

Date : September 23, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20114-PTH03


**Customer identification** : Bergamont Organic - BQ010594R

**Type** : Essential oil

**Source** : *Citrus bergamia*

**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** : Fanny Charlier, B. Sc., chimiste à l'entraînement

**Analysis date** : September 17, 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:** 1.4640 ± 0.0003 (20 °C; method PC-MAT-016)

*NFT 75-215:2009 - OIL OF BERGAMOT - ITALY*

<b>Compound</b>	<b>Min. %</b>	<b>Max. %</b>	<b>Observed %</b>	<b>Complies?</b>
β-Bisabolene	0.3	0.6	0.1	No
Geranial	0.25	0.50	0.27	Yes
Linalyl acetate	22	36	27	Yes
Linalool	3	15	14	Yes
γ-Terpinene	6	10	6	Yes
Limonene	30	45	37	Yes
β-Pinene	5.5	9.5	7.1	Yes
<b>Refractive index</b>	1.4650	1.4700	1.4640	No

*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
(3Z)-Hexenol	0.01	Aliphatic alcohol
$\alpha$ -Thujene	0.20	Monoterpene
$\alpha$ -Pinene	1.27	Monoterpene
Camphene	0.05	Monoterpene
$\beta$ -Pinene	7.06	Monoterpene
Sabinene	1.03	Monoterpene
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Myrcene	0.83	Monoterpene
$\alpha$ -Phellandrene	0.03	Monoterpene
Octanal	0.03	Aliphatic aldehyde
$\Delta^3$ -Carene	0.01	Monoterpene
$\alpha$ -Terpinene	0.10	Monoterpene
para-Cymene	1.06	Monoterpene
Limonene	36.74	Monoterpene
$\beta$ -Phellandrene	0.15	Monoterpene
1,8-Cineole	0.02	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.06	Monoterpene
(E)- $\beta$ -Ocimene	0.13	Monoterpene
$\gamma$ -Terpinene	6.31	Monoterpene
cis-Sabinene hydrate	0.02	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.04	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.23	Monoterpene
trans-Linalool oxide (fur.)	0.04	Monoterpenic alcohol
Linalool	13.58	Monoterpenic alcohol
Nonanal	tr	Aliphatic aldehyde
cis-Limonene oxide	0.03	Monoterpenic ether
trans-Limonene oxide	0.03	Monoterpenic ether
Camphor	0.01	Monoterpenic ketone
Epoxyterpinolene	0.01	Monoterpenic ether
Citronellal	0.01	Monoterpenic aldehyde
Terpinen-4-ol	0.06	Monoterpenic alcohol
$\alpha$ -Terpineol	0.30	Monoterpenic alcohol
$\gamma$ -Terpineol	0.01	Monoterpenic alcohol
Decanal	0.05	Aliphatic aldehyde
Octyl acetate	0.15	Aliphatic ester
Nerol	0.09	Monoterpenic alcohol
Citronellol	0.01	Monoterpenic alcohol
Neral	0.19	Monoterpenic aldehyde
(cis?)-Linalool oxide acetate (fur.)?	0.04	Monoterpenic ester
Geraniol	0.05	Monoterpenic alcohol
Linalyl acetate	26.71	Monoterpenic ester
(trans?)-Linalool oxide acetate (fur.)?	0.05	Monoterpenic ester
Geranial	0.27	Monoterpenic aldehyde
Bornyl acetate	0.01	Monoterpenic ester

