

GC/MS BATCH NUMBER: T30110

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

KEY CONSTITUENTS PRESENT IN THIS BATCH OF TEA TREE ORGANIC OIL	%
TERPINEN-4-OL	36.1
γ-TERPINENE	19.0
α-TERPINENE	9.7
TERPINOLENE	3.7
BICYCLOGERMACRENE	3.3
1,8-CINEOLE + β-PHELLANDRENE	3.1
AROMADENDRENE	2.2
α-TERPINEOL	2.4
α-PINENE	2.3
δ-CADINENE	2.2

Comments from Robert Tisserand: Crisp, clean-green odor profile. All 15 key ISO constituents are within range.

Date : March 26, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18C12-PTH1-1-CC

Customer identification : Tea Tree Organic - Australia - T3011079R

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 : March 21, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4785 ± 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	0.05	0.06	Aliphatic alcohol
Isobutyral	0.03	0.03	Aliphatic aldehyde
Ethyl acetate	tr	tr	Aliphatic ester
Isobutanol	tr	0.68*	Aliphatic alcohol
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	0.02	0.03	Aliphatic aldehyde
Isoamyl alcohol	tr		Aliphatic alcohol
2-Methylbutanol	tr		Aliphatic alcohol
Prenol	0.01		Aliphatic alcohol
(3Z)-Hexenol	0.05	0.07	Aliphatic alcohol
Hexanol	0.01	tr	Aliphatic alcohol
α -Thujene	0.87	0.88	Monoterpene
α -Pinene	2.26	2.27	Monoterpene
α -Fenchene	0.01*	tr	Monoterpene
Camphene	[0.01]*	0.01	Monoterpene
Thuja-2,4(10)-diene	tr	0.55*	Monoterpene
Sabinene	1.23*	[0.55]*	Monoterpene
β -Pinene	[1.23]*	[0.68]*	Monoterpene
3-Methyl-3-cyclohexenone?	tr	0.01*	Aliphatic ketone
Myrcene	0.76	0.77	Monoterpene
α -Phellandrene	0.51*	0.50	Monoterpene
Pseudolimonene	[0.51]*	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.02	0.02*	Aliphatic ester
α -Terpinene	9.65	9.72	Monoterpene
Carvomenthene	0.02	tr	Aliphatic alcohol
para-Cymene	1.34	1.35	Monoterpene
Limonene	3.93*	0.80	Monoterpene
1,8-Cineole	[3.93]*	3.14*	Monoterpenic ether
β -Phellandrene	[3.93]*	[3.14]*	Monoterpene
(Z)- β -Ocimene	0.01	19.06*	Monoterpene
(E)- β -Ocimene	0.02	0.01	Monoterpene
γ -Terpinene	19.02	[19.06]*	Monoterpene
cis-Sabinene hydrate	0.07*	0.05*	Monoterpenic alcohol
Unknown	[0.07]*	[0.02]*	Oxygenated monoterpene
para-Cymenene	3.67*	0.03	Monoterpene
Terpinolene	[3.67]*	3.66	Monoterpene
trans-Sabinene hydrate	0.08	0.08	Monoterpenic alcohol
Linalool	0.06	0.06	Monoterpenic alcohol
Unknown	tr	0.04*	Monoterpenic alcohol
para-Mentha-1,3,8-triene	tr	[0.01]*	Monoterpene
endo-Fenchol	tr	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.29	0.30	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.01	0.03	Aliphatic alcohol
Cosmene isomer I	0.02*	0.01	Monoterpene
trans-Pinocarveol	[0.02]*	0.10*	Monoterpenic alcohol
Cosmene isomer II	0.20*	[0.01]*	Monoterpene
trans-para-Menth-2-en-1-ol	[0.20]*	0.45*	Monoterpenic alcohol

