

Date : 2023-07-07

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 23F29-PTH04

**Customer Identification** : Organic Marjoram - Egypt - MJ0109R

**Type** : Essential Oil

**Source** : *Origanum majorana* ct. Sabinene hydrate

**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 :** Amélie Simard, Analyste

**Date :** 2023-07-06

## PHYSICOCHEMICAL DATA

**Physical aspect :** Faintly yellow liquid

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

**Date :** 2023-06-29

**Refractive index :**  $1.4732 \pm 0.0003$  (20 °C)

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

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

**Date :** 2023-07-06

## 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
Isobutyral	tr	Aliphatic aldehyde
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.03	Aliphatic ester
Hexanal	tr	Aliphatic aldehyde
Octane	tr	Alkane
(2E)-Hexenal	0.02	Aliphatic aldehyde
(3Z)-Hexenol	0.02	Aliphatic alcohol
(2E)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Hashishene	0.02	Monoterpene
$\alpha$ -Thujene	0.60	Monoterpene
$\alpha$ -Pinene	0.74	Monoterpene
$\alpha$ -Fenchene	tr	Monoterpene
Camphene	0.02	Monoterpene
$\beta$ -Pinene	0.42	Monoterpene
Sabinene	6.92	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
Octen-3-ol	0.01	Aliphatic alcohol
Octan-3-one	0.07	Aliphatic ketone
Myrcene	1.98	Monoterpene
Pseudolimonene	0.07	Monoterpene
$\alpha$ -Phellandrene	0.38	Monoterpene
(2E,4E)-Heptadienal	0.01	Aliphatic aldehyde
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
$\alpha$ -Terpinene	8.49	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
<i>para</i> -Cymene	1.41	Monoterpene
1,8-Cineole	1.95	Monoterpenic ether
Limonene	2.17	Monoterpene
(Z)- $\beta$ -Ocimene	0.04	Monoterpene
(E)- $\beta$ -Ocimene	0.06	Monoterpene
$\gamma$ -Terpinene	13.85	Monoterpene
<i>cis</i> -Sabinene hydrate	4.13	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	3.14	Monoterpene
<i>para</i> -Cymenene	0.02	Monoterpene
<i>trans</i> -Sabinene hydrate	15.54	Monoterpenic alcohol

Linalool	0.94	Monoterpenic alcohol
Unknown	tr	Oxygenated monoterpene
Unknown	0.02	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	1.34	Monoterpenic alcohol
$\alpha$ -Campholenal	0.04	Monoterpenic aldehyde
4-Hydroxy-4-methylcyclohex-2-enone	0.02	Aliphatic alcohol
<i>trans</i> -Pinocarveol	0.07	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.87	Monoterpenic alcohol
Unknown	0.03	Unknown
1,4-Dimethyl-4-acetylcyclohexene	0.01	Monoterpenic ketone
Pinocarvone	0.02	Monoterpenic ketone
Isomenthone	0.02	Monoterpenic ketone
Borneol	0.05	Monoterpenic alcohol
$\delta$ -Terpineol	0.01	Monoterpenic alcohol
Terpinen-4-ol	22.69	Monoterpenic alcohol
Cryptone	0.04	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.01	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
$\alpha$ -Terpineol	2.77	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.03	Monoterpenic ketone
<i>cis</i> -Piperitol	0.32	Monoterpenic alcohol
Myrtenol	0.01	Monoterpenic alcohol
<i>trans</i> -Dihydrocarvone	0.02	Monoterpenic ketone
Unknown	0.02	Unknown
<i>trans</i> -Piperitol	0.52	Monoterpenic alcohol
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
Nerol	0.02	Monoterpenic alcohol
Citronellol	0.07	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Neral	0.02	Monoterpenic aldehyde
Carvenone	0.03	Monoterpenic ketone
<i>trans</i> -Sabinene hydrate acetate	0.08	Monoterpenic ester
Geraniol	0.08	Monoterpenic alcohol
Linalyl acetate	2.18	Monoterpenic ester
<i>trans</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Geranial	0.04	Monoterpenic aldehyde
Citronellyl formate	0.02	Monoterpenic ester
Bornyl acetate	0.02	Monoterpenic ester
<i>cis</i> -Ascaridole glycol	0.04	Monoterpenic alcohol
Terpinen-4-yl acetate	0.04	Monoterpenic ester
Thymol	0.07	Monoterpenic alcohol
Unknown	0.02	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.09	Monoterpenic alcohol

