Date : January 23, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19A10-ORA03-1-CC
Customer identification : Organic sweet orange
Type : Essential oil
Source : *Citrus sinensis*
Customer : Organic Aromas Inc.

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 : Lindsay Girard, B. Sc.
Analysis date : January 14, 2019

Checked and approved by :

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.

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

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid
Refractive index: 1.4720 ± 0.0003 (20 °C)

CONCLUSION

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Hexanal	tr	tr	Aliphatic aldehyde
Heptanal	tr	0.01	Aliphatic aldehyde
α-Thujene	tr	tr	Monoterpene
α-Pinene	0.44	0.44	Monoterpene
Camphene	tr	tr	Monoterpene
β-Pinene	0.56*	0.04	Monoterpene
Sabinene	[0.56]*	0.53	Monoterpene
Myrcene	1.59	1.59	Monoterpene
α-Phellandrene	0.29*	0.02	Monoterpene
Octanal	[0.29]*	0.27	Aliphatic aldehyde
Δ3-Carene	0.06	0.06	Monoterpene
(*Z*)-β-Ocimene	92.84*	tr	Monoterpene
Limonene	[92.84]*	92.35	Monoterpene
β-Phellandrene	[92.84]*	0.18	Monoterpene
(*E*)-β-Ocimene	0.02	0.02	Monoterpene
γ-Terpinene	0.01	0.01	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Octanol	0.02	0.03	Aliphatic alcohol
Terpinolene	0.01	0.01	Monoterpene
Linalool	0.42	0.43	Monoterpenic alcohol
Nonanal	0.05	0.05	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.05	0.07	Monoterpenic alcohol
cis-Limonene oxide	0.09	0.09	Monoterpenic ether
trans-Limonene oxide	0.05	0.06	Monoterpenic ether
Citronellal	0.05	0.05	Monoterpenic aldehyde
Terpinen-4-ol	0.02	0.01	Monoterpenic alcohol
para-Cymen-8-ol	0.01	0.01	Monoterpenic alcohol
α-Terpineol	0.03	0.03	Monoterpenic alcohol
Decanal	0.30	0.31	Aliphatic aldehyde
Octyl acetate	0.01	0.02	Aliphatic ester
trans-Carveol	0.06	0.06	Monoterpenic alcohol
Nerol	0.04	0.01	Monoterpenic alcohol
Neral	0.11	0.12	Monoterpenic aldehyde
Geraniol	0.04	0.02	Monoterpenic alcohol
Perillaldehyde	0.01	0.02	Monoterpenic aldehyde
Geranial	0.02	0.08	Monoterpenic aldehyde
Limonen-10-ol	0.01	0.01	Monoterpenic alcohol
Undecanal	0.02	0.02	Aliphatic aldehyde
Neryl acetate	0.01	0.01	Monoterpenic ester
α-Copaene	0.02	0.02	Sesquiterpene
Geranyl acetate	0.01	0.01	Monoterpenic ester
β-Elemene	0.02	0.03*	Sesquiterpene
Dodecanal	0.07	0.08	Aliphatic aldehyde
β-Caryophyllene	0.02	0.03	Sesquiterpene
β-Copaene	0.03	[0.03]*	Sesquiterpene
α-Humulene	0.01	0.01	Sesquiterpene
(*E*)-β-Farnesene	tr	0.02	Sesquiterpene
Germacrene D	0.01	0.01	Sesquiterpene

