Date : April 12, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22D07-PTH05
Customer identification : Oregano ORGANIC - Spain - O50112R
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 : Seydou Ka, Ph. D.
Analysis date : April 11, 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid
Refractive index: 1.5090 ± 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	0.01	Aliphatic aldehyde
Acetic acid	tr	Aliphatic acid
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.08	Aliphatic ester
Octane	0.01	Alkane
(3*Z*)-Hexenol	tr	Aliphatic alcohol
Heptan-3-one	0.01	Aliphatic ketone
Hashishene	0.01	Monoterpene
Tricyclene	0.01	Monoterpene
α-Thujene	1.21	Monoterpene
α-Pinene	1.05	Monoterpene
Camphene	0.19	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β-Pinene	0.17	Monoterpene
Sabinene	0.01	Monoterpene
Octen-3-ol	0.47	Aliphatic alcohol
Octan-3-one	0.23	Aliphatic ketone
Myrcene	1.72	Monoterpene
Pseudolimonene	0.01	Monoterpene
α-Phellandrene	0.20	Monoterpene
Δ3-Carene	0.09	Monoterpene
α-Terpinene	1.15	Monoterpene
para-Cymene	7.37	Monoterpene
Limonene	0.23	Monoterpene
1,8-Cineole	0.24	Monoterpenic ether
(*Z*)-β-Ocimene	0.10	Monoterpene
(*E*)-β-Ocimene	0.09	Monoterpene
γ-Terpinene	5.29	Monoterpene
cis-Sabinene hydrate	0.30	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.10	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
para-Cymenene	0.04	Monoterpene
trans-Sabinene hydrate	0.11	Monoterpenic alcohol
Linalool	1.18	Monoterpenic alcohol
Hotrienol	0.01	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
Camphor	0.03	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
Borneol	0.28	Monoterpenic alcohol

Terpinen-4-ol	0.72	Monoterpenic alcohol
α-Terpineol	0.14	Monoterpenic alcohol
cis-Dihydrocarvone	0.05	Monoterpenic ketone
trans-Dihydrocarvone	0.07	Monoterpenic ketone
trans-Piperitol	0.05	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone
Carvacrol methyl ether	0.06	Monoterpenic ether
Carvenone	0.04	Monoterpenic ketone
Geraniol	0.03	Monoterpenic alcohol
Bornyl acetate	0.02	Monoterpenic ester
Thymol	3.21	Monoterpenic alcohol
Carvacrol	69.29	Monoterpenic alcohol
α-Copaene	0.01	Sesquiterpene
Carvacryl acetate	0.02	Monoterpenic ester
β-Bourbonene	0.02	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
β-Elemene	0.02	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
β-Caryophyllene	2.18	Sesquiterpene
β-Copaene	0.01	Sesquiterpene
Aromadendrene	0.01	Sesquiterpene
α-Humulene	0.16	Sesquiterpene
Thymohydroquinone isomer?	0.01	Simple phenolic
(*E*)-β-Farnesene	0.04	Sesquiterpene
cis-Muurola-4(15),5-diene	0.02	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
α-Selinene	0.01	Sesquiterpene
(3*Z*,6*E*)-α-Farnesene	0.01	Sesquiterpene
β-Bisabolene	0.28	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.19	Sesquiterpenic ether
Spathulenol	0.01	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Humulene epoxide I	0.01	Sesquiterpenic ether
Humulene epoxide II	tr	Sesquiterpenic ether
Caryophylladienol I	tr	Sesquiterpenic alcohol
Caryophylladienol II	0.01	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.02	Sesquiterpenic alcohol
Phytone	tr	Terpenic ketone
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.06	Unknown
Unknown	0.05	Unknown
Unknown	0.01	Unknown
meta-Camphorene	tr	Diterpene
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.03	Unknown

