Date : June 22, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21F17-PTH02
Customer identification : Peppermint - India - P50112214R
Type : Essential oil
Source : *Mentha x piperita*
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 : Seydou Ka, Ph. D., Chimiste
Analysis date : June 17, 2021

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4588 ± 0.0003 (20 °C; method PC-MAT-016)

EUROPEAN PHARMACOPOEIA 9.0 - 07/2012:0405 - PEPPERMINT OIL

Compound	Min. %	Max. %	Observed %	Complies?
Limonene	1.0	3.5	2.6	Yes
1,8-Cineole	3.5	8.0	5.4	Yes
Menthone	14.0	32.0	26.6	Yes
Menthofuran	1.0	8.0	1.2	Yes
Isomenthone	1.5	10.0	4.0	Yes
Menthyl acetate	2.8	10.0	5.4	Yes
Menthol	30.0	55.0	41.7	Yes
Pulegone		3.0	0.7	Yes
Carvone		1.0	0	Yes
Total isopulegol		0.20	0.03	Yes
Refractive index	1.457	1.467	1.459	Yes

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
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.02	Furan
Hashishene	0.01	Monoterpene
α-Thujene	0.04	Monoterpene
α-Pinene	0.80	Monoterpene
3-Methylcyclohexanone	0.01	Aliphatic ketone
Camphene	0.02	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β-Pinene	1.05	Monoterpene
Sabinene	0.23	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
cis-Carane	0.01	Monoterpene
Octan-3-one	0.01	Aliphatic ketone
Myrcene	0.23	Monoterpene
Octan-3-ol	0.26	Aliphatic alcohol
α-Phellandrene	0.04	Monoterpene
Pseudolimonene	0.01	Monoterpene
α-Terpinene	0.05	Monoterpene
para-Cymene	0.24	Monoterpene
Limonene	2.61	Monoterpene
1,8-Cineole	5.39	Monoterpenic ether
(*Z*)-β-Ocimene	0.04	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	0.20	Monoterpene
cis-Sabinene hydrate	0.06	Monoterpenic alcohol
cis-Linalool oxide (fur.)	tr	Monoterpenic alcohol
Octanol	0.04	Aliphatic alcohol
para-Cymenene	0.01	Monoterpene
Terpinolene	0.03	Monoterpene
trans-Sabinene hydrate	0.01	Monoterpenic alcohol
Nonan-3-ol	0.01	Aliphatic alcohol
Linalool	0.09	Monoterpenic alcohol
Amyl isovalerate	0.02	Aliphatic ester
cis-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
allo-Ocimene	0.01	Monoterpene
trans-Sabinol	0.07	Monoterpenic alcohol
Isopulegol	0.03	Monoterpenic alcohol
cis-α-Dihydroterpineol	0.08	Monoterpenic alcohol
Menthone	26.59	Monoterpenic ketone
para-Menthan-4-ol isomer	0.17	Monoterpenic alcohol
Isomenthone	4.03	Monoterpenic ketone

Menthofuran	1.19	Monoterpenic ether
neo-Menthol	3.27	Monoterpenic alcohol
δ-Terpineol	0.04	Monoterpenic alcohol
Menthol	41.66	Monoterpenic alcohol
Terpinen-4-ol	0.41	Monoterpenic alcohol
Isomenthol	0.40	Monoterpenic alcohol
neoiso-Menthol	0.06	Monoterpenic alcohol
α-Terpineol	0.08	Monoterpenic alcohol
Methylchavicol	0.02	Phenylpropanoid
Unknown	0.02	Unknown
Citronellol	0.01	Monoterpenic alcohol
Pulegone	0.68	Monoterpenic ketone
Piperitone	0.13	Monoterpenic ketone
Decanol	0.02	Aliphatic alcohol
2-Ethylmenthone?	0.08	Aliphatic ketone
Dihydroedulan I	0.02	Terpenic ether
Dihydroedulan II	0.02	Terpenic ether
Menthyl acetate	5.35	Monoterpenic ester
Thymol	0.01	Monoterpenic alcohol
Isomenthyl acetate	0.05	Monoterpenic alcohol
Bicycloelemene	0.05	Sesquiterpene
α-Cubebene	0.01	Sesquiterpene
Eugenol	0.01	Phenylpropanoid
α-Copaene	0.02	Sesquiterpene
β-Bourbonene	0.05	Sesquiterpene
β-Elemene	0.02	Sesquiterpene
Unknown	tr	Unknown
Unknown	0.02	Sesquiterpene
β-Caryophyllene	2.63	Sesquiterpene
β-Copaene	0.01	Sesquiterpene
Isogermacrene D	0.01	Sesquiterpene
α-Humulene	0.03	Sesquiterpene
(*E*)-β-Farnesene	0.05	Sesquiterpene
Germacrene D	0.21	Sesquiterpene
Menthalactone	0.01	Monoterpenic lactone
Bicyclogermacrene	0.04	Sesquiterpene
Viridiflorene	0.01	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
Caryophyllene oxide	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Viridiflorol	0.03	Sesquiterpenic alcohol
Consolidated total	**99.37%**	