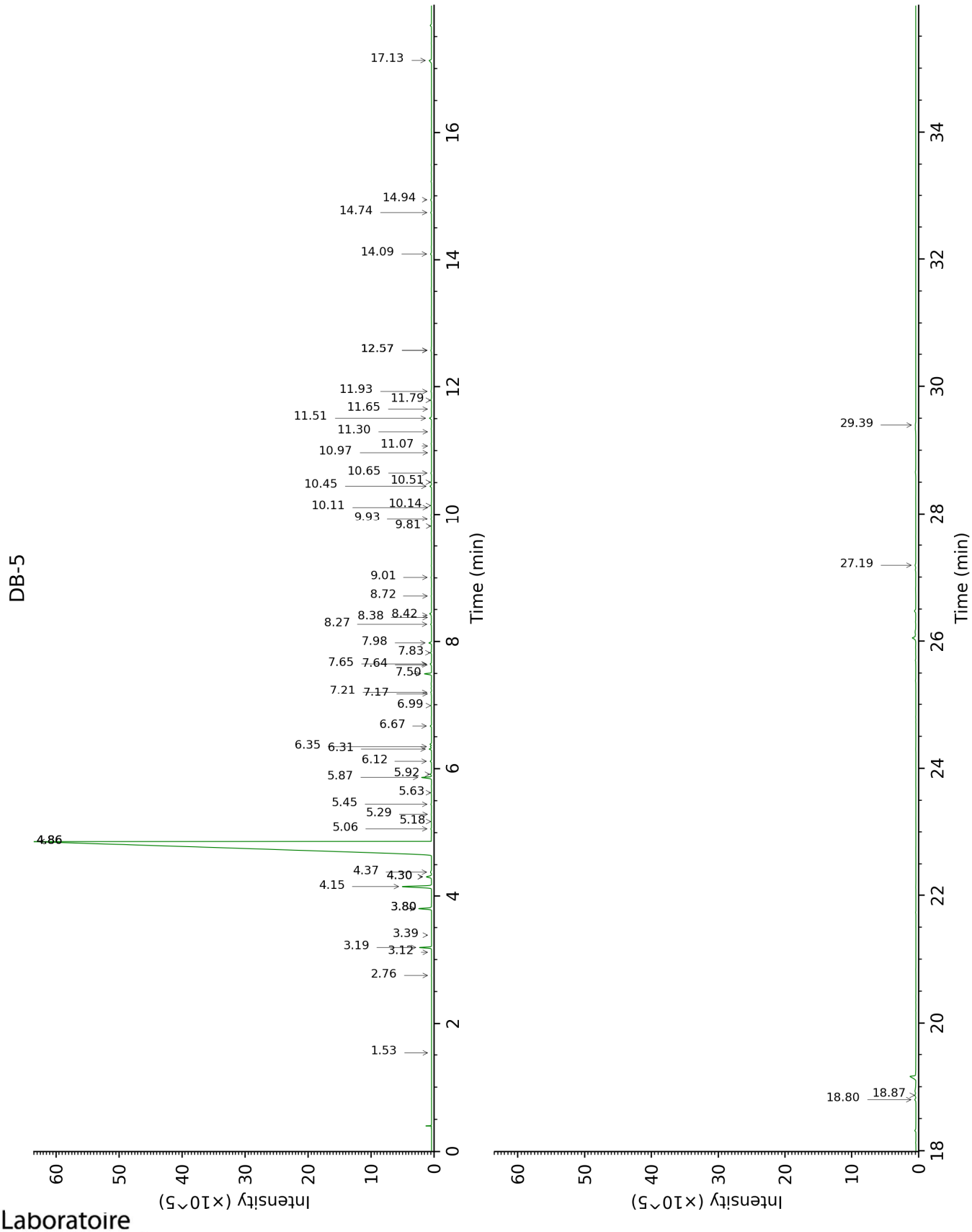
Valencene	0.10	0.10	Sesquiterpene
α-Muurolene	0.01	0.01	Sesquiterpene
γ-Cadinene	0.03	0.03	Sesquiterpene
δ-Cadinene	0.03	0.02	Sesquiterpene
Caryophyllene oxide	0.04*	0.01	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.04]*	tr	Sesquiterpenic ether
β-Sinensal	0.05	0.05	Sesquiterpenic aldehyde
α-Sinensal	0.04	0.04	Sesquiterpenic aldehyde
Myristic acid	0.05		Aliphatic acid
Palmitic acid	0.17		Aliphatic acid
Linoleic acid	0.07		Aliphatic acid
Oleic acid	0.08	0.09	Aliphatic acid
Tetramethoxyflavone isomer	0.05		Flavonoid
Nobiletin	0.05		Flavonoid
Myristic acid		0.06	Aliphatic acid
Palmitic acid		0.20	Aliphatic acid
Total identified	**98.22%**	**97.86%**	