Consolidated total	**99.13%**	

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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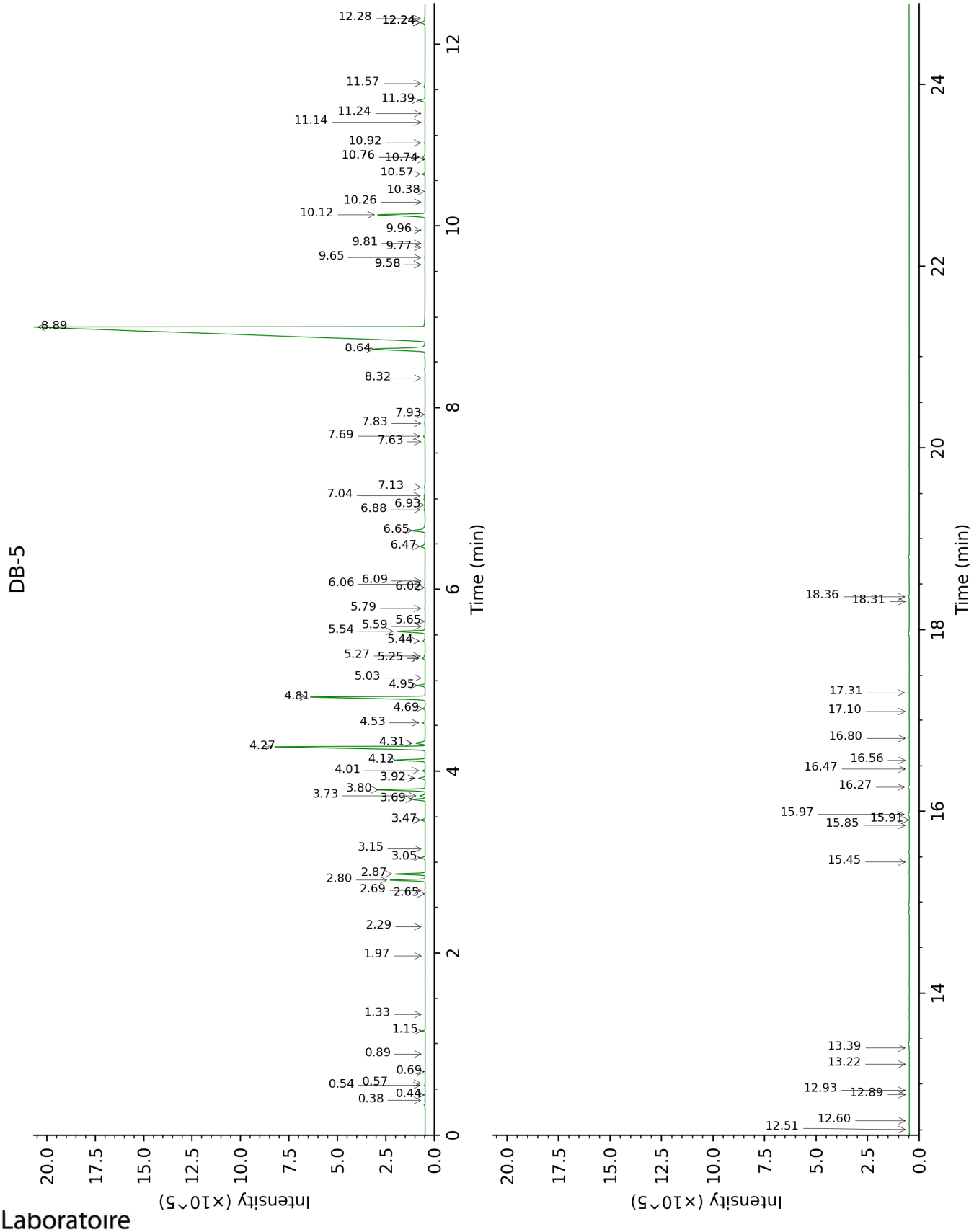
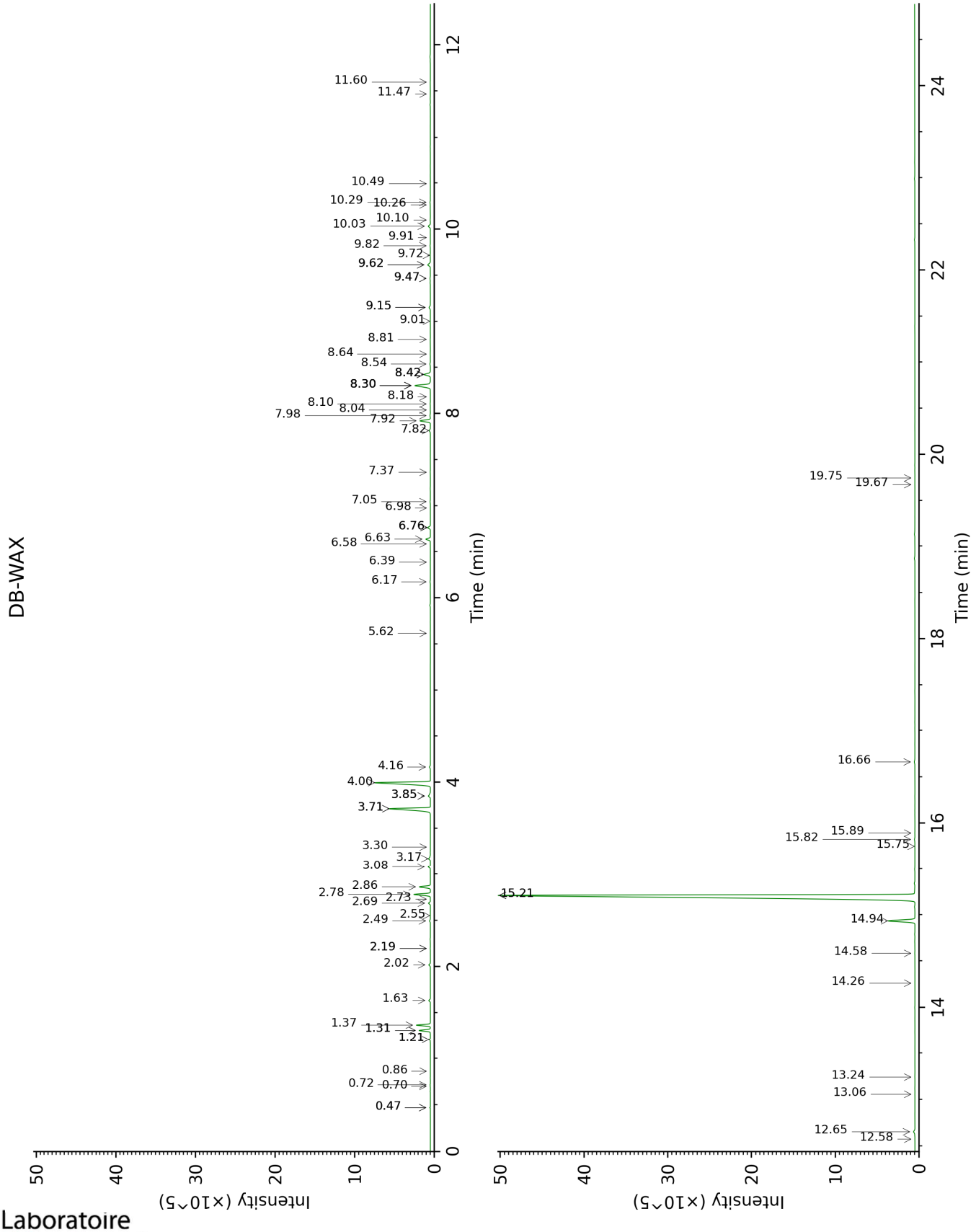