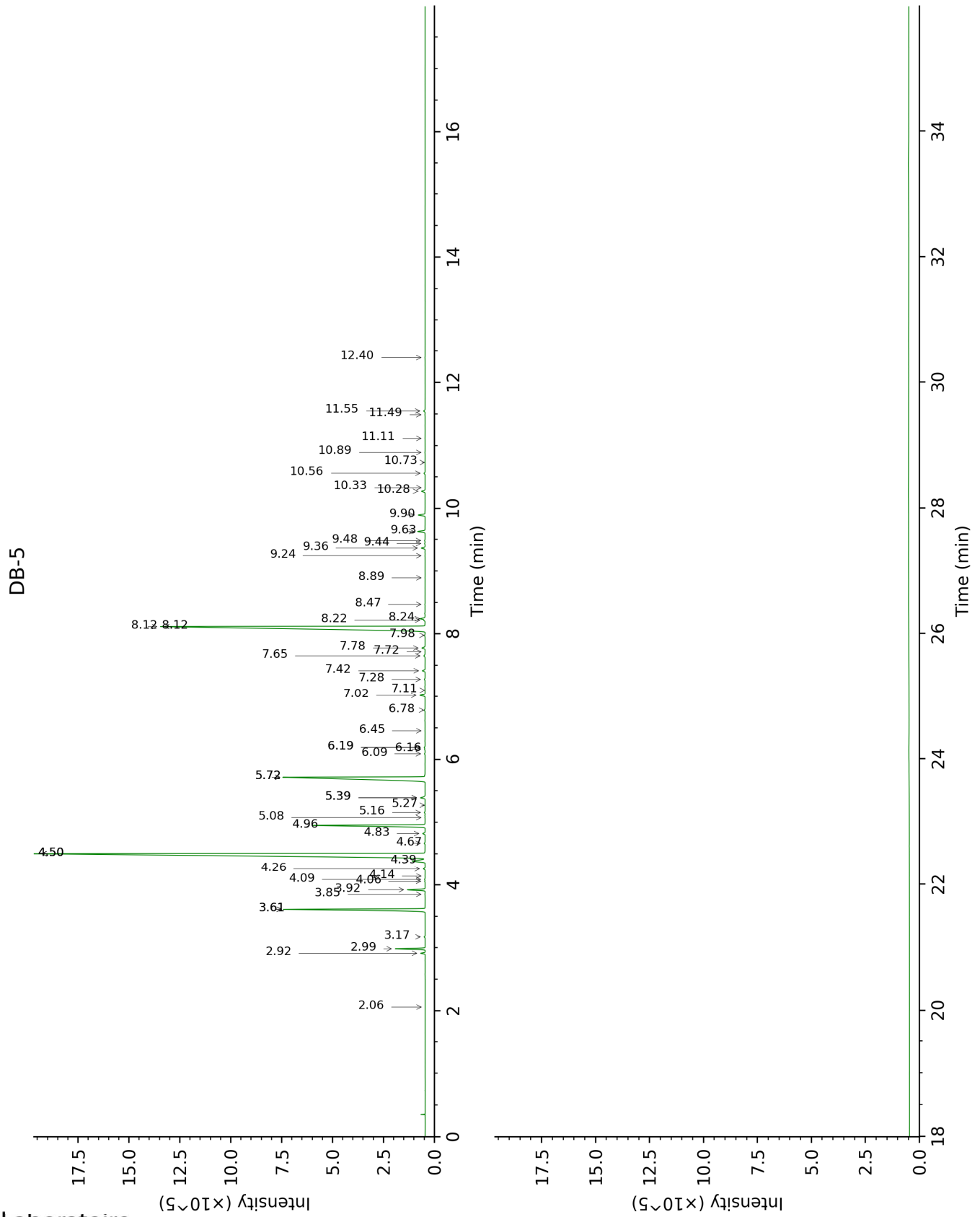
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.01	Monoterpenic peroxide
Linalyl propionate	0.01	Monoterpenic ester
$\alpha$ -Terpinyl acetate	0.21	Monoterpenic ester
Unknown	0.03	Monoterpenic ester
Unknown	0.04	Oxygenated monoterpene
Neryl acetate	0.42	Monoterpenic ester
Geranyl acetate	0.37	Monoterpenic ester
$\beta$ -Caryophyllene	0.22	Sesquiterpene
<i>cis</i> - $\alpha$ -Bergamotene	0.01	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.07	Sesquiterpene
$\alpha$ -Humulene	0.01	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
Hodiendiol derivative II	0.02	Oxygenated monoterpene
$\beta$ -Bisabolene	0.09	Sesquiterpene
Caryophyllene oxide	0.02	Sesquiterpenic ether
<b>Consolidated total</b>	<b>98.68%</b>	

