

GC/MS BATCH NUMBER: T40106

ESSENTIAL OIL: THYME THYMOL
BOTANICAL NAME: THYMUS VULGARIS
ORIGIN: SPAIN

KEY CONSTITUENTS PRESENT IN THIS BATCH OF THYME THYMOL OIL	%
THYMOL	46.2
p-CYMENE	19.7
γ-TERPINENE	9.4
CARVACROL	4.0
LINALOOL	3.9
β-PINENE	2.0
α-PINENE	1.9
α-TERPINENE	1.7
β-CARYOPHYLLENE	1.3
BORNEOL	1.2
α-THUJENE	1.1

Comments from Robert Tisserand: Beautiful sweet, green herbaceous odor quality. All thirteen key ISO constituents are within range.

Date : April 11, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18D10-PTH4-1-CC

Customer identification : Thyme Thymol - Spain - T4010681R

Type : Essential oil

Source : *Thymus vulgaris* ct. Thymol

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - 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 : April 10, 2018

Checked and approved by :

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

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This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4998 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.02	0.02	Aliphatic alcohol
Acetic acid	tr	0.01	Aliphatic acid
2-Methyl-3-buten-2-ol	tr	tr	Aliphatic alcohol
Isovaleral	0.01	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	tr	Furan
Isoamyl alcohol	0.01	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.06	0.07*	Aliphatic ester
(3Z)-Hexenol	0.01	0.01	Aliphatic alcohol
Hexanol	tr	tr	Aliphatic alcohol
Hashishene	tr	1.89*	Monoterpene
Tricyclene	0.01	[0.07]*	Monoterpene
α -Thujene	1.09	1.10	Monoterpene
α -Pinene	1.88	[1.89]*	Monoterpene
Camphene	0.66*	0.56	Monoterpene
α -Fenchene	[0.66]*	0.10	Monoterpene
Thuja-2,4(10)-diene	tr	0.01*	Monoterpene
β -Pinene	1.98*	1.97	Monoterpene
Sabinene	[1.98]*	[0.01]*	Monoterpene
Octen-3-ol	0.47	0.46	Aliphatic alcohol
Octan-3-one	0.03	0.02*	Aliphatic ketone
Myrcene	1.92	1.93	Monoterpene
Octan-3-ol	0.19*	0.02	Aliphatic alcohol
α -Phellandrene	[0.19]*	0.10	Monoterpene
Pseudolimonene	[0.19]*	0.06	Monoterpene
Δ^3 -Carene	0.24	0.24	Monoterpene
α -Terpinene	1.65	1.65	Monoterpene
Carvomenthene	0.03	0.03	Aliphatic alcohol
ortho-Cymene	0.05	19.84*	Simple phenolic
para-Cymene	19.66	[19.84]*	Monoterpene
1,8-Cineole	1.28*	0.85*	Monoterpenic ether
β -Phellandrene	[1.28]*	[0.85]*	Monoterpene
Limonene	[1.28]*	0.33	Monoterpene
Cymene analog	0.03	0.02	Monoterpene
(Z)- β -Ocimene	0.01	9.42*	Monoterpene
(E)- β -Ocimene	0.02	[0.02]*	Monoterpene
γ -Terpinene	9.39	[9.42]*	Monoterpene
2-Methylbutyl butyrate	0.07		Aliphatic ester
cis-Sabinene hydrate	0.06	0.09	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	0.01	Monoterpenic alcohol
meta-Cymenene	0.03	0.03*	Monoterpene
Terpinolene	0.04	0.04	Monoterpene
para-Cymenene	0.04*	[0.03]*	Monoterpene
trans-Linalool oxide (fur.)	[0.04]*	0.02	Monoterpenic alcohol
trans-Sabinene hydrate	0.04	0.04	Monoterpenic alcohol
Linalool	3.92*	3.92	Monoterpenic alcohol
Nonanal	[3.92]*	0.01	Aliphatic aldehyde
endo-Fenchol	0.01	0.12	Monoterpenic alcohol

