

Date : January 28, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22A14-PTH10


Customer identification : Thyme Thymol (Red) Organic - SPAIN - TO0103207R

Type : Essential oil

Source : *Thymus vulgaris* ct. Thymol

Customer : Plant Therapy

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 : Sarah-Eve Tremblay, M. Sc. A., Chimiste

Analysis date : January 27, 2022

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow liquid

Refractive index: 1.5018 ± 0.0003 (20 °C; method PC-MAT-016)

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
Isobutyral	tr	Aliphatic aldehyde
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl 2-methylbutyrate	0.01	Aliphatic ester
Hexan-3-one	tr	Aliphatic ketone
Octane	tr	Alkane
Unknown	tr	Unknown
Unknown	tr	Unknown
(3Z)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Heptan-3-one	0.01	Aliphatic ketone
Hashishene	0.01	Monoterpene
Tricyclene	0.02	Monoterpene
α -Thujene	0.83	Monoterpene
α -Pinene	0.80	Monoterpene
Unknown	0.02	Monoterpene
Camphene	0.32	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	0.18	Monoterpene
Octen-3-ol	0.06	Aliphatic alcohol
Octan-3-one	0.08	Aliphatic ketone
Myrcene	1.70	Monoterpene
Octan-3-ol	0.04	Aliphatic alcohol
α -Phellandrene	0.19	Monoterpene
Pseudolimonene	0.01	Monoterpene
Δ^3 -Carene	0.09	Monoterpene
α -Terpinene	1.46	Monoterpene
para-Cymene	18.49	Monoterpene
β -Phellandrene	0.32*	Monoterpene
1,8-Cineole	0.32*	Monoterpenic ether
Limonene	0.39	Monoterpene
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.06	Monoterpene
γ -Terpinene	9.40	Monoterpene
2-Methylbutyl butyrate	0.01	Aliphatic ester
cis-Sabinene hydrate	0.23	Monoterpenic alcohol
3-Methyl-3-butenyl butyrate?	0.02	Aliphatic ester
cis-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
meta-Cymenene	0.01	Monoterpene
Fenchone	0.01	Monoterpenic ketone
trans-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
Terpinolene	0.14	Monoterpene

para-Cymenene	0.06	Monoterpene
<i>trans</i> -Sabinene hydrate	0.11	Monoterpenic alcohol
Linalool	4.02	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Hotrienol	0.06	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
<i>cis</i> -para-Menth-2-en-1-ol	0.04	Monoterpenic alcohol
Unknown	0.03	Unknown
<i>trans</i> -Pinocarveol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Camphor	0.03	Monoterpenic ketone
<i>trans</i> -para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
Camphene hydrate	0.03	Monoterpenic alcohol
<i>trans</i> -Chrysanthemal	0.01	Monoterpenic aldehyde
Unknown	0.07	Oxygenated monoterpene
Isoborneol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Borneol	0.54	Monoterpenic alcohol
Lavandulol	0.03	Monoterpenic alcohol
Terpinen-4-ol	0.76	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α -Terpineol	0.08	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.11	Monoterpenic ketone
<i>trans</i> -Dihydrocarvone	0.06	Monoterpenic ketone
Bornyl formate	0.03	Monoterpenic ester
Thymol methyl ether	0.02	Monoterpenic ether
Neral	0.01	Monoterpenic aldehyde
Carvacrol methyl ether	0.23	Monoterpenic ether
Geraniol	0.01	Monoterpenic alcohol
Geranial	0.06	Monoterpenic aldehyde
Unknown	0.08	Unknown
Bornyl acetate	0.04	Monoterpenic ester
Thymol analogue I (isothymol?)	0.09	Monoterpenic alcohol
Thymol	50.41	Monoterpenic alcohol
Thymol analogue II	0.05	Monoterpenic alcohol
Carvacrol	3.64	Monoterpenic alcohol
α -Terpinyl acetate	0.01	Monoterpenic ester
Thymyl acetate	0.01	Monoterpenic ester
Eugenol	0.03	Phenylpropanoid
Isodauca-4,7(14)-diene?	0.01	Sesquiterpene
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
Unknown	0.01	Unknown
Isocaryophyllene	0.01	Sesquiterpene
α -Gurjunene	0.01	Sesquiterpene
β -Caryophyllene	1.22	Sesquiterpene
Aromadendrene	0.09	Sesquiterpene
Unknown	0.06	Oxygenated monoterpene
α -Humulene	0.03	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
Thymohydroquinone isomer?	0.32	Simple phenolic

