Date : October 14, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20J13-PTH04
Customer identification : Oregano - O40107207R
Type : Essential oil
Source : *Origanum vulgare* ct. Carvacrol
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 : Lindsay Girard, M. Sc.
Analysis date : October 14, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

Laboratoire PhytoChemia
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PHYSICOCHEMICAL DATA

Physical aspect: Light orange liquid
Refractive index: 1.5085 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 13171:2016 (ESSENTIAL OIL OF OREGANO)

Compound	Min. %	Max. %	Observed %	Complies?
β-Caryophyllene	0.5	4.0	1.4	Yes
Carvacrol	60.0	80.0	61.8	Yes
Thymol	0.5	5.0	4.7	Yes
Terpinen-4-ol	0.5	2.0	0.2	No
Linalool	tr	3.00	3.58	No
γ-Terpinene	3.0	9.0	5.3	Yes
para-Cymene	4.0	10.0	10.7	No
α-Terpinene	0.5	2.0	0.7	Yes
Myrcene	0.5	3.0	1.4	Yes
α-Pinene	0.2	2.5	1.4	Yes
α-Thujene	0.2	1.5	0.1	No
Refractive index	1.5000	1.5130	1.5085	Yes

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
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Tricyclene	0.01	Monoterpene
α-Thujene	0.10	Monoterpene
α-Pinene	1.42	Monoterpene
Camphene	0.38	Monoterpene
β-Pinene	1.55	Monoterpene
Sabinene	0.34	Monoterpene
Octen-3-ol	0.28	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
Myrcene	1.41	Monoterpene
Octan-3-ol	0.01	Aliphatic alcohol
α-Phellandrene	0.08	Monoterpene
Pseudolimonene	0.03	Monoterpene
α-Terpinene	0.66	Monoterpene
para-Cymene	10.67	Monoterpene
Limonene	1.31	Monoterpene
1,8-Cineole	0.14	Monoterpenic ether
(*Z*)-β-Ocimene	0.03	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	5.33	Monoterpene
cis-Sabinene hydrate	0.04	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Terpinolene	0.57	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	3.58	Monoterpenic alcohol
Hotrienol	0.02	Monoterpenic alcohol
exo-Fenchol	0.01	Monoterpenic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
Borneol	0.43	Monoterpenic alcohol
Terpinen-4-ol	0.18	Monoterpenic alcohol
α-Terpineol	0.11	Monoterpenic alcohol
Carvacrol methyl ether	0.58	Monoterpenic ether
Thymol	4.75	Monoterpenic alcohol
Carvacrol	61.76	Monoterpenic alcohol
α-Copaene	0.03	Sesquiterpene
β-Caryophyllene	1.44	Sesquiterpene
α-Humulene	0.03	Sesquiterpene
γ-Muurolene	0.01	Sesquiterpene
α-Selinene	0.02	Sesquiterpene
β-Bisabolene	0.36	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
β-Sesquiphellandrene	0.01	Sesquiterpene
(*E*)-α-Bisabolene	0.01	Sesquiterpene

Caryophyllene oxide	0.36	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
10-epi-Cubenol	0.01	Sesquiterpenic alcohol
Caryophylladienol I	0.01	Sesquiterpenic alcohol
Caryophylladienol II	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.04	Sesquiterpenic alcohol
τ-Muurolol	0.01	Sesquiterpenic alcohol
α-Muurolol	0.01	Sesquiterpenic alcohol
α-Bisabolol	0.01	Sesquiterpenic alcohol
Phytone	0.01	Terpenic ketone
Unknown	0.08	Unknown
Unknown	0.01	Unknown
Unknown	0.17	Unknown
Unknown	0.06	Unknown
Unknown	0.01	Unknown
Unknown	0.05	Unknown
Unknown	0.03	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Consolidated total	**98.77%**	

