Date : August 23, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21H09-PTH07
Customer identification : Sweet Fennel - F10111201
Type : Essential oil
Source : *Foeniculum vulgare*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : August 23, 2021

Checked and approved by :

Alexis St-Gelais, M. Sc., Chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.5371 ± 0.0003 (20 °C; method PC-MAT-016)

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
Isovaleral	tr	Aliphatic aldehyde
Toluene	tr	Simple phenolic
(3*Z*)-Hexenol	tr	Aliphatic alcohol
Hashishene	0.01	Monoterpene
Tricyclene	tr	Monoterpene
α-Thujene	0.03	Monoterpene
α-Pinene	6.61	Monoterpene
α-Fenchene	0.01	Monoterpene
Camphene	0.03	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
β-Pinene	0.08	Monoterpene
Sabinene	0.05	Monoterpene
Myrcene	0.25	Monoterpene
α-Phellandrene	0.59	Monoterpene
cis-Dehydroxylinalool oxide	0.01	Monoterpenic ether
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.01	Monoterpene
para-Cymene	0.11	Monoterpene
Limonene	10.61	Monoterpene
1,8-Cineole	0.18	Monoterpenic ether
(*Z*)-β-Ocimene	0.02	Monoterpene
(*E*)-β-Ocimene	tr	Monoterpene
γ-Terpinene	0.07	Monoterpene
cis-Sabinene hydrate	tr	Monoterpenic alcohol
Octanol	tr	Aliphatic alcohol
Fenchone	1.99	Monoterpenic ketone
Terpinolene	0.02	Monoterpene
Linalool	0.02	Monoterpenic alcohol
endo-Fenchol	tr	Monoterpenic alcohol
trans-Pinene hydrate	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
Camphor	0.04	Monoterpenic ketone
Unknown	0.01	Oxygenated monoterpene
Borneol	tr	Monoterpenic alcohol
Terpinen-4-ol	0.01	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.01	Monoterpenic alcohol
Methylchavicol	3.61	Phenylpropanoid
cis-α-Phellandrene epoxide (IPP vs Me)	0.02	Monoterpenic ether
Dihydroanethole	0.02	Phenylpropanoid
trans-Carveol	0.01	Monoterpenic alcohol
cis-Carveol	0.01	Monoterpenic alcohol
(*Z*)-Anethole	0.05	Phenylpropanoid
para-Anisaldehyde	0.95	Simple phenolic

(*E*)-Anethole	73.22	Phenylpropanoid
para-Menth-5-en-1,2-diol isomer II	tr	Monoterpenic alcohol
cis-para-Mentha-2,8-diene-1-hydroperoxide	tr	Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	0.01	Monoterpenic peroxide
para-Acetonylanisole	0.21	Phenylpropanoid
Unknown	0.14	Phenylpropanoid
cis-para-Mentha-6,8-diene-2-hydroperoxide	0.01	Monoterpenic peroxide
1-(4-Methoxyphenyl)-1-propanol	0.01	Phenylpropanoid
Methyleugenol	tr	Phenylpropanoid
β-Caryophyllene	0.05	Sesquiterpene
trans-α-Bergamotene	0.05	Sesquiterpene
α-Humulene	tr	Sesquiterpene
Unknown	0.01	Phenylpropanoid
Unknown	tr	Phenylpropanoid
Unknown	tr	Phenylpropanoid
(*E*)-para-Methoxycinnamaldehyde	0.01	Phenylpropanoid
(*E*)-para-Methoxycinnamyl alcohol	tr	Phenylpropanoid
1-(4-Methoxyphenyl)propane-1,2-diol isomer I	0.02	Phenylpropanoid
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	tr	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
Unknown	0.06	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
1-Hydroxy-1-(4-methoxyphenyl)-propan-2-one	tr	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
Unknown	0.01	Unknown
Unknown	tr	Lignan
Consolidated total	**99.35%**	

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.