(E)-β-Farnesene	0.09	Sesquiterpene
γ-Murolene	0.03	Sesquiterpene
β-Selinene	0.02	Sesquiterpene
Viridiflorene	0.08	Sesquiterpene
α-Murolene	0.02	Sesquiterpene
γ-Cadinene	0.05	Sesquiterpene
δ-Cadinene	0.09	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	Sesquiterpene
α-Cadinene	0.01	Sesquiterpene
Thymohydroquinone	0.01	Monoterpenic alcohol
Geranyl butyrate	0.05	Monoterpenic ester
Spathulenol	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.14	Sesquiterpenic ether
Unknown	0.03	Oxygenated sesquiterpene
Humulene epoxide II	0.01	Sesquiterpenic ether
Geranyl isovalerate	0.02	Monoterpenic ester
10-epi-γ-Eudesmol	0.01	Sesquiterpenic alcohol
1-epi-Cubenol	0.01	Sesquiterpenic alcohol
Isospathulenol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.01	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	0.02	Sesquiterpenic alcohol
Shyobunol	0.01	Sesquiterpenic alcohol
Unknown	0.02	Unknown
Unknown	0.05	Unknown
Unknown	0.09	Unknown
Unknown	0.01	Unknown
meta-Camphorene	0.01	Diterpene
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Consolidated total	98.92%	

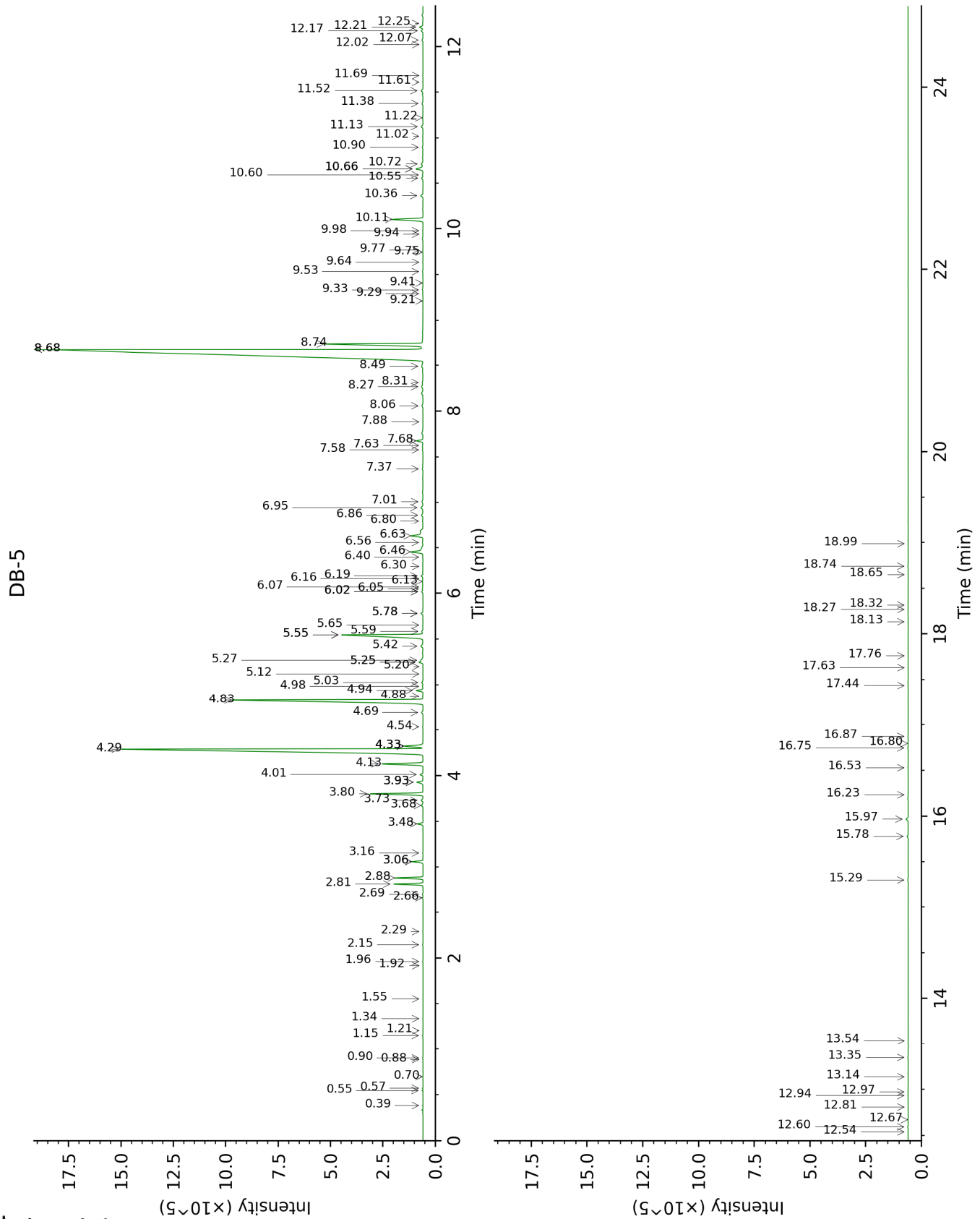
*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

