

Date : February 06, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20B04-PTH04

Customer identification : Thyme Thymol - Spain - T4010796R

Type : Essential oil

Source : *Thymus vulgaris* ct. Thymol

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

Analysis date : February 05, 2020

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid
Refractive index: 1.5017 ± 0.0003 (20 °C)

ISO 19817:2017 - ESSENTIAL OIL OF THYME, THYMOL TYPE

Compound	Min. %	Max. %	Observed %	Complies?
β-Caryophyllene	0.5	4.0	1.5	Yes
Carvacrol	0.5	5.5	0.5	Yes
Thymol	35.0	55.0	47.9	Yes
Carvacrol methyl ether	0.1	1.5	0.1	Yes
Terpinen-4-ol	0.1	2.5	0.9	Yes
Linalool	0.5	6.5	4.7	Yes
cis-Sabinene hydrate	tr	0.50	0.15	Yes
para-Cymene	14.0	28.0	21.3	Yes
γ-Terpinene	4.0	13.0	8.0	Yes
α-Terpinene	0.9	2.6	1.3	Yes
Myrcene	1.0	2.8	1.5	Yes
α-Pinene	0.5	2.5	0.9	Yes
α-Thujene	0.5	1.5	0.7	Yes
Refractive index	1.4940	1.5040	1.5017	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for thymol type thyme oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Classe
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Methyl 2-methylbutyrate	0.01	Aliphatic ester
Hexanol	tr	Aliphatic alcohol
Hashishene	tr	Monoterpene
Tricyclene	0.05	Monoterpene
α -Thujene	0.69	Monoterpene
α -Pinene	0.92	Monoterpene
α -Fenchene	0.02	Monoterpene
Camphene	0.71	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
Sabinene	0.01	Monoterpene
β -Pinene	0.25	Monoterpene
Octen-3-ol	0.06	Aliphatic alcohol
Octan-3-one	0.06	Aliphatic ketone
Myrcene	1.48	Monoterpene
Octan-3-ol	0.01	Aliphatic alcohol
α -Phellandrene	0.11	Monoterpene
Pseudolimonene	0.03	Monoterpene
Δ^3 -Carene	0.04	Monoterpene
α -Terpinene	1.27	Monoterpene
Carvomenthene	0.10	Aliphatic alcohol
para-Cymene	21.28	Monoterpene
Limonene	0.40	Monoterpene
β -Phellandrene	0.09	Monoterpene
1,8-Cineole	0.18	Monoterpenic ether
Cymene analog	0.02	Monoterpene
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.08	Monoterpene
γ -Terpinene	7.97	Monoterpene
2-Methylbutyl butyrate	0.01	Aliphatic ester
cis-Sabinene hydrate	0.15	Monoterpenic alcohol
3-Methyl-3-butenyl butyrate?	0.03	Aliphatic ester
cis-Linalool oxide (fur.)	0.06	Monoterpenic alcohol
Octanol	tr	Aliphatic alcohol
Fenchone	0.01	Monoterpenic ketone
Terpinolene	0.08	Monoterpene
trans-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
para-Cymenene	0.03	Monoterpene
trans-Sabinene hydrate	0.05	Monoterpenic alcohol
Linalool	4.74	Monoterpenic alcohol
Nonanal	0.05	Aliphatic aldehyde
endo-Fenchol	0.01	Monoterpenic alcohol
Unknown	0.05	Unknown
trans-Pinocarveol	0.04	Monoterpenic alcohol
Camphor	0.06	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.04	Monoterpenic alcohol

