Date : 2023-09-28

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 23I21-PTH02
Customer Identification : Niaouli - Madagascar - N20105R
Type : Essential Oil
Source : *Melaleuca quinquenervia 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

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 : Benoit Roger, Ph. D.
Date : 2023-09-28

Physicochemical data

Refractive index : 1.4678 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2023-09-22

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
Methyl 2-methylbutyrate	0.01	Aliphatic ester
α-Thujene	0.17	Monoterpene
α-Pinene	8.18	Monoterpene
α-Fenchene	0.02	Monoterpene
Camphene	0.08	Monoterpene
Benzaldehyde	0.16	Simple phenolic
Sabinene	0.01	Monoterpene
β-Pinene	2.17	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	0.67	Monoterpene
Pseudolimonene	0.05	Monoterpene
α-Phellandrene	0.06	Monoterpene
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.23	Monoterpene
para-Cymene	1.08	Monoterpene
Limonene	6.86	Monoterpene
1,8-Cineole	56.44	Monoterpenic ether
(*Z*)-β-Ocimene	tr	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	1.14	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Terpinolene	0.60	Monoterpene
para-Cymenene	0.03	Monoterpene
Methyl benzoate	0.02	Phenolic ester
Linalool	0.14	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
trans-Pinocarveol	0.03	Monoterpenic alcohol
Isopulegol	0.06	Monoterpenic alcohol
iso-Isopulegol	0.01	Monoterpenic alcohol
Borneol	0.03	Monoterpenic alcohol
δ-Terpineol	0.14	Monoterpenic alcohol
Ethyl benzoate	0.01	Phenolic ester
Terpinen-4-ol	0.76	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
α-Terpineol	6.29	Monoterpenic alcohol
Myrtenol	0.03	Monoterpenic alcohol
trans-Carveol	0.01	Monoterpenic alcohol
exo-2-Hydroxycineole	0.02	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Carvone	0.02	Monoterpenic ketone

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Geraniol	0.03	Monoterpenic alcohol
Methyl thiobenzoate?	0.03	Simple phenolic
δ-Terpinyl acetate	0.02	Monoterpenic ester
Myrtenyl acetate	0.01	Monoterpenic ester
α-Terpinyl acetate	0.67	Monoterpenic ester
Eugenol	0.02	Phenylpropanoid
Isoledene	0.02	Sesquiterpene
α-Copaene	0.06	Sesquiterpene
7-Cubebene	0.05	Sesquiterpene
α-Gurjunene	0.15	Sesquiterpene
β-Caryophyllene	1.62	Sesquiterpene
Aromadendrene	0.14	Sesquiterpene
α-Humulene	0.30	Sesquiterpene
allo-Aromadendrene	0.45	Sesquiterpene
γ-Muurolene	0.06	Sesquiterpene
β-Selinene	0.20	Sesquiterpene
allo-Aromadendr-9-ene	0.14	Sesquiterpene
Viridiflorene	0.89	Sesquiterpene
α-Selinene	0.19	Sesquiterpene
α-Muurolene	0.06	Sesquiterpene
γ-Cadinene	0.20	Sesquiterpene
Unknown	0.02	Sesquiterpene
δ-Cadinene	0.25	Sesquiterpene
α-Cadinene	0.03	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Palustrol	0.15	Sesquiterpenic alcohol
(*E*)-Nerolidol	0.62	Sesquiterpenic alcohol
Caryophyllene oxide	0.26	Sesquiterpenic ether
Globulol	0.09	Sesquiterpenic alcohol
Viridiflorol	5.26	Sesquiterpenic alcohol
Cubeban-11-ol	0.10	Sesquiterpenic alcohol
Guaiol	0.05	Sesquiterpenic alcohol
Ledol	0.74	Sesquiterpenic alcohol
Humulene epoxide II	0.04	Sesquiterpenic ether
10-epi-Cubenol	0.04	Sesquiterpenic alcohol
1-epi-Cubenol	0.05	Sesquiterpenic alcohol
γ-Eudesmol	0.03	Sesquiterpenic alcohol
τ-Muurolol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.09	Sesquiterpenic alcohol
β-Eudesmol	0.06	Sesquiterpenic alcohol
α-Eudesmol	0.06	Sesquiterpenic alcohol
Bulnesol	0.02	Sesquiterpenic alcohol
Consolidated total	**98.84**	