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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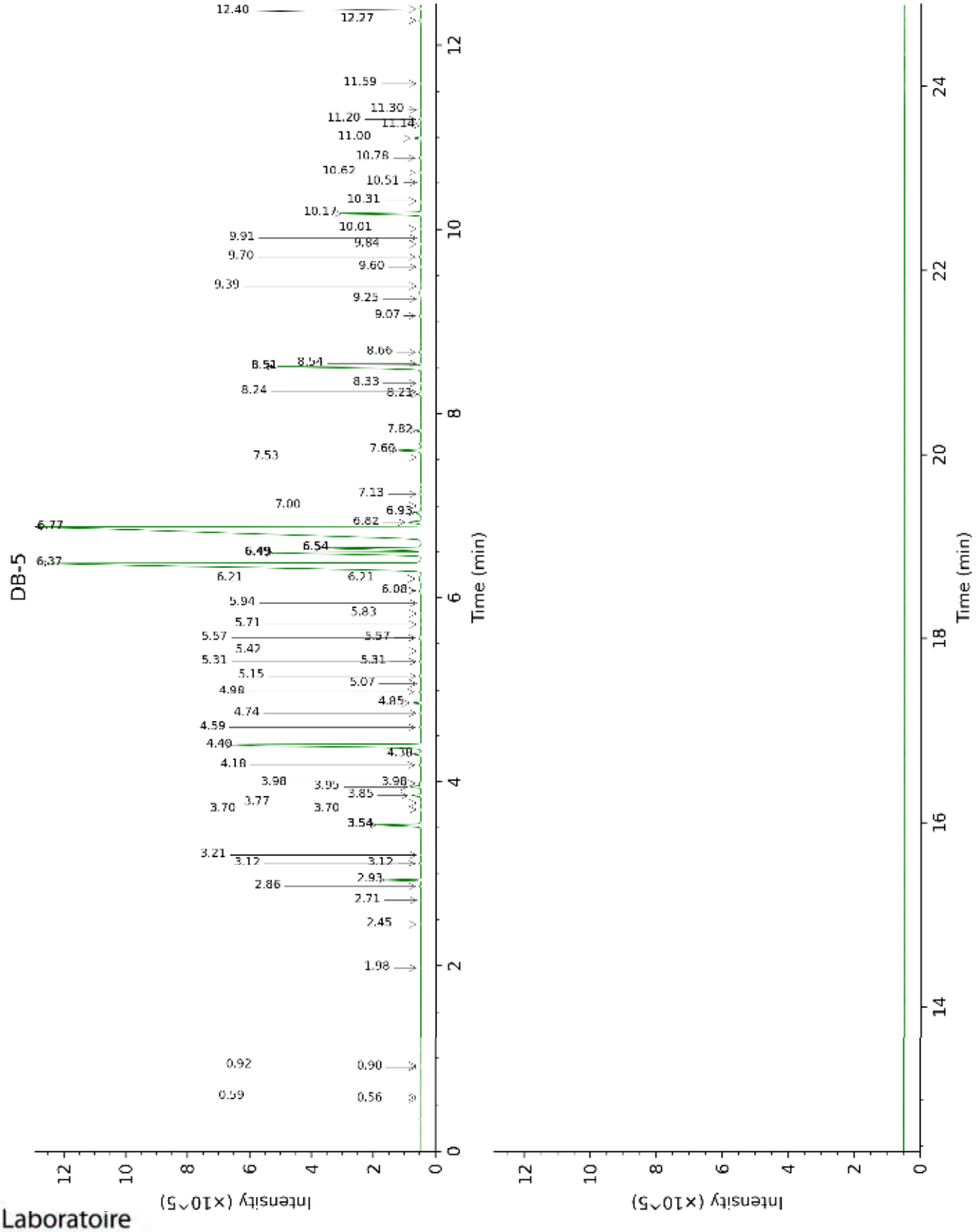
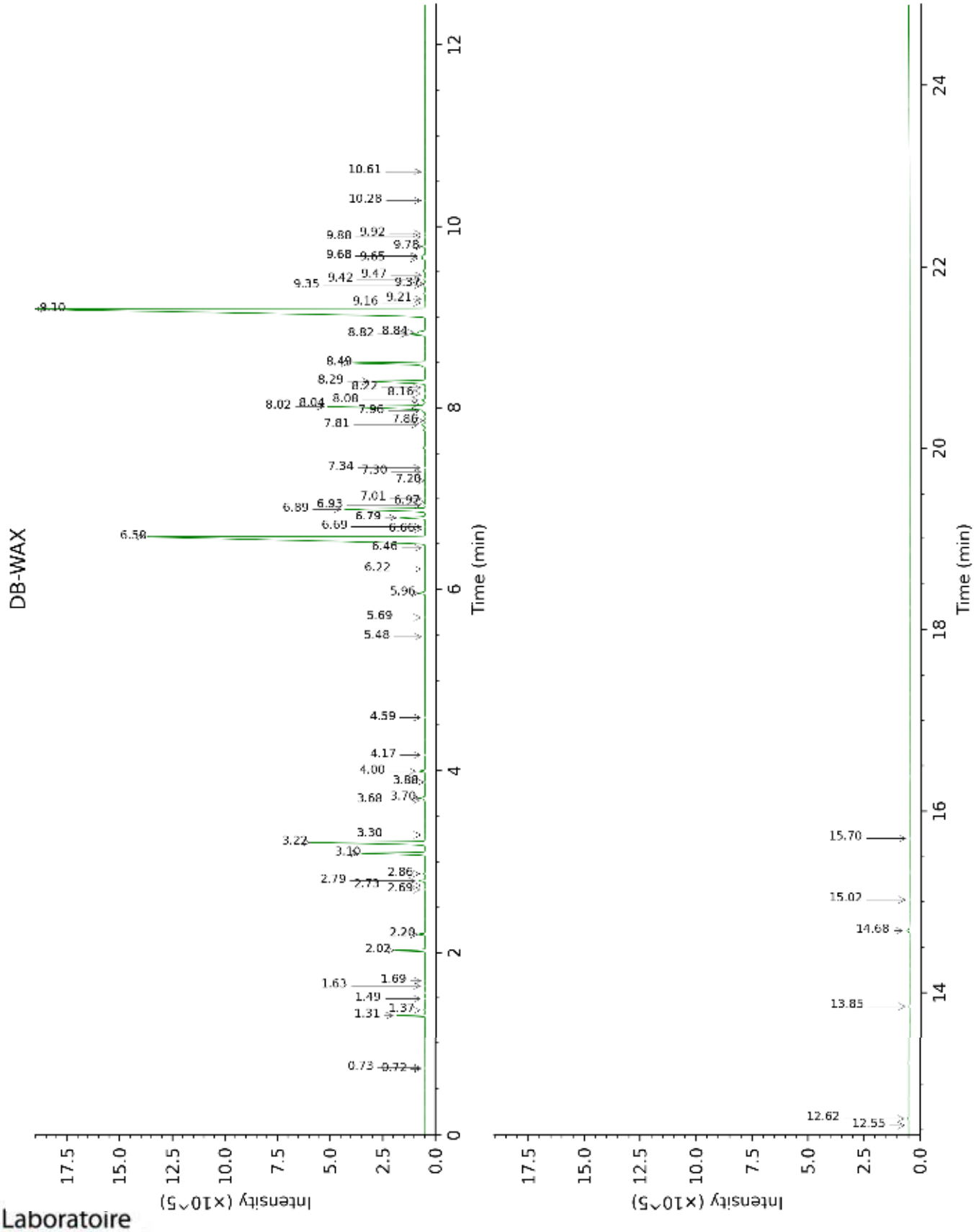

