Date : July 15, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22G08-PTH08
Customer identification : Yuzu - Japan - Y40104R
Type : Essential oil
Source : *Citrus junos*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Pamela Lavoie, M.Sc., Chimiste
Analysis date : July 14, 2022

Checked and 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4735 ± 0.0003 (20 °C; method PC-MAT-016)

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
Hexanal	tr	Aliphatic aldehyde
α-Thujene	0.31	Monoterpene
α-Pinene	1.04	Monoterpene
Camphene	0.02	Monoterpene
Sabinene	0.15	Monoterpene
β-Pinene	0.62	Monoterpene
Myrcene	1.32	Monoterpene
α-Phellandrene	0.32	Monoterpene
Pseudolimonene	0.02	Monoterpene
Octanal	tr	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
α-Terpinene	0.17	Monoterpene
para-Cymene	1.12	Monoterpene
1,8-Cineole	2.50*	Monoterpenic ether
β-Phellandrene	2.50*	Monoterpene
Limonene	79.09	Monoterpene
(*Z*)-β-Ocimene	0.02	Monoterpene
(*E*)-β-Ocimene	0.18	Monoterpene
γ-Terpinene	8.87	Monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
para-Cymenene	0.05	Monoterpene
Terpinolene	0.35	Monoterpene
Linalool	1.81	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.02	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
trans-Limonene oxide	0.02	Monoterpenic ether
Camphor	0.01	Monoterpenic ketone
trans-Sabinol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.11	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
α-Terpineol	0.11	Monoterpenic alcohol
Decanal	0.02	Aliphatic aldehyde
trans-Carveol	0.01	Monoterpenic alcohol
cis-Carveol	0.01	Monoterpenic alcohol
Thymol methyl ether	0.01	Monoterpenic ether
Carvone	0.01	Monoterpenic ketone
Thymol	0.06	Monoterpenic alcohol
δ-Elemene	0.04	Sesquiterpene
α-Cubebene	0.01	Sesquiterpene
α-Copaene	0.02	Sesquiterpene
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.02	Sesquiterpene

Sesquithujene	0.01	Sesquiterpene
β-Caryophyllene	0.11	Sesquiterpene
γ-Elemene	0.01	Sesquiterpene
α-Humulene	0.03	Sesquiterpene
(*E*)-β-Farnesene	0.25	Sesquiterpene
Germacrene D	0.11	Sesquiterpene
Bicyclogermacrene	0.23	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.05	Sesquiterpene
β-Sesquiphellandrene	0.02	Sesquiterpene
Unknown	0.03	Unknown
Germacrene B	0.07	Sesquiterpene
Spathulenol	0.19	Sesquiterpenic alcohol
Globulol	0.01	Sesquiterpenic alcohol
Alismol	0.03	Sesquiterpenic alcohol
Isospathulenol	0.03	Sesquiterpenic alcohol
τ-Muurolol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.03	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
Consolidated total	**99.81%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of 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.

