Date : 2025-03-25

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 25C11-PTH04
Customer Identification : Lime Steam Distilled - Mexico - LL0112R
Type : Essential Oil
Source : *Citrus aurantifolia ct. Distilled*
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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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 : 2025-03-13

Physicochemical data

Refractive index : 1.4753 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2025-03-12

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
Heptane	tr	Alkane
4,5-Dihydrotoluene	0.01	Alkene
1-Methylcyclohexa-1,3-diene	0.08	Alkene
3-Methylenecyclohexadiene	0.01	Alkene
Octane	0.01	Alkane
Cyclofenchene	0.01	Monoterpene
Bornylene	0.01	Monoterpene
Nonane	0.02	Alkane
Tricyclene	0.03	Monoterpene
α-Thujene	0.05	Monoterpene
α-Pinene	1.21	Monoterpene
β-Fenchene	0.01	Monoterpene
α-Fenchene	0.15	Monoterpene
Camphene	0.41	Monoterpene
1,4-Dimethyl-4-vinylcyclohexene?	0.01	Monoterpene
Unknown	0.04	Monoterpene
Geranic oxide	0.10	Monoterpenic ether
β-Pinene	2.55	Monoterpene
Sabinene	0.05	Monoterpene
3-Methyl-3-cyclohexenone	0.04	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Dehydro-1,8-cineole	0.01	Monoterpenic ether
trans-Dehydroxylinalool oxide	0.01	Monoterpenic ether
Myrcene	1.06	Monoterpene
Menthatriene isomer I	0.05	Monoterpene
α-Phellandrene	0.31	Monoterpene
Pseudolimonene	0.06	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Δ3-Carene	0.03	Monoterpene
1,4-Cineole	1.88	Monoterpenic ether
α-Terpinene	2.30	Monoterpene
para-Cymene	2.13	Monoterpene
1,8-Cineole	1.22	Monoterpenic ether
β-Phellandrene	0.27	Monoterpene
Limonene	52.73	Monoterpene
(*Z*?)-Citroxide	0.02	Monoterpenic ether
(*Z*)-β-Ocimene	0.10	Monoterpene
(*E*?)-Citroxide	0.15	Monoterpenic ether
(*E*)-β-Ocimene	0.29	Monoterpene

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γ-Terpinene	11.68	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
para-Mentha-3,8-diene	0.02	Monoterpene
Unknown	0.02	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene isomer	0.25	Monoterpene
Terpinolene	8.54	Monoterpene
para-Cymenene	0.18	Monoterpene
Linalool	0.10	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
para-Mentha-1,3,8-triene	0.02	Monoterpene
endo-Fenchol	0.29	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
Myrcenol	0.01	Monoterpenic alcohol
allo-Ocimene	0.01	Monoterpene
cis-Limonene oxide	0.01	Monoterpenic ether
1-Terpineol	0.28	Monoterpenic alcohol
trans-Limonene oxide	tr	Monoterpenic ether
Epoxyterpinolene	0.05	Monoterpenic ether
cis-β-Terpineol	0.21	Monoterpenic alcohol
Unknown	0.01	Unknown
Isoborneol	0.02	Monoterpenic alcohol
(*Z*)-Ocimenol	0.02	Monoterpenic alcohol
Borneol	0.10	Monoterpenic alcohol
trans-β-Terpineol	0.04	Monoterpenic alcohol
Isoneral	0.01	Monoterpenic aldehyde
α-Phellandren-8-ol	0.07	Monoterpenic alcohol
Terpinen-4-ol	0.33	Monoterpenic alcohol
para-Cymen-8-ol	0.07	Monoterpenic alcohol
α-Terpineol	5.79	Monoterpenic alcohol
γ-Terpineol	0.34	Monoterpenic alcohol
Decanal	0.03	Aliphatic aldehyde
trans-Carveol	0.01	Monoterpenic alcohol
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde
Nerol	0.01	Monoterpenic alcohol
Unknown	0.03	Oxygenated monoterpene
Neral	0.10	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Geranial	0.10	Monoterpenic aldehyde
Unknown	0.02	Oxygenated monoterpene
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Monoterpenic alcohol
δ-Elemene	0.03	Sesquiterpene