Unknown	0.06	[0.05]*	Unknown
Borneol	0.01	2.44*	Monoterpenic alcohol
δ-Terpineol	0.01	0.01	Monoterpenic alcohol
Terpinen-4-ol	36.09*	[39.29]*	Monoterpenic alcohol
Dill ether	[36.09]*	0.01	Monoterpenic ether
para-Cymen-8-ol	0.05	0.02*	Monoterpenic alcohol
α-Terpineol	2.41	[2.44]*	Monoterpenic alcohol
cis-Piperitol	0.12*	tr	Monoterpenic alcohol
Unknown	[0.12]*		Oxygenated monoterpene
trans-Piperitol	0.11	0.11	Monoterpenic alcohol
endo-Fenchyl acetate	0.01	0.04	Monoterpenic ester
exo-2-Hydroxycineole	0.01	[0.02]*	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	tr	0.01	Monoterpenic alcohol
Nerol	0.02	0.02	Monoterpenic alcohol
Unknown	0.01	0.10*	Oxygenated monoterpene
Piperitone	0.05	0.23*	Monoterpenic ketone
cis-Carvenone oxide?	0.02		Monoterpenic ketone
trans-Ascaridole glycol	0.02	0.01	Monoterpenic alcohol
cis-Ascaridole glycol?	0.01		Monoterpenic alcohol
Thymol	0.01	0.05*	Monoterpenic alcohol
Carvacrol	0.01	0.01	Monoterpenic alcohol
Unknown	0.02*	tr	Monoterpenic alcohol
Myrtenyl acetate	[0.02]*	0.22*	Monoterpenic ester
Bicycloelemene	0.03	0.03	Sesquiterpene
α-Cubebene	0.10	0.10*	Sesquiterpene
Cyclosativene I	0.02	0.11	Sesquiterpene
Cyclosativene II	tr	tr	Sesquiterpene
Isoledene	0.11	[0.10]*	Sesquiterpene
α-Copaene	0.18	0.18	Sesquiterpene
7-Cubebene	0.13	0.12	Sesquiterpene
7-Cubebene epimer?	0.06	0.07	Aliphatic alcohol
β-Cubebene	0.01	0.08	Sesquiterpene
β-Elemene	0.11	39.29*	Sesquiterpene
α-Gurjunene	0.67	0.68*	Sesquiterpene
Methyleugenol	0.05	0.13*	Phenylpropanoid
β-Maaliene	0.04	[0.68]*	Sesquiterpene
β-Caryophyllene	0.92	[39.29]*	Sesquiterpene
γ-Maaliene	0.10*	[0.04]*	Sesquiterpene
β-Gurjunene	[0.10]*	0.04	Sesquiterpene
α-Maaliene	0.11	[39.29]	Sesquiterpene
Aromadendrene	2.50	[39.29]*	Sesquiterpene
Selina-5,11-diene	[2.50]	0.32	Sesquiterpene
trans-Muurolo-3,5-diene	0.47	[0.45]*	Sesquiterpene
α-Humulene	[0.47]	0.69*	Sesquiterpene
allo-Aromadendrene	0.97*	0.89	Sesquiterpene
Valerena-4,7(11)-diene	[0.97]*	[0.45]*	Sesquiterpene
γ-Gurjunene	0.09	[0.10]*	Sesquiterpene
γ-Muurolo-ene	0.64*	[0.22]*	Sesquiterpene
Selina-4,11-diene	[0.64]*	0.03	Sesquiterpene
trans-Cadina-1(6),4-diene	[0.64]*	[0.69]*	Sesquiterpene
β-Selinene	0.14	[0.23]*	Sesquiterpene
allo-Aromadendr-9-ene	0.18*	0.07	Sesquiterpene

