

Date : April 25, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 22D19-PTH04

**Customer identification** : Niaouli - N2010494R

**Type** : Essential oil

**Source** : *Melaleuca quinquenervia* ct. 1,8-Cineole

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

**Analysis date** : April 26, 2022

Checked and approved by :

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

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### PHYSICOCHEMICAL DATA

**Physical aspect:** Faintly yellow viscous liquid

**Refractive index:**  $1.4675 \pm 0.0003$  (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
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.01	Aliphatic ester
2,4-Dimethyl-3-pentanone	tr	Aliphatic ketone
Styrene	tr	Simple phenolic
$\alpha$ -Thujene	0.17	Monoterpene
$\alpha$ -Pinene	8.89	Monoterpene
Camphene	0.08	Monoterpene
$\alpha$ -Fenchene	0.02	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Benzaldehyde	0.19	Simple phenolic
Sabinene	0.03	Monoterpene
$\beta$ -Pinene	2.27	Monoterpene
Myrcene	0.99	Monoterpene
Pseudolimonene	0.05	Monoterpene
$\alpha$ -Phellandrene	0.09	Monoterpene
$\Delta^3$ -Carene	0.02	Monoterpene
$\alpha$ -Terpinene	0.34	Monoterpene
para-Cymene	0.87	Monoterpene
1,8-Cineole	55.34	Monoterpenic ether
Limonene	6.92	Monoterpene
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.03	Monoterpene
$\gamma$ -Terpinene	1.32	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Terpinolene	0.73	Monoterpene
para-Cymenene	0.03	Monoterpene
Methyl benzoate	0.03	Phenolic ester
Linalool	0.16	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
trans-Pinocarveol	0.03	Monoterpenic alcohol
Camphene hydrate	0.07	Monoterpenic alcohol
iso-Isopulegol	0.01	Monoterpenic alcohol
Borneol	0.03	Monoterpenic alcohol
$\delta$ -Terpineol	0.15	Monoterpenic alcohol
Ethyl benzoate	0.02	Phenolic ester
Terpinen-4-ol	0.79	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
$\alpha$ -Terpineol	6.52	Monoterpenic alcohol
Myrtanal	0.03	Monoterpenic aldehyde
Myrtenol	0.03	Monoterpenic alcohol
exo-2-Hydroxycineole	0.04	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol

Carvone	0.01	Monoterpenic ketone
Geraniol	0.04	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol?	0.02	Oxygenated monoterpene
Methyl thiobenzoate?	0.03	Simple phenolic
δ-Terpinyl acetate	0.02	Monoterpenic ester
Myrtenyl acetate	0.02	Monoterpenic ester
Bicycloelemene	0.01	Sesquiterpene
α-Terpinyl acetate	0.66	Monoterpenic ester
Eugenol	0.03	Phenylpropanoid
Isoledene	0.02	Sesquiterpene
α-Copaene	0.05	Sesquiterpene
7-Cubebene	0.04	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
α-Gurjunene	0.15	Sesquiterpene
β-Caryophyllene	1.75	Sesquiterpene
Aromadendrene	0.05	Sesquiterpene
Selina-5,11-diene	0.02	Sesquiterpene
α-Humulene	0.33	Sesquiterpene
allo-Aromadendrene	0.39	Sesquiterpene
Valerena-4,7(11)-diene	0.02	Sesquiterpene
γ-Gurjunene	0.02	Sesquiterpene
Selina-4,11-diene	0.04	Sesquiterpene
β-Selinene	0.18	Sesquiterpene
allo-Aromadendr-9-ene	0.11	Sesquiterpene
Viridiflorene	0.71	Sesquiterpene
α-Selinene	0.17	Sesquiterpene
α-Muurolene	0.06	Sesquiterpene
γ-Cadinene	0.19	Sesquiterpene
Unknown	0.01	Sesquiterpene
δ-Cadinene	0.25	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.02	Sesquiterpene
α-Cadinene	0.02	Sesquiterpene
Isocaryophyllene epoxide B	0.01	Sesquiterpenic ether
Epiglobulol	0.02	Sesquiterpenic alcohol
Palustrol	0.13	Sesquiterpenic alcohol
( <i>E</i> )-Nerolidol	0.82	Sesquiterpenic alcohol
Caryophyllene oxide	0.19	Sesquiterpenic ether
Gleenol	0.01	Sesquiterpenic alcohol
Globulol	0.07	Sesquiterpenic alcohol
Viridiflorol	4.91	Sesquiterpenic alcohol
Cubeban-11-ol	0.13	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	0.01	Sesquiterpenic alcohol
Guaiol	0.09	Sesquiterpenic alcohol
Ledol	0.63	Sesquiterpenic alcohol
Humulene epoxide II	0.04	Sesquiterpenic ether
Rosifoliol	0.04	Sesquiterpenic alcohol
1-epi-Cubenol	0.04	Sesquiterpenic alcohol
γ-Eudesmol	0.03	Sesquiterpenic alcohol
τ-Cadinol	0.08	Sesquiterpenic alcohol
τ-Muurolol	0.02	Sesquiterpenic alcohol