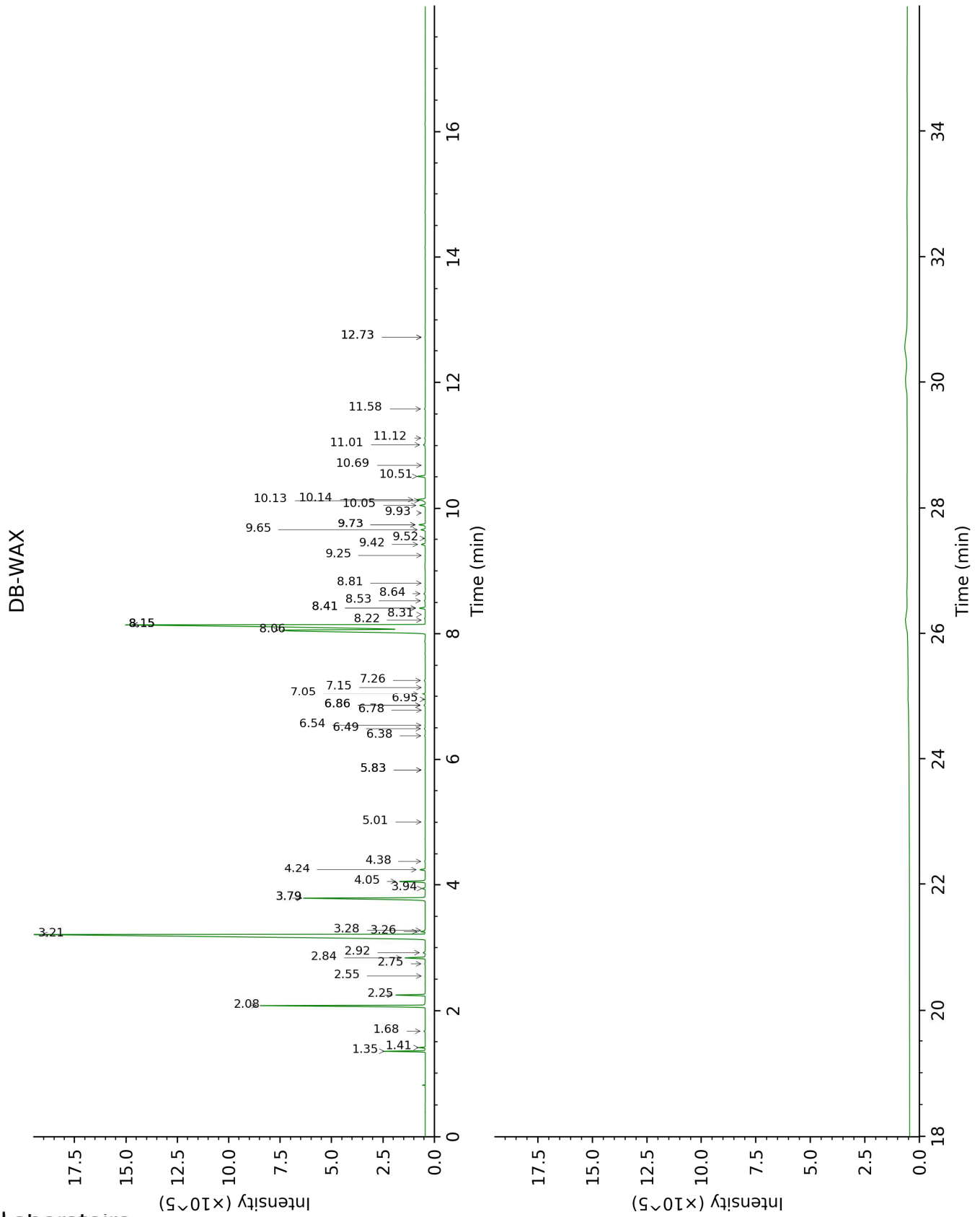
Note: no correction factor was applied

**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.

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
(3Z)-Hexenol	2.06	858	0.01	5.83*	1350	0.01
$\alpha$ -Thujene	2.92	925	0.20	1.41	999	0.19
$\alpha$ -Pinene	2.99	930	1.27	1.35	990	1.23
Camphene	3.18	942	0.05	1.68	1026	0.05
$\beta$ -Pinene	3.61*	972	8.23	2.08	1066	7.06
Sabinene	3.61*	972	[8.23]	2.25	1083	1.03
6-Methyl-5-hepten-2-one	3.85	987	0.02	5.01	1293	0.01
Myrcene	3.92	992	0.83	2.84	1132	0.82
$\alpha$ -Phellandrene	4.06	1001	0.03	2.75	1124	0.02
Octanal	4.09	1003	0.03	4.38	1248	0.03
$\Delta^3$ -Carene	4.14	1006	0.01	2.55	1109	0.01
$\alpha$ -Terpinene	4.26	1014	0.10	2.92	1138	0.10
para-Cymene	4.39	1022	1.06	4.05	1224	1.08
Limonene	4.50*	1029	37.53	3.21	1161	36.74
$\beta$ -Phellandrene	4.50*	1029	[37.53]	3.26	1164	0.15
1,8-Cineole	4.50*	1029	[37.53]	3.28	1166	0.02
(Z)- $\beta$ -Ocimene	4.67	1040	0.06	3.79*	1205	6.28
(E)- $\beta$ -Ocimene	4.82	1049	0.13	3.94	1216	0.13
$\gamma$ -Terpinene	4.96	1058	6.31	3.79*	1205	[6.28]
cis-Sabinene hydrate	5.08	1065	0.02	6.86*	1426	0.06
cis-Linalool oxide (fur.)	5.16	1070	0.04	6.49	1398	0.05
Octanol	5.27	1078	0.01	8.22	1529	0.01
Terpinolene	5.39*	1085	0.28	4.24	1238	0.23
trans-Linalool oxide (fur.)	5.39*	1085	[0.28]	6.86*	1426	[0.06]
Linalool	5.72*	1105	13.21	8.06	1516	13.58
Nonanal	5.72*	1105	[13.21]	5.83*	1350	[0.01]
cis-Limonene oxide	6.09	1129	0.03	6.38	1390	0.03
trans-Limonene oxide	6.16	1134	0.03	6.54	1402	0.02
Camphor	6.19*	1136	0.05	7.15	1447	0.01
Epoxyterpinolene	6.19*	1136	[0.05]	6.78	1420	0.01
Citronellal	6.45	1152	0.01	6.95	1432	0.01
Terpinen-4-ol	6.78	1173	0.06	8.53	1552	0.05
$\alpha$ -Terpineol	7.02	1188	0.30	9.73*	1648	0.30
$\gamma$ -Terpineol	7.11	1194	0.01	9.93	1664	0.01