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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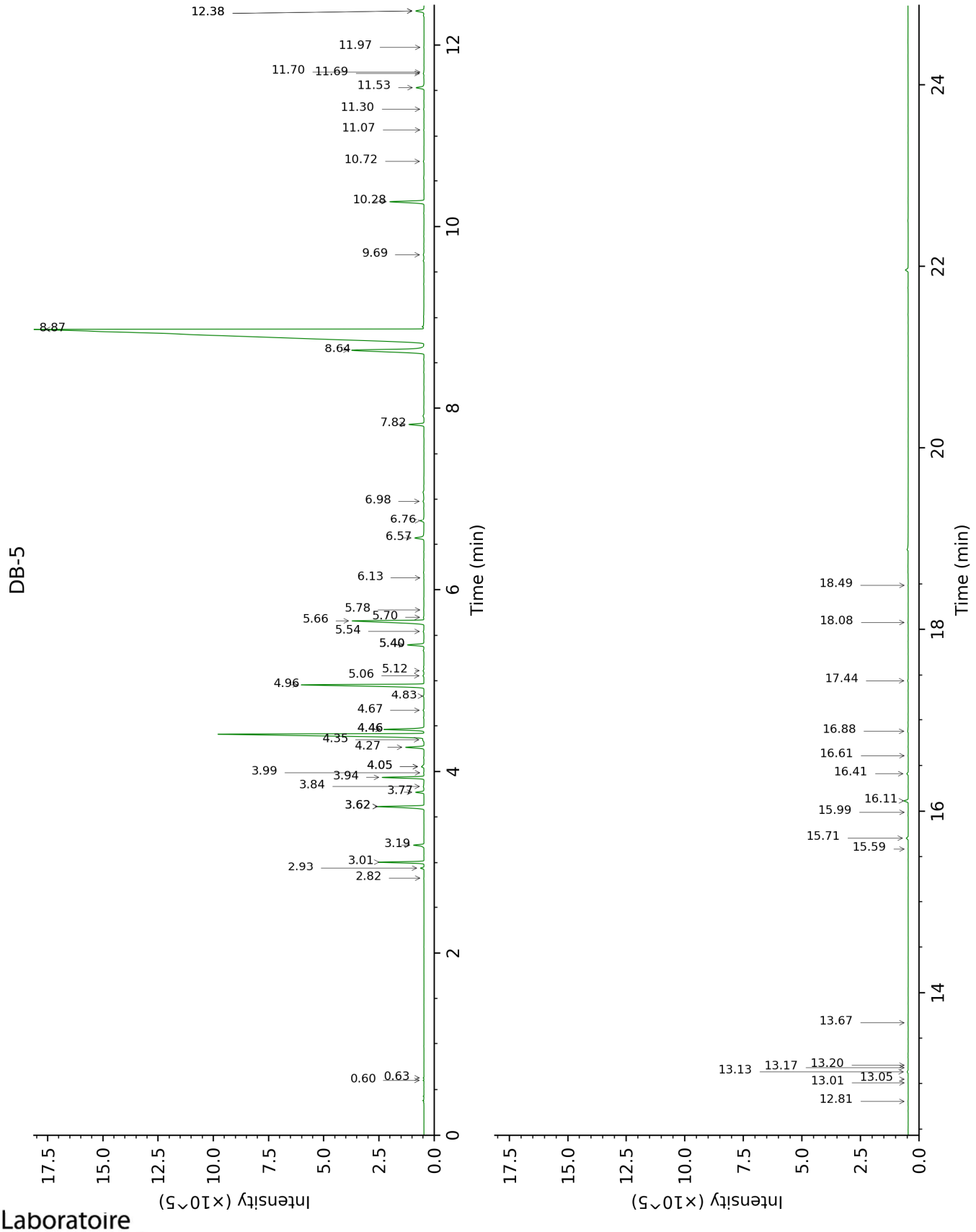
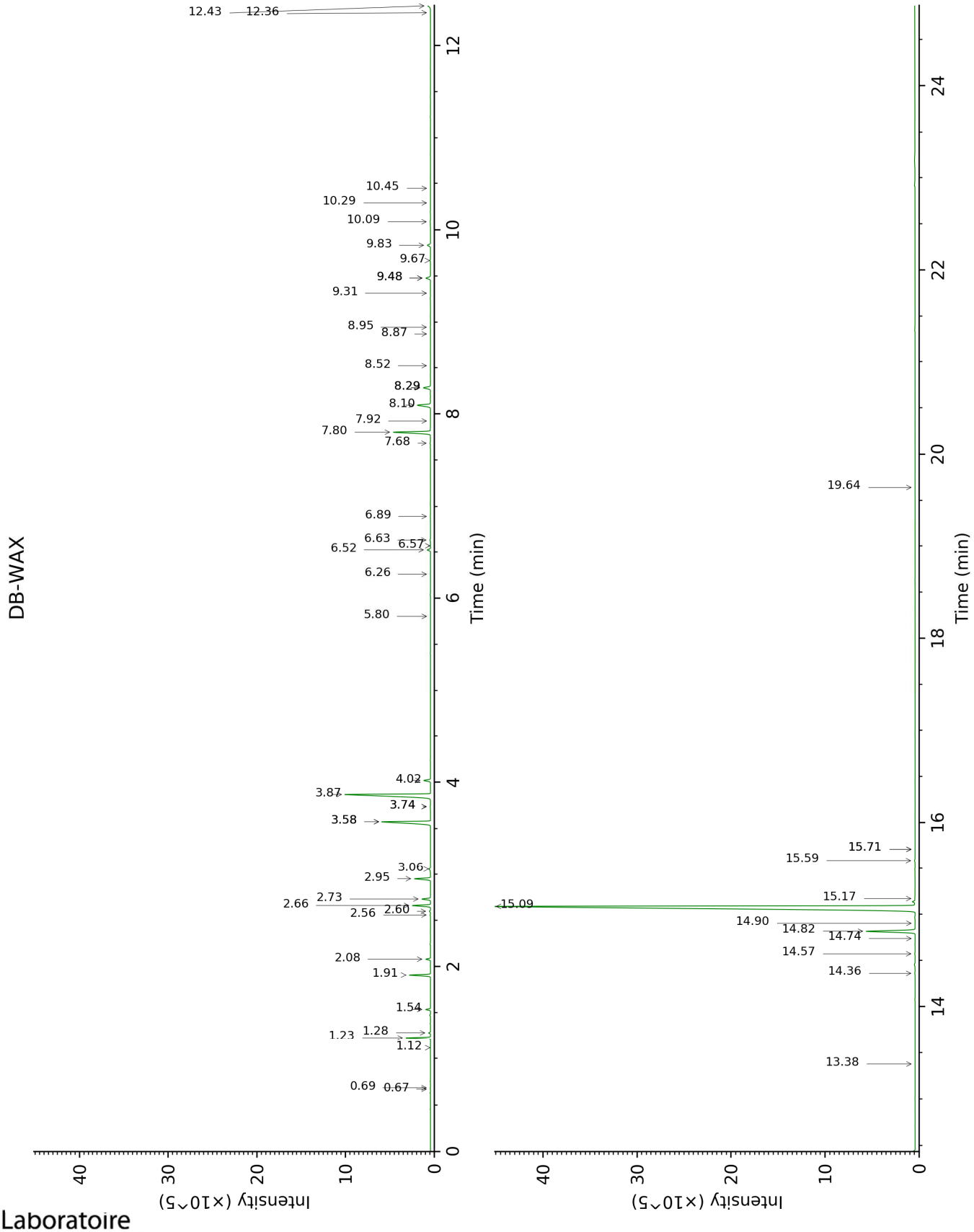

