Date : December 11, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19K29-PTH01-1-CC
Customer identification : Peppermint - India - P5010996R
Type : Essential oil
Source : *Mentha x piperita*
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Lindsay Girard, B. Sc.
Analysis date : December 04, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4592 ± 0.0003 (20 °C)

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

Compound	Min. %	Max. %	Observed %	Complies?
Carvone		1.0	0.1	Yes
Pulegone		3.0	0.8	Yes
Menthol	30.0	55.0	40.4	Yes
Menthyl acetate	2.8	10.0	5.1	Yes
Isomenthone	1.5	10.0	3.8	Yes
Menthofuran	1.0	8.0	1.6	Yes
Menthone	14.0	32.0	25.5	Yes
1,8-Cineole	3.5	8.0	5.5	Yes
Limonene	1.0	3.5	2.7	Yes
Total isopulegol		0.20	0.09	Yes
Refractive index	1.457	1.467	1.459	Yes

NF T 75-210:2007 & ISO 856:2006 - OIL OF PEPPERMINT - "OTHER ORIGINS"

Compound	Min. %	Max. %	Observed %	Complies?
β-Caryophyllene	1.0	3.5	2.3	Yes
Menthyl acetate	2.0	8.0	5.1	Yes
Pulegone	0.5	3.0	0.8	Yes
Menthol	32.0	49.0	40.4	Yes
neo-Menthol	2.0	6.0	3.8	Yes
Menthofuran	1.0	8.0	1.6	Yes
Isomenthone	2.0	8.0	3.8	Yes
Menthone	13.0	28.0	25.5	Yes
cis-Sabinene hydrate	0.5	2.0	0.1	No
Limonene	1.0	3.0	2.7	Yes
1,8-Cineole	3.0	8.0	5.5	Yes
Octan-3-ol	0.1	0.5	0.2	Yes
Refractive index	1.459	1.465	1.459	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the European Pharmacopoeia standard for peppermint oil, and does not comply with the ISO/AFNOR standard for peppermint oil of non-USA origin.

Analysis summary – Consolidated contents

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

Identification	%	Classe
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Methylbutanol	0.01	Aliphatic alcohol
(3*Z*)-Hexenol	0.02	Aliphatic alcohol
trans-2,5-Diethyltetrahydrofuran	0.12	Furan
α-Thujene	0.03	Monoterpene
α-Pinene	0.78	Monoterpene
3-Methylcyclohexanone	0.09	Aliphatic ketone
β-Pinene	1.15	Monoterpene
Sabinene	0.46	Monoterpene
Octen-3-ol	0.03	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
Myrcene	0.11	Monoterpene
Octan-3-ol	0.24	Aliphatic alcohol
α-Phellandrene	0.03	Monoterpene
α-Terpinene	0.09	Monoterpene
para-Cymene	0.12	Monoterpene
Limonene	2.66	Monoterpene
1,8-Cineole	5.50	Monoterpenic ether
(*Z*)-β-Ocimene	0.08	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	0.15	Monoterpene
cis-Sabinene hydrate	0.13	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Terpinolene	0.05	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.10	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.03	Aliphatic ester
Amyl isovalerate	0.03	Aliphatic ester
cis-para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
Octan-3-yl acetate	0.02	Aliphatic ester
neo-allo-Ocimene	0.03	Monoterpene
Isopulegol	0.09	Monoterpenic alcohol
cis-α-Dihydroterpineol	0.02	Monoterpenic alcohol
Menthone	25.47	Monoterpenic ketone
Menthofuran	1.56	Monoterpenic ether
Isomenthone	3.85	Monoterpenic ketone
neo-Menthol	3.78	Monoterpenic alcohol
δ-Terpineol	0.03	Monoterpenic alcohol
Lavandulol	0.12	Monoterpenic alcohol
Menthol	40.44	Monoterpenic alcohol
Terpinen-4-ol	0.41	Monoterpenic alcohol
Isomenthol	1.26	Monoterpenic alcohol
neoiso-Menthol	0.17	Monoterpenic alcohol
trans-Isopiperitenol	0.02	Monoterpenic alcohol

