

GC/MS BATCH NUMBER: T30111

ESSENTIAL OIL: TEA TREE ORGANIC
BOTANICAL NAME: MELALEUCA ALTERNIFOLIA
ORIGIN: AUSTRALIA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF TEA TREE ORGANIC OIL	%
TERPINEN-4-OL	40.9
γ-TERPINENE	18.6
α-TERPINENE	8.6
TERPINOLENE	3.3
α-TERPINEOL	3.0
EPIZONARENE	3.0
p-CYMENE	3.0
1,8-CINEOLE + β-PHELLANDRENE	2.6
α-PINENE	2.3
AROMADENDRENE	1.3
δ-CADINENE	1.3
VIRIDIFLORENE	1.1

Comments from Robert Tisserand: Fresh, clean, after-the-rain odor quality. All 15 ISO constituents are within range.

Date : August 30, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18H23-PTH1-1-CC

Customer identification : Tea Tree Organic - Australia - T3011199R

Type : Essential oil

Source : *Melaleuca alternifolia* ct. Terpinen-4-ol

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 : August 28, 2018

Checked and approved by :

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.

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

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4780 ± 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	0.06	Aliphatic alcohol
Ethyl acetate	tr	tr	Aliphatic ester
Isobutanol	tr	0.65*	Aliphatic alcohol
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	0.01	0.01	Aliphatic aldehyde
Isoamyl alcohol	tr	0.01*	Aliphatic alcohol
2-Methylbutanol	tr	[0.01]*	Aliphatic alcohol
Prenol	0.01	0.02*	Aliphatic alcohol
(3Z)-Hexenol	0.06	0.07	Aliphatic alcohol
Hexanol	0.01	tr	Aliphatic alcohol
2-Methylbutyric acid	tr	0.11	Aliphatic acid
α -Thujene	0.82	0.82	Monoterpene
α -Pinene	2.27	2.26	Monoterpene
Camphene	0.02*	0.01	Monoterpene
α -Fenchene	[0.02]*	tr	Monoterpene
Thuja-2,4(10)-diene	tr	0.25*	Monoterpene
Sabinene	0.90*	[0.25]*	Monoterpene
β -Pinene	[0.90]*	[0.65]*	Monoterpene
3-Methyl-3-cyclohexenone	0.03	0.02*	Aliphatic ketone
Myrcene	0.74	0.75	Monoterpene
α -Phellandrene	0.41*	0.40	Monoterpene
Pseudolimonene	[0.41]*	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.01	[0.02]*	Aliphatic ester
α -Terpinene	8.61	8.60	Monoterpene
ortho-Cymene	0.02*	2.95*	Simple phenolic
Carvomenthene	[0.02]*	0.01	Aliphatic alcohol
para-Cymene	2.96	[2.95]*	Monoterpene
Limonene	3.37*	0.77	Monoterpene
1,8-Cineole	[3.37]*	2.60*	Monoterpenic ether
β -Phellandrene	[3.37]*	[2.60]*	Monoterpene
(Z)- β -Ocimene	tr	18.60*	Monoterpene
(E)- β -Ocimene	0.01	0.02	Monoterpene
γ -Terpinene	18.59	[18.60]*	Monoterpene
cis-Sabinene hydrate	0.04	0.11*	Monoterpenic alcohol
Terpinolene	3.29*	3.26	Monoterpene
para-Cymenene	[3.29]*	0.06*	Monoterpene
trans-Sabinene hydrate	0.05	0.06	Monoterpenic alcohol
Linalool	0.07	0.08	Monoterpenic alcohol
Unknown	0.01	0.43*	Monoterpenic alcohol
para-Mentha-1,3,8-triene	0.01	[0.02]*	Monoterpene
endo-Fenchol	0.01	0.02	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.34	0.37	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.03	0.01	Aliphatic alcohol
Cosmene isomer I	0.02	[0.06]*	Monoterpene
trans-para-Menth-2-en-1-ol	0.25	0.27	Monoterpenic alcohol
Unknown	0.02		Oxygenated monoterpene
Unknown	0.03	0.03	Unknown

