0.04	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.22	Sesquiterpene
Unknown	0.05	Sesquiterpene
Germaacrene D	0.22	Sesquiterpene
$\alpha$ -Muurolene	0.02	Sesquiterpene
$\gamma$ -Cadinene	0.02	Sesquiterpene
$\delta$ -Cadinene	0.04	Sesquiterpene
Caryophyllene oxide	0.08	Sesquiterpenic ether
Viridiflorol	0.02	Sesquiterpenic alcohol
<b>Consolidated total</b>	<b>98.75</b>	

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

Note: no correction factor was applied

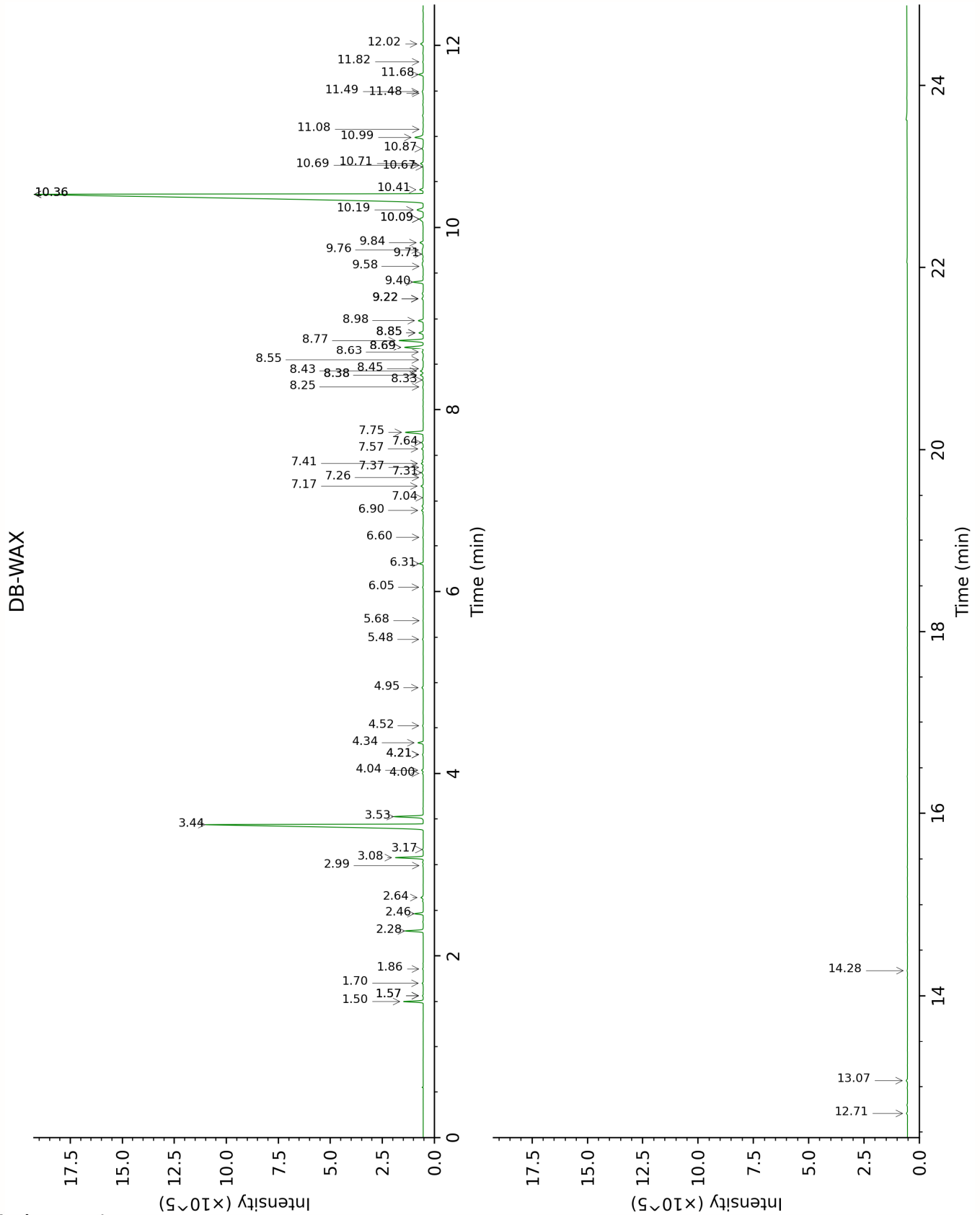
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

