

## GC/MS BATCH NUMBER: RG0102

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**ESSENTIAL OIL:** RAVINTSARA  
**BOTANICAL NAME:** CINNAMOMUM CAMPHORA  
**ORIGIN:** MADAGASCAR

KEY CONSTITUENTS PRESENT IN THIS BATCH OF RAVINTSARA OIL	%
1,8-CINEOLE + $\beta$ -PHELLANDRENE	58.5
SABINENE	13.1
$\alpha$ -TERPINEOL	6.9
$\alpha$ -PINENE	4.5
$\beta$ -PINENE	3.3
TERPINEN-4-ol	2.1
MYRCENE	1.4
$\gamma$ -TERPINENE	1.3

Comments from Robert Tisserand: Fresh, green, Eucalyptus-Rosemary odor profile. Constituents are in expected amounts.

Date : July 19, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 18G19-PTH1-1-CC

**Customer identification :** Ravintsara - Madagascar - RG010284R

**Type :** Essential oil

**Source :** *Cinnamomum camphora*

**Customer :** Plant Therapy


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 :** Sarah-Eve Tremblay, M. Sc. A., Chimiste

**Analysis date :** July 19, 2018

Checked and approved by :



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

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*This report is digitally signed, it is only considered valid if the digital signature is intact.*

*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:**  $1.4640 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.02	0.02	Aliphatic alcohol
Isoamyl alcohol	tr	58.52*	Aliphatic alcohol
2-Methylbutanol	tr	[58.52]*	Aliphatic alcohol
(3Z)-Hexenol	0.01	0.02	Aliphatic alcohol
(2E)-Hexenol	tr	tr	Aliphatic alcohol
Hexanol	tr	0.01	Aliphatic alcohol
Bornylene	tr		Monoterpene
Hashishene	tr	4.52*	Monoterpene
Tricyclene	0.01	0.01	Monoterpene
$\alpha$ -Thujene	0.83	0.84	Monoterpene
$\alpha$ -Pinene	4.49	[4.52]*	Monoterpene
Camphene	0.20*	0.18	Monoterpene
$\alpha$ -Fenchene	[0.20]*	0.01	Monoterpene
Thuja-2,4(10)-diene	tr	13.30*	Monoterpene
Sabinene	16.47*	[13.30]*	Monoterpene
$\beta$ -Pinene	[16.47]*	3.33	Monoterpene
6-Methyl-5-hepten-2-one	0.02	0.01	Aliphatic ketone
Myrcene	1.40	1.41	Monoterpene
$\alpha$ -Phellandrene	0.06	0.06	Monoterpene
$\alpha$ -Terpinene	0.78	0.79	Monoterpene
para-Cymene	59.68	0.24	Monoterpene
1,8-Cineole	[59.68]*	[58.52]*	Monoterpenic ether
$\beta$ -Phellandrene	[59.68]*	[58.52]*	Monoterpene
Limonene	[59.68]*	0.73	Monoterpene
Benzyl alcohol	0.04		Simple phenolic
(Z)- $\beta$ -Ocimene	0.05	0.04	Monoterpene
(E)- $\beta$ -Ocimene	0.21	0.22	Monoterpene
$\gamma$ -Terpinene	1.28	1.30	Monoterpene
cis-Sabinene hydrate	0.37	0.38*	Monoterpenic alcohol
Octanol	tr	tr	Aliphatic alcohol
Terpinolene	0.33*	0.33	Monoterpene
para-Cymenene	[0.33]*	tr	Monoterpene
trans-Linalool oxide (fur.)	[0.33]*	tr	Monoterpenic alcohol
trans-Sabinene hydrate	0.21	0.22	Monoterpenic alcohol
Linalool	0.04	0.04	Monoterpenic alcohol
Unknown	0.01	0.73*	Monoterpenic alcohol
endo-Fenchol	0.01	0.01	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.10*	0.01	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	[0.10]*	0.10	Monoterpenic alcohol
$\alpha$ -Campholenal	tr	0.01	Monoterpenic aldehyde
allo-Ocimene	tr		Monoterpene
cis-para-Mentha-2,8-dien-1-ol	0.01*	0.02	Monoterpenic alcohol
trans-Limonene oxide	[0.01]*	tr	Monoterpenic ether
trans-para-Menth-2-en-1-ol	0.07*	0.07	Monoterpenic alcohol
Camphor	[0.07]*	0.01	Monoterpenic ketone
neo-allo-Ocimene	0.01		Monoterpene
Unknown	0.01	tr	Unknown
Unknown	0.01	[0.38]*	Oxygenated monoterpene