Bicycloelemene	0.02	Sesquiterpene
$\alpha$ -Cubebene	0.01	Sesquiterpene
Eugenol	0.03	Phenylpropanoid
Neryl acetate	0.03	Monoterpenic ester
$\alpha$ -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.04	Monoterpenic ester
$\beta$ -Elemene	0.01	Sesquiterpene
$\beta$ -Caryophyllene	2.25	Sesquiterpene
Aromadendrene	0.03	Sesquiterpene
$\alpha$ -Humulene	0.10	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.02	Sesquiterpene
$\gamma$ -Muurolene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
(1S,2S,4S)- <i>para</i> -Menthane-1,2,4-triol	0.02	Monoterpenic alcohol
Viridiflorene	0.06	Sesquiterpene
Bicyclogermacrene	0.97	Sesquiterpene
$\alpha$ -Selinene	0.01	Sesquiterpene
$\alpha$ -Muurolene	0.01	Sesquiterpene
(3E,6E)- $\alpha$ -Farnesene	0.03	Sesquiterpene
$\gamma$ -Cadinene	0.02	Sesquiterpene
$\delta$ -Cadinene	0.02	Sesquiterpene
Spathulenol	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.07	Sesquiterpenic ether
Globulol	0.03	Sesquiterpenic alcohol
Viridiflorol	0.01	Sesquiterpenic alcohol
Humulene epoxide II	0.02	Sesquiterpenic ether
10-epi- $\gamma$ -Eudesmol	0.04	Sesquiterpenic alcohol
Caryophylladienol II	0.01	Sesquiterpenic alcohol
Isospathulenol	0.05	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	0.01	Sesquiterpenic alcohol
Unknown	0.03	Diterpene
<b>Consolidated total</b>	<b>99.04</b>	

