

Date : May 13, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22E06-PTH04

Customer identification : Pine Scots - Austria - P70109R

Type : Essential oil

Source : *Pinus sylvestris*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - 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 : May 11, 2022

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4706 ± 0.0003 (20 °C; method PC-MAT-016)

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
Toluene	0.01	Simple phenolic
Santene	0.07	Normonoterpene
Unknown	0.01	Unknown
(4E)-2,6-Dimethyloctene	tr	Monoterpene
Tricyclene	0.12	Monoterpene
α -Thujene	0.04	Monoterpene
α -Pinene	57.17	Monoterpene
α -Fenchene	0.05	Monoterpene
Camphene	1.36	Monoterpene
Thuja-2,4(10)-diene	0.04	Monoterpene
Unknown	0.04	Monoterpene
β -Pinene	9.22	Monoterpene
Sabinene	0.03	Monoterpene
Unknown	0.14	Monoterpene
Myrcene	3.76	Monoterpene
<i>trans</i> -Carane?	0.01	Monoterpene
2,7-Dimethyl-2,6-octadiene	0.04	Monoterpene
α -Phellandrene	0.13	Monoterpene
Pseudolimonene	0.23	Monoterpene
Δ^3 -Carene	9.40	Monoterpene
1,4-Cineole	0.23	Monoterpenic ether
α -Terpinene	0.18	Monoterpene
Carvomenthene	0.03	Aliphatic alcohol
para-Cymene	0.82	Monoterpene
β -Phellandrene	0.62	Monoterpene
Limonene	8.15	Monoterpene
1,8-Cineole	0.09	Monoterpenic ether
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.02	Monoterpene
γ -Terpinene	0.12	Monoterpene
Unknown	0.02	Oxygenated monoterpene
Fenchone	tr	Monoterpenic ketone
Terpinolene isomer	0.01	Monoterpene
Terpinolene	0.60	Monoterpene
para-Cymenene	0.02	Monoterpene
α -Pinene oxide	0.02	Monoterpenic ether
Unknown	0.01	Unknown
Linalool	0.02	Monoterpenic alcohol
endo-Fenchol	0.06	Monoterpenic alcohol
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
Nopinone	0.01	Normonoterpenic ketone
<i>trans</i> -Pinocarveol	0.06	Monoterpenic alcohol
Camphor	0.03	Monoterpenic ketone
Camphene hydrate	0.02	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.07	Monoterpenic alcohol

Isoborneol	0.01	Monoterpenic alcohol
Pinocamphone	0.01	Monoterpenic ketone
Pinocarvone	0.03	Monoterpenic ketone
Borneol	0.09	Monoterpenic alcohol
Terpinen-4-ol	0.04	Monoterpenic alcohol
meta-Cymen-8-ol	0.01	Monoterpenic alcohol
para-Cymen-8-ol	0.04	Monoterpenic alcohol
α -Terpineol	0.58	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.03	Monoterpenic alcohol
Methylchavicol	0.03	Phenylpropanoid
Verbenone	0.04	Monoterpenic ketone
<i>trans</i> -Carveol	0.03	Monoterpenic alcohol
<i>cis</i> -Carveol	0.01	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Carvone	0.01	Monoterpenic ketone
Piperitone	0.01	Monoterpenic ketone
Unknown	0.01	Unknown
Unknown	0.01	Unknown
(7Z)-Undecen-2-one	0.02	Aliphatic ketone
Bornyl acetate	1.42	Monoterpenic ester
2-Undecanone	0.02	Aliphatic ketone
Car-3-en-5-one	0.02	Monoterpenic ketone
Unknown	0.01	Unknown
α -Longipinene	0.06	Sesquiterpene
α -Cubebene	0.05	Sesquiterpene
Longicyclene	0.03	Sesquiterpene
α -Ylangene	0.01	Sesquiterpene
α -Copaene	0.09	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
allo-Isolongifolene	0.01	Sesquiterpene
Longifolene	0.49	Sesquiterpene
β -Caryophyllene	2.34	Sesquiterpene
β -Copaene	0.01	Sesquiterpene
α -Humulene	0.14	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.02	Sesquiterpene
γ -Murolene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
<i>trans</i> -Muurolo-4(15),5-diene	0.01	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
α -Murolene	0.03	Sesquiterpene
γ -Cadinene	0.01	Sesquiterpene
<i>trans</i> -Calamenene	0.02	Sesquiterpene
Zonarene	0.01	Sesquiterpene
δ -Cadinene	0.10	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.02	Sesquiterpene
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.09	Sesquiterpenic ether
Longiborneol	0.01	Sesquiterpenic alcohol
Guaiool	0.02	Sesquiterpenic alcohol
Humulene epoxide II	0.01	Sesquiterpenic ether
1-epi-Cubenol	0.01	Sesquiterpenic alcohol

