Date : April 07, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20C27-PTH02
Customer identification : Rosemary - Morocco - R40109911R
Type : Essential oil
Source : *Rosmarinus officinalis* ct. 1,8-Cineole
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc.
Analysis date : March 31, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4669 ± 0.0003 (20 °C)

ISO 1342:2001 - OIL OF ROSEMARY - MOROCCO & TUNISIA

Compound	Min. %	Max. %	Observed %	Complies?
Verbenone		0.4	0.1	Yes
Borneol	1	5	2	Yes
α-Terpineol	1.0	2.5	1.2	Yes
Bornyl acetate	0.1	1.6	1.1	Yes
Camphor	5	15	10	Yes
para-Cymene	0.5	2.5	1.4	Yes
1,8-Cineole	38	55	42	Yes
Limonene	1.5	4.0	3.0	Yes
Myrcene	1.0	2.0	1.3	Yes
β-Pinene	4	9	9	Yes
Camphene	2.5	6.0	6.5	No
α-Pinene	9	14	12	Yes
Refractive index	1.4640	1.4700	1.4669	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for Moroccan rosemary oil.

Analysis summary – Consolidated contents

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

Identification	%	Classe
Acetone	0.01	Aliphatic ketone
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Hexanol	0.01	Aliphatic alcohol
Santene	0.06	Normonoterpene
Hashishene	0.02	Monoterpene
Tricyclene	0.48	Monoterpene
α-Thujene	0.17	Monoterpene
α-Pinene	11.83	Monoterpene
Camphene	6.52	Monoterpene
α-Fenchene	0.38	Monoterpene
Thuja-2,4(10)-diene	0.06	Monoterpene
β-Pinene	8.65	Monoterpene
Sabinene	0.09	Monoterpene
Octen-3-ol	0.07	Aliphatic alcohol
Octan-3-one	0.09	Aliphatic ketone
Myrcene	1.26	Monoterpene
Octan-3-ol	0.02	Aliphatic alcohol
α-Phellandrene	0.44	Monoterpene
Pseudolimonene	0.03	Monoterpene
Δ3-Carene	0.38	Monoterpene
α-Terpinene	0.34	Monoterpene
para-Cymene	1.45	Monoterpene
Limonene	3.00	Monoterpene
1,8-Cineole	42.25	Monoterpenic ether
(*Z*)-β-Ocimene	0.05	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	0.85	Monoterpene
cis-Sabinene hydrate	0.03	Monoterpenic alcohol
Terpinolene	0.21	Monoterpene
para-Cymenene	0.02	Monoterpene
α-Pinene oxide	0.02	Monoterpenic ether
trans-Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.95	Monoterpenic alcohol
Unknown	0.01	Unknown
endo-Fenchol	0.01	Monoterpenic alcohol
Hotrienol	0.01	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
cis-Limonene oxide	tr	Monoterpenic ether
Camphor	9.97	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol
Camphene hydrate	0.06	Monoterpenic alcohol
Isoborneol	0.03	Monoterpenic alcohol
Pinocamphone	0.04	Monoterpenic ketone
Pinocarvone	0.04	Monoterpenic ketone

Borneol	1.82	Monoterpenic alcohol
δ-Terpineol	0.16	Monoterpenic alcohol
Isopinocamphone	0.10	Monoterpenic ketone
Terpinen-4-ol	0.34	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	1.16	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.02	Monoterpenic alcohol
Verbenone	0.12	Monoterpenic ketone
Unknown	0.01	Unknown
Citronellol	0.01	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone
Piperitone	0.01	Monoterpenic ketone
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Bornyl acetate	1.07	Monoterpenic ester
α-Cubebene	0.02	Sesquiterpene
α-Ylangene	0.03	Sesquiterpene
α-Copaene	0.07	Sesquiterpene
cis-para-Mentha-6,8-diene-2-hydroperoxide	0.01	Monoterpenic peroxide
Methyleugenol	0.03	Phenylpropanoid
β-Caryophyllene	3.70	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
Aromadendrene	0.03	Sesquiterpene
α-Humulene	0.22	Sesquiterpene
(*E*)-β-Farnesene	0.01	Sesquiterpene
trans-Cadina-1(6),4-diene	0.01	Sesquiterpene
γ-Muurolene	0.05	Sesquiterpene
β-Selinene	0.02	Sesquiterpene
Unknown	0.03	Unknown
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.07	Sesquiterpene
δ-Cadinene	0.09	Sesquiterpene
trans-Cadina-1,4-diene	0.02	Sesquiterpene
α-Calacorene	0.03	Sesquiterpene
Unknown	0.01	Sesquiterpene
Caryophyllene oxide	0.05	Sesquiterpenic ether
Ledol?	0.01	Oxygenated sesquiterpene
Humulene epoxide II	0.01	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
meta-Camphorene	0.02	Diterpene
Consolidated total	**99.41%**	