Borneol	0.01	3.02*	Monoterpenic alcohol
δ-Terpineol	0.01	0.02	Monoterpenic alcohol
Terpinen-4-ol	40.87	42.42*	Monoterpenic alcohol
Dill ether	0.04*	0.01	Monoterpenic ether
para-Cymen-8-ol	[0.04]*	0.01	Monoterpenic alcohol
α-Terpineol	2.99	[3.02]*	Monoterpenic alcohol
cis-Piperitol	0.09	0.09	Monoterpenic alcohol
Unknown	tr		Oxygenated monoterpene
trans-Piperitol	0.16	0.16	Monoterpenic alcohol
endo-Fenchyl acetate	0.01	0.01	Monoterpenic ester
exo-2-Hydroxycineole	0.04	0.02	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	tr	0.02	Monoterpenic alcohol
Nerol	0.03	0.04	Monoterpenic alcohol
Unknown	0.03	0.02	Oxygenated monoterpene
Piperitone	0.07	0.13	Monoterpenic ketone
cis-Carvenone oxide?	tr		Monoterpenic ketone
trans-Ascaridole glycol	0.10	0.09	Monoterpenic alcohol
cis-Ascaridole glycol?	0.05	0.06	Monoterpenic alcohol
Thymol	0.03	0.04	Monoterpenic alcohol
Carvacrol	0.02	0.02	Monoterpenic alcohol
Unknown	0.07	0.09	Monoterpenic alcohol
Myrtenyl acetate	tr	0.12*	Monoterpenic ester
Bicycloelemene	0.02	0.02	Sesquiterpene
α-Cubebene	0.06	0.07	Sesquiterpene
Unknown	0.04	0.25*	Unknown
Cyclosativene II	0.01	[0.11]*	Sesquiterpene
Isoledene	0.09	[0.11]*	Sesquiterpene
α-Copaene	0.12	0.12	Sesquiterpene
7-Cubebene	0.07	0.07	Sesquiterpene
7-Cubebene epimer?	0.03	0.02	Aliphatic alcohol
β-Cubebene	0.07	0.04	Sesquiterpene
β-Elemene	0.04	[0.43]*	Sesquiterpene
α-Gurjunene	0.44*	0.39*	Sesquiterpene
Methyleugenol	[0.44]*	0.11	Phenylpropanoid
β-Maaliene	0.02	[0.39]*	Sesquiterpene
β-Caryophyllene	0.44	[0.43]*	Sesquiterpene
γ-Maaliene	0.08	0.10	Sesquiterpene
β-Gurjunene	0.02	0.03	Sesquiterpene
α-Maaliene	0.08	[42.42]*	Sesquiterpene
Aromadendrene	1.33	[42.42]*	Sesquiterpene
Selina-5,11-diene	0.17	0.19	Sesquiterpene
trans-Muurolo-3,5-diene	0.13	0.13	Sesquiterpene
α-Humulene	0.13	0.09	Sesquiterpene
allo-Aromadendrene	0.62	0.62	Sesquiterpene
Valerena-4,7(11)-diene	0.04	0.03	Sesquiterpene
γ-Gurjunene	0.06	0.07	Sesquiterpene
trans-Cadina-1(6),4-diene	0.35*	0.32	Sesquiterpene
Selina-4,11-diene	[0.35]*	0.02	Sesquiterpene
γ-Muurolo-ene	0.04	0.04	Sesquiterpene
Germacrene D	0.04	[3.02]*	Sesquiterpene
β-Selinene	0.11	0.12*	Sesquiterpene
allo-Aromadendr-9-ene	0.11	[0.12]*	Sesquiterpene