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

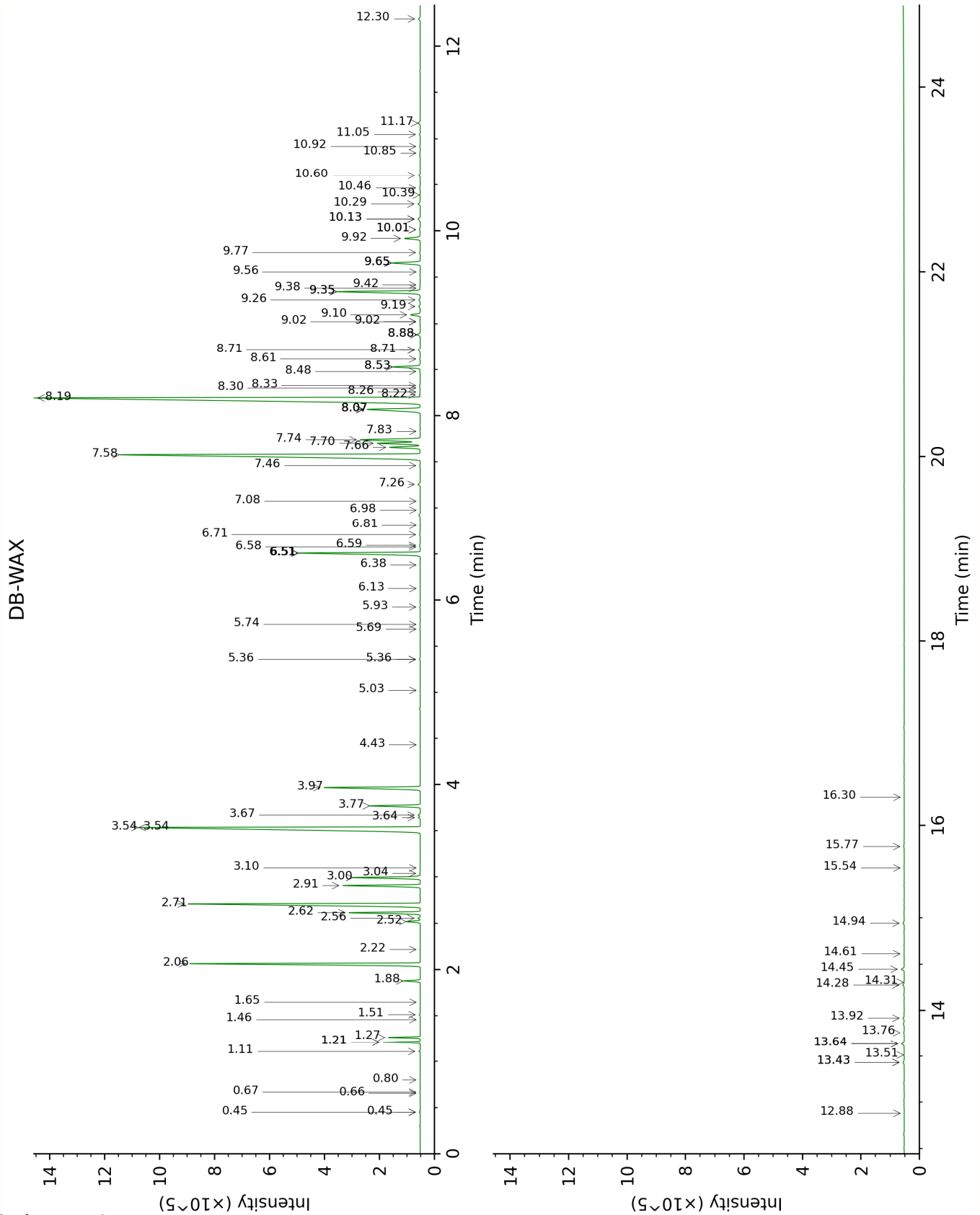
Note: no correction factor was applied

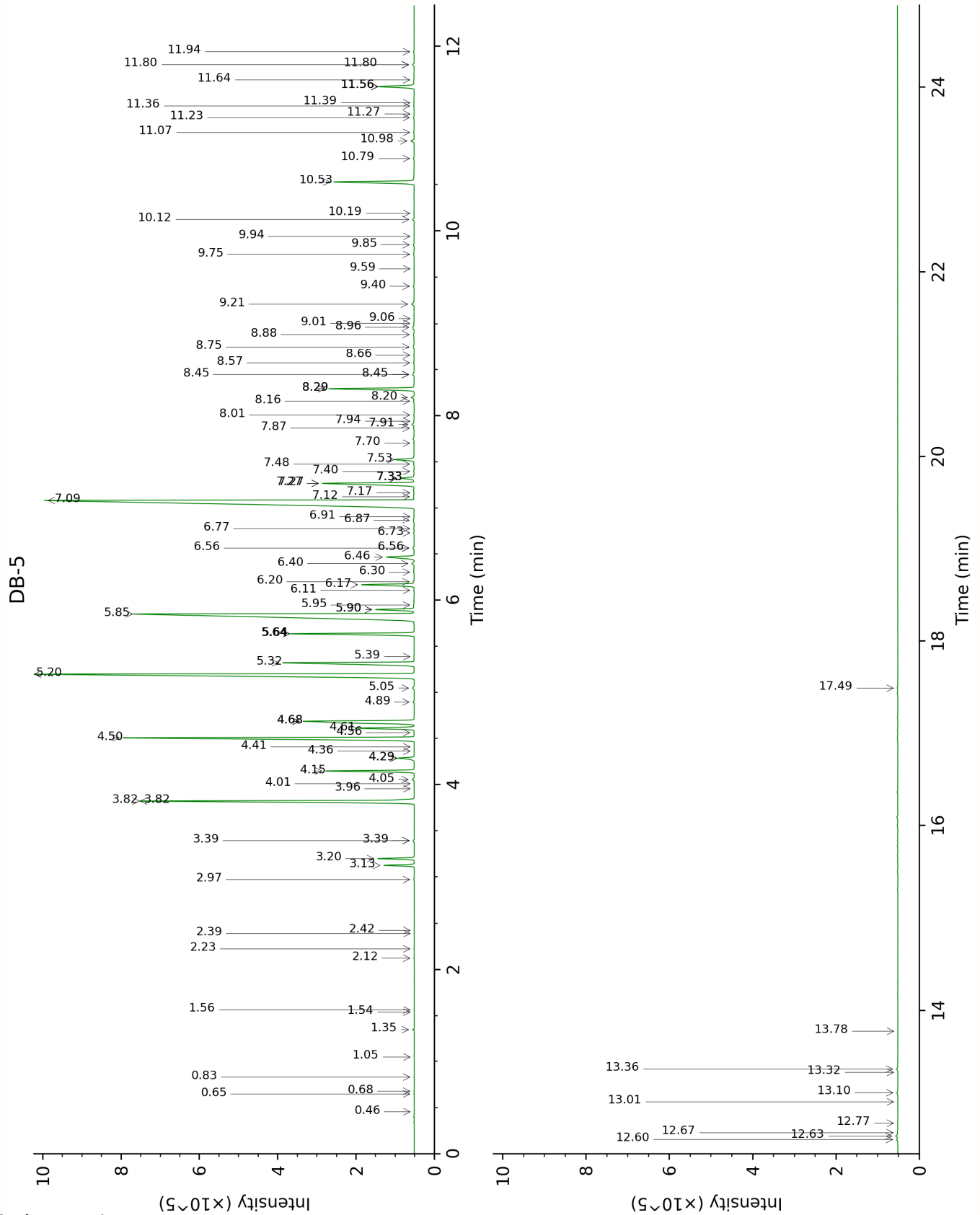
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Isobutyral	Column DB-WAX			Column DB-5		
	0.45*	783.7	[0.01]	0.46	538.2	tr
Isovaleral	0.67	885.3	0.01	0.65	640.8	tr
2-Methylbutyral	0.66	880.1	tr	0.68	651.1	tr
2-Ethylfuran	0.80	921.3	tr	0.83	701.7	tr
Isoamyl alcohol	3.10	1174.2	0.02	1.05	732.8	tr
Methyl 2-methylbutyrate	1.11	974.4	0.03	1.35	774.1	0.03
Hexanal	1.65	1042.5	tr	1.54	799.9	tr
Octane	0.45*	783.7	[0.01]	1.56	803.2	tr
(2E)-Hexenal	3.04	1169.3	0.02	2.12	849.4	0.02
(3Z)-Hexenol	5.36*	1343.2	[0.03]	2.22	857.7	0.02
(2E)-Hexenol	5.69	1367.1	0.02	2.39	871.2	0.01
Hexanol	5.03	1318.9	0.01	2.42	874.0	0.01
Hashishene	1.21*	992.2	[0.74]	2.97	916.1	0.02
$\alpha$ -Thujene	1.27	1001.5	0.61	3.13	926.2	0.60
$\alpha$ -Pinene	1.21*	992.2	[0.74]	3.20	931.0	0.74
$\alpha$ -Fenchene	1.46	1023.2	tr	3.39*	943.7	[0.04]
Camphene	1.51	1028.6	0.02	3.39*	943.7	[0.04]
