



GC/MS BATCH NUMBER: O20107

ESSENTIAL OIL: ORANGE SWEET
BOTANICAL NAME: CITRUS SINENSIS
ORIGIN: GREECE

KEY CONSTITUENTS PRESENT IN THIS BATCH OF ORANGE SWEET OIL	%
LIMONENE	94.4
MYRCENE	1.9

Comments from Robert Tisserand: Sweet, juicy odor quality. All thirteen key ISO constituents for Sweet Orange oil are within range.

Date : March 26, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18C14-PTH2-1-CC

Customer identification : Orange Sweet - Greece - O2010778R

Type : Essential oil

Source : *Citrus sinensis*

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 : March 26, 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: Bright orange liquid

Refractive index: 1.4725 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Toluene	tr	tr*	Simple phenolic
Hexanal	tr		Aliphatic aldehyde
α -Thujene	tr	[tr]*	Monoterpene
α -Pinene	0.50	0.50	Monoterpene
Camphene	tr	tr	Monoterpene
Sabinene	0.45*	0.42	Monoterpene
β -Pinene	[0.45]*	0.04	Monoterpene
Myrcene	1.93	1.96	Monoterpene
α -Phellandrene	0.05	0.06	Monoterpene
Octanal	0.14	0.14	Aliphatic aldehyde
Δ^3 -Carene	0.32	0.32	Monoterpene
α -Terpinene	tr	0.01	Monoterpene
Limonene	94.36*	94.37	Monoterpene
1,8-Cineole	[94.36]*	0.27*	Monoterpenic ether
β -Phellandrene	[94.36]*	[0.27]*	Monoterpene
(Z)- β -Ocimene	[94.36]	0.01	Monoterpene
(E)- β -Ocimene	0.05	0.02	Monoterpene
γ -Terpinene	0.01	0.01	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Octanol	0.04	0.05*	Aliphatic alcohol
Isoterpinolene	0.01	0.01	Monoterpene
Terpinolene	0.05	0.05	Monoterpene
Linalool	0.20	0.21	Monoterpenic alcohol
Nonanal	0.03	0.03	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	tr	tr	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	tr	[0.05]*	Monoterpenic alcohol
cis-Limonene oxide	0.01	0.01	Monoterpenic ether
trans-Limonene oxide	0.02	0.02	Monoterpenic ether
Citronellal	0.06	0.06	Monoterpenic aldehyde
Terpinen-4-ol	0.01	tr	Monoterpenic alcohol
α -Terpineol	0.04	0.04	Monoterpenic alcohol
cis-Piperitol	0.02	0.01*	Monoterpenic alcohol
Decanal	0.19	0.18	Aliphatic aldehyde
Octyl acetate	0.01	0.01	Aliphatic ester
trans-Carveol	0.01	tr	Monoterpenic alcohol
Nerol	0.02	0.03	Monoterpenic alcohol
cis-Carveol	0.02	tr	Monoterpenic alcohol
Neral	0.05	0.06	Monoterpenic aldehyde
Geraniol	0.02	0.03	Monoterpenic alcohol
Perillaldehyde	0.01	0.04*	Monoterpenic aldehyde
Geranial	0.10	0.10*	Monoterpenic aldehyde
Decanol	0.01	[0.04]*	Aliphatic alcohol
Limonen-10-ol	0.01	tr	Monoterpenic alcohol
Undecanal	0.01	0.01	Aliphatic aldehyde
Neryl acetate	0.02	0.02	Monoterpenic ester
α -Copaene	0.02	0.02	Sesquiterpene
Geranyl acetate	0.04	0.03	Monoterpenic ester
β -Elemene	0.01	0.03*	Sesquiterpene

Dodecanal	0.04	0.03*	Aliphatic aldehyde
β -Caryophyllene	0.03	[0.03]*	Sesquiterpene
β -Copaene	0.02	0.02	Sesquiterpene
α -Humulene	0.01	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.01	[0.01]*	Sesquiterpene
Germacrene D	0.02	0.02	Sesquiterpene
Valencene	0.07	0.08	Sesquiterpene
Bicyclogermacrene	0.01	[0.10]*	Sesquiterpene
α -Muurolene	0.02	[0.03]*	Sesquiterpene
γ -Cadinene	0.02	0.02*	Sesquiterpene
δ -Cadinene	0.03*	0.02	Sesquiterpene
Zonarene	[0.03]*	[0.02]*	Sesquiterpene
Caryophyllene oxide	0.01	0.01	Sesquiterpenic ether
β -Sinensal	0.03	0.03	Sesquiterpenic aldehyde
α -Sinensal	0.02	0.02	Sesquiterpenic aldehyde
Myristic acid	0.05	0.04	Aliphatic acid
Palmitic acid	0.07	0.05	Aliphatic acid
Linoleic acid	0.09	0.07	Aliphatic acid
Oleic acid	0.05		Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.02		Aliphatic acid
Stearic acid	0.01	0.01	Aliphatic acid
Tetramethoxyflavone isomer	0.01		Flavonoid
Tangeretin	0.03		Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.07		Flavonoid
Nobiletin	0.04		Flavonoid
Total identified	99.65%	99.63%	

