Date : March 20, 2023

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 23C14-PTH02
Customer identification : Rosemary - Hungary - R40111R
Type : Essential oil
Source : *Rosmarinus officinalis* ct. 1,8-Cineole
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 : Sylvain Mercier, M. Sc., Chimiste 2014-005
Analysis date : March 17, 2023

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4670 ± 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
Isobutyral	tr	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isovaleral	0.13	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	0.02	Aliphatic alcohol
Toluene	tr	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
(2*E*)-Hexenal	tr	Aliphatic aldehyde
(3*Z*)-Hexenol	tr	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Hashishene	0.02	Monoterpene
Tricyclene	0.05	Monoterpene
α-Thujene	0.06	Monoterpene
α-Pinene	14.21	Monoterpene
α-Fenchene	0.71	Monoterpene
Camphene	5.01	Monoterpene
Thuja-2,4(10)-diene	0.03	Monoterpene
Sabinene	tr	Monoterpene
β-Pinene	6.55	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Octan-3-one	tr	Aliphatic ketone
Dehydro-1,8-cineole	0.01	Monoterpenic ether
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	1.43	Monoterpene
α-Phellandrene	0.39	Monoterpene
Pseudolimonene	0.06	Monoterpene
Δ3-Carene	0.03	Monoterpene
α-Terpinene	0.18	Monoterpene
para-Cymene	3.80	Monoterpene
1,8-Cineole	40.08	Monoterpenic ether
Limonene	3.38	Monoterpene
(*Z*)-β-Ocimene	0.06	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	1.63	Monoterpene
cis-Sabinene hydrate	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Fenchone	0.01	Monoterpenic ketone
para-Cymenene	0.03	Monoterpene
Terpinolene	0.10	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
trans-Sabinene hydrate	0.01	Monoterpenic alcohol
Linalool	0.46	Monoterpenic alcohol
Nonanal	0.02	Aliphatic aldehyde

endo-Fenchol	0.03	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol
α-Campholenal	0.01	Monoterpenic aldehyde
Camphor	10.52	Monoterpenic ketone
Camphene hydrate	0.02	Monoterpenic alcohol
Isopulegol	tr	Monoterpenic alcohol
Isoborneol	0.08	Monoterpenic alcohol
Pinocarvone	0.02	Monoterpenic ketone
Isopinocamphone	0.02	Monoterpenic ketone
δ-Terpineol	0.12	Monoterpenic alcohol
Borneol	3.75	Monoterpenic alcohol
Terpinen-4-ol	0.30	Monoterpenic alcohol
Menthol	0.06	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α-Terpineol	2.88	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
Myrtenol	0.02	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Unknown	0.02	Unknown
trans-Carveol	0.01	Monoterpenic alcohol
Bornyl formate	0.01	Monoterpenic ester
cis-para-Mentha-1(7),8-dien-2-ol	0.01	Monoterpenic alcohol
Citronellol	0.01	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone
Piperitone	0.01	Monoterpenic ketone
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Bornyl acetate	0.98	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Unknown	tr	Monoterpenic alcohol
α-Cubebene	0.03	Sesquiterpene
α-Ylangene	0.01	Sesquiterpene
α-Copaene	0.04	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
Isocaryophyllene	0.01	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
α-Gurjunene	0.03	Sesquiterpene
β-Caryophyllene	0.91	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
Aromadendrene	0.24	Sesquiterpene
trans-α-Bergamotene	0.01	Sesquiterpene
α-Humulene	0.07	Sesquiterpene
allo-Aromadendrene	0.07	Sesquiterpene
(*E*)-β-Farnesene	0.01	Sesquiterpene
γ-Muurolene	0.03	Sesquiterpene
β-Selinene	0.02	Sesquiterpene
α-Selinene	0.01	Sesquiterpene
Viridiflorene	0.05	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
β-Bisabolene	0.03	Sesquiterpene
δ-Cadinene	0.04	Sesquiterpene
trans-Calamenene	0.01	Sesquiterpene

Caryophyllene oxide	0.03	Sesquiterpenic ether
Globulol	0.05	Sesquiterpenic alcohol
Viridiflorol	0.01	Sesquiterpenic alcohol
Caryophylladienol II	0.02	Sesquiterpenic alcohol
14-Hydroxy-(*Z*)-caryophyllene	0.01	Sesquiterpenic alcohol
meta-Camphorene	0.02	Diterpene
para-Camphorene	0.01	Diterpene
Consolidated total	**99.39%**	