Borneol	0.12	7.03*	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (pyr.)	0.56*	0.03	Monoterpenic alcohol
Unknown	[0.56]*		Oxygenated monoterpene
$\delta$ -Terpineol	[0.56]*	0.58	Monoterpenic alcohol
Terpinen-4-ol	2.09	2.10	Monoterpenic alcohol
Cryptone	0.01	tr	Normonoterpenic ketone
$\alpha$ -Terpineol	6.86	[7.03]*	Monoterpenic alcohol
Hodiendiol	0.04	0.04*	Monoterpenic alcohol
Dodecane	0.03		Alkane
Unknown	tr		Unknown
Unknown	tr		Unknown
Nerol	0.06	0.06	Monoterpenic alcohol
Unknown	0.02		Oxygenated monoterpene
Carvone	0.01	0.10*	Monoterpenic ketone
Unknown	tr	tr	Unknown
Geraniol	0.01	0.01*	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.02	0.01	Monoterpenic alcohol
Safrole	tr	[0.01]*	Phenylpropanoid
Unknown	0.01		Unknown
Unknown	0.01	0.01	Unknown
$\delta$ -Elemene isomer	0.03	[0.38]*	Sesquiterpene
$\alpha$ -Cubebene	0.02	[0.38]*	Sesquiterpene
Unknown	0.01	0.01	Unknown
$\alpha$ -Ylangene	0.02	0.03	Sesquiterpene
$\alpha$ -Copaene	0.01	0.01	Sesquiterpene
$\beta$ -Bourbonene	0.02	0.02	Sesquiterpene
$\beta$ -Elemene	0.09	[0.73]*	Sesquiterpene
$\alpha$ -Gurjunene	0.01*	tr	Sesquiterpene
Methyleugenol	[0.01]*	tr	Phenylpropanoid
$\beta$ -Caryophyllene	0.66	[0.73]*	Sesquiterpene
$\alpha$ -Santalene	tr	0.01	Sesquiterpene
$\beta$ -Gurjunene	0.01	tr	Sesquiterpene
Aromadendrene	0.01	0.02	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.03	[0.73]*	Sesquiterpene
6,9-Guaiadiene	0.02	0.02	Sesquiterpene
$\alpha$ -Humulene	0.63	0.63	Sesquiterpene
$\beta$ -Santalene	0.02	0.02	Sesquiterpene
Germacrene D	0.28	0.28	Sesquiterpene
$\beta$ -Selinene	0.15	0.15	Sesquiterpene
Patchoulene analog II	0.01	[7.03]*	Sesquiterpene
$\alpha$ -Selinene	0.01	[0.10]*	Sesquiterpene
Viridiflorene	0.63*	0.05	Sesquiterpene
Bicyclogermacrene	[0.63]*	0.51	Sesquiterpene
$\gamma$ -Cadinene	0.02	0.05	Sesquiterpene
$\delta$ -Cadinene	0.03	0.02	Sesquiterpene
Germacrene B	0.08	0.08	Sesquiterpene
Spathulenol	0.04	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.04*	[0.04]*	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.04]*	tr	Sesquiterpenic ether
Globulol	0.01	0.02	Sesquiterpenic alcohol
Viridiflorol	0.01	0.01	Sesquiterpenic alcohol
Guaiol	0.04	0.04	Sesquiterpenic alcohol

Humulene epoxide II	0.03	0.03	Sesquiterpenic ether
Isospathulenol	0.01	0.01	Sesquiterpenic alcohol
Neointermedeol	0.03	0.02	Sesquiterpenic alcohol
<b>Total identified</b>	<b>99.51%</b>	<b>99.53%</b>	