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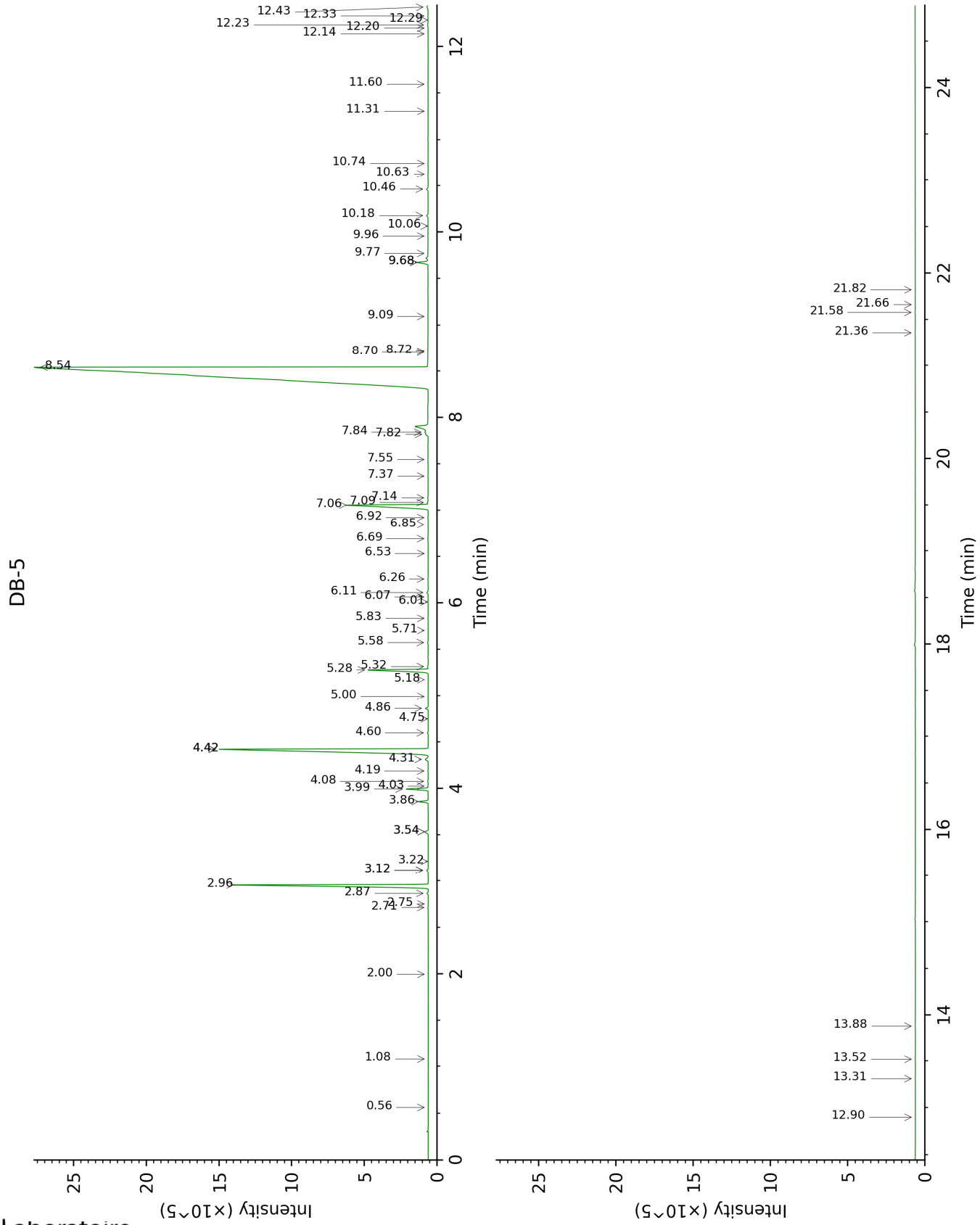
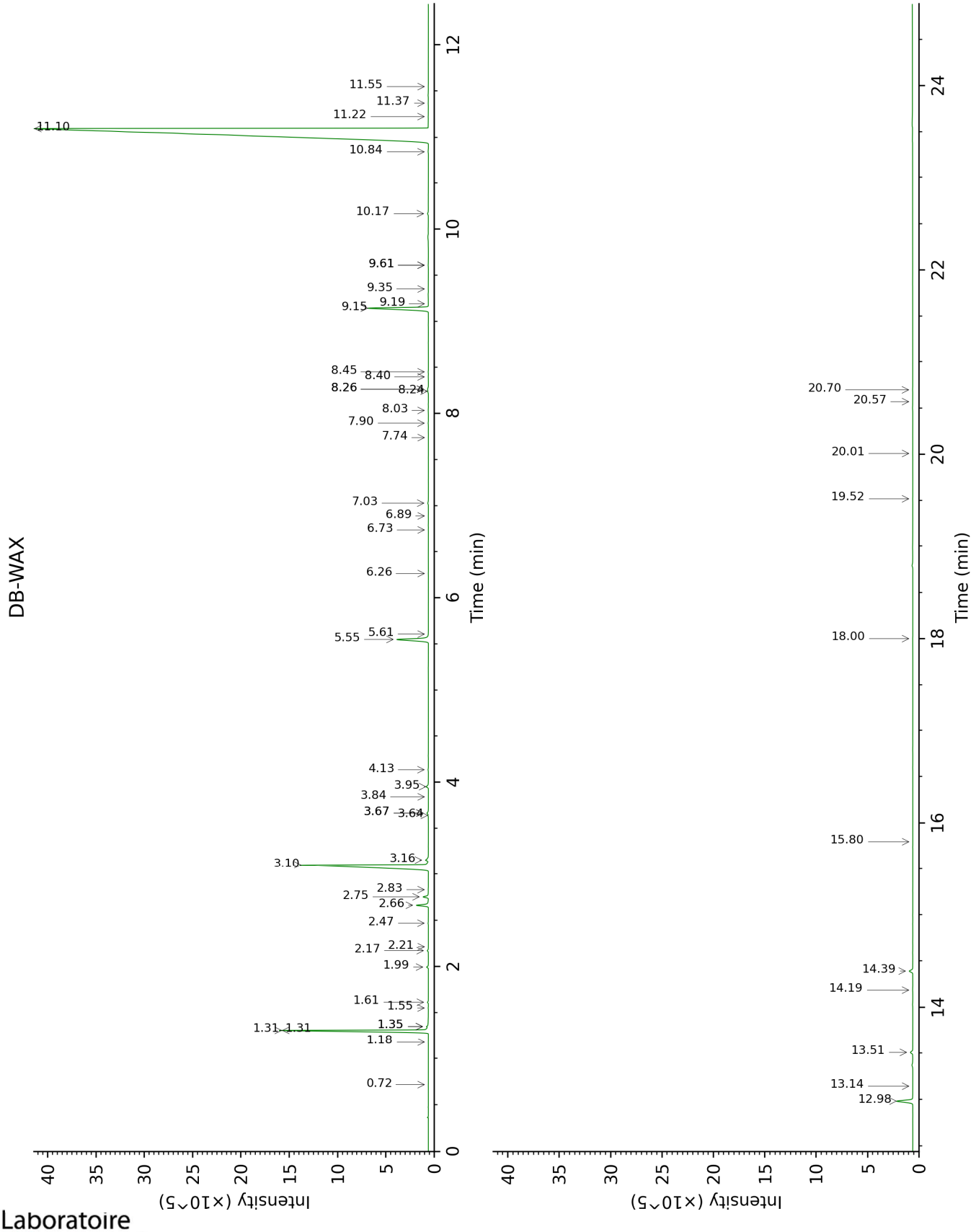