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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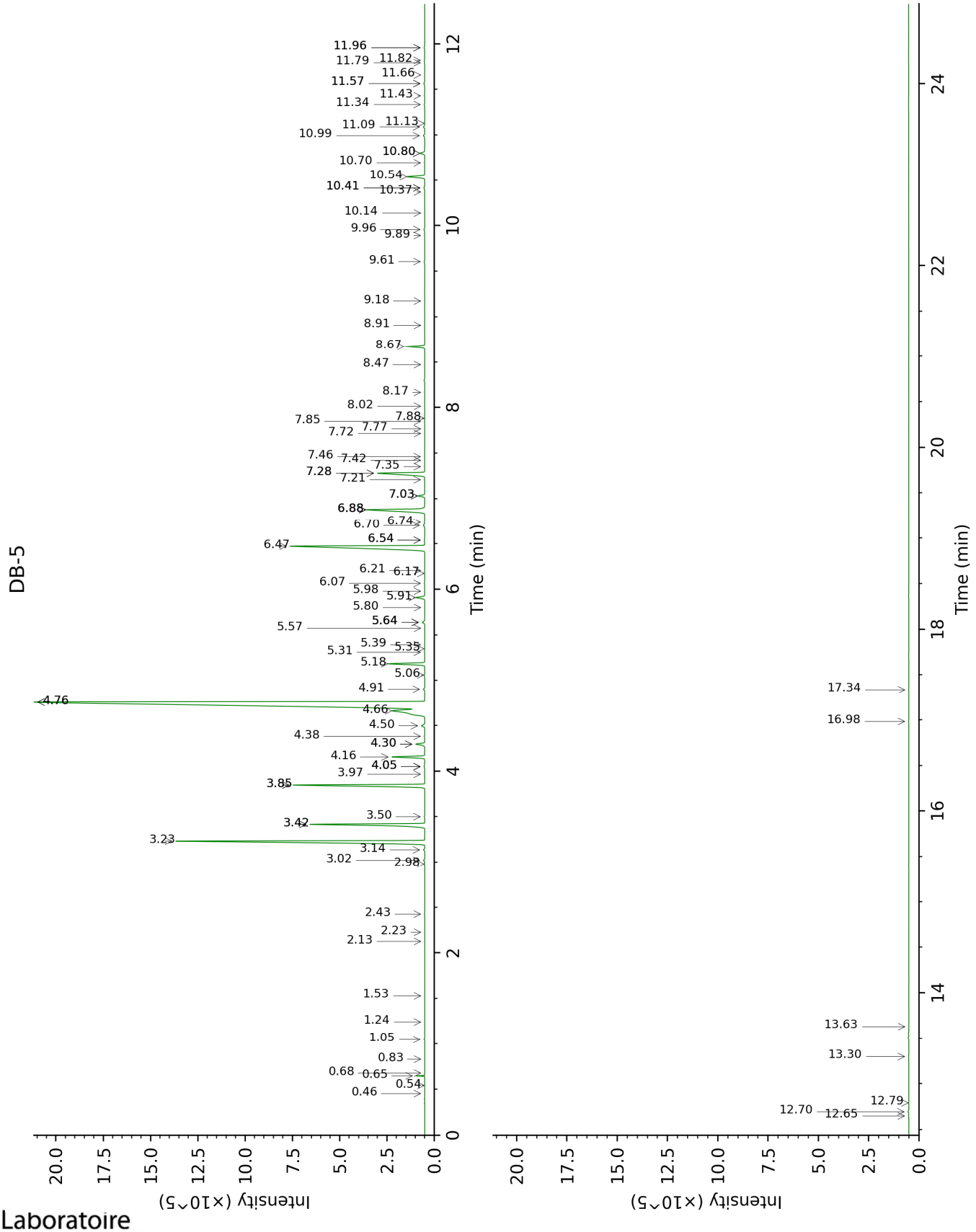
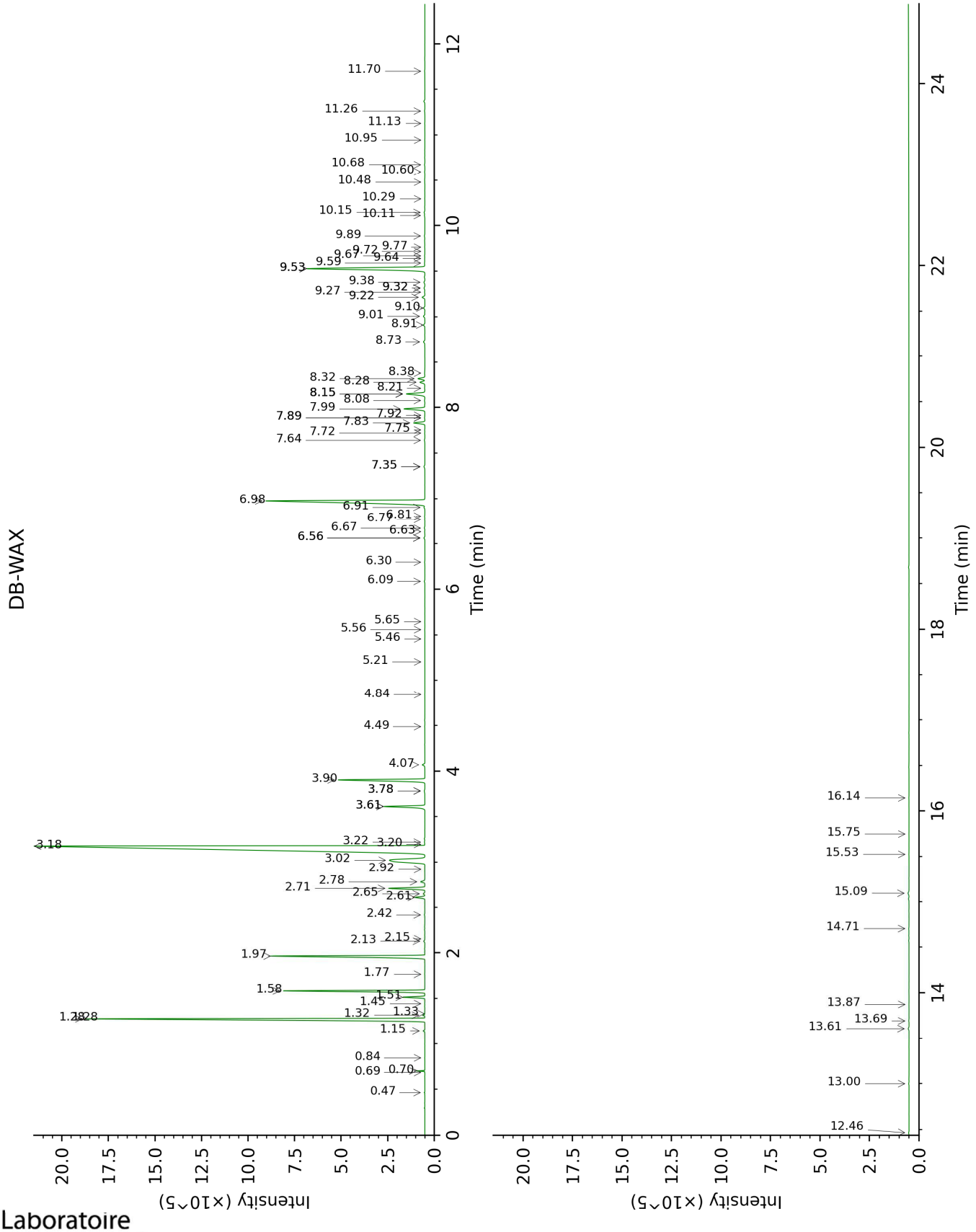