Neryl acetate	0.04	Monoterpenic ester
Geranyl acetate	0.05	Monoterpenic ester
β-Elemene	0.03	Sesquiterpene
Dodecanal	0.01	Aliphatic aldehyde
cis-α-Bergamotene	0.03	Sesquiterpene
β-Caryophyllene	0.17	Sesquiterpene
α-Santalene	0.02	Sesquiterpene
γ-Elemene	0.02	Sesquiterpene
trans-α-Bergamotene	0.31	Sesquiterpene
α-Humulene	0.05	Sesquiterpene
(*E*)-β-Farnesene	0.06	Sesquiterpene
β-Santalene	0.02	Sesquiterpene
Selina-4,11-diene	0.06	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
Unknown	0.03	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
δ-Selinene	0.11	Sesquiterpene
α-Selinene	0.05	Sesquiterpene
(*Z*)-α-Bisabolene	0.07	Sesquiterpene
β-Bisabolene	0.68	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.32	Sesquiterpene
(*Z*)-γ-Bisabolene	0.05	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Selina-4(15),7(11)-diene	0.04	Sesquiterpene
Selina-4,7(11)-diene	0.09	Sesquiterpene
Selina-3,7(11)-diene	0.03	Sesquiterpene
(*E*)-α-Bisabolene	0.03	Sesquiterpene
Germacrene B	0.03	Sesquiterpene
Caryophyllenyl alcohol	0.04	Sesquiterpenic alcohol
10-epi-γ-Eudesmol	0.02	Sesquiterpenic alcohol
Clovan-2β-ol	0.02	Sesquiterpenic alcohol
γ-Eudesmol	0.04	Sesquiterpenic alcohol
β-Eudesmol	0.02	Sesquiterpenic alcohol
Unknown	0.02	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
α-Bisabolol	0.02	Sesquiterpenic alcohol
Consolidated total	**99.11**	

