Date : 2023-10-19

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 23J12-PTH03
Customer Identification : Fennel - Egypt - F10113R
Type : Essential Oil
Source : *Foeniculum vulgare*
Customer : Plant Therapy

Checked an approved by:

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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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 : 1.5323 ± 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.

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Analysis Summary - Consolidated Contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Acetaldehyde	0.02	Aliphatic aldehyde
Toluene	tr	Simple phenolic
Hashishene	0.01	Monoterpene
α-Thujene	0.04	Monoterpene
α-Pinene	9.49	Monoterpene
Camphene	0.03	Monoterpene
α-Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Sabinene	0.05	Monoterpene
β-Pinene	0.13	Monoterpene
Myrcene	0.43	Monoterpene
cis-Dehydroxylinalool oxide	tr	Monoterpenic ether
Pseudolimonene	0.03	Monoterpene
α-Phellandrene	0.99	Monoterpene
Δ3-Carene	0.03	Monoterpene
Isoamyl isobutyrate	0.01	Aliphatic ester
para-Cymene	0.14	Monoterpene
β-Phellandrene	0.05	Monoterpene
Limonene	13.94	Monoterpene
1,8-Cineole	0.03	Monoterpenic ether
(*Z*)-β-Ocimene	tr	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.12	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Fenchone	2.43	Monoterpenic ketone
Terpinolene	0.02	Monoterpene
α-Pinene oxide	0.01	Monoterpenic ether
Linalool	0.03	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.02	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
Camphor	0.14	Monoterpenic ketone
Unknown	0.01	Oxygenated monoterpene
Terpinen-4-ol	0.01	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
α-Terpineol	0.01	Monoterpenic alcohol
Methylchavicol	3.89	Phenylpropanoid
cis-α-Phellandrene epoxide (iPr vs Me)	0.02	Monoterpenic ether

trans-Isopiperitenol	0.01	Monoterpenic alcohol
Dihydroanethole	0.09	Phenylpropanoid
trans-Carveol	0.02	Monoterpenic alcohol
cis-Carveol	0.02	Monoterpenic alcohol
Carvone	0.02	Monoterpenic ketone
(*Z*)-Anethole	0.09	Phenylpropanoid
para-Anisaldehyde	1.38	Simple phenolic
(*E*)-Anethole	65.18	Phenylpropanoid
cis-para-Mentha-2,8-diene-1-hydroperoxide	0.02	Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	0.01	Monoterpenic peroxide
(*Z*)-Anethole epoxide?	0.01	Phenylpropanoid
Unknown	0.22	Phenylpropanoid
para-Acetonylanisole	0.05	Phenylpropanoid
cis-para-Mentha-6,8-diene-2-hydroperoxide	0.03	Monoterpenic peroxide
β-Caryophyllene	0.05	Sesquiterpene
trans-α-Bergamotene	0.03	Sesquiterpene
α-Humulene	0.02	Sesquiterpene
Unknown	0.01	Phenylpropanoid
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	0.02	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I	0.01	Lignan
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II	0.01	Lignan
Consolidated total	**99.54**	

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.

