Date : 2024-05-16

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 24E03-PTH04
Customer Identification : Organic Tea Tree - S. Africa - T30120R
Type : Essential Oil
Source : *Melaleuca alternifolia ct. Terpinen-4-ol (Tea Tree)*
Customer : Plant Therapy

Checked an approved by:

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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. The results only describe the samples that were submitted to the assays.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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Gas Chromatographic Analysis

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID
ISO
Results : See analysis summary (next page)
Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005
Date : 2024-05-14

Physicochemical data

Refractive index : 1.477 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2024-05-08

Conclusion

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

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Analysis Summary - Consolidated Contents

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

Identification	%	Class
Ethanol	0.02	Aliphatic alcohol
Isobutyral	0.02	Aliphatic aldehyde
Isobutanol	tr	Aliphatic alcohol
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	0.02	Aliphatic aldehyde
(3*Z*)-Hexenol	0.05	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
α-Thujene	0.93	Monoterpene
α-Pinene	2.35	Monoterpene
Camphene	0.01	Monoterpene
α-Fenchene	tr	Monoterpene
Sabinene	0.79	Monoterpene
β-Pinene	0.74	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
Myrcene	0.95	Monoterpene
Pseudolimonene	0.02	Monoterpene
α-Phellandrene	0.43	Monoterpene
(3*Z*)-Hexenyl acetate	0.03	Aliphatic ester
α-Terpinene	10.57	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
para-Cymene	1.52	Monoterpene
1,8-Cineole	4.54	Monoterpenic ether
Limonene	1.03	Monoterpene
(*Z*)-β-Ocimene	tr	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	20.64	Monoterpene
cis-Sabinene hydrate	0.14	Monoterpenic alcohol
para-Cymenene	0.02	Monoterpene
Terpinolene	3.62	Monoterpene
trans-Sabinene hydrate	0.27	Monoterpenic alcohol
Linalool	0.06	Monoterpenic alcohol
para-Mentha-1,3,8-triene	0.01	Monoterpene
endo-Fenchol	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.38	Monoterpenic alcohol
Cosmene isomer I	0.01	Monoterpene
trans-Pinocarveol	0.02	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.28	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Unknown	0.03	Unknown
δ-Terpineol	0.02	Monoterpenic alcohol

Dill ether	0.01	Monoterpenic ether
Terpinen-4-ol	40.50	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	2.69	Monoterpenic alcohol
cis-Piperitol	0.12	Monoterpenic alcohol
trans-Piperitol	0.19	Monoterpenic alcohol
exo-2-Hydroxycineole	0.03	Monoterpenic alcohol
Nerol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Piperitone	0.03	Monoterpenic ketone
Unknown	0.01	Unknown
trans-Ascaridole glycol	0.05	Monoterpenic alcohol
cis-Ascaridole glycol	0.03	Monoterpenic alcohol
Thymol	0.01	Monoterpenic alcohol
Carvacrol	0.01	Monoterpenic alcohol
Unknown	0.04	Monoterpenic alcohol
Bicycloelemene	0.01	Sesquiterpene
α-Cubebene	0.04	Sesquiterpene
Isoledene	0.05	Sesquiterpene
α-Copaene	0.07	Sesquiterpene
7-Cubebene	0.04	Sesquiterpene
7-Cubebene epimer?	0.01	Aliphatic alcohol
β-Elemene	0.03	Sesquiterpene
Unknown	0.02	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
α-Gurjunene	0.23	Sesquiterpene
β-Maaliene	0.01	Sesquiterpene
β-Caryophyllene	0.25	Sesquiterpene
β-Gurjunene	0.04	Sesquiterpene
α-Maaliene	0.04	Sesquiterpene
Aromadendrene	0.58	Sesquiterpene
Selina-5,11-diene	0.10	Sesquiterpene
Cadina-3,5-diene isomer I?	0.09	Sesquiterpene
trans-Muurola-3,5-diene	0.10	Sesquiterpene
α-Humulene	0.08	Sesquiterpene
allo-Aromadendrene	0.31	Sesquiterpene
Valerena-4,7(11)-diene	0.02	Sesquiterpene
γ-Gurjunene	0.03	Sesquiterpene
Selina-4,11-diene	0.01	Sesquiterpene
trans-Cadina-1(6),4-diene	0.21	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
β-Selinene	0.06	Sesquiterpene
allo-Aromadendr-9-ene	0.06	Sesquiterpene
δ-Selinene	0.06	Sesquiterpene