Bulnesol	0.03	Sesquiterpenic alcohol
Sandaracopimaradiene?	0.01	Diterpene
meta-Camphorene	0.02	Diterpene
Unknown	0.01	Oxygenated diterpene
para-Camphorene	0.01	Diterpene
Unknown	0.02	Diterpene
Unknown	0.02	Unknown
Sandaracopimarinal?	0.02	Diterpenic aldehyde
Isopimaral	0.01	Diterpenic aldehyde
Consolidated total	99.44%	

tr: The compound has been detected below 0.005% of total signal.

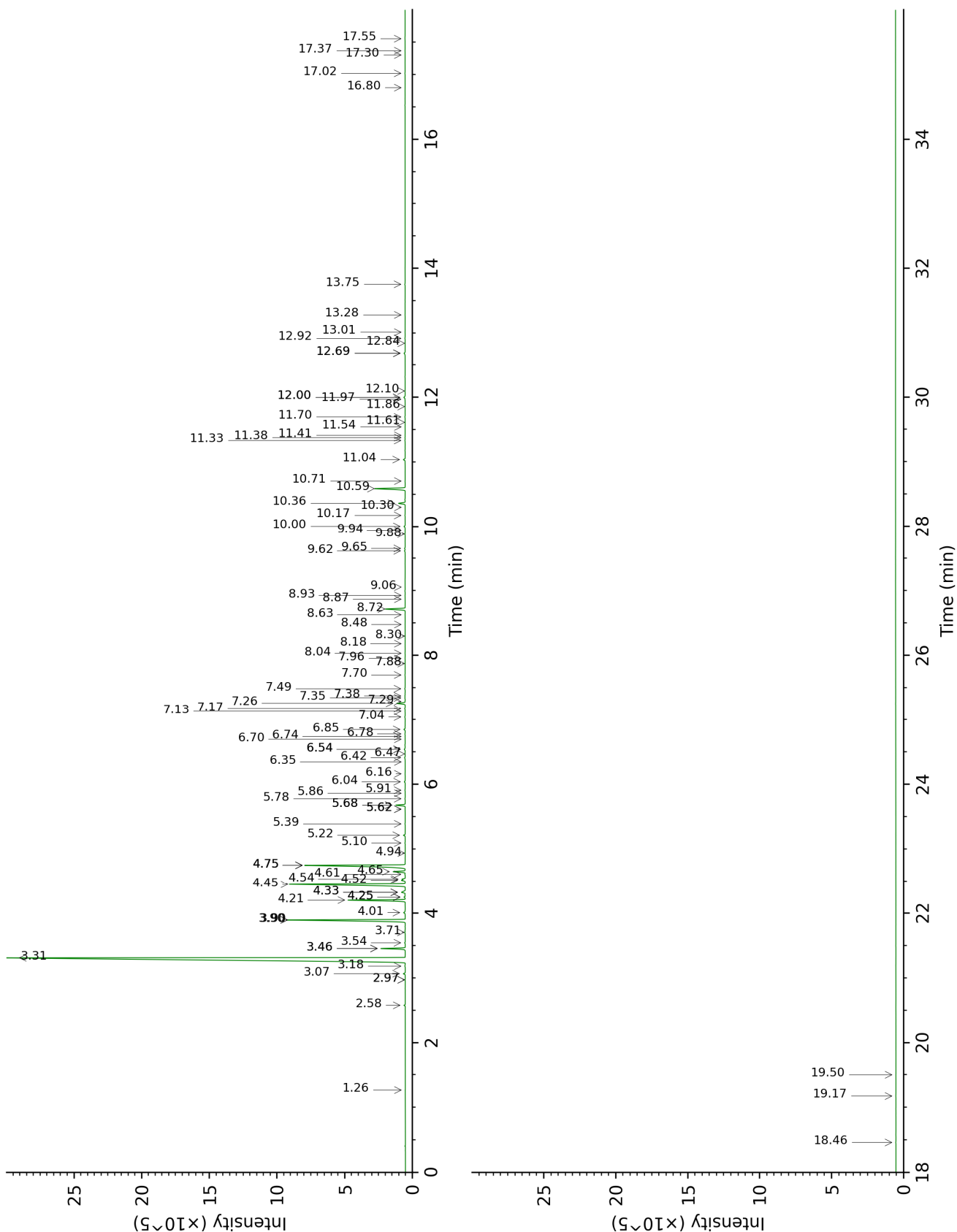
Note: no correction factor was applied

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.

