

Date : May 04, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21D20-ORA01

Customer identification : Peppermint - India - 3 years - B634024

Type : Essential oil

Source : *Mentha x piperita*

Customer : Organic Aromas Inc.

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : May 04, 2021

Checked and approved by :

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

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*P*HYSICO*C*HEMICAL *D*ATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4604 ± 0.0003 (20 °C; method PC-MAT-016)

*C*ONCLUSION

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
Isobutanol	tr	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Ethyl 2-methylbutyrate	tr	Aliphatic ester
(3Z)-Hexenol	tr	Aliphatic alcohol
Hexanol	tr	Aliphatic alcohol
<i>trans</i> -2,5-Diethyltetrahydrofuran	0.01	Furan
Hashishene	tr	Monoterpene
α-Thujene	0.02	Monoterpene
α-Pinene	0.79	Monoterpene
<i>trans</i> -3-Methylcyclohexanol	0.03	Aliphatic alcohol
α-Fenchene	0.01	Monoterpene
Camphene	0.04	Monoterpene
3-Methylcyclohexanone	0.06	Aliphatic ketone
Thuja-2,4(10)-diene	0.01	Monoterpene
β-Pinene	1.23	Monoterpene
Sabinene	0.40	Monoterpene
Octen-3-ol	0.03	Aliphatic alcohol
<i>cis</i> -Carane	0.01	Monoterpene
Octan-3-one	0.02	Aliphatic ketone
Myrcene	0.16	Monoterpene
Octan-3-ol	0.11	Aliphatic alcohol
α-Phellandrene	0.02	Monoterpene
Pseudolimonene	0.03	Monoterpene
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.10	Monoterpene
para-Cymene	0.24	Monoterpene
Limonene	2.76	Monoterpene
1,8-Cineole	5.71	Monoterpenic ether
2-Ethylhexanol	0.02	Aliphatic alcohol
(Z)-β-Ocimene	0.08	Monoterpene
(E)-β-Ocimene	0.04	Monoterpene
γ-Terpinene	0.14	Monoterpene
<i>cis</i> -Sabinene hydrate	0.15	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
Terpinolene	0.06	Monoterpene
para-Cymenene	0.02	Monoterpene
<i>trans</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.12	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.02	Aliphatic ester
Amyl isovalerate	0.02	Aliphatic ester
<i>cis</i> -para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol

Octan-3-yl acetate	0.01	Aliphatic ester
<i>trans</i> -β-Dihydroterpineol	0.03	Monoterpenic alcohol
<i>trans</i> -Sabinol	0.01	Monoterpenic alcohol
<i>cis</i> -α-Dihydroterpineol	0.03	Monoterpenic alcohol
Isopulegol	0.14	Monoterpenic alcohol
para-Menthan-4-ol isomer	0.10	Monoterpenic alcohol
Menthone	22.72	Monoterpenic ketone
Menthofuran	1.81	Monoterpenic ether
Isomenthone	3.75	Monoterpenic ketone
δ-Terpineol	0.03	Monoterpenic alcohol
neo-Menthol	3.12	Monoterpenic alcohol
Terpinen-4-ol	0.32	Monoterpenic alcohol
Menthol	41.16	Monoterpenic alcohol
Isomenthol	0.48	Monoterpenic alcohol
para-Cymen-8-ol	0.07	Monoterpenic alcohol
α-Terpineol	0.55	Monoterpenic alcohol
neoisoo-Menthol	0.45	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.05	Monoterpenic alcohol
Myrtenol	0.02	Monoterpenic alcohol
Methylchavicol	0.04	Phenylpropanoid
Unknown	0.03	Unknown
<i>trans</i> -Piperitol	0.03	Monoterpenic alcohol
iso-Dihydrocarveol ?	0.01	Monoterpenic alcohol
<i>trans</i> -Carveol	tr	Monoterpenic alcohol
(3Z)-Hexenyl 2-methylbutyrate	0.02	Aliphatic ester
Citronellol	0.02	Monoterpenic alcohol
Pulegone	0.99	Monoterpenic ketone
Carvone	0.08	Monoterpenic ketone
Piperitone	0.36	Monoterpenic ketone
Isopiperitenone	0.01	Monoterpenic ketone
neo-Menthyl acetate	0.18	Monoterpenic ester
Decanol	0.05	Aliphatic alcohol
2-Ethylmenthone?	0.03	Aliphatic ketone
Dihydroedulan I	0.03	Terpenic ether
Thymol	0.02	Monoterpenic alcohol
Dihydroedulan II	0.04	Terpenic ether
Menthyl acetate	5.08	Monoterpenic ester
Isomenthyl acetate	0.09	Monoterpenic alcohol
neoisoo-Menthyl acetate?	0.01	Monoterpenic ester
Bicycloelemene	0.09	Sesquiterpene
Piperitenone	0.02	Monoterpenic ketone
α-Cubebene	0.02	Sesquiterpene
Evodone	0.03	Monoterpenic ketone
Menthofurolactone	0.02	Aliphatic alcohol
α-Ylangene	0.02	Sesquiterpene
α-Copaene	0.05	Sesquiterpene
β-Bourbonene	0.16	Sesquiterpene
1,5-diepi-β-Bourbonene	0.01	Sesquiterpene
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.06	Sesquiterpene
Unknown	0.03	Unknown
Unknown	0.02	Sesquiterpene