<i>trans</i> -Muurolo-4(15),5-diene	0.09	0.04	Sesquiterpene
δ-Selinene	0.14	1.21*	Sesquiterpene
Epizonarene	2.04*	[3.02]*	Sesquiterpene
α-Selinene	[2.04]*	[0.12]*	Sesquiterpene
Viridiflorene	[2.04]*	[1.21]*	Sesquiterpene
Bicyclogermacrene	[2.04]*	0.94	Sesquiterpene
α-Muurolole	0.20	0.12	Sesquiterpene
γ-Cadinene	0.04	0.32*	Sesquiterpene
<i>trans</i> -Calamenene	1.69*	0.12	Sesquiterpene
δ-Cadinene	[1.69]*	1.28	Sesquiterpene
Zonarene	[1.69]*	[0.32]*	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.21	0.22	Sesquiterpene
α-Calacorene	0.02	0.05	Sesquiterpene
Epiglobulol?	0.09	0.03	Sesquiterpenic alcohol
Eudesma-5,7(11)-diene	0.14*	0.03	Sesquiterpene
Unknown	[0.14]*	0.02	Oxygenated sesquiterpene
Palustrol	[0.14]*	0.06	Sesquiterpenic alcohol
Maaliol	[0.14]*	0.05	Sesquiterpenic alcohol
Unknown	0.01	0.02	Oxygenated sesquiterpene
Spathulenol	0.12	0.13	Sesquiterpenic alcohol
Globulol	0.40	0.39	Sesquiterpenic alcohol
Gleenol	0.04	0.04	Sesquiterpenic alcohol
Viridiflorol	0.20	[0.25]*	Sesquiterpenic alcohol
Cubeban-11-ol	0.16	0.28*	Sesquiterpenic alcohol
Ledol	0.15*	0.06	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	[0.15]*	0.11	Sesquiterpenic alcohol
Eudesm-5-en-11-ol	tr	0.01	Sesquiterpenic alcohol
10-epi-Cubenol	0.01	tr	Sesquiterpenic alcohol
Rosifoliol	0.16	0.17	Sesquiterpenic alcohol
1-epi-Cubenol	0.23	0.23	Sesquiterpenic alcohol
Isospathulenol	0.09	0.10	Sesquiterpenic alcohol
Cubenol	0.14	[0.28]*	Sesquiterpenic alcohol
α-Muurolol	0.05	0.07	Sesquiterpenic alcohol
Total identified	98.68%	98.84%	

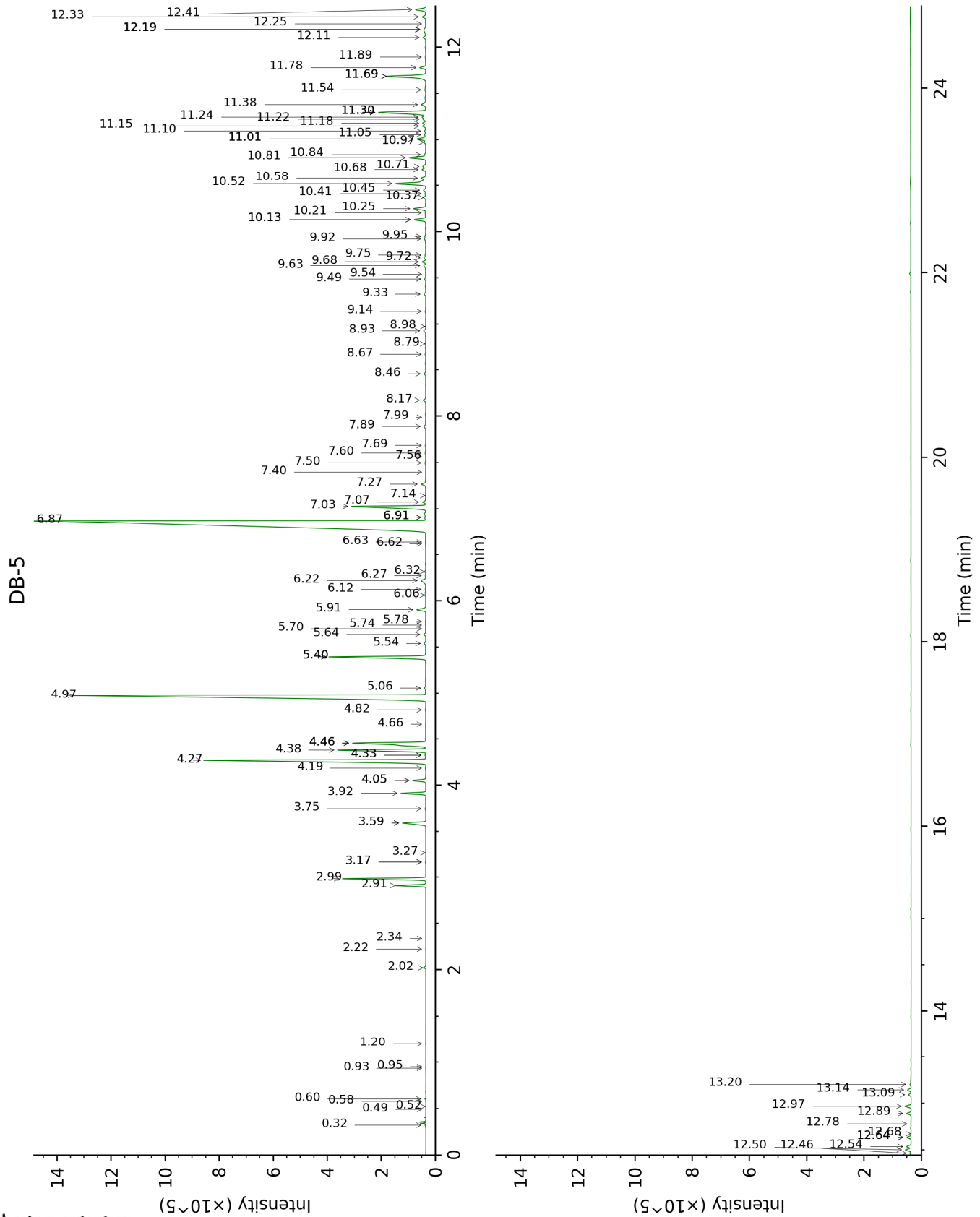
*: Two or more compounds are coeluting on this column