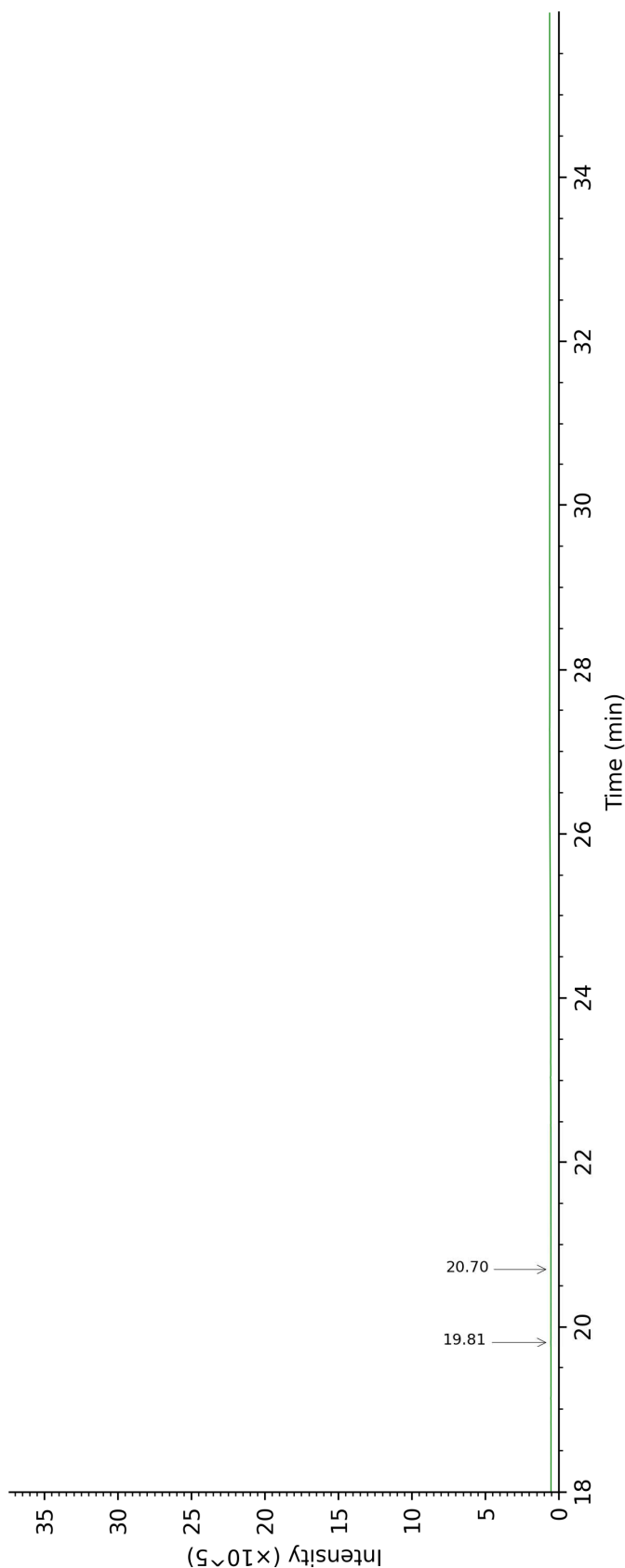
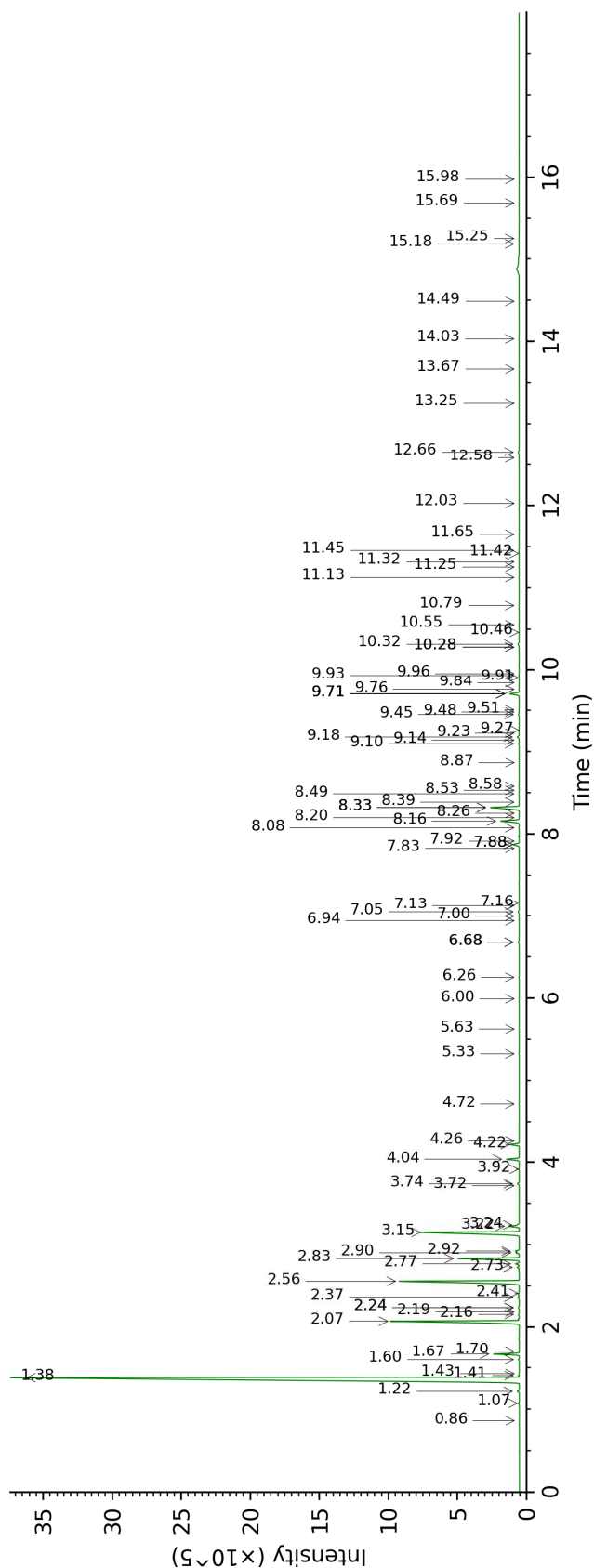
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

This page was intentionally left blank. The following pages present the complete data of the analysis.

