Date : July 15, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20G13-PTH02
Customer identification : Sea Fennel - Greece - SB5102911R
Type : Essential oil
Source : *Crithmum maritimum*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - 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., chimiste à l'entraînement
Analysis date : July 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4780 ± 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
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Heptane	tr	Alkane
Heptanal	0.01	Aliphatic aldehyde
Tricyclene	tr	Monoterpene
α-Thujene	0.49	Monoterpene
α-Pinene	3.24	Monoterpene
Camphene	0.07	Monoterpene
Sabinene	15.67	Monoterpene
β-Pinene	0.28	Monoterpene
Myrcene	1.66	Monoterpene
Pseudolimonene	0.10	Monoterpene
α-Phellandrene	0.46	Monoterpene
Δ3-Carene	0.06	Monoterpene
α-Terpinene	1.17	Monoterpene
para-Cymene	4.41	Monoterpene
1,8-Cineole	13.18	Monoterpenic ether
Limonene	16.65	Monoterpene
(*Z*)-β-Ocimene	4.80	Monoterpene
(*E*)-β-Ocimene	0.32	Monoterpene
γ-Terpinene	27.19	Monoterpene
cis-Sabinene hydrate	0.07	Monoterpenic alcohol
α-Pinene oxide analog	0.02	Monoterpenic ether
Terpinolene	0.53	Monoterpene
para-Cymenene	0.03	Monoterpene
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.05	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Unknown	0.01	Oxygenated monoterpene
cis-para-Menth-2-en-1-ol	0.13	Monoterpenic alcohol
allo-Ocimene	0.08	Monoterpene
cis-Limonene oxide	0.02	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.04	Monoterpenic alcohol
trans-Limonene oxide	0.02	Monoterpenic ether
trans-para-Menth-2-en-1-ol	0.07	Monoterpenic alcohol
Epoxyterpinolene	0.04	Monoterpenic ether
1,4-Dimethyl-4-acetylcyclohexene	0.02	Monoterpenic ketone
Sabinaketone	0.01	Normonoterpenic ketone
Unknown	0.06	Unknown
Unknown	0.02	Oxygenated monoterpene
Terpinen-4-ol	2.81	Monoterpenic alcohol
Cryptone	0.07	Normonoterpenic ketone
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	0.15	Monoterpenic alcohol
cis-Piperitol	0.05	Monoterpenic alcohol

cis-α-Phellandrene epoxide (IPP vs Me)	0.02	Monoterpenic ether
trans-Piperitol	0.05	Monoterpenic alcohol
trans-Carveol	0.01	Monoterpenic alcohol
Unknown	0.03	Unknown
Thymol methyl ether analog I	0.13	Monoterpenic ether
Thymol methyl ether	1.84	Monoterpenic ether
Carvacrol methyl ether	0.06	Monoterpenic ether
Unknown	0.13	Unknown
(2*E*)-Decenal	0.02	Aliphatic aldehyde
trans-Ascaridole glycol	0.02	Monoterpenic alcohol
Phellandral	0.06	Monoterpenic aldehyde
Geranial	0.01	Monoterpenic aldehyde
Bornyl acetate	0.06	Monoterpenic ester
cis-Ascaridole glycol	0.02	Monoterpenic alcohol
Cuminol	tr	Monoterpenic alcohol
Thymol	0.07	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Carvacrol	0.02	Monoterpenic alcohol
Unknown	0.04	Unknown
Unknown	0.04	Unknown
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.02	Unknown
Unknown	0.03	Unknown
β-Caryophyllene	0.10	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
Unknown	0.01	Unknown
Unknown	0.04	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
Germacrene D	0.10	Sesquiterpene
(1S,2S,4S)-para-Menthane-1,2,4-triol	0.02	Monoterpenic alcohol
Unknown	0.05	Sesquiterpene
Cuparene	0.02	Sesquiterpene
β-Bisabolene	0.02	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
β-Sesquiphellandrene	0.02	Sesquiterpene
Elemicin	0.02	Phenylpropanoid
Spathulenol	0.11	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Dill apiole	1.30	Phenylpropanoid
Germacra-4(15),5,10(14)-trien-1α-ol	0.03	Sesquiterpenic alcohol
Phytone	0.01	Terpenic ketone
Consolidated total	**98.83%**	

