

**Date :** May 27, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 20E25-PTH09

**Customer identification :** Pine Scots - Austria - P7010794R

**Type :** Essential oil

**Source :** *Pinus sylvestris*

**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 :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** May 27, 2020

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:**  $1.4710 \pm 0.0003$  (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	tr	Simple phenolic
Santene	0.14	Normonoterpene
Hashishene	0.03	Monoterpene
(4E)-2,6-Dimethyloctene	tr	Monoterpene
Tricyclene	0.19	Monoterpene
$\alpha$ -Thujene	0.03	Monoterpene
$\alpha$ -Pinene	51.56	Monoterpene
Camphene	2.11	Monoterpene
$\alpha$ -Fenchene	0.10	Monoterpene
Thuja-2,4(10)-diene	0.04	Monoterpene
Unknown	0.04	Monoterpene
$\beta$ -Pinene	9.69	Monoterpene
Sabinene	0.02	Monoterpene
Unknown	0.17	Monoterpene
Myrcene	4.66	Monoterpene
2,7-Dimethyl-2,6-octadiene	0.08	Monoterpene
<i>trans</i> -Carane?	0.03	Monoterpene
$\alpha$ -Phellandrene	0.11	Monoterpene
Pseudolimonene	0.31	Monoterpene
$\Delta^3$ -Carene	10.93	Monoterpene
1,4-Cineole	0.08	Monoterpenic ether
$\alpha$ -Terpinene	0.42	Monoterpene
Carvomenthene	0.03	Aliphatic alcohol
para-Cymene	1.16	Monoterpene
Limonene	7.99	Monoterpene
$\beta$ -Phellandrene	0.96	Monoterpene
1,8-Cineole	0.07	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.02	Monoterpene
$\gamma$ -Terpinene	0.11	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Fenchone	0.01	Monoterpenic ketone
Terpinolene	0.53	Monoterpene
para-Cymenene	0.02	Monoterpene
$\alpha$ -Pinene oxide	0.02	Monoterpenic ether
Linalool	0.03	Monoterpenic alcohol
endo-Fenchol	0.07	Monoterpenic alcohol
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
$\alpha$ -Campholenal	tr	Monoterpenic aldehyde
Nopinone	tr	Normonoterpenic ketone
<i>trans</i> -Pinocarveol	0.06	Monoterpenic alcohol
Camphor	0.02	Monoterpenic ketone
<i>trans</i> -Verbenol	0.05	Monoterpenic alcohol
Camphene hydrate	0.04	Monoterpenic alcohol
Pinocamphone	0.01	Monoterpenic ketone

Pinocarvone	0.01	Monoterpenic ketone
Borneol	0.14	Monoterpenic alcohol
Terpinen-4-ol	0.04	Monoterpenic alcohol
meta-Cymen-8-ol	tr	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
$\alpha$ -Terpineol	0.67	Monoterpenic alcohol
Unknown	0.01	Unknown
Myrtenol	0.03	Monoterpenic alcohol
Methylchavicol	0.03	Phenylpropanoid
Verbenone	0.04	Monoterpenic ketone
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
endo-Fenchyl acetate	0.01	Monoterpenic ester
Thymol methyl ether	0.02	Monoterpenic ether
(7Z)-Undecen-2-one	0.01	Aliphatic ketone
Bornyl acetate	1.90	Monoterpenic ester
Isobornyl acetate	0.02	Monoterpenic ester
2-Undecanone	0.01	Aliphatic ketone
Carvacrol	0.02	Monoterpenic alcohol
$\alpha$ -Longipinene	0.09	Sesquiterpene
$\alpha$ -Cubebene	0.04	Sesquiterpene
Longicyclene	0.04	Sesquiterpene
$\alpha$ -Ylangene	0.02	Sesquiterpene
$\alpha$ -Copaene	0.09	Sesquiterpene
$\beta$ -Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.04	Monoterpenic ester
$\beta$ -Elemene	0.01	Sesquiterpene
$\beta$ -Longipinene	0.01	Sesquiterpene
Longifolene	0.80	Sesquiterpene
$\beta$ -Caryophyllene	2.14	Sesquiterpene
$\beta$ -Copaene	0.02	Sesquiterpene
6,9-Guaiadiene	0.01	Sesquiterpene
Cadina-3,5-diene?	0.01	Sesquiterpene
$\alpha$ -Humulene	0.19	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.02	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.03	Sesquiterpene
$\gamma$ -Muurolole	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
<i>trans</i> -Muurolo-4(15),5-diene	0.01	Sesquiterpene
$\alpha$ -Selinene	0.01	Sesquiterpene
Bicyclogermacrene	tr	Sesquiterpene
$\alpha$ -Muurolole	0.03	Sesquiterpene
(Z)- $\alpha$ -Bisabolene	0.01	Sesquiterpene
$\gamma$ -Cadinene	0.03	Sesquiterpene
<i>trans</i> -Calamenene	0.01	Sesquiterpene
$\delta$ -Cadinene	0.12	Sesquiterpene
Zonarene	0.01	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.02	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.05	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Longiborneol	0.01	Sesquiterpenic alcohol