DB-5
Time (min)
Intensity (×10^5)
12.28
12.24
11.57
11.39
11.24
11.14
10.92
10.76
10.74
10.57
10.38
10.26
10.12
9.96
9.81
9.77
9.65
9.58
8.89
8.64
8.32
7.93
7.83
7.69
7.63
7.13
7.04
6.93
6.88
6.65
6.47
6.09
6.06
6.02
5.79
5.65
5.59
5.54
5.44
5.27
5.25
5.03
4.95
4.81
4.69
4.53
4.31
4.27
4.12
4.01
3.92
3.80
3.73
3.69
3.47
3.15
3.05
2.87
2.80
2.69
2.65
2.29
1.97
1.33
1.15
0.89
0.69
0.57
0.54
0.44
0.38
18.36
18.31
17.31
17.10
16.80
16.56
16.47
16.27
15.97
15.91
15.85
15.45
13.39
13.22
12.93
12.89
12.60
12.51


DB-WAX
Intensity (×10^5)
Time (min)
11.60
11.47
10.49
10.29
10.26
10.03
10.10
9.91
9.82
9.72
9.62
9.47
9.15
9.01
8.81
8.64
8.54
8.42
8.30
8.18
8.10
8.04
7.98
7.92
7.82
7.37
7.05
6.98
6.76
6.58
6.63
6.39
6.17
5.62
4.16
4.00
3.85
3.71
3.30
3.17
3.08
2.86
2.78
2.69
2.73
2.49
2.55
2.19
2.02
1.63
1.37
1.31
1.21
0.86
0.72
0.70
0.47
19.75
19.67
16.66
15.89
15.82
15.75
15.21
14.94
14.58
14.26
13.24
13.06
12.65
12.58