DB-5



DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.26	758	0.01	1.43	1003	0.01
Santene	2.58	882	0.07	1.07	947	0.07
Unknown [m/z 69, 93 (91), 41 (88), 79 (22), 40 (20), 91 (17)...]	2.97*	911	0.02	1.70	1030	0.01
(4E)-2,6-Dimethyloctene	2.97*	911	[0.02]	0.86	912	tr
Tricyclene	3.07	918	0.12	1.22	971	0.12
α-Thujene	3.18	925	0.04	1.40	1000	0.04
α-Pinene	3.31	934	57.17	1.38	998	57.20
α-Fenchene	3.46*	943	1.41	1.60	1020	0.05
Camphene	3.46*	943	[1.41]	1.67	1027	1.36
Thuja-2,4(10)-diene	3.54	949	0.04	2.24*	1084	0.07
Unknown [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]	3.71	960	0.04			
β-Pinene	3.90*	972	9.28	2.07	1068	9.22
Sabinene	3.90*	972	[9.28]	2.24*	1084	[0.07]
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	4.01	980	0.14	2.36	1097	0.08
Myrcene	4.20	992	3.76	2.83	1134	3.77
trans-Carane?	4.25*	995	0.08	2.19	1079	0.01
2,7-Dimethyl-2,6-octadiene	4.25*	995	[0.08]	2.16	1076	0.04
α-Phellandrene	4.32*	1000	0.35	2.73	1126	0.13
Pseudolimonene	4.32*	1000	[0.35]	2.77	1129	0.23
Δ3-Carene	4.45	1008	9.40	2.56	1112	9.40
1,4-Cineole	4.52	1013	0.23	2.92	1141	0.23
α-Terpinene	4.54	1014	0.18	2.90	1140	0.18
Carvomenthene	4.61	1018	0.03	2.41	1101	0.04
para-Cymene	4.65	1021	0.82	4.04	1227	0.82
β-Phellandrene	4.75*	1027	8.87	3.22	1165	0.62
Limonene	4.75*	1027	[8.87]	3.15	1159	8.15
1,8-Cineole	4.75*	1027	[8.87]	3.24	1166	0.09
(Z)-β-Ocimene	4.94	1039	0.01	3.72	1204	0.01
(E)-β-Ocimene	5.10	1049	0.02	3.92	1218	0.03
γ-Terpinene	5.22	1056	0.12	3.74	1206	0.12
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.39	1068	0.02	4.72	1277	0.02
Fenchone	5.62*	1082	0.02	5.63	1342	tr
Terpinolene isomer	5.62*	1082	[0.02]	4.26	1244	0.01
Terpinolene	5.68*	1086	0.62	4.22	1240	0.60
para-Cymenene	5.68*	1086	[0.62]	6.26	1387	0.02
α-Pinene oxide	5.78	1092	0.02	5.33	1321	0.02

Unknown [m/z 109, 43 (65), 95 (54), 119 (50), 91 (47)... 149 (8)...]	5.86	1097	0.01	6.00	1369	0.01
Linalool	5.91	1100	0.02	8.08	1523	0.03
endo-Fenchol	6.04	1109	0.06	8.33*	1542	2.41
trans-para-Mentha-2,8-dien-1-ol	6.16	1117	0.02	8.87	1584	0.01
Nopinone	6.35	1129	0.01	8.20	1532	0.02
trans-Pinocarveol	6.42	1133	0.06	9.10	1602	0.05
Camphor	6.47	1137	0.03	7.13	1451	0.01
Camphene hydrate	6.54*	1141	0.08	8.39	1547	0.02
trans-Verbenol	6.54*	1141	[0.08]	9.45	1631	0.07
Isoborneol	6.70	1151	0.01	9.26	1616	0.02
Pinocamphone	6.74	1154	0.01	7.16	1454	0.01
Pinocarvone	6.78	1157	0.03	7.88*	1507	0.49
Borneol	6.85	1161	0.09	9.70*	1651	0.69
Terpinen-4-ol	7.04	1174	0.04	8.49	1555	0.02
meta-Cymen-8-ol	7.13	1180	0.01	11.42	1794	tr
para-Cymen-8-ol	7.17	1182	0.04	11.45	1797	0.03
α-Terpineol	7.26	1188	0.58	9.70*	1651	[0.69]
Myrtenal	7.29	1190	0.01	8.58	1562	0.01
Myrtenol	7.35	1194	0.03	10.79	1741	0.03
Methylchavicol	7.38	1196	0.03	9.23	1612	0.03
Verbenone	7.49	1203	0.04	9.51	1636	0.02
trans-Carveol	7.70	1217	0.03	11.32	1786	0.02
cis-Carveol	7.88	1229	0.01	11.65	1815	0.01
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.96	1234	0.02	11.25	1780	0.02
Carvone	8.04	1240	0.01	9.91	1668	0.01
Piperitone	8.18	1250	0.01	9.84	1662	0.01
Unknown [m/z 58, 43 (87), 71 (37), 59 (28), 41 (22), 55 (14)...]	8.30	1258	0.01	7.83	1504	0.01
Unknown [m/z 109, 43 (83), 95 (70), 110 (70), 99 (53), 119 (48)...]	8.48	1270	0.01			
(7Z)-Undecen-2-one	8.63	1281	0.02			
Bornyl acetate	8.72	1287	1.42	8.16	1529	1.41
2-Undecanone	8.87	1297	0.02	8.53	1558	0.01
Car-3-en-5-one	8.93	1301	0.02	12.02	1848	0.01
Unknown [m/z 69, 41 (79), 91 (59), 92 (55), 79 (52), 107 (40)...]	9.06	1305	0.01			
α-Longipinene	9.62	1345	0.06	6.68*	1418	0.11
α-Cubebene	9.66	1348	0.05	6.68*	1418	[0.11]
Longicyclene	9.88	1363	0.03	7.00	1442	0.02
α-Ylangene	9.94	1368	0.01	6.94	1438	0.01
α-Copaene	10.00	1372	0.09	7.05	1446	0.08
Geranyl acetate	10.17	1384	0.02	10.46	1713	0.01
allo-Isolongifolene	10.30	1393	0.01	7.92	1510	0.01
Longifolene	10.36	1398	0.49	7.88*	1507	[0.49]