Guaiol	0.03	Sesquiterpenic alcohol
Humulene epoxide II	0.01	Sesquiterpenic ether
1-epi-Cubenol	0.01	Sesquiterpenic alcohol
$\alpha$ -Muurolol	0.01	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.01	Sesquiterpenic alcohol
Bulnesol	0.04	Sesquiterpenic alcohol
meta-Camphorene	0.02	Diterpene
Unknown	0.04	Norditerpene
Unknown	0.01	Oxygenated diterpene
para-Camphorene	0.01	Diterpene
Unknown	0.03	Unknown
<b>Consolidated total</b>	<b>99.13%</b>	

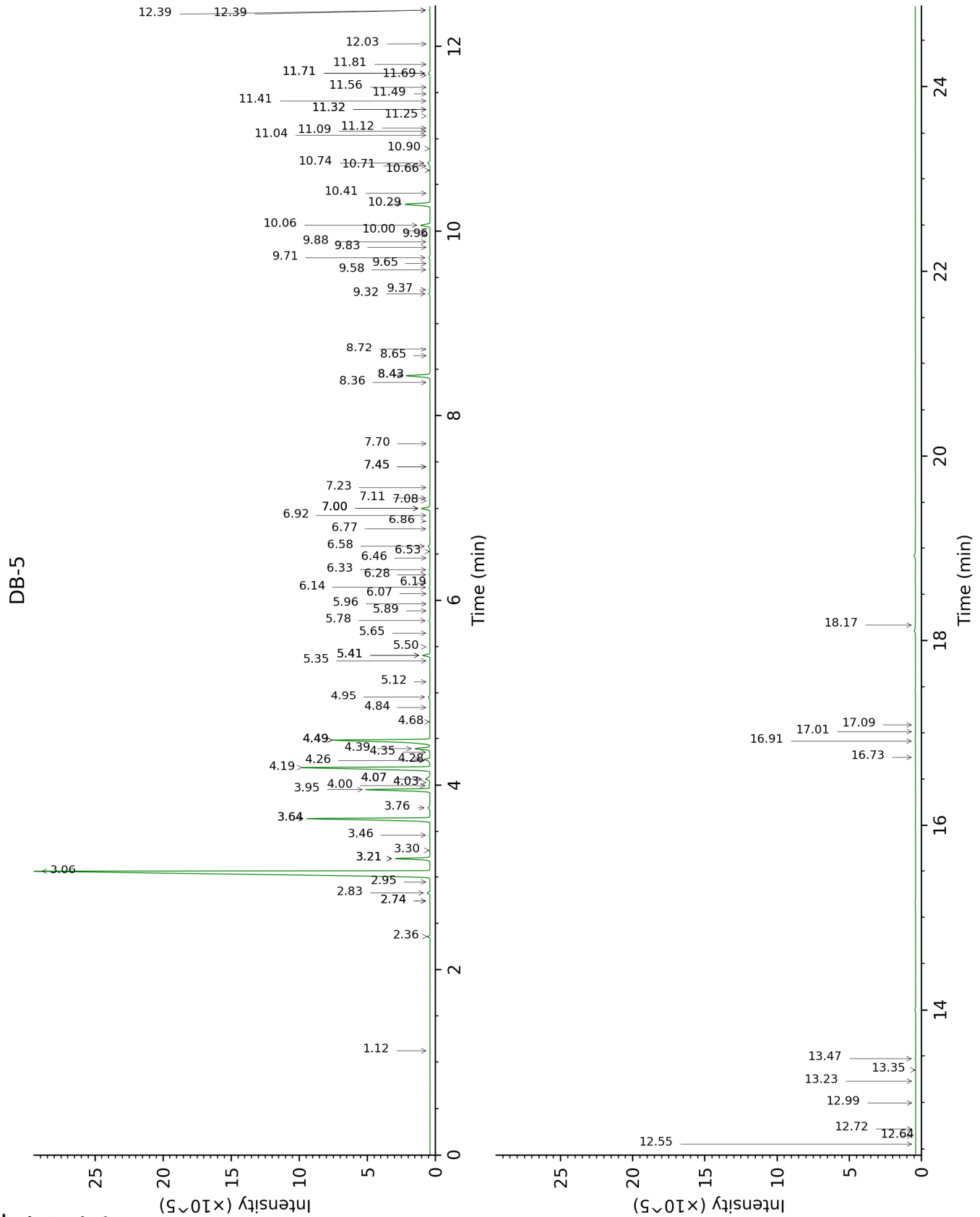
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