DB-5
12.43
12.33
12.29
12.23
12.20
12.14
11.60
11.31
10.74
10.63
10.46
10.18
10.06
9.96
9.77
9.68
9.09
8.70
8.72
8.54
7.84
7.82
7.55
7.37
7.14
7.09
7.06
6.92
6.85
6.69
6.53
6.26
6.11
6.07
6.01
5.83
5.71
5.58
5.32
5.28
5.18
5.00
4.86
4.75
4.60
4.42
4.31
4.19
4.08
4.03
3.99
3.86
3.54
3.22
3.12
2.96
2.87
2.75
2.74
2.00
1.08
0.56
Time (min)
Intensity (×10^5)
21.82
21.66
21.58
21.36
13.88
13.52
13.31
12.90
Time (min)
Intensity (×10^5)


DB-WAX
Time (min)
Intensity (×10^5)
11.55
11.37
11.22
11.10
10.84
10.17
9.61
9.35
9.19
9.15
8.45
8.40
8.26
8.24
8.03
7.90
7.74
7.03
6.89
6.73
6.26
5.61
5.55
4.13
3.95
3.84
3.67
3.64
3.16
3.10
2.83
2.75
2.66
2.47
2.21
2.17
1.99
1.61
1.55
1.35
1.31
1.31
1.18
0.72
20.70
20.57
20.01
19.52
18.00
15.80
14.39
14.19
13.51
13.14
12.98

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.56	641	tr	0.72	886	tr
Toluene	1.08	758	tr	1.35*	1000	0.14
(3*Z*)-Hexenol	2.00	857	tr	5.61	1345	0.01
Hashishene	2.71	916	0.01	1.31*	994	6.48
Tricyclene	2.75	918	tr	1.18	972	tr
α-Thujene	2.87	926	0.03	1.35*	1000	[0.14]
α-Pinene	2.96	932	6.61	1.31*	994	[6.48]
α-Fenchene	3.12*	943	0.04	1.55	1020	0.01
Camphene	3.12*	943	[0.04]	1.61	1026	0.03
Thuja-2,4(10)-diene	3.22	950	tr	2.21	1088	tr
β-Pinene	3.54*	971	0.12	1.99	1065	0.08
Sabinene	3.54*	971	[0.12]	2.17	1083	0.05
Myrcene	3.86	993	0.25	2.75	1133	0.25
α-Phellandrene	3.99	1002	0.59	2.66	1126	0.58
cis-Dehydroxylinalool oxide	4.02	1004	0.01	3.64	1205	0.02
Δ3-Carene	4.08	1008	0.01	2.47	1110	0.02
α-Terpinene	4.19	1014	0.01	2.83	1139	0.01
para-Cymene	4.31	1022	0.11	3.95	1228	0.12
Limonene	4.42*	1029	10.84	3.10	1161	10.61
1,8-Cineole	4.42*	1029	[10.84]	3.16	1166	0.18
(*Z*)-β-Ocimene	4.60	1040	0.02	3.67*	1206	0.08
(*E*)-β-Ocimene	4.75	1050	tr	3.84	1220	tr
γ-Terpinene	4.86	1057	0.07	3.67*	1206	[0.08]
cis-Sabinene hydrate	5.00	1066	tr	6.73	1428	0.01
Octanol	5.18	1077	tr	8.03	1526	0.02
Fenchone	5.28	1084	1.99	5.55	1341	2.00
Terpinolene	5.32	1086	0.02	4.14	1242	0.02
Linalool	5.58	1102	0.02	7.90	1515	0.01
endo-Fenchol	5.70	1111	tr	8.24	1542	0.03
trans-Pinene hydrate	5.84	1119	0.01	7.74	1503	0.01
cis-Limonene oxide	6.01	1130	0.01	6.26	1393	0.01
cis-para-Mentha-2,8-dien-1-ol	6.06	1134	0.01	9.35	1630	0.01
Camphor	6.11	1137	0.04	7.03	1450	0.04
Unknown [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)]	6.26	1146	0.01	6.89	1440	0.01
Borneol	6.53	1164	tr	9.61*	1651	0.02
Terpinen-4-ol	6.69	1174	0.01	8.45	1558	0.01
para-Cymen-8-ol	6.85	1184	0.01	11.37	1798	0.01
α-Terpineol	6.92	1189	0.01	9.61*	1651	[0.02]
Methylchavicol	7.06	1198	3.61	9.15	1613	3.62
cis-α-Phellandrene epoxide (IPP vs Me)	7.09	1199	0.02	10.84	1754	0.02
Dihydroanethole	7.14	1203	0.02	8.40	1554	0.01
trans-Carveol	7.37	1218	0.01	11.22	1786	0.02
cis-Carveol	7.55	1230	0.01	11.55	1814	0.01