Viridiflorene	0.60	Sesquiterpene
Bicyclogermacrene	0.75	Sesquiterpene
α-Selinene	0.05	Sesquiterpene
α-Muurolene	0.10	Sesquiterpene
γ-Cadinene	0.03	Sesquiterpene
δ-Cadinene	0.91	Sesquiterpene
trans-Calamenene	0.06	Sesquiterpene
trans-Cadina-1,4-diene	0.12	Sesquiterpene
α-Calacorene	0.01	Sesquiterpene
Epiglobulol	0.05	Sesquiterpenic alcohol
Eudesma-5,7(11)-diene	0.02	Sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Palustrol	0.04	Sesquiterpenic alcohol
Spathulenol	0.04	Sesquiterpenic alcohol
Globulol	0.19	Sesquiterpenic alcohol
Gleenol	0.03	Sesquiterpenic alcohol
Viridiflorol	0.10	Sesquiterpenic alcohol
Cubeban-11-ol	0.09	Sesquiterpenic alcohol
Ledol	0.03	Sesquiterpenic alcohol
Eudes*m*-5-en-11-ol analog	0.05	Sesquiterpenic alcohol
Rosifoliol	0.09	Sesquiterpenic alcohol
1-epi-Cubenol	0.13	Sesquiterpenic alcohol
Isospathulenol	0.04	Sesquiterpenic alcohol
Cubenol	0.07	Sesquiterpenic alcohol
α-Muurolol	0.03	Sesquiterpenic alcohol
Methyl eudesmate	tr	Phenolic ester
Unknown	tr	Oxygenated sesquiterpene
Consolidated total	**99.68**	