trans-Piperitol	tr	Monoterpenic alcohol
Unknown	0.02	Unknown
Citronellol	0.01	Monoterpenic alcohol
Pulegone	0.76	Monoterpenic ketone
Carvone	0.06	Monoterpenic ketone
Piperitone	0.19	Monoterpenic ketone
neo-Menthyl acetate	0.13	Monoterpenic ester
Decanol	0.02	Aliphatic alcohol
2-Ethylmenthone?	0.02	Aliphatic ketone
Dihydroedulan I	0.04	Terpenic ether
Menthyl acetate	5.09	Monoterpenic ester
Dihydroedulan II	0.03	Terpenic ether
Isomenthyl acetate	0.10	Monoterpenic alcohol
Bicycloelemene	0.02	Sesquiterpene
α-Cubebene	0.01	Sesquiterpene
α-Copaene	0.02	Sesquiterpene
β-Bourbonene	0.07	Sesquiterpene
β-Elemene	0.03	Sesquiterpene
Unknown	0.02	Unknown
β-Caryophyllene	2.29	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
Isogermacrene D	0.01	Sesquiterpene
α-Humulene	0.05	Sesquiterpene
(*E*)-β-Farnesene	0.12	Sesquiterpene
Germacrene D	0.46	Sesquiterpene
Menthalactone	0.02	Monoterpenic lactone
Bicyclogermacrene	0.08	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Viridiflorol	0.04	Sesquiterpenic alcohol
Benzyl benzoate	0.01	Phenolic ester
para-Camphorene	0.01	Diterpene
α-Terpineol	0.14	Monoterpenic alcohol
Consolidated total	**99.36%**	