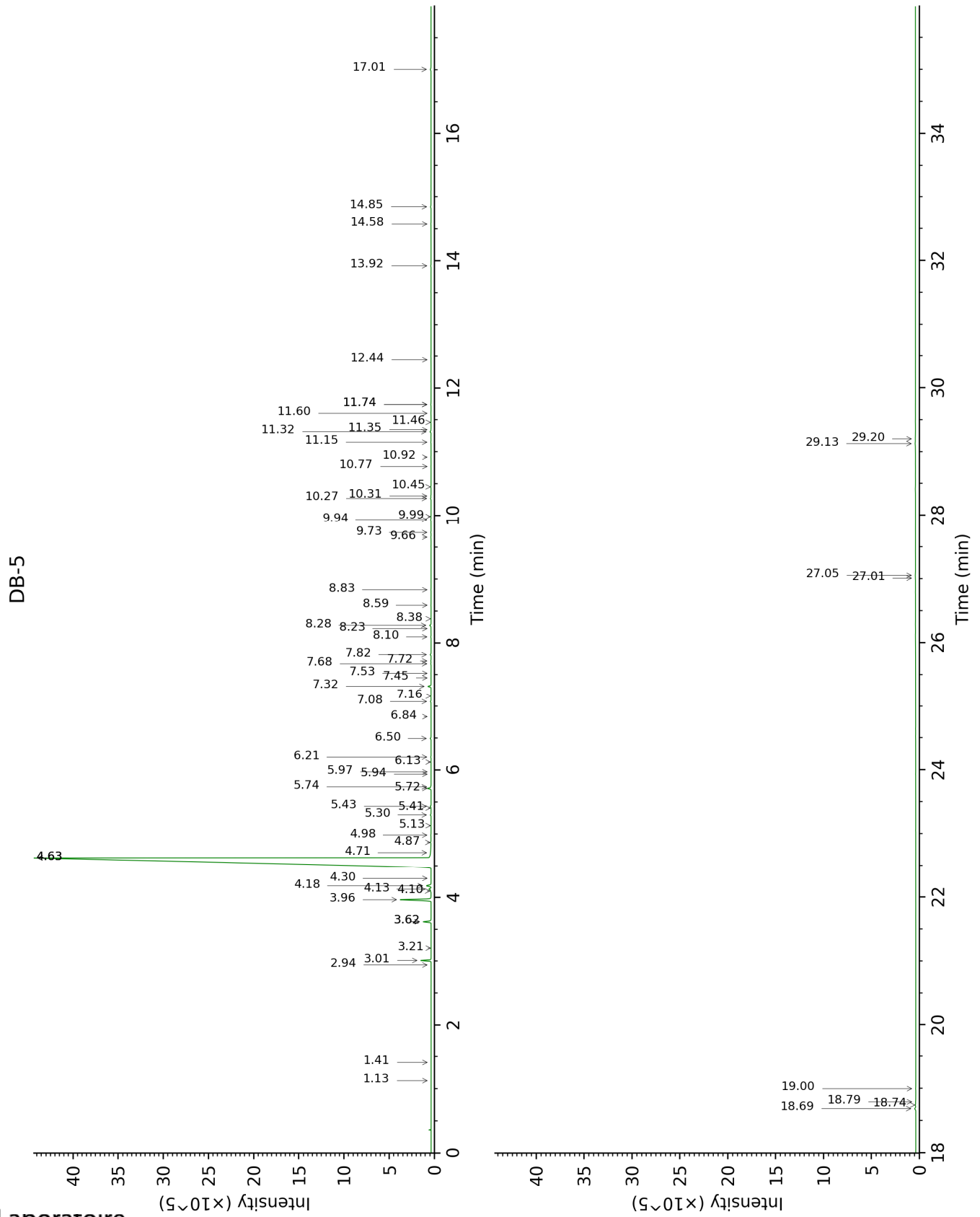
*: Two or more compounds are coeluting on this column