$\beta$ -Pinene	1.88	1066.1	0.42	3.82*	971.8	[7.29]
Sabinene	2.06	1085.5	6.92	3.82*	971.8	[7.29]
3-Methyl-3-cyclohexenone	5.74	1370.8	0.01	3.96	980.6	0.01
Octen-3-ol	6.38	1418.0	0.02	4.01	984.1	0.01
Octan-3-one	3.64	1218.4	0.05	4.06	987.1	0.07
Myrcene	2.62	1134.6	2.00	4.15	993.1	1.98
Pseudolimonene	2.56	1129.8	0.07	4.28*	1002.2	[0.45]
$\alpha$ -Phellandrene	2.52	1126.9	0.38	4.28*	1002.2	[0.45]
(2E,4E)-Heptadienal	7.08	1470.3	0.01	4.36	1007.1	0.01
(3Z)-Hexenyl acetate	4.43	1279.0	0.01	4.41	1010.0	0.01
$\alpha$ -Terpinene	2.71	1142.3	8.55	4.50	1016.1	8.49
Carvomenthene	2.22	1101.5	0.01	4.56	1019.6	0.02
<i>para</i> -Cymene	3.77	1228.1	1.42	4.61	1022.6	1.41
1,8-Cineole	3.00	1165.7	1.95	4.68*	1027.3	[4.09]
Limonene	2.91	1158.6	2.17	4.68*	1027.3	[4.09]
(Z)- $\beta$ -Ocimene	3.54*	1210.2	[13.97]	4.89	1040.3	0.04
(E)- $\beta$ -Ocimene	3.67	1220.5	0.06	5.05	1050.2	0.06
$\gamma$ -Terpinene	3.54*	1210.2	[13.97]	5.20	1059.6	13.85
<i>cis</i> -Sabinene hydrate	6.51*	1427.7	[4.12]	5.32	1067.3	4.13
<i>cis</i> -Linalool oxide (fur.)	6.13	1399.2	0.01	5.39	1071.4	0.02