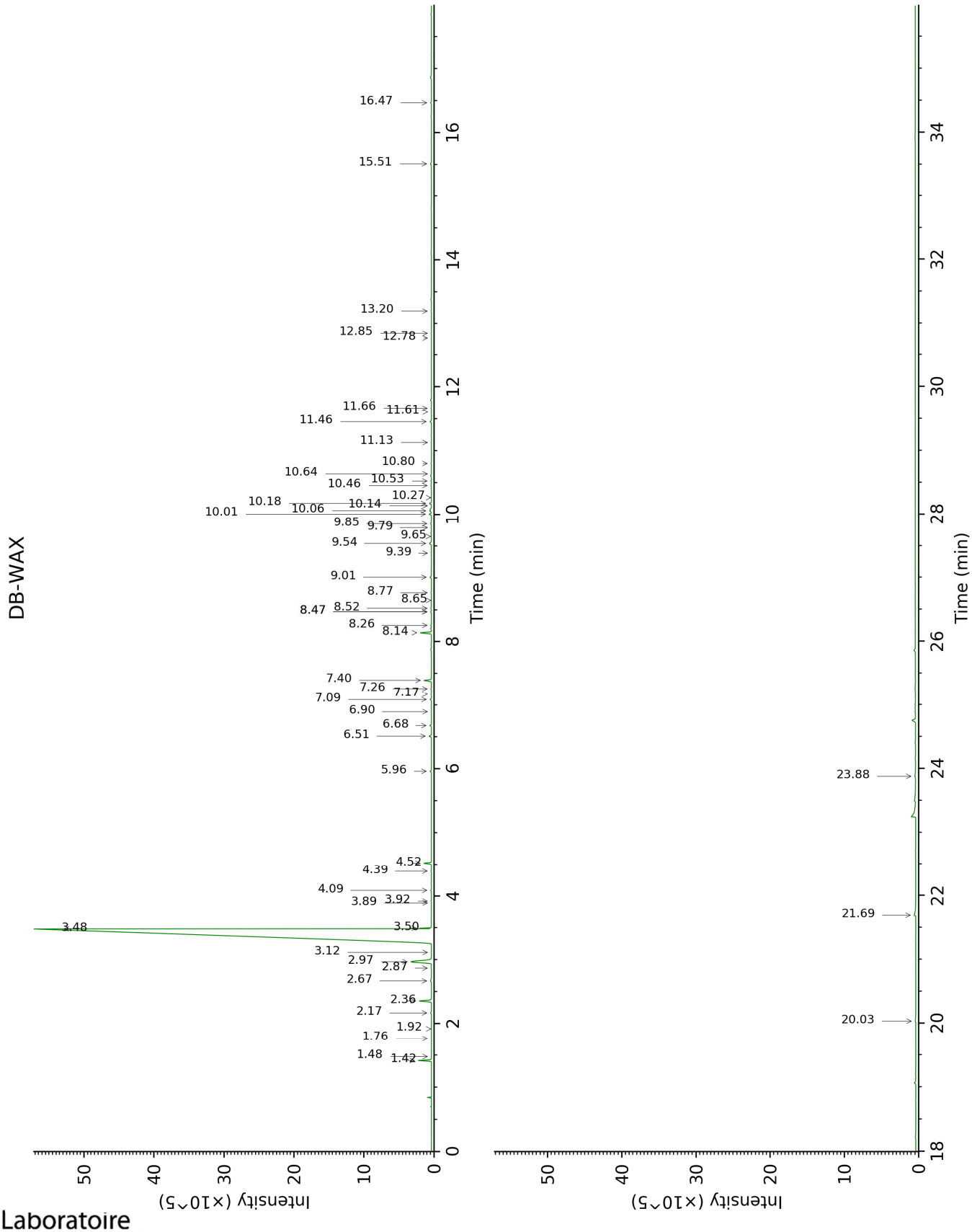
*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

This page was intentionally left blank. The following pages present the complete data of the analysis.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Time (min)
Intensity (×10^5)
17.13
14.94
14.74
14.09
12.57
11.93
11.79
11.65
11.51
11.30
11.07
10.97
10.65
10.51
10.45
10.14
10.11
9.93
9.81
9.01
8.72
8.42
8.38
8.27
7.98
7.83
7.65
7.64
7.50
7.21
7.17
6.99
6.67
6.35
6.31
6.12
5.92
5.87
5.63
5.45
5.29
5.18
5.06
4.86
4.37
4.30
4.15
3.80
3.39
3.19
3.12
2.76
1.53
29.39
27.19
18.87
18.80