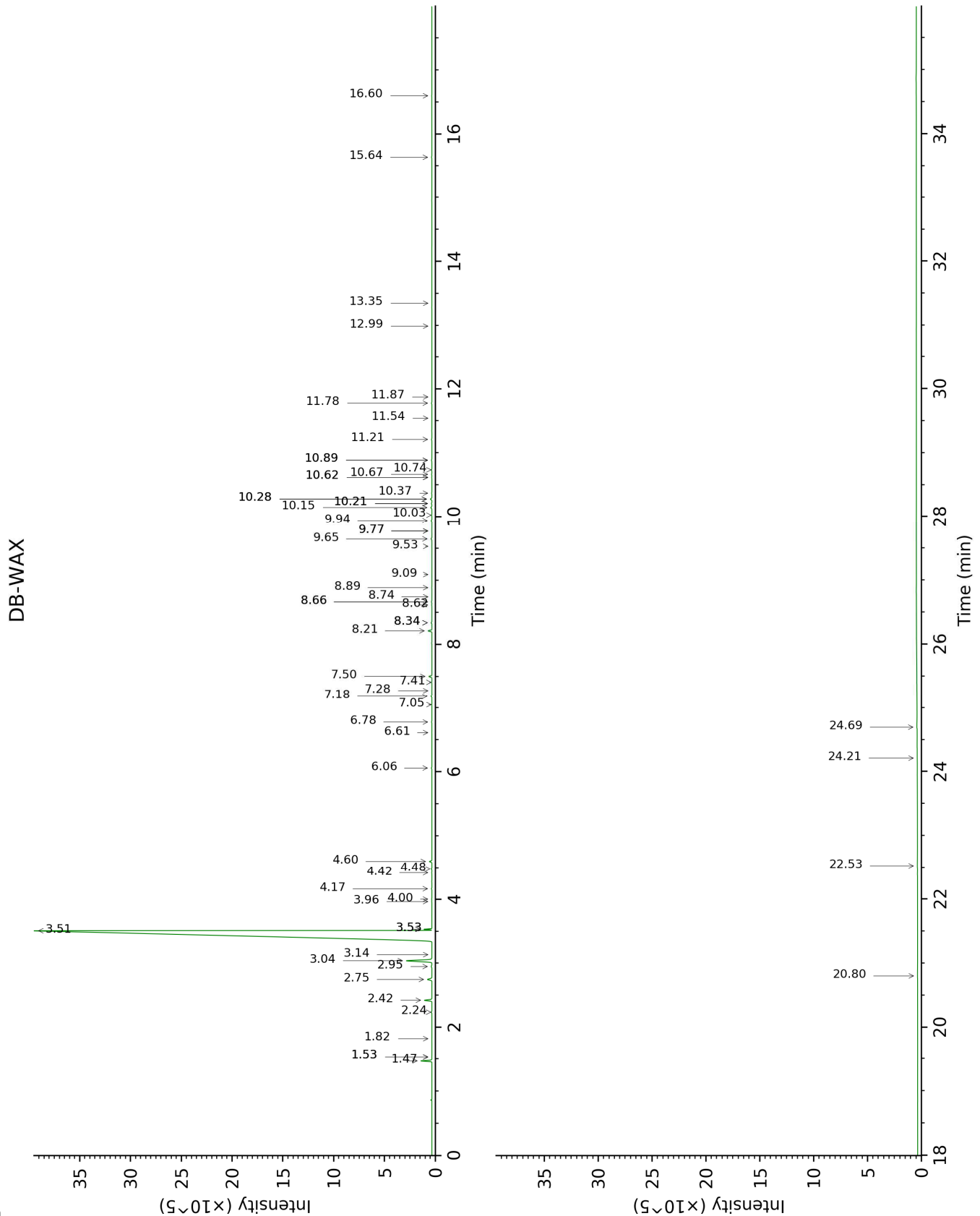
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Toluene	1.13	754	tr	1.53*	1002	tr
Hexanal	1.41	796	tr			
α -Thujene	2.94	922	tr	1.53*	1002	[tr]
α -Pinene	3.01	927	0.50	1.47	996	0.50
Camphene	3.21	940	tr	1.82	1031	tr
Sabinene	3.62*	968	0.45	2.42	1088	0.42
β -Pinene	3.62*	968	[0.45]	2.24	1070	0.04
Myrcene	3.96	991	1.93	3.04	1137	1.96
α -Phellandrene	4.10	1000	0.05	2.95	1130	0.06
Octanal	4.13	1002	0.14	4.60	1252	0.14
Δ 3-Carene	4.18	1005	0.32	2.75	1115	0.32
α -Terpinene	4.30	1012	tr	3.14	1144	0.01
Limonene	4.63*†	1033	94.36	3.51	1173	94.37
1,8-Cineole	4.63*†	1033	[94.36]	3.53*	1174	0.27
β -Phellandrene	4.63*†	1033	[94.36]	3.53*	1174	[0.27]
(Z)- β -Ocimene	4.71†	1038	[94.36]	3.96	1207	0.01
(E)- β -Ocimene	4.87	1048	0.05	4.17	1221	0.02
γ -Terpinene	4.98	1056	0.01	4.00	1210	0.01
<i>cis</i> -Sabinene hydrate	5.13	1065	0.01	7.05	1428	0.01
Octanol	5.30	1075	0.04	8.34*	1525	0.05
Isoterpinolene	5.41	1082	0.01	4.42	1239	0.01
Terpinolene	5.44	1084	0.05	4.48	1244	0.05
Linalool	5.72	1102	0.20	8.21	1515	0.21
Nonanal	5.74	1103	0.03	6.06	1356	0.03
<i>trans</i> -para-Mentha-2,8-dien-1-ol	5.94	1116	tr	9.09	1583	tr
<i>cis</i> -para-Menth-2-en-1-ol	5.98	1118	tr	8.34*	1525	[0.05]
<i>cis</i> -Limonene oxide	6.13	1128	0.01	6.61	1396	0.01
<i>trans</i> -Limonene oxide	6.21	1133	0.02	6.78	1408	0.02
Citronellal	6.50	1152	0.06	7.18	1438	0.06
Terpinen-4-ol	6.84	1174	0.01	8.74	1556	tr
α -Terpineol	7.08	1189	0.04	9.94	1651	0.04
<i>cis</i> -Piperitol	7.16	1194	0.02	9.77*	1637	0.01
Decanal	7.32	1204	0.19	7.50	1462	0.18
Octyl acetate	7.45	1213	0.01	7.28	1445	0.01
<i>trans</i> -Carveol	7.53	1218	0.01	11.54	1784	tr
Nerol	7.68	1228	0.02	11.21	1756	0.03
<i>cis</i> -Carveol	7.72	1231	0.02	11.87	1813	tr
Neral	7.82	1238	0.05	9.65	1627	0.06
Geraniol	8.10	1256	0.02	11.78	1804	0.03
Perillaldehyde	8.23	1265	0.01	10.89*	1729	0.04
Geranial	8.28	1268	0.10	10.28*	1678	0.10
Decanol	8.38	1275	0.01	10.89*	1729	[0.04]
Limonen-10-ol	8.59	1290	0.01	13.35	1945	tr
Undecanal	8.83	1306	0.01	8.89	1567	0.01
Neryl acetate	9.66	1364	0.02	10.37	1686	0.02
α -Copaene	9.73	1369	0.02	7.41	1455	0.02