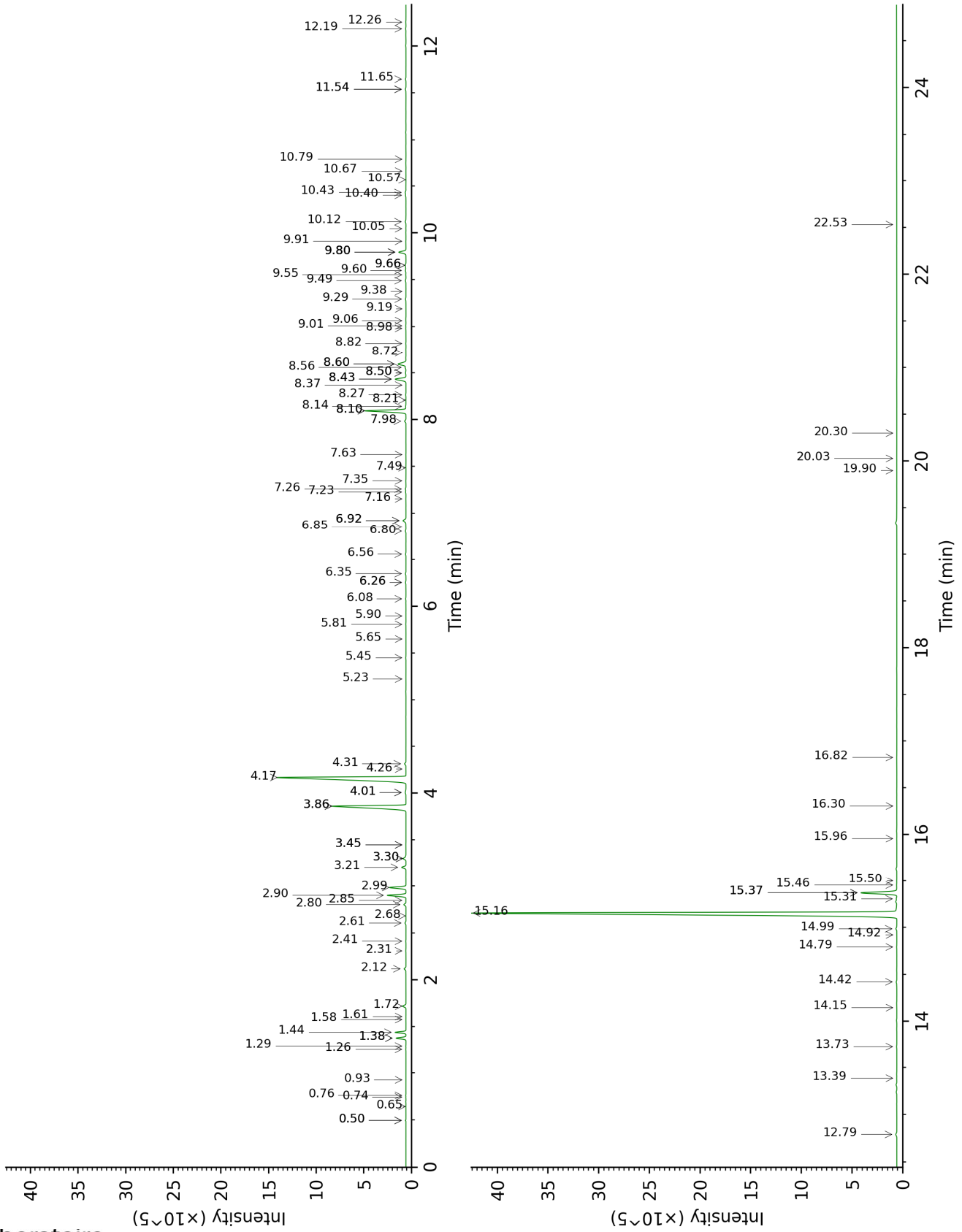
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.



DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutylal	0.38	536	tr	0.50*	784	0.02
Isovaleral	0.55	640	0.01	0.76	887	0.01
2-Methylbutylal	0.57	651	0.01	0.74	880	0.01
2-Ethylfuran	0.70	700	tr	0.93	919	tr
Isoamyl alcohol	0.88	732	tr	3.45*	1177	0.02
2-Methylbutanol	0.90	734	0.01	3.45*	1177	[0.02]
Methyl 2-methylbutyrate	1.15	773	0.01	1.29	978	0.01
Hexan-3-one	1.21	782	tr	1.58	1012	0.01
Octane	1.34	802	tr	0.50*	784	[0.02]
Unknown [m/z 81, 69 (80), 41 (65), 83 (52), 109 (48), 55 (47)...]	1.55	822	tr	0.64	845	tr
Unknown [m/z 109, 43 (28), 124 (28), 41 (14), 55 (11), 79 (9), 81 (8)...]	1.92	854	tr	1.61	1016	tr
(3Z)-Hexenol	1.96	858	0.01	5.81	1348	0.02
Hexanol	2.15	874	0.01	5.45	1322	0.02
Heptan-3-one	2.29	886	0.01	2.68	1117	0.01
Hashishene	2.66	915	0.01	1.38*	991	0.81
Tricyclene	2.70	918	0.02	1.26	972	0.02
α-Thujene	2.81	926	0.83	1.44	999	0.82
α-Pinene	2.88	930	0.80	1.38*	991	[0.81]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.06*	943	0.34	2.41	1095	0.02
Camphene	3.06*	943	[0.34]	1.72	1027	0.32
Thuja-2,4(10)-diene	3.16	949	0.01	2.31	1085	0.02
β-Pinene	3.48	971	0.18	2.12	1066	0.18
Octen-3-ol	3.68	984	0.06	6.80	1420	0.06
Octan-3-one	3.73	988	0.08	4.01*	1220	0.11
Myrcene	3.80	993	1.70	2.90	1134	1.67
Octan-3-ol	3.93*	1002	0.23	6.08	1367	0.04
α-Phellandrene	3.93*	1002	[0.23]	2.80	1126	0.19
Pseudolimonene	3.93*	1002	[0.23]	2.85	1130	0.01
Δ3-Carene	4.01	1007	0.09	2.61	1111	0.09
α-Terpinene	4.13	1015	1.46	2.99	1141	1.47
para-Cymene	4.29	1025	18.49	4.17	1232	18.53
β-Phellandrene	4.32*	1027	0.71	3.30*	1166	0.30
1,8-Cineole	4.32*	1027	[0.71]	3.30*	1166	[0.30]
Limonene	4.32*	1027	[0.71]	3.21	1158	0.39
(Z)-β-Ocimene	4.54	1040	0.01	3.86*	1209	9.42
(E)-β-Ocimene	4.69	1050	0.06	4.01*	1220	[0.11]
γ-Terpinene	4.83	1059	9.40	3.86*	1209	[9.42]
2-Methylbutyl butyrate	4.88	1062	0.01	4.26	1239	0.01
cis-Sabinene hydrate	4.94	1066	0.23	6.92*	1429	0.35