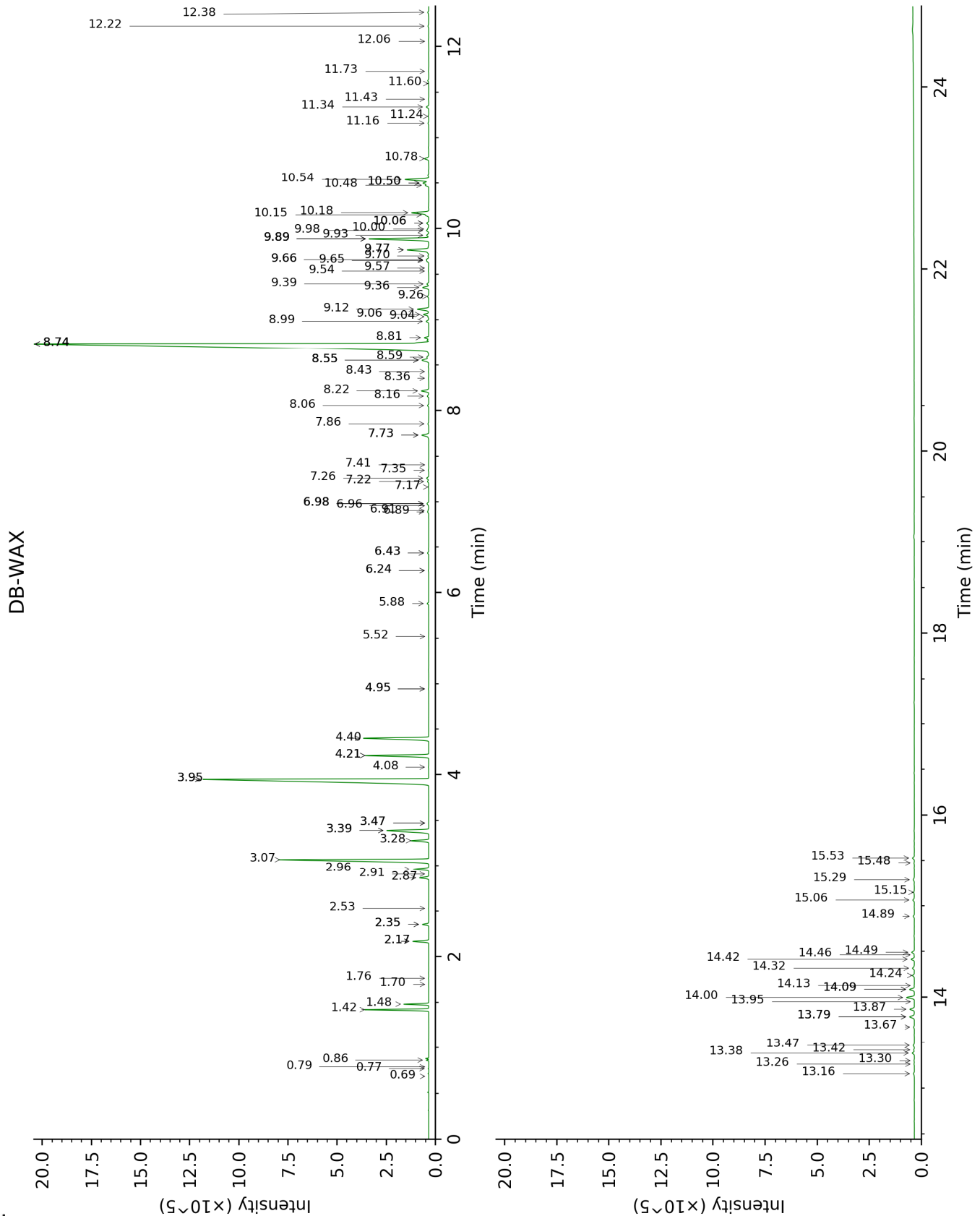
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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	%
Ethanol	0.32	497	0.02	0.86	906	0.06
Ethyl acetate	0.49	607	tr	0.69	854	tr
Isobutanol	0.52	618	tr	2.17*	1071	0.65
Isovaleral	0.58	639	tr	0.79	891	tr
2-Methylbutyral	0.60	648	0.01	0.77	884	0.01
Isoamyl alcohol	0.93	729	tr	3.47*	1178	0.01
2-Methylbutanol	0.95	732	tr	3.47*	1178	[0.01]
Prenol	1.20	768	0.01	4.95*	1285	0.02
(3Z)-Hexenol	2.02	853	0.06	5.88	1352	0.07
Hexanol	2.22	870	0.01	5.52	1326	tr
2-Methylbutyric acid	2.34	880	tr	9.93	1658	0.11
α-Thujene	2.91	923	0.82	1.48	1003	0.82
α-Pinene	2.99	928	2.27	1.42	996	2.26
Camphene	3.17*	941	0.02	1.76	1031	0.01
α-Fenchene	3.17*	941	[0.02]	1.70	1024	tr
Thuja-2,4(10)-diene	3.27	948	tr	2.35*	1089	0.25
Sabinene	3.59*	969	0.90	2.35*	1089	[0.25]
β-Pinene	3.59*	969	[0.90]	2.17*	1071	[0.65]
3-Methyl-3-cyclohexenone	3.75	980	0.03	6.24*	1377	0.02
Myrcene	3.92	991	0.74	2.96	1140	0.75
α-Phellandrene	4.05*	1000	0.41	2.87	1132	0.40
Pseudolimonene	4.05*	1000	[0.41]	2.91	1135	0.01
(3Z)-Hexenyl acetate	4.19	1008	0.01	4.95*	1285	[0.02]
α-Terpinene	4.27	1014	8.61	3.07	1148	8.60
ortho-Cymene	4.33*	1017	0.02	4.21*	1232	2.95
Carvomenthene	4.33*	1017	[0.02]	2.53	1106	0.01
para-Cymene	4.38	1021	2.96	4.21*	1232	[2.95]
Limonene	4.46*	1026	3.37	3.28	1164	0.77
1,8-Cineole	4.46*	1026	[3.37]	3.39*	1172	2.60
β-Phellandrene	4.46*	1026	[3.37]	3.39*	1172	[2.60]
(Z)-β-Ocimene	4.66	1038	tr	3.95*	1214	18.60
(E)-β-Ocimene	4.82	1048	0.01	4.08	1223	0.02
γ-Terpinene	4.97	1058	18.59	3.95*	1214	[18.60]
cis-Sabinene hydrate	5.06	1064	0.04	6.98*	1431	0.11
Terpinolene	5.40*	1085	3.29	4.40	1246	3.26
para-Cymenene	5.40*	1085	[3.29]	6.44*	1391	0.06
trans-Sabinene hydrate	5.54	1094	0.05	8.06	1511	0.06
Linalool	5.64	1100	0.07	8.16	1519	0.08
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152	5.70	1104	0.01	8.55*	1549	0.43