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Isocaryophyllene	0.03	Sesquiterpene
β-Caryophyllene	2.60	Sesquiterpene
Unknown	0.02	Unknown
β-Copaene	0.04	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.01	Sesquiterpene
Isogermacrene D	0.03	Sesquiterpene
α-Humulene	0.11	Sesquiterpene
Muurola-4,11-diene	0.02	Sesquiterpene
(E)-β-Farnesene	0.08	Sesquiterpene
9-epi-β-Caryophyllene	0.03	Sesquiterpene
γ-Murolene	0.02	Sesquiterpene
Germacrene D	0.38	Sesquiterpene
Menthalactone	0.03	Monoterpenic lactone
Viridiflorene	0.03	Sesquiterpene
Bicyclogermacrene	0.07	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
<i>trans</i> -Calamenene	0.01	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.07	Sesquiterpenic ether
Viridiflorol	0.04	Sesquiterpenic alcohol
Unknown	0.01	Unknown
Consolidated total	98.81%	

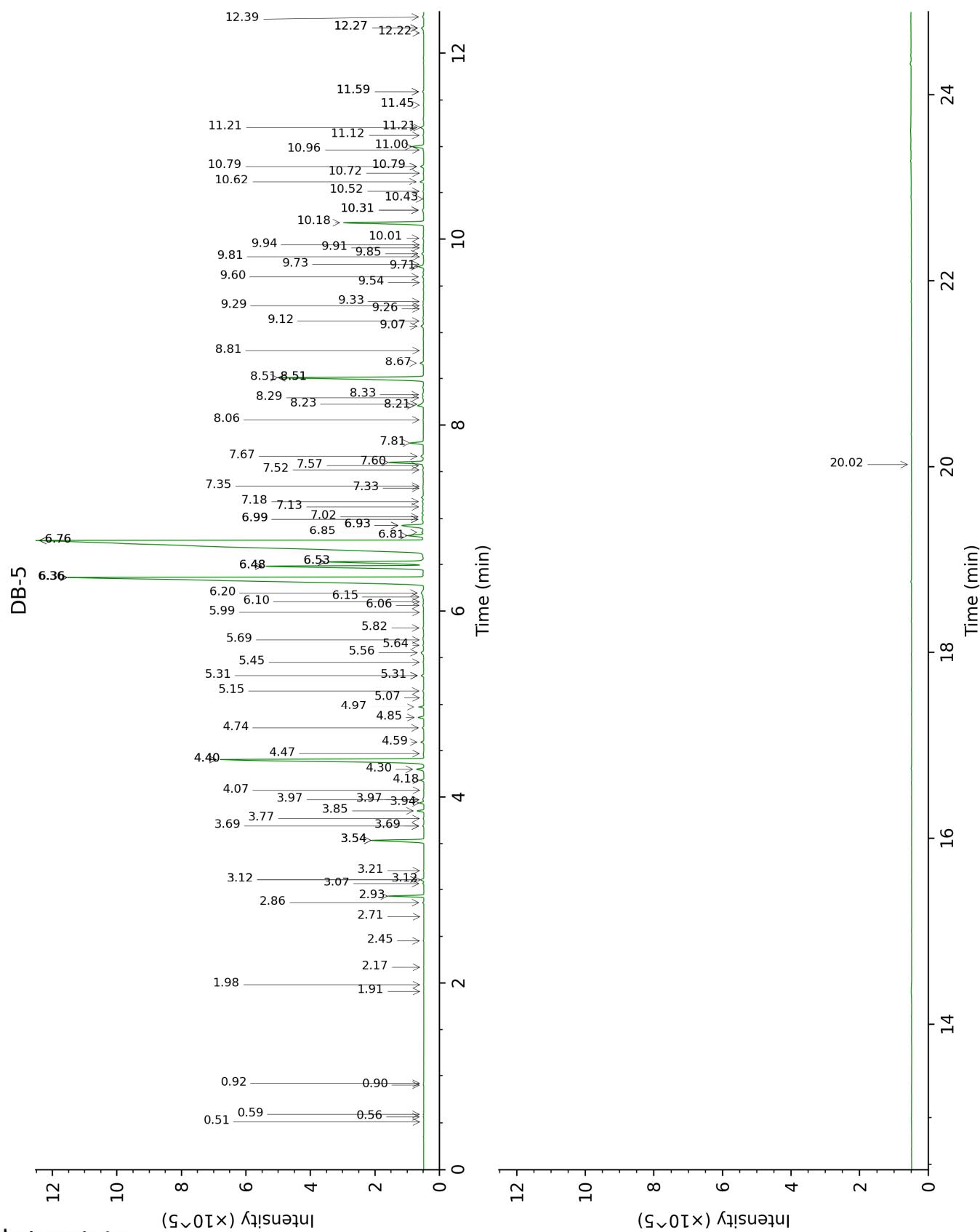
tr: The compound has been detected below 0.005% of total signal.