Geranyl acetate	9.94	1384	0.04	10.74	1716	0.03
β-Elemene	9.99	1387	0.01	8.66*	1550	0.03
Dodecanal	10.27	1408	0.04	10.21*	1673	0.03
β-Caryophyllene	10.31	1410	0.03	8.66*	1550	[0.03]
β-Copaene	10.45	1421	0.02	8.62	1546	0.02
α-Humulene	10.77	1445	0.01	9.53	1618	0.01
(E)-β-Farnesene	10.92	1456	0.01	9.77*	1637	[0.01]
Germacrene D	11.15	1473	0.02	10.03	1658	0.02
Valencene	11.32	1485	0.07	10.15	1668	0.08
Bicyclogermacrene	11.35	1488	0.01	10.28*	1678	[0.10]
α-Murolene	11.46	1496	0.02	10.21*	1673	[0.03]
γ-Cadinene	11.60	1507	0.02	10.62*	1706	0.02
δ-Cadinene	11.74*	1518	0.03	10.67	1710	0.02
Zonarene	11.74*	1518	[0.03]	10.62*	1706	[0.02]
Caryophyllene oxide	12.44	1573	0.01	12.99	1912	0.01
β-Sinensal	13.92	1693	0.03	15.64	2166	0.03
α-Sinensal	14.58	1750	0.02	16.60	2265	0.02
Myristic acid	14.85	1773	0.05	20.80	2744	0.04
Palmitic acid	17.01	1971	0.07	22.53	2966	0.05
Linoleic acid	18.69	2137	0.09	24.69	3267	0.07
Oleic acid	18.74	2143	0.05			
cis-Vaccenic acid?	18.79	2148	0.02			
Stearic acid	19.00	2169	0.01	24.21	3198	0.01
Tetramethoxyflavone isomer	27.01	3142	0.01			
Tangeretin	27.05	3147	0.03			
3,3',4',5,6,7,8-Heptamethoxyflavone	29.13	3329	0.07			
Nobiletin	29.20	3334	0.04			
Total identified		99.65%			99.63%	
Total reported		99.65%			99.63%	

*: 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