Date : April 06, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21C19-PTH13
Customer identification : Rosemary ORGANIC - Tunisia - R501092010R
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 : Seydou Ka, M. Sc.
Analysis date : March 29, 2021

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4668 ± 0.0003 (20 °C; method PC-MAT-016)

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

Compound	Min. %	Max. %	Observed %	Complies?
α-Pinene	9	14	11	Yes
Camphene	2.5	6.0	4.4	Yes
β-Pinene	4	9	8	Yes
Myrcene	1.0	2.0	1.4	Yes
Limonene	1.5	4.0	2.2	Yes
1,8-Cineole	38	55	46*	Yes
para-Cymene	0.5	2.5	1.1	Yes
Camphor	5	15	11	Yes
Bornyl acetate	0.1	1.6	0.9	Yes
α-Terpineol	1.0	2.5	1.5	Yes
Borneol	1	5	2	Yes
Verbenone		0.4	tr	Yes
Refractive index	1.4640	1.4700	1.4668	Yes

*Coelutes with a small amount of β-phellandrene on both columns considered

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

Analysis summary – Consolidated contents

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

Identification	%	Class
Isovaleral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
(3*Z*)-Hexenol	0.03	Aliphatic alcohol
Hashishene	0.02	Monoterpene
Tricyclene	0.16	Monoterpene
α-Thujene	0.39	Monoterpene
α-Pinene	10.55	Monoterpene
Camphene	4.41	Monoterpene
α-Fenchene	0.06	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
Sabinene	0.14	Monoterpene
β-Pinene	8.36	Monoterpene
Octen-3-ol	0.03	Aliphatic alcohol
Octan-3-one	0.01	Aliphatic ketone
Dehydro-1,8-cineole	0.02	Monoterpenic ether
Myrcene	1.38	Monoterpene
Octan-3-ol	0.01	Aliphatic alcohol
α-Phellandrene	0.14	Monoterpene
Pseudolimonene	0.03	Monoterpene
Δ3-Carene	0.26	Monoterpene
α-Terpinene	0.42	Monoterpene
para-Cymene	1.13	Monoterpene
β-Phellandrene	45.56*	Monoterpene
1,8-Cineole	[45.56]*	Monoterpenic ether
Limonene	2.19	Monoterpene
(*Z*)-β-Ocimene	0.05	Monoterpene
(*E*)-β-Ocimene	0.07	Monoterpene
γ-Terpinene	0.77	Monoterpene
cis-Sabinene hydrate	0.14	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.39	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
trans-Sabinene hydrate	0.07	Monoterpenic alcohol
Linalool	0.74	Monoterpenic alcohol
Unknown	0.02	Unknown
endo-Fenchol	0.03	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
α-Campholenal	0.02	Monoterpenic aldehyde
cis-Limonene oxide	0.01	Monoterpenic ether
Camphor	10.53	Monoterpenic ketone

Camphene hydrate	0.05	Monoterpenic alcohol
Isoborneol	0.02	Monoterpenic alcohol
Pinocarvone	0.01	Monoterpenic ketone
Borneol	2.39	Monoterpenic alcohol
δ-Terpineol	0.32	Monoterpenic alcohol
Terpinen-4-ol	0.73	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	1.47	Monoterpenic alcohol
Myrtenol	0.02	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Bornyl formate	0.01	Monoterpenic ester
cis-Carveol	0.02	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Piperitone	0.01	Monoterpenic ketone
Linalyl acetate	0.02	Monoterpenic ester
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Bornyl acetate	0.94	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Unknown	0.02	Monoterpenic alcohol
Unknown	0.01	Unknown
α-Cubebene	0.05	Sesquiterpene
Eugenol	0.02	Phenylpropanoid
α-Ylangene	0.05	Sesquiterpene
α-Copaene	0.19	Sesquiterpene
α-Gurjunene	0.02	Sesquiterpene
Methyleugenol	0.03	Phenylpropanoid
β-Caryophyllene	3.27	Sesquiterpene
β-Copaene	0.06	Sesquiterpene
Aromadendrene	0.05	Sesquiterpene
α-Humulene	0.34	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.01	Sesquiterpene
trans-Cadina-1(6),4-diene	0.01	Sesquiterpene
γ-Muurolene	0.15	Sesquiterpene
β-Selinene	0.01	Sesquiterpene
α-Selinene	0.06	Sesquiterpene
α-Muurolene	0.04	Sesquiterpene
β-Bisabolene	0.06	Sesquiterpene
γ-Cadinene	0.10	Sesquiterpene
trans-Calamenene	0.02	Sesquiterpene
δ-Cadinene	0.18	Sesquiterpene
trans-Cadina-1,4-diene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.12	Sesquiterpenic ether
14-Hydroxy-(*Z*)-caryophyllene	0.01	Sesquiterpenic alcohol
Unknown	tr	Oxygenated sesquiterpene
Consolidated total	**99.32%**	