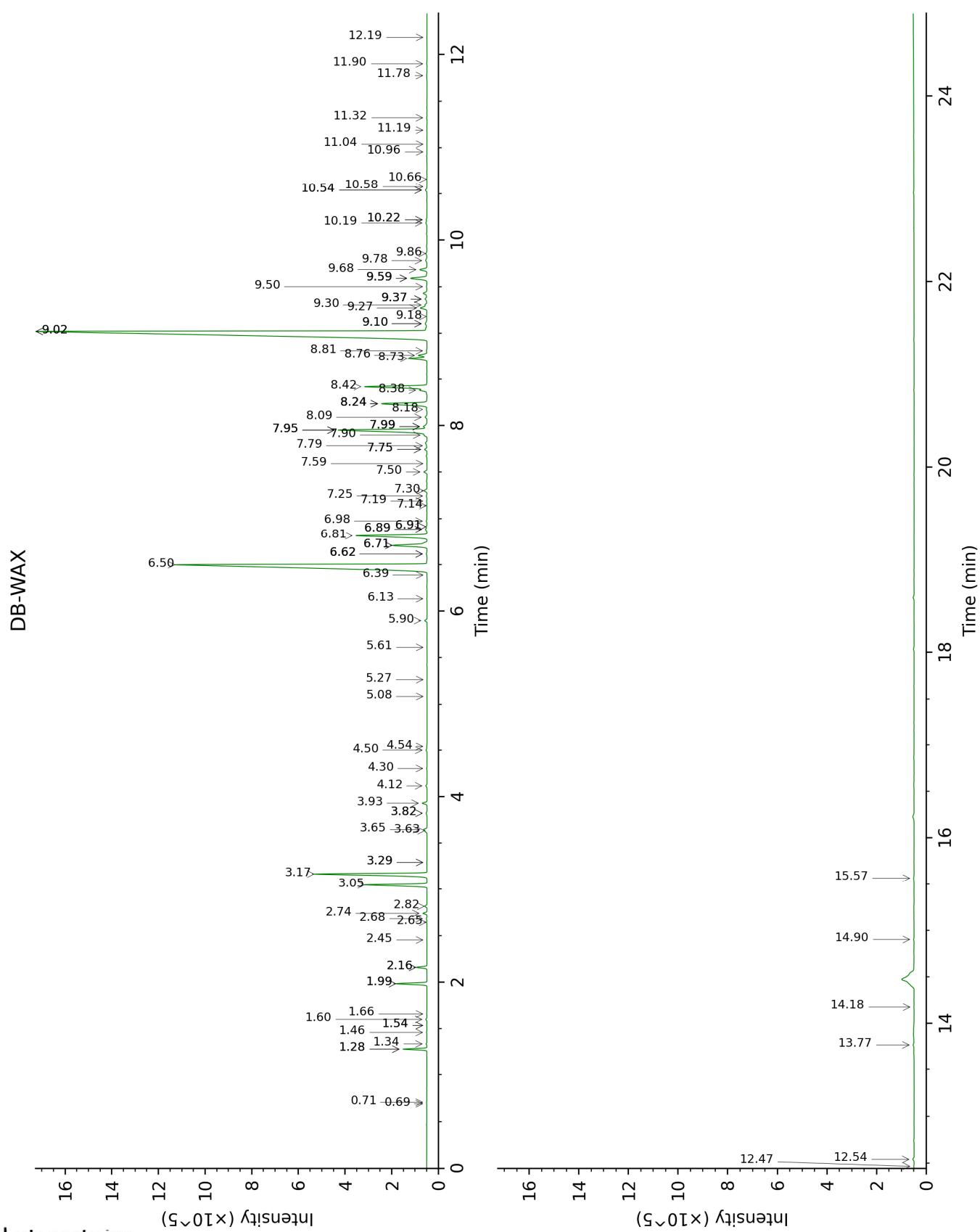
Note: no correction factor was applied

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.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutanol	0.51	618	tr	1.98*	1066	1.23
Isovaleral	0.56	639	0.01	0.71	887	0.01
2-Methylbutyral	0.59	650	tr	0.69	880	tr
Isoamyl alcohol	0.90	731	0.01	3.29*	1178	0.01
2-Methylbutanol	0.92	734	tr	3.29*	1178	[0.01]
Ethyl 2-methylbutyrate	1.91	850	tr	1.54*	1021	0.01
(3Z)-Hexenol	1.98	856	tr	5.61	1348	0.01
Hexanol	2.17	873	tr	5.27	1323	0.01
<i>trans</i> -2,5-Diethyltetrahydrofuran	2.45	897	0.01	1.46	1013	0.02
Hashishene	2.71	916	tr	1.28*	992	0.80
α -Thujene	2.86	927	0.02	1.34	1001	0.03
α -Pinene	2.93	931	0.79	1.28*	992	[0.80]
<i>trans</i> -3-Methylcyclohexanol	3.07	940	0.03	6.62*	1421	0.05
α -Fenchene	3.12*	944	0.09	1.54*	1021	[0.01]
Camphene	3.12*	944	[0.09]	1.60	1027	0.04
3-Methylcyclohexanone	3.12*	944	[0.09]	4.50	1269	0.06
Thuja-2,4(10)-diene	3.21	950	0.01	2.16*	1084	0.41
β -Pinene	3.54*	972	1.64	1.98*	1066	[1.23]
Sabinene	3.54*	972	[1.64]	2.16*	1084	[0.41]
Octen-3-ol	3.69*	983	0.04	6.62*	1421	[0.05]