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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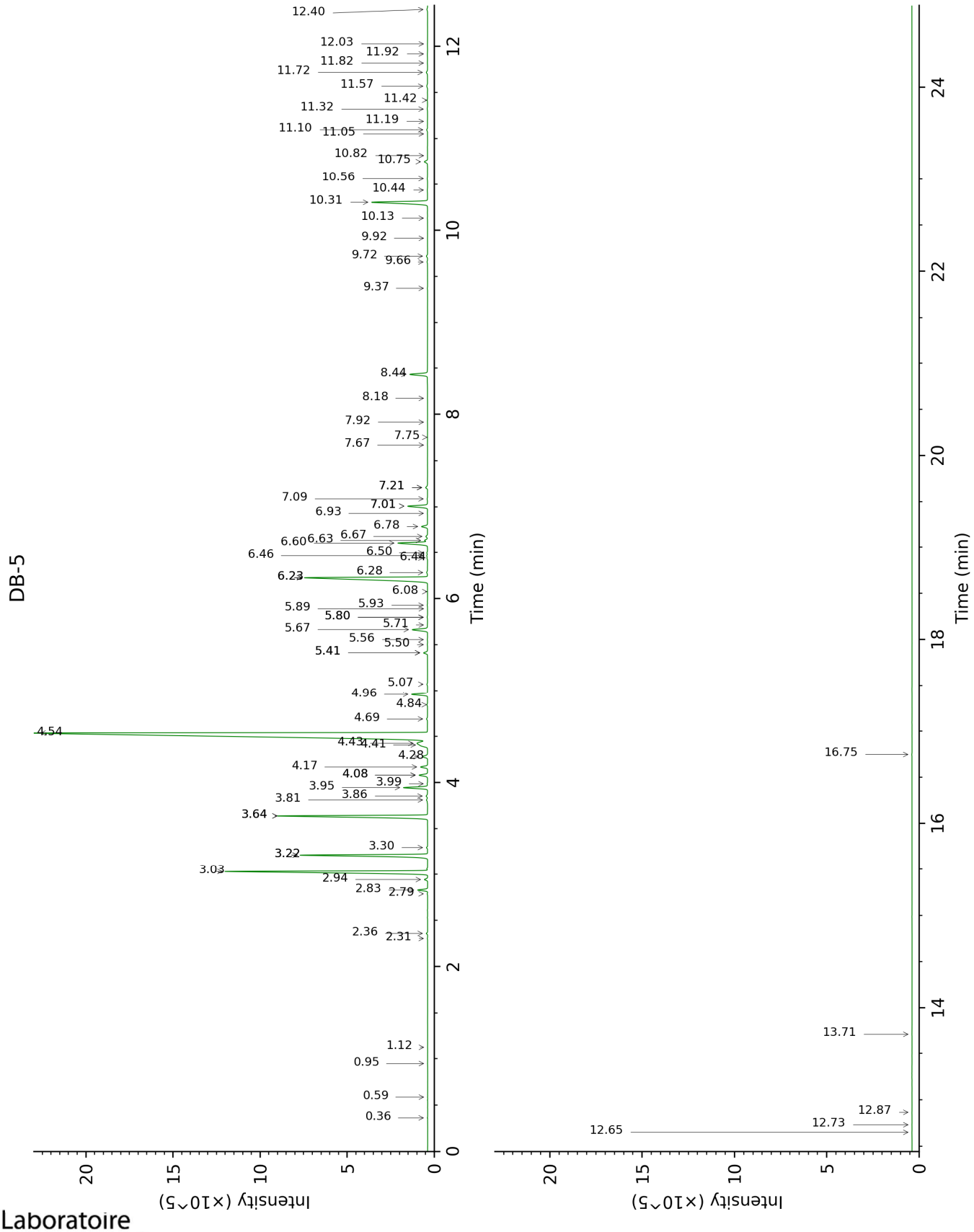
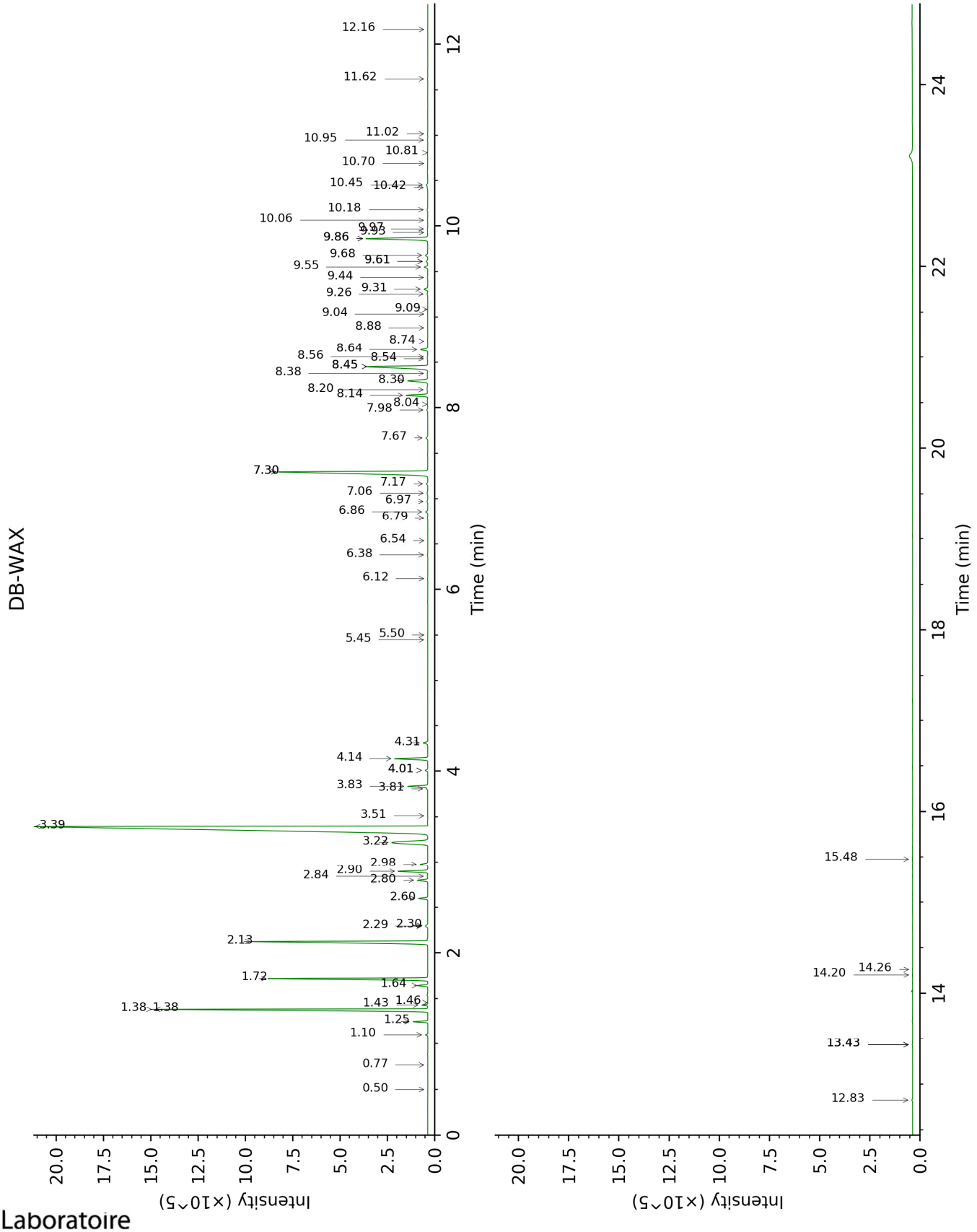