$\beta$ -Eudesmol	0.06	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.06	Sesquiterpenic alcohol
Bulnesol	0.02	Sesquiterpenic alcohol
(2E,6E)-Farnesol	0.03	Sesquiterpenic alcohol
<b>Consolidated total</b>	<b>99.30%</b>	

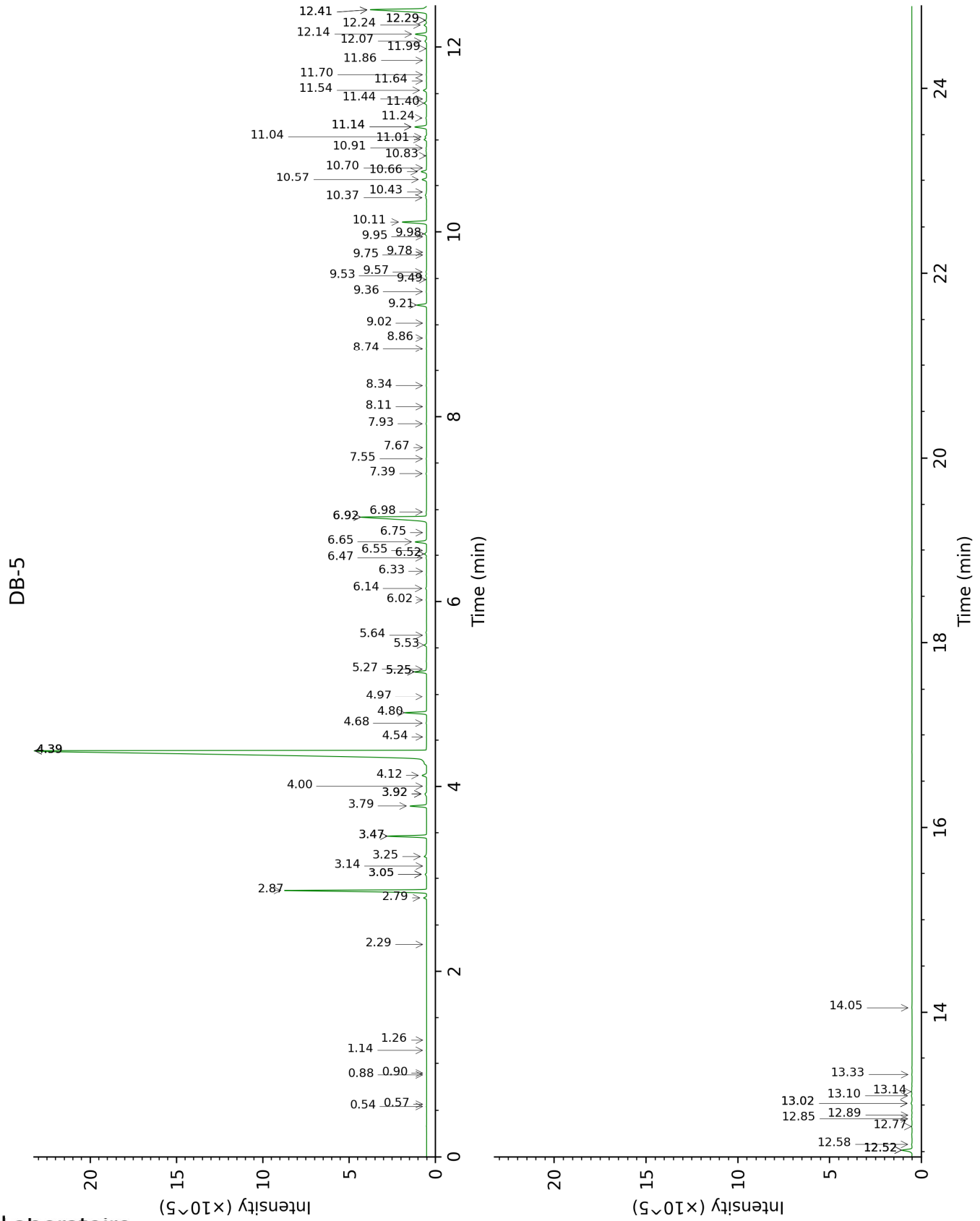
tr: The compound has been detected below 0.005% of total signal.