<i>cis</i> -Carane	3.69*	983	[0.04]	1.66	1033	0.01
Octan-3-one	3.77	988	0.02	3.82*	1219	0.05
Myrcene	3.85	994	0.16	2.74	1133	0.16
Octan-3-ol	3.94	999	0.11	5.90	1369	0.11
α -Phellandrene	3.97*†	1002	0.05	2.64	1126	0.02
Pseudolimonene	3.97*†	1002	[0.05]	2.68	1129	0.03
Δ 3-Carene	4.07	1008	0.01	2.45	1111	0.01
α -Terpinene	4.18	1015	0.10	2.82	1140	0.10
para-Cymene	4.30	1022	0.24	3.93	1227	0.22
Limonene	4.40*	1029	8.45	3.05	1158	2.76
1,8-Cineole	4.40*	1029	[8.45]	3.17	1168	5.71
2-Ethylhexanol	4.47	1033	0.02	7.14	1460	0.02
(Z)- β -Ocimene	4.59	1041	0.08	3.64	1205	0.08
(E)- β -Ocimene	4.74	1051	0.04	3.82*	1219	[0.05]
γ -Terpinene	4.85	1058	0.14	3.65	1206	0.16
<i>cis</i> -Sabinene hydrate	4.97	1065	0.15	6.71*†	1428	1.99
<i>cis</i> -Linalool oxide (fur.)	5.07	1072	0.01	6.39	1404	0.02
Octanol	5.15	1076	0.03	7.99*	1525	0.23
Terpinolene	5.31*	1086	0.07	4.12	1241	0.06
para-Cymenene	5.31*	1086	[0.07]	6.14	1386	0.02
<i>trans</i> -Sabinene hydrate	5.45	1096	0.02	7.75*	1506	0.12
Linalool	5.56	1102	0.12	7.90	1518	0.12
2-Methylbutyl 2-methylbutyrate	5.64	1107	0.02	4.30	1254	0.03