DB-5
12.40
12.03
11.92
11.82
11.72
11.57
11.42
11.32
11.19
11.10
11.05
10.82
10.75
10.56
10.44
10.31
10.13
9.92
9.72
9.66
9.37
8.44
8.18
7.92
7.75
7.67
7.21
7.09
7.01
6.93
6.78
6.67
6.63
6.60
6.50
6.46
6.44
6.28
6.23
6.08
5.93
5.89
5.80
5.71
5.67
5.56
5.50
5.41
5.07
4.96
4.84
4.69
4.54
4.43
4.41
4.28
4.17
4.08
3.99
3.95
3.86
3.81
3.64
3.30
3.22
3.03
2.94
2.83
2.79
2.36
2.31
1.12
0.95
0.59
0.36
Time (min)
Intensity (×10^5)
16.75
13.71
12.87
12.73
12.65
Time (min)
Intensity (×10^5)


DB-WAX
Time (min)
Intensity (×10^5)
12.16
11.62
11.02
10.95
10.81
10.70
10.45
10.42
10.18
10.06
9.97
9.93
9.86
9.68
9.61
9.55
9.44
9.31
9.26
9.09
9.04
8.88
8.74
8.64
8.56
8.54
8.45
8.38
8.30
8.20
8.14
8.04
7.98
7.67
7.30
7.17
7.06
6.97
6.86
6.79
6.54
6.38
6.12
5.50
5.45
4.31
4.14
4.01
3.83
3.81
3.51
3.39
3.22
2.98
2.90
2.84
2.80
2.60
2.30
2.29
2.13
1.72
1.64
1.46
1.43
1.38
1.38
1.25
1.10
0.77
0.50
15.48
14.26
14.20
13.43
12.83

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetone	0.36	522	0.01	0.50	787	tr
Isovaleral	0.59	640	tr	0.77	891	tr
2-Methylbutanol	0.95	738	tr	3.51	1181	0.01
Toluene	1.12	762	tr	1.46	1002	tr
Hexanol	2.31	878	0.01	5.50	1324	tr
Santene	2.36	883	0.06	1.10	949	0.07
Hashishene	2.79	915	0.02	1.38*	995	11.72
Tricyclene	2.83	918	0.48	1.25	973	0.48
α-Thujene	2.94	925	0.17	1.43	999	0.17
α-Pinene	3.03	931	11.83	1.38*	995	[11.72]
Camphene	3.22*	943	6.97	1.72	1028	6.52
α-Fenchene	3.22*	943	[6.97]	1.64	1021	0.38
Thuja-2,4(10)-diene	3.30	949	0.06	2.30	1086	0.05
β-Pinene	3.64*	971	8.81	2.13	1068	8.65
Sabinene	3.64*	971	[8.81]	2.29	1085	0.09
Octen-3-ol	3.81	983	0.07	6.86	1422	0.10
Octan-3-one	3.86	986	0.09	4.01*	1218	0.11
Myrcene	3.95	992	1.26	2.90	1134	1.26
Octan-3-ol	3.99	994	0.02	6.12	1369	0.01
α-Phellandrene	4.08*	1001	0.48	2.80	1126	0.44
Pseudolimonene	4.08*	1001	[0.48]	2.84	1129	0.03
Δ3-Carene	4.17	1006	0.38	2.60	1110	0.38
α-Terpinene	4.28	1013	0.34	2.98	1140	0.34
para-Cymene	4.41†	1021	46.89	4.14	1227	1.45
Limonene	4.43†	1022	[46.89]	3.22	1158	3.00
1,8-Cineole	4.54†	1030	[46.89]	3.39	1172	42.25
(*Z*)-β-Ocimene	4.69	1039	0.05	3.81	1203	0.04
(*E*)-β-Ocimene	4.84	1049	0.03	4.01*	1218	[0.11]
γ-Terpinene	4.96	1056	0.85	3.84	1205	0.87
cis-Sabinene hydrate	5.07	1063	0.03	6.97	1431	0.04
Terpinolene	5.41*	1085	0.23	4.31	1239	0.21
para-Cymenene	5.41*	1085	[0.23]	6.38	1387	0.02
α-Pinene oxide	5.50	1091	0.02	5.45	1321	0.02
trans-Sabinene hydrate	5.56	1094	0.02	8.04	1510	0.02
Linalool	5.66	1101	0.95	8.14	1518	0.99
Unknown [m/z 139, 95 (95), 109 (64), 121 (40), 41 (23), 136 (22)...]	5.72	1104	0.01			
endo-Fenchol	5.80*	1110	0.02	8.54	1549	0.01
Hotrienol	5.80*	1110	[0.02]	8.88	1575	0.01
trans-para-Mentha-2,8-dien-1-ol	5.89	1116	0.01	9.04	1587	0.01
cis-para-Menth-2-	5.93	1118	0.02	8.20	1523	0.03