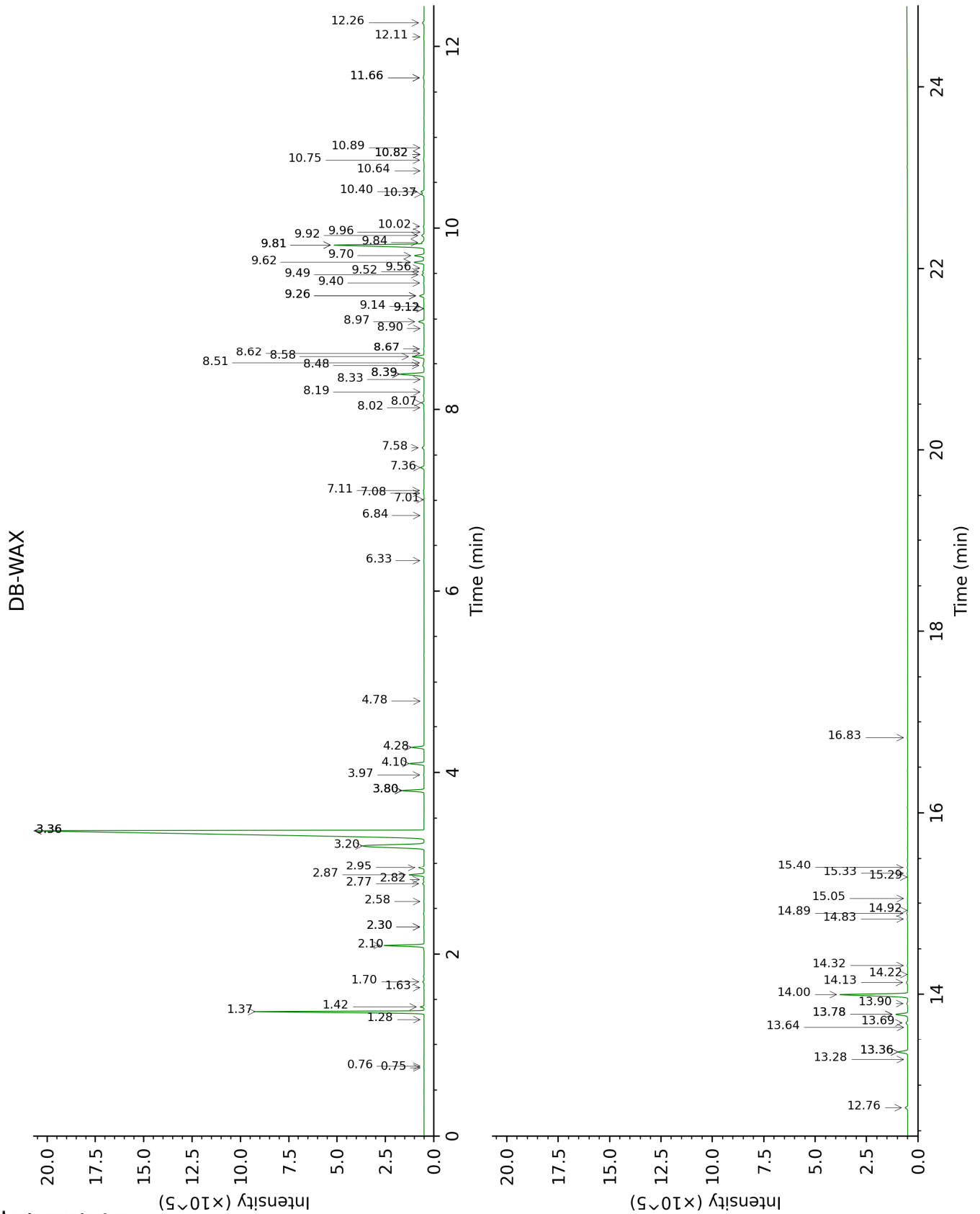
Note: no correction factor was applied

**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.







FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.54	642	0.01	0.76	889	0.01
2-Methylbutyral	0.57	652	tr	0.75	882	tr
Isoamyl alcohol	0.88	733	0.01	3.36*	1173	55.35
2-Methylbutanol	0.90	736	tr	3.36*	1173	[55.35]
Methyl 2-methylbutyrate	1.14	774	0.01	1.28	978	0.01
2,4-Dimethyl-3-pentanone	1.26	793	tr			
Styrene	2.29	888	tr	3.80*	1208	1.30
α-Thujene	2.79	926	0.17	1.42	998	0.17
α-Pinene	2.87	931	8.89	1.37	993	8.88
Camphene	3.05*	943	0.10	1.70	1026	0.08
α-Fenchene	3.05*	943	[0.10]	1.63	1019	0.02
Thuja-2,4(10)-diene	3.14	949	0.01	2.30*	1087	0.04
Benzaldehyde	3.25	956	0.19	7.36	1465	0.23
Sabinene	3.47*	971	2.26	2.30*	1087	[0.04]
β-Pinene	3.47*	971	[2.26]	2.10	1066	2.27
Myrcene	3.79	993	0.99	2.87	1134	0.90
Pseudolimonene	3.92*	1002	0.15	2.82	1130	0.05
α-Phellandrene	3.92*	1002	[0.15]	2.77	1126	0.09