(32), 137 (31), 134 (24)]						
para-Mentha-1,3,8-triene	5.74	1106	0.01	6.24*	1377	[0.02]
endo-Fenchol	5.78	1109	0.01	8.43	1540	0.02
cis-para-Menth-2-en-1-ol	5.90	1117	0.34	8.22	1523	0.37
4-Hydroxy-4-methylcyclohex-2-enone	6.06	1127	0.03	14.13	2029	0.01
Cosmene isomer I	6.12	1131	0.02	6.44*	1391	[0.06]
trans-para-Menth-2-en-1-ol	6.22	1137	0.25	9.06	1589	0.27
Unknown [m/z 109, 43 (73), 71 (54), 124 (51), 69 (37), 41 (35)... 152 (5)]	6.27	1141	0.02			
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.32	1143	0.03	6.91	1426	0.03
Borneol	6.62	1163	0.01	9.89*	1655	3.02
δ-Terpineol	6.64	1164	0.01	9.54	1627	0.02
Terpinen-4-ol	6.87	1179	40.87	8.74*	1564	42.42
Dill ether	6.91*	1182	0.04	7.41	1462	0.01
para-Cymen-8-ol	6.91*	1182	[0.04]	11.60	1798	0.01
α-Terpineol	7.03	1189	2.99	9.89*	1655	[3.02]
cis-Piperitol	7.07	1192	0.09	9.65	1636	0.09
Unknown [m/z 121, 43 (99), 91 (85), 77 (73), 93 (41), 136 (33)... 166 (3)]	7.14	1197	tr			
trans-Piperitol	7.27	1205	0.16	10.48	1703	0.16
endo-Fenchyl acetate	7.40	1213	0.01	6.96	1429	0.01
exo-2-Hydroxycineole	7.50	1220	0.04	11.73	1810	0.02
cis-para-Mentha-1(7),8-dien-2-ol	7.56	1224	tr	12.06	1839	0.02
Nerol	7.60	1227	0.03	11.16	1761	0.04
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.69	1233	0.03	11.42	1783	0.02
Piperitone	7.89	1246	0.07	9.98	1663	0.13
cis-Carvenone oxide?	7.99	1253	tr			
trans-Ascaridole glycol	8.17	1265	0.10	14.24	2040	0.09
cis-Ascaridole	8.46	1284	0.05	14.89	2102	0.06