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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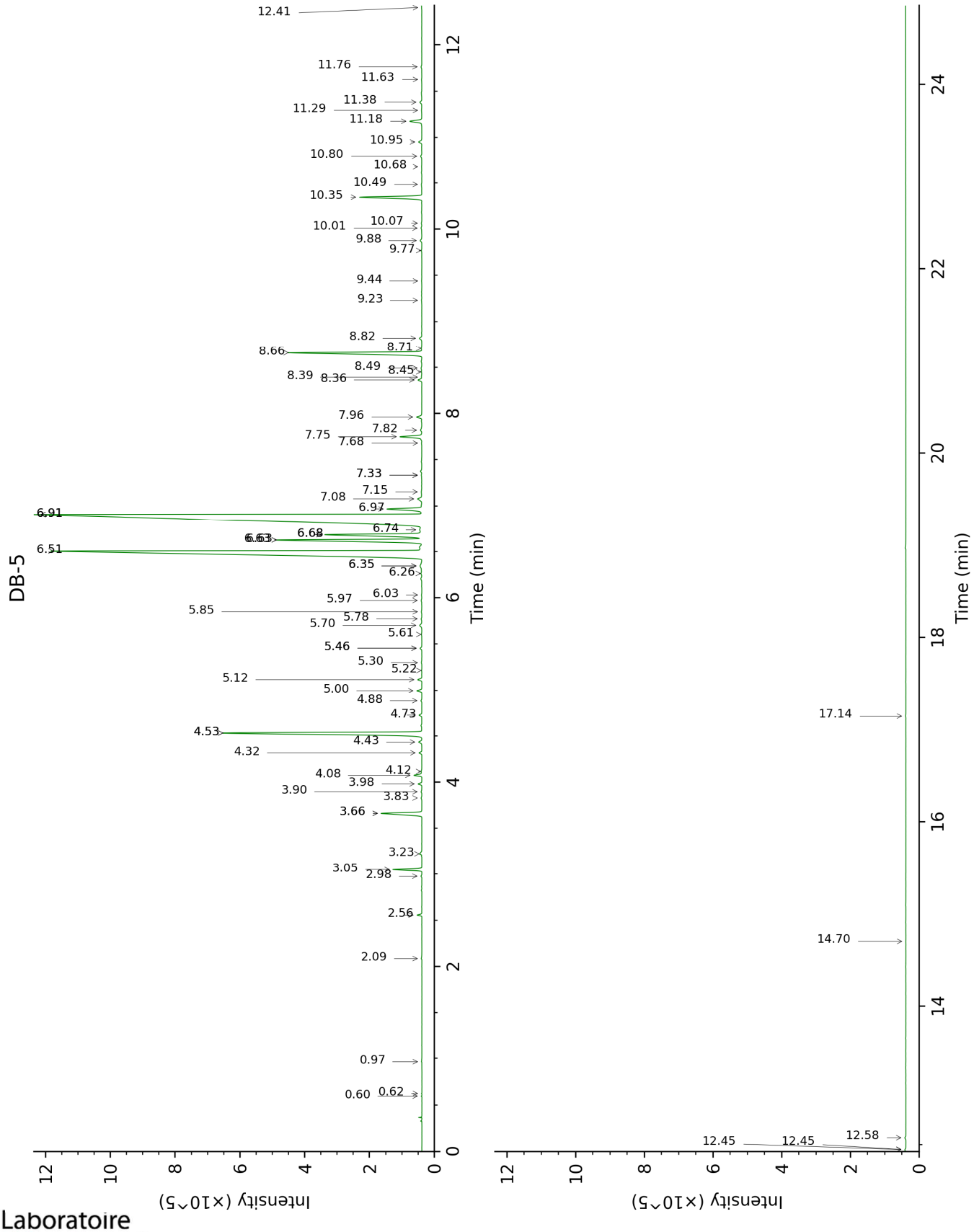
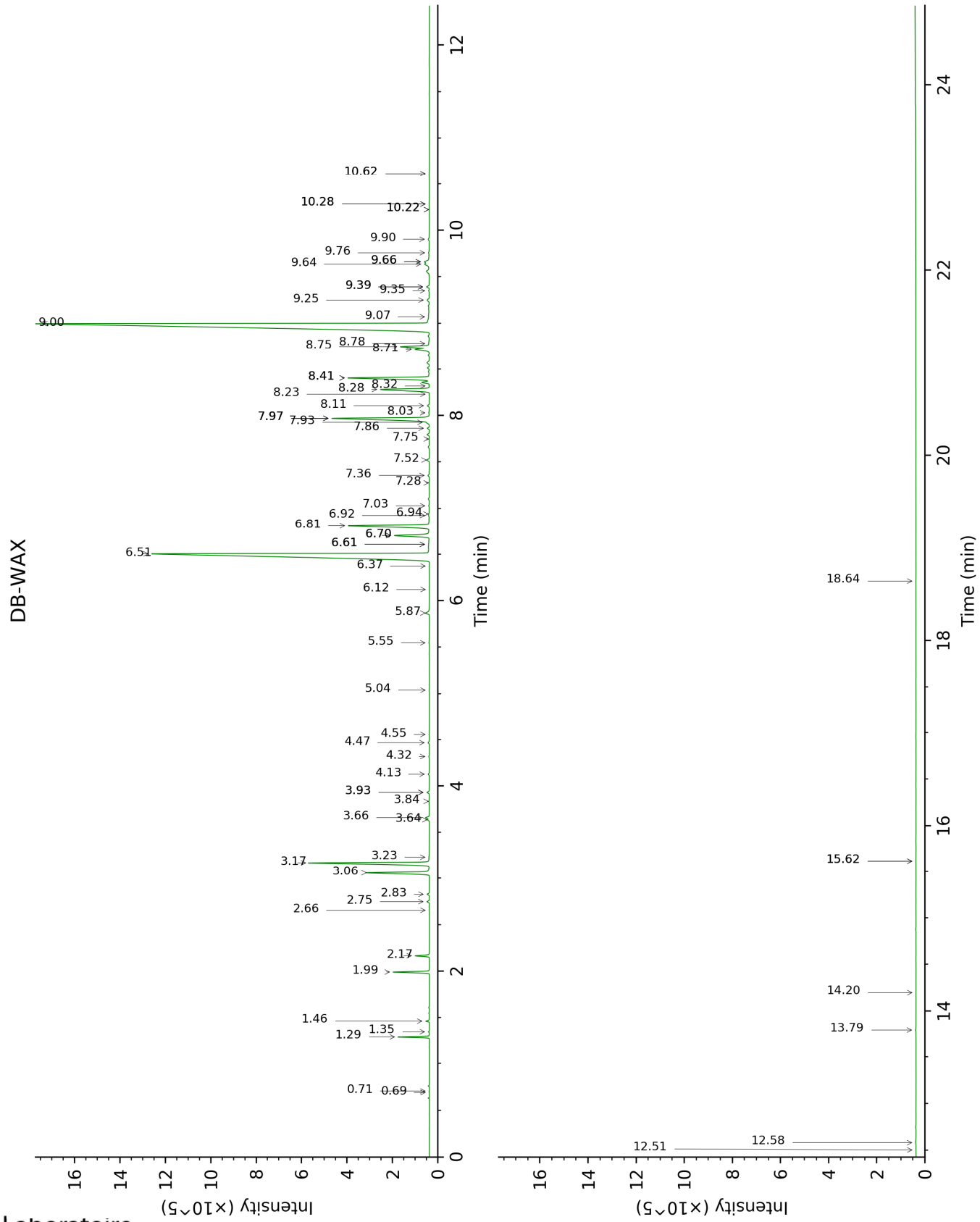