<i>trans</i> -Chrysanthemal	0.05	Monoterpenic aldehyde
<i>trans</i> -Chrysanthemol	0.07	Monoterpenic alcohol
Isoborneol	0.03	Monoterpenic alcohol
Borneol	0.99	Monoterpenic alcohol
Terpinen-4-ol	0.91	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
α -Terpineol	0.04	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.08	Monoterpenic ketone
<i>trans</i> -Dihydrocarvone	0.03	Monoterpenic ketone
Bornyl formate	0.03	Monoterpenic ester
Thymol methyl ether	0.12	Monoterpenic ether
Carvone	0.02	Monoterpenic ketone
Carvacrol methyl ether	0.12	Monoterpenic ether
Neral	0.07	Monoterpenic aldehyde
Geranial	0.04	Monoterpenic aldehyde
Thymol analogue I	0.14	Monoterpenic alcohol
Thymol analogue II	3.24	Monoterpenic alcohol
Thymol	47.90	Monoterpenic alcohol
Carvacrol	0.53	Monoterpenic alcohol
Thymyl acetate	0.03	Monoterpenic ester
Eugenol	0.02	Phenylpropanoid
α -Copaene	0.01	Sesquiterpene
β -Bourbonene	tr	Sesquiterpene
Geranyl acetate	tr	Monoterpenic ester
Unknown	0.01	Unknown
Isocaryophyllene	0.01	Sesquiterpene
α -Gurjunene	0.01	Sesquiterpene
β -Caryophyllene	1.45	Sesquiterpene
Aromadendrene	0.06	Sesquiterpene
α -Humulene	0.07	Sesquiterpene
Unknown	0.02	Unknown
Unknown	0.13	Oxygenated monoterpene
Unknown	0.01	Unknown
allo-Aromadendrene	0.02	Sesquiterpene
Thymohydroquinone isomer?	0.05	Simple phenolic
(<i>E</i>)- β -Farnesene	0.01	Sesquiterpene
γ -Muurolene	0.02	Sesquiterpene
β -Selinene	tr	Sesquiterpene
Viridiflorene	tr	Sesquiterpene
Bicyclogermacrene	tr	Sesquiterpene
α -Muurolene	0.02	Sesquiterpene
(<i>Z</i>)- γ -Bisabolene	0.01	Sesquiterpene
γ -Cadinene	0.03	Sesquiterpene
<i>trans</i> -Calamenene	0.02	Sesquiterpene
δ -Cadinene	0.08	Sesquiterpene
<i>trans</i> -Cadin-1,4-diene	0.01	Sesquiterpene
α -Cadinene	0.01	Sesquiterpene
Geranyl butyrate	0.04	Monoterpenic ester
Spathulenol	0.06	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.19	Sesquiterpenic ether

Unknown	0.03	Oxygenated sesquiterpene
Humulene epoxide II	0.01	Sesquiterpenic ether
Geranyl isovalerate	0.01	Monoterpenic ester
10-epi- γ -Eudesmol	0.01	Sesquiterpenic alcohol
10,10-Dimethyl-2,6-dimethylenebicyclo[7.2.0]undecan-5 β -ol?	tr	Sesquiterpenic alcohol
Isospathulenol	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.01	Sesquiterpenic alcohol
α -Cadinol	tr	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	0.02	Sesquiterpenic alcohol
Shyobunol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.04	Unknown
Unknown	0.05	Unknown
Unknown	0.01	Unknown
meta-Camphorene	0.02	Diterpene
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01*	Unknown
Unknown	[0.01]*	Unknown
Unknown	0.01	Unknown
Unknown	tr	Unknown
Unknown	0.10	Unknown
Unknown	0.01	Unknown
Consolidated total	98.59%	

