

**Date :** June 18, 2019

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 19F07-ORA04-1-SCC  
**Customer identification :** Organic Lavender  
**Type :** Essential oil  
**Source :** *Lavandula angustifolia*  
**Customer :** Organic Aromas Inc.

**ANALYSIS**

**Method:** PC-PA-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 :** Lindsay Girard, B. Sc.

**Analysis date :** June 14, 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:**  $1.4601 \pm 0.0003$  (20 °C)

*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	%	Classe
Methoxyacetone	0.07	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	0.04	Aliphatic alcohol
Isoamyl alcohol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Butyl acetate	0.03	Aliphatic ester
Methyl hexyl ether	0.10	Aliphatic ether
(3Z)-Hexenol	0.03	Aliphatic alcohol
Hexanol	0.08	Aliphatic alcohol
Unknown	0.01	Unknown
Hashishene	0.01	Monoterpene
Tricyclene	0.02	Monoterpene
$\alpha$ -Thujene	0.09	Monoterpene
$\alpha$ -Pinene	0.21	Monoterpene
Camphene	0.15	Monoterpene
Butyl isobutyrate	0.01	Aliphatic ester
Sabinene	0.04	Monoterpene
$\beta$ -Pinene	0.04	Monoterpene
Octen-3-ol	0.21	Aliphatic alcohol
Octan-3-one	1.67	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	0.48	Monoterpene
Butyl butyrate	0.13	Aliphatic ester
Octan-3-ol	0.24	Aliphatic alcohol
$\alpha$ -Phellandrene	0.02	Monoterpene
$\Delta^3$ -Carene	0.14	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.06	Monoterpenic ether
$\alpha$ -Terpinene	0.02	Monoterpene
Hexyl acetate	0.74	Aliphatic ester
ortho-Cymene	0.05	Monoterpene
para-Cymene	0.28	Monoterpene
Limonene	0.29	Monoterpene
1,8-Cineole	0.86*	Monoterpenic ether
$\beta$ -Phellandrene	[0.86]*	Monoterpene
Lavender lactone	0.02	Aliphatic lactone
(Z)- $\beta$ -Ocimene	2.49	Monoterpene
(E)- $\beta$ -Ocimene	1.43	Monoterpene
$\gamma$ -Terpinene	0.06	Monoterpene
<i>cis</i> -Sabinene hydrate	0.08	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.25	Monoterpenic alcohol
Unknown	0.01	Unknown
Octanol	0.05	Aliphatic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.04	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.21	Monoterpenic alcohol
Rosefuran	0.01	Monoterpenic ether
Linalool	30.11	Monoterpenic alcohol