Unknown	0.01	0.01	Unknown
<i>trans</i> -Pinocarveol	0.03	0.03	Monoterpenic alcohol
Camphor	0.05	0.06	Monoterpenic ketone
<i>trans</i> -para-Menth-2-en-1-ol	0.01	0.01	Monoterpenic alcohol
Camphene hydrate	0.01	1.29*	Monoterpenic alcohol
<i>trans</i> -Chrysanthemal	0.01	0.01	Monoterpenic aldehyde
Isoborneol	0.02	0.01	Monoterpenic alcohol
Borneol	1.24	1.69*	Monoterpenic alcohol
Terpinen-4-ol	0.16	0.39*	Monoterpenic alcohol
para-Cymen-8-ol	0.01	0.03	Monoterpenic alcohol
α -Terpineol	0.29	[1.69]*	Monoterpenic alcohol
<i>cis</i> -Dihydrocarvone	0.15	0.16	Monoterpenic ketone
Bornyl formate	tr		Monoterpenic ester
Thymol methyl ether	0.13	[1.29]*	Monoterpenic ether
Carvacrol methyl ether	0.39*	[0.39]*	Monoterpenic ether
Neral	[0.39]*	0.01	Monoterpenic aldehyde
(<i>E</i>)-Isogeraniol?	0.01	0.01	Monoterpenic alcohol
Geraniol	0.01	0.02	Monoterpenic alcohol
Geranial	0.02	0.02	Monoterpenic aldehyde
Thymol analogue I	0.05	0.03	Monoterpenic alcohol
Thymol	45.74*	46.24	Monoterpenic alcohol
Thymol analogue II	[45.74]*	0.09	Monoterpenic alcohol
Carvacrol	3.96	3.25	Monoterpenic alcohol
Thymyl acetate	0.01	0.01	Monoterpenic ester
Eugenol	0.01	0.01	Phenylpropanoid
Isodauca-4,7(14)-diene?	0.01		Sesquiterpene
α -Copaene	0.02	0.02	Sesquiterpene
β -Bourbonene	0.01	0.01	Sesquiterpene
Isocaryophyllene	0.01	0.01	Sesquiterpene
β -Caryophyllene	1.29	[1.29]*	Sesquiterpene
Aromadendrene	0.06	0.06	Sesquiterpene
α -Humulene	0.02	0.02	Sesquiterpene
Unknown	0.02		Oxygenated monoterpene
Thymohydroquinone isomer?	0.07		Simple phenolic
γ -Muurolene	0.03	0.04	Sesquiterpene
Germacrene D	0.03	[1.69]*	Sesquiterpene
Viridiflorene	0.02	[1.69]*	Sesquiterpene
α -Muurolene	0.02	0.01	Sesquiterpene
β -Bisabolene	0.02	0.02	Sesquiterpene
γ -Cadinene	0.06	0.06	Sesquiterpene
δ -Cadinene	0.08*	0.08	Sesquiterpene
<i>trans</i> -Calamenene	[0.08]*	0.01	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	0.01	Sesquiterpene
α -Cadinene	0.01	0.01	Sesquiterpene
Caryophyllene oxide	0.05*	0.04	Sesquiterpenic ether
Spathulenol	[0.05]*	0.01	Sesquiterpenic alcohol
Caryophyllene oxide isomer	[0.05]*	0.01	Sesquiterpenic ether
Unknown	0.01		Oxygenated sesquiterpene
1-epi-Cubenol	tr	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.03	0.06	Sesquiterpenic alcohol
Unknown	0.03		Unknown
Unknown	0.01		Unknown

Unknown	0.01		Unknown
Unknown	0.01		Unknown
Unknown	0.03		Unknown
Unknown	tr		Unknown
Total identified	99.12%	98.86%	