*: 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

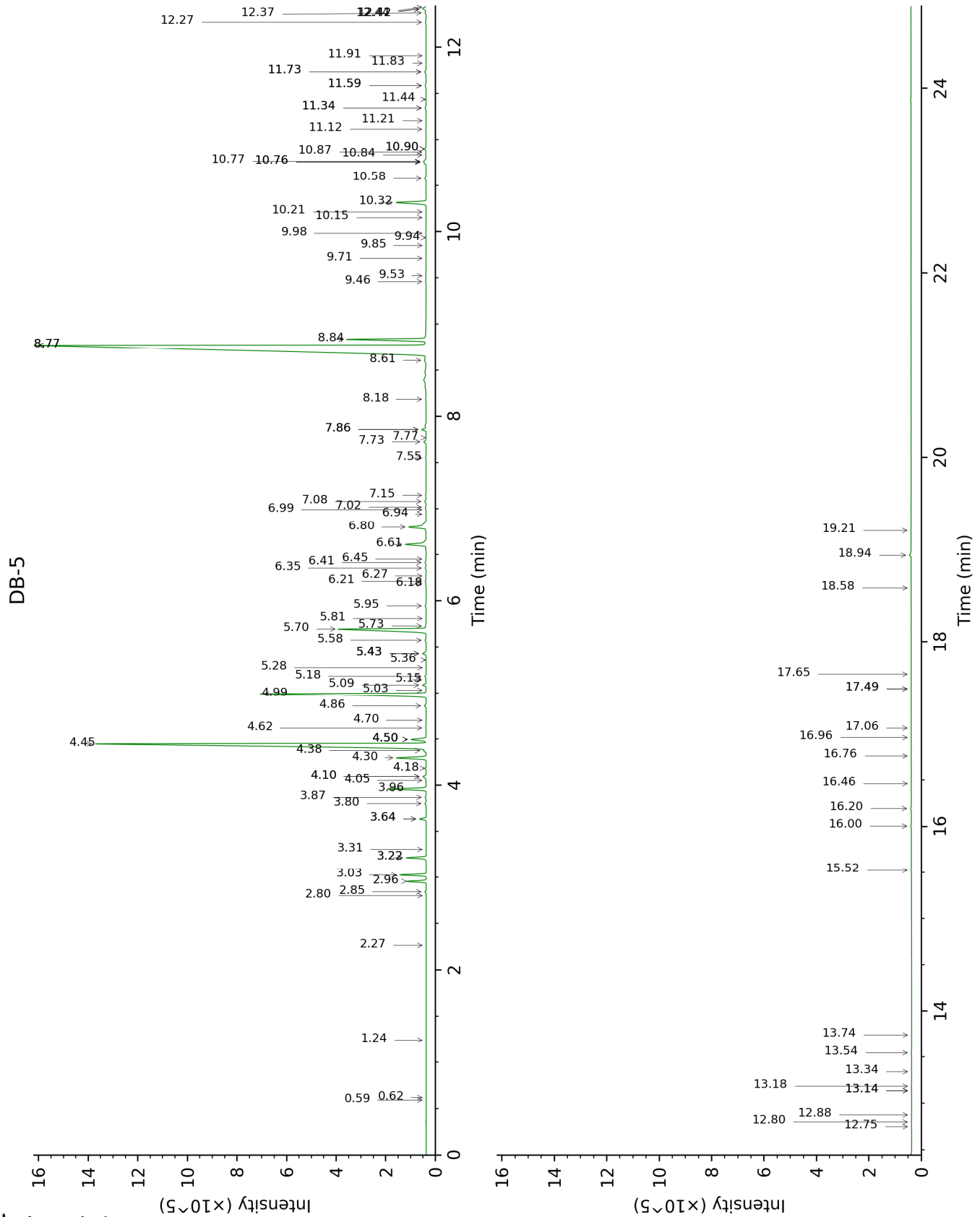
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