DB-5
Time (min)
Intensity (x10^5)
12.40
12.27
11.59
11.30
11.20
11.14
11.00
10.78
10.62
10.51
10.31
10.17
10.01
9.91
9.84
9.70
9.60
9.39
9.25
9.07
8.66
8.52
8.44
8.33
8.24
8.21
7.82
7.60
7.53
7.13
7.00
6.93
6.82
6.77
6.54
6.49
6.37
6.21
6.21
6.08
5.94
5.83
5.71
5.57
5.57
5.42
5.31
5.31
5.15
5.07
4.98
4.85
4.74
4.59
4.40
4.30
4.18
3.98
3.95
3.98
3.85
3.77
3.70
3.70
3.54
3.21
3.12
3.12
2.93
2.86
2.71
2.45
1.98
0.92
0.90
0.59
0.56


DB-WAX
Intensity (x10^5)
Time (min)
10.61
10.28
9.80
9.92
9.78
9.68
9.65
9.35
9.42
9.47
9.37
9.16
9.21
9.10
8.82
8.84
8.49
8.29
8.27
8.16
8.02
8.04
8.08
7.96
7.86
7.81
7.34
7.30
7.20
7.01
6.97
6.89
6.93
6.79
6.69
6.66
6.58
6.46
6.22
5.96
5.69
5.48
4.59
4.17
4.00
3.88
3.68
3.70
3.30
3.22
3.10
2.86
2.79
2.71
2.69
2.20
2.02
1.69
1.63
1.49
1.37
1.31
0.73
0.72
15.70
15.07
14.68
13.85
12.62
12.55

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.56	642	tr	0.73	888	tr
2-Methylbutyral	0.59	653	tr	0.72	881	tr
Isoamyl alcohol	0.90	731	tr	3.30*	1175	0.01
2-Methylbutanol	0.92	734	tr	3.30*	1175	[0.01]
(3*Z*)-Hexenol	1.98	856	0.01	5.69	1350	0.02
trans-2,5-Diethyltetrahydrofuran	2.45	896	0.02	1.49	1012	0.02
Hashishene	2.71	916	0.01	1.31*	991	0.79
α-Thujene	2.86	926	0.04	1.37	999	0.03
α-Pinene	2.93	930	0.80	1.31*	991	[0.79]
3-Methylcyclohexanone	3.12*	943	0.04	4.59*	1274	0.03
Camphene	3.12*	943	[0.04]	1.63	1026	0.02
Thuja-2,4(10)-diene	3.21	949	0.01	2.20*	1084	0.24
β-Pinene	3.54*	971	1.34	2.02	1066	1.05
Sabinene	3.54*	971	[1.34]	2.20*	1084	[0.24]
Octen-3-ol	3.70*	983	0.02	6.69	1423	0.02
cis-Carane	3.70*	983	[0.02]	1.69	1032	0.01
Octan-3-one	3.77	988	0.01	3.88*	1220	0.03
Myrcene	3.85	993	0.23	2.79	1134	0.22
Octan-3-ol	3.95	999	0.26	5.96	1370	0.26
α-Phellandrene	3.98*	1002	0.05	2.69	1126	0.04
Pseudolimonene	3.98*	1002	[0.05]	2.73	1130	0.01
α-Terpinene	4.18	1014	0.05	2.86	1140	0.05
para-Cymene	4.30	1022	0.24	4.00	1229	0.22
Limonene	4.40*	1029	8.08	3.10	1159	2.61
1,8-Cineole	4.40*	1029	[8.08]	3.22	1169	5.39
(*Z*)-β-Ocimene	4.59	1041	0.04	3.68	1206	0.04
(*E*)-β-Ocimene	4.74	1050	0.03	3.88*	1220	[0.03]
γ-Terpinene	4.85	1057	0.20	3.70	1207	0.21
cis-Sabinene hydrate	4.98	1065	0.06	6.79*	1431	1.25
cis-Linalool oxide (fur.)	5.07	1071	tr	6.46	1406	0.01
Octanol	5.15	1076	0.04	8.08	1528	0.15
para-Cymenene	5.31*	1086	0.04	6.22	1389	0.01
Terpinolene	5.31*	1086	[0.04]	4.18	1243	0.03
trans-Sabinene hydrate	5.42	1094	0.01	7.86	1511	0.05
Nonan-3-ol	5.57*	1103	0.10	7.20	1461	0.01
Linalool	5.57*	1103	[0.10]	7.96	1519	0.09
Amyl isovalerate	5.71	1112	0.02	4.59*	1274	[0.03]
cis-para-Menth-2-en-1-ol	5.83	1120	0.02	8.02*	1523	5.43
allo-Ocimene	5.94	1127	0.01	5.48	1335	tr
trans-Sabinol	6.08	1136	0.07	9.68*†	1654	[0.35]
Isopulegol	6.21*	1144	0.12	8.02*	1523	[5.43]
cis-α-Dihydroterpineol	6.21*	1144	[0.12]	8.04	1524	0.08
Menthone	6.37*	1155	26.81	6.58	1415	26.59