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

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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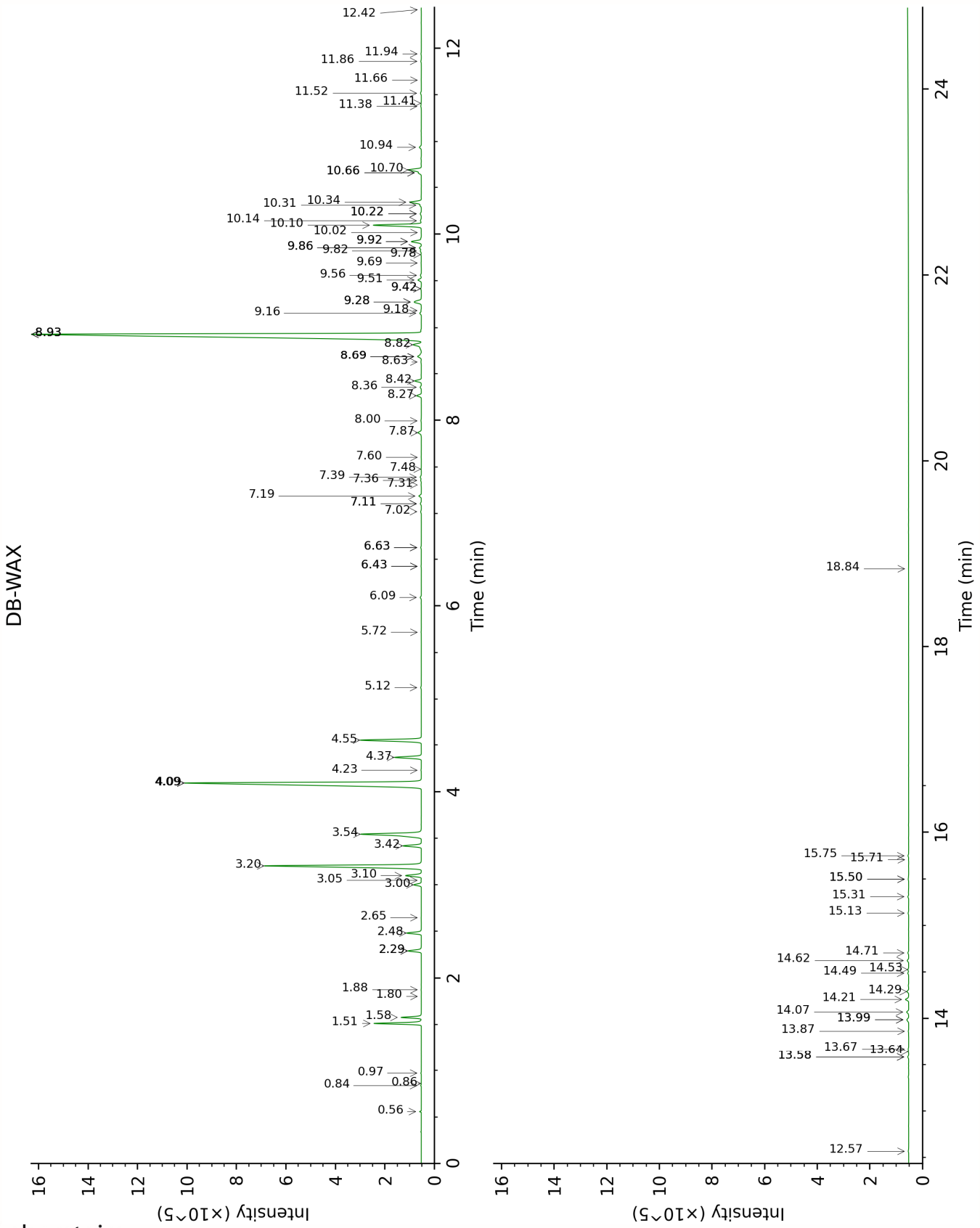
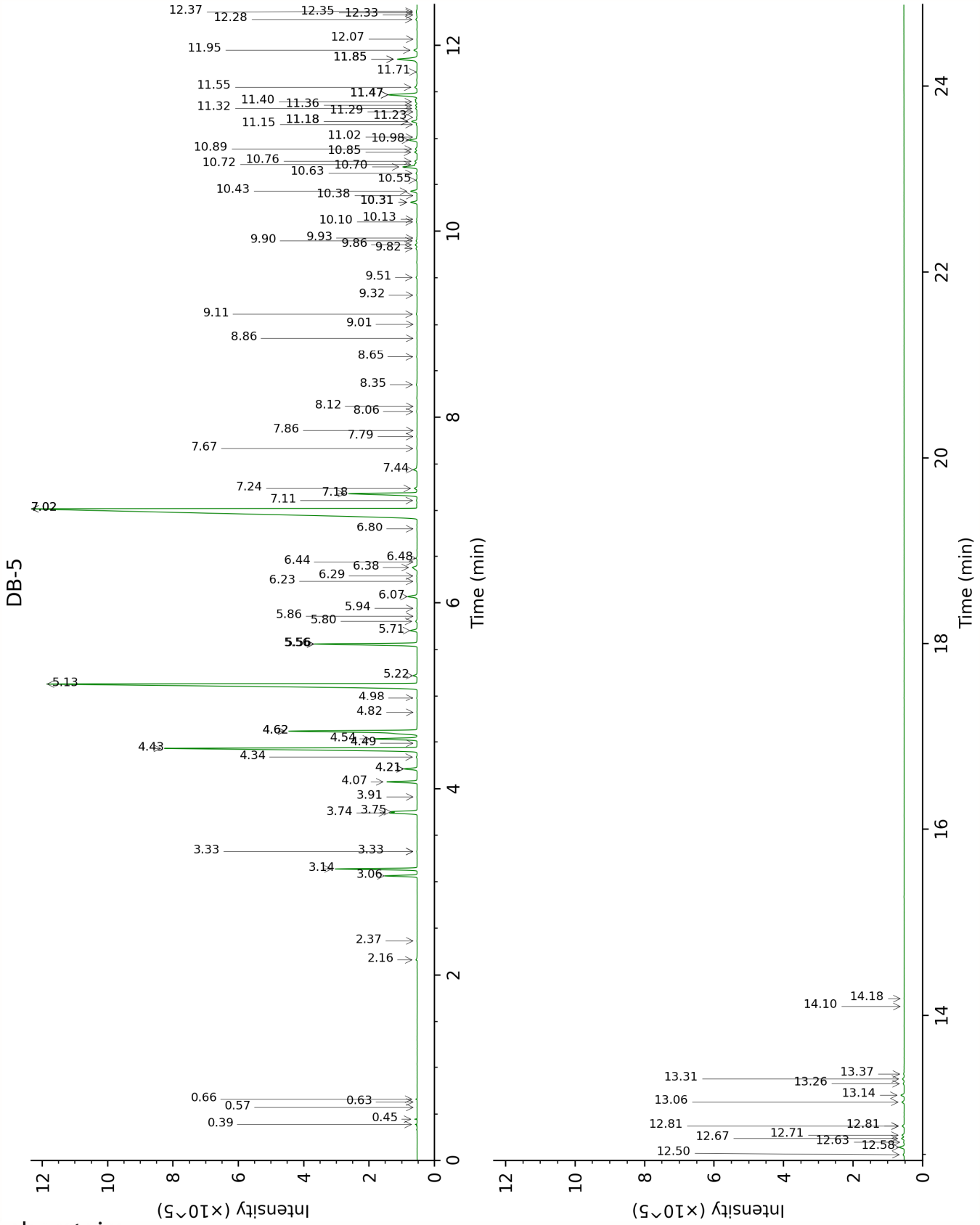