DB-5
Time (min)
Intensity (×10^5)
12.41
11.76
11.63
11.38
11.29
11.18
10.95
10.80
10.68
10.49
10.35
10.07
10.01
9.88
9.77
9.44
9.23
8.82
8.71
8.66
8.49
8.45
8.39
8.36
7.96
7.82
7.75
7.68
7.33
7.15
7.08
6.97
6.91
6.74
6.68
6.63
6.51
6.35
6.26
6.03
5.97
5.85
5.78
5.70
5.61
5.46
5.30
5.22
5.12
5.00
4.88
4.73
4.53
4.43
4.32
4.12
4.08
3.98
3.90
3.83
3.66
3.23
3.05
2.98
2.56
2.09
0.97
0.62
0.60
17.14
14.70
12.58
12.45
12.45


DB-WAX
Intensity (×10^5)
Time (min)
10.62
10.28
10.22
9.90
9.76
9.64
9.66
9.39
9.35
9.25
9.07
9.00
8.75
8.78
8.71
8.41
8.32
8.28
8.23
8.11
8.03
7.97
7.93
7.86
7.75
7.52
7.36
7.28
7.03
6.94
6.92
6.81
6.70
6.61
6.51
6.37
6.12
5.87
5.55
5.04
4.55
4.47
4.32
4.13
3.93
3.84
3.66
3.64
3.23
3.17
3.06
2.83
2.75
2.66
2.17
1.99
1.46
1.35
1.29
0.71
0.69
18.64
15.62
14.20
13.79
12.58
12.51

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.60	642	0.01	0.71	885	0.01
2-Methylbutyral	0.62	653	tr	0.69	879	tr
2-Methylbutanol	0.97	737	0.01	3.23	1172	0.02
(3*Z*)-Hexenol	2.09	856	0.02	5.55	1341	0.03
trans-2,5-Diethyltetrahydrofuran	2.56	895	0.12	1.46	1014	0.11
α-Thujene	2.98	924	0.03	1.35	1002	0.02
α-Pinene	3.05	929	0.78	1.29	992	0.80
3-Methylcyclohexanone	3.23	940	0.09	4.47	1268	0.06
β-Pinene	3.66*	970	1.58	1.99	1065	1.15
Sabinene	3.66*	970	[1.58]	2.17	1083	0.46
Octen-3-ol	3.83	980	0.03	6.61*	1418	0.01
Octan-3-one	3.90	985	0.03	3.84	1220	0.03
Myrcene	3.98	991	0.11	2.75	1134	0.10
Octan-3-ol	4.08	997	0.24	5.87	1364	0.24
α-Phellandrene	4.12	1000	0.03	2.66	1126	0.01
α-Terpinene	4.32	1013	0.09	2.83	1140	0.09
para-Cymene	4.44	1020	0.12	3.93*	1228	0.11
Limonene	4.53*	1026	8.13	3.06	1158	2.66
1,8-Cineole	4.53*	1026	[8.13]	3.17	1168	5.50
(*Z*)-β-Ocimene	4.73	1038	0.08	3.64	1205	0.07
(*E*)-β-Ocimene	4.88	1048	0.03	3.93*	1228	[0.11]
γ-Terpinene	5.00	1056	0.15	3.66	1207	0.16
cis-Sabinene hydrate	5.12	1063	0.13	6.70*	1425	1.69
cis-Linalool oxide (fur.)	5.22	1070	0.01	6.37	1401	0.01
Octanol	5.30	1075	0.02	8.03	1525	0.02
Terpinolene	5.46*	1085	0.06	4.13	1242	0.05
para-Cymenene	5.46*	1085	[0.06]	6.12	1383	0.01
trans-Sabinene hydrate	5.61	1095	0.02	7.75	1503	0.02
Linalool	5.70	1101	0.10	7.86	1512	0.08
2-Methylbutyl 2-methylbutyrate	5.78	1106	0.03	4.32	1257	0.03
Amyl isovalerate	5.85	1111	0.03	4.56	1275	0.01
cis-para-Menth-2-en-1-ol	5.97	1119	0.03	7.97*	1520	5.24
Octan-3-yl acetate	6.03	1123	0.02	5.04	1312	0.01
neo-allo-Ocimene	6.26	1138	0.03			
Isopulegol	6.35*	1144	0.11	7.93	1517	0.09
cis-α-Dihydroterpineol	6.35*	1144	[0.11]	7.97*	1520	[5.24]
Menthone	6.51	1154	25.47	6.51	1410	25.36
Menthofuran	6.63*	1162	5.60	6.70*	1425	[1.69]
Isomenthone	6.63*	1162	[5.60]	6.81	1433	3.85
neo-Menthol	6.68*	1166	3.80	8.41*	1554	3.71
δ-Terpineol	6.68*	1166	[3.80]	9.35	1629	0.03
Lavandulol	6.74	1170	0.12	9.39*	1633	0.11
Menthol	6.91*	1181	40.85	9.00	1601	40.44