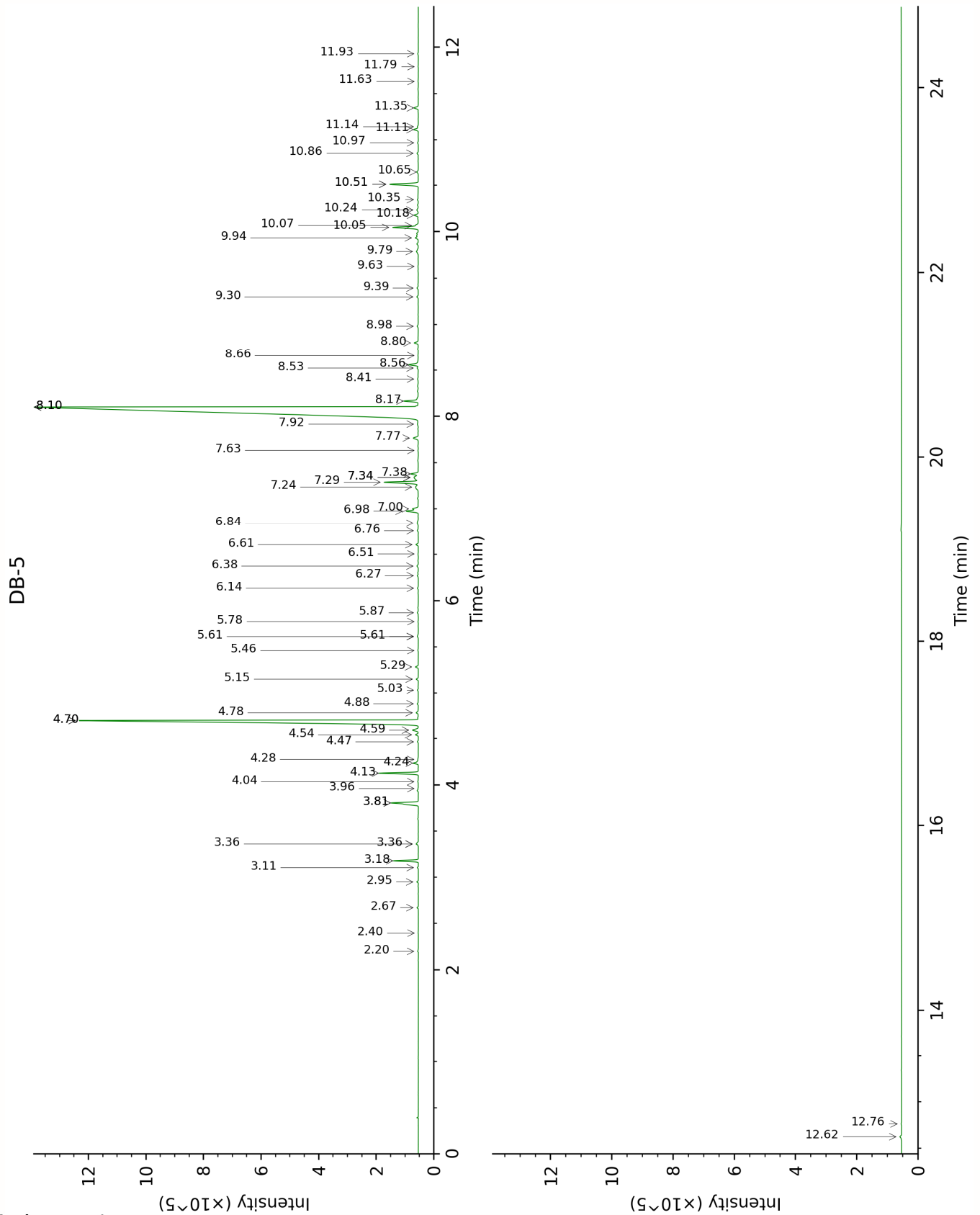
chromatograms in this report to access the full untreated data and perform their own calculations if needed.