*: 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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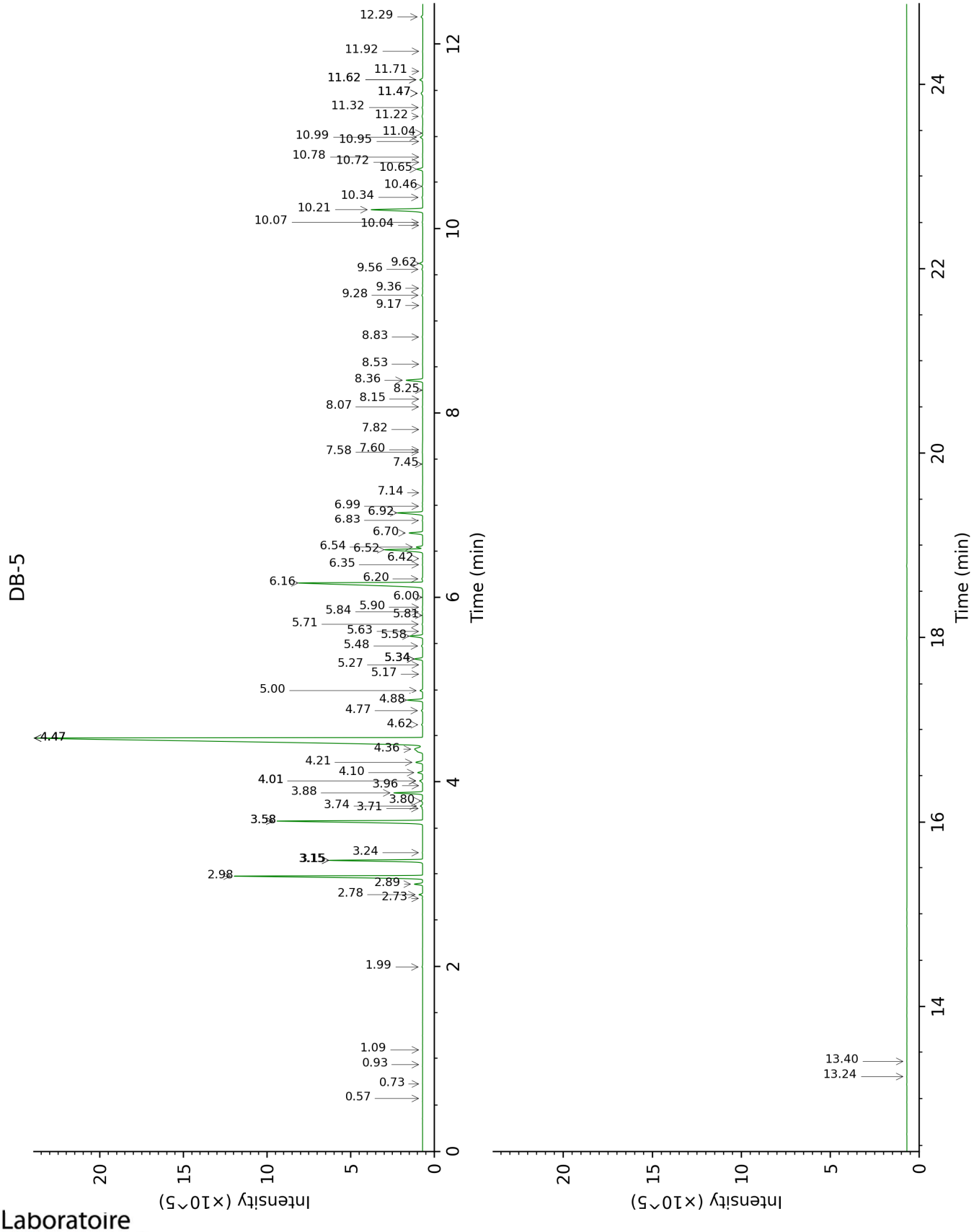
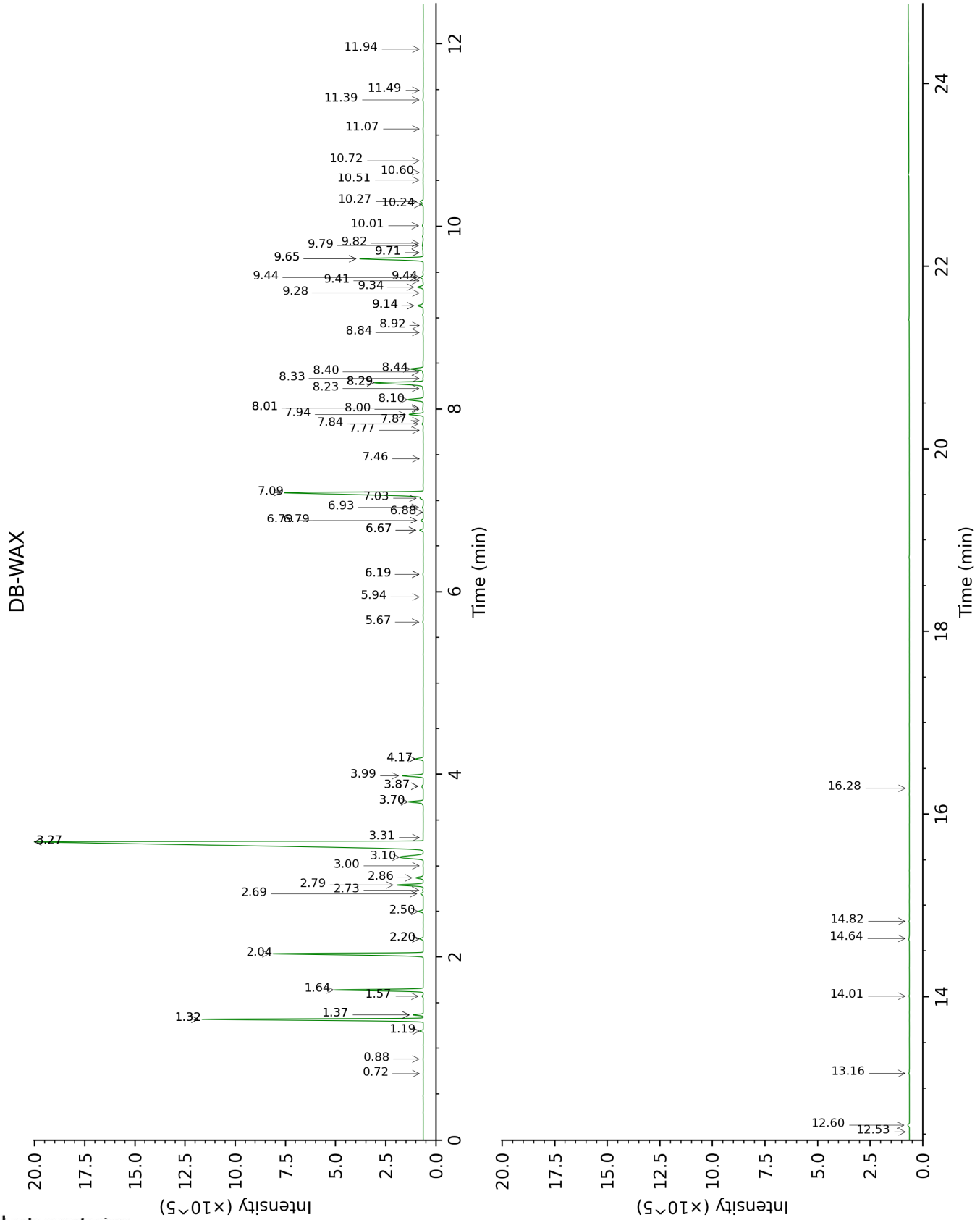