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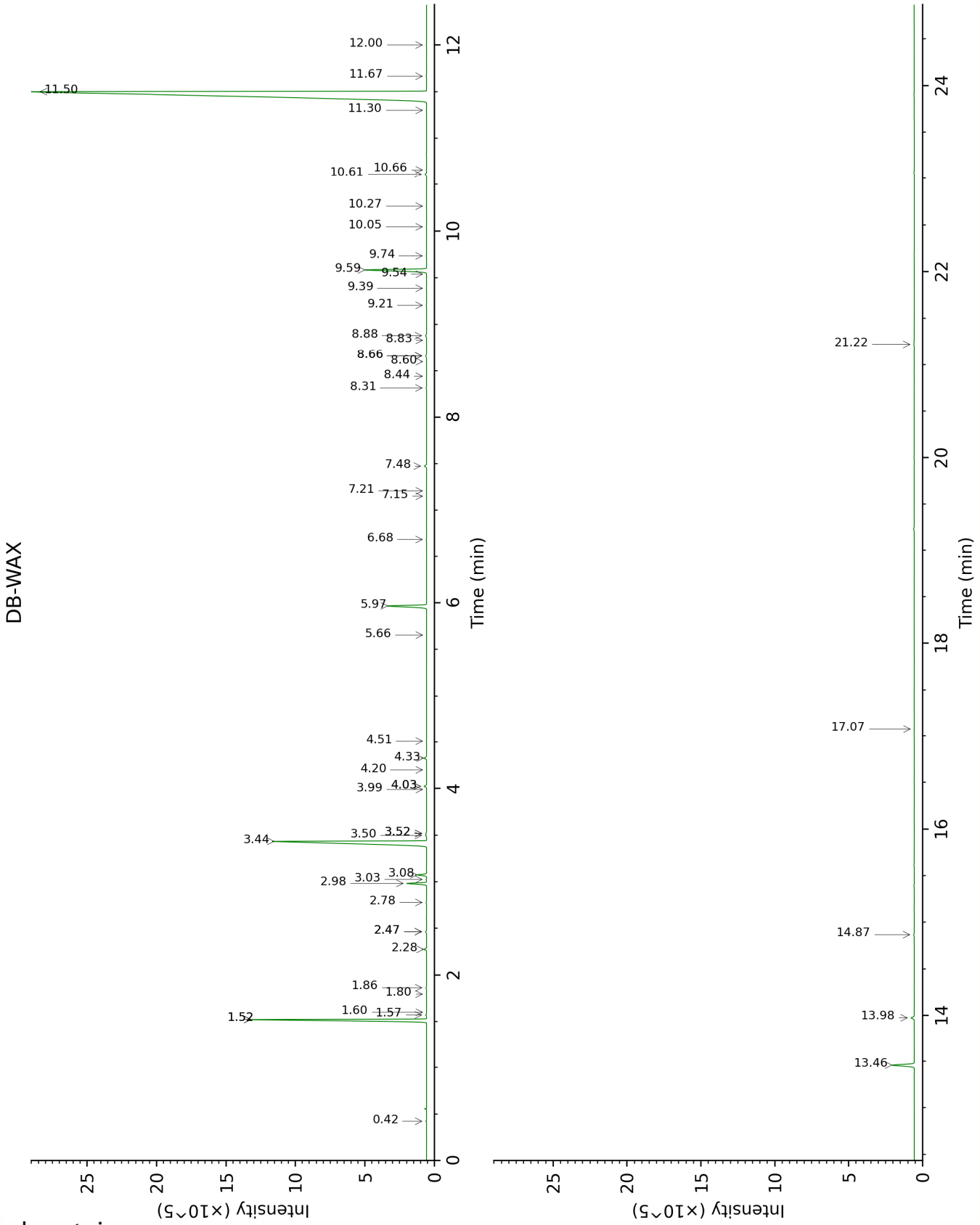
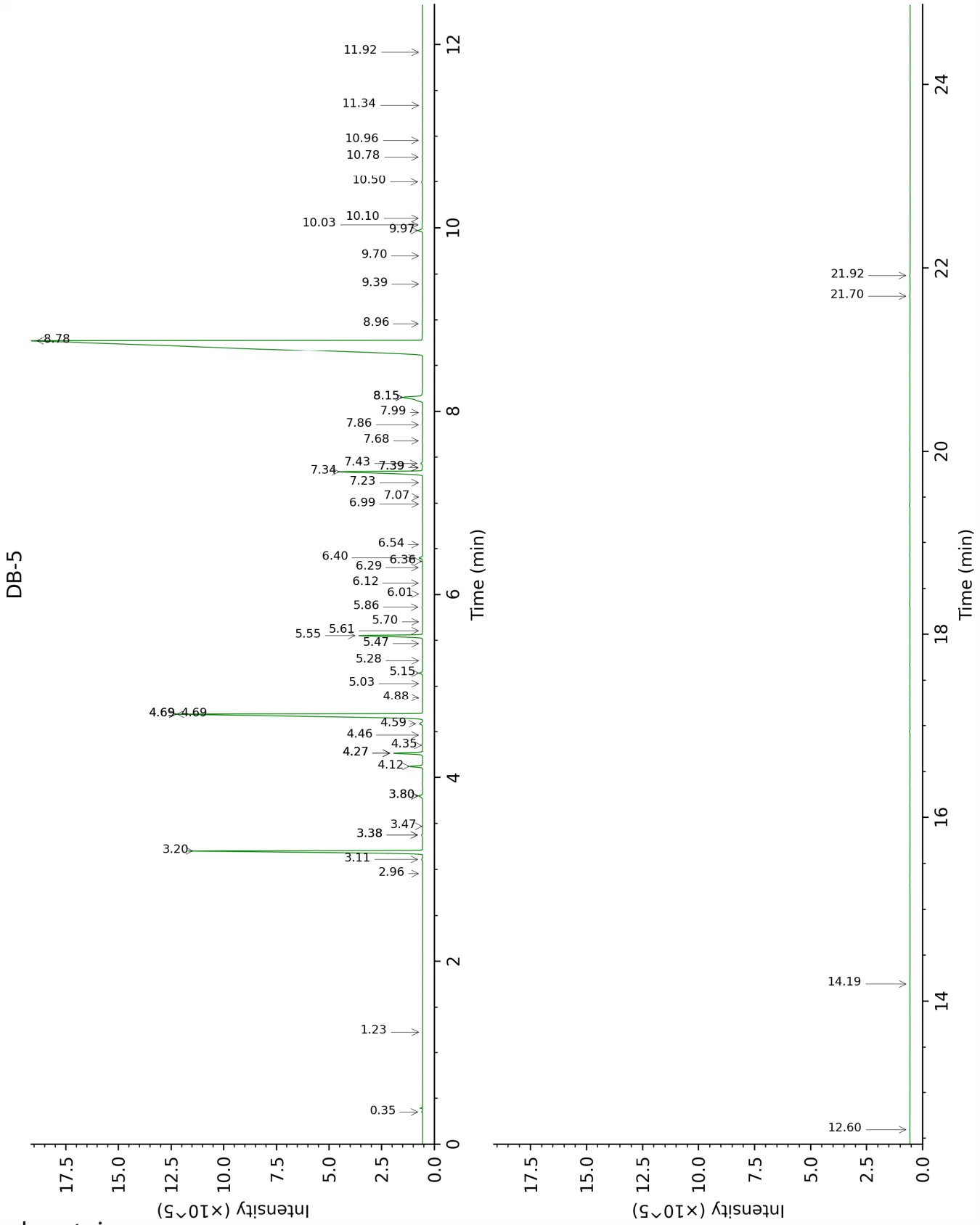