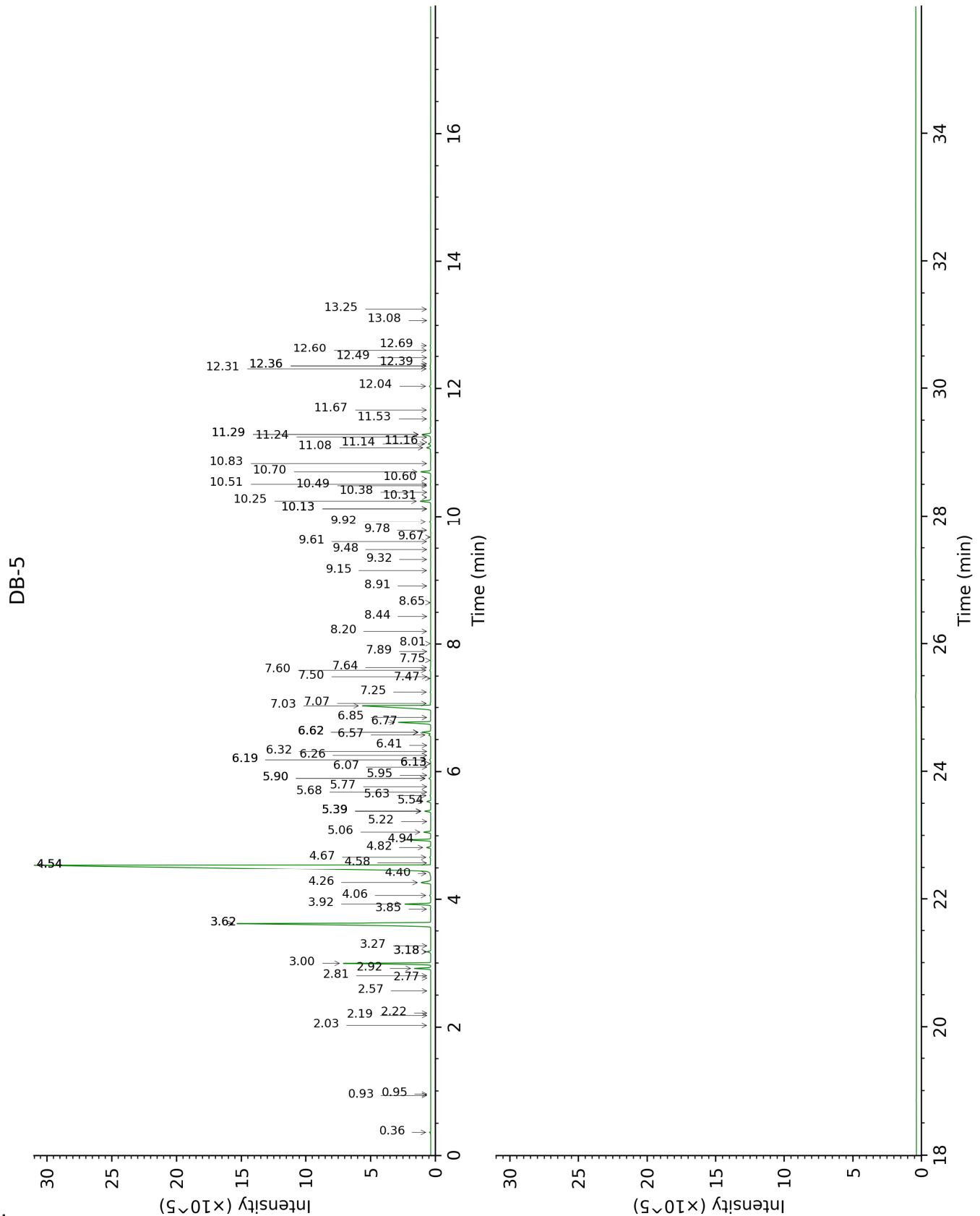
\*: Two or more compounds are coeluting on this column