DB-5
Intensity (×10^5)
Time (min)
12.29
11.92
11.71
11.62
11.47
11.32
11.22
11.04
10.99
10.95
10.78
10.72
10.65
10.46
10.34
10.21
10.07
10.04
9.62
9.56
9.36
9.28
9.17
8.83
8.53
8.36
8.25
8.15
8.07
7.82
7.60
7.58
7.45
7.14
6.99
6.92
6.83
6.70
6.54
6.52
6.42
6.35
6.20
6.16
6.00
5.90
5.84
5.81
5.71
5.63
5.58
5.48
5.34
5.27
5.17
5.00
4.88
4.77
4.62
4.47
4.36
4.21
4.10
4.01
3.96
3.88
3.80
3.74
3.71
3.58
3.24
3.15
2.98
2.89
2.78
2.73
1.99
1.09
0.93
0.73
0.57
13.40
13.24


DB-WAX
Time (min)
Intensity (×10^5)
11.94
11.49
11.39
11.07
10.72
10.60
10.51
10.27
10.24
10.01
9.79
9.82
9.71
9.65
9.44
9.41
9.44
9.34
9.28
9.14
8.84
8.92
8.33
8.40
8.44
8.23
8.29
8.10
8.01
7.94
8.00
7.84
7.87
7.77
7.46
7.09
7.03
6.93
6.88
6.79
6.67
6.19
5.94
5.67
4.17
3.99
3.87
3.70
3.27
3.31
3.10
3.00
2.86
2.79
2.73
2.69
2.50
2.20
2.04
1.64
1.57
1.37
1.32
1.19
0.88
0.72
16.28
14.82
14.64
14.01
13.16
12.60
12.53

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.57	641	tr	0.72	886	tr
2-Ethylfuran	0.73	701	tr	0.88	920	0.01
Isoamyl alcohol	0.93	734	tr	3.31	1176	0.01
Toluene	1.09	758	tr	1.37*	1002	0.40
(3*Z*)-Hexenol	1.99	856	0.03	5.67	1349	0.03
Hashishene	2.74	916	0.02	1.32*	995	10.59
Tricyclene	2.78	919	0.16	1.19	973	0.16
α-Thujene	2.89	927	0.39	1.37*	1002	[0.40]
α-Pinene	2.98	933	10.55	1.32*	995	[10.59]
Camphene	3.15*	945	4.48	1.64	1029	4.41
α-Fenchene	3.15*	945	[4.48]	1.57	1022	0.06
Thuja-2,4(10)-diene	3.24	950	0.02	2.20*	1085	0.18
Sabinene	3.58*	973	8.50	2.20*	1085	[0.18]
β-Pinene	3.58*	973	[8.50]	2.04	1069	8.36
Octen-3-ol	3.71	983	0.03	6.67*	1422	0.19
Octan-3-one	3.74†	984	1.62	3.87*	1219	0.08
Dehydro-1,8-cineole	3.80†	988	[1.62]	3.00	1152	0.02
Myrcene	3.88†	994	[1.62]	2.79	1135	1.38
Octan-3-ol	3.96	999	0.01	5.94	1369	tr
α-Phellandrene	4.01*	1003	0.19	2.69	1127	0.14
Pseudolimonene	4.01*	1003	[0.19]	2.73	1130	0.03
Δ3-Carene	4.10	1008	0.26	2.50	1112	0.25
α-Terpinene	4.21	1016	0.42	2.86	1141	0.42
para-Cymene	4.36	1024	1.13	3.99	1227	1.09
β-Phellandrene	4.47*	1032	47.76	3.27*	1172	45.51
1,8-Cineole	4.47*	1032	[47.76]	3.27*	1172	[45.51]
Limonene	4.47*	1032	[47.76]	3.10	1159	2.19
(*Z*)-β-Ocimene	4.62	1041	0.05	3.70*	1206	0.83
(*E*)-β-Ocimene	4.77	1051	0.07	3.87*	1219	[0.08]
γ-Terpinene	4.88	1058	0.77	3.70*	1206	[0.83]
cis-Sabinene hydrate	5.00	1065	0.14	6.78*	1431	0.14
Octanol	5.17	1076	0.01	8.00	1522	0.02
Isoterpinolene	5.27	1083	0.01	4.17*	1240	0.40
Terpinolene	5.34*	1087	0.43	4.17*	1240	[0.40]
para-Cymenene	5.34*	1087	[0.43]	6.19*	1387	0.02
trans-Linalool oxide (fur.)	5.34*	1087	[0.43]	6.78*	1431	[0.14]
trans-Sabinene hydrate	5.48	1096	0.07	7.84	1510	0.06
Linalool	5.58	1102	0.74	7.94	1518	0.75
Unknown [m/z 139, 95 (95), 109 (64), 121 (40), 41 (23), 136 (22)...]	5.63	1106	0.02			
endo-Fenchol	5.71	1111	0.03	8.23	1540	0.04