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.38	538	0.01	0.47*	785	0.02
Acetic acid	0.44	596	tr	6.58	1416	0.01
Isovaleral	0.54	642	0.02	0.72	887	0.02
2-Methylbutyral	0.57	652	0.01	0.70	881	0.01
2-Ethylfuran	0.70	702	tr	0.86	920	tr
Isoamyl alcohol	0.89	733	tr	3.30	1176	0.01
Methyl 2-methylbutyrate	1.15	774	0.08	1.21*	976	0.09
Octane	1.33	802	0.01	0.47*	785	[0.02]
(3*Z*)-Hexenol	1.97	858	tr	5.62	1346	0.01
Heptan-3-one	2.29	886	0.01	2.55	1116	0.01
Hashishene	2.65	914	0.01	1.31*	993	1.05
Tricyclene	2.69	917	0.01	1.21*	976	[0.09]
α-Thujene	2.80	925	1.21	1.37	1002	1.21
α-Pinene	2.87	929	1.05	1.31*	993	[1.05]
Camphene	3.05	942	0.19	1.63	1028	0.16
Thuja-2,4(10)-diene	3.15	948	0.01	2.20*	1085	0.02
β-Pinene	3.47*	970	0.17	2.02	1067	0.17
Sabinene	3.47*	970	[0.17]	2.20*	1085	[0.02]
Octen-3-ol	3.69	985	0.47	6.64	1420	0.49
Octan-3-one	3.73	988	0.23	3.85*	1219	0.30
Myrcene	3.80	992	1.72	2.78	1135	1.70
Pseudolimonene	3.92*	1001	0.26	2.73	1130	0.01
α-Phellandrene	3.92*	1001	[0.26]	2.68	1127	0.20
Δ3-Carene	4.01	1006	0.09	2.49	1112	0.09
α-Terpinene	4.12	1013	1.15	2.86	1141	1.14
para-Cymene	4.27	1023	7.37	4.00	1230	7.34
Limonene	4.31*	1025	0.49	3.08	1158	0.23
1,8-Cineole	4.31*	1025	[0.49]	3.17	1166	0.24
(*Z*)-β-Ocimene	4.53	1039	0.10	3.71*	1209	5.37
(*E*)-β-Ocimene	4.69	1049	0.09	3.85*	1219	[0.30]
γ-Terpinene	4.81	1057	5.29	3.71*	1209	[5.37]
cis-Sabinene hydrate	4.95	1066	0.30	6.76*	1429	0.31
cis-Linalool oxide (fur.)	5.03	1071	0.01	6.39	1401	0.01
Terpinolene	5.25*†	1084	0.15	4.16	1242	0.10
trans-Linalool oxide (fur.)	5.25*†	1084	[0.15]	6.76*	1429	[0.31]
para-Cymenene	5.27†	1086	[0.15]	6.17	1386	0.04
trans-Sabinene hydrate	5.44	1096	0.11	7.82	1507	0.14
Linalool	5.54	1103	1.18	7.92	1515	1.16
Hotrienol	5.60	1106	0.01	8.64	1571	0.01
endo-Fenchol	5.65	1110	0.01	8.18	1536	0.01
cis-para-Menth-2-en-1-ol	5.79	1119	0.03	7.98	1520	0.05
trans-Pinocarveol	6.02	1134	0.01	9.01	1600	0.02
Camphor	6.06	1136	0.03	7.05	1450	0.04