(Z)-6-Methyl-3,5-heptadien-2-one	0.06	Aliphatic ketone
Octen-3-yl acetate	1.09	Aliphatic ester
Unknown	0.03	Unknown
Octan-3-yl acetate	0.23	Aliphatic ester
allo-Ocimene	0.02	Monoterpene
Camphor	0.28	Monoterpenic ketone
(Z)-Myroxide	0.03	Monoterpenic ether
(E)-Myroxide	0.06	Monoterpenic ether
Hexyl isobutyrate	0.08	Aliphatic ester
Nerol oxide	0.03	Aliphatic ether
Borneol	0.53	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Lavandulol	0.79	Monoterpenic alcohol
Terpinen-4-ol	3.65	Monoterpenic alcohol
Cryptone	0.13	Normonoterpenic ketone
meta-Cymen-8-ol	0.04	Monoterpenic alcohol
para-Cymen-8-ol	0.05	Monoterpenic alcohol
$\alpha$ -Terpineol	0.86	Monoterpenic alcohol
Hexyl butyrate	0.38	Aliphatic ester
Hodiendiol	0.09	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Unknown	0.05	Unknown
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.06	Monoterpenic alcohol
Octyl acetate	0.03	Aliphatic ester
trans-Carveol	0.01	Monoterpenic alcohol
Bornyl formate	0.03	Monoterpenic ester
Nerol	0.19	Monoterpenic alcohol
Neral	0.05	Monoterpenic aldehyde
Linalyl acetate	33.73	Monoterpenic ester
Geraniol	0.52	Monoterpenic alcohol
Geranial	0.04	Monoterpenic aldehyde
2,6-Dimethyl-1,7-octadiene-3,6-diol	0.01	Monoterpenic alcohol
Bornyl acetate	0.13	Monoterpenic ester
Lavandulyl acetate	3.35	Monoterpenic ester
Hexyl tiglate	0.04	Aliphatic ester
Hodiendiol derivative	0.08	Oxygenated monoterpene
Unknown	0.11	Oxygenated monoterpene
Unknown	0.10	Oxygenated monoterpene
Neryl acetate	0.27	Monoterpenic ester
$\alpha$ -Copaene	0.01	Sesquiterpene
$\beta$ -Bourbonene	0.07	Sesquiterpene
Geranyl acetate	0.45	Monoterpenic ester
Hexyl hexanoate	0.09	Aliphatic ester
7-epi-Sesquithujene	0.06	Sesquiterpene
$\alpha$ -Funebrene	0.01	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
$\beta$ -Caryophyllene	2.79	Sesquiterpene
$\alpha$ -Santalene	0.40	Sesquiterpene
Coumarin	0.02	Coumarin
trans- $\alpha$ -Bergamotene	0.13	Sesquiterpene
Isogermacrene D	0.02	Sesquiterpene
Sesquisabinene A	0.04	Sesquiterpene

<i>cis</i> -β-Bergamotene?	0.07	Sesquiterpene
α-Humulene	0.10	Sesquiterpene
Lavandulyl butyrate?	0.11	Monoterpenic ester
( <i>E</i> )-β-Farnesene	2.41	Sesquiterpene
Germacrene D	0.27	Sesquiterpene
<i>trans</i> -β-Bergamotene	0.06	Sesquiterpene
Valencene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
β-Bisabolene	0.19	Sesquiterpene
δ-Cadinene	0.04	Sesquiterpene
Isocaryophyllene epoxide B	0.09	Sesquiterpenic ether
α-Elemol	0.01	Sesquiterpenic alcohol
( <i>E</i> )-Nerolidol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.71	Sesquiterpenic ether
Caryophyllene oxide isomer	0.16	Sesquiterpenic ether
τ-Cadinol	0.08	Sesquiterpenic alcohol
Herniarin	0.01	Coumarin
<b>Consolidated total</b>	<b>96.63%</b>	

\*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered [xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