<i>trans</i> -Muurolo-4(15),5-diene	[0.18]*	[0.23]*	Sesquiterpene
δ-Selinene	0.38	1.74	Sesquiterpene
α-Selinene	[0.38]	0.17	Sesquiterpene
Bicyclogermacrene	3.37*	1.91*	Sesquiterpene
Epizonarene	[3.37]*	0.02	Sesquiterpene
Viridiflorene	[3.37]*	0.04	Sesquiterpene
α-Muurolole	0.28	[1.91]*	Sesquiterpene
γ-Cadinene	0.04	0.44*	Sesquiterpene
δ-Cadinene	2.24*	1.73	Sesquiterpene
<i>trans</i> -Calamenene	[2.24]*	[0.10]*	Sesquiterpene
Zonarene	[2.24]*	[0.44]*	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.30	0.31	Sesquiterpene
Eudesma-5,7(11)-diene	0.10	0.03	Sesquiterpene
Maaliol	0.06	0.04	Sesquiterpenic alcohol
Unknown	0.10*	[0.13]*	Oxygenated sesquiterpene
Palustrol	[0.10]*	0.05	Sesquiterpenic alcohol
Unknown	[0.10]*	0.02	Oxygenated sesquiterpene
Spathulenol	0.07	0.07	Sesquiterpenic alcohol
Globulol	0.37	0.38	Sesquiterpenic alcohol
Gleenol	0.04	0.03	Sesquiterpenic alcohol
Viridiflorol	0.15	0.16	Sesquiterpenic alcohol
Cubeban-11-ol	0.15	0.23*	Sesquiterpenic alcohol
Eudesm-5-en-11-ol	0.12	0.14*	Sesquiterpenic alcohol
10-epi-Cubenol	0.01		Sesquiterpenic alcohol
Rosifoliol	0.14	[0.14]*	Sesquiterpenic alcohol
1-epi-Cubenol	0.20	0.19	Sesquiterpenic alcohol
Isospathulenol	0.03	0.04	Sesquiterpenic alcohol
Cubenol	0.11	[0.23]*	Sesquiterpenic alcohol
α-Muurolol	0.05	[0.05]*	Sesquiterpenic alcohol
Total identified	99.18%	98.64%	

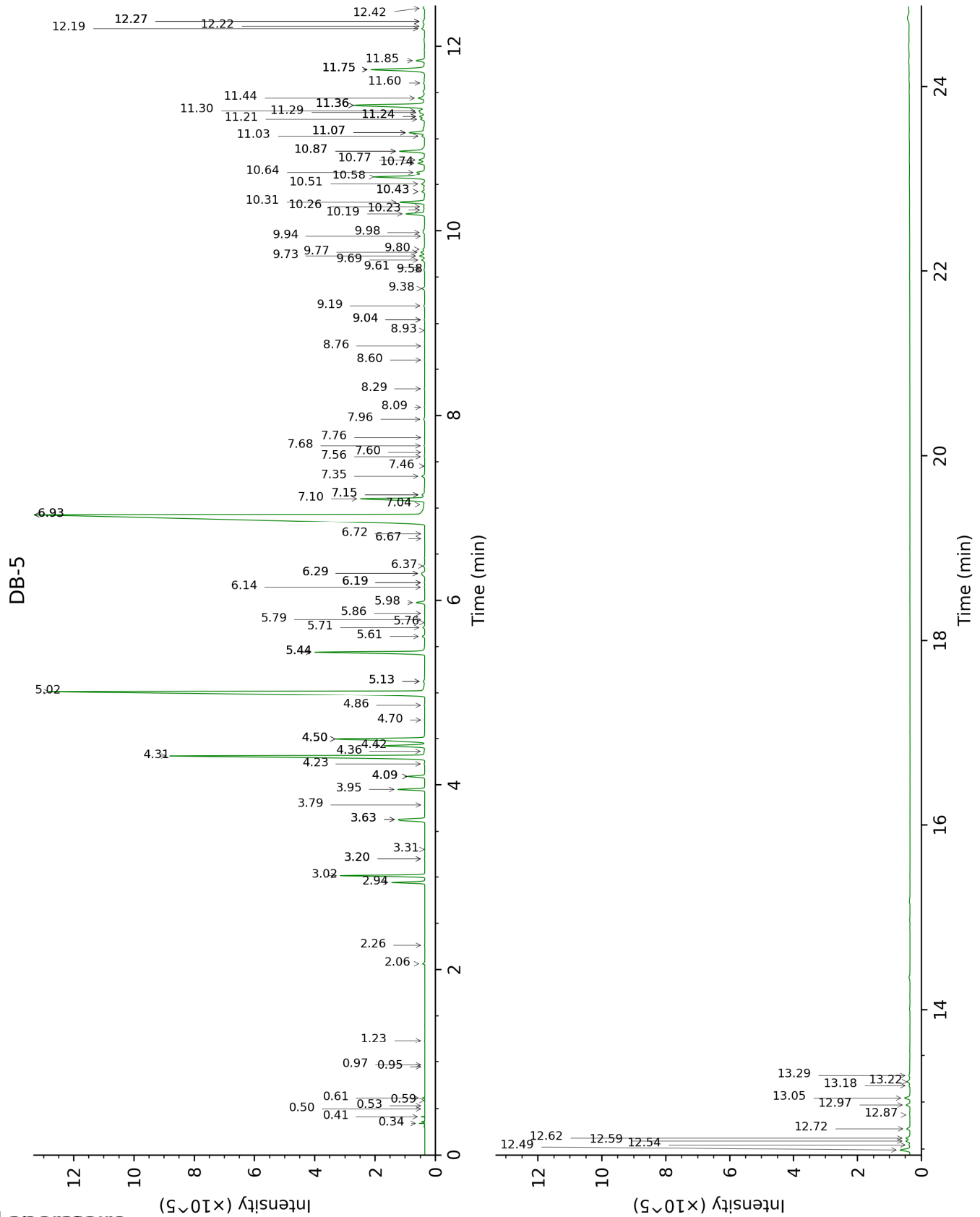
*: Two or more compounds are coeluting on this column