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

Note: no correction factor was applied

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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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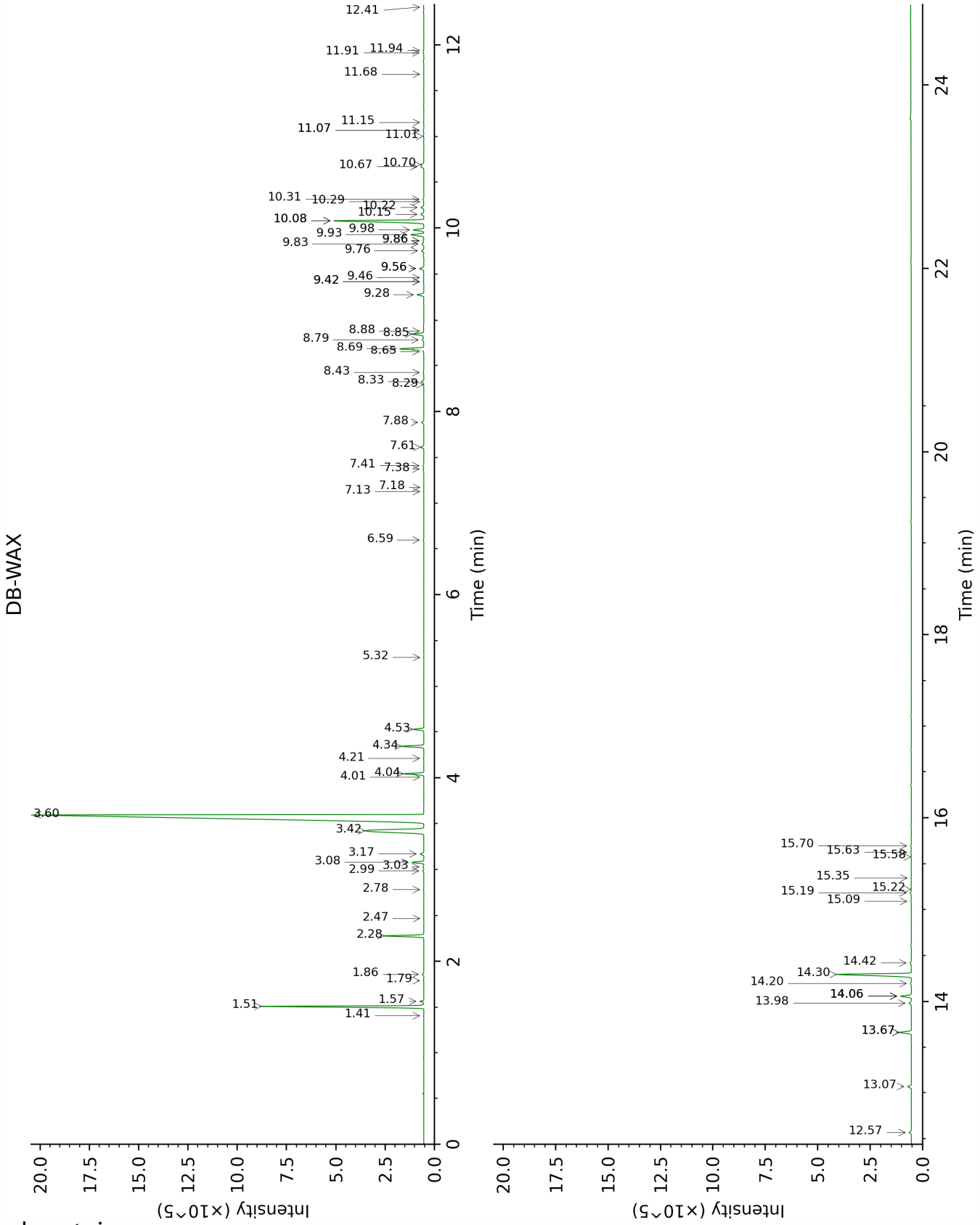
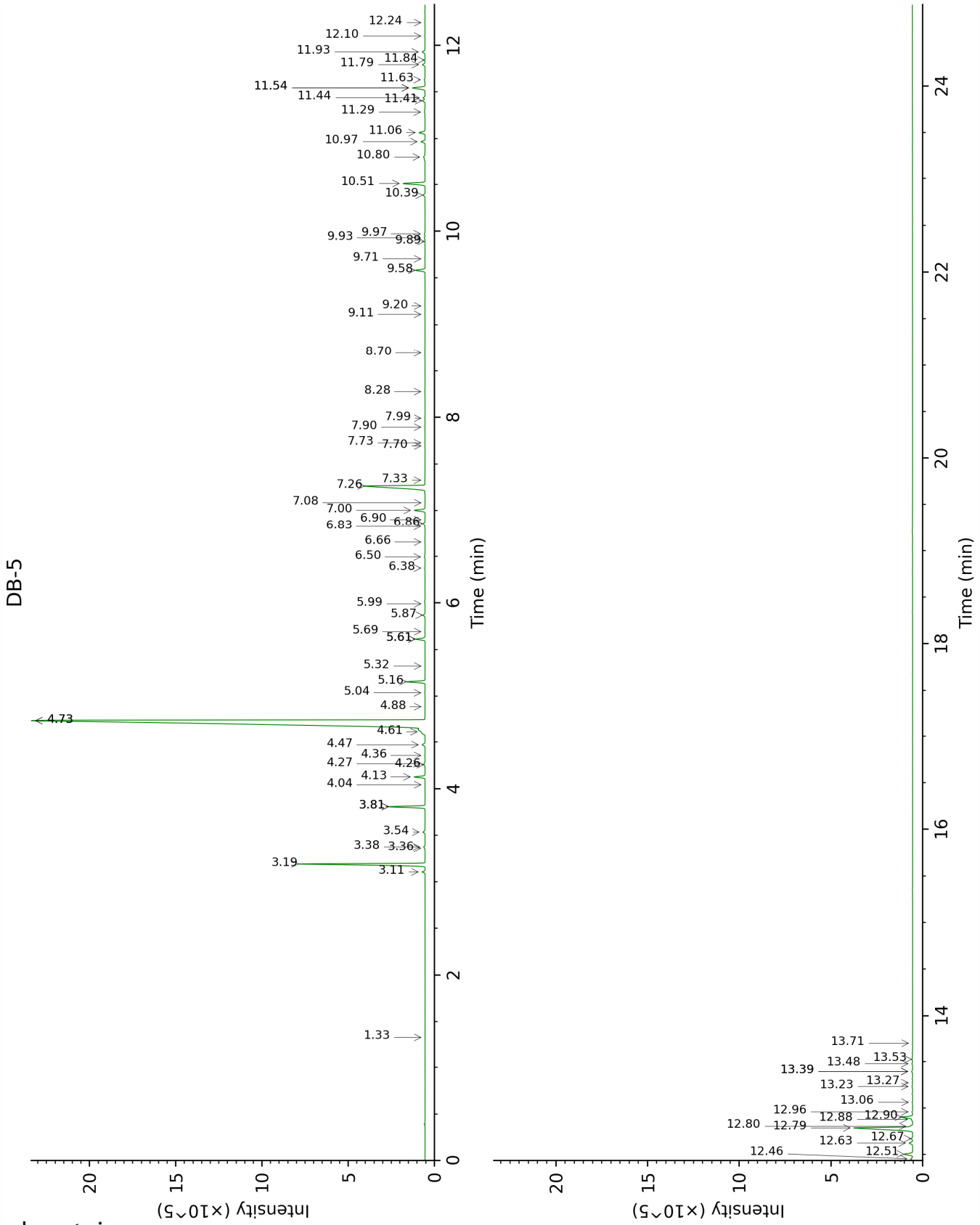