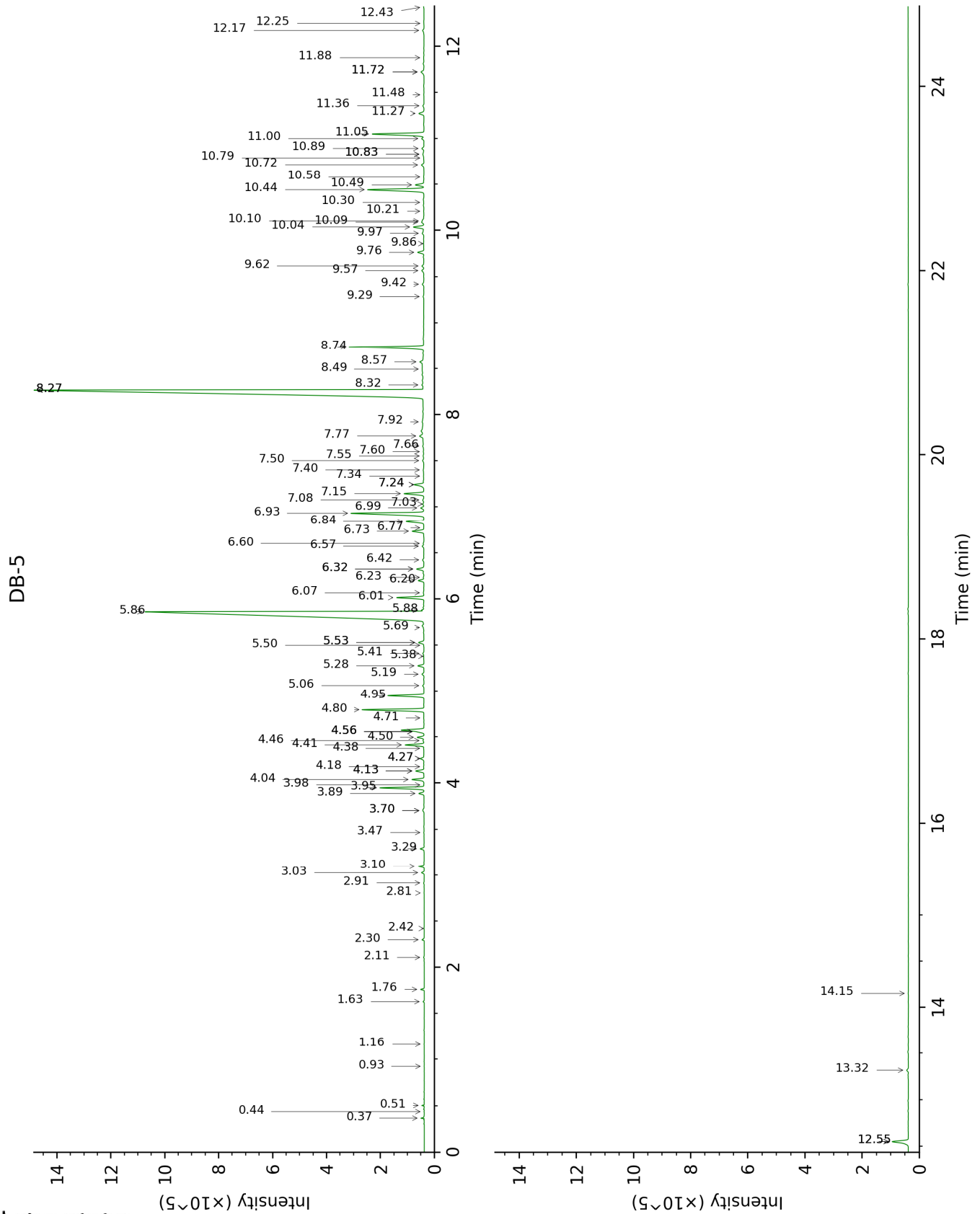
tr: The compound has been detected below 0.005% of total signal.