DB-WAX
Time (min)
Intensity (×10^5)
12.00
11.67
11.50
11.30
10.66
10.61
10.27
10.05
9.74
9.59
9.54
9.39
9.21
8.88
8.83
8.66
8.60
8.44
8.31
7.48
7.21
7.15
6.68
5.97
5.66
4.51
4.33
4.20
3.99
4.03
3.50
3.52
3.44
3.08
3.03
2.98
2.78
2.47
2.28
1.86
1.80
1.60
1.57
1.52
0.42
21.22
17.07
14.87
13.98
13.46


DB-5
11.92
11.34
10.96
10.78
10.50
10.10
10.03
9.97
9.70
9.39
8.96
8.78
8.15
7.99
7.86
7.68
7.43
7.39
7.34
7.23
7.07
6.99
6.54
6.40
6.36
6.29
6.12
6.01
5.86
5.70
5.61
5.55
5.47
5.28
5.15
5.03
4.88
4.69
4.69
4.59
4.46
4.35
4.27
4.12
3.80
3.47
3.38
3.20
3.11
2.96
1.23
0.35
Time (min)
Intensity (×10^5)
21.92
21.70
14.19
12.60
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Acetaldehyde	**Column DB-WAX**			**Column DB-5**		
	0.42	656.2	0.02	0.35	501.9	0.02
Toluene	1.60	1004.4	tr	1.23	760.6	tr
Hashishene	1.52*	996.4	[9.47]	2.96	917.1	0.01
α-Thujene	1.57	1001.7	0.04	3.11	927.2	0.04
α-Pinene	1.52*	996.4	[9.47]	3.20	933.3	9.49
Camphene	1.86	1029.2	0.03	3.38*	944.7	[0.05]
α-Fenchene	1.80	1022.8	0.01	3.38*	944.7	[0.05]
Thuja-2,4(10)-diene	2.47*	1085.9	[0.06]	3.47	950.9	0.01
Sabinene	2.47*	1085.9	[0.06]	3.80*	972.6	[0.18]
β-Pinene	2.28	1068.1	0.13	3.80*	972.6	[0.18]
Myrcene	3.08	1134.3	0.44	4.12	993.7	0.43
cis-Dehydroxylinalool oxide	3.99	1203.0	tr	4.27*	1003.1	[1.01]
Pseudolimonene	3.03	1130.6	0.03	4.27*	1003.1	[1.01]
α-Phellandrene	2.98	1127.4	0.99	4.27*	1003.1	[1.01]
Δ3-Carene	2.78	1111.9	0.03	4.35	1008.6	0.03
Isoamyl isobutyrate	3.52*	1167.8	[0.04]	4.46	1015.5	0.01
para-Cymene	4.33	1226.8	0.14	4.59	1023.2	0.14
β-Phellandrene	3.50	1166.2	0.05	4.69*	1029.7	[14.02]
Limonene	3.44	1161.4	13.94	4.69*	1029.7	[14.02]
1,8-Cineole	3.52*	1167.8	[0.04]	4.69*	1029.7	[14.02]
(*Z*)-β-Ocimene	4.03*	1205.5	[0.12]	4.88	1041.2	tr
(*E*)-β-Ocimene	4.20	1217.9	0.01	5.03	1050.9	0.01
γ-Terpinene	4.03*	1205.5	[0.12]	5.15	1058.0	0.12
cis-Sabinene hydrate	7.15	1431.0	0.01	5.28	1066.5	0.01
Octanol	8.44	1526.7	0.01	5.47	1078.0	0.01
Fenchone	5.97	1346.0	2.43	5.55	1083.5	2.43
Terpinolene	4.51	1239.7	0.01	5.61	1086.8	0.02
α-Pinene oxide	5.66	1323.9	0.01	5.70	1092.9	0.01
Linalool	8.32	1517.1	0.02	5.86	1102.8	0.03
endo-Fenchol	8.60	1538.8	0.01	6.01	1111.9	0.01
trans-para-Mentha-2,8-dien-1-ol	9.21	1585.4	0.02	6.12	1119.4	0.02
cis-Limonene oxide	6.68	1396.5	0.02	6.29	1130.2	0.02
cis-para-Mentha-2,8-dien-1-ol	9.74	1627.4	0.02	6.36	1134.5	0.02
Camphor	7.48	1454.7	0.13	6.40	1136.9	0.14
Unknown CALU I [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)]	7.21	1435.2	0.01	6.54	1146.1	0.01
Terpinen-4-ol	8.83	1556.8	0.01	6.99	1174.7	0.01
Cryptone	9.39	1599.6	0.02	7.07	1179.5	0.01
α-Terpineol	10.05	1652.3	0.01	7.23	1189.5	0.01

Methylchavicol	9.59	1615.3	3.92	7.34	1197.0	3.89
cis-α-Phellandrene epoxide (iPr vs Me)	11.30	1755.8	0.02	7.39*	1199.9	[0.03]
trans-Isopiperitenol	10.66	1702.1	0.01	7.39*	1199.9	[0.03]
Dihydroanethole	8.88	1560.6	0.06	7.44	1202.8	0.09
trans-Carveol	11.67	1786.5	0.03	7.68	1219.1	0.02
cis-Carveol	12.00	1815.7	0.02	7.86	1230.7	0.02
Carvone	10.27	1670.0	0.02	7.99	1239.6	0.02
(*Z*)-Anethole	10.61	1698.1	0.09	8.16*	1250.7	[1.45]
para-Anisaldehyde	13.46	1946.1	1.38	8.16*	1250.7	[1.45]
(*E*)-Anethole	11.50	1772.6	65.15	8.78	1292.3	65.18
cis-para-Mentha-2,8-diene-1-hydroperoxide				8.96	1304.5	0.02
para-Mentha-1,8-diene-4-hydroperoxide				9.39	1334.8	0.01
(*Z*)-Anethole epoxide?				9.70	1356.3	0.01
Unknown FOVU I [121, 91 (60), 120 (39), 164 (37), 77 (34), 135 (26)]	13.98	1993.5	0.18	9.97	1375.7	0.22
para-Acetonylanisole	14.87	2078.8	0.04	10.03	1379.9	0.05
cis-para-Mentha-6,8-diene-2-hydroperoxide				10.10	1384.9	0.03
β-Caryophyllene	8.66*	1543.6	[0.07]	10.50	1413.2	0.05
trans-α-Bergamotene	8.66*	1543.6	[0.07]	10.78	1433.8	0.03
α-Humulene	9.54	1611.7	0.01	10.96	1447.3	0.02
Unknown FOVU IV [m/z 137, 148 (14), 121 (14), 208 (13)]				11.92	1519.3	0.01
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	21.22	2784.6	0.04	12.60	1572.4	0.02
Unknown FOVU VII [m/z 137, 109 (15), 43 (10), 164 (9), 138 (9)...]				14.19	1702.1	0.01
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I				21.70	2448.6	0.01
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II				21.92	2474.6	0.01
Total reported		99.34%			99.52%	

*: 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

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