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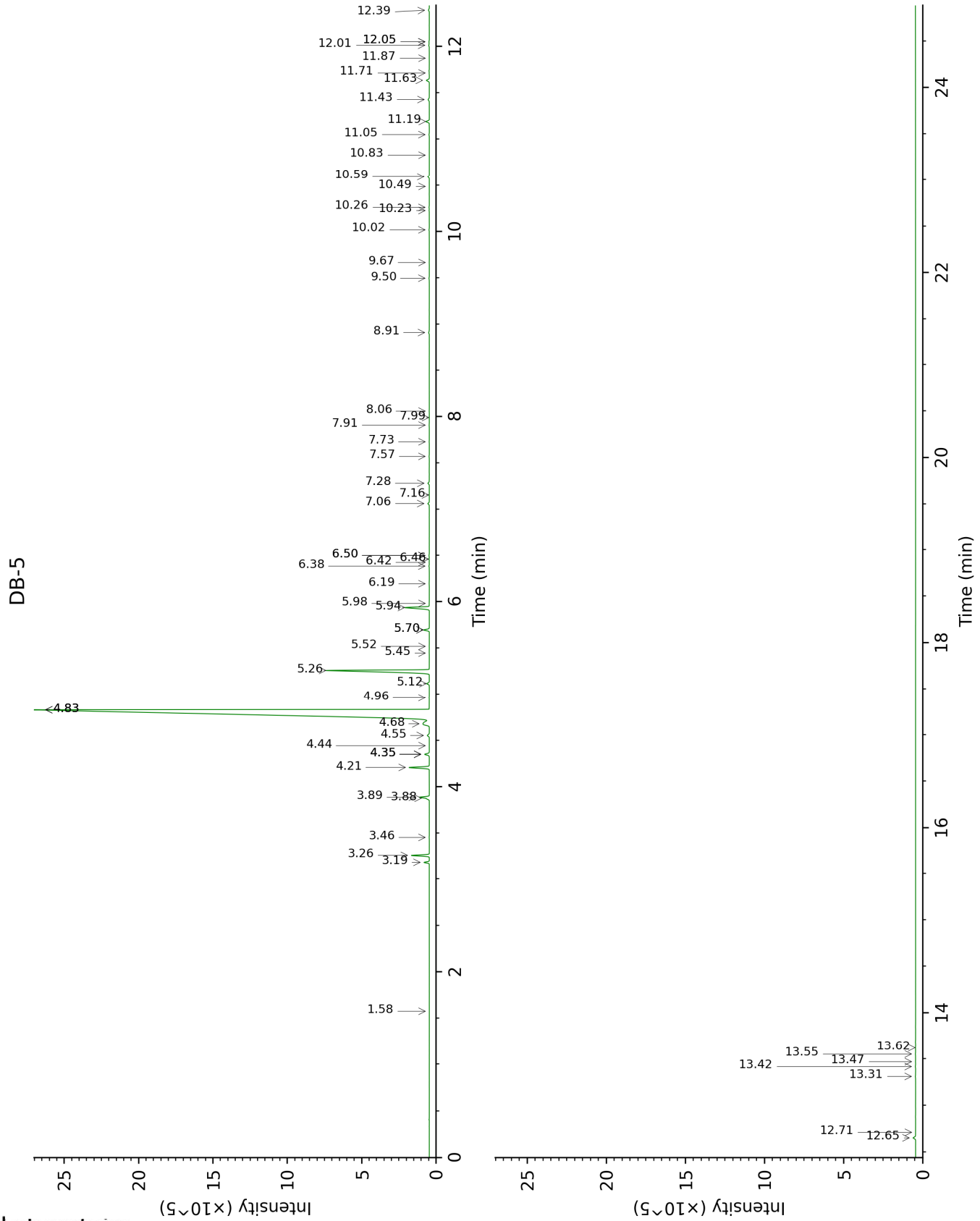
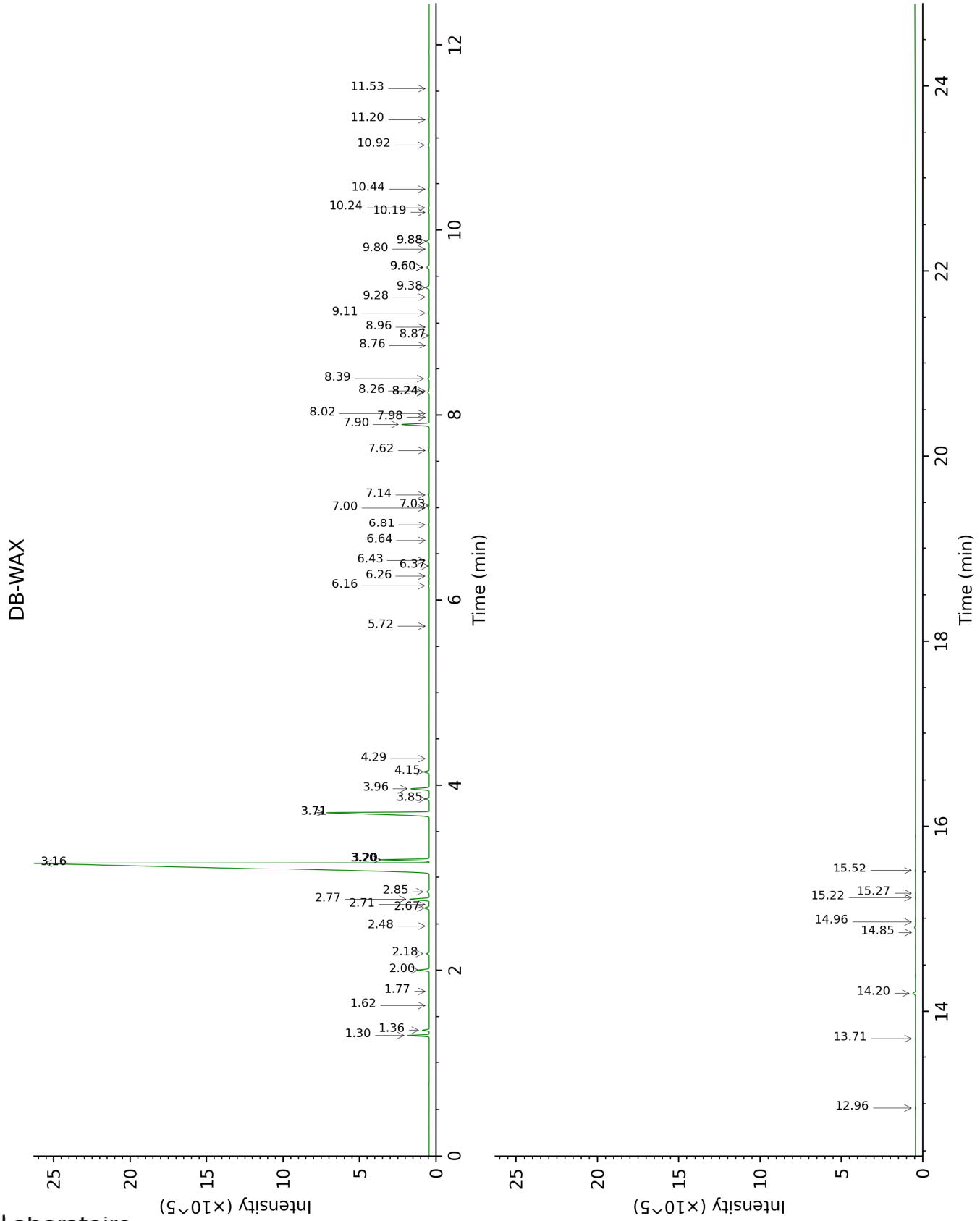