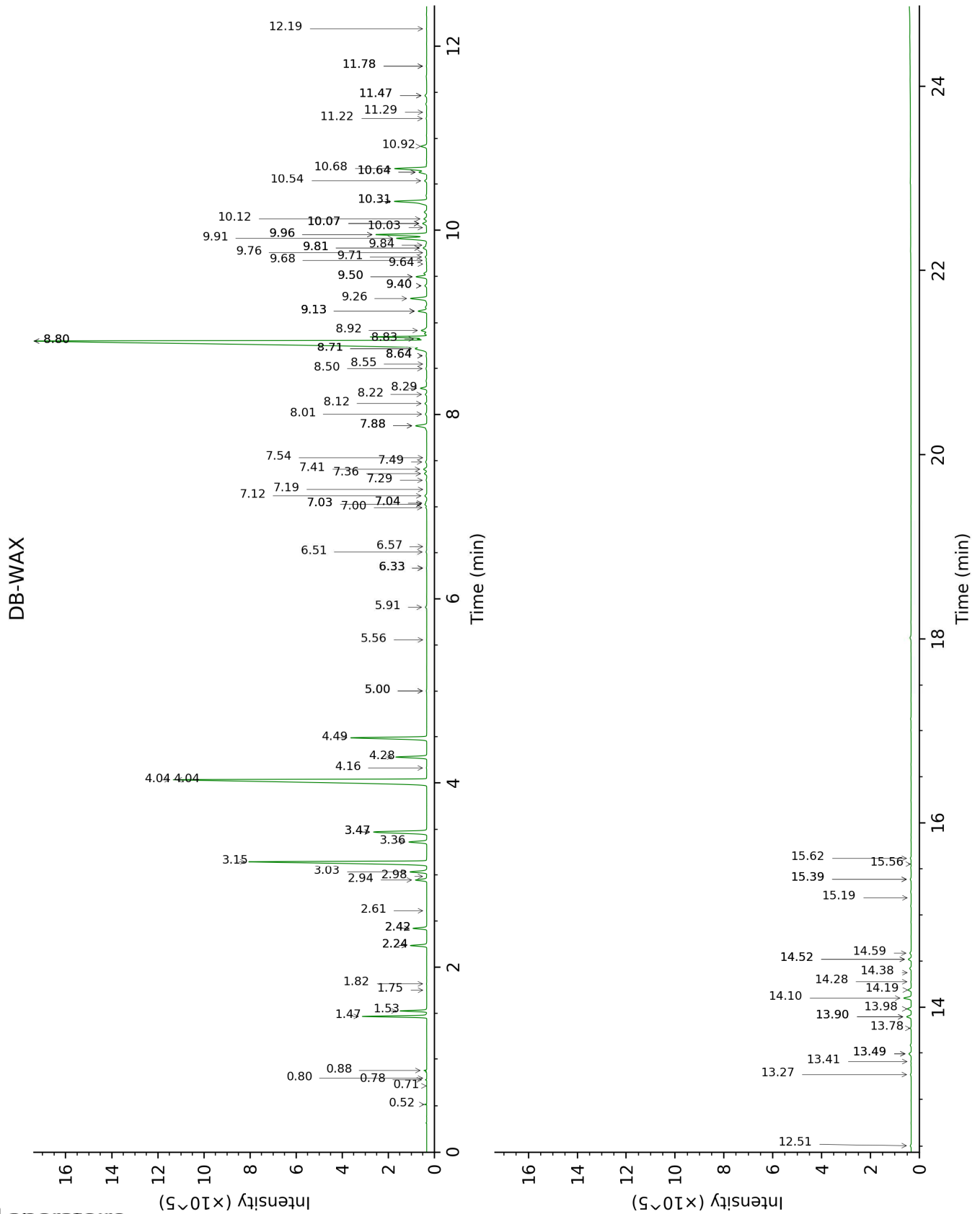
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.34	496	0.05	0.88	905	0.06
Isobutyral	0.41	538	0.03	0.52	776	0.03
Ethyl acetate	0.50	607	tr	0.71	857	tr
Isobutanol	0.53	619	tr	2.24*	1070	0.68
Isovaleral	0.59	639	tr	0.80	885	tr
2-Methylbutyral	0.61	648	0.02	0.78	879	0.03
Isoamyl alcohol	0.95	728	tr			
2-Methylbutanol	0.97	731	tr			
Prenol	1.23	770	0.01			
(3Z)-Hexenol	2.06	854	0.05	5.91	1346	0.07
Hexanol	2.26	871	0.01	5.56	1320	tr
α -Thujene	2.94	922	0.87	1.53	1002	0.88
α -Pinene	3.02	927	2.26	1.47	996	2.27
α -Fenchene	3.20*	940	0.01	1.75	1024	tr
Camphene	3.20*	940	[0.01]	1.82	1030	0.01
Thuja-2,4(10)-diene	3.31	947	tr	2.42*	1088	0.55
Sabinene	3.63*	968	1.23	2.42*	1088	[0.55]
β -Pinene	3.63*	968	[1.23]	2.24*	1070	[0.68]
3-Methyl-3-cyclohexenone?	3.79	979	tr	6.33*	1376	0.01
Myrcene	3.95	990	0.76	3.03	1136	0.77
α -Phellandrene	4.09*	999	0.51	2.94	1130	0.50
Pseudolimonene	4.09*	999	[0.51]	2.98	1133	0.01
(3Z)-Hexenyl acetate	4.23	1008	0.02	5.00*	1281	0.02
α -Terpinene	4.31	1013	9.65	3.15	1145	9.72
Carvomenthene	4.36	1016	0.02	2.61	1104	tr
para-Cymene	4.42	1020	1.34	4.28	1229	1.35
Limonene	4.50*	1025	3.93	3.36	1162	0.80
1,8-Cineole	4.50*	1025	[3.93]	3.47*	1170	3.14
β -Phellandrene	4.50*	1025	[3.93]	3.47*	1170	[3.14]
(Z)- β -Ocimene	4.70	1038	0.01	4.04*	1212	19.06
(E)- β -Ocimene	4.86	1048	0.02	4.16	1221	0.01
γ -Terpinene	5.02	1058	19.02	4.04*	1212	[19.06]
cis-Sabinene hydrate	5.13*	1064	0.07	7.04*	1428	0.05
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.13*	1064	[0.07]	5.00*	1281	[0.02]
para-Cymenene	5.44*	1084	3.67	6.51	1388	0.03
Terpinolene	5.44*	1084	[3.67]	4.49	1244	3.66
trans-Sabinene hydrate	5.61	1095	0.08	8.12	1508	0.08
Linalool	5.71	1101	0.06	8.22	1516	0.06
Unknown [m/z	5.76	1104	tr	8.64*	1548	0.04