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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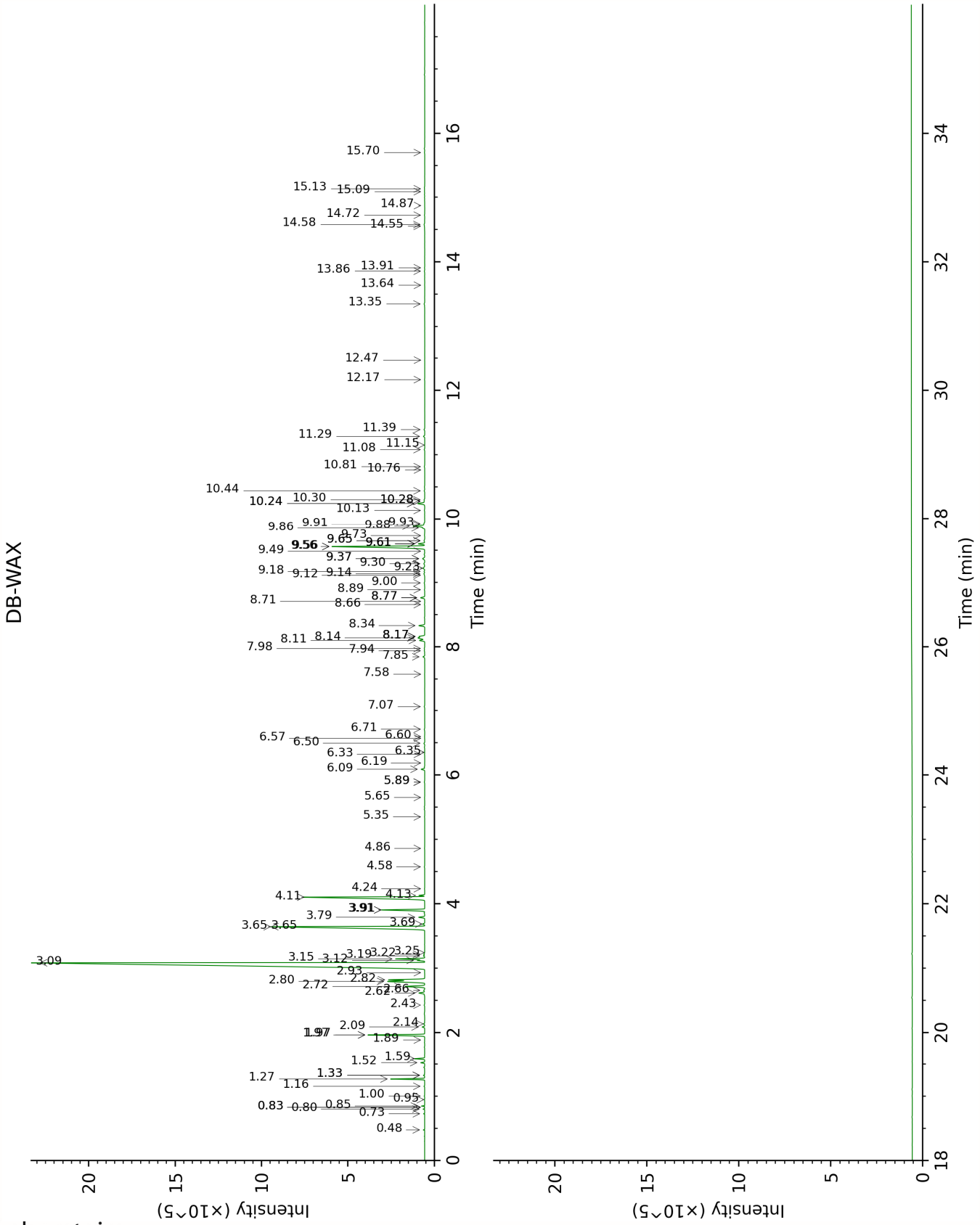
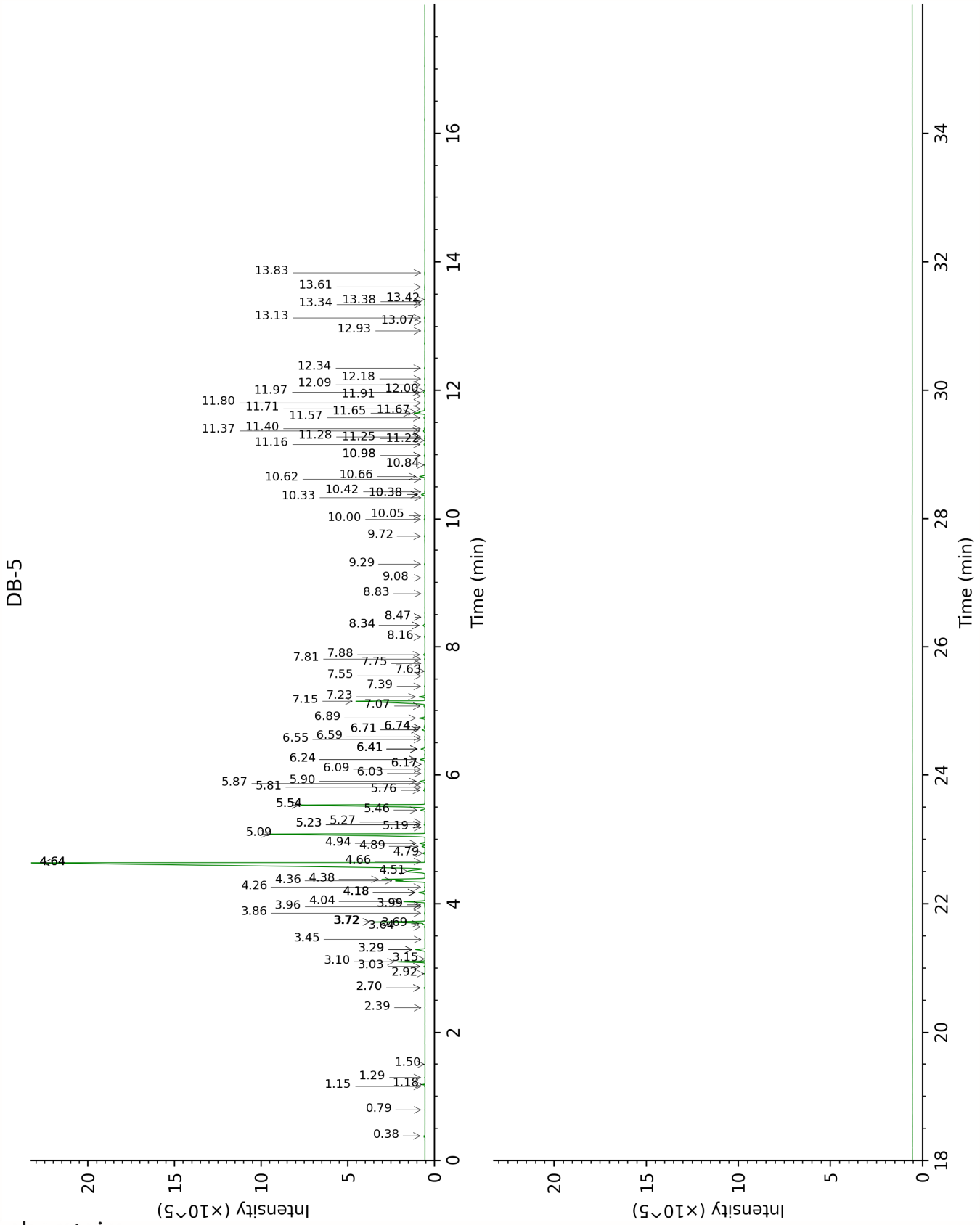

