

**Date :** February 10, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 19B07-HBN02-1-SCC

**Customer identification :** Eucalyptus radiata - 190148956

**Type :** Essential oil

**Source :** *Eucalyptus radiata*

**Customer :** Health & Beauty Natural Oils

**ANALYSIS**

**Method:** PC-PA-014-17J19 - 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

**Analysis date :** February 07, 2019

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow liquid

**Refractive index:**  $1.4653 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Isovaleral	tr	tr	Aliphatic aldehyde
$\alpha$ -Thujene	0.02	0.01	Monoterpene
$\alpha$ -Pinene	0.77	0.76	Monoterpene
Camphene	0.02*	0.01	Monoterpene
$\alpha$ -Fenchene	[0.02]*	tr	Monoterpene
Thuja-2,4(10)-diene	0.01	0.27*	Monoterpene
Sabinene	0.55	[0.27]*	Monoterpene
$\beta$ -Pinene	[0.55]	0.26	Monoterpene
Unknown	0.01		Unknown
Myrcene	0.59	0.56	Monoterpene
$\alpha$ -Phellandrene	0.89*	0.83	Monoterpene
Pseudolimonene	[0.89]*	0.02	Monoterpene
$\Delta^3$ -Carene	0.03	0.02	Monoterpene
$\alpha$ -Terpinene	0.24	0.24	Monoterpene
para-Cymene	3.54	4.10	Monoterpene
Limonene	73.14*	7.81	Monoterpene
1,8-Cineole	[73.14]*	64.86	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.10	0.08	Monoterpene
(E)- $\beta$ -Ocimene	0.03	0.03	Monoterpene
$\gamma$ -Terpinene	0.94	1.00	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Terpinolene	0.04*	0.02	Monoterpene
para-Cymenene	[0.04]*	0.01	Monoterpene
trans-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Linalool	0.02	0.03	Monoterpenic alcohol
Unknown	0.01	0.02	Unknown
endo-Fenchol	0.04	0.04*	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.01	0.02	Monoterpenic alcohol
trans-Pinocarveol	0.08	0.12*	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.02	0.02	Monoterpenic alcohol
Citronellal	0.01	0.01	Monoterpenic aldehyde
Borneol	0.17	10.55*	Monoterpenic alcohol
$\delta$ -Terpineol	0.61	0.68*	Monoterpenic alcohol
Isopinocampone	0.01	0.01	Monoterpenic ketone
Terpinen-4-ol	0.80	0.67	Monoterpenic alcohol
4-Methylacetophenone	0.04	0.05*	Simple phenolic
Cryptone	0.05	[0.12]*	Normoterpenic ketone
para-Cymen-8-ol	0.12	0.11	Monoterpenic alcohol
$\alpha$ -Terpineol	10.84*	[10.55]*	Monoterpenic alcohol
trans-Isocarveol	[10.84]*	0.39	Monoterpenic alcohol
Myrtenol	0.11	0.08	Monoterpenic alcohol
$\alpha$ -Phellandrene epoxide	0.13	0.09	Monoterpenic ether
Verbenone	0.06	0.07	Monoterpenic ketone
trans-Piperitol	0.02	0.07	Monoterpenic alcohol
Unknown	0.03		Oxygenated monoterpene
trans-Carveol	0.04	0.04	Monoterpenic alcohol
exo-2-Hydroxycineole	0.02	0.13*	Monoterpenic alcohol
cis-Isocarveol	0.11	[0.13]*	Monoterpenic alcohol