DB-WAX
Time (min)
Intensity (×10^5)
12.41
11.91
11.94
11.68
11.15
11.07
11.01
10.67
10.70
10.31
10.29
10.22
10.15
10.08
9.93
9.98
9.86
9.83
9.76
9.56
9.42
9.46
9.28
8.88
8.85
8.79
8.69
8.65
8.43
8.33
8.29
7.88
7.61
7.41
7.38
7.13
7.18
6.59
5.32
4.53
4.34
4.21
4.01
4.04
3.60
3.42
3.17
3.08
2.99
3.03
2.78
2.47
2.28
1.86
1.79
1.57
1.51
1.41
15.70
15.63
15.58
15.35
15.19
15.22
15.09
14.42
14.30
14.20
14.06
13.98
13.67
13.07
12.57


DB-5
Time (min)
Intensity (×10^5)
12.24
12.10
11.93
11.79
11.84
11.63
11.54
11.44
11.41
11.29
11.06
10.97
10.80
10.51
10.39
9.93
9.97
9.89
9.71
9.58
9.20
9.11
8.70
8.28
7.99
7.90
7.73
7.70
7.33
7.26
7.08
7.00
6.90
6.86
6.83
6.66
6.50
6.38
5.99
5.87
5.69
5.61
5.32
5.16
5.04
4.88
4.73
4.61
4.47
4.36
4.27
4.26
4.13
4.04
3.81
3.54
3.38
3.36
3.19
3.11
1.33
13.71
13.48
13.53
13.39
13.23
13.27
13.06
12.96
12.88
12.90
12.80
12.79
12.63
12.67
12.46
12.51

FULL ANALYSIS DATA

Methyl 2-methylbutyrate	**Column DB-WAX**			**Column DB-5**		
	1.41	975.8	0.01	1.33	774.2	0.01
α-Thujene	1.57	997.5	0.17	3.11	926.7	0.17
α-Pinene	1.51	991.1	8.13	3.19	932.3	8.18
α-Fenchene	1.79	1018.6	0.02	3.36*†	943.3	[0.01]
Camphene	1.86	1025.0	0.08	3.38*†	944.3	[0.09]
Benzaldehyde	7.61	1461.4	0.18	3.54	954.7	0.16
Sabinene	2.47	1082.6	0.01	3.81*	972.6	[2.19]
β-Pinene	2.28	1064.7	2.17	3.81*	972.6	[2.19]
6-Methyl-5-hepten-2-one	5.32	1295.3	0.01	4.04	988.1	0.01
Myrcene	3.08	1131.6	0.68	4.13	993.6	0.67
Pseudolimonene	3.03	1127.8	0.05	4.26*†	1002.2	[0.04]
α-Phellandrene	2.99	1124.4	0.06	4.27*†	1002.8	[0.07]
Δ3-Carene	2.78	1108.9	0.01	4.36	1008.5	0.01
α-Terpinene	3.17	1138.6	0.23	4.47	1015.6	0.23
para-Cymene	4.34	1227.1	1.26	4.61†	1024.3	0.34
Limonene	3.42	1158.0	6.86	4.73*	1031.7	[63.82]
1,8-Cineole	3.60	1171.2	56.44	4.73*	1031.7	[63.82]
(*Z*)-β-Ocimene	4.01	1202.6	tr	4.88	1041.1	tr
(*E*)-β-Ocimene	4.21	1217.4	0.02	5.04	1050.9	0.02
γ-Terpinene	4.04	1205.3	1.15	5.16	1058.3	1.14
cis-Sabinene hydrate	7.18	1429.2	0.01	5.32	1068.7	0.01
Terpinolene	4.53	1240.5	0.60	5.61*	1086.8	[0.63]
para-Cymenene	6.60	1386.5	0.03	5.61*	1086.8	[0.63]
Methyl benzoate	8.88	1557.8	0.02	5.69	1091.8	0.02
Linalool	8.33	1514.9	0.15	5.87	1102.8	0.14
endo-Fenchol	8.65	1540.0	0.03	5.99	1110.5	0.01
trans-Pinocarveol	9.46	1602.8	0.03	6.38	1134.9	0.03
Isopulegol	8.43	1522.6	0.04	6.50	1142.5	0.06
iso-Isopulegol	8.30	1512.5	0.01	6.66	1152.7	0.01
Borneol	10.08*	1652.3	[6.32]	6.83	1163.5	0.03
δ-Terpineol	9.76	1626.2	0.14	6.86	1165.6	0.14
Ethyl benzoate	9.56*	1610.7	[0.29]	6.90	1168.3	0.01
Terpinen-4-ol	8.85	1555.3	0.71	7.00	1174.8	0.76
Cryptone	9.42*	1599.3	[0.03]	7.08	1180.0	0.01
α-Terpineol	10.08*	1652.3	[6.32]	7.26	1191.5	6.29
Myrtenol	11.16	1740.8	0.02	7.33	1195.4	0.03
trans-Carveol	11.68	1784.9	0.02	7.70	1219.5	0.01
exo-2-Hydroxycineole	11.94	1807.3	0.02	7.73	1221.7	0.02
Citronellol	11.00	1728.2	0.03	7.90	1232.9	0.02