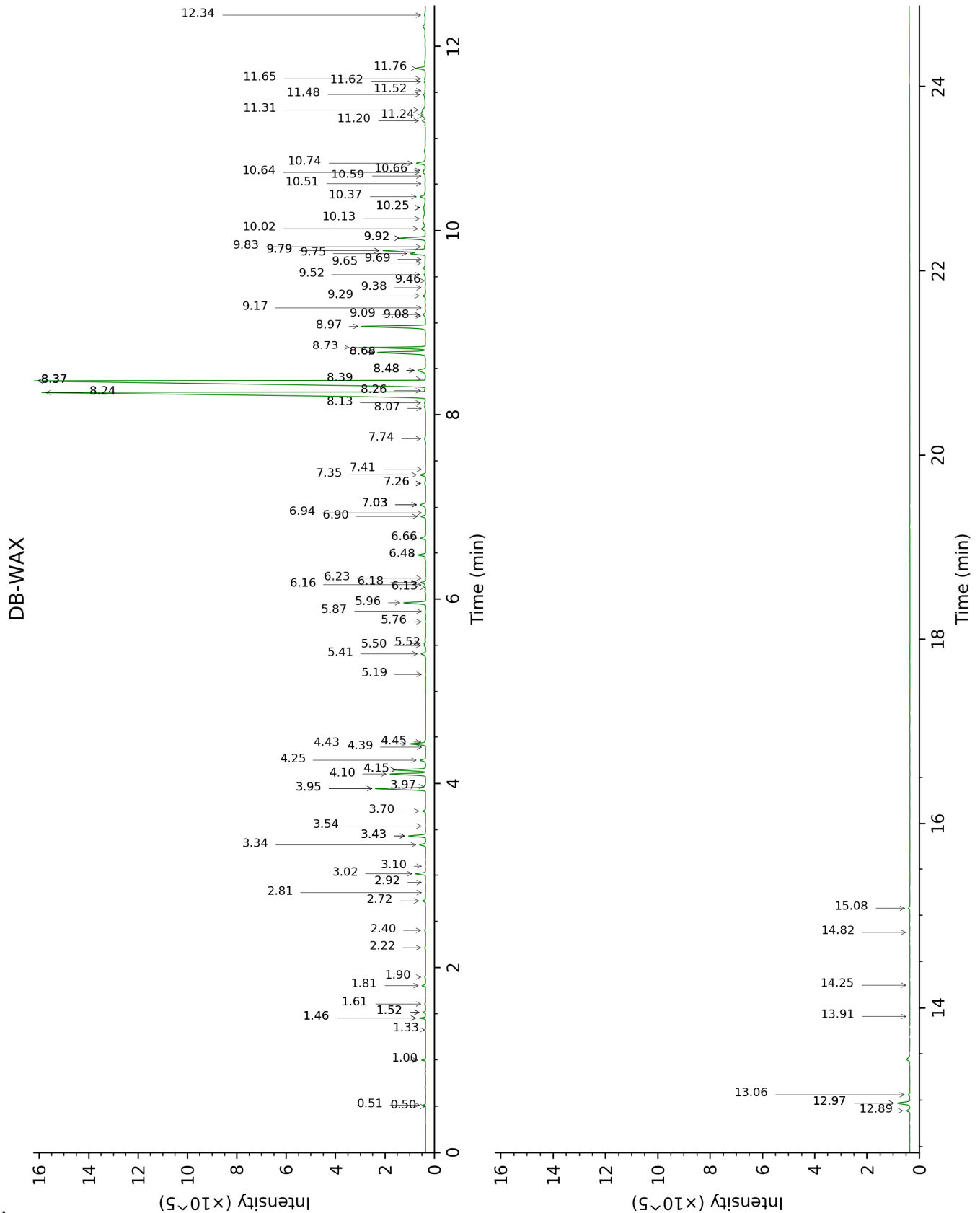
Note: no correction factor was applied

**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	%
Methoxyacetone	0.37	513	0.07	0.51	784	0.05
Isobutyral	0.44	540	tr	0.50	772	tr
2-Methyl-3-buten-2-ol	0.50	590	0.04	1.61	1010	0.03
Isoamyl alcohol	0.92	727	tr	3.54	1177	0.03
Toluene	1.16	760	tr	1.52*	1002	0.09
Butyl acetate	1.63	816	0.03	1.90	1038	0.03
Methyl hexyl ether	1.76	826	0.10	1.00	925	0.10
(3Z)-Hexenol	2.11	855	0.03	5.87	1341	0.02
Hexanol	2.30	870	0.08	5.52	1316	0.07
Unknown [m/z 59, 85 (88), 41 (57), 43 (43)...]	2.42	880	0.01	6.13	1359	0.02
Hashishene	2.80	910	0.01	1.46*	995	0.20
Tricyclene	2.91	917	0.02	1.33	976	0.02
$\alpha$ -Thujene	3.03	924	0.09	1.52*	1002	[0.09]
$\alpha$ -Pinene	3.10	929	0.21	1.46*	995	[0.20]
Camphene	3.29	942	0.15	1.81	1029	0.14
Butyl isobutyrate	3.47	953	0.01	2.81	1120	0.02
Sabinene	3.70*†	969	0.08	2.40	1087	0.04
$\beta$ -Pinene	3.70*†	969	[0.08]	2.22	1069	0.04
Octen-3-ol	3.89	981	0.21	6.90	1416	0.22
Octan-3-one	3.95	985	1.67	4.10	1220	1.59
6-Methyl-5-hepten-2-one	3.98	987	0.01	5.19	1302	0.02
Myrcene	4.04	991	0.48	3.02	1136	0.44
Butyl butyrate	4.13*	997	0.37	3.70	1190	0.13
Octan-3-ol	4.13*	997	[0.37]	6.18	1363	0.24
$\alpha$ -Phellandrene	4.18	1000	0.02	2.92	1129	0.02
$\Delta$ 3-Carene	4.27*	1005	0.18	2.72	1113	0.14
<i>cis</i> -Dehydroxylinalool oxide	4.27*	1005	[0.18]	3.97	1210	0.06
$\alpha$ -Terpinene	4.38	1012	0.02	3.10	1143	0.02
Hexyl acetate	4.41	1015	0.74	4.43	1245	0.71
ortho-Cymene	4.46	1018	0.05	4.15*	1224	1.37
para-Cymene	4.50	1020	0.28	4.25	1232	0.29
Limonene	4.56*†	1024	1.15	3.34	1162	0.29
1,8-Cineole	4.56*†	1024	[1.15]	3.43*	1169	0.82
$\beta$ -Phellandrene	4.56*†	1024	[1.15]	3.43*	1169	[0.82]
Lavender lactone	4.71	1033	0.02	9.46	1613	0.03
(Z)- $\beta$ -Ocimene	4.80	1038	2.49	3.95*	1209	2.40
(E)- $\beta$ -Ocimene	4.95	1048	1.43	4.15*	1224	[1.37]
$\gamma$ -Terpinene	5.06	1055	0.06	3.95*	1209	[2.40]
<i>cis</i> -Sabinene hydrate	5.19	1063	0.08	7.03*	1426	0.33
<i>cis</i> -Linalool oxide	5.28	1069	0.25	6.66	1398	0.28