Terpinolene	3.97	1243.2	3.14	5.64*	1086.9	[3.13]
<i>para</i> -Cymenene	5.93	1384.5	0.02	5.64*	1086.9	[3.13]
<i>trans</i> -Sabinene hydrate	7.58	1508.2	15.46	5.85	1100.2	15.54
Linalool	7.66	1514.4	0.94	5.90*	1103.3	[0.93]
Unknown CEDE I [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.36*	1343.2	[0.03]	5.90*	1103.3	[0.93]
Unknown ORMA I [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	8.07*	1546.6	[2.29]	5.95	1106.3	0.02
<i>trans-para</i> - Mentha-2,8-dien- 1-ol	8.53*	1582.8	[0.88]	6.11	1116.4	0.03
<i>cis-para</i> -Menth-2- en-1-ol	7.70	1517.9	1.35	6.17	1120.3	1.34
$\alpha$ -Campholenal	6.59	1434.0	0.03	6.20	1122.3	0.04
4-Hydroxy-4- methylcyclohex-2- enone	13.64*	2031.8	[0.10]	6.30	1128.9	0.02
<i>trans</i> -Pinocarveol	8.71*	1597.4	[0.08]	6.40	1134.8	0.07
<i>trans-para</i> -Menth- 2-en-1-ol	8.53*	1582.8	[0.88]	6.46	1139.2	0.87
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.51*	1427.7	[4.12]	6.56*	1145.5	[0.04]
1,4-Dimethyl-4- acetylcyclohexene	6.98	1463.0	0.01	6.56*	1145.5	[0.04]
Pinocarvone	7.46	1499.4	0.03	6.73	1156.0	0.02
Isomenthone	6.58	1432.6	0.01	6.77	1158.9	0.02
Borneol	9.35*	1649.0	[2.83]	6.87	1165.1	0.05
$\delta$ -Terpineol	9.02*	1622.3	[0.02]	6.91	1167.7	0.01
Terpinen-4-ol	8.19	1556.4	22.71	7.09	1178.8	22.69
Cryptone	8.71*	1597.4	[0.08]	7.12	1181.3	0.04
<i>para</i> -Cymen-8-ol	11.05	1792.9	0.03	7.17	1184.0	0.01
Myrtenal	8.26	1561.5	0.02	7.27*	1190.5	[2.79]
$\alpha$ -Terpineol	9.35*	1649.0	[2.83]	7.27*	1190.5	[2.79]
<i>cis</i> - Dihydrocarvone	8.07*	1546.6	[2.29]	7.32*	1194.0	[0.36]
<i>cis</i> -Piperitol	9.10	1628.4	0.32	7.32*	1194.0	[0.36]

Myrtenol	10.39	1735.9	0.01	7.32*	1194.0	[0.36]
<i>trans</i> -Dihydrocarvone	8.30	1564.9	0.01	7.40	1198.7	0.02
Unknown PIMA 7 [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	10.46	1742.5	0.03	7.48	1203.8	0.02
<i>trans</i> -Piperitol	9.92	1696.2	0.54	7.53	1207.0	0.52
<i>trans</i> -Carveol	10.92	1781.7	0.02	7.70	1218.8	0.02
Nerol	10.60	1754.4	0.05	7.87	1229.6	0.02
Citronellol	10.29	1727.5	0.08	7.91	1232.3	0.07
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	10.85	1775.6	0.01	7.94	1234.7	0.02
Neral	9.02*	1622.3	[0.02]	8.01	1239.1	0.02
Carvenone	9.42	1655.0	0.02	8.16	1249.1	0.03
<i>trans</i> -Sabinene hydrate acetate	7.26	1484.1	0.09	8.20	1251.8	0.08
Geraniol	11.17	1803.5	0.08	8.29*	1258.0	[2.25]
Linalyl acetate	7.74	1520.9	2.18	8.29*	1258.0	[2.25]
<i>trans</i> -Ascaridole glycol	13.76	2044.0	0.02	8.45*	1268.3	[0.06]
Geranial	9.66*	1674.4	[1.00]	8.45*	1268.3	[0.06]
Citronellyl formate	8.48	1578.9	0.02	8.57	1276.7	0.02
Bornyl acetate	7.83	1528.0	0.02	8.66	1282.3	0.02
<i>cis</i> -Ascaridole glycol	14.28	2094.7	0.05	8.75	1288.7	0.05
Terpinen-4-yl acetate	8.33	1567.0	0.02	8.88	1297.6	0.04
Thymol	14.61	2128.6	0.01	8.96	1302.8	0.07
Unknown MEAL I analog	13.43*	2011.8	[0.05]	9.00	1305.6	0.02
Unknown MISC X [m/z 69, 41 (79), 91 (56), 92 (54), 79 (50), 77 (35)...]				9.06	1309.3	0.01
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	14.45	2111.5	0.12	9.21	1320.3	0.09
Bicycloelemene	6.71	1442.7	0.03	9.40	1333.8	0.02
$\alpha$ -Cubebene	6.51*	1427.7	[4.12]	9.59	1347.1	0.01
Eugenol	14.31	2097.7	0.01	9.75	1358.0	0.03