Decanal	7.28	1205	0.05	7.26	1456	0.05
Octyl acetate	7.42	1214	0.15	7.05	1440	0.15
Nerol	7.65	1230	0.09	11.01	1755	0.09
Citronellol	7.72	1234	0.01	10.69	1727	0.01
Neral	7.78	1238	0.19	9.42	1623	0.20
(cis?)-Linalool oxide acetate (fur.)?	7.98	1252	0.04	8.15*	1523	26.76



Geraniol	8.12*	1261	27.14	11.58	1803	0.05
Linalyl acetate	8.12*	1261	[27.14]	8.15*	1523	[26.76]
( <i>trans</i> ?)-Linalool oxide acetate (fur.)?	8.22	1268	0.05	8.64	1561	0.07
Geranial	8.24	1269	0.27	10.05	1674	0.27
Bornyl acetate	8.47	1284	0.01	8.31	1535	0.01
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	8.89	1312	0.01			
Linalyl propionate	9.24	1337	0.01	8.81	1574	0.01
$\alpha$ -Terpinyl acetate	9.36	1345	0.21	9.65	1642	0.21
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.44	1350	0.03			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.48	1354	0.04	11.12	1764	0.03
Neryl acetate	9.63	1364	0.42	10.14	1682	0.44
Geranyl acetate	9.90	1383	0.37	10.51	1712	0.38
$\beta$ -Caryophyllene	10.28	1410	0.22	8.41*	1543	0.27
<i>cis</i> - $\alpha$ -Bergamotene	10.33	1414	0.01	8.15*	1523	[26.76]
<i>trans</i> - $\alpha$ -Bergamotene	10.56	1431	0.07	8.41*	1543	[0.27]
$\alpha$ -Humulene	10.73	1444	0.01	9.25	1609	0.01
( <i>E</i> )- $\beta$ -Farnesene	10.89	1456	0.02	9.52	1631	0.02
Germacrene D	11.11	1472	0.01	9.73*	1648	[0.30]
Hodiendiol derivative II	11.49	1500	0.02	12.73*	1905	0.02
$\beta$ -Bisabolene	11.55	1505	0.09	10.13	1680	0.07
Caryophyllene oxide	12.40	1572	0.02	12.73*	1905	[0.02]
<b>Total identified</b>		<b>99.40%</b>			<b>98.45%</b>	
<b>Total reported</b>		<b>99.46%</b>			<b>98.48%</b>	

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

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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index