(fur.)						
Unknown [m/z 56, 55 (94), 41 (85), 69 (74), 43 (65), 70 (63)...]	5.38	1075	0.01			
Octanol	5.41	1077	0.05	8.37*†	1528	[63.98]
Isoterpinolene	5.50	1083	0.01	4.39	1242	0.01
Terpinolene	5.53*	1085	0.25	4.45	1246	0.04
<i>trans</i> -Linalool oxide (fur.)	5.53*	1085	[0.25]	7.03*	1426	[0.33]
Rosefuran	5.69	1095	0.01	6.23	1367	0.02
Linalool	5.86	1106	30.11	8.24†	1518	63.98
( <i>Z</i> )-6-Methyl-3,5-heptadien-2-one	5.88	1107	0.06	8.37*†	1528	[63.98]
Octen-3-yl acetate	6.02	1115	1.09	5.96	1347	1.04
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	6.07	1119	0.03	9.69	1632	0.03
Octan-3-yl acetate	6.20	1127	0.23	5.41	1307	0.26
allo-Ocimene	6.23	1130	0.02	5.76	1332	0.03
Camphor	6.32*	1135	0.34	7.35	1450	0.28
( <i>Z</i> )-Myroxide	6.32*	1135	[0.34]	7.03*	1426	[0.33]
( <i>E</i> )-Myroxide	6.42	1142	0.06	7.26*	1443	0.06
Hexyl isobutyrate	6.57	1151	0.08	5.50	1314	0.07
Nerol oxide	6.60	1153	0.03	6.94	1419	0.01
Borneol	6.73	1162	0.53	9.92*	1651	1.38
<i>cis</i> -Linalool oxide (pyr.)	6.77	1164	0.01	10.51	1699	0.02
Lavandulol	6.84	1169	0.79	9.75	1637	0.74
Terpinen-4-ol	6.93	1175	3.65	8.74	1556	3.51
Cryptone	6.99	1178	0.13	9.30	1600	0.13
meta-Cymen-8-ol	7.03	1181	0.04	11.62	1793	0.04
para-Cymen-8-ol	7.08	1184	0.05	11.65	1796	0.04
$\alpha$ -Terpineol	7.15	1188	0.86	9.92*	1651	[1.38]
Hexyl butyrate	7.24*	1195	0.48	6.48	1385	0.38
Hodiendiol	7.24*	1195	[0.48]	12.97*	1913	0.70
Verbenone	7.34	1201	0.01	9.79*	1640	2.33
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.40	1205	0.05	6.16	1362	0.04
(3 <i>E</i> ,5 <i>E</i> )-2,6-Dimethylocta-3,5,7-trien-2-ol	7.50	1212	0.06	11.48	1781	0.17
Octyl acetate	7.55	1216	0.03	7.26*	1443	[0.06]
<i>trans</i> -Carveol	7.60	1219	0.01	11.52	1785	0.03
Bornyl formate	7.66	1223	0.03	8.26†	1519	[63.98]
Nerol	7.77	1230	0.19	11.20	1757	0.16
Neral	7.92	1241	0.05	9.65	1629	0.04
Linalyl acetate	8.27*	1264	36.17	8.37*†	1528	[63.98]
Geraniol	8.27*	1264	[36.17]	11.76	1806	0.52
Geranial	8.32	1268	0.04	10.25*	1678	0.31