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

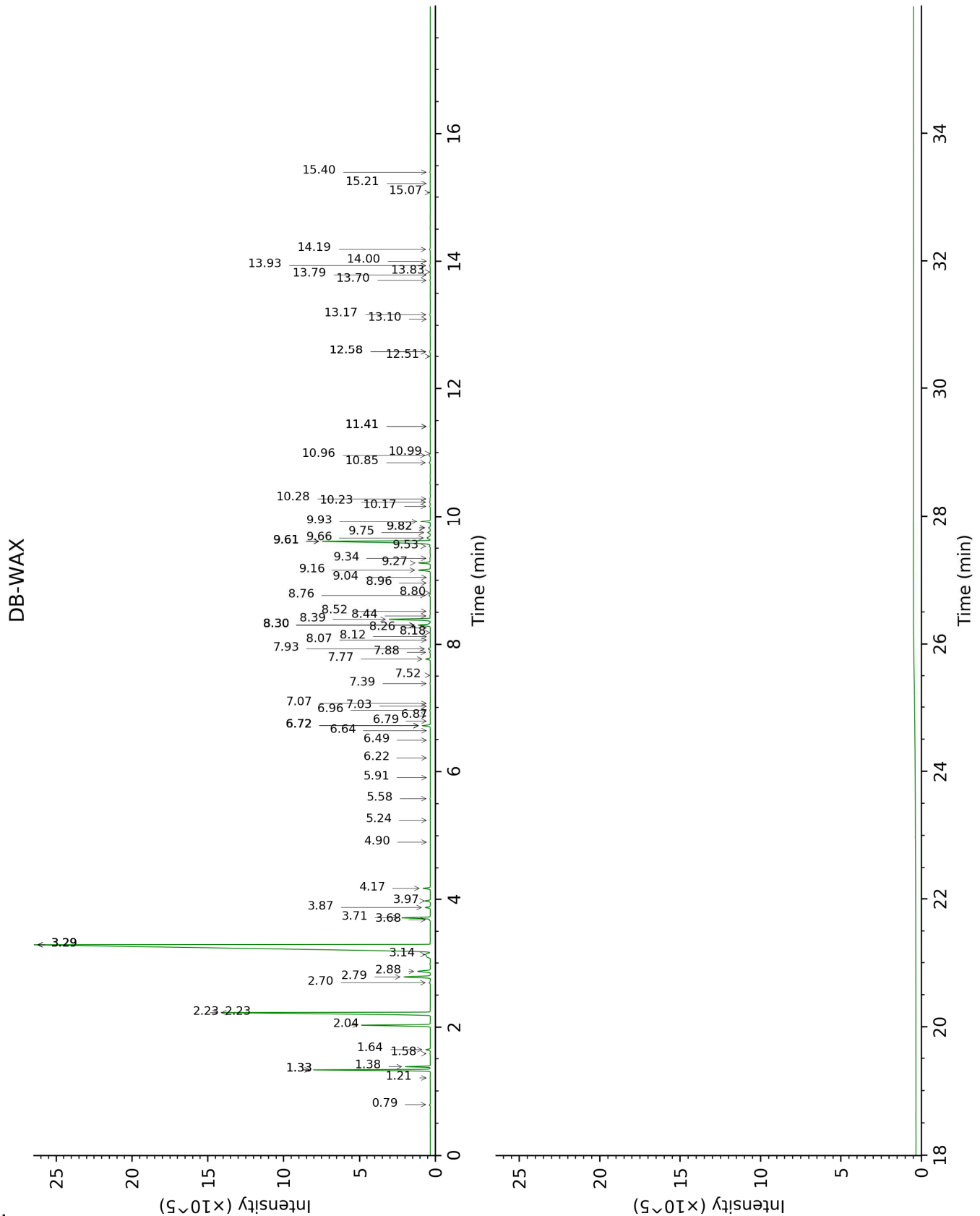
tr: The compound has been detected below 0.005% of total signal.

