

Date : May 22, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18E09-VIV5-1-CC

Customer identification : Organic Orange - Mexico - 170559

Type : Essential oil

Source : *Citrus sinensis*

Customer : Viva Naturals

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 : May 18, 2018

Checked and approved by :

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

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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.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Hexanal	tr	tr	Aliphatic aldehyde
Heptanal	tr	tr	Aliphatic aldehyde
α -Thujene	tr	tr	Monoterpene
α -Pinene	0.50	0.51	Monoterpene
Camphene	tr	tr	Monoterpene
Sabinene	0.21*	0.19	Monoterpene
β -Pinene	[0.21]*	0.02	Monoterpene
Myrcene	1.92	1.93	Monoterpene
Octanal	0.24	0.21	Aliphatic aldehyde
Δ^3 -Carene	0.06	0.05	Monoterpene
Limonene	94.43*	94.75*	Monoterpene
β -Phellandrene	[94.43]*	[94.75]*	Monoterpene
1,8-Cineole	[94.43]*	[94.75]*	Monoterpenic ether
(Z)- β -Ocimene	0.01	tr	Monoterpene
(E)- β -Ocimene	0.01	0.01	Monoterpene
γ -Terpinene	tr	0.01	Monoterpene
<i>cis</i> -Sabinene hydrate	tr	tr	Monoterpenic alcohol
Octanol	0.03	0.03	Aliphatic alcohol
Terpinolene	0.02	0.02	Monoterpene
Linalool	0.39	0.39	Monoterpenic alcohol
Nonanal	0.05	0.04	Aliphatic aldehyde
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.01	0.01	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	tr	tr	Monoterpenic ether
<i>cis</i> -para-Mentha-2,8-dien-1-ol	tr	tr	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.01	0.01	Monoterpenic ether
Citronellal	0.05	0.04	Monoterpenic aldehyde
Terpinen-4-ol	tr	tr	Monoterpenic alcohol
α -Terpineol	0.04	0.07*	Monoterpenic alcohol
<i>cis</i> -Piperitol	tr	tr	Monoterpenic alcohol
Decanal	0.23	0.22	Aliphatic aldehyde
Octyl acetate	0.01	0.01	Aliphatic ester
<i>trans</i> -Carveol	0.01	tr	Monoterpenic alcohol
Nerol	0.01	0.01	Monoterpenic alcohol
(E)-Isogeraniol?	0.01	0.01	Monoterpenic alcohol
Geraniol	0.01	0.01	Monoterpenic alcohol
Perillaldehyde	0.02	0.01*	Monoterpenic aldehyde
Geranial	0.08	0.08*	Monoterpenic aldehyde
Decanol	tr	[0.01]*	Aliphatic alcohol
Limonen-10-ol	0.01	tr	Monoterpenic alcohol
Undecanal	0.02	0.02	Aliphatic aldehyde
α -Cubebene	tr	tr	Sesquiterpene
Neryl acetate	tr	tr	Monoterpenic ester
α -Copaene	0.03	0.03	Sesquiterpene
Geranyl acetate	0.03	0.03	Monoterpenic ester
β -Elemene	0.01	0.03*	Sesquiterpene
Dodecanal	0.05	0.05	Aliphatic aldehyde
β -Caryophyllene	0.03	[0.03]*	Sesquiterpene
β -Copaene	0.03	0.02	Sesquiterpene

α -Humulene	0.01	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.01	0.01	Sesquiterpene
γ -Muurolene	0.01	0.01	Sesquiterpene
Germacrene D	0.03	[0.07]*	Sesquiterpene
Valencene	0.05	0.05	Sesquiterpene
Bicyclogermacrene	0.01	0.01	Sesquiterpene
α -Muurolene	0.01	[0.08]*	Sesquiterpene
γ -Cadinene	0.02	0.03*	Sesquiterpene
δ -Cadinene	0.03*	tr	Sesquiterpene
Zonarene	[0.03]*	[0.03]*	Sesquiterpene
Caryophyllene oxide	0.01*	0.01	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.01]*	tr	Sesquiterpenic ether
β -Sinensal	0.04	0.03	Sesquiterpenic aldehyde
α -Sinensal	0.02	0.02	Sesquiterpenic aldehyde
Myristic acid	0.06	0.05	Aliphatic acid
Palmitic acid	0.06	0.06	Aliphatic acid
Linoleic acid	0.04	0.03	Aliphatic acid
Oleic acid	0.02	0.04	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.01	0.04*	Aliphatic acid
Stearic acid	0.04	[0.04]*	Aliphatic acid
Tetramethoxyflavone isomer	0.02		Flavonoid
Tangeretin	0.04		Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.10		Flavonoid
Nobiletin	0.04		Flavonoid
Total identified	99.28%	99.24%	