Δ <sup>3</sup> -Carene	4.00	1007	0.02	2.58	1111	0.02
α-Terpinene	4.12	1015	0.34	2.95	1140	0.34
para-Cymene	4.39*	1031	63.23	4.10	1230	0.87
1,8-Cineole	4.39*	1031	[63.23]	3.36*	1173	[55.35]
Limonene	4.39*	1031	[63.23]	3.20	1160	6.92
(Z)-β-Ocimene	4.54	1041	0.01	3.80*	1208	[1.30]
(E)-β-Ocimene	4.68	1050	0.03	3.97	1221	0.04
γ-Terpinene	4.80	1057	1.32	3.80*	1208	[1.30]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	4.97	1068	0.01	4.78	1281	0.01
Terpinolene	5.25*	1086	0.74	4.28	1243	0.73
para-Cymenene	5.25*	1086	[0.74]	6.33	1390	0.03
Methyl benzoate	5.27	1088	0.03	8.62	1560	0.02
Linalool	5.53	1104	0.16	8.08	1519	0.16
endo-Fenchol	5.64	1111	0.01	8.33	1538	0.01
trans-Pinocarveol	6.02	1135	0.03	9.14	1600	0.02
Camphene hydrate	6.14	1143	0.07	8.48	1550	0.11
iso-Isopulegol	6.33	1155	0.01	8.02	1514	0.03
Borneol	6.47	1164	0.03	9.81*	1654	6.56
δ-Terpineol	6.52	1167	0.15	9.49	1628	0.15
Ethyl benzoate	6.55	1169	0.02	9.26*	1610	0.32
Terpinen-4-ol	6.65	1175	0.79	8.58	1557	0.78