Nerol	0.06	0.06	Monoterpenic alcohol
Citronellol	0.02	0.04	Monoterpenic alcohol
Neral	0.10*	[0.68]*	Monoterpenic aldehyde
Carvone	[0.10]*	0.07	Monoterpenic ketone
Piperitone	0.10	0.10	Monoterpenic ketone
Unknown	0.02	0.03	Unknown
Geraniol	0.09	[0.13]*	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.02	0.02	Monoterpenic alcohol
Geranial	0.04	0.31*	Monoterpenic aldehyde
Bornyl acetate	0.01	0.01	Monoterpenic ester
<i>cis</i> -Ascaridole glycol?	0.01	0.03	Monoterpenic alcohol
Unknown	0.01		Unknown
Unknown	0.02		Oxygenated monoterpene
Unknown	0.01		Unknown
$\delta$ -Terpinyl acetate	0.01	0.01	Monoterpenic ester
Unknown	0.01	0.02	Unknown
Unknown	0.06*		Unknown
Unknown	[0.06]*	0.02	Monoterpenic alcohol
$\delta$ -Elemene	0.25	0.25	Sesquiterpene
Limonene <i>trans</i> -glycol	0.01	0.01	Monoterpenic alcohol
$\alpha$ -Terpinyl acetate	0.05	0.15	Monoterpenic ester
Isoledene	0.17	0.15	Sesquiterpene
$\alpha$ -Copaene	0.12	0.14	Sesquiterpene
Methyl ( <i>E</i> )-cinnamate	0.02	0.01	Phenylpropanoid ester
Geranyl acetate	0.07*	0.03	Monoterpenic ester
$\beta$ -Cubebene	[0.07]*	0.01	Sesquiterpene
Unknown	0.02		Sesquiterpene
$\alpha$ -Gurjunene	0.22	0.21	Sesquiterpene
$\beta$ -Caryophyllene	1.09	1.12*	Sesquiterpene
$\gamma$ -Maaliene	0.02	[1.12]*	Sesquiterpene
8-Hydroxycarvotanacetone	0.01	0.01	Monoterpenic alcohol
$\beta$ -Gurjunene	0.02	[0.04]*	Sesquiterpene
Aromadendrene	0.28	0.27	Sesquiterpene
$\alpha$ -Humulene	0.53	0.52	Sesquiterpene
allo-Aromadendrene	0.12*	0.14*	Sesquiterpene
Unknown	[0.12]*	[0.14]*	Sesquiterpene
Unknown	0.15		Sesquiterpene
$\beta$ -Selinene	0.03	0.04	Sesquiterpene
Phenylethyl isovalerate	0.02	0.01	Phenolic ester
Bicyclogermacrene	0.39*	[0.31]*	Sesquiterpene
Viridiflorene	[0.39]*	0.14	Sesquiterpene
$\gamma$ -Cadinene	0.01	[0.05]*	Sesquiterpene
$\delta$ -Cadinene	0.03	[0.05]*	Sesquiterpene
Isocaryophyllene epoxide B	0.02	0.02	Sesquiterpenic ether
Spathulenol	0.06	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	0.02	Sesquiterpenic ether
Globulol	0.04	0.05	Sesquiterpenic alcohol
Viridiflorol	0.01	0.02	Sesquiterpenic alcohol
Cubeban-11-ol	0.01	0.01	Sesquiterpenic alcohol
Eudesm-5-en-11-ol	0.01	0.01	Sesquiterpenic alcohol
$\gamma$ -Eudesmol	0.02	0.01	Sesquiterpenic alcohol
Isospathulenol	0.02	0.04	Sesquiterpenic alcohol

$\beta$ -Eudesmol	0.02	0.02	Sesquiterpenic alcohol
<b>Total identified</b>	<b>98.46%</b>	<b>98.18%</b>	