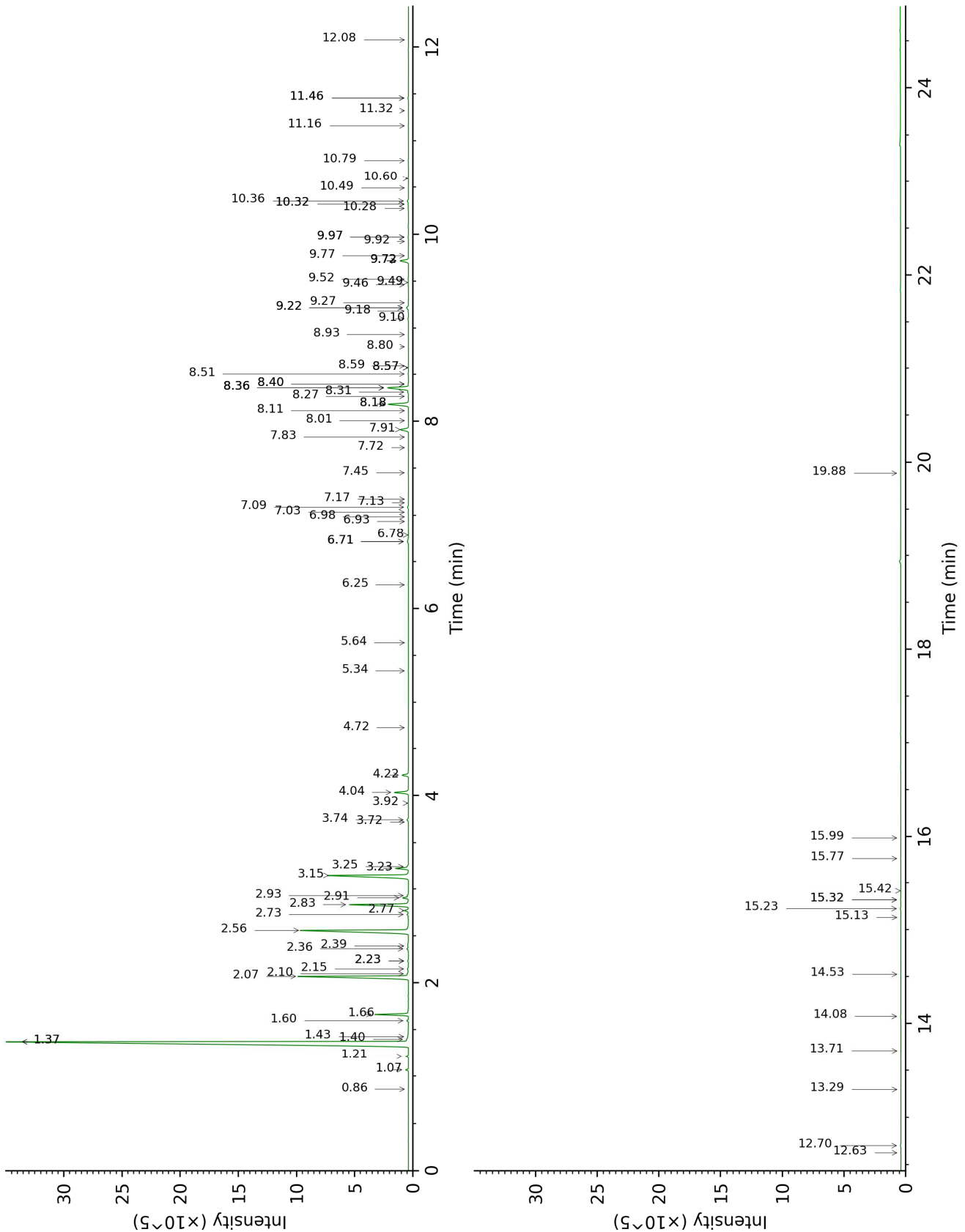
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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-WAX