3-Methyl-3-butenyl butyrate?	4.98	1069	0.02	5.23	1306	0.01
<i>cis</i> -Linalool oxide (fur.)	5.03	1071	0.05	6.56	1402	0.04
meta-Cymenene	5.12	1077	0.01	6.26*	1380	0.06
Fenchone	5.20	1082	0.01	5.65	1336	tr
<i>trans</i> -Linalool oxide (fur.)	5.25*†	1086	0.25	6.92*	1429	[0.35]
Terpinolene	5.25*†	1086	[0.25]	4.31	1243	0.14
para-Cymenene	5.27†	1087	[0.25]	6.35	1387	0.06
<i>trans</i> -Sabinene hydrate	5.42	1097	0.11	7.98	1508	0.14
Linalool	5.55*	1104	4.05	8.10*	1517	4.05
Nonanal	5.55*	1104	[4.05]	5.90	1354	0.01
Hotrienol	5.59	1107	0.06	8.82	1573	0.02
endo-Fenchol	5.65	1111	0.01	8.37	1538	0.01
<i>cis</i> -para-Menth-2-en-1-ol	5.78*	1120	0.07	8.14	1521	0.04
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	5.78*	1120	[0.07]	6.26*	1380	[0.06]
<i>trans</i> -Pinocarveol	6.02*	1135	0.05	9.19	1602	0.01
Unknown [m/z 81, 70 (98), 67 (63), 82 (53), 41 (46), 69 (46), 109 (43)...]	6.02*	1135	[0.05]	6.85	1424	0.01
Camphor	6.05	1137	0.03	7.23	1452	0.04
<i>trans</i> -para-Menth-2-en-1-ol	6.07	1138	0.02	9.01	1588	0.02
Camphene hydrate	6.13	1142	0.03	8.50*	1548	0.06
<i>trans</i> -Chrysanthemal	6.16	1144	0.01	7.26	1454	0.06
Unknown [m/z 123, 81 (60), 67 (49), 95 (36), 41 (29), 68 (25)...152 (2)]	6.19	1146	0.07	7.35	1461	0.03
Isoborneol	6.30	1152	0.01	9.38	1617	0.01
Unknown [m/z 123, 81 (46), 43 (45), 95 (34), 166 (30)]	6.40	1159	0.01	8.98	1586	0.03
Borneol	6.46	1163	0.54	9.80*	1651	0.77
Lavandulol	6.56	1169	0.03	9.60	1635	0.07
Terpinen-4-ol	6.63	1174	0.76	8.60*	1556	0.99
para-Cymen-8-ol	6.80	1185	0.03	11.54*	1797	0.07
α-Terpineol	6.86	1189	0.08	9.80*	1651	[0.77]
<i>cis</i> -Dihydrocarvone	6.95	1194	0.11	8.43*	1543	1.22
<i>trans</i> -Dihydrocarvone	7.01	1198	0.06	8.72	1565	0.01
Bornyl formate	7.37	1222	0.03	8.10*	1517	[4.05]
Thymol methyl ether	7.58	1236	0.02	8.50*	1548	[0.06]
Neral	7.63	1240	0.01	9.49	1627	0.07
Carvacrol methyl ether	7.68	1243	0.23	8.60*	1556	[0.99]

Geraniol	7.88	1257	0.01	11.65	1807	0.05
Geranial	8.06	1269	0.06	10.12	1678	0.08
Unknown [m/z 43, 109 (77), 58 (49), 71 (41), 81 (37), 55 (34)...]	8.27	1283	0.08			
Bornyl acetate	8.31	1286	0.04	8.26	1530	0.03
Thymol analogue I (isothymol?)	8.49	1298	0.09	14.99	2118	0.10
Thymol	8.68*	1310	50.34	15.16	2134	50.41
Thymol analogue II	8.68*	1310	[50.34]	15.31	2150	0.05
Carvacrol	8.74	1315	3.64	15.37*	2156	3.58
α -Terpinyl acetate	9.21	1348	0.01	9.80*	1651	[0.77]
Thymyl acetate	9.29	1354	0.01	11.54*	1797	[0.07]
Eugenol	9.33	1357	0.03	14.79	2098	0.04
Isodauca-4,7(14)-diene?	9.41	1362	0.01			
α -Copaene	9.53	1371	0.02	7.16	1446	0.02
β -Bourbonene	9.64	1378	0.01	7.49	1471	0.01
Geranyl acetate	9.75	1386	0.01	10.57	1715	0.01
Unknown [m/z 148, 133 (66), 105 (46), 43 (33), 77 (15)...]	9.77	1388	0.01			
Isocaryophyllene	9.94	1400	0.01	8.21	1526	0.02
α -Gurjunene	9.98	1403	0.01	7.63	1481	0.01
β -Caryophyllene	10.10	1412	1.22	8.43*	1543	[1.22]
Aromadendrene	10.36	1431	0.09	8.56	1553	0.08
Unknown [m/z 151, 166 (40), 105 (26)...]	10.56	1446	0.06			
α -Humulene	10.60	1449	0.03	9.30	1611	0.06
allo-Aromadendrene	10.66*	1454	0.34	9.06	1592	0.02
Thymohydroquinone isomer?	10.66*	1454	[0.34]			
(<i>E</i>)- β -Farnesene	10.72	1458	0.09	9.55	1632	0.02
γ -Muurolole	10.90	1471	0.03	9.66*	1640	0.12
β -Selinene	11.02	1480	0.02	9.91	1661	0.02
Viridiflorene	11.13	1488	0.08	9.66*	1640	[0.12]
α -Muurolole	11.22	1495	0.02	10.05	1672	0.02
γ -Cadinene	11.38	1507	0.05	10.40	1701	0.05
δ -Cadinene	11.52	1518	0.09	10.43	1703	0.09
<i>trans</i> -Cadina-1,4-diene	11.61	1526	0.01	10.67	1723	0.01
α -Cadinene	11.68	1531	0.01	10.80	1734	0.01
Thymohydroquinone	12.02	1558	0.01	22.53	2986	0.01
Geranyl butyrate	12.07	1562	0.05	12.19	1855	0.04
Spathulenol	12.17	1570	0.07	14.42	2062	0.07
Caryophyllene oxide	12.21	1573	0.14	12.79	1909	0.14
Unknown [m/z 161, 187 (29), 105 (24), 91 (23), 93 (23)... 205 (19), 220? (2)]	12.25	1576	0.03			
Humulene epoxide II	12.54	1599	0.01	13.39	1964	0.02