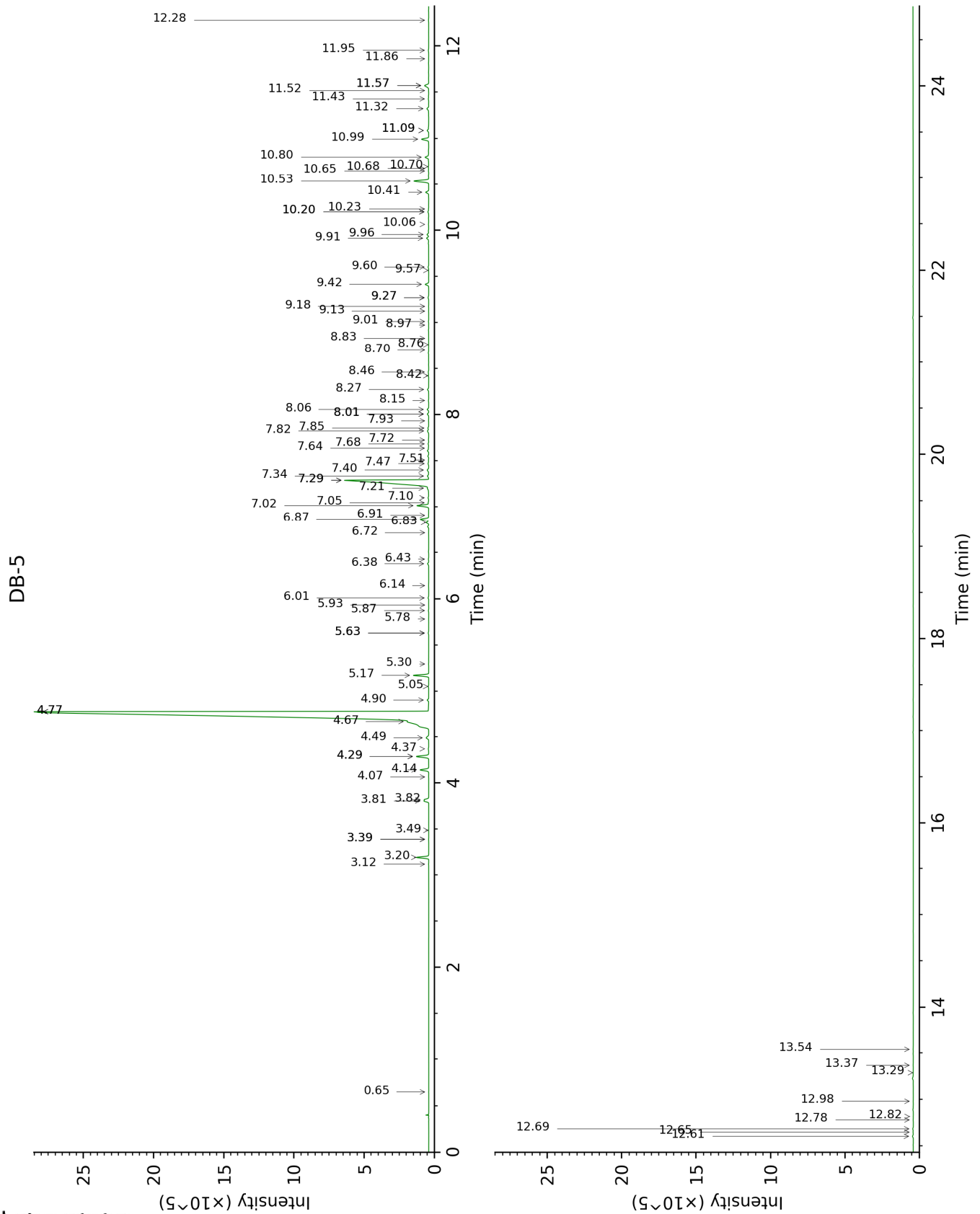
\*: Two or more compounds are coeluting on this column

