Date : 2024-04-22

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 24C28-PTH05
Customer Identification : Organic Rosemary - Greece - R50114R
Type : Essential Oil
Source : *Rosmarinus officinalis ct. 1,8-Cineole*
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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

This report is an update from the first version issued on 2024-04-15 to clarify the conclusion.

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 : 2024-04-10

Physicochemical data

Refractive index : 1.4665 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2024-03-28

Conclusion

No clear adulterant, contaminant or diluent has been detected using this method. The isoborneol content of the sample is higher than in most rosemary essential oils, but higher proportions of this constituent have been described in quality literature,[1,2] and this therefore may be the result of a less common chemotype.

References

(1) Bajalan, I.; Rouzbahani, R.; Pirbalouti, A. G.; Maggi, F. Antioxidant and Antibacterial Activities of the Essential Oils Obtained from Seven Iranian Populations of Rosmarinus Officinalis. *Ind. Crops Prod.* **2017**, *107* (February), 305–311. https://doi.org/10.1016/j.indcrop.2017.05.063.
(2) Tucker, A. O.; Maciarello, M. J. The Essential Oils of Some Rosemary Cultivars. *Flavour Fragr. J.* **1986**, *1* (4–5), 137–142. https://doi.org/10.1002/ffj.2730010402.

Analysis Summary - Consolidated Contents

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

Identification	%	Class
Toluene	0.02	Simple phenolic
Hexanol	0.01	Aliphatic alcohol
Bornylene	0.01	Monoterpene
Hashishene	0.03	Monoterpene
Tricyclene	0.05	Monoterpene
α-Thujene	0.23	Monoterpene
α-Pinene	11.59	Monoterpene
β-Fenchene	0.03	Monoterpene
α-Fenchene	0.83	Monoterpene
Camphene	5.03	Monoterpene
Thuja-2,4(10)-diene	0.07	Monoterpene
Unknown	0.04	Monoterpene
Cymene isomer?	0.08	Monoterpene
Sabinene	0.51	Monoterpene
β-Pinene	7.18	Monoterpene
Unknown	0.02	Monoterpene
Octen-3-ol	0.01	Aliphatic alcohol
Dehydro-1,8-cineole	0.01	Monoterpenic ether
Octan-3-one	0.01	Aliphatic ketone
trans-meta-Mentha-2,8-diene	tr	Monoterpene
Myrcene	1.20	Monoterpene
2-Carene	0.02	Monoterpene
Pseudolimonene	0.08	Monoterpene
α-Phellandrene	0.05	Monoterpene
Δ3-Carene	0.19	Monoterpene
α-Terpinene	0.35	Monoterpene
para-Cymene	2.60	Monoterpene
1,8-Cineole	43.29	Monoterpenic ether
Limonene	3.29	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	1.30	Monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.03	Monoterpene
α-Pinene oxide	0.01	Monoterpenic ether
Linalool	0.06	Monoterpenic alcohol
Unknown	0.06	Unknown
endo-Fenchol	0.01	Monoterpenic alcohol
trans-Pinene hydrate	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol
Camphor	13.61	Monoterpenic ketone

trans-para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol
Isoborneol	4.45	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Borneol	0.14	Monoterpenic alcohol
Isopinocamphone	0.03	Monoterpenic ketone
Terpinen-4-ol	0.03	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	1.90	Monoterpenic alcohol
Myrtenol	0.04	Monoterpenic alcohol
γ-Terpineol	0.05	Monoterpenic alcohol
Verbenone	0.39	Monoterpenic ketone
Unknown	0.01	Unknown
Bornyl acetate	0.22	Monoterpenic ester
trans-Pinocarvyl acetate	0.01	Monoterpenic ester
Myrtenyl acetate	0.01	Monoterpenic ester
exo-2-Hydroxycineole acetate	0.01	Monoterpenic ester
Unknown	0.01	Sesquiterpene
Unknown	0.01	Oxygenated monoterpene
α-Copaene	0.01	Sesquiterpene
β-Caryophyllene	0.05	Sesquiterpene
α-Humulene	0.01	Sesquiterpene
Caryophyllene oxide	0.01	Sesquiterpenic ether
5-Ethenyl-1,5-bis(4-methyl-3-penten-1-yl)-cyclohexene?	0.01	Diterpene
4-Ethenyl-1,4-bis(4-methyl-3-penten-1-yl)-cyclohexene?	0.01	Diterpene
meta-Camphorene	0.10	Diterpene
para-Camphorene	0.04	Diterpene
Consolidated total	**99.53**	