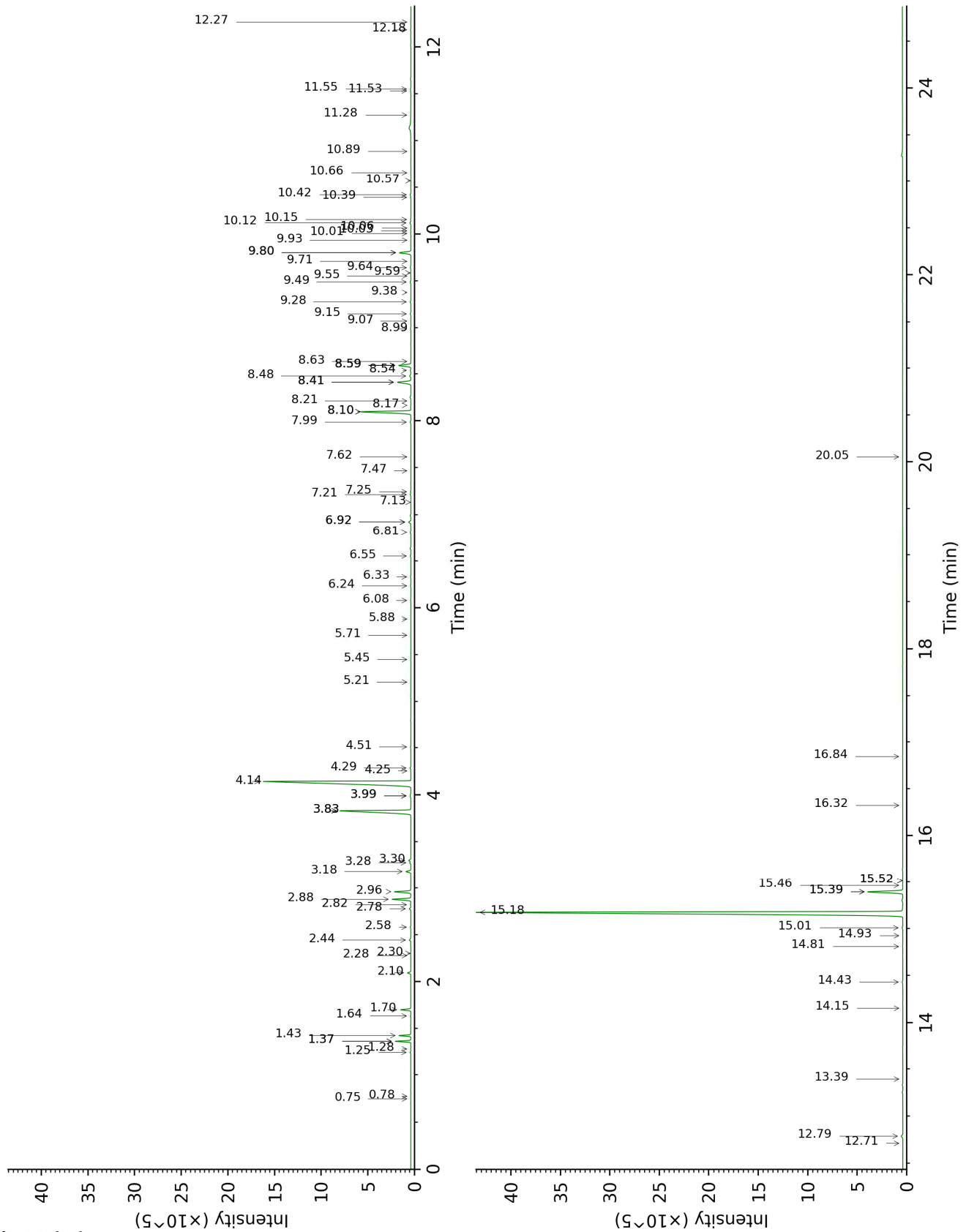
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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	%
Isovaleral	0.59	639	tr	0.78	889	tr
2-Methylbutyral	0.62	650	tr	0.75	879	tr
Methyl 2-methylbutyrate	1.24	776	0.01	1.28	977	tr
Hexanol	2.27	873	tr	5.45	1323	0.01
Hashishene	2.80	915	tr	1.37*	991	0.94
Tricyclene	2.84	918	0.05	1.25	971	0.04
α -Thujene	2.96	925	0.69	1.43	999	0.69
α -Pinene	3.03	930	0.92	1.37*	991	[0.94]
α -Fenchene	3.22*	942	0.75	1.64	1020	0.02
Camphene	3.22*	942	[0.75]	1.70	1026	0.71
Thuja-2,4(10)-diene	3.31	948	tr	2.30	1086	0.01
Sabinene	3.64*	970	0.26	2.28	1084	0.01
β -Pinene	3.64*	970	[0.26]	2.10	1066	0.25
Octen-3-ol	3.80	981	0.06	6.81	1421	0.06
Octan-3-one	3.87	986	0.06	3.99*	1218	0.11
Myrcene	3.96	992	1.48	2.88	1133	1.49
Octan-3-ol	4.05	998	0.01	6.08	1368	0.03
α -Phellandrene	4.10*	1000	0.15	2.78	1125	0.11
Pseudolimonene	4.10*	1000	[0.15]	2.82	1129	0.03
Δ^3 -Carene	4.18	1006	0.04	2.58	1110	0.04
α -Terpinene	4.30	1013	1.27	2.96	1140	1.28
Carvomenthene	4.38	1018	0.10	2.44	1099	0.14
para-Cymene	4.45	1023	21.28	4.14	1229	21.09
Limonene	4.50*	1026	0.73	3.18	1157	0.40
β -Phellandrene	4.50*	1026	[0.73]	3.28	1164	0.09
1,8-Cineole	4.50*	1026	[0.73]	3.30	1166	0.18
Cymene analog	4.62	1034	0.02	4.51	1255	0.03
(Z)- β -Ocimene	4.70	1039	0.01	3.83*	1206	8.02
(E)- β -Ocimene	4.86	1049	0.08	3.99*	1218	[0.11]
γ -Terpinene	4.99	1057	7.97	3.83*	1206	[8.02]
2-Methylbutyl butyrate	5.03	1060	0.01	4.26	1237	0.01
cis-Sabinene hydrate	5.09	1063	0.15	6.92*	1430	0.22
3-Methyl-3-butenyl butyrate?	5.15	1067	0.03	5.21	1306	0.01
cis-Linalool oxide (fur.)	5.18	1069	0.06	6.55	1402	0.06
Octanol	5.28	1075	tr	8.21	1527	0.01
Fenchone	5.36	1081	0.01	5.71	1342	0.01
Terpinolene	5.43*	1085	0.16	4.29	1239	0.08
trans-Linalool oxide (fur.)	5.43*	1085	[0.16]	6.92*	1430	[0.22]
para-Cymenene	5.43*	1085	[0.16]	6.33	1386	0.03
trans-Sabinene hydrate	5.58	1094	0.05	7.99	1509	0.07
Linalool	5.70	1102	4.74	8.10*	1518	4.75
Nonanal	5.73	1104	0.05	5.88	1354	0.01
endo-Fenchol	5.81	1109	0.01	8.41*	1542	1.44
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	5.95	1118	0.05	6.24	1379	0.04
trans-Pinocarveol	6.18	1134	0.04	9.15	1599	0.06
Camphor	6.21	1136	0.06	7.22	1451	0.06
trans-para-Menth-2-en-1-ol	6.27	1139	0.04	8.99	1586	0.04