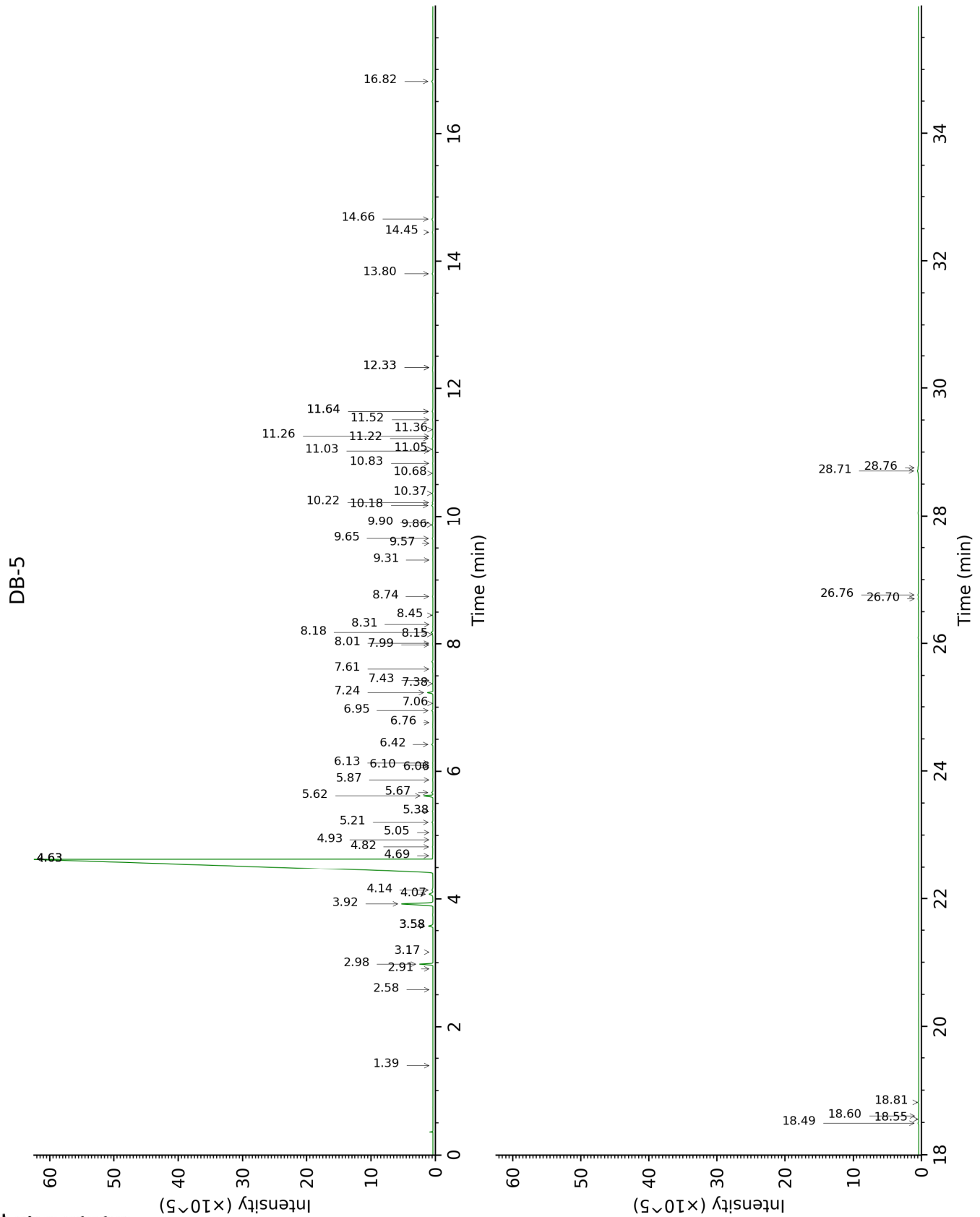
*: Two or more compounds are coeluting on this column