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	%
Ethanol	0.36	498	0.02	0.79	905	0.02
Isoamyl alcohol	0.93	728	tr	3.29*	1176	58.52
2-Methylbutanol	0.95	731	tr	3.29*	1176	[58.52]
(3Z)-Hexenol	2.03	854	0.01	5.58	1344	0.02
(2E)-Hexenol	2.19	867	tr	5.91	1368	tr
Hexanol	2.22	870	tr	5.24	1320	0.01
Bornylene	2.57	900	tr			
Hashishene	2.77	914	tr	1.33*	994	4.52
Tricyclene	2.81	916	0.01	1.20	974	0.01
$\alpha$ -Thujene	2.92	924	0.83	1.38	1002	0.84
$\alpha$ -Pinene	3.00	930	4.49	1.33*	994	[4.52]
Camphene	3.18*	942	0.20	1.64	1031	0.18
$\alpha$ -Fenchene	3.18*	942	[0.20]	1.58	1024	0.01
Thuja-2,4(10)-diene	3.27	948	tr	2.23*	1089	13.30
Sabinene	3.62*	971	16.47	2.23*	1089	[13.30]
$\beta$ -Pinene	3.62*	971	[16.47]	2.04	1070	3.33
6-Methyl-5-hepten-2-one	3.85	986	0.02	4.90	1295	0.01
Myrcene	3.92	992	1.40	2.79	1137	1.41
$\alpha$ -Phellandrene	4.06	1001	0.06	2.70	1130	0.06
$\alpha$ -Terpinene	4.26	1014	0.78	2.88	1143	0.79
para-Cymene	4.40†	1023	59.68	3.97	1228	0.24
1,8-Cineole	4.54*†	1032	[59.68]	3.29*	1176	[58.52]
$\beta$ -Phellandrene	4.54*†	1032	[59.68]	3.29*	1176	[58.52]
Limonene	4.54*†	1032	[59.68]	3.14	1164	0.73
Benzyl alcohol	4.58	1034	0.04			
(Z)- $\beta$ -Ocimene	4.67	1039	0.05	3.68	1206	0.04
(E)- $\beta$ -Ocimene	4.82	1049	0.21	3.87	1220	0.22
$\gamma$ -Terpinene	4.94	1057	1.28	3.71	1209	1.30
cis-Sabinene hydrate	5.06	1064	0.37	6.72*	1427	0.38
Octanol	5.22	1075	tr	8.07	1529	tr
Terpinolene	5.39*	1085	0.33	4.17	1242	0.33
para-Cymenene	5.39*	1085	[0.33]	6.22	1390	tr
trans-Linalool oxide (fur.)	5.39*	1085	[0.33]	6.79	1432	tr
trans-Sabinene hydrate	5.54	1094	0.21	7.77	1506	0.22
Linalool	5.63	1100	0.04	7.88	1514	0.04
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)]	5.68	1104	0.01	8.30*	1547	0.73
endo-Fenchol	5.77	1109	0.01	8.18	1538	0.01
trans-para-	5.90*	1118	0.10	8.80	1587	0.01

Mentha-2,8-dien-1-ol						
<i>cis</i> -para-Menth-2-en-1-ol	5.90*	1118	[0.10]	7.93	1518	0.10
$\alpha$ -Campholenal	5.95	1121	tr	6.87	1439	0.01
allo-Ocimene	6.07	1129	tr			
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.13*	1132	0.01	9.34	1630	0.02
<i>trans</i> -Limonene oxide	6.13*	1132	[0.01]	6.49	1410	tr
<i>trans</i> -para-Menth-2-en-1-ol	6.19*	1136	0.07	8.76	1584	0.07
Camphor	6.19*	1136	[0.07]	7.07	1453	0.01
neo-allo-Ocimene	6.26	1141	0.01			
Unknown [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	6.32	1145	0.01	6.64	1421	tr
Unknown [m/z 109, 41 (49), 124 (41), 43 (31), 95 (28), 84 (22)... 152 (7)]	6.41	1151	0.01	6.72*	1427	[0.38]
Borneol	6.57	1161	0.12	9.61*	1652	7.03
<i>cis</i> -Linalool oxide (pyr.)	6.62*	1164	0.56	10.17	1697	0.03
Unknown [m/z 109, 79 (18), 81 (15), 91 (12), 77 (10)... 152 (3)]	6.62*	1164	[0.56]			
$\delta$ -Terpineol	6.62*	1164	[0.56]	9.27	1624	0.58
Terpinen-4-ol	6.77	1174	2.09	8.39	1554	2.10
Cryptone	6.85	1179	0.01	9.04	1606	tr
$\alpha$ -Terpineol	7.03	1190	6.86	9.61*	1652	[7.03]
Hodiendiol	7.07	1193	0.04	12.58*	1908	0.04
Dodecane	7.26	1205	0.03			
Unknown [m/z 43, 97 (72), 41 (44), 71 (27), 55 (26), 82 (25)...]	7.47	1219	tr			
Unknown [m/z 83, 55 (23), 43 (15), 71 (14), 82 (13), 98 (11), ... 153 (4)]	7.50	1221	tr			
Nerol	7.60	1228	0.06	10.85	1755	0.06
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.64	1231	0.02			
Carvone	7.75	1238	0.01	9.82*	1669	0.10
Unknown [m/z 43, 97 (69), 107 (46),	7.89	1248	tr	10.99	1767	tr