<i>trans</i> -Chrysanthemal	6.35	1145	0.05	7.25	1454	0.04
<i>trans</i> -Chrysanthemol	6.41	1149	0.07	9.64	1639	0.08
Isoborneol	6.45	1151	0.03	9.38	1618	0.01
Borneol	6.61	1162	0.99	9.80*	1652	1.13
Terpinen-4-ol	6.80	1174	0.91	8.59*	1556	1.20
para-Cymen-8-ol	6.94	1183	0.01	11.55	1798	0.05
Unknown [m/z 43, 135 (73), 59 (46), 93 (39), 91 (35), 81 (32)...]	6.99	1186	0.01			
α -Terpineol	7.02	1188	0.04	9.80*	1652	[1.13]
<i>cis</i> -Dihydrocarvone	7.08	1192	0.08	8.54	1552	0.06
<i>trans</i> -Dihydrocarvone	7.15	1197	0.03	8.63	1559	0.02
Bornyl formate	7.55	1224	0.03	8.10*	1518	[4.75]
Thymol methyl ether	7.73	1236	0.12	8.48	1547	0.14
Carvone	7.77	1239	0.02	10.03	1671	0.01
Carvacrol methyl ether	7.86*	1246	0.19	8.59*	1556	[1.20]
Neral	7.86*	1246	[0.19]	9.49	1627	0.07
Geranial	8.18	1268	0.04	10.16	1680	0.04
Thymol analogue I	8.61	1298	0.14	15.01	2118	0.07
Thymol analogue II	8.84	1308	3.24	15.40*	2156	3.19
Thymol	8.77*	1309	48.43	15.18	2134	47.90
Carvacrol	8.77*	1309	[48.43]	15.40*	2156	[3.19]
Thymyl acetate	9.46	1352	0.03	11.53	1796	0.03
Eugenol	9.53	1357	0.02	14.81	2098	0.03
α -Copaene	9.71	1370	0.01	7.13	1445	0.01
β -Bourbonene	9.85	1380	tr	7.47	1470	0.01
Geranyl acetate	9.94	1386	tr	10.57	1715	0.01
Unknown [m/z 148, 133 (66), 105 (46), 43 (33), 77 (15)...]	9.98	1389	0.01			
Isocaryophyllene	10.15	1401	0.01	8.17	1523	0.01
α -Gurjunene	10.22	1406	0.01	7.62	1481	0.02
β -Caryophyllene	10.32	1413	1.45	8.41*	1542	[1.44]
Aromadendrene	10.58	1433	0.06	8.59*	1556	[1.20]
α -Humulene	10.76*	1446	0.10	9.28	1610	0.07
Unknown [m/z 79, 67 (75), 93 (47), 81 (47), 55 (46), 41 (43)...]	10.76*	1446	[0.10]			
Unknown [m/z 151, 166 (40), 105 (26)...]	10.77	1447	0.13			
Unknown [m/z 151, 68 (64), 55 (58), 67 (56), 81 (45), 41 (44)...]	10.84	1452	0.01			
allo-Aromadendrene	10.87	1454	0.02	9.07	1593	0.02
Thymohydroquinone isomer?	10.90*	1457	0.07			
(<i>E</i>)- β -Farnesene	10.90*	1457	[0.07]	9.55	1632	0.01
γ -Muurolene	11.12	1473	0.02	9.59	1634	0.03
β -Selinene	11.21	1480	tr	9.93	1663	tr
Viridiflorene	11.34*	1490	0.05	9.71	1644	tr
Bicyclogermacrene	11.34*	1490	[0.05]	10.06	1673	tr
α -Muurolene	11.44	1497	0.02	10.12	1678	0.10
(<i>Z</i>)- γ -Bisabolene	11.59*	1508	0.06	10.01	1668	0.01
γ -Cadinene	11.59*	1508	[0.06]	10.39	1700	0.03
<i>trans</i> -Calamenene	11.74*	1520	0.07	11.28	1774	0.02
δ -Cadinene	11.74*	1520	[0.07]	10.42	1702	0.08
<i>trans</i> -Cadina-1,4-diene	11.83	1527	0.01	10.66	1722	0.01