DB-WAX
Time (min)
Intensity (×10^5)
12.42
11.94
11.86
11.66
11.52
11.41
11.38
10.94
10.70
10.66
10.34
10.31
10.22
10.14
10.10
10.02
9.92
9.86
9.82
9.78
9.69
9.56
9.51
9.42
9.28
9.18
9.16
8.93
8.82
8.69
8.63
8.42
8.36
8.27
8.00
7.87
7.60
7.48
7.39
7.36
7.31
7.19
7.11
7.02
6.63
6.43
6.09
5.72
5.12
4.55
4.37
4.23
4.09
3.54
3.42
3.20
3.10
3.05
3.00
2.65
2.48
2.29
1.88
1.80
1.58
1.51
0.97
0.86
0.84
0.56
18.84
15.75
15.71
15.50
15.31
15.13
14.71
14.62
14.53
14.49
14.29
14.21
14.07
13.99
13.87
13.67
13.64
13.58
12.57


DB-5
Intensity (×10^5)
Time (min)
12.37
12.28
12.35
12.33
12.07
11.95
11.85
11.71
11.55
11.47
11.32
11.40
11.36
11.29
11.23
11.15
11.18
11.02
10.98
10.89
10.85
10.72
10.76
10.63
10.70
10.55
10.43
10.38
10.31
10.10
10.13
9.90
9.93
9.86
9.82
9.51
9.32
9.11
9.01
8.86
8.65
8.35
8.12
8.06
7.86
7.79
7.67
7.44
7.24
7.18
7.11
7.02
6.80
6.44
6.48
6.38
6.23
6.29
6.07
5.94
5.86
5.80
5.71
5.56
5.22
5.13
4.98
4.82
4.62
4.54
4.49
4.43
4.34
4.21
4.07
3.91
3.74
3.75
3.33
3.33
3.14
3.06
2.37
2.16
0.66
0.63
0.57
0.45
0.39
14.10
14.18
13.31
13.37
13.26
13.14
13.06
12.81
12.81
12.67
12.71
12.63
12.58
12.50

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Ethanol	0.97	907.9	0.02	0.39	499.9	0.02
Isobutyral	0.56	777.5	0.04	0.44	537.2	0.02
Isobutanol	2.29*	1067.0	[0.76]	0.57	621.0	tr
Isovaleral	0.86	889.1	tr	0.63	641.2	tr
2-Methylbutyral	0.84	881.3	0.02	0.66	651.6	0.02
(3*Z*)-Hexenol	6.09	1351.2	0.07	2.16	857.5	0.05
Hexanol	5.72	1324.5	0.02	2.37	874.5	0.01
α-Thujene	1.58	998.8	0.94	3.06	926.7	0.93
α-Pinene	1.51	992.1	2.33	3.14	931.6	2.35
Camphene	1.88	1027.2	0.01	3.33*	944.0	[0.02]
α-Fenchene	1.80	1020.4	tr	3.33*	944.0	[0.02]
Sabinene	2.48	1085.3	0.79	3.74*†	971.4	[0.83]
β-Pinene	2.29*	1067.0	[0.76]	3.75*†	972.4	[0.70]
3-Methyl-3-cyclohexenone	6.43*	1375.1	[0.02]	3.91	982.8	0.01
Myrcene	3.10	1133.7	0.95	4.07	993.5	0.95
Pseudolimonene	3.05	1129.9	0.02	4.21*	1002.7	[0.44]
α-Phellandrene	3.00	1126.2	0.43	4.21*	1002.7	[0.44]
(3*Z*)-Hexenyl acetate	5.12	1279.2	0.04	4.34	1010.8	0.03
α-Terpinene	3.20	1141.6	10.56	4.43	1016.6	10.57
Carvomenthene	2.65	1099.5	0.01	4.49	1020.1	0.01
para-Cymene	4.37	1226.6	1.52	4.54	1023.1	1.52
1,8-Cineole	3.54	1167.2	4.54	4.62*	1028.2	[5.57]
Limonene	3.42	1157.8	1.03	4.62*	1028.2	[5.57]
(*Z*)-β-Ocimene	4.09*	1207.4	[20.60]	4.82	1040.9	tr
(*E*)-β-Ocimene	4.23	1216.9	0.02	4.98	1051.0	0.02
γ-Terpinene	4.09*	1207.4	[20.60]	5.13	1060.5	20.64
cis-Sabinene hydrate	7.19	1430.8	0.14	5.22	1066.1	0.14
para-Cymenene	6.63*	1389.5	[0.04]	5.56*	1087.4	[3.64]
Terpinolene	4.55	1239.5	3.62	5.56*	1087.4	[3.64]
trans-Sabinene hydrate	8.26	1511.1	0.27	5.70	1096.4	0.27
Linalool	8.36	1518.1	0.07	5.80	1102.7	0.06
para-Mentha-1,3,8-triene	6.43*	1375.1	[0.02]	5.86	1106.1	0.01
endo-Fenchol	8.68*	1543.5	[0.31]	5.94	1111.6	0.01
cis-para-Menth-2-en-1-ol	8.42	1523.3	0.39	6.07	1119.6	0.38
Cosmene isomer I	6.63*	1389.5	[0.04]	6.23	1130.1	0.01
trans-Pinocarveol	9.42*	1600.3	[0.04]	6.29	1133.8	0.02
trans-para-Menth-	9.28*	1588.9	[0.60]	6.38	1139.6	0.28