DB-5
Time (min)
Intensity (×10^5)
11.96
11.79
11.82
11.66
11.57
11.43
11.34
11.09
11.13
10.99
10.80
10.70
10.54
10.41
10.37
10.14
9.96
9.89
9.61
9.18
8.91
8.67
8.47
8.17
8.02
7.85
7.88
7.72
7.77
7.46
7.42
7.35
7.28
7.21
7.03
6.88
6.70
6.74
6.54
6.47
6.21
6.17
6.07
5.98
5.91
5.80
5.64
5.57
5.39
5.35
5.31
5.18
5.06
4.91
4.76
4.66
4.50
4.38
4.30
4.16
4.05
3.97
3.85
3.50
3.42
3.23
3.14
3.02
2.98
2.43
2.23
2.13
1.53
1.24
1.05
0.83
0.68
0.65
0.54
0.46
17.34
16.98
13.63
13.30
12.79
12.70
12.65


DB-WAX
Time (min)
Intensity (×10^5)
11.70
11.26
11.13
10.95
10.68
10.60
10.48
10.29
10.15
10.11
9.89
9.77
9.72
9.67
9.64
9.59
9.53
9.38
9.32
9.27
9.22
9.10
9.01
8.91
8.73
8.38
8.32
8.28
8.21
8.15
8.08
7.99
7.92
7.89
7.83
7.75
7.72
7.64
7.35
6.98
6.91
6.81
6.77
6.67
6.63
6.56
6.30
6.09
5.65
5.56
5.46
5.21
4.84
4.49
4.07
3.90
3.78
3.61
3.22
3.20
3.18
3.02
2.92
2.78
2.71
2.65
2.61
2.42
2.15
2.13
1.97
1.77
1.58
1.51
1.45
1.33
1.32
1.15
0.84
0.70
0.69
0.47
16.14
15.75
15.53
15.09
14.71
13.87
13.69
13.61
13.00
12.46

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.46	538	tr	0.47	784	0.01
2-Methyl-3-buten-2-ol	0.54	606	tr	1.44	1013	0.01
Isovaleral	0.65	641	0.13	0.70	888	0.13
2-Methylbutyral	0.68	651	tr	0.69	881	tr
2-Ethylfuran	0.83	701	tr	0.84	919	tr
Isoamyl alcohol	1.05	732	0.02	3.22	1177	0.02
Toluene	1.24	759	tr	1.34	1002	tr
Hexanal	1.53	798	tr	1.77	1046	tr
(2*E*)-Hexenal	2.13	849	tr	3.20	1175	0.01
(3*Z*)-Hexenol	2.23	858	tr	5.56	1348	0.01
Hexanol	2.43	874	0.01	5.20	1322	tr
Hashishene	2.98	916	0.02	1.28*	995	14.28
Tricyclene	3.02	919	0.05	1.15	972	0.05
α-Thujene	3.14	926	0.06	1.32	1000	0.06
α-Pinene	3.23	933	14.21	1.28*	995	[14.28]
α-Fenchene	3.42*	945	5.72	1.52	1020	0.71
Camphene	3.42*	945	[5.72]	1.58	1028	5.01
Thuja-2,4(10)-diene	3.50	950	0.03	2.13	1084	0.05
Sabinene	3.85*	973	6.55	2.16	1087	tr
β-Pinene	3.85*	973	[6.55]	1.97	1067	6.55
Octen-3-ol	3.97	981	0.02	6.56*	1422	0.04
Octan-3-one	4.05*	986	0.05	3.78*	1222	0.03
Dehydro-1,8-cineole	4.05*	986	[0.05]	2.92	1152	0.01
6-Methyl-5-hepten-2-one	4.05*	986	[0.05]	4.84	1304	0.01
Myrcene	4.16	993	1.43	2.71	1135	1.43
α-Phellandrene	4.30*	1002	0.46	2.61	1127	0.39
Pseudolimonene	4.30*	1002	[0.46]	2.65	1130	0.06
Δ3-Carene	4.38	1008	0.03	2.42	1111	0.02
α-Terpinene	4.50	1015	0.18	2.78	1141	0.18
para-Cymene	4.66	1025	3.80	3.90	1231	3.83
1,8-Cineole	4.76*	1031	43.61	3.18	1173	40.08
Limonene	4.76*	1031	[43.61]	3.02	1161	3.38
(*Z*)-β-Ocimene	4.90	1041	0.06	3.61*	1209	1.72
(*E*)-β-Ocimene	5.06	1050	0.03	3.78*	1222	[0.03]
γ-Terpinene	5.18	1058	1.63	3.61*	1209	[1.72]
cis-Sabinene hydrate	5.31	1066	0.02	6.67	1430	0.02
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.35	1068	0.01	4.49	1276	0.01
cis-Linalool oxide (fur.)	5.39	1071	0.01	6.30	1402	0.01