Neryl acetate	9.77	1683.7	0.03	9.85	1365.3	0.03
$\alpha$ -Copaene	6.81	1450.4	0.01	9.94	1371.7	0.01
Geranyl acetate	10.13*	1713.5	[0.10]	10.12	1384.5	0.04
$\beta$ -Elemene	8.07*	1546.6	[2.29]	10.19	1389.1	0.01
$\beta$ -Caryophyllene	8.07*	1546.6	[2.29]	10.53	1413.3	2.25
Aromadendrene	8.22	1558.9	0.02	10.79	1432.7	0.03
$\alpha$ -Humulene	8.88*	1610.8	[0.11]	10.98	1446.9	0.10
allo-Aromadendrene	8.61	1589.5	0.02	11.07	1453.7	0.02
<i>trans</i> -Cadina-1(6),4-diene	8.88*	1610.8	[0.11]	11.23	1465.7	0.02
$\gamma$ -Muurolene	9.19	1635.9	0.05	11.27	1468.6	0.01
Germacrene D	9.38	1652.1	0.02	11.36	1475.0	0.02
(1S,2S,4S)- <i>para</i> -Menthane-1,2,4-triol				11.39	1477.6	0.02
Viridiflorene	9.26	1641.6	0.06	11.56*	1490.6	[1.04]
Bicyclogermacrene	9.66*	1674.4	[1.00]	11.56*	1490.6	[1.04]
$\alpha$ -Selinene	9.56	1666.4	0.01	11.56*	1490.6	[1.04]
$\alpha$ -Muurolene	9.66*	1674.4	[1.00]	11.64	1496.0	0.01
(3E,6E)- $\alpha$ -Farnesene	10.13*	1713.5	[0.10]	11.80*	1508.3	[0.05]
$\gamma$ -Cadinene	10.01*	1704.0	[0.04]	11.80*	1508.3	[0.05]
$\delta$ -Cadinene	10.01*	1704.0	[0.04]	11.94	1519.3	0.02
Spathulenol	13.92	2059.5	0.04	12.60	1570.8	0.04
Caryophyllene oxide	12.30	1904.8	0.07	12.63	1573.7	0.07
Globulol	13.43*	2011.8	[0.05]	12.67	1576.6	0.03
Viridiflorol	13.51	2019.7	0.01	12.77	1584.7	0.01
Humulene epoxide II	12.88	1959.7	0.01	13.00	1602.8	0.02
10-epi- $\gamma$ -Eudesmol	13.64*	2031.8	[0.10]	13.10	1610.8	0.04
Caryophylladienol II	15.54	2224.3	0.01	13.32	1629.0	0.01
Isospathulenol	14.94	2162.6	0.05	13.36	1632.0	0.05
(3Z)-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	16.30	2306.1	0.01	13.78	1666.4	0.01
Unknown PISI IV [m/z 257, 258 (20), 91 (19), 272 (18)]	15.77	2249.1	0.03	17.49	1999.2	0.03
Total reported		99.08%			98.96%	

\*: 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

Essential Oil, *Origanum majorana* ct. *Sabinene hydrate*

Internal code: 23F29-PTH04

Organic Marjoram - Egypt - MJ0109R

Report prepared for:

Plant Therapy

†: 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