119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]						
para-Mentha-1,3,8-triene	5.79	1106	tr	6.33*	1376	[0.01]
endo-Fenchol	5.86	1111	tr	8.55	1541	0.01
cis-para-Menth-2-en-1-ol	5.98	1118	0.29	8.29	1521	0.30
4-Hydroxy-4-methylcyclohex-2-enone	6.14	1129	0.01	14.28	2033	0.03
Cosmene isomer I	6.19*	1132	0.02	6.57	1392	0.01
trans-Pinocarveol	6.19*	1132	[0.02]	9.40*	1607	0.10
Cosmene isomer II	6.29*	1138	0.20	6.33*	1376	[0.01]
trans-para-Menth-2-en-1-ol	6.29*	1138	[0.20]	9.13*	1586	0.45
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.37	1143	0.06	7.04*	1428	[0.05]
Borneol	6.67	1162	0.01	9.96*	1652	2.44
δ-Terpineol	6.72	1166	0.01	9.64	1626	0.01
Terpinen-4-ol	6.93*	1179	36.09	8.80*†	1561	[39.29]
Dill ether	6.93*	1179	[36.09]	7.54	1464	0.01
para-Cymen-8-ol	7.04	1186	0.05	11.78*	1805	0.02
α-Terpineol	7.10	1190	2.41	9.96*	1652	[2.44]
cis-Piperitol	7.15*	1193	0.12	9.76	1636	tr
Unknown [m/z 121, 43 (99), 91 (85), 77 (73), 93 (41), 136 (33)... 166 (3)]	7.15*	1193	[0.12]			
trans-Piperitol	7.35	1206	0.11	10.54	1699	0.11
endo-Fenchyl acetate	7.46	1214	0.01	7.00	1424	0.04
exo-2-Hydroxycineole	7.56	1220	0.01	11.78*	1805	[0.02]
cis-para-Mentha-1(7),8-dien-2-ol	7.60	1223	tr	12.19	1841	0.01
Nerol	7.68	1228	0.02	11.29	1762	0.02
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.76	1234	0.01	11.47*	1778	0.10
Piperitone	7.96	1247	0.05	10.08*	1662	0.23
cis-Carvenone oxide?	8.09	1256	0.02			
trans-Ascaridole glycol	8.29	1269	0.02	14.38	2042	0.01
cis-Ascaridole	8.60	1290	0.01			