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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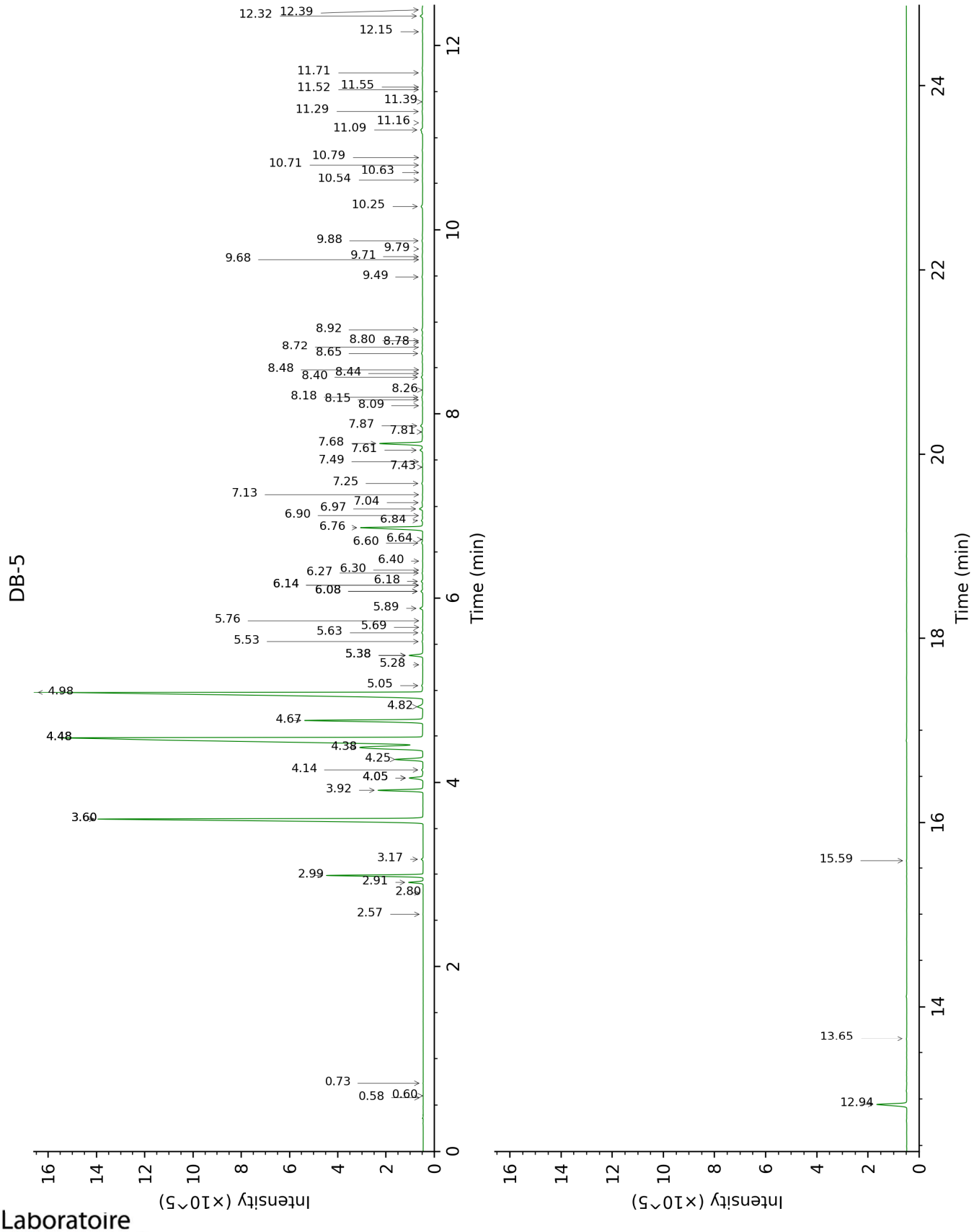
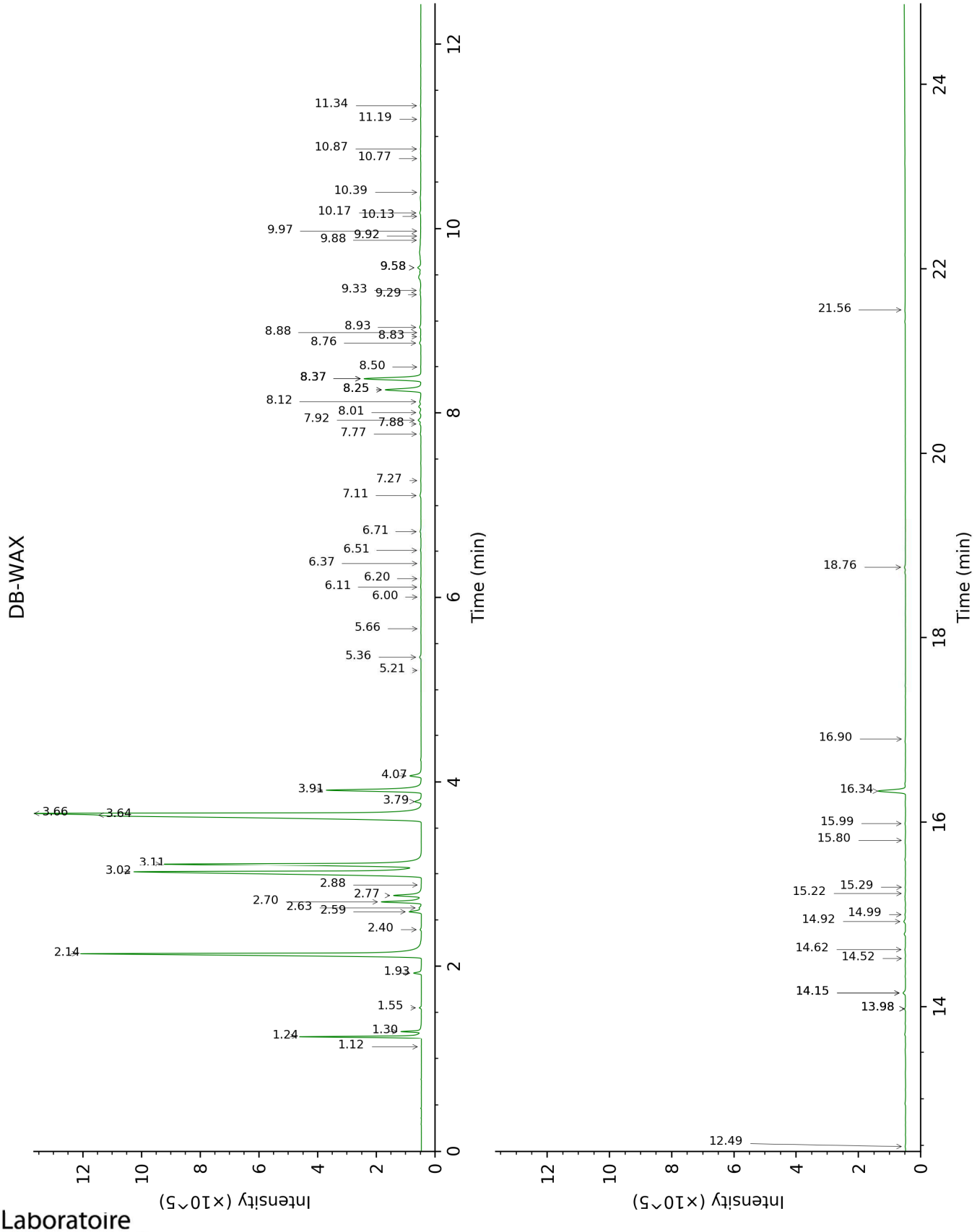