β -Caryophyllene	10.59	1414	2.34	8.33*	1542	[2.41]
β -Copaene	10.70	1423	0.01	8.26	1537	0.01
α -Humulene	11.04	1448	0.14	9.18	1609	0.14
<i>trans</i> -Cadina-1(6),4-diene	11.33	1470	0.02	9.14	1606	0.02
γ -Muuroleone	11.38	1473	0.02	9.48	1633	0.02
Germacrene D	11.41	1476	0.01	9.70*	1651	[0.69]
<i>trans</i> -Muuroleone-4(15),5-diene	11.54	1485	0.01	9.76	1656	0.02
Bicyclogermacrene	11.61	1490	0.01	9.96	1672	0.02
α -Muuroleone	11.70	1497	0.03	9.93	1670	0.03
γ -Cadinene	11.86	1509	0.01	10.28*	1698	0.03
<i>trans</i> -Calamenene	11.97	1518	0.02	11.13	1770	0.02
Zonarene	12.00*	1520	0.11	10.28*	1698	[0.03]
δ -Cadinene	12.00*	1520	[0.11]	10.32	1701	0.10
<i>trans</i> -Cadina-1,4-diene	12.10	1528	0.02	10.55	1721	0.02
Caryophyllene oxide isomer	12.69*	1574	0.10	12.58	1898	0.02
Caryophyllene oxide	12.69*	1574	[0.10]	12.66	1904	0.09
Longiborneol	12.84	1587	0.01	14.49	2077	0.01
Guaio	12.92	1592	0.02	14.03	2033	0.03
Humulene epoxide II	13.01	1600	0.01	13.25	1959	0.01
1-epi-Cubenol	13.28	1622	0.01	13.67	1998	0.01
Bulnesol	13.75	1661	0.03	15.18	2146	0.03
Sandaracopimaradiene?	16.80	1930	0.01			
meta-Camphorene	17.02	1951	0.02	15.25	2153	0.02
Unknown [m/z 105, 91 (100), 81 (89), 79 (86), 109 (86), 257 (83)... 275 (12)...]	17.30	1978	0.01	15.98	2227	0.01
para-Camphorene	17.37	1984	0.01	15.69	2197	0.01
Unknown [m/z 159, 241 (87), 69 (60), 185 (34), 81 (31), 256 (26)...]	17.56	2001	0.02			
Unknown [m/z 191, 81 (47), 95 (41), 69 (39), 109 (32), 93 (32)...]	18.46	2091	0.02	19.81	2657	0.01
Sandaracopimarinal?	19.17	2164	0.02			
Isopimaral	19.50	2198	0.01	20.70	2766	0.01
Total identified		99.17%			99.02%	
Total reported		99.48%			99.18%	

*: Two or more compounds are coeluting on this column

[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

R.T.: Retention time (minutes)

R.I.: Retention index