en-1-ol						
cis-Limonene oxide	6.08	1128	tr	6.54	1399	tr
Camphor	6.23*	1138	10.03	7.30*	1455	10.01
trans-para-Menth-2-en-1-ol	6.23*	1138	[10.03]	9.09	1591	0.01
Camphene hydrate	6.28	1141	0.06	8.45*	1542	3.66
Isoborneol	6.44	1151	0.03	9.44	1619	0.03
Pinocamphone	6.46	1153	0.04	7.30*	1455	[10.01]
Pinocarvone	6.50	1155	0.04	7.98	1506	0.05
Borneol	6.60	1162	1.82	9.86*	1654	3.01
δ-Terpineol	6.63	1164	0.16	9.55	1628	0.17
Isopinocamphone	6.67	1167	0.10	7.67	1482	0.09
Terpinen-4-ol	6.78	1174	0.34	8.64	1557	0.35
para-Cymen-8-ol	6.93	1184	0.01	11.62	1800	0.02
α-Terpineol	7.01*	1189	1.17	9.86*	1654	[3.01]
Myrtenal	7.01*	1189	[1.17]	8.74	1564	0.01
Myrtenol	7.09	1194	0.02	10.95	1744	0.02
Verbenone	7.21*	1202	0.12	9.68	1639	0.12
Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	7.21*	1202	[0.12]	11.02	1749	0.01
Citronellol	7.67	1234	0.01	10.81	1732	0.01
Carvone	7.75	1240	0.01	10.06	1670	0.02
Piperitone	7.92	1251	0.01	9.97	1662	0.02
trans-Ascaridole glycol	8.18	1269	0.01	14.26	2041	0.01
Bornyl acetate	8.44	1287	1.07	8.30	1530	1.07
α-Cubebene	9.37	1348	0.02	6.79	1417	0.02
α-Ylangene	9.66	1368	0.03	7.06	1438	0.04
α-Copaene	9.72	1372	0.07	7.17	1445	0.07
cis-para-Mentha-6,8-diene-2-hydroperoxide	9.92	1386	0.01			
Methyleugenol	10.13	1401	0.03	13.43*	1963	0.04
β-Caryophyllene	10.31	1414	3.70	8.45*	1542	[3.66]
β-Copaene	10.44	1424	0.02	8.38	1536	0.02
Aromadendrene	10.56	1433	0.03	8.56	1550	0.02
α-Humulene	10.75	1447	0.22	9.31	1609	0.20
(*E*)-β-Farnesene	10.82	1452	0.01	9.61*	1634	0.08
trans-Cadina-1(6),4-diene	11.05	1470	0.01	9.26	1605	0.04
γ-Muurolene	11.10	1473	0.05	9.61*	1634	[0.08]
β-Selinene	11.19	1480	0.02	9.93	1659	0.01
Unknown [m/z 59, 94 (67), 95 (50), 79 (44), 43 (41), 73 (16)...]	11.32	1490	0.03			
α-Muurolene	11.42	1497	0.02	10.18	1679	0.03

γ-Cadinene	11.57	1508	0.07	10.45	1702	0.08
δ-Cadinene	11.72	1520	0.09	10.42	1699	0.03
trans-Cadina-1,4-diene	11.82	1528	0.02	10.70	1722	0.01
α-Calacorene	11.92	1536	0.03	12.16	1848	0.01
Unknown [m/z 148, 133 (86), 107 (67), 93 (58), 95 (51), 91 (51)... 204 (7)]	12.03	1544	0.01			
Caryophyllene oxide	12.40	1574	0.05	12.83	1907	0.04
Ledol?	12.65	1593	0.01	13.43*	1963	[0.04]
Humulene epoxide II	12.73	1600	0.01	13.43*	1963	[0.04]
Unknown [m/z 94, 91 (83), 105 (78), 79 (75), 107 (62), 120 (58)... 218 (11)]	12.87	1610	0.01	14.20	2036	0.02
Unknown [m/z 43, 108 (62), 93 (51), 41 (42), 109 (37), 69 (36)...]	13.71	1680	0.01			
meta-Camphorene	16.75	1952	0.02	15.48	2161	0.02
Total identified		**99.73%**			**99.23%**	
Total reported		**99.80%**			**99.26%**	

*: 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