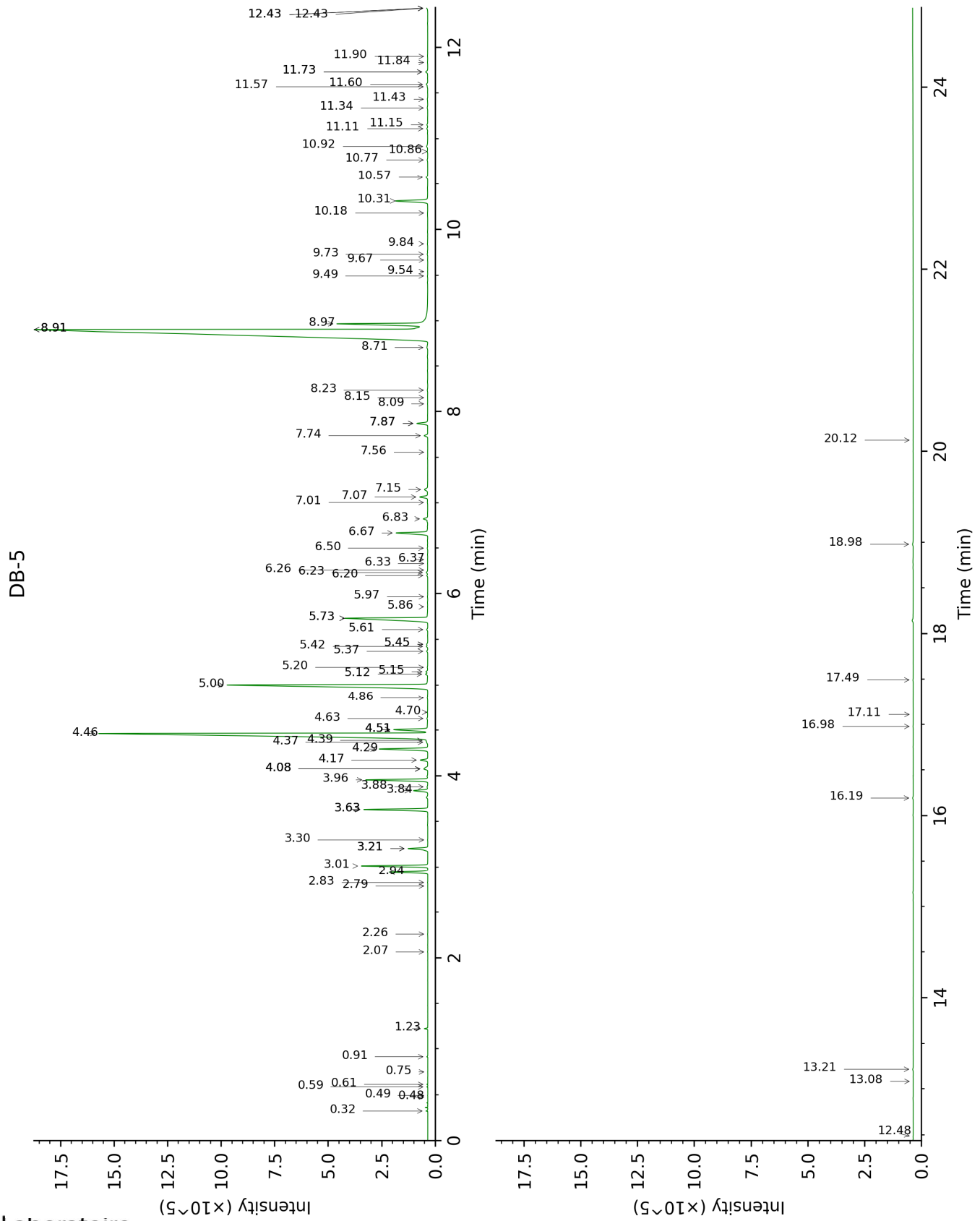
*: Two or more compounds are coeluting on this column