trans-para-Mentha-2,8-dien-1-ol	5.81	1117	0.01	8.84	1589	0.01
cis-para-Menth-2-en-1-ol	5.84	1119	0.03	8.01*	1524	0.05
α-Campholenal	5.90	1122	0.02	6.88	1438	0.01
cis-Limonene oxide	6.00	1129	0.01	6.19*	1387	[0.02]
Camphor	6.16	1139	10.53	7.09	1454	10.46
Camphene hydrate	6.20	1142	0.05	8.33	1549	0.03
Isoborneol	6.35	1152	0.02	9.28	1623	0.01
Pinocarvone	6.42	1156	0.01	7.77	1505	0.02
Borneol	6.52	1162	2.39	9.65*	1654	3.85
δ-Terpineol	6.54	1164	0.32	9.34	1628	0.33
Terpinen-4-ol	6.70	1174	0.73	8.44	1557	0.73
para-Cymen-8-ol	6.83	1183	0.03	11.39	1800	0.03
α-Terpineol	6.92	1188	1.47	9.65*	1654	[3.85]
Myrtenol	6.99	1193	0.02	10.72	1744	0.02
Verbenone	7.14	1202	0.01	9.44*	1637	0.17
Bornyl formate	7.45	1223	0.01	7.87	1513	0.01
cis-Carveol	7.58	1232	0.02	11.49	1810	0.01
Citronellol	7.60	1234	0.02	10.60	1733	0.02
Piperitone	7.82	1248	0.01	9.71*	1659	0.03
Linalyl acetate	8.07	1265	0.02	8.01*	1524	[0.05]
trans-Ascaridole glycol	8.15	1270	0.01	14.01	2041	0.02
Unknown [m/z 43, 79 (78), 128 (46), 58 (42), 127 (42)...]	8.25	1277	0.01	12.53	1902	0.01
Bornyl acetate	8.36	1284	0.94	8.10	1531	0.94
Unknown [m/z 43, 93 (66), 91 (44), 41 (38), 69 (35)... 152? (1)]	8.53	1296	0.01			
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	8.83	1316	0.02	14.82	2121	0.02
Unknown [m/z 133, 105 (45), 91 (38), 119 (36)... 150 (3)]	9.17	1341	0.01			
α-Cubebene	9.28	1348	0.05	6.67*	1422	[0.19]
Eugenol	9.36	1354	0.02	14.64	2102	0.02
α-Ylangene	9.56	1368	0.05	6.93	1442	0.05
α-Copaene	9.62	1373	0.19	7.03	1449	0.17
α-Gurjunene	10.04	1402	0.02	7.46	1481	0.01
Methyleugenol	10.07	1404	0.03	13.16	1961	0.03
β-Caryophyllene	10.20	1414	3.27	8.29*	1545	3.33
β-Copaene	10.34	1424	0.06	8.29*	1545	[3.33]

Aromadendrene	10.46	1433	0.05	8.40	1554	0.04
α-Humulene	10.65	1448	0.34	9.14*	1612	0.37
allo-Aromadendrene	10.72	1453	0.01	8.92	1595	0.01
(*E*)-β-Farnesene	10.78	1457	0.01	9.41	1634	0.02
trans-Cadina-1(6),4-diene	10.95	1470	0.01	9.14*	1612	[0.37]
γ-Muurolene	11.00	1474	0.15	9.44*	1637	[0.17]
β-Selinene	11.04	1477	0.01	9.71*	1659	[0.03]
α-Selinene	11.22	1490	0.06	9.79	1666	0.08
α-Muurolene	11.32	1497	0.04	9.82	1668	0.04
β-Bisabolene	11.47*	1509	0.13	10.01	1683	0.06
γ-Cadinene	11.47*	1509	[0.13]	10.24	1702	0.10
trans-Calamenene	11.62*	1521	0.19	11.07	1773	0.02
δ-Cadinene	11.62*	1521	[0.19]	10.27	1705	0.18
trans-Cadina-1,4-diene	11.71	1528	0.01	10.51	1725	0.02
Isocaryophyllene epoxide B	11.92	1545	0.02	11.94	1850	0.01
Caryophyllene oxide	12.30	1574	0.12	12.60	1908	0.10
14-Hydroxy-(*Z*)-caryophyllene	13.24	1651	0.01	16.28	2270	0.01
Unknown [m/z 43, 108 (62), 93 (51), 41 (42), 109 (37), 69 (36)...]	13.40	1664	tr			
Total identified		**99.45%**			**99.19%**	
Total reported		**99.51%**			**99.21%**	

*: 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