DB-WAX
Intensity (×10^5)
Time (min)
15.70
15.13
15.09
14.87
14.72
14.58
14.55
13.86
13.91
13.64
13.35
12.47
12.17
11.29
11.39
11.08
11.15
10.81
10.76
10.44
10.24
10.30
10.28
10.13
9.86
9.91
9.88
9.93
9.73
9.65
9.61
9.49
9.56
9.37
9.30
9.23
9.18
9.12
9.14
9.00
8.89
8.71
8.66
8.77
8.34
8.17
7.98
8.11
8.14
7.94
7.85
7.58
7.07
6.71
6.60
6.57
6.50
6.33
6.35
6.19
6.09
5.89
5.65
5.35
4.86
4.58
4.24
4.13
4.11
3.91
3.79
3.69
3.65
3.65
3.09
3.15
3.12
3.19
3.22
3.25
2.93
2.80
2.72
2.82
2.66
2.62
2.43
2.14
2.09
1.89
1.52
1.59
1.33
1.27
1.16
1.00
0.95
0.83
0.80
0.85
0.73
0.48


DB-5
Time (min)
Intensity (×10^5)
13.83
13.61
13.34
13.38
13.42
13.13
13.07
12.93
12.34
12.18
12.09
11.97
12.00
11.91
11.80
11.71
11.65
11.67
11.57
11.37
11.40
11.28
11.25
11.22
11.16
10.98
10.84
10.62
10.66
10.42
10.38
10.33
10.05
10.00
9.72
9.29
9.08
8.83
8.47
8.34
8.16
7.88
7.81
7.75
7.63
7.55
7.39
7.23
7.15
7.07
6.89
6.74
6.71
6.59
6.55
6.41
6.24
6.17
6.09
6.03
5.90
5.87
5.81
5.76
5.54
5.46
5.27
5.23
5.19
5.09
4.94
4.89
4.79
4.66
4.64
4.51
4.38
4.36
4.26
4.18
4.04
3.99
3.96
3.86
3.72
3.69
3.64
3.45
3.29
3.15
3.10
3.03
2.92
2.70
2.39
1.50
1.29
1.18
1.15
0.79
0.38