Terpinen-4-ol	6.91*	1181	[40.85]	8.41*	1554	[3.71]
Isomenthol	6.97	1185	1.26	8.75	1581	1.25
neoiso-Menthol	7.08	1192	0.17	9.25	1621	0.11
trans-Isopiperitenol	7.15	1197	0.02	10.28*	1706	0.03
trans-Piperitol	7.33*	1210	0.02	10.22*	1701	0.01
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.33*	1210	[0.02]			
Citronellol	7.68	1234	0.01	10.62*	1734	0.02
Pulegone	7.75	1235	0.76	8.71	1578	0.72
Carvone	7.82	1239	0.06	9.76	1663	0.06
Piperitone	7.96	1249	0.19	9.66*	1655	0.32
neo-Menthyl acetate	8.36	1276	0.13	7.52	1486	0.12
Decanol	8.39	1278	0.02	10.62*	1734	[0.02]
2-Ethylmenthone?	8.45	1281	0.02			
Dihydroedulan I	8.49	1284	0.04	6.92	1442	0.03
Menthyl acetate	8.66	1295	5.09	7.97*	1520	[5.24]
Dihydroedulan II	8.71	1298	0.03	7.28	1468	0.02
Isomenthyl acetate	8.82	1306	0.10	8.11	1531	0.08
Bicycloelemene	9.23	1335	0.02	6.94	1443	0.02
α-Cubebene	9.44	1350	0.01	6.61*	1418	[0.01]
α-Copaene	9.77	1372	0.02	7.03	1449	0.02
β-Bourbonene	9.88	1380	0.07	7.36	1474	0.06
β-Elemene	10.01	1390	0.03	8.32	1548	0.02
Unknown [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]	10.07	1393	0.02			
β-Caryophyllene	10.35	1414	2.29	8.28	1544	2.53
β-Copaene	10.49	1424	0.02	8.23	1540	0.01
Isogermacrene D	10.68	1438	0.01	8.78	1584	0.04
α-Humulene	10.80	1447	0.05	9.07	1606	0.03
(*E*)-β-Farnesene	10.95	1458	0.12	9.39*	1633	[0.11]
Germacrene D	11.18	1475	0.46	9.64	1653	0.30
Menthalactone	11.29	1484	0.02	15.62*	2202	0.01
Bicyclogermacrene	11.38	1490	0.08	9.90	1675	0.07
γ-Cadinene	11.63	1509	0.01	10.22*	1701	[0.01]
δ-Cadinene	11.76	1519	0.03	10.28*	1706	[0.03]
Spathulenol	12.41	1570	0.01	14.20	2060	0.01
Caryophyllene oxide	12.45*	1573	0.05	12.58	1908	0.04
Caryophyllene oxide isomer	12.45*	1573	[0.05]	12.50	1900	0.01
Viridiflorol	12.58	1583	0.04	13.80	2021	0.03
Benzyl benzoate	14.70	1760	0.01	18.64	2533	0.01
para-Camphorene	17.14	1984	0.01	15.62*	2202	[0.01]
α-Terpineol				9.66*	1655	[0.32]
Total identified		**99.34%**			**98.42%**	
Total reported		**99.35%**			**98.42%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

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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