2-en-1-ol						
Unknown PLOR I [m/z 109, 43 (73), 71 (54), 124 (51), 69 (37), 41 (35)...152 (5)]				6.44	1143.4	0.01
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	7.11*	1424.8	[0.06]	6.48	1145.9	0.03
δ-Terpineol	9.78	1629.5	0.02	6.80	1166.1	0.02
Dill ether	7.60	1461.5	0.01	7.02*	1180.3	[40.52]
Terpinen-4-ol	8.93*	1562.4	[40.46]	7.02*	1180.3	[40.52]
para-Cymen-8-ol	11.86	1801.8	0.03	7.11	1186.0	0.03
α-Terpineol	10.10	1654.8	2.78	7.18	1190.8	2.69
cis-Piperitol	9.86*†	1635.4	[0.12]	7.24	1194.3	0.12
trans-Piperitol	10.66*	1700.9	[0.16]	7.44	1207.3	0.19
exo-2-Hydroxycineole	11.94	1808.8	0.03	7.67	1222.6	0.03
Nerol	11.38	1760.7	0.04	7.80	1231.1	0.02
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.66	1784.3	0.01	7.86	1235.5	0.01
Piperitone	10.22*	1664.6	[0.08]	8.06	1249.1	0.03
Unknown PLOR IV [m/z 43, 82 (79), 109 (69), 110 (65), 95 (38), 41 (36)...]				8.12	1252.8	0.01
trans-Ascaridole glycol	14.49	2040.0	0.05	8.35	1268.4	0.05
cis-Ascaridole glycol	15.13	2101.8	0.04	8.65	1288.5	0.03
Thymol	15.50*	2137.5	[0.04]	8.86	1302.3	0.01
Carvacrol	15.71	2158.1	tr	9.01	1312.7	0.01
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.31	2119.2	0.05	9.11	1320.3	0.04
Bicycloelemene	7.31	1439.6	0.02	9.32	1334.7	0.01
α-Cubebene	7.02	1418.5	0.04	9.51	1348.0	0.04
Isoledene	7.11*	1424.8	[0.06]	9.82	1369.9	0.05
α-Copaene	7.39	1445.8	0.07	9.86	1372.6	0.07
7-Cubebene	7.36	1443.2	0.04	9.90	1375.7	0.04
7-Cubebene	7.48	1452.2	0.01	9.93	1377.8	0.01