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Ethanol	0.80	910.9	0.04	0.38	500.1	0.02
Heptane				0.79	700.2	tr
4,5-Dihydrotoluene	0.83*	915.7	[0.01]	1.15	754.9	0.01
1-Methylcyclohexa-1,3-diene	0.85	919.0	0.07	1.18	759.1	0.08
3-Methylenecyclohexadiene	0.95	936.0	0.01	1.29	774.6	0.01
Octane	0.48	785.5	0.03	1.50	803.8	0.01
Cyclofenchene	0.83*	915.7	[0.01]	2.39	878.7	0.01
Bornylene	1.00	945.4	0.01	2.70*	904.4	[0.04]
Nonane	0.73	893.2	0.02	2.70*	904.4	[0.04]
Tricyclene	1.16	971.4	0.02	2.92	919.2	0.03
α-Thujene	1.33*	1000.7	[0.04]	3.03	926.6	0.05
α-Pinene	1.27	990.9	1.21	3.10	931.5	1.21
β-Fenchene	1.33*	1000.7	[0.04]	3.14	934.4	0.01
α-Fenchene	1.52	1021.2	0.15	3.29*	944.2	[0.59]
Camphene	1.59	1027.5	0.41	3.29*	944.2	[0.59]
1,4-Dimethyl-4-vinylcyclohexene?	1.89	1058.1	0.01	3.45	954.5	0.01
Unknown CIAU I [m/z 93, 91 (60), 121 (55), 136 (42), 79 (40)]	1.97*	1066.2	[2.56]	3.64	967.4	0.04
Geranic oxide	2.09	1078.9	0.11	3.69	970.7	0.10
β-Pinene	1.97*	1066.2	[2.56]	3.72*	972.6	[2.60]
Sabinene	2.14	1083.8	0.05	3.72*	972.6	[2.60]
3-Methyl-3-cyclohexenone	5.89*	1372.5	[0.03]	3.86	981.6	0.04
6-Methyl-5-hepten-2-one	4.86	1300.6	0.02	3.96	988.2	0.02
Dehydro-1,8-cineole	2.93	1151.7	0.01	3.99*	990.2	[0.02]
trans-Dehydroxylinalool oxide	3.24	1176.9	0.01	3.99*	990.2	[0.02]
Myrcene	2.72	1134.5	1.07	4.04	993.7	1.06
Menthatriene isomer I	3.19	1172.7	0.05	4.18*	1002.9	[0.41]
α-Phellandrene	2.62	1126.4	0.31	4.18*	1002.9	[0.41]
Pseudolimonene	2.66	1129.6	0.06	4.18*	1002.9	[0.41]
Octanal	4.24	1253.3	0.01	4.18*	1002.9	[0.41]
Δ3-Carene	2.43	1111.3	0.03	4.26	1008.3	0.03
1,4-Cineole	2.82	1142.8	1.80	4.36	1014.5	1.88
α-Terpinene	2.80	1140.7	2.39	4.38	1015.9	2.30
para-Cymene	3.91*	1228.6	[2.11]	4.51	1023.7	2.13
1,8-Cineole	3.15	1169.0	1.22	4.64*	1032.0	[54.50]
β-Phellandrene	3.12	1167.1	0.27	4.64*	1032.0	[54.50]
Limonene	3.09	1164.0	52.73	4.64*	1032.0	[54.50]