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

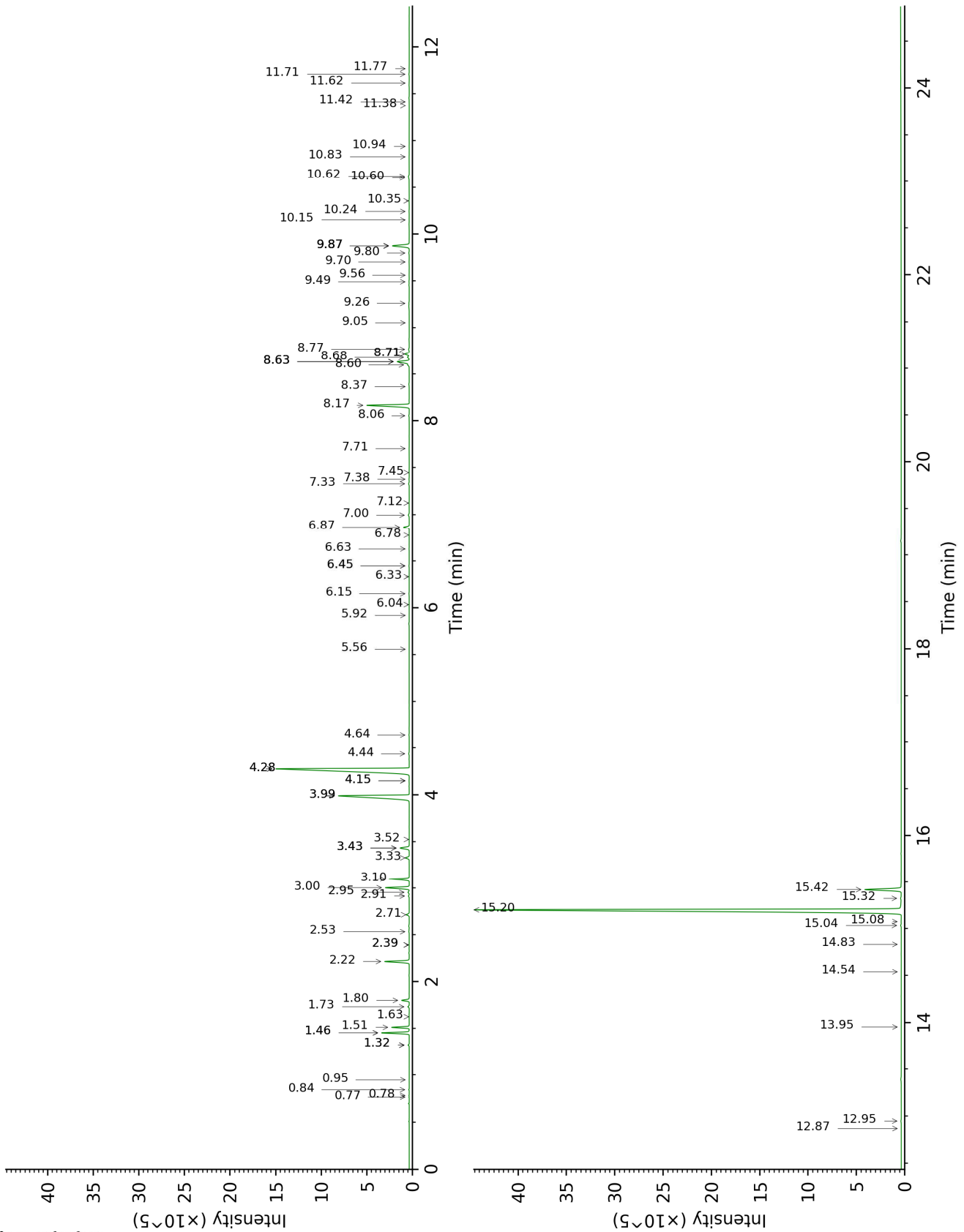
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.32	496	0.02	0.84	903	0.02
Acetic acid	0.48	599	tr	6.78	1408	0.01
2-Methyl-3-buten-2-ol	0.49	606	tr	1.63	1014	tr
Isovaleral	0.59	638	0.01	0.78	884	0.01
2-Methylbutyral	0.61	648	0.01	0.77	878	0.01
2-Ethylfuran	0.75	695	tr	0.95	919	tr
Isoamyl alcohol	0.91	723	0.01	3.52	1175	tr
Methyl 2-methylbutyrate	1.23	769	0.06	1.32*	976	0.07
(3Z)-Hexenol	2.07	853	0.01	5.92	1346	0.01
Hexanol	2.26	870	tr	5.56	1320	tr
Hashishene	2.79	912	tr	1.46*	996	1.89
Tricyclene	2.83	914	0.01	1.32*	976	[0.07]
α -Thujene	2.94	922	1.09	1.51	1004	1.10
α -Pinene	3.01	927	1.88	1.46*	996	[1.89]
Camphene	3.20*	939	0.66	1.80	1031	0.56
α -Fenchene	3.20*	939	[0.66]	1.73	1024	0.10
Thuja-2,4(10)-diene	3.30	946	tr	2.39*	1087	0.01
β -Pinene	3.63*	968	1.98	2.22	1070	1.97
Sabinene	3.63*	968	[1.98]	2.39*	1087	[0.01]
Octen-3-ol	3.84	982	0.47	6.86	1414	0.46
Octan-3-one	3.88	984	0.03	4.15*	1221	0.02
Myrcene	3.96	990	1.92	3.00	1136	1.93
Octan-3-ol	4.08*	998	0.19	6.15	1362	0.02
α -Phellandrene	4.08*	998	[0.19]	2.95	1132	0.10
Pseudolimonene	4.08*	998	[0.19]	2.91	1129	0.06
Δ^3 -Carene	4.17	1004	0.24	2.71	1114	0.24
α -Terpinene	4.29	1011	1.65	3.10	1143	1.65
Carvomenthene	4.37	1016	0.03	2.53	1100	0.03
ortho-Cymene	4.39	1017	0.05	4.28*	1230	19.84
para-Cymene	4.46	1022	19.66	4.28*	1230	[19.84]
1,8-Cineole	4.51*	1025	1.28	3.43*	1168	0.85
β -Phellandrene	4.51*	1025	[1.28]	3.43*	1168	[0.85]
Limonene	4.51*	1025	[1.28]	3.33	1160	0.33
Cymene analog	4.63	1032	0.03	4.64	1256	0.02
(Z)- β -Ocimene	4.70	1037	0.01	3.99*	1210	9.42
(E)- β -Ocimene	4.86	1047	0.02	4.15*	1221	[0.02]
γ -Terpinene	5.00	1056	9.39	3.99*	1210	[9.42]
2-Methylbutyl butyrate	5.12	1063	0.07			
cis-Sabinene hydrate	5.15	1065	0.06	7.00	1424	0.09
cis-Linalool oxide (fur.)	5.20	1068	0.02	6.63	1397	0.01
meta-Cymenene	5.37	1079	0.03	6.45*	1384	0.03
Terpinolene	5.42	1082	0.04	4.44	1242	0.04
para-Cymenene	5.45*	1084	0.04	6.45*	1384	[0.03]
trans-Linalool oxide	5.45*	1084	[0.04]	7.12	1434	0.02