glycol?						
Thymol	8.67	1299	0.03	15.15	2129	0.04
Carvacrol	8.79	1307	0.02	15.48	2161	0.02
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	8.93	1317	0.07	15.06	2120	0.09
Myrtenyl acetate	8.98	1320	tr	9.66*	1637	0.12
Bicycloelemene	9.14	1332	0.02	7.16	1445	0.02
α -Cubebene	9.33	1345	0.06	6.89	1424	0.07
Unknown [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...]	9.49	1356	0.04	14.09*	2025	0.25
Cyclosativene II	9.54	1360	0.01	6.98*	1431	[0.11]
Isoledene	9.64	1367	0.09	6.98*	1431	[0.11]
α -Copaene	9.68	1370	0.12	7.26	1452	0.12
7-Cubebene	9.72	1372	0.07	7.22	1449	0.07
7-Cubebene epimer?	9.75	1375	0.03	7.35	1458	0.02
β -Cubebene	9.92	1387	0.07	7.86	1496	0.04
β -Elemene	9.95	1389	0.04	8.55*	1549	[0.43]
α -Gurjunene	10.13*	1402	0.44	7.73*	1486	0.39
Methyleugenol	10.13*	1402	[0.44]	13.38	1959	0.11
β -Maaliene	10.20	1407	0.02	7.73*	1486	[0.39]
β -Caryophyllene	10.25	1410	0.44	8.55*	1549	[0.43]
γ -Maaliene	10.37	1419	0.08	8.59	1552	0.10
β -Gurjunene	10.41	1422	0.02	8.36	1534	0.03
α -Maaliene	10.45	1425	0.08	8.74*	1564	[42.42]
Aromadendrene	10.52	1431	1.33	8.74*	1564	[42.42]
Selina-5,11-diene	10.58	1435	0.17	8.81	1569	0.19
<i>trans</i> -Muurola-3,5-diene	10.68	1442	0.13	8.99	1583	0.13
α -Humulene	10.71	1445	0.13	9.40	1615	0.09
allo-Aromadendrene	10.81	1452	0.62	9.12	1593	0.62
Valerena-4,7(11)-diene	10.84	1454	0.04	9.04	1587	0.03
γ -Gurjunene	10.97	1464	0.06	9.26	1604	0.07
<i>trans</i> -Cadina-1(6),4-diene	11.01*	1467	0.35	9.36	1612	0.32
Selina-4,11-diene	11.01*	1467	[0.35]	9.57	1629	0.02
γ -Muurolene	11.06	1470	0.04	9.70	1640	0.04
Germacrene D	11.10	1473	0.04	9.89*	1655	[3.02]
β -Selinene	11.15	1478	0.11	10.06*	1669	0.12
allo-Aromadendr-9-ene	11.18	1480	0.11	9.66*	1637	[0.12]
<i>trans</i> -Muurola-4(15),5-diene	11.22	1483	0.09	10.00	1664	0.04
δ -Selinene	11.24	1485	0.14	9.77*	1645	1.21
Epizonarene	11.30*	1488	2.04	9.89*	1655	[3.02]
α -Selinene	11.30*	1488	[2.04]	10.06*	1669	[0.12]