α-Cadinene	11.91	1533	0.01	10.89	1742	0.01
Geranyl butyrate	12.27	1562	0.04	12.18	1854	0.04
Spathulenol	12.37	1570	0.06	14.43	2061	0.06
Caryophyllene oxide isomer	12.42*	1573	0.20	12.71	1900	0.01
Caryophyllene oxide	12.42*	1573	[0.20]	12.79	1907	0.19
Unknown [m/z 161, 187 (29), 105 (24), 91 (23), 93 (23)... 205 (19), 220? (2)]	12.44	1575	0.03			
Humulene epoxide II	12.75	1600	0.01	13.39	1963	0.02
Geranyl isovalerate	12.80	1603	0.01	12.27	1861	0.02
10-epi-γ-Eudesmol	12.88	1610	0.01	14.15	2034	0.01
10,10-Dimethyl-2,6-dimethylenebicyclo[7.2.0]undecan-5β-ol?	13.14*	1631	0.01			
Isospathulenol	13.14*	1631	[0.01]	15.52*	2168	0.01
τ-Cadinol	13.18	1635	0.01	14.93	2109	0.01
α-Cadinol	13.34	1648	tr	15.52*	2168	[0.01]
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	13.54	1665	0.02	16.84	2305	0.02
Shyobunol	13.74	1681	0.01	16.32	2250	tr
Unknown [m/z 81, 136 (68), 135 (58), 150 (44), 93 (34), 121 (30)...]	15.52	1835	0.01			
Unknown [m/z 81, 136 (62), 135 (56), 150 (39), 93 (33), 121 (24)...]	16.00	1879	0.04			
Unknown [m/z 136, 81 (96), 135 (76), 93 (48), 150 (47), 121 (43), 137 (28)...]	16.20	1896	0.05			
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.46	1921	0.01			
meta-Camphorene	16.76	1950	0.02	15.46	2163	0.02
Unknown [m/z 201, 159 (37), 148 (27), 173 (22), 41 (20)... 284 (16)]	16.96	1969	0.01			
Unknown [m/z 135, 150 (61), 81 (45), 69 (37), 41 (24), 136 (21), 93 (19)...]	17.06	1978	0.01			
Unknown [m/z 135, 150 (67), 69 (57), 41 (24)...]	17.49*	2020	0.01			
Unknown [m/z 135, 150 (66), 43 (38), 109 (27), 93 (25), 137 (20)...]	17.49*	2020	[0.01]			
Unknown [m/z 135, 43 (51), 150 (36), 109 (30), 93 (27), 95 (21)...]	17.65	2035	0.01			
Unknown [m/z 69, 41 (74), 166 (36), 91 (32), 105 (28), 43 (25)...]	18.58	2128	tr	20.05	2667	tr
Unknown [m/z 267, 282 (24), 268 (21), 117 (16), 126 (11)...]	18.94	2165	0.10			
Unknown [m/z 175, 163 (78), 161 (33), 41 (32)... 286 (18)]	19.21	2192	0.01			
Total identified		98.22%			97.53%	
Total reported		98.72%			97.57%	

*: 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