Carvone	10.29	1668.9	0.02	7.99	1239.3	0.02
Geraniol	11.91	1805.1	0.04	8.28	1258.4	0.03
Methyl thiobenzoate?				8.70	1286.3	0.03
δ-Terpinyl acetate	9.42*	1599.3	[0.03]	9.11	1314.6	0.02
Myrtenyl acetate	9.86*	1634.9	[0.05]	9.20	1320.9	0.01
α-Terpinyl acetate	9.98	1644.3	0.66	9.58	1347.8	0.67
Eugenol	15.09	2096.2	0.04	9.71	1356.3	0.02
Isoledene	7.13	1425.8	0.01	9.89	1369.4	0.02
α-Copaene	7.41	1446.6	0.05	9.93	1372.2	0.06
7-Cubebene	7.38	1443.8	0.04	9.97	1375.2	0.05
α-Gurjunene	7.88	1481.3	0.14	10.39	1404.3	0.15
β-Caryophyllene	8.69	1543.1	1.61	10.51	1413.6	1.62
Aromadendrene	8.79	1550.5	0.10	10.80	1435.2	0.14
α-Humulene	9.56*	1610.7	[0.29]	10.97	1447.4	0.30
allo-Aromadendrene	9.28	1588.0	0.42	11.06	1454.6	0.45
γ-Muurolene	9.86*	1634.9	[0.05]	11.28	1471.0	0.06
β-Selinene	10.15	1657.9	0.21	11.41	1480.0	0.20
allo-Aromadendr-9-ene	9.83	1632.1	0.14	11.44	1482.4	0.14
Viridiflorene	9.93	1640.2	0.89	11.54*	1490.3	[1.03]
α-Selinene	10.22	1663.9	0.19	11.54*	1490.3	[1.03]
α-Muurolene	10.31	1671.1	0.05	11.63	1496.8	0.06
γ-Cadinene	10.67	1700.5	0.21	11.79	1509.1	0.20
Unknown EUGL VII [m/z 159, 145 (91), 131 (67), 105 (46), 202 (43)]	11.07*	1733.6	[0.06]	11.84	1512.9	0.02
δ-Cadinene	10.70	1702.5	0.20	11.93	1519.8	0.25
α-Cadinene	11.07*	1733.6	[0.06]	12.10	1533.1	0.03
Isocaryophyllene epoxide B	12.42	1849.0	0.04	12.24	1544.4	0.02
Palustrol	12.57	1862.3	0.15	12.46	1560.8	0.15
(*E*)-Nerolidol	14.06*	1997.9	[0.63]	12.51	1564.8	0.62
Caryophyllene oxide	13.07	1906.9	0.24	12.63	1574.2	0.26
Globulol	14.20	2010.9	0.08	12.67	1577.9	0.09
Viridiflorol	14.30	2020.3	5.23	12.79	1586.9	5.26
Cubeban-11-ol	13.98	1990.7	0.16	12.80	1588.2	0.10
Guaiol	14.42	2032.2	0.09	12.88	1594.1	0.05

Ledol	13.67*	1961.5	[0.75]	12.90	1595.9	0.74
Humulene epoxide II	13.67*	1961.5	[0.75]	12.96	1600.4	0.04
10-epi-Cubenol	14.06*	1997.9	[0.63]	13.06	1608.7	0.04
1-epi-Cubenol	14.06*	1997.9	[0.63]	13.23	1622.7	0.05
γ-Eudesmol	15.22	2109.2	0.01	13.27	1626.0	0.03
τ-Muurolol	15.34	2121.2	0.02	13.40*	1636.1	[0.08]
τ-Cadinol	15.18	2105.4	0.09	13.40*	1636.1	[0.08]
β-Eudesmol	15.70	2155.9	0.05	13.48	1642.9	0.06
α-Eudesmol	15.63	2149.0	0.05	13.53	1646.9	0.06
Bulnesol	15.58	2144.0	0.02	13.71	1661.7	0.02
Total reported		98.78%			99.28%	

*: 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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