DB-WAX
16.47
15.51
13.20
12.85
12.78
11.66
11.61
11.46
11.13
10.80
10.64
10.53
10.46
10.27
10.18
10.14
10.06
10.01
9.85
9.79
9.65
9.54
9.39
9.01
8.77
8.65
8.52
8.47
8.26
8.14
7.40
7.26
7.17
7.09
6.90
6.68
6.51
5.96
4.52
4.39
4.09
3.92
3.89
3.48
3.50
3.12
2.97
2.87
2.67
2.36
2.17
1.92
1.76
1.48
1.42
23.88
21.69
20.03
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Hexanal	1.54	797	tr	1.92	1044	tr
Heptanal	2.76	900	tr	3.12	1148	0.01
α-Thujene	3.12	924	tr	1.48	1003	tr
α-Pinene	3.19	929	0.44	1.42	994	0.44
Camphene	3.39	942	tr	1.76	1030	tr
β-Pinene	3.80*	969	0.56	2.17	1068	0.04
Sabinene	3.80*	969	[0.56]	2.36	1086	0.53
Myrcene	4.15	992	1.59	2.97	1136	1.59
α-Phellandrene	4.30*	1002	0.29	2.87	1128	0.02
Octanal	4.30*	1002	[0.29]	4.52	1257	0.27
Δ3-Carene	4.37	1007	0.06	2.67	1113	0.06
(*Z*)-β-Ocimene	4.86*	1038	92.84	3.89	1209	tr
Limonene	4.86*	1038	[92.84]	3.48	1177	92.35
β-Phellandrene	4.86*	1038	[92.84]	3.50	1178	0.18
(*E*)-β-Ocimene	5.06	1050	0.02	4.09	1224	0.02
γ-Terpinene	5.18	1057	0.01	3.92	1211	0.01
cis-Sabinene hydrate	5.29	1064	0.01	6.90	1423	0.01
Octanol	5.45	1074	0.02	8.26	1526	0.03
Terpinolene	5.63	1086	0.01	4.39	1247	0.01
Linalool	5.87	1101	0.42	8.14	1518	0.43
Nonanal	5.92	1104	0.05	5.96	1355	0.05
trans-para-Mentha-2,8-dien-1-ol	6.12	1117	0.05	9.01	1585	0.07
cis-Limonene oxide	6.31	1129	0.09	6.51	1395	0.09
trans-Limonene oxide	6.35	1132	0.05	6.68	1407	0.06
Citronellal	6.67	1153	0.05	7.09	1438	0.05
Terpinen-4-ol	6.99	1174	0.02	8.65	1557	0.01
para-Cymen-8-ol	7.17	1185	0.01	11.61	1801	0.01
α-Terpineol	7.21	1188	0.03	9.85	1653	0.03
Decanal	7.50	1207	0.30	7.40	1461	0.31
Octyl acetate	7.64	1216	0.01	7.17	1444	0.02
trans-Carveol	7.65	1217	0.06	11.46	1788	0.06
Nerol	7.83	1229	0.04	11.13	1760	0.01
Neral	7.98	1240	0.11	9.54	1628	0.12
Geraniol	8.27	1260	0.04	11.66	1806	0.02
Perillaldehyde	8.38	1267	0.01	10.80	1732	0.02
Geranial	8.42	1269	0.02	10.18	1680	0.08
Limonen-10-ol	8.72	1290	0.01	13.20	1945	0.01
Undecanal	9.01	1306	0.02	8.77	1566	0.02
Neryl acetate	9.81	1364	0.01	10.27	1687	0.01
α-Copaene	9.93	1372	0.02	7.26	1451	0.02
Geranyl acetate	10.11	1385	0.01	10.64	1719	0.01
β-Elemene	10.14	1387	0.02	8.47*	1543	0.03
Dodecanal	10.44	1409	0.07	10.06	1670	0.08
β-Caryophyllene	10.51	1414	0.02	8.52	1547	0.03
β-Copaene	10.65	1424	0.03	8.47*	1543	[0.03]
α-Humulene	10.97	1448	0.01	9.39	1616	0.01

(*E*)-β-Farnesene	11.07	1456	tr	9.65	1637	0.02
Germacrene D	11.30	1473	0.01	9.79	1648	0.01
Valencene	11.51	1488	0.10	10.01	1666	0.10
α-Muurolene	11.65	1499	0.01	10.14	1677	0.01
γ-Cadinene	11.79	1510	0.03	10.46	1703	0.03
δ-Cadinene	11.93	1521	0.03	10.53	1709	0.02
Caryophyllene oxide	12.57*	1571	0.04	12.85	1912	0.01
Caryophyllene oxide isomer	12.57*	1571	[0.04]	12.78	1906	tr
β-Sinensal	14.09	1696	0.05	15.51	2169	0.05
α-Sinensal	14.74	1751	0.04	16.47	2268	0.04
Myristic acid	14.94	1769	0.05			
Palmitic acid	17.13	1969	0.17			
Linoleic acid	18.80	2134	0.07			
Oleic acid	18.87	2142	0.08	23.88	3170	0.09
Tetramethoxyflavone isomer	27.19	3137	0.05			
Nobiletin	29.39	3322	0.05			
Myristic acid				20.03	2670	0.06
Palmitic acid				21.69	2876	0.20
Total identified		**98.22%**			**97.86%**	
Total reported		**98.22%**			**97.86%**	

*: 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
R.T.: Retention time (minutes)
R.I.: Retention index