glycol?						
Thymol	8.76	1301	0.01	15.39*	2141	0.05
Carvacrol	8.93	1312	0.01	15.56	2158	0.01
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.04*	1321	0.02	15.19	2121	tr
Myrtenyl acetate	9.04*	1321	[0.02]	9.81*	1640	0.22
Bicycloelemene	9.19	1331	0.03	7.29	1446	0.03
α-Cubebene	9.38	1344	0.10	7.03*	1427	0.10
Cyclosativene I	9.58	1358	0.02	7.12	1434	0.11
Cyclosativene II	9.61	1360	tr	7.19	1439	tr
Isoledene	9.69	1366	0.11	7.03*	1427	[0.10]
α-Copaene	9.73	1369	0.18	7.41	1455	0.18
7-Cubebene	9.77	1372	0.13	7.36	1451	0.12
7-Cubebene epimer?	9.80	1374	0.06	7.49	1461	0.07
β-Cubebene	9.94	1384	0.01	8.01	1499	0.08
β-Elemene	9.98	1387	0.11	8.71*†	1554	39.29
α-Gurjunene	10.18	1401	0.67	7.88*	1490	0.68
Methyleugenol	10.23	1404	0.05	13.49*	1959	0.13
β-Maaliene	10.26	1407	0.04	7.88*	1490	[0.68]
β-Caryophyllene	10.31	1410	0.92	8.71*†	1554	[39.29]
γ-Maaliene	10.43*	1419	0.10	8.64*	1548	[0.04]
β-Gurjunene	10.43*	1419	[0.10]	8.50	1537	0.04
α-Maaliene	10.51	1425	0.11	8.83†	1562	[39.29]
Aromadendrene	10.58†	1431	2.50	8.80*†	1561	[39.29]
Selina-5,11-diene	10.64†	1435	[2.50]	8.92	1569	0.32
trans-Muurolo-3,5-diene	10.74†	1442	0.47	9.13*	1586	[0.45]
α-Humulene	10.77†	1445	[0.47]	9.50*†	1615	0.69
allo-Aromadendrene	10.87*	1452	0.97	9.26	1596	0.89
Valerena-4,7(11)-diene	10.87*	1452	[0.97]	9.13*	1586	[0.45]
γ-Gurjunene	11.03	1464	0.09	9.40*	1607	[0.10]
γ-Muurolole	11.07*†	1467	0.64	9.81*	1640	[0.22]
Selina-4,11-diene	11.07*†	1467	[0.64]	9.68	1629	0.03
trans-Cadina-1(6),4-diene	11.07*†	1467	[0.64]	9.50*†	1615	[0.69]
β-Selinene	11.21	1478	0.14	10.08*	1662	[0.23]
allo-Aromadendrene	11.24*	1480	0.18	9.71	1632	0.07
trans-Muurolo-4(15),5-diene	11.24*	1480	[0.18]	10.08*	1662	[0.23]
δ-Selinene	11.29†	1483	0.38	9.92	1649	1.74
α-Selinene	11.30†	1484	[0.38]	10.12	1666	0.17
Bicyclogermacrene	11.36*	1489	3.37	10.31*	1681	1.91
Epizonarene	11.36*	1489	[3.37]	10.03	1658	0.02
Viridiflorene	11.36*	1489	[3.37]	9.84	1643	0.04
α-Muurolole	11.44	1495	0.28	10.31*	1681	[1.91]
γ-Cadinene	11.60	1507	0.04	10.64*	1708	0.44