DB-5
Time (min)
Intensity (×10^5)
12.32
12.39
12.15
11.71
11.52
11.55
11.39
11.29
11.09
11.16
10.71
10.79
10.63
10.54
10.25
9.88
9.79
9.68
9.71
9.49
8.92
8.80
8.78
8.72
8.65
8.48
8.40
8.44
8.26
8.18
8.15
8.09
7.87
7.81
7.68
7.61
7.49
7.43
7.25
7.13
7.04
6.97
6.90
6.84
6.76
6.60
6.64
6.40
6.27
6.30
6.18
6.14
6.08
5.89
5.76
5.69
5.63
5.53
5.38
5.28
5.05
4.98
4.82
4.67
4.48
4.38
4.25
4.14
4.05
3.92
3.60
3.17
2.99
2.91
2.80
2.57
0.73
0.58
0.60
15.59
13.65
12.94


DB-WAX
Time (min)
Intensity (×10^5)
11.34
11.19
10.87
10.77
10.39
10.17
10.13
9.97
9.88
9.92
9.58
9.33
9.29
8.88
8.93
8.83
8.76
8.50
8.37
8.25
8.12
7.92
8.01
7.88
7.77
7.27
7.11
6.71
6.51
6.37
6.20
6.11
6.00
5.66
5.36
5.21
4.07
3.91
3.79
3.66
3.64
3.11
3.02
2.88
2.77
2.70
2.63
2.59
2.40
2.14
1.93
1.55
1.30
1.24
1.12
21.56
18.76
16.90
16.34
15.99
15.80
15.22
15.29
14.92
14.99
14.62
14.52
14.15
13.98
12.49

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.58	640	tr			
2-Methylbutyral	0.60	649	tr			
Heptane	0.74	708	tr			
Heptanal	2.57	903	0.01	2.88	1147	0.01
Tricyclene	2.80	918	tr	1.12	965	tr
α-Thujene	2.91	926	0.49	1.30	996	0.60
α-Pinene	2.99	931	3.24	1.24	986	3.12
Camphene	3.17	943	0.07	1.55	1022	0.06
Sabinene	3.60*	971	15.93	2.14	1084	15.67
β-Pinene	3.60*	971	[15.93]	1.93	1062	0.28
Myrcene	3.92	992	1.66	2.70	1132	1.60
Pseudolimonene	4.05*	1001	0.61	2.63	1127	0.10
α-Phellandrene	4.05*	1001	[0.61]	2.59	1123	0.46
Δ3-Carene	4.14	1006	0.06	2.40	1108	0.05
α-Terpinene	4.25	1013	1.17	2.77	1138	1.21
para-Cymene	4.38	1021	4.41	3.91	1228	4.50
1,8-Cineole	4.48*	1028	29.90	3.11	1166	13.18
Limonene	4.48*	1028	[29.90]	3.02	1158	16.65
(*Z*)-β-Ocimene	4.67	1040	4.80	3.64†	1208	31.95
(*E*)-β-Ocimene	4.82	1049	0.32	3.79	1218	0.30
γ-Terpinene	4.98	1059	27.19	3.66†	1209	[31.95]
cis-Sabinene hydrate	5.06	1064	0.07	6.71	1428	0.05
α-Pinene oxide analog	5.28	1078	0.02	5.21	1318	0.01
Terpinolene	5.38*	1084	0.54	4.07	1239	0.53
para-Cymenene	5.38*	1084	[0.54]	6.11	1383	0.03
trans-Sabinene hydrate	5.53	1094	0.03	7.77	1507	0.04
Linalool	5.63	1100	0.05	7.88	1516	0.05
Nonanal	5.69	1104	0.01	5.66	1351	0.01
Unknown [m/z 109, 81 (54), 91 (32), 79 (22)...]	5.76	1108	0.01	6.00	1375	0.01
cis-para-Menth-2-en-1-ol	5.89	1117	0.13	7.92	1519	0.15
allo-Ocimene	6.08*	1129	0.08	5.36	1328	0.08
cis-Limonene oxide	6.08*	1129	[0.08]	6.20	1390	0.02
cis-para-Mentha-2,8-dien-1-ol	6.14*	1133	0.04	9.29	1626	0.04
trans-Limonene oxide	6.14*	1133	[0.04]	6.37	1402	0.02
trans-para-Menth-2-en-1-ol	6.18	1136	0.07	8.76	1584	0.07
Epoxyterpinolene	6.27	1142	0.04	6.51	1412	0.03
1,4-Dimethyl-4-acetylcyclohexene	6.30	1144	0.02	7.27	1469	0.02
Sabinaketone	6.40	1150	0.01	8.50	1564	0.01