Viridiflorene	11.30*	1488	[2.04]	9.77*	1645	[1.21]
Bicyclogermacrene	11.30*	1488	[2.04]	10.18	1678	0.94
α-Muurolene	11.38	1495	0.20	10.15	1676	0.12
γ-Cadinene	11.54	1507	0.04	10.50*	1705	0.32
<i>trans</i> -Calamenene	11.69*	1518	1.69	11.34	1776	0.12
δ-Cadinene	11.69*	1518	[1.69]	10.54	1708	1.28
Zonarene	11.69*	1518	[1.69]	10.50*	1705	[0.32]
<i>trans</i> -Cadina-1,4-diene	11.78	1526	0.21	10.78	1728	0.22
α-Calacorene	11.89	1535	0.02	12.22	1854	0.05
Epiglobulol?	12.10	1551	0.09	13.42	1962	0.03
Eudesma-5,7(11)-diene	12.19*	1558	0.14	11.24	1767	0.03
Unknown [m/z 161, 109 (98), 82 (93), 43 (72), 105 (68), 93 (59), 69 (56), 119 (55)... 222 (7)]	12.19*	1558	[0.14]	13.30	1951	0.02
Palustrol	12.19*	1558	[0.14]	12.38	1867	0.06
Maaliol	12.19*	1558	[0.14]	13.16	1938	0.05
Unknown [m/z 107, 163 (88), 59 (60), 93 (49), 43 (47), 81 (46... 204 (5)...]	12.25	1563	0.01	13.26	1948	0.02
Spathulenol	12.33	1569	0.12	14.49	2064	0.13
Globulol	12.41	1575	0.40	14.00	2016	0.39
Gleenol	12.46	1579	0.04	13.67	1985	0.04
Viridiflorol	12.50	1582	0.20	14.09*	2025	[0.25]
Cubeban-11-ol	12.54	1585	0.16	13.79*	1996	0.28
Ledol	12.64*	1593	0.15	13.47	1967	0.06
Eudesm-5-en-11-ol analog	12.64*	1593	[0.15]	14.32	2047	0.11
Eudesm-5-en-11-ol	12.68	1596	tr	14.46	2061	0.01
10-epi-Cubenol	12.78	1604	0.01	13.95	2012	tr
Rosifoliol	12.89	1614	0.16	14.42	2057	0.17
1-epi-Cubenol	12.97	1620	0.23	13.87	2004	0.23
Isospathulenol	13.09	1630	0.09	15.53	2167	0.10
Cubenol	13.14	1634	0.14	13.79*	1996	[0.28]
α-Muurolol	13.20	1639	0.05	15.29	2142	0.07
Total identified		98.68%			98.84%	
Total reported		98.89%			99.00%	

*: 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