δ-Cadinene	11.75*	1518	2.24	10.68	1711	1.73
<i>trans</i> -Calamenene	11.75*	1518	[2.24]	11.47*	1778	[0.10]
Zonarene	11.75*	1518	[2.24]	10.64*	1708	[0.44]
<i>trans</i> -Cadina-1,4-diene	11.85	1526	0.30	10.92	1731	0.31
Eudesma-5,7(11)-diene	12.19	1553	0.10	11.22	1757	0.03
Maaliol	12.22	1555	0.06	13.27	1938	0.04
Unknown [m/z 161, 109 (98), 82 (93), 43 (72), 105 (68), 93 (59), 69 (56), 119 (55)... 222 (7)]	12.27*	1559	0.10	13.49*	1959	[0.13]
Palustrol	12.27*	1559	[0.10]	12.50	1869	0.05
Unknown [m/z 107, 163 (88), 59 (60), 93 (49), 43 (47), 81 (46... 204 (5)...]	12.27*	1559	[0.10]	13.41	1951	0.02
Spathulenol	12.42	1571	0.07	14.59	2062	0.07
Globulol	12.49	1577	0.37	14.10	2016	0.38
Gleenol	12.54	1581	0.04	13.78	1985	0.03
Viridiflorol	12.59	1584	0.15	14.19	2024	0.16
Cubeban-11-ol	12.62	1586	0.15	13.90*	1996	0.23
Eudesm-5-en-11-ol	12.72	1594	0.12	14.52*	2056	0.14
10-epi-Cubenol	12.86	1606	0.01			
Rosifoliol	12.97	1615	0.14	14.52*	2056	[0.14]
1-epi-Cubenol	13.05	1621	0.20	13.98	2004	0.19
Isospathulenol	13.18	1632	0.03	15.62	2164	0.04
Cubenol	13.22	1636	0.11	13.90*	1996	[0.23]
α-Muurolol	13.29	1641	0.05	15.39*	2141	[0.05]
Total identified		99.18%			98.64%	
Total reported		99.25%			98.66%	

*: Two or more compounds are coeluting on this column

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