(*Z*)-Anethole	7.82†	1248	0.96	10.17	1696	0.05
para-Anisaldehyde	7.84†	1250	[0.96]	12.98	1943	0.95
(*E*)-Anethole	8.54	1297	73.22	11.10	1775	73.22
para-Menth-5-en-1,2-diol isomer II	8.70	1308	tr	14.19	2057	0.01
cis-para-Mentha-2,8-diene-1-hydroperoxide	8.72	1309	tr			
para-Mentha-1,8-diene-4-hydroperoxide	9.09	1336	0.01			
para-Acetonylanisole	9.68*	1377	0.36	14.39	2077	0.21
Unknown [121, 91 (60), 120 (39), 164 (37), 77 (34), 135 (26)]	9.68*	1377	[0.36]	13.51	1992	0.14
cis-para-Mentha-6,8-diene-2-hydroperoxide	9.77	1383	0.01			
1-(4-Methoxyphenyl)-1-propanol	9.96	1397	0.01			
Methyleugenol	10.06	1404	tr	13.14	1958	tr
β-Caryophyllene	10.18	1413	0.05	8.26*	1544	0.06
trans-α-Bergamotene	10.46	1434	0.05	8.26*	1544	[0.06]
α-Humulene	10.63	1446	tr	9.19	1617	tr
Unknown [m/z 135, 77 (20), 92 (11), 136 (9), 107 (9)...]	10.74	1455	0.01	15.80	2218	tr
Unknown [m/z 135, 77 (22), 92 (12), 107 (10), 136 (10)... 194 (t)]	11.31	1497	tr			
Unknown [m/z 137, 148 (14), 121 (14), 208 (13)]	11.60	1519	tr			
(*E*)-para-Methoxycinnamaldehyde	12.14	1562	0.01	18.00	2454	0.01
(*E*)-para-Methoxycinnamyl alcohol	12.20	1567	tr	19.52	2630	0.01
1-(4-Methoxyphenyl)propane-1,2-diol isomer I	12.23	1569	0.02	20.57	2757	0.01
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	12.28	1574	tr	20.70	2773	0.01
Unknown [m/z 137, 109 (19), 77 (17), 94 (15), 180 (13)]	12.33	1577	0.01			
Unknown [m/z 137, 109 (18), 77 (16), 94 (14), 180 (13)]	12.43	1585	0.06	20.01	2688	tr
Unknown [m/z 137, 131 (46), 166 (44), 109 (26), 77 (21)...]	12.90	1623	0.01			
Unknown [m/z 137, 109 (19), 94 (13), 77 (12), 121 (11), 138 (9)...]	13.31	1657	0.01			

1-Hydroxy-1-(4-methoxyphenyl)-propan-2-one	13.52	1674	tr	
Unknown [m/z 137, 109 (15), 43 (10), 164 (9), 138 (9)...]	13.88	1704	0.01	
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I	21.36	2450	0.01	
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II	21.58	2475	0.01	
Unknown [m/z 165, 148 (36), 137 (21), 121 (14), 166 (11)...]	21.66	2485	0.01	
Unknown [m/z 165, 148 (35), 137 (18), 147 (14), 166 (12), 121 (12)... 312? (t)]	21.82	2503	tr	
Total identified		**99.25%**		**99.08%**
Total reported		**99.38%**		**99.23%**

*: 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