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Amyl isovalerate	5.69	1111	0.02	4.54	1272	0.02
cis-para-Menth-2-en-1-ol	5.82	1119	0.03	7.95*	1522	5.27
Octan-3-yl acetate	5.99	1130	0.01	5.08	1309	0.01
trans-β-Dihydroterpineol	6.06	1135	0.03	7.79	1509	0.03
trans-Sabinol	6.10	1137	0.01	9.59*	1652	0.94
cis-a-Dihydroterpineol	6.15	1140	0.03	7.99*	1525	[0.23]
Isopulegol	6.20	1143	0.14	7.99*	1525	[0.23]
para-Menth-4-ol isomer	6.36*	1154	22.82	7.75*	1506	[0.12]
Menthone	6.36*	1154	[22.82]	6.50	1412	22.72
Menthofuran	6.48*	1162	5.56	6.71*†	1428	[1.99]
Isomenthone	6.48*	1162	[5.56]	6.81	1436	3.75
δ-Terpineol	6.53*	1165	3.15	9.30†	1629	[0.48]
neo-Menthol	6.53*	1165	[3.15]	8.42	1559	3.12
Terpinen-4-ol	6.76*	1179	41.87	8.38	1556	0.32
Menthol	6.76*	1179	[41.87]	9.02*	1606	41.19
Isomenthol	6.81	1183	0.48	8.76	1586	0.44
para-Cymen-8-ol	6.85	1185	0.07	11.32	1798	0.02
α-Terpineol	6.93*	1190	0.89	9.59*	1652	[0.94]
neoiso-Menthol	6.93*	1190	[0.89]	9.27†	1626	0.48
cis-Piperitol	6.99*	1194	0.06	9.37*	1634	0.12
Myrtenol	6.99*	1194	[0.06]	10.66	1742	0.02
Methylchavicol	7.02	1196	0.04	9.10*	1612	0.14
Unknown [m/z 43, 99 (84), 81 (46), 986 (43), 126 (36), 71 (28)... 170 (12)]	7.13	1203	0.03			
trans-Piperitol	7.18	1207	0.03	10.22*	1704	0.04
iso-Dihydrocarveol ?	7.33	1216	0.01	10.58	1734	0.01
trans-Carveol	7.35	1218	tr	11.19	1787	0.01
(3Z)-Hexenyl 2-methylbutyrate	7.52	1230	0.02	6.91*	1444	0.04
Citronellol	7.57	1232	0.02	10.54*	1731	0.08
Pulegone	7.60	1235	0.99	8.73	1582	1.03
Carvone	7.67	1239	0.08	9.78	1668	0.08
Piperitone	7.81	1249	0.36	9.68	1660	0.37
Isopiperitenone	8.06	1266	0.01	10.96	1767	0.01
neo-Menthyl acetate	8.21	1276	0.18	7.50	1488	0.16
Decanol	8.23	1277	0.05	10.54*	1731	[0.08]
2-Ethylmenthone?	8.30	1282	0.03			
Dihydroedulan I	8.33	1284	0.03	6.91*	1444	[0.04]
Thymol	8.51*	1296	5.14	14.90	2133	0.02
Dihydroedulan II	8.51*	1296	[5.14]	7.25	1468	0.04
Menthyl acetate	8.51*	1296	[5.14]	7.95*	1522	[5.27]
Isomenthyl acetate	8.67	1306	0.09	8.09	1533	0.10
neoiso-Menthyl acetate?	8.81	1317	0.01			
Bicycloelemene	9.07	1335	0.09	6.89*	1441	0.09
Piperitenone	9.12	1339	0.02	11.90	1850	0.03
α-Cubebene	9.26	1348	0.02	6.62*	1421	[0.05]