trans-para-Menth-2-en-1-ol	6.10	1138	0.02	8.81	1584	0.01
Borneol	6.47	1162	0.28	9.62*	1649	0.38
Terpinen-4-ol	6.65	1174	0.72	8.42*	1554	0.80
α-Terpineol	6.88	1189	0.14	9.62*	1649	[0.38]
cis-Dihydrocarvone	6.94	1192	0.05	8.30*	1545	2.25
trans-Dihydrocarvone	7.04	1199	0.07	8.54	1563	0.06
trans-Piperitol	7.13	1205	0.05	10.29	1704	0.04
Carvone	7.63	1238	0.01	9.91	1673	0.01
Carvacrol methyl ether	7.69	1242	0.06	8.42*	1554	[0.80]
Carvenone	7.83	1251	0.04	9.72	1657	0.03
Geraniol	7.93	1258	0.03	11.47	1805	0.01
Bornyl acetate	8.32	1284	0.02	8.10	1530	0.03
Thymol	8.64	1306	3.21	14.94	2130	3.16
Carvacrol	8.89	1324	69.29	15.21*	2158	68.88
α-Copaene	9.58*	1372	0.02	6.98	1445	0.01
Carvacryl acetate	9.58*	1372	[0.02]	11.60	1816	0.02
β-Bourbonene	9.66	1377	0.02	7.36	1474	0.02
Geranyl acetate	9.77	1385	0.01	10.49	1721	0.01
β-Elemene	9.81	1388	0.02	8.30*	1545	[2.25]
Isocaryophyllene	9.96	1398	0.01	8.04	1524	0.02
β-Caryophyllene	10.12	1411	2.18	8.30*	1545	[2.25]
β-Copaene	10.26	1421	0.01	8.30*	1545	[2.25]
Aromadendrene	10.38	1430	0.01	8.42*	1554	[0.80]
α-Humulene	10.57	1444	0.16	9.15*	1611	0.18
Thymohydroquinone isomer?	10.74	1456	0.01			
(*E*)-β-Farnesene	10.76*	1458	0.11	9.47*	1637	0.06
cis-Muurola-4(15),5-diene	10.76*	1458	[0.11]	9.15*	1611	[0.18]
γ-Muurolene	10.92	1470	0.02	9.47*	1637	[0.06]
α-Selinene	11.14	1486	0.01	9.82	1666	0.05
(3*Z*,6*E*)-α-Farnesene	11.24	1494	0.01	10.10	1688	0.02
β-Bisabolene	11.39	1504	0.28	10.03	1683	0.26
δ-Cadinene	11.57	1519	0.01	10.26	1702	0.02
Caryophyllene oxide isomer	12.24*	1571	0.22	12.58	1904	0.01
Caryophyllene oxide	12.24*	1571	[0.22]	12.66	1911	0.19
Spathulenol	12.24*	1571	[0.22]	14.26	2064	0.01
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.28	1575	0.03			
Humulene epoxide I	12.51	1592	0.01	13.06	1949	0.01
Humulene epoxide II	12.60	1600	tr	13.24	1966	0.01
Caryophylladienol I	12.89	1623	tr	15.82	2221	0.05
Caryophylladienol II	12.93	1627	0.01	15.89	2229	0.01
Unknown [m/z 161, 59 (67), 95 (45), 93	13.22	1650	0.01			

(40), 105 (40), 149 (39), 81 (39), 43 (38), 204 (37)... 220 (5)]						
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.39	1665	0.02	16.66	2311	0.09
Phytone	15.45	1843	tr	14.58	2095	0.02
Unknown [m/z 93, 135 (57), 43 (41), 91 (39), 150 (22)...]	15.85	1880	0.01			
Unknown [m/z 133, 150 (34), 105 (22), 135 (16), 134 (12)...]	15.91	1885	0.01			
Unknown [m/z 81, 150 (83), 136 (81), 135 (67), 93 (48), 121 (36)...]	15.97	1890	0.06			
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.27	1918	0.05	15.75	2214	0.01
Unknown [m/z 81, 136 (71), 150 (57), 93 (47), 135 (42)...]	16.47	1937	0.01			
meta-Camphorene	16.56	1946	tr	15.21*	2158	[68.88]
Unknown [m/z 151, 135 (46), 109 (41), 43 (26), 150 (24), 107 (23)...]	16.80	1969	0.01			
Unknown [m/z 99, 43 (43), 69 (37), 71 (37), 41 (28)...]	17.10	1997	0.01			
Unknown [m/z 135, 150 (66), 43 (38), 109 (27), 93 (25), 137 (20)...]	17.31	2018	0.01			
Unknown [m/z 69, 41 (81), 91 (37), 166 (35), 105 (33), 43 (30)...]	18.31	2118	0.01	19.67	2659	tr
Unknown [m/z 69, 41 (74), 166 (36), 91 (32), 105 (28), 43 (25)...]	18.36	2124	0.03	19.75	2668	0.01
Total identified		**99.03%**			**98.52%**	
Total reported		**99.27%**			**98.54%**	

*: 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