**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

(3Z)-Hexenol	Column DB-WAX			Column DB-5		
	6.05	1347.6	0.04	2.20	857.9	0.03
Hexanol	5.68	1321.4	0.01	2.40	874.0	0.01
<i>trans</i> -2,5-Diethyltetrahydrofuran	1.70	1010.2	0.05	2.67	896.5	0.05
Hashishene	1.57*	997.4	[0.03]	2.95	916.4	0.06
$\alpha$ -Thujene	1.57*	997.4	[0.03]	3.11	926.6	0.03
$\alpha$ -Pinene	1.50	989.6	0.96	3.18	931.4	0.89
Camphene	1.86	1025.0	0.03	3.36*	943.3	[0.12]
3-Methylcyclohexanone	4.95	1271.3	0.08	3.36*	943.3	[0.12]
Sabinene	2.46	1082.2	0.47	3.81*	972.5	[1.51]
$\beta$ -Pinene	2.28	1064.3	1.01	3.81*	972.5	[1.51]
Octen-3-ol	7.04	1418.9	0.02	3.96	982.7	0.02
Octan-3-one	4.21*	1217.2	[0.05]	4.04	987.6	0.04
Myrcene	3.08	1131.5	1.53	4.13	993.6	1.53
Octan-3-ol	6.31	1366.0	0.22	4.24	1000.7	0.26
$\alpha$ -Phellandrene	2.99	1124.8	0.02	4.28	1003.4	0.03
$\alpha$ -Terpinene	3.17	1138.3	0.04	4.47	1015.3	0.04
Carvomenthene	2.64	1098.0	0.15	4.54	1020.0	0.12
<i>para</i> -Cymene	4.34	1226.6	0.31	4.59	1023.2	0.32
1,8-Cineole	3.53	1166.1	1.75	4.70*	1029.6	[22.60]
Limonene	3.44	1159.3	20.78	4.70*	1029.6	[22.60]
2-Ethylhexanol	7.57	1458.4	0.10	4.78	1034.9	0.10
( <i>Z</i> )- $\beta$ -Ocimene	4.00	1202.2	0.05	4.88	1040.9	0.04
( <i>E</i> )- $\beta$ -Ocimene	4.21*	1217.2	[0.05]	5.03	1050.6	0.03
$\gamma$ -Terpinene	4.04	1204.7	0.10	5.15	1058.0	0.08
<i>cis</i> -Sabinene hydrate	7.16	1428.4	0.14	5.28	1066.3	0.12
Octanol	8.45	1524.5	0.05	5.46	1077.3	0.02
<i>para</i> -Cymenene	6.60	1386.6	0.03	5.61*	1086.8	[0.06]
Terpinolene	4.52	1240.2	0.04	5.61*	1086.8	[0.06]
<i>trans</i> -Sabinene hydrate	8.25	1509.2	0.05	5.78	1096.8	0.02
Linalool	8.33	1515.0	0.04	5.87	1102.8	0.05
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.22*	1583.8	[0.10]	6.14	1119.6	0.04
Octan-3-yl acetate	5.48	1306.8	0.04	6.27	1128.3	0.05
<i>cis-para</i> -Mentha-2,8-dien-1-ol	9.76	1626.2	0.09	6.38	1134.8	0.08
Isopulegol	8.43	1522.5	0.19	6.51	1143.2	0.02
Menthone	6.90	1408.7	0.11	6.61	1149.6	0.10
Isomenthone	7.26	1435.3	0.04	6.76	1159.2	0.06
neo-Menthol	8.85*	1555.2	[0.30]	6.84	1164.7	0.07
Menthol	9.40	1598.1	0.65	6.98	1173.1	0.62