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.12	762	tr	1.40†	1002	[51.65]
Santene	2.36	883	0.14	1.07	949	0.14
Hashishene	2.74*	912	0.03	1.37*†	999	51.65
(4E)-2,6-Dimethyloctene	2.74*	912	[0.03]	0.86	916	tr
Tricyclene	2.83	918	0.19	1.21	973	0.19
α-Thujene	2.95	926	0.03	1.43†	1005	[51.65]
α-Pinene	3.06	934	51.56	1.37*†	999	[51.65]
Camphene	3.21*	943	2.24	1.66	1028	2.11
α-Fenchene	3.21*	943	[2.24]	1.60	1022	0.10
Thuja-2,4(10)-diene	3.30	949	0.04	2.23*	1085	0.06
Unknown [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]	3.46	960	0.04			
β-Pinene	3.64*	971	9.86	2.07	1068	9.69
Sabinene	3.64*	971	[9.86]	2.23*	1085	[0.06]
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.76	979	0.17	2.36	1098	0.11
Myrcene	3.95	992	4.66	2.83	1135	4.71
2,7-Dimethyl-2,6-octadiene	4.00	995	0.08	2.10	1071	0.10
trans-Carane?	4.03	997	0.03	2.15	1076	0.09
α-Phellandrene	4.07*	1000	0.43	2.73	1127	0.11
Pseudolimonene	4.07*	1000	[0.43]	2.77	1130	0.31
Δ3-Carene	4.19	1008	10.93	2.56	1113	10.95
1,4-Cineole	4.26	1012	0.08	2.93†	1143	[0.51]
α-Terpinene	4.28	1013	0.42	2.91†	1141	0.51
Carvomenthene	4.35	1018	0.03	2.39	1100	0.05
para-Cymene	4.39	1020	1.16	4.04	1228	1.18
Limonene	4.49*	1026	9.03	3.15	1160	7.99
β-Phellandrene	4.49*	1026	[9.03]	3.23	1166	0.96
1,8-Cineole	4.49*	1026	[9.03]	3.25	1168	0.07
(Z)-β-Ocimene	4.68	1039	0.01	3.72	1205	0.01
(E)-β-Ocimene	4.84	1048	0.02	3.92	1220	0.02
γ-Terpinene	4.95	1055	0.11	3.74	1207	0.12
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.12	1066	0.01	4.72	1280	0.02
Fenchone	5.35	1081	0.01	5.64	1341	0.01
Terpinolene	5.41*	1084	0.55	4.22	1242	0.53
para-Cymenene	5.41*	1084	[0.55]	6.25	1385	0.02
α-Pinene oxide	5.50	1090	0.02	5.34	1319	0.02

Linalool	5.65	1100	0.03	8.01	1517	0.01
endo-Fenchol	5.78	1108	0.07	8.31	1540	0.07
<i>trans</i> -para-Mentha-2,8-dien-1-ol	5.89	1115	0.01	8.93	1589	0.02
$\alpha$ -Campholenal	5.96	1120	tr	6.94	1436	tr
Nopinone	6.07	1127	tr	8.18*	1530	1.95
<i>trans</i> -Pinocarveol	6.14	1132	0.06	9.10	1602	0.05
Camphor	6.19	1134	0.02	7.13	1451	0.02
<i>trans</i> -Verbenol	6.28	1140	0.05	9.46†	1632	0.05
Camphene hydrate	6.33	1144	0.04	8.40*†	1547	[2.17]
Pinocamphone	6.46	1152	0.01	7.17	1454	0.01
Pinocarvone	6.53	1157	0.01	7.83	1503	0.01
Borneol	6.58	1160	0.14	9.72*	1652	0.82
Terpinen-4-ol	6.77	1173	0.04	8.50	1556	0.03
meta-Cymen-8-ol	6.86	1178	tr	11.46*	1798	0.06
para-Cymen-8-ol	6.92	1183	0.02	11.46*	1798	[0.06]
Myrtenal	7.00*	1188	0.68	8.57*	1561	0.02
$\alpha$ -Terpineol	7.00*	1188	[0.68]	9.72*	1652	[0.82]
Unknown [m/z 83, 55 (24), 41 (8), 84 (6), 69 (5)... 152 (1)]	7.00*	1188	[0.68]	8.11	1525	0.01
Myrtenol	7.08	1193	0.03	10.79	1741	0.03
Methylchavicol	7.11	1195	0.03	9.22*	1612	0.21
Verbenone	7.23	1202	0.04	9.52	1636	0.04
<i>trans</i> -Carveol	7.45*	1218	0.01	11.32	1787	0.01
endo-Fenchyl acetate	7.45*	1218	[0.01]	6.78	1425	0.01
Thymol methyl ether	7.70	1235	0.02	8.40*†	1547	[2.17]
(7Z)-Undecen-2-one	8.36	1280	0.01			
Bornyl acetate	8.43*	1286	1.92	8.18*	1530	[1.95]
Isobornyl acetate	8.43*	1286	[1.92]	8.27	1537	0.02
2-Undecanone	8.65	1300	0.01	8.57*	1561	[0.02]
Carvacrol	8.72	1306	0.02	15.32*	2160	0.04
$\alpha$ -Longipinene	9.32	1344	0.09	6.71*	1419	0.15
$\alpha$ -Cubebene	9.37	1347	0.04	6.71*	1419	[0.15]
Longicyclene	9.58	1362	0.04	7.03	1443	0.02
$\alpha$ -Ylangene	9.65	1367	0.02	6.98	1440	0.01
$\alpha$ -Copaene	9.71	1371	0.09	7.09	1447	0.09
$\beta$ -Bourbonene	9.83	1379	0.01	7.45	1475	0.02
Geranyl acetate	9.88	1383	0.04	10.49	1716	0.02
$\beta$ -Elemene	9.96	1388	0.01	8.36*†	1544	2.17
$\beta$ -Longipinene	10.00	1391	0.01	7.72	1495	0.01
Longifolene	10.06	1396	0.80	7.91	1509	0.81
$\beta$ -Caryophyllene	10.29	1412	2.14	8.36*†	1544	[2.17]
$\beta$ -Copaene	10.41	1421	0.02	8.36*†	1544	[2.17]
6,9-Guaiadiene	10.66	1440	0.01	8.59	1562	0.01
Cadina-3,5-diene?	10.71	1444	0.01	8.80	1579	0.01
$\alpha$ -Humulene	10.74	1446	0.19	9.22*	1612	[0.21]