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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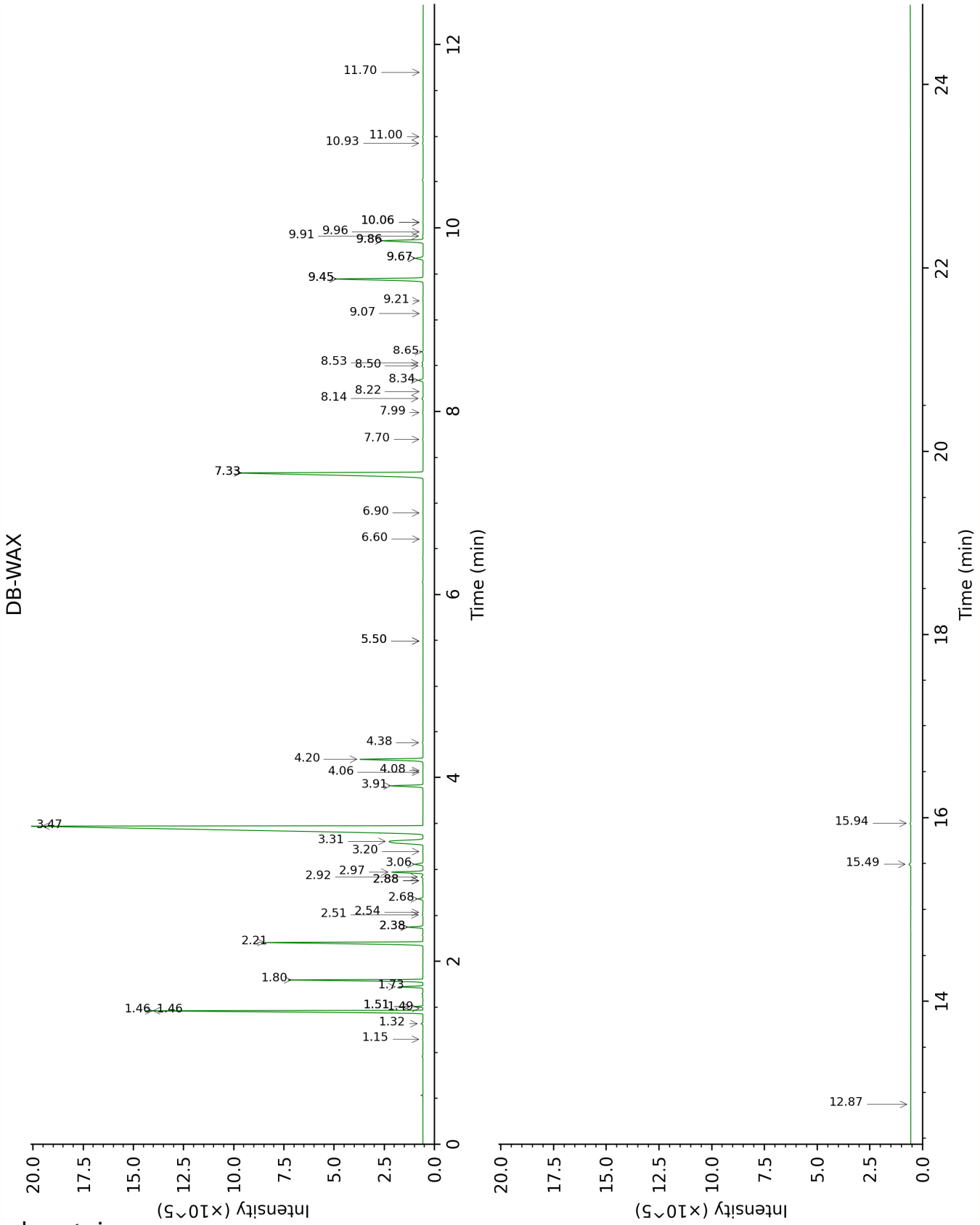
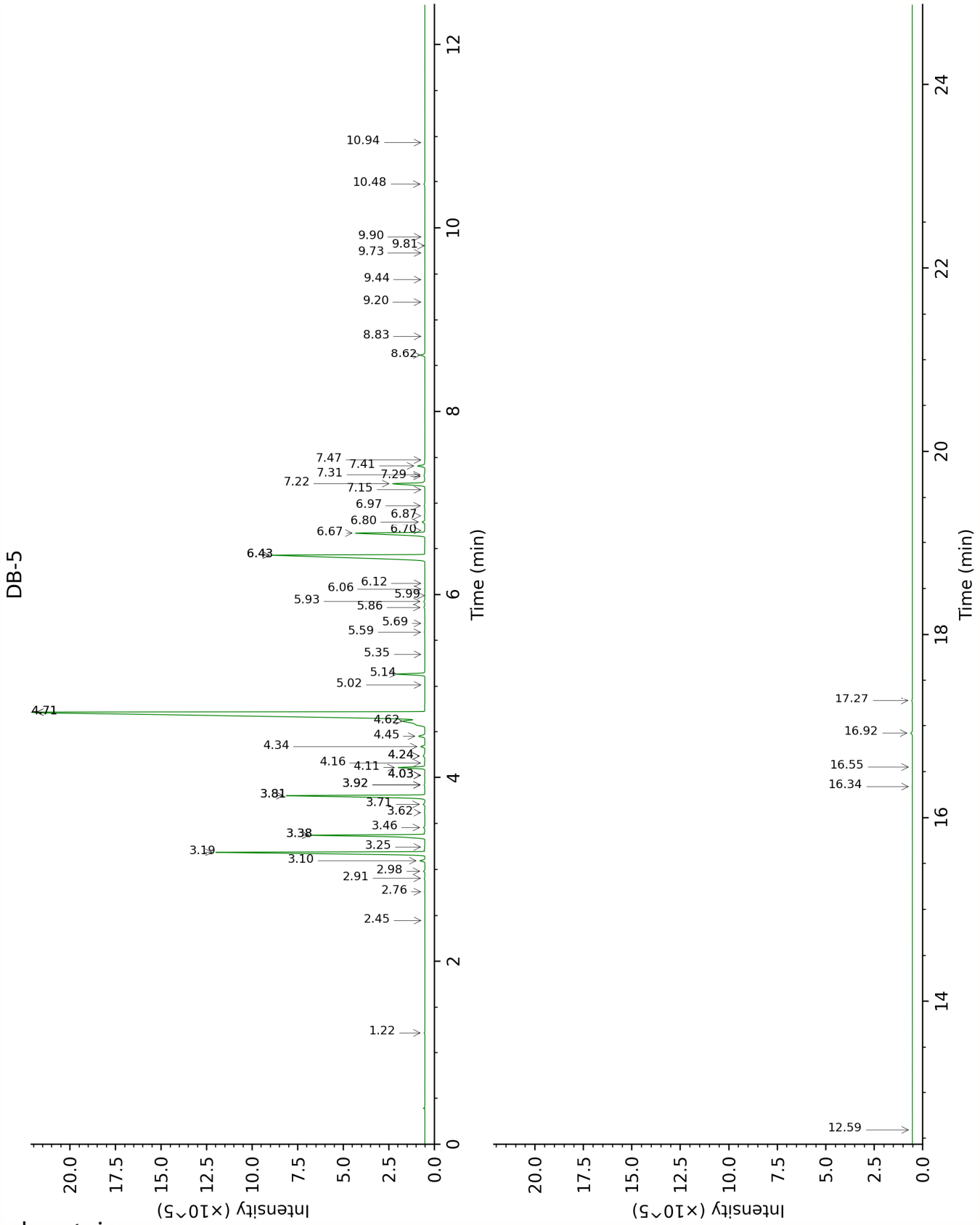