(fur.)						
<i>trans</i> -Sabinene hydrate	5.61	1094	0.04	8.06	1504	0.04
Linalool	5.73*	1102	3.92	8.17	1512	3.92
Nonanal	5.73*	1102	[3.92]	6.04	1354	0.01
endo-Fenchol	5.86	1110	0.01	8.60	1546	0.12
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	5.97	1117	0.01	6.33	1376	0.01
<i>trans</i> -Pinocarveol	6.20	1132	0.03	9.26	1598	0.03
Camphor	6.23	1134	0.05	7.33	1449	0.06
<i>trans</i> -para-Menth-2-en-1-ol	6.26	1136	0.01	9.05	1581	0.01
Camphene hydrate	6.33	1140	0.01	8.63*	1549	1.29
<i>trans</i> -Chrysanthemal	6.37	1143	0.01	7.45	1458	0.01
Isoborneol	6.50	1151	0.02	9.56	1622	0.01
Borneol	6.67	1161	1.24	9.87*	1648	1.69
Terpinen-4-ol	6.83	1172	0.16	8.71*	1555	0.39
para-Cymen-8-ol	7.01	1183	0.01	11.71	1802	0.03
α -Terpineol	7.07	1187	0.29	9.87*	1648	[1.69]
<i>cis</i> -Dihydrocarvone	7.15	1192	0.15	8.68	1552	0.16
Bornyl formate	7.56	1219	tr			
Thymol methyl ether	7.74	1231	0.13	8.63*	1549	[1.29]
Carvacrol methyl ether	7.87*	1240	0.39	8.71*	1555	[0.39]
Neral	7.87*	1240	[0.39]	9.70	1634	0.01
(<i>E</i>)-Isogeraniol?	8.09	1254	0.01	11.38	1773	0.01
Geraniol	8.15	1259	0.01	11.77	1807	0.02
Geranial	8.24	1264	0.02	10.24	1677	0.02
Thymol analogue I	8.71	1296	0.05	15.08	2116	0.03
Thymol	8.91*	1310	45.74	15.20	2129	46.24
Thymol analogue II	8.91*	1310	[45.74]	15.32	2141	0.09
Carvacrol	8.97	1314	3.96	15.42	2151	3.25
Thymyl acetate	9.49	1351	0.01	11.62	1794	0.01
Eugenol	9.54	1354	0.01	14.83	2092	0.01
Isodauca-4,7(14)-diene?	9.67	1363	0.01			
α -Copaene	9.73	1368	0.02	7.38	1453	0.02
β -Bourbonene	9.84	1376	0.01	7.71	1477	0.01
Isocaryophyllene	10.18	1400	0.01	8.37	1528	0.01
β -Caryophyllene	10.31	1409	1.29	8.63*	1549	[1.29]
Aromadendrene	10.57	1429	0.06	8.77	1559	0.06
α -Humulene	10.77	1443	0.02	9.49	1616	0.02
Unknown [m/z 151, 166 (40), 105 (26)...]	10.86	1450	0.02			
Thymohydroquinone isomer?	10.92	1454	0.07			
γ -Muurolene	11.11	1469	0.03	9.80	1641	0.04
Germacrene D	11.15	1472	0.03	9.87*	1648	[1.69]
Viridiflorene	11.34	1486	0.02	9.87*	1648	[1.69]
α -Muurolene	11.43	1493	0.02	10.15	1670	0.01
β -Bisabolene	11.57	1503	0.02	10.35	1687	0.02