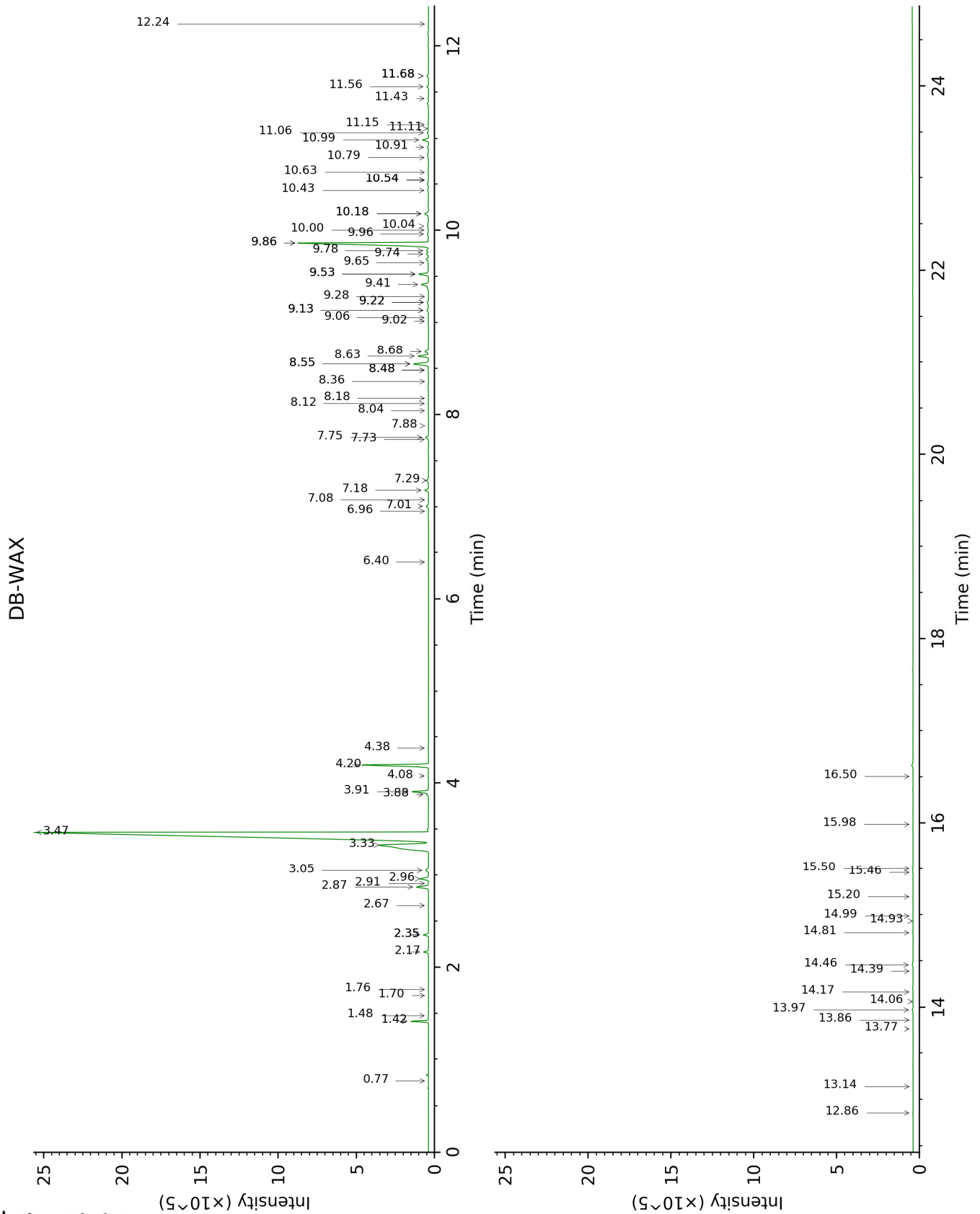
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.65	640	tr	0.77	887	tr
$\alpha$ -Thujene	3.12	923	0.02	1.48	1002	0.01
$\alpha$ -Pinene	3.20	928	0.77	1.42	993	0.76
Camphene	3.39*	941	0.02	1.76	1028	0.01
$\alpha$ -Fenchene	3.39*	941	[0.02]	1.70	1022	tr
Thuja-2,4(10)-diene	3.49	947	0.01	2.35*	1084	0.27
Sabinene	3.81†	968	0.55	2.35*	1084	[0.27]
$\beta$ -Pinene	3.82†	969	[0.55]	2.17	1067	0.26
Unknown [m/z 67, 68 (95), 43 (73), 94 (65), 79 (54), 41 (50)...]	4.07	985	0.01			
Myrcene	4.14	990	0.59	2.96	1134	0.56
$\alpha$ -Phellandrene	4.29*	999	0.89	2.87	1127	0.83
Pseudolimonene	4.29*	999	[0.89]	2.91	1130	0.02
$\Delta$ 3-Carene	4.37	1005	0.03	2.67	1112	0.02
$\alpha$ -Terpinene	4.49	1012	0.24	3.05	1142	0.24
para-Cymene	4.67	1023	3.54	4.20	1232	4.10
Limonene	4.77*	1030	73.14	3.33	1164	7.81
1,8-Cineole	4.77*	1030	[73.14]	3.47	1175	64.86
(Z)- $\beta$ -Ocimene	4.90	1038	0.10	3.88	1207	0.08
(E)- $\beta$ -Ocimene	5.05	1047	0.03	4.08	1223	0.03
$\gamma$ -Terpinene	5.17	1055	0.94	3.91	1210	1.00
cis-Sabinene hydrate	5.30	1062	0.01	6.96	1424	0.01
Terpinolene	5.63*	1083	0.04	4.38	1246	0.02
para-Cymenene	5.63*	1083	[0.04]	6.40	1382	0.01
trans-Sabinene hydrate	5.78	1093	0.01	8.04	1507	0.01
Linalool	5.87	1098	0.02	8.12	1513	0.03
Unknown [m/z 43, 59 (37), 79 (33), 91 (32), 119 (31)...]	5.93	1102	0.01	9.06	1587	0.02
endo-Fenchol	6.01	1107	0.04	8.48*	1542	0.04
cis-para-Menth-2-en-1-ol	6.14	1116	0.01	8.18	1518	0.02
trans-Pinocarveol	6.38	1131	0.08	9.22*	1600	0.12
trans-para-Menth-2-en-1-ol	6.43	1134	0.02	9.02	1584	0.02
Citronellal	6.72	1152	0.01	7.08	1434	0.01
Borneol	6.83	1160	0.17	9.86*	1653	10.55
$\delta$ -Terpineol	6.87	1162	0.61	9.53*	1625	0.68
Isopinocampone	6.91	1165	0.01	7.73	1483	0.01
Terpinen-4-ol	7.02	1172	0.80	8.63	1554	0.67
4-Methylacetophenone	7.05	1174	0.04	10.54*	1709	0.05
Cryptone	7.10	1177	0.05	9.22*	1600	[0.12]
para-Cymen-8-ol	7.20	1184	0.12	11.56	1797	0.11
$\alpha$ -Terpineol	7.29*	1189	10.84	9.86*	1653	[10.55]
trans-Isocarveol	7.29*	1189	[10.84]	10.99	1747	0.39
Myrtenol	7.34	1192	0.11	10.91	1740	0.08
$\alpha$ -Phellandrene epoxide	7.40	1196	0.13	11.06	1754	0.09
Verbenone	7.47	1201	0.06	9.65	1635	0.07