epimer?						
β-Elemene	8.68*	1543.5	[0.31]	10.10	1390.0	0.03
Unknown EUGL IV [m/z 93, 122 (98), 161 (98), 107 (86), 95 (46), 105 (72)... 204 (34)]				10.13	1392.0	0.02
Methyleugenol	13.64	1960.6	0.02	10.31*	1404.8	[0.25]
α-Gurjunene	7.87	1481.0	0.23	10.31*	1404.8	[0.25]
β-Maaliene	8.00	1490.4	0.03	10.38	1410.1	0.01
β-Caryophyllene	8.68*	1543.5	[0.31]	10.43	1413.6	0.25
β-Gurjunene	8.63	1539.0	0.03	10.55	1422.4	0.04
α-Maaliene	8.93*	1562.4	[40.46]	10.63	1428.5	0.04
Aromadendrene	8.82	1553.8	0.69	10.70	1433.6	0.58
Selina-5,11-diene	8.93*	1562.4	[40.46]	10.72	1435.5	0.10
Cadina-3,5-diene isomer I?				10.76	1438.1	0.09
trans-Muurola-3,5-diene	9.16	1579.7	0.10	10.85	1445.3	0.10
α-Humulene	9.56	1611.7	0.06	10.89	1447.9	0.08
allo-Aromadendrene	9.28*	1588.9	[0.60]	10.98	1455.0	0.31
Valerena-4,7(11)-diene	9.18	1581.9	0.02	11.02	1457.4	0.02
γ-Gurjunene	9.42*	1600.3	[0.04]	11.15	1467.5	0.03
Selina-4,11-diene	9.69	1622.3	0.01	11.18*	1469.9	[0.22]
trans-Cadina-1(6),4-diene	9.51	1607.7	0.21	11.18*	1469.9	[0.22]
γ-Muurolene	9.82*†	1632.7	[0.07]	11.23	1473.2	0.02
Germacrene D	10.02	1648.4	0.01	11.29	1477.6	0.02
β-Selinene	10.14	1658.6	0.06	11.32	1480.3	0.06
allo-Aromadendr-9-ene	9.86*†	1635.4	[0.12]	11.36	1482.9	0.06
δ-Selinene	9.92*	1640.7	[0.67]	11.40	1485.7	0.06
Viridiflorene	9.92*	1640.7	[0.67]	11.47*	1491.3	[1.35]
Bicyclogermacrene	10.34	1674.5	0.75	11.47*	1491.3	[1.35]
α-Selinene	10.22*	1664.6	[0.08]	11.47*	1491.3	[1.35]
α-Muurolene	10.31	1672.0	0.08	11.55	1497.3	0.10
γ-Cadinene	10.66*	1700.9	[0.16]	11.72	1509.8	0.03
δ-Cadinene	10.70	1703.4	0.91	11.85*	1520.6	[0.93]
trans-Calamenene	11.52	1772.5	0.06	11.85*	1520.6	[0.93]
trans-Cadina-1,4-diene	10.94	1723.9	0.13	11.95	1528.2	0.12
α-Calacorene	12.42	1850.6	0.01	12.07	1537.5	0.01
Epiglobulol	13.58*	1955.3	[0.06]	12.28	1554.0	0.05

Eudesma-5,7(11)-diene	11.41	1763.5	0.01	12.33	1557.8	0.02
Unknown MEAL III [m/z 161, 109 (98), 82 (93), 43 (72), 105 (68), 93 (59), 69 (56), 119 (55)... 222 (7)]	13.58*	1955.3	[0.06]	12.35*†	1559.7	[0.03]
Palustrol	12.57	1863.8	0.04	12.37*†	1561.1	[0.03]
Spathulenol	14.71	2060.6	0.05	12.50	1571.5	0.04
Globulol	14.21	2013.3	0.20	12.58	1577.7	0.19
Gleenol	13.87	1981.0	0.03	12.63	1582.0	0.03
Viridiflorol	14.29	2021.3	0.11	12.67	1585.1	0.10
Cubeban-11-ol	13.99*	1992.6	[0.15]	12.71	1588.0	0.09
Ledol	13.67	1963.5	0.03	12.81*	1595.7	[0.08]
Eudes*m*-5-en-11-ol analog	14.53	2043.7	0.05	12.81*	1595.7	[0.08]
Rosifoliol	14.62	2052.9	0.09	13.06	1616.4	0.09
1-epi-Cubenol	14.07	2000.5	0.14	13.14	1622.6	0.13
Isospathulenol	15.75	2162.3	0.03	13.26	1632.8	0.04
Cubenol	13.99*	1992.6	[0.15]	13.31	1637.0	0.07
α-Muurolol	15.50*	2137.5	[0.04]	13.37	1641.4	0.03
Methyl eudesmate				14.10	1702.0	tr
Unknown KUER IX [m/z 43, 93 (44), 162 (39), 107 (39), 121 (34), 95 (32)...220 (7)]	18.84	2488.0	0.01	14.18	1709.2	tr
Total reported		99.51%			99.60%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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