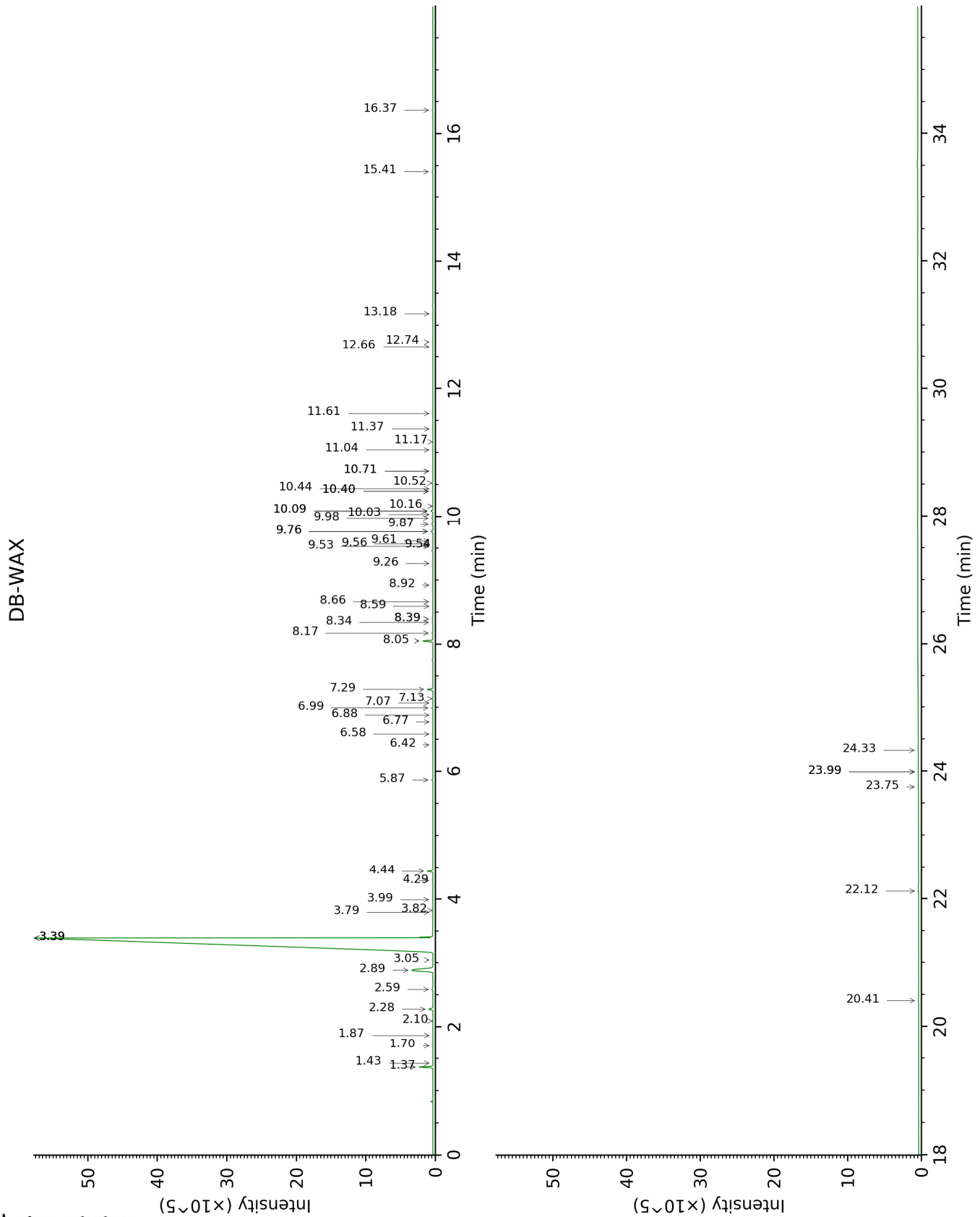
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Hexanal	1.39	794	tr	1.87	1045	tr
Heptanal	2.58	899	tr	3.05	1148	tr
α -Thujene	2.91	922	tr	1.43	1001	tr
α -Pinene	2.98	926	0.50	1.37	992	0.51
Camphene	3.17	939	tr	1.70	1028	tr
Sabinene	3.58*	967	0.21	2.28	1085	0.19
β -Pinene	3.58*	967	[0.21]	2.10	1067	0.02
Myrcene	3.92	990	1.92	2.89	1136	1.93
Octanal	4.07	1000	0.24	4.44	1250	0.21
Δ 3-Carene	4.14	1004	0.06	2.59	1112	0.05
Limonene	4.63*	1035	94.43	3.39*	1174	94.75
β -Phellandrene	4.63*	1035	[94.43]	3.39*	1174	[94.75]
1,8-Cineole	4.63*	1035	[94.43]	3.39*	1174	[94.75]
(Z)- β -Ocimene	4.69	1039	0.01	3.79	1205	tr
(E)- β -Ocimene	4.82	1048	0.01	3.99	1219	0.01
γ -Terpinene	4.93	1055	tr	3.82	1207	0.01
cis-Sabinene hydrate	5.05	1062	tr	6.88	1427	tr
Octanol	5.21	1072	0.03	8.17	1524	0.03
Terpinolene	5.38	1083	0.02	4.29	1240	0.02
Linalool	5.62	1098	0.39	8.05	1514	0.39
Nonanal	5.67	1102	0.05	5.87	1354	0.04
trans-para-Mentha-2,8-dien-1-ol	5.87	1114	0.01	8.92	1582	0.01
cis-Limonene oxide	6.06	1126	tr	6.42	1393	tr
cis-para-Mentha-2,8-dien-1-ol	6.10	1129	tr	9.54	1632	tr
trans-Limonene oxide	6.13	1131	0.01	6.58	1405	0.01
Citronellal	6.42	1150	0.05	6.99	1435	0.04
Terpinen-4-ol	6.76	1172	tr	8.59	1556	tr
α -Terpineol	6.95	1184	0.04	9.76*	1649	0.07
cis-Piperitol	7.06	1191	tr	9.56	1634	tr
Decanal	7.24	1203	0.23	7.29	1458	0.22