<i>trans</i> -Piperitol	7.51	1203	0.02	10.43	1700	0.07
Unknown [m/z 107, 79 (99), 91 (57), 94 (54), 135 (44), 150 (44)]	7.64	1212	0.03			
<i>trans</i> -Carveol	7.68	1215	0.04	11.43	1786	0.04
exo-2-Hydroxycineole	7.72	1218	0.02	11.68*	1807	0.13
<i>cis</i> -Isocarveol	7.82	1225	0.11	11.68*	1807	[0.13]
Nerol	7.85	1227	0.06	11.11	1758	0.06
Citronellol	7.93	1232	0.02	10.79	1731	0.04
Neral	8.01*	1237	0.10	9.53*	1625	[0.68]
Carvone	8.01*	1237	[0.10]	10.04	1668	0.07
Piperitone	8.06	1240	0.10	9.96	1661	0.10
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	8.15	1247	0.02	11.15	1761	0.03
Geraniol	8.27	1255	0.09	11.68*	1807	[0.13]
<i>trans</i> -Ascaridole glycol	8.42	1265	0.02	14.17	2036	0.02
Geranial	8.46	1268	0.04	10.18*	1679	0.31
Bornyl acetate	8.70	1284	0.01	8.36	1532	0.01
<i>cis</i> -Ascaridole glycol?	8.76	1288	0.01	14.81	2098	0.03
Unknown [m/z 95, 110 (95), 67 (31), 43 (29), 122 (18), 41 (14)...]	8.83	1293	0.01			
Unknown [m/z 59, 94 (99), 79 (68), 43 (32), 97 (17)... 137 (8)...]	9.01	1302	0.02			
Unknown [m/z 93, 43 (65), 79 (59), 91 (57), 107 (55), 135 (49)...]	8.98	1303	0.01			
$\delta$ -Terpinyl acetate	9.13	1310	0.01	9.28	1605	0.01
Unknown [m/z 111, 126 (93), 43 (90), 71 (60)...]	9.18	1313	0.01	15.20	2137	0.02
Unknown [m/z 69, 41 (58), 114 (29), 43 (25), 83 (24), 123 (20)...]	9.27*	1320	0.06			
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.27*	1320	[0.06]	14.99	2116	0.02
$\delta$ -Elemene	9.42	1330	0.25	7.18	1441	0.25
Limonene <i>trans</i> -glycol	9.57	1341	0.01	15.98	2216	0.01
$\alpha$ -Terpinyl acetate	9.60	1343	0.05	9.78	1646	0.15
Isoledene	9.92	1365	0.17	7.01	1428	0.15
$\alpha$ -Copaene	9.96	1368	0.12	7.29	1449	0.14
Methyl ( <i>E</i> )-cinnamate	10.06	1376	0.02	13.86	2006	0.01
Geranyl acetate	10.20*	1385	0.07	10.64	1717	0.03
$\beta$ -Cubebene	10.20*	1385	[0.07]	7.88*	1494	0.01
Unknown [m/z 93, 122 (98), 161 (98), 107 (86), 95 (46), 105 (72)... 204 (34)]	10.23	1388	0.02			
$\alpha$ -Gurjunene	10.41	1400	0.22	7.75	1485	0.21
$\beta$ -Caryophyllene	10.53	1410	1.09	8.55*	1547	1.12