DB-5
12.39
12.01
12.05
11.87
11.71
11.63
11.43
11.19
11.05
10.83
10.59
10.49
10.26
10.23
10.02
9.67
9.50
8.91
8.06
7.99
7.91
7.73
7.57
7.28
7.16
7.06
6.50
6.42
6.46
6.38
6.19
5.98
5.94
5.70
5.52
5.45
5.26
5.12
4.96
4.83
4.68
4.55
4.44
4.35
4.21
3.89
3.88
3.46
3.26
3.19
1.58
13.55
13.62
13.47
13.42
13.31
12.71
12.65
Time (min)
Intensity (×10^5)


DB-WAX
Intensity (×10^5)
Time (min)
11.53
11.20
10.92
10.44
10.24
10.19
9.88
9.80
9.60
9.38
9.28
9.11
8.96
8.87
8.76
8.39
8.26
8.24
8.02
7.98
7.90
7.62
7.14
7.00
7.03
6.81
6.64
6.43
6.37
6.26
6.16
5.72
4.29
4.15
3.96
3.85
3.71
3.20
3.16
2.85
2.77
2.71
2.67
2.48
2.18
2.00
1.77
1.62
1.36
1.30
15.52
15.27
15.22
14.96
14.85
14.20
13.71
12.96

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Hexanal	1.58	800	tr	1.77	1041	tr
α-Thujene	3.19	926	0.31	1.36	998	0.31
α-Pinene	3.26	931	1.04	1.30	989	1.04
Camphene	3.46	943	0.02	1.62	1026	0.01
Sabinene	3.88†	971	0.77	2.18	1082	0.15
β-Pinene	3.89†	972	[0.77]	2.00	1064	0.62
Myrcene	4.21	993	1.32	2.77	1132	1.33
α-Phellandrene	4.35*	1002	0.34	2.67	1125	0.32
Pseudolimonene	4.35*	1002	[0.34]	2.71	1128	0.02
Octanal	4.35*	1002	[0.34]	4.29	1249	tr
Δ3-Carene	4.44	1008	0.01	2.48	1109	0.01
α-Terpinene	4.55	1015	0.17	2.85	1138	0.17
para-Cymene	4.68	1023	1.12	3.96	1225	1.17
1,8-Cineole	4.83*	1032	81.60	3.20*	1166	2.37
β-Phellandrene	4.83*	1032	[81.60]	3.20*	1166	[2.37]
Limonene	4.83*	1032	[81.60]	3.16	1163	79.09
(*Z*)-β-Ocimene	4.96	1041	0.02	3.71*	1206	8.89
(*E*)-β-Ocimene	5.12	1050	0.18	3.85	1217	0.19
γ-Terpinene	5.26	1060	8.87	3.71*	1206	[8.89]
cis-Linalool oxide (fur.)	5.45	1071	0.01	6.37	1398	0.01
Octanol	5.52	1076	0.01	8.02	1522	0.01
para-Cymenene	5.70*	1087	0.39	6.16	1383	0.05
Terpinolene	5.70*	1087	[0.39]	4.15	1239	0.35
Linalool	5.94	1102	1.81	7.90	1513	1.82
Nonanal	5.98	1105	0.01	5.72	1351	tr
trans-para-Mentha-2,8-dien-1-ol	6.19	1119	0.02	8.76	1580	0.01
cis-Limonene oxide	6.38	1131	0.02	6.26	1390	0.03
cis-para-Mentha-2,8-dien-1-ol	6.42	1134	0.01	9.28	1622	0.01
trans-Limonene oxide	6.46	1136	0.02	6.43	1402	0.02
Camphor	6.50*	1138	0.03	7.03	1448	0.01
trans-Sabinol	6.50*	1138	[0.03]	9.60*	1648	0.20
Terpinen-4-ol	7.06	1175	0.11	8.39	1552	0.11
Cryptone	7.16	1181	0.01	8.96	1596	0.01
α-Terpineol	7.28	1189	0.11	9.60*	1648	[0.20]
Decanal	7.57	1208	0.02	7.14	1456	0.02
trans-Carveol	7.73	1219	0.01	11.20	1782	0.02
cis-Carveol	7.91	1231	0.01	11.53	1811	0.02
Thymol methyl ether	7.99	1236	0.01	8.26†	1541	[0.14]
Carvone	8.06	1241	0.01	9.80	1664	0.01
Thymol	8.91	1299	0.06	14.96	2132	0.01
δ-Elemene	9.50	1336	0.04	6.81	1431	0.03
α-Cubebene	9.67	1348	0.01	6.64	1419	0.01
α-Copaene	10.02	1373	0.02	7.00	1446	0.02

β-Cubebene	10.23	1387	0.02	7.62	1492	0.03
β-Elemene	10.26	1390	0.02	8.24*†	1540	0.14
Sesquithujene	10.49	1406	0.01	7.98	1519	0.01
β-Caryophyllene	10.59	1414	0.11	8.24*†	1540	[0.14]
γ-Elemene	10.83	1432	0.01	8.87	1589	0.01
α-Humulene	11.05	1448	0.03	9.11	1608	0.02
(*E*)-β-Farnesene	11.19	1459	0.25	9.38	1630	0.27
Germacrene D	11.43	1476	0.11	9.60*	1648	[0.20]
Bicyclogermacrene	11.64	1492	0.23	9.88*	1671	0.23
α-Muurolene	11.71	1498	0.01	9.88*	1671	[0.23]
γ-Cadinene	11.87	1510	0.01	10.19	1696	0.03
δ-Cadinene	12.01	1521	0.05	10.24	1700	0.05
β-Sesquiphellandrene	12.05*	1524	0.04	10.44	1717	0.02
Unknown [m/z 68, 67 (84), 81 (69), 54 (58), 55 (53), 41 (50)...]	12.05*	1524	[0.04]	12.96	1939	0.03
Germacrene B	12.39	1550	0.07	10.92	1758	0.07
Spathulenol	12.65	1571	0.19	14.20	2056	0.19
Globulol	12.71	1576	0.01	13.71	2009	0.01
Alismol	13.31	1624	0.03	15.52	2188	0.02
Isospathulenol	13.42	1632	0.03			
τ-Muurolol	13.47	1637	0.02	14.85	2120	0.01
β-Eudesmol	13.55	1644	0.03	15.22	2158	0.02
α-Cadinol	13.62	1649	0.02	15.27	2163	0.02
Total identified		**99.79%**			**99.61%**	
Total reported		**99.79%**			**99.64%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not 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