γ-Cadinene	11.60	1505	0.06	10.60	1707	0.06
δ-Cadinene	11.73*	1516	0.08	10.62	1709	0.08
<i>trans</i> -Calamenene	11.73*	1516	[0.08]	11.42	1777	0.01
<i>trans</i> -Cadina-1,4-diene	11.84	1524	0.01	10.83	1727	0.01
α-Cadinene	11.90	1529	0.01	10.94	1736	0.01
Caryophyllene oxide	12.43*	1570	0.05	12.95	1913	0.04
Spathulenol	12.43*	1570	[0.05]	14.54	2064	0.01
Caryophyllene oxide isomer	12.43*	1570	[0.05]	12.87	1906	0.01
Unknown [m/z 161, 187 (29), 105 (24), 91 (23), 93 (23)... 205 (19), 220? (2)]	12.48	1574	0.01			
1-epi-Cubenol	13.08	1622	tr	13.95	2006	0.01
τ-Cadinol	13.21	1633	0.03	15.04	2112	0.06
Unknown [m/z 136, 81 (96), 135 (76), 93 (48), 150 (47), 121 (43), 137 (28)...]	16.19	1892	0.03			
Unknown [m/z 201, 159 (37), 148 (27), 173 (22), 41 (20)... 284 (16)]	16.98	1966	0.01			
Unknown [m/z 135, 150 (61), 81 (45), 69 (37), 41 (24), 136 (21), 93 (19)...]	17.11	1978	0.01			
Unknown [m/z 135, 150 (67), 69 (57), 41 (24)...]	17.49	2015	0.01			
Unknown [m/z 267, 282 (24), 268 (21), 117 (16), 126 (11)...]	18.98	2165	0.03			
Unknown [m/z 135, 81 (77), 150 (74), 95 (73), 109 (65), 149 (59)...]	20.12	2287	tr			
Total identified		99.12%			98.86%	
Total reported		99.26%			98.87%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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