$\gamma$ -Maaliene	10.65	1418	0.02	8.55*	1547	[1.12]
$\delta$ -Hydroxycarvotanacetone	10.68	1420	0.01	16.50	2270	0.01
$\beta$ -Gurjunene	10.70	1422	0.02	8.48*	1542	[0.04]
Aromadendrene	10.80	1429	0.28	8.68	1558	0.27
$\alpha$ -Humulene	10.99	1444	0.53	9.42	1616	0.52
allo-Aromadendrene	11.09*	1451	0.12	9.14*	1593	0.14
Unknown [m/z 105, 161 (78), 93 (70), 133 (67), 91 (66), 204 (63), 119 (41)]	11.09*	1451	[0.12]	9.14*	1593	[0.14]
Unknown [m/z 121, 93 (86), 161 (61), 105 (46), 91 (43), 119 (310), 136 (27)... 204 (19)]	11.32	1468	0.15			
$\beta$ -Selinene	11.43	1476	0.03	10.00	1664	0.04
Phenylethyl isovalerate	11.52	1483	0.02	13.14	1939	0.01
Bicyclogermacrene	11.57*	1487	0.39	10.18*	1679	[0.31]
Viridiflorene	11.57*	1487	[0.39]	9.74	1643	0.14
$\gamma$ -Cadinene	11.86	1509	0.01	10.54*	1709	[0.05]
$\delta$ -Cadinene	11.95	1516	0.03	10.54*	1709	[0.05]
Isocaryophyllene epoxide B	12.28	1541	0.02	12.24	1857	0.02
Spathulenol	12.60	1567	0.06	14.46	2064	0.07
Caryophyllene oxide	12.65	1570	0.02	12.86	1913	0.02
Globulol	12.68	1573	0.04	13.97	2017	0.05
Viridiflorol	12.78	1581	0.01	14.06	2026	0.02
Cubeban-11-ol	12.82	1584	0.01	13.77	1998	0.01
Eudesm-5-en-11-ol	12.98	1596	0.01	14.39	2058	0.01
$\gamma$ -Eudesmol	13.29	1622	0.02	14.93	2110	0.01
Isospathulenol	13.37	1628	0.02	15.50	2168	0.04
$\beta$ -Eudesmol	13.54	1642	0.02	15.46	2163	0.02
<b>Total identified</b>		<b>98.46%</b>			<b>98.18%</b>	
<b>Total reported</b>		<b>98.75%</b>			<b>98.28%</b>	

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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