Terpinen-4-ol	8.85*	1555.2	[0.30]	7.00	1174.7	0.27
$\alpha$ -Terpineol	10.09*	1653.3	[0.39]	7.24	1189.7	0.27
<i>cis</i> -Dihydrocarvone	8.77	1548.7	1.59	7.29	1193.1	1.60
Dihydrocarveol	10.71	1703.1	0.19	7.34*	1196.3	[0.41]
neo-Dihydrocarveol	10.41	1679.0	0.21	7.34*	1196.3	[0.41]
<i>trans</i> -Dihydrocarvone	8.98	1565.4	0.33	7.38	1198.8	0.34
iso-Dihydrocarveol ?	11.08	1734.6	0.02	7.63	1215.4	0.02
<i>trans</i> -Carveol	11.68	1785.0	0.29	7.77	1224.4	0.29
Pulegone	9.22*	1583.8	[0.10]	7.92	1234.4	0.06
Carvone	10.36*	1674.9	[60.18]	8.10*	1246.7	[60.55]
<i>cis</i> -Carveol	12.02	1814.1	0.18	8.10*	1246.7	[60.55]
Piperitone	10.19	1661.4	0.54	8.17	1251.0	0.65
Isopiperitenone	11.48	1767.7	0.03	8.41	1266.9	0.04
<i>trans</i> -Carvone oxide	11.49	1769.3	0.08	8.52	1274.9	0.05
Decanol	10.99	1727.2	0.63	8.56	1277.3	0.50
Dihydroedulan I	7.37	1443.5	0.05	8.66	1283.9	0.02
Menthyl acetate	8.38*	1519.1	[0.20]	8.80	1293.4	0.18
Isomenthyl acetate	8.55	1532.0	0.05	8.98	1305.5	0.06
Dihydrocarvyl acetate	9.71	1622.6	0.08	9.30	1327.8	0.07
Bicycloelemene	7.31	1439.2	0.13	9.39	1334.4	0.07
iso-Dihydrocarvyl acetate				9.63	1350.8	0.02
<i>cis</i> -Carvyl acetate	10.87	1716.8	0.09	9.79	1362.2	0.09
$\alpha$ -Copaene	7.41	1446.6	0.13	9.94	1372.5	0.15
$\beta$ -Bourbonene	7.75	1471.8	1.21	10.05	1380.4	1.24
1,5-diepi- $\beta$ -Bourbonene	7.64	1463.5	0.12	10.07	1381.8	0.10
$\beta$ -Elemene	8.69*	1543.0	[1.42]	10.18	1389.6	0.20
( <i>Z</i> )-Jasmone	12.71	1874.4	0.06	10.24	1393.6	0.10
Unknown MEPI VIII [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	11.82	1796.9	0.03	10.35	1401.5	0.03
$\beta$ -Ylangene	8.38*	1519.1	[0.20]	10.51*	1413.6	[1.42]
$\beta$ -Caryophyllene	8.69*	1543.0	[1.42]	10.51*	1413.6	[1.42]
$\beta$ -Copaene	8.63	1538.6	0.09	10.65	1424.0	0.08
Isogermacrene D	9.22*	1583.8	[0.10]	10.86	1439.1	0.06
$\alpha$ -Humulene	9.58	1611.8	0.02	10.97	1447.5	0.04
( <i>E</i> )- $\beta$ -Farnesene	9.84	1632.6	0.22	11.11	1458.0	0.22
Unknown MISC XLIX [m/z 161, 105 (56), 91 (50), 93 (36), 119 (33), 79 (31)...204 (5)]				11.14	1460.4	0.05
Germacrene D	10.09*	1653.3	[0.39]	11.35	1475.5	0.22
$\alpha$ -Muurolene	10.36*	1674.9	[60.18]	11.63	1496.7	0.02

$\gamma$ -Cadinene	10.67	1700.1	0.01	11.79	1508.9	0.02
$\delta$ -Cadinene	10.69	1701.5	0.02	11.93	1519.8	0.04
Caryophyllene oxide	13.07	1906.7	0.08	12.62	1574.1	0.08
Viridiflorol	14.28	2018.7	0.03	12.76	1585.0	0.02
Total reported		98.37%			98.84%	

\*: 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