DB-WAX
Time (min)
Intensity (×10^5)
11.70
10.93
11.00
10.06
9.91
9.96
9.86
9.67
9.45
9.21
9.07
8.65
8.53
8.50
8.34
8.14
8.22
7.99
7.70
7.33
6.90
6.60
5.50
4.38
4.20
4.06
4.08
3.91
3.47
3.31
3.20
3.06
2.92
2.97
2.88
2.68
2.51
2.54
2.38
2.21
1.80
1.73
1.46
1.46
1.51
1.49
1.32
1.15
15.94
15.49
12.87


DB-5
Time (min)
Intensity (×10^5)
10.94
10.48
9.90
9.81
9.73
9.44
9.20
8.83
8.62
7.47
7.41
7.31
7.29
7.22
7.15
6.97
6.87
6.80
6.70
6.67
6.43
6.12
6.06
5.99
5.93
5.86
5.69
5.59
5.35
5.14
5.02
4.71
4.62
4.45
4.34
4.24
4.16
4.11
4.03
3.92
3.81
3.71
3.62
3.46
3.38
3.25
3.19
3.10
2.98
2.91
2.76
2.45
1.22
17.27
16.92
16.55
16.34
12.59

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Toluene	1.51*	1002.5	[0.25]	1.22	759.1	0.02
Hexanol	5.50*	1318.8	[0.01]	2.45	878.2	0.01
Bornylene	1.15	949.2	0.01	2.76	903.9	0.01
Hashishene	1.46*	995.8	[11.59]	2.91	913.8	0.03
Tricyclene	1.32	974.7	0.06	2.98	918.9	0.05
α-Thujene	1.51*	1002.5	[0.25]	3.10	926.4	0.23
α-Pinene	1.46*	995.8	[11.59]	3.19	932.4	11.59
β-Fenchene	1.49	999.5	tr	3.25	936.2	0.03
α-Fenchene	1.72	1024.3	0.83	3.38*	944.7	[5.87]
Camphene	1.80	1031.3	5.03	3.38*	944.7	[5.87]
Thuja-2,4(10)-diene	2.38*	1085.4	[0.53]	3.46	950.2	0.07
Unknown BOSE VIII [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]				3.62	960.9	0.04
Cymene isomer?				3.71	966.8	0.08
Sabinene	2.38*	1085.4	[0.53]	3.80*	973.0	[7.69]
β-Pinene	2.21	1069.6	7.18	3.80*	973.0	[7.69]
Unknown ORVU I [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	2.54	1100.5	0.02	3.92*	980.7	[0.04]
Octen-3-ol	6.90	1420.6	0.01	3.92*	980.7	[0.04]
Dehydro-1,8-cineole	3.20	1151.6	0.01	4.03*	987.6	[0.02]
Octan-3-one	4.08	1217.7	0.01	4.03*	987.6	[0.02]
trans-meta-Mentha-2,8-diene	2.88*	1127.5	[0.02]	4.03*	987.6	[0.02]
Myrcene	2.97	1134.7	1.29	4.11	993.2	1.20
2-Carene	2.51	1097.9	0.03	4.16	996.4	0.02
Pseudolimonene	2.92	1130.6	0.08	4.24*	1001.4	[0.12]
α-Phellandrene	2.88*	1127.5	[0.02]	4.24*	1001.4	[0.12]
Δ3-Carene	2.68	1112.6	0.19	4.34	1008.0	0.19
α-Terpinene	3.06	1141.1	0.36	4.45	1015.1	0.35
para-Cymene	4.20	1226.4	2.72	4.62	1025.3	2.60
1,8-Cineole	3.47	1172.6	43.29	4.71*	1031.4	[46.70]
Limonene	3.31	1160.0	3.29	4.71*	1031.4	[46.70]
(*E*)-β-Ocimene	4.06	1216.3	0.01	5.02	1050.5	0.01
γ-Terpinene	3.91	1205.9	1.32	5.14	1057.9	1.30
cis-Linalool oxide (fur.)	6.60	1398.9	tr	5.35	1071.3	0.01