41 (28), 55 (21), 109 (20)...						
Geraniol	8.01	1256	0.01	11.41*	1804	0.01
<i>trans</i> -Ascaridole glycol	8.20	1269	0.02	14.00	2042	0.01
Safrole	8.44	1284	tr	11.41*	1804	[0.01]
Unknown [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...	8.65	1299	0.01			
Unknown [m/z 111, 126 (93), 43 (90), 71 (60)...	8.91	1317	0.01	15.07	2147	0.01
$\delta$ -Elemene isomer	9.15	1334	0.03	6.72*	1427	[0.38]
$\alpha$ -Cubebene	9.32	1346	0.02	6.72*	1427	[0.38]
Unknown [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...	9.48	1357	0.01	13.79	2021	0.01
$\alpha$ -Ylangene	9.61	1366	0.02	6.96	1445	0.03
$\alpha$ -Copaene	9.67	1371	0.01	7.02	1450	0.01
$\beta$ -Bourbonene	9.78	1379	0.02	7.39	1477	0.02
$\beta$ -Elemene	9.92	1388	0.09	8.30*	1547	[0.73]
$\alpha$ -Gurjunene	10.13*	1403	0.01	7.52	1487	tr
Methyleugenol	10.13*	1403	[0.01]	13.10	1956	tr
$\beta$ -Caryophyllene	10.25	1412	0.66	8.30*	1547	[0.73]
$\alpha$ -Santalene	10.31	1416	tr	8.12	1533	0.01
$\beta$ -Gurjunene	10.38	1422	0.01	8.26	1544	tr
Aromadendrene	10.49	1430	0.01	8.44	1559	0.02
<i>trans</i> - $\alpha$ - Bergamotene	10.51	1432	0.03	8.30*	1547	[0.73]
6,9-Guaiadiene	10.60	1438	0.02	8.52	1564	0.02
$\alpha$ -Humulene	10.70	1446	0.63	9.16	1615	0.63
$\beta$ -Santalene	10.83	1456	0.02	8.96	1599	0.02
Germacrene D	11.08	1474	0.28	9.66	1656	0.28
$\beta$ -Selinene	11.14	1479	0.15	9.75	1663	0.15
Patchoulene analog II	11.16	1481	0.01	9.61*	1652	[7.03]
$\alpha$ -Selinene	11.24	1487	0.01	9.82*	1669	[0.10]
Viridiflorene	11.29*	1490	0.63	9.53	1645	0.05
Bicyclogermacrene	11.29*	1490	[0.63]	9.92	1678	0.51
$\gamma$ -Cadinene	11.53	1508	0.02	10.23	1702	0.05
$\delta$ -Cadinene	11.67	1519	0.03	10.28	1707	0.02
Germacrene B	12.04	1548	0.08	10.96	1765	0.08
Spathulenol	12.31	1570	0.04	14.19	2060	0.04
Caryophyllene oxide	12.36*	1573	0.04	12.58*	1908	[0.04]
Caryophyllene oxide isomer	12.36*	1573	[0.04]	12.51	1901	tr
Globulol	12.39	1576	0.01	13.70	2013	0.02
Viridiflorol	12.49	1583	0.01	13.83	2025	0.01
Guaiol	12.60	1592	0.04	13.93	2035	0.04

Humulene epoxide II	12.69	1599	0.03	13.17	1962	0.03
Isospathulenol	13.08	1631	0.01	15.22	2162	0.01
Neointermedeol	13.25	1646	0.03	15.40	2181	0.02
<b>Total identified</b>	<b>99.51%</b>			<b>99.53%</b>		
<b>Total reported</b>	<b>99.58%</b>			<b>99.56%</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