para-Menthan-4-ol isomer	6.37*	1155	[26.81]	7.81	1507	0.17
Isomenthone	6.49*	1163	5.23	6.89	1438	4.03
Menthofuran	6.49*	1163	[5.23]	6.79*	1431	[1.25]
neo-Menthol	6.54*	1166	3.31	8.49*	1560	3.48
δ-Terpineol	6.54*	1166	[3.31]	9.37	1629	0.04
Menthol	6.77*	1181	42.07	9.10	1607	41.66
Terpinen-4-ol	6.77*	1181	[42.07]	8.49*	1560	[3.48]
Isomenthol	6.82	1184	0.40	8.82*†	1585	1.02
neoiso-Menthol	6.93*	1192	0.21	9.35	1628	0.06
α-Terpineol	6.93*	1192	[0.21]	9.65†	1652	0.35
Methylchavicol	7.00	1196	0.02	9.21	1616	0.01
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.13	1205	0.02			
Citronellol	7.53	1232	0.01	10.61*	1731	0.03
Pulegone	7.60	1237	0.68	8.82*†	1585	[1.02]
Piperitone	7.82	1251	0.13	9.78	1662	0.13
Decanol	8.21†	1278	0.10	10.61*	1731	[0.03]
2-Ethylmenthone?	8.24†	1280	[0.10]			
Dihydroedulan I	8.33	1286	0.02	6.97	1444	0.01
Dihydroedulan II	8.51*	1299	5.37	7.30	1469	0.02
Menthyl acetate	8.51*	1299	[5.37]	8.02*	1523	[5.43]
Thymol	8.54	1301	0.01	15.02	2135	0.01
Isomenthyl acetate	8.66	1306	0.05	8.16	1534	0.05
Bicycloelemene	9.07	1334	0.05	6.93	1441	0.04
α-Cubebene	9.25	1347	0.01	6.66	1421	0.01
Eugenol	9.39	1357	0.01	14.68	2101	0.17
α-Copaene	9.60	1372	0.02	7.01	1447	0.02
β-Bourbonene	9.70	1380	0.05	7.34	1472	0.04
β-Elemene	9.84	1389	0.02	8.29*	1544	2.63
Unknown [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]	9.91	1394	tr			
Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	10.01	1401	0.02			
β-Caryophyllene	10.17	1413	2.63	8.29*	1544	[2.63]
β-Copaene	10.31	1423	0.01	8.22	1539	0.03
Isogermacrene D	10.51	1439	0.01	8.84†	1587	[1.02]
α-Humulene	10.62	1447	0.03	9.16	1612	0.04
(*E*)-β-Farnesene	10.78	1459	0.05	9.42	1633	0.06
Germacrene D	11.00	1475	0.21	9.68*†	1654	[0.35]
Menthalactone	11.14	1486	0.01	15.70	2203	0.01
Bicyclogermacrene	11.20*	1490	0.05	9.88	1671	0.04
Viridiflorene	11.20*	1490	[0.05]	9.47	1637	0.01
α-Muurolene	11.30	1498	0.01	9.92	1674	0.03
δ-Cadinene	11.59	1520	0.02	10.28	1703	0.02
Caryophyllene oxide	12.27*	1574	0.03	12.62	1907	0.03

Caryophyllene oxide isomer	12.27*	1574	[0.03]	12.55	1900	0.01
Viridiflorol	12.40	1584	0.03	13.85	2021	0.03
Total identified		**99.61%**			**99.31%**	
Total reported		**99.66%**			**99.31%**	

*: 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

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