Terpinolene	4.38	1239.2	0.03	5.59	1086.3	0.03
α-Pinene oxide	5.50*	1318.8	[0.01]	5.69	1092.4	0.01
Linalool	8.14	1514.4	0.06	5.86	1103.1	0.06
Unknown UNKN LX [m/z 139, 95 (95), 109 (64), 121 (40), 41 (23), 136 (22)...]				5.93	1107.3	0.06
endo-Fenchol	8.50	1542.3	0.06	5.99	1111.4	0.01
trans-Pinene hydrate	7.99	1502.5	0.02	6.06	1115.8	0.01
cis-para-Menth-2-en-1-ol	8.22	1520.3	0.01	6.12	1119.8	0.01
Camphor	7.33*	1453.3	[13.61]	6.43*	1139.5	[13.62]
trans-para-Menth-2-en-1-ol	9.07	1587.6	0.01	6.43*	1139.5	[13.62]
Isoborneol	9.45*	1617.6	[4.40]	6.67	1154.8	4.45
Unknown CUCY IV [m/z 95, 81 (36), 93 (34), 53 (29), 136 (29)...]				6.70	1156.6	0.02
Borneol	9.86*	1651.8	[2.01]	6.80	1162.9	0.14
Isopinocamphone	7.70	1480.5	0.02	6.87	1167.3	0.03
Terpinen-4-ol	8.65	1554.4	0.03	6.98	1174.2	0.03
para-Cymen-8-ol	11.70	1798.7	0.01	7.15	1185.4	0.01
α-Terpineol	9.86*	1651.8	[2.01]	7.22	1189.6	1.90
Myrtenol	10.93	1741.5	0.03	7.30	1194.6	0.04
γ-Terpineol	9.91	1656.0	0.04	7.31	1195.7	0.05
Verbenone	9.67*	1636.1	[0.40]	7.41	1201.9	0.39
Unknown PIMA 7 [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	11.00	1747.7	0.02	7.47	1206.0	0.01
Bornyl acetate	8.34	1530.0	0.23	8.62	1282.3	0.22
trans-Pinocarvyl acetate	9.21	1598.4	0.01	8.83	1296.4	0.01
Myrtenyl acetate	9.67*	1636.1	[0.40]	9.20	1322.1	0.01
exo-2-Hydroxycineole acetate	10.06*	1668.2	[0.01]	9.44	1339.3	0.01
Unknown LACA I [m/z 93, 43 (56), 121 (53), 67 (43), 107 (38), 69	9.96	1659.7	0.01	9.73	1359.7	0.01

(38)...204(14)]						
Unknown PIMA 8 [m/z 93, 121 (68), 43 (67), 67 (44), 136 (36), 107 (34)... 180 (4)]	10.06*	1668.2	[0.01]	9.81	1365.2	0.01
α-Copaene	7.33*	1453.3	[13.61]	9.90	1372.0	0.01
β-Caryophyllene	8.53	1544.9	0.06	10.48	1412.6	0.05
α-Humulene	9.45*	1617.6	[4.40]	10.94	1446.8	0.01
Caryophyllene oxide	12.87	1905.5	0.01	12.59	1573.7	0.01
5-Ethenyl-1,5-bis(4-methyl-3-penten-1-yl)-cyclohexene?				16.34	1894.0	0.01
4-Ethenyl-1,4-bis(4-methyl-3-penten-1-yl)-cyclohexene?				16.55	1913.8	0.01
meta-Camphorene	15.49	2161.1	0.10	16.92	1948.9	0.10
para-Camphorene	15.94	2206.4	0.04	17.28	1982.6	0.04
Total reported		99.35%			99.68%	

*: 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