<i>cis</i> -Muurolo-4(15),5-diene	10.90	1458	0.02	9.27	1616	0.02
<i>trans</i> -Cadina-1(6),4-diene	11.04	1468	0.03	9.18	1609	0.03
$\gamma$ -Muurolole	11.09	1472	0.02	9.49†	1634	[0.05]
Germacrene D	11.12	1474	0.01	9.72*	1652	[0.82]
<i>trans</i> -Muurolo-4(15),5-diene	11.25	1484	0.01	9.77	1657	0.01
$\alpha$ -Selinene	11.32*	1489	0.02	9.92	1669	0.01
Bicyclogermacrene	11.32*	1489	[0.02]	9.97*	1673	0.04
$\alpha$ -Muurolole	11.41	1496	0.03	9.97*	1673	[0.04]
( <i>Z</i> )- $\alpha$ -Bisabolene	11.49	1502	0.01	10.28	1698	0.05
$\gamma$ -Cadinene	11.56	1507	0.03	10.32*	1701	0.04
<i>trans</i> -Calamenene	11.69	1517	0.01	11.16	1773	0.02
$\delta$ -Cadinene	11.71*	1519	0.13	10.36	1704	0.12
Zonarene	11.71*	1519	[0.13]	10.32*	1701	[0.04]
<i>trans</i> -Cadina-1,4-diene	11.81	1526	0.02	10.60	1725	0.02
Isocaryophyllene epoxide B	12.03	1544	0.02	12.08	1853	0.01
Caryophyllene oxide	12.39*	1572	0.07	12.70	1909	0.05
Caryophyllene oxide isomer	12.39*	1572	[0.07]	12.63	1902	0.01
Longiborneol	12.56	1585	0.01	14.53	2081	0.01
Guaiol	12.64	1592	0.03	14.08	2038	0.04
Humulene epoxide II	12.72	1598	0.01	13.30	1964	0.01
1- <i>epi</i> -Cubenol	13.00	1620	0.01	13.71	2002	0.01
$\alpha$ -Muurolol	13.23	1640	0.01	15.13	2141	0.01
$\alpha$ -Cadinol	13.35	1650	0.01	15.42	2169	0.01
Bulnesol	13.47	1660	0.04	15.23	2150	0.05
meta-Camphorene	16.74	1950	0.02	15.32*	2160	[0.04]
Unknown [m/z 159, 241 (59), 185 (24), 117 (23), 69 (23), 41 (22)... 256 (14)]	16.91	1967	0.04			
Unknown [m/z 105, 91 (100), 81 (89), 79 (86), 109 (86), 257 (83)... 275 (12)...]	17.01	1976	0.01	15.99	2228	0.01
para-Camphorene	17.09	1983	0.01	15.77	2205	0.01
Unknown [m/z 191, 81 (47), 95 (41), 69 (39), 109 (32), 93 (32)...]	18.17	2091	0.03	19.88	2662	0.01
<b>Total identified</b>		<b>99.01%</b>			<b>99.06%</b>	
<b>Total reported</b>		<b>99.32%</b>			<b>99.22%</b>	

\*: 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