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Evodone	9.29	1351	0.03	12.19	1875	0.01
Menthofurolactone	9.33	1354	0.02	11.78	1838	0.02
α -Ylangene	9.54	1368	0.02	6.89*	1441	[0.09]
α -Copaene	9.60	1373	0.05	6.98	1448	0.05
β -Bourbonene	9.71	1380	0.16	7.30	1473	0.16
1,5-diepi- β -Bourbonene	9.73	1382	0.01	7.19	1464	0.03
β -Cubebene	9.81	1388	0.02	7.59	1494	0.01
β -Elemene	9.85	1390	0.06	8.24*	1544	2.59
Unknown [m/z 107, 121 (79), 119 (66), 91 (58), 136 (55), 105 (49)... 194 (1)]	9.91	1394	0.03			
Unknown [m/z 106, 119 (99), 43 (78), 91 (74), 105 (60), 134 (55)... 204 (19)]	9.94	1397	0.02			
Isocaryophyllene	10.01	1402	0.03	7.95*	1522	[5.27]
β -Caryophyllene	10.18	1414	2.60	8.24*	1544	[2.59]
Unknown [m/z 177, 109 (32), 192 (26), 95 (25), 137 (23)]	10.31*	1424	0.06			
β -Copaene	10.31*	1424	[0.06]	8.18	1540	0.04
trans- α -Bergamotene	10.43	1433	0.01	8.24*	1544	[2.59]
Isogermacrene D	10.52	1439	0.03	8.81	1589	0.03
α -Humulene	10.62	1447	0.11	9.10*	1612	[0.14]
Muurola-4,11-diene	10.72	1454	0.02	9.02*	1606	[41.19]
(E)- β -Farnesene	10.79*	1460	0.10	9.37*	1634	[0.12]
9-epi- β -Caryophyllene	10.79*	1460	[0.10]	9.18	1619	0.03
γ -Muurolene	10.96	1473	0.02	9.37*	1634	[0.12]
Germacrene D	11.00	1476	0.38	9.59*	1652	[0.94]
Menthylactone	11.12	1484	0.03	15.57	2200	0.03
Viridiflorene	11.21*	1491	0.10	9.50	1645	0.03
Bicyclogermacrene	11.21*	1491	[0.10]	9.86	1674	0.07
γ -Cadinene	11.45	1509	0.02	10.19	1701	0.07
δ -Cadinene	11.59*	1520	0.04	10.22*	1704	[0.04]
trans-Calamenene	11.59*	1520	[0.04]	11.04	1774	0.01
Spathulenol	12.22	1570	0.01	14.18	2062	0.01
Caryophyllene oxide isomer	12.27*	1574	0.10	12.47	1900	0.02
Caryophyllene oxide	12.27*	1574	[0.10]	12.54	1907	0.07
Viridiflorol	12.39	1583	0.04	13.77	2022	0.04
Unknown [m/z 165, 166 (48), 137 (11), 67 (9), 124 (7), 43 (7)...]	20.02	2300	0.01			
Total identified			98.99%			98.71%
Total reported			99.08%			98.71%

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

t: 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

Essential oil, *Mentha x piperita*
Internal code: 21D20-ORA01

Peppermint - India - 3 years - B634024

Report prepared for
Organic Aromas Inc.

R.T.: Retention time (minutes)

R.I.: Retention index