DB-5
12.38
11.97
11.70
11.69
11.53
11.30
11.07
10.72
10.28
9.69
8.87
8.64
7.82
6.98
6.76
6.57
6.13
5.78
5.66
5.70
5.54
5.40
5.06
5.12
4.96
4.83
4.67
4.46
4.35
4.27
4.05
3.99
3.94
3.84
3.77
3.62
3.19
3.01
2.93
2.82
0.60
0.63
Time (min)
Intensity (×10^5)
18.49
18.08
17.44
16.88
16.61
16.41
16.11
15.99
15.71
15.59
13.67
13.13
13.17
13.20
13.01
13.05
12.81
Time (min)
Intensity (×10^5)


DB-WAX
Time (min)
Intensity (×10^5)
12.43
12.36
10.45
10.29
10.09
9.83
9.67
9.48
9.31
8.95
8.87
8.52
8.29
8.10
7.92
7.80
7.68
6.89
6.63
6.57
6.52
6.26
5.80
4.02
3.87
3.74
3.58
3.06
2.95
2.73
2.66
2.60
2.56
2.08
1.91
1.54
1.28
1.23
1.12
0.69
0.67
19.64
15.71
15.59
15.17
15.09
14.90
14.82
14.74
14.57
14.36
13.38

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.60	639	0.01	0.69	885	0.01
2-Methylbutyral	0.63	650	0.01	0.67	878	0.01
Tricyclene	2.82	919	0.01	1.12	970	tr
α-Thujene	2.93	927	0.10	1.28	998	0.10
α-Pinene	3.01	932	1.42	1.23	990	1.45
Camphene	3.19	944	0.38	1.54	1025	0.32
β-Pinene	3.62*	973	1.90	1.91	1065	1.55
Sabinene	3.62*	973	[1.90]	2.08	1083	0.34
Octen-3-ol	3.77	983	0.28	6.52	1421	0.28
Octan-3-one	3.84	987	0.03	3.74*	1218	0.04
Myrcene	3.94	994	1.41	2.66	1133	1.41
Octan-3-ol	3.99	998	0.01	5.80	1368	0.01
α-Phellandrene	4.05*	1002	0.11	2.60	1128	0.08
Pseudolimonene	4.05*	1002	[0.11]	2.56	1125	0.03
α-Terpinene	4.27	1016	0.66	2.73	1139	0.65
para-Cymene	4.35	1021	10.67	3.87	1228	10.67
Limonene	4.46*	1028	1.49	2.95	1157	1.31
1,8-Cineole	4.46*	1028	[1.49]	3.06	1165	0.14
(*Z*)-β-Ocimene	4.67	1041	0.03	3.58*	1206	5.36
(*E*)-β-Ocimene	4.83	1051	0.03	3.74*	1218	[0.04]
γ-Terpinene	4.96	1059	5.33	3.58*	1206	[5.36]
cis-Sabinene hydrate	5.06	1066	0.04	6.63	1429	0.05
cis-Linalool oxide (fur.)	5.12	1069	0.03	6.26	1401	0.02
Terpinolene	5.40*	1087	0.61	4.02	1239	0.57
trans-Linalool oxide (fur.)	5.40*	1087	[0.61]	6.57	1424	0.01
trans-Sabinene hydrate	5.54	1096	0.03	7.68	1508	0.04
Linalool	5.66	1104	3.58	7.80	1517	3.58
Hotrienol	5.70	1106	0.02	8.52	1573	0.01
exo-Fenchol	5.78	1111	0.01	7.92	1527	0.01
trans-Pinocarveol	6.13	1134	0.01	8.87	1601	0.01
Borneol	6.57	1162	0.43	9.48*	1650	0.49
Terpinen-4-ol	6.76	1174	0.18	8.28*	1555	0.75
α-Terpineol	6.98	1188	0.11	9.48*	1650	[0.49]
Carvacrol methyl ether	7.82	1244	0.58	8.28*	1555	[0.75]
Thymol	8.64	1299	4.75	14.82	2132	4.71
Carvacrol	8.87	1315	61.76	15.09	2158	61.33
α-Copaene	9.69	1373	0.03	6.89	1448	0.02
β-Caryophyllene	10.28	1415	1.44	8.10	1540	1.44
α-Humulene	10.72	1448	0.03	8.95	1607	0.03
γ-Muurolene	11.07	1474	0.01	9.32	1637	0.01
α-Selinene	11.30	1491	0.02	9.67	1665	0.05
β-Bisabolene	11.53	1508	0.36	9.83	1679	0.32
δ-Cadinene	11.69	1521	0.03	10.09	1700	0.04

β-Sesquiphellandrene	11.70	1522	0.01	10.29	1717	0.01
(*E*)-α-Bisabolene	11.98	1543	0.01	10.45	1730	0.01
Caryophyllene oxide	12.38*	1575	0.39	12.43	1904	0.36
Caryophyllene oxide isomer	12.38*	1575	[0.39]	12.36	1897	0.02
10-epi-Cubenol	12.81	1609	0.01	13.38	1991	0.01
Caryophylladienol I	13.01	1626	0.01	15.71*	2222	0.01
Caryophylladienol II	13.05	1629	0.01	15.71*	2222	[0.01]
τ-Cadinol	13.13	1635	0.04	14.57	2107	0.05
τ-Muurolol	13.17	1639	0.01	14.74	2124	0.01
α-Muurolol	13.20	1641	0.01	14.90	2140	0.01
α-Bisabolol	13.67	1680	0.01	15.17	2167	0.02
Phytone	15.58	1847	0.01	14.36	2086	0.04
Unknown [m/z 81, 150 (90), 136 (88), 135 (74), 93 (54), 121 (41)...]	15.70	1858	0.08			
Unknown [m/z 93, 135 (57), 43 (41), 91 (39), 150 (22)...]	15.99	1884	0.01			
Unknown [m/z 81, 150 (83), 136 (81), 135 (67), 93 (48), 121 (36)...]	16.11	1895	0.17			
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.41	1923	0.06	15.59	2209	0.06
Unknown [m/z 81, 136 (71), 150 (57), 93 (47), 135 (42)...]	16.61	1942	0.01			
Unknown [m/z 151, 135 (46), 109 (41), 43 (26), 150 (24), 107 (23)...]	16.88	1967	0.05			
Unknown [m/z 135, 150 (66), 43 (38), 109 (27), 93 (25), 137 (20)...]	17.44	2022	0.03			
Unknown [m/z 135, 150 (71), 43 (55), 93 (36), 109 (36), 91 (28)...]	18.08	2085	0.01			
Unknown [m/z 69, 41 (81), 91 (37), 166 (35), 105 (33), 43 (30)...]	18.49	2127	0.01	19.64	2660	0.01
Total identified		**98.44%**			**97.78%**	
Total reported		**98.87%**			**97.84%**	

*: 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

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