Unknown [m/z 43, 109 (68), 67 (62), 81 (36), 41 (31), 137 (29), 79 (26)...]	6.60	1163	0.06	7.11	1457	0.06
Unknown [m/z 43, 71 (87), 95 (50), 81 (38), 109 (30), 41 (27)...152 (5)]	6.64	1165	0.02			
Terpinen-4-ol	6.76	1174	2.81	8.37*	1554	2.86
Cryptone	6.84	1178	0.07	8.93	1598	0.07
para-Cymen-8-ol	6.90	1182	0.03	11.34	1797	0.02
α-Terpineol	6.97	1187	0.15	9.58*	1650	0.17
cis-Piperitol	7.04	1192	0.05	9.33	1630	0.05
cis-α-Phellandrene epoxide (IPP vs Me)	7.13	1197	0.02	10.76	1748	0.02
trans-Piperitol	7.25	1205	0.05	10.17	1698	0.07
trans-Carveol	7.43	1217	0.01	11.19	1784	0.02
Unknown [m/z 43, 119 (32), 97 (32), 41 (29), 71 (28), 58 (25)...]	7.48	1221	0.03			
Thymol methyl ether analog I	7.61	1230	0.13	8.12	1534	0.10
Thymol methyl ether	7.68	1235	1.84	8.25*	1544	1.80
Carvacrol methyl ether	7.81	1243	0.06	8.37*	1554	[2.86]
Unknown [m/z 43, 81 (62), 109 (51), 71 (40), 55 (26), 41 (25)...]	7.87	1248	0.13			
(2*E*)-Decenal	8.09	1263	0.02	8.83	1590	0.02
trans-Ascaridole glycol	8.15	1267	0.02	13.98*	2038	0.03
Phellandral	8.18	1269	0.06	9.88	1674	0.04
Geranial	8.26	1275	0.01	9.97	1682	0.01
Bornyl acetate	8.40	1284	0.06	8.01	1525	0.07
cis-Ascaridole glycol	8.44	1287	0.02	14.62	2100	0.04
Cuminol	8.48	1290	tr	13.98*	2038	[0.03]
Thymol	8.66	1302	0.07	14.92	2130	0.10
Unknown [m/z 81, 137 (39), 43 (36), 95 (27), 69 (23), 79 (18)...]	8.78	1306	0.01			
Unknown [m/z 43, 111 (84), 109 (71), 126 (70)...]	8.72	1307	0.02	14.15*	2054	0.13
Carvacrol	8.80	1307	0.02	15.22	2160	0.02
Unknown [m/z 111, 126 (93), 43 (90), 71 (60)...]	8.92	1316	0.04	15.00	2138	0.03

Unknown [m/z 139, 69 (45), 83 (38), 121 (34), 79 (29), 43 (27)...]	9.49	1356	0.04			
Unknown [m/z 69, 43 (89), 71 (78), 139 (74), 41 (67), 81 (60)...]	9.68	1370	0.01			
Unknown [m/z 139, 69 (53), 83 (42), 121 (39), 43 (30), 79 (28)...]	9.71	1372	0.02			
Unknown [m/z 139, 69 (63), 83 (53), 43 (49), 41 (39)...]	9.79	1378	0.02	15.99	2238	0.03
Unknown [m/z 159, 43 (68), 91 (57), 119 (52), 105 (51), 107 (42)...]	9.88	1384	0.03			
β-Caryophyllene	10.25	1411	0.10	8.25*	1544	[1.80]
Aromadendrene	10.54	1432	0.02	8.37*	1554	[2.86]
Unknown [m/z 41, 97 (78), 69 (77), 43 (71), 125 (67), 55 (56)... 168 (39)]	10.63	1439	0.01	16.90	2334	0.01
Unknown [m/z 139, 69 (60), 41 (51), 43 (47), 119 (41)... 204 (1)]	10.71	1445	0.04			
allo-Aromadendrene	10.79	1451	0.01	8.88	1593	0.01
Germacrene D	11.09	1473	0.10	9.58*	1650	[0.17]
(1S,2S,4S)-para-Menthane-1,2,4-triol	11.16	1479	0.02	21.56	2879	0.02
Unknown [m/z 81, 82 (62), 41 (37), 69 (36), 43 (36), 110 (33), 71 (32)...204 (1)]	11.29	1488	0.05	18.76	2541	0.06
Cuparene	11.39	1496	0.02	10.87	1757	0.02
β-Bisabolene	11.52	1506	0.02	9.92	1678	0.02
γ-Cadinene	11.55	1508	0.02	10.13	1695	0.02
β-Sesquiphellandrene	11.71	1520	0.02	10.39	1717	0.02
Elemicin	12.15	1555	0.02	15.29	2167	0.02
Spathulenol	12.32	1569	0.11	14.15*	2054	[0.13]
Caryophyllene oxide	12.39	1574	0.04	12.49	1899	0.03
Dill apiole	12.94	1618	1.30	16.34	2274	1.31
Germacra-4(15),5,10(14)-trien-	13.65	1677	0.03	15.80	2219	0.04

1α-ol						
Phytone	15.59	1846	0.01	14.52	2090	0.02
Total identified		**98.35%**			**98.05%**	
Total reported		**98.89%**			**98.26%**	

*: 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