Fenchone	5.57	1082	0.01	5.46	1341	0.01
para-Cymenene	5.64*	1086	0.13	6.09	1387	0.03
Terpinolene	5.64*	1086	[0.13]	4.07	1244	0.10
trans-Linalool oxide (fur.)	5.64*	1086	[0.13]	6.63	1427	0.01
trans-Sabinene hydrate	5.80	1097	0.01	7.72	1509	0.01
Linalool	5.91	1103	0.46	7.83	1518	0.46
Nonanal	5.98	1108	0.02	5.65	1355	0.01
endo-Fenchol	6.07	1113	0.03	8.08	1537	0.02
cis-para-Menth-2-en-1-ol	6.18	1120	0.01	7.89*	1522	0.01
α-Campholenal	6.21	1122	0.01	6.77	1438	0.01
Camphor	6.47	1139	10.52	6.98	1453	10.41
Camphene hydrate	6.54*	1143	0.04	8.21	1548	0.02
Isopulegol	6.54*	1143	[0.04]	7.92	1524	tr
Isoborneol	6.70	1154	0.08	9.10	1618	0.06
Pinocarvone	6.74	1156	0.02	7.64	1503	0.03
Isopinocamphone	6.88*	1165	3.89	7.35*	1481	0.05
δ-Terpineol	6.88*	1165	[3.89]	9.22	1627	0.12
Borneol	6.88*	1165	[3.89]	9.53*	1653	6.63
Terpinen-4-ol	7.03*	1175	0.32	8.32	1556	0.30
Menthol	7.03*	1175	[0.32]	8.91	1602	0.06
para-Cymen-8-ol	7.21	1186	0.02	11.26	1799	0.02
α-Terpineol	7.28*	1190	2.91	9.53*	1653	[6.63]
Myrtenal	7.28*	1190	[2.91]	8.38	1561	0.02
Myrtenol	7.35	1195	0.02	10.60	1742	0.01
Verbenone	7.42	1200	0.01	9.32*	1636	0.05
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.46	1202	0.02	10.68	1749	0.02
trans-Carveol	7.72	1219	0.01	11.13	1788	0.01
Bornyl formate	7.77	1222	0.01	7.76	1512	0.01
cis-para-Mentha-1(7),8-dien-2-ol	7.85	1228	0.01	11.70	1838	0.01
Citronellol	7.88	1230	0.01	10.48	1732	0.01
Carvone	8.02	1239	0.01	9.72	1668	0.01
Piperitone	8.17	1249	0.01	9.64	1662	0.01
trans-Ascaridole glycol	8.47	1269	0.01	13.87	2039	tr
Bornyl acetate	8.67	1283	0.98	7.98	1530	0.97
Unknown [m/z 43, 93 (66), 91 (44), 41 (38), 69 (35)... 152? (1)]	8.91	1298	0.01			
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.18	1317	tr	14.70	2120	0.02

α-Cubebene	9.61	1347	0.03	6.56*	1422	[0.04]
α-Ylangene	9.89	1368	0.01	6.81	1440	0.01
α-Copaene	9.96	1372	0.04	6.90	1448	0.04
Geranyl acetate	10.14	1385	0.01	10.30	1716	tr
Isocaryophyllene	10.37	1401	0.01	7.89*	1522	[0.01]
Methyleugenol	10.41*	1404	0.05	13.00	1956	0.02
α-Gurjunene	10.41*	1404	[0.05]	7.35*	1481	[0.05]
β-Caryophyllene	10.54	1413	0.91	8.15*	1543	0.94
β-Copaene	10.70	1425	0.02	8.15*	1543	[0.94]
Aromadendrene	10.80*	1433	0.25	8.28	1553	0.24
trans-α-Bergamotene	10.80*	1433	[0.25]	8.15*	1543	[0.94]
α-Humulene	11.00	1447	0.07	9.01	1610	0.07
allo-Aromadendrene	11.09	1454	0.07	8.73	1588	0.07
(*E*)-β-Farnesene	11.13	1457	0.01	9.27	1632	0.02
γ-Muurolene	11.34	1473	0.03	9.32*	1636	[0.05]
β-Selinene	11.43	1480	0.02	9.59	1658	0.03
α-Selinene	11.57*	1490	0.05	9.67	1664	0.01
Viridiflorene	11.57*	1490	[0.05]	9.38	1641	0.05
α-Muurolene	11.66	1497	0.02	9.76	1672	0.01
γ-Cadinene	11.79†	1507	0.04	10.11	1701	0.02
β-Bisabolene	11.82†	1509	[0.04]	9.89	1682	0.03
δ-Cadinene	11.96*	1520	0.04	10.15	1704	0.04
trans-Calamenene	11.96*	1520	[0.04]	10.95	1772	0.01
Caryophyllene oxide	12.65	1574	0.03	12.46	1906	0.02
Globulol	12.70	1578	0.05	13.61	2013	0.04
Viridiflorol	12.79	1585	0.01	13.69	2021	0.01
Caryophylladienol II	13.30	1626	0.02	15.75	2226	0.01
14-Hydroxy-(*Z*)-caryophyllene	13.63	1653	0.01	16.14	2267	0.01
meta-Camphorene	16.98	1950	0.02	15.09	2159	0.07
para-Camphorene	17.34	1983	0.01	15.53	2203	0.01
Total identified		**99.50%**			**99.39%**	
Total reported		**99.54%**			**99.44%**	

*: 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