Geranyl isovalerate	12.60	1603	0.02	12.26	1861	0.03
10-epi- γ -Eudesmol	12.67	1609	0.01	14.15	2036	0.01
1-epi-Cubenol	12.81	1621	0.01	13.73	1996	0.03
Isospathulenol	12.94	1631	0.02	15.46	2164	0.02
τ -Cadinol	12.98	1634	0.01	14.92	2111	0.01
α -Cadinol	13.14	1648	0.01	15.50	2169	tr
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	13.35	1666	0.02	16.82	2306	0.02
Shyobunol	13.54	1681	0.01	16.30	2252	tr
Unknown [m/z 81, 136 (68), 135 (58), 150 (44), 93 (34), 121 (30)...]	15.30	1834	0.02			
Unknown [m/z 81, 136 (62), 135 (56), 150 (39), 93 (33), 121 (24)...]	15.78	1878	0.05			
Unknown [m/z 136, 81 (96), 135 (76), 93 (48), 150 (47), 121 (43), 137 (28)...]	15.97	1896	0.09			
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.23	1920	0.01	15.96	2215	0.01
meta-Camphorene	16.53	1948	0.01	15.37*	2156	[3.58]
Unknown [m/z 201, 159 (37), 148 (27), 173 (22), 41 (20)... 284 (16)]	16.75	1969	0.02			
Unknown [m/z 135, 150 (90), 201 (83), 81 (52), 136 (35)... 286 (25)]	16.80	1974	0.01			
Unknown [m/z 135, 150 (61), 81 (45), 69 (37), 41 (24), 136 (21), 93 (19)...]	16.87	1981	0.02			
Unknown [m/z 135, 43 (51), 150 (36), 109 (30), 93 (27), 95 (21)...]	17.44	2036	0.01			
Unknown [m/z 173, 159 (29), 216 (27), 286 (15)]	17.63	2056	0.01			
Unknown [m/z 135, 150 (78), 109 (38), 43 (20), 93 (19), 91 (18)...]	17.76	2068	0.01			
Unknown [m/z 163, 175 (51), 201 (40),	18.13	2106	0.01	20.30	2702	0.01

147 (33), 41 (31), 123 (29)... 286 (23)]						
Unknown [m/z 69, 41 (81), 91 (37), 166 (35), 105 (33), 43 (30)...]	18.27	2120	0.01	19.90	2654	0.01
Unknown [m/z 69, 41 (74), 166 (36), 91 (32), 105 (28), 43 (25)...]	18.32	2124	0.01	20.03	2669	0.01
Unknown [m/z 163, 175 (91), 173 (83), 161 (82), 41 (66), 286 (66)]	18.65	2159	0.01			
Unknown [m/z 267, 282 (24), 268 (21), 117 (16), 126 (11)...]	18.74	2169	0.02			
Unknown [m/z 175, 163 (78), 161 (33), 41 (32)... 286 (18)]	18.99	2194	0.01			
Total identified		98.27%			98.27%	
Total reported		98.83%			98.41%	

*: 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