Cryptone	6.75	1182	0.01	9.12*	1598	0.01
$\alpha$ -Terpineol	6.92*	1193	6.53	9.81*	1654	[6.56]
Myrtenal	6.92*	1193	[6.53]	8.67*	1564	0.05
Myrtenol	6.98	1196	0.03	10.89	1743	0.02
exo-2-Hydroxycineole	7.39	1224	0.04	11.66*	1808	0.08
Citronellol	7.55	1234	0.03	10.75	1731	0.07
Carvone	7.67	1242	0.01	9.96	1666	0.01
Geraniol	7.93	1260	0.04	11.66*	1808	[0.08]
<i>trans</i> -Ascaridole glycol?	8.11	1272	0.02			
Methyl thiobenzoate?	8.34	1287	0.03			
$\delta$ -Terpinyl acetate	8.74	1315	0.02	9.12*	1598	[0.01]
Myrtenyl acetate	8.86	1323	0.02	9.56	1634	0.05
Bicycloelemene	9.02	1334	0.01	7.01	1440	0.01
$\alpha$ -Terpinyl acetate	9.21	1348	0.66	9.70	1645	0.65
Eugenol	9.36	1358	0.03	14.83	2101	0.03
Isoledene	9.49	1367	0.02	6.84	1427	0.02
$\alpha$ -Copaene	9.53	1370	0.05	7.11	1447	0.05
7-Cubebene	9.57	1373	0.04	7.08	1445	0.04
Geranyl acetate	9.75	1386	0.01			
$\beta$ -Elemene	9.78	1388	0.01	8.39*	1542	1.78
Isocaryophyllene	9.95	1400	0.01	8.19	1528	0.01
$\alpha$ -Gurjunene	9.98	1402	0.15	7.58	1481	0.15
$\beta$ -Caryophyllene	10.11	1412	1.75	8.39*	1542	[1.78]
Aromadendrene	10.37	1431	0.05	8.51	1552	0.05
Selina-5,11-diene	10.43	1436	0.02	8.67*	1564	[0.05]
$\alpha$ -Humulene	10.57	1446	0.33	9.26*	1610	[0.32]
allo-Aromadendrene	10.66	1453	0.39	8.97	1587	0.39
Valerena-4,7(11)-diene	10.70	1456	0.02	8.90	1581	0.01
$\gamma$ -Gurjunene	10.83	1465	0.02	9.12*	1598	[0.01]
Selina-4,11-diene	10.91	1472	0.04	9.40	1621	0.05
$\beta$ -Selinene	11.01	1478	0.18	9.84	1656	0.17
allo-Aromadendr-9-ene	11.04	1480	0.11	9.52	1631	0.11
Viridiflorene	11.14*	1488	0.88	9.62	1639	0.71
$\alpha$ -Selinene	11.14*	1488	[0.88]	9.92	1663	0.17
$\alpha$ -Muurolene	11.24	1496	0.06	10.02	1671	0.05
$\gamma$ -Cadinene	11.40	1508	0.19	10.37	1699	0.18
Unknown [m/z 159, 145 (91), 131 (67), 105 (46), 202 (43)]	11.44	1511	0.01	10.82*	1737	0.01
$\delta$ -Cadinene	11.54	1519	0.25	10.40	1702	0.22

<i>trans</i> -Cadin-1,4-diene	11.64	1527	0.02	10.64	1722	0.02
$\alpha$ -Cadinene	11.70	1532	0.02	10.82*	1737	[0.01]
Isocaryophyllene epoxide B	11.86	1544	0.01	12.11	1848	0.02
Epiglobulol	11.99	1554	0.02	13.28	1954	0.02
Palustrol	12.07	1560	0.13	12.26	1861	0.13
( <i>E</i> )-Nerolidol	12.14	1566	0.82	13.78*	2000	0.77
Caryophyllene oxide	12.24	1574	0.19	12.76	1905	0.17
Gleenol	12.29*	1578	0.08	13.64	1986	0.01
Globulol	12.29*	1578	[0.08]	13.90	2011	0.07
Viridiflorol	12.41*	1587	5.08	14.00	2021	4.91
Cubeban-11-ol	12.41*	1587	[5.08]	13.69	1991	0.13
Eudesm-5-en-11-ol analog	12.52*	1596	0.74	14.22	2042	0.01
Guaiol	12.52*	1596	[0.74]	14.13	2034	0.09
Ledol	12.52*	1596	[0.74]	13.36*	1961	0.67
Humulene epoxide II	12.58	1600	0.04	13.36*	1961	[0.67]
Rosifoliol	12.77	1616	0.04	14.32	2051	0.03
1- <i>epi</i> -Cubenol	12.85	1623	0.04	13.78*	2000	[0.77]
$\gamma$ -Eudesmol	12.89	1626	0.03	14.92	2110	0.01
$\tau$ -Cadinol	13.02*	1637	0.09	14.89	2107	0.08
$\tau$ -Muurolol	13.02*	1637	[0.09]	15.05	2123	0.02
$\beta$ -Eudesmol	13.10	1643	0.06	15.40	2158	0.05
$\alpha$ -Eudesmol	13.14	1647	0.06	15.33	2151	0.04
Bulnesol	13.33	1662	0.02	15.29	2147	0.02
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	14.05	1723	0.03	16.83	2306	0.03
<b>Total identified</b>		<b>99.33%</b>			<b>98.99%</b>	
<b>Total reported</b>		<b>99.35%</b>			<b>99.00%</b>	

\*: 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