(*Z*?)-Citroxide	3.22	1174.9	0.05	4.66	1033.4	0.02
(*Z*)-β-Ocimene	3.65*	1209.0	[11.76]	4.79	1041.3	0.10
(*E*?)-Citroxide	3.69	1212.1	0.10	4.89	1048.0	0.15
(*E*)-β-Ocimene	3.79	1220.1	0.29	4.94	1051.0	0.29
γ-Terpinene	3.65*	1209.0	[11.76]	5.09	1060.1	11.68
cis-Sabinene hydrate	6.60	1424.4	0.01	5.19	1066.4	0.01
para-Mentha-3,8-diene	3.91*	1228.6	[2.11]	5.23*	1069.2	[0.05]
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	4.58	1278.9	0.02	5.23*	1069.2	[0.05]
cis-Linalool oxide (fur.)	6.32	1403.9	0.01	5.27	1071.7	0.01
Terpinolene isomer	4.13	1245.5	0.22	5.46	1083.4	0.25
Terpinolene	4.11	1243.4	8.54	5.54*	1088.4	[8.77]
para-Cymenene	6.09	1387.0	0.18	5.54*	1088.4	[8.77]
Linalool	7.85	1518.7	0.09	5.76	1102.7	0.10
Nonanal	5.65	1355.2	0.01	5.81	1105.7	0.01
para-Mentha-1,3,8-triene	5.89*	1372.5	[0.03]	5.87	1109.4	0.02
endo-Fenchol	8.17*†	1543.4	[0.27]	5.90	1111.6	0.29
trans-para-Mentha-2,8-dien-1-ol	8.71	1586.1	0.01	6.03	1119.4	0.01
Myrcenol	8.66	1582.2	0.02	6.09	1123.7	0.01
allo-Ocimene	5.35	1333.3	0.01	6.17*	1128.5	[0.01]
cis-Limonene oxide	6.19	1394.0	0.01	6.17*	1128.5	[0.01]
1-Terpineol	8.10	1538.6	0.28	6.24*	1133.3	[0.32]
trans-Limonene oxide	6.35	1406.0	tr	6.24*	1133.3	[0.32]
Epoxyterpinolene	6.50	1416.7	0.05	6.41*	1143.7	[0.26]
cis-β-Terpineol	8.77*	1590.5	[0.23]	6.41*	1143.7	[0.26]
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.57	1422.4	0.01	6.41*	1143.7	[0.26]
Isoborneol	9.12	1618.4	0.01	6.55	1153.2	0.02
(*Z*)-Ocimenol	9.14	1620.1	0.06	6.59	1155.7	0.02
Borneol	9.56*	1654.9	[5.89]	6.71*	1162.9	[0.17]
trans-β-Terpineol	9.37*	1639.4	[0.16]	6.71*	1162.9	[0.17]
Isoneral	7.58	1497.8	0.01	6.74*	1165.3	[0.07]
α-Phellandren-8-ol	9.91	1683.5	0.07	6.74*	1165.3	[0.07]
Terpinen-4-ol	8.34	1556.6	0.32	6.89	1174.4	0.33
para-Cymen-8-ol	11.28	1799.9	0.08	7.07	1186.4	0.07
α-Terpineol	9.56*	1654.9	[5.89]	7.15	1191.2	5.79
γ-Terpineol	9.61*	1658.4	[0.33]	7.23	1196.4	0.34
Decanal	7.06	1459.3	0.03	7.39	1206.7	0.03
trans-Carveol	11.15	1788.3	0.01	7.55	1217.6	0.01
2,3-Epoxyneral?				7.63	1222.5	0.01
Nerol	10.76	1755.3	0.01	7.75	1230.6	0.01

Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.08	1782.3	0.03	7.81	1235.0	0.03
Neral	9.23	1627.3	0.13	7.88	1239.7	0.10
Geraniol	11.39	1809.1	0.05	8.16	1258.2	0.03
trans-Ascaridole glycol	13.91	2041.4	0.01	8.34*	1270.1	[0.14]
Geranial	9.86	1678.8	0.10	8.34*	1270.1	[0.14]
Unknown CIAU V [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	12.17	1878.5	0.02	8.47*	1278.9	[0.02]
Unknown CIAU IV [m/z 43, 79 (78), 128 (46), 58 (42), 127 (42)...]	12.47	1905.7	0.01	8.47*	1278.9	[0.02]
Unknown CICA VI [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...]	13.64	2015.2	0.01	8.83	1303.2	0.01
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	14.72	2121.0	0.02	9.08	1320.4	0.01
δ-Elemene	6.71	1433.0	0.03	9.29	1335.6	0.03
Neryl acetate	9.93	1684.7	0.03	9.72	1366.1	0.04
Geranyl acetate	10.30	1715.7	0.04	10.00	1385.4	0.05
β-Elemene	8.17*†	1543.4	[0.27]	10.05	1389.5	0.03
Dodecanal	9.73	1668.7	0.03	10.33	1409.4	0.01
cis-α-Bergamotene	7.98	1528.8	0.03	10.38*	1413.0	[0.21]
β-Caryophyllene	8.17*†	1543.4	[0.27]	10.38*	1413.0	[0.21]
α-Santalene	7.94	1526.0	0.03	10.42	1416.2	0.02
γ-Elemene	8.77*	1590.5	[0.23]	10.62	1430.8	0.02
trans-α-Bergamotene	8.14*†	1541.7	[0.50]	10.66	1434.0	0.31
α-Humulene	9.00	1608.6	0.03	10.84	1447.2	0.05
(*E*)-β-Farnesene	9.30	1633.0	0.06	10.98*	1458.0	[0.05]
β-Santalene	8.89	1600.2	0.02	10.98*	1458.0	[0.05]
Selina-4,11-diene	9.18	1623.2	0.04	11.16	1470.9	0.06
Germacrene D	9.49	1649.0	0.02	11.22	1475.7	0.03
Unknown BOSE VII [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	9.65*	1662.3	[0.05]	11.25	1477.8	0.03
β-Selinene	9.61*	1658.4	[0.33]	11.28	1479.7	0.03
δ-Selinene	9.37*	1639.4	[0.16]	11.37	1486.6	0.11
α-Selinene	9.65*	1662.3	[0.05]	11.40	1489.3	0.05
(*Z*)-α-Bisabolene				11.57	1501.9	0.07
β-Bisabolene	9.88	1680.9	0.70	11.65	1507.4	0.68
(3*E*,6*E*)-α-Farnesene	10.24*	1710.7	[0.42]	11.67	1509.2	0.32
(*Z*)-γ-Bisabolene	9.61*	1658.4	[0.33]	11.71	1512.5	0.05

δ-Cadinene	10.13	1701.6	0.03	11.80	1519.7	0.03
Selina-4(15),7(11)-diene	10.28*	1713.5	[0.03]	11.91	1528.4	0.04
Selina-4,7(11)-diene	10.24*	1710.7	[0.42]	11.97	1532.8	0.09
Selina-3,7(11)-diene	10.28*	1713.5	[0.03]	12.00	1535.0	0.03
(*E*)-α-Bisabolene	10.44	1727.6	0.03	12.08	1541.9	0.03
Germacrene B	10.81	1759.6	0.04	12.18	1549.2	0.03
Caryophyllenyl alcohol	13.35	1987.7	0.05	12.34	1562.2	0.04
10-epi-γ-Eudesmol	13.86	2036.3	0.03	12.93	1608.7	0.02
Clovan-2β-ol				13.07	1620.0	0.02
γ-Eudesmol	14.58	2106.4	0.03	13.13	1625.3	0.04
β-Eudesmol	15.09	2157.7	0.02	13.34	1642.3	0.02
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	14.87	2136.0	0.01	13.38	1646.0	0.02
Unknown CILI I [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	14.55	2103.8	0.01	13.42	1648.7	0.01
Unknown CILI II [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	15.70	2220.6	0.03	13.61	1664.7	0.04
α-Bisabolol	15.13	2162.1	0.02	13.83	1682.8	0.02
Total reported		98.75%			99.50%	

*: 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

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