2,6-Dimethyl-1,7-octadiene-3,6-diol	8.49	1280	0.01	14.82	2088	0.02
Bornyl acetate	8.57	1285	0.13	8.48*	1536	0.56
Lavandulyl acetate	8.74	1296	3.35	8.97	1574	3.32
Hexyl tiglate	9.29	1330	0.04	9.08	1583	0.04
Hodiendiol derivative	9.42	1339	0.08	13.06	1922	0.07
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.57	1350	0.11	11.24†	1761	0.77
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.62	1353	0.10	11.31†	1767	[0.77]
Neryl acetate	9.76	1364	0.27	10.37	1687	0.28
α-Copaene	9.86	1370	0.01	7.41	1455	0.02
β-Bourbonene	9.97	1378	0.07	7.74	1479	0.09
Geranyl acetate	10.04	1383	0.45	10.74	1718	0.54
Hexyl hexanoate	10.09	1386	0.09	9.09	1584	0.13
7-epi-Sesquithujene	10.10	1387	0.06	8.13	1509	0.06
α-Funebrene	10.21	1395	0.01	8.07	1504	0.01
Isocaryophyllene	10.30	1402	0.01	8.39	1529	0.01
β-Caryophyllene	10.44	1412	2.79	8.68*	1552	2.71
α-Santalene	10.49	1416	0.40	8.48*	1536	[0.56]
Coumarin	10.58	1422	0.02			
trans-α-Bergamotene	10.72	1432	0.13	8.68*	1552	[2.71]
Isogermacrene D	10.79	1438	0.02	9.17	1590	0.02
Sesquisabinene A	10.83*	1441	0.10	9.38	1607	0.04
cis-β-Bergamotene?	10.83*	1441	[0.10]			
α-Humulene	10.90	1445	0.10	9.52	1618	0.11
Lavandulyl butyrate?	11.00	1453	0.11	10.64	1710	0.17
(E)-β-Farnesene	11.05	1457	2.41	9.79*	1640	[2.33]
Germacrene D	11.27	1473	0.27	10.02	1659	0.30
trans-β-Bergamotene	11.36	1479	0.06	9.83	1643	0.07
Valencene	11.48	1488	0.01	10.13	1668	0.23
γ-Cadinene	11.72*	1507	0.20	10.59	1706	0.02
β-Bisabolene	11.72*	1507	[0.20]	10.25*	1678	[0.31]
δ-Cadinene	11.88	1519	0.04	10.66	1712	0.07
Isocaryophyllene epoxide B	12.17	1542	0.09	12.34	1857	0.09
α-Elemol	12.25	1548	0.01	14.25	2033	0.01
(E)-Nerolidol	12.43	1562	0.02	13.91	2000	0.01
Caryophyllene oxide	12.55*	1571	0.88	12.97*	1913	[0.70]
Caryophyllene	12.55*	1571	[0.88]	12.89	1906	0.16

oxide isomer						
τ-Cadinol	13.32	1633	0.08	15.08	2113	0.09
Herniarin	14.15	1702	0.01			
<b>Total identified</b>		<b>98.24%</b>			<b>95.84%</b>	
<b>Total reported</b>		<b>98.55%</b>			<b>96.71%</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