Octyl acetate	7.38	1212	0.01	7.07	1441	0.01
trans-Carveol	7.44	1216	0.01	11.37	1784	tr
Nerol	7.61	1227	0.01	11.04	1756	0.01
(E)-Isogeraniol?	7.99	1253	0.01	11.17	1767	0.01
Geraniol	8.01	1254	0.01	11.61	1805	0.01
Perillaldehyde	8.15	1264	0.02	10.71*	1728	0.01
Geranial	8.18	1266	0.08	10.09*	1676	0.08
Decanol	8.31	1274	tr	10.71*	1728	[0.01]
Limonen-10-ol	8.45	1284	0.01	13.18	1946	tr
Undecanal	8.74	1304	0.02	8.66	1562	0.02
α -Cubebene	9.31	1344	tr	6.77	1419	tr
Neryl acetate	9.57	1362	tr	10.16	1682	tr
α -Copaene	9.65	1368	0.03	7.14	1446	0.03
Geranyl acetate	9.86	1383	0.03	10.52	1712	0.03
β -Elemene	9.90	1385	0.01	8.39*	1541	0.03
Dodecanal	10.18	1405	0.05	9.98	1667	0.05

β-Caryophyllene	10.22	1409	0.03	8.39*	1541	[0.03]
β-Copaene	10.36	1419	0.03	8.34	1537	0.02
α-Humulene	10.68	1443	0.01	9.26	1609	0.01
(E)-β-Farnesene	10.83	1454	0.01	9.53	1630	0.01
γ-Murolene	11.02	1469	0.01	9.61	1637	0.01
Germacrene D	11.05	1471	0.03	9.76*	1649	[0.07]
Valencene	11.22	1483	0.05	9.87	1659	0.05
Bicyclogermacrene	11.26	1486	0.01	10.03	1672	0.01
α-Murolene	11.36	1494	0.01	10.09*	1676	[0.08]
γ-Cadinene	11.52	1506	0.02	10.40*	1701	0.03
δ-Cadinene	11.64*	1516	0.03	10.44	1705	tr
Zonarene	11.64*	1516	[0.03]	10.40*	1701	[0.03]
Caryophyllene oxide	12.33*	1570	0.01	12.74	1905	0.01
Caryophyllene oxide isomer	12.33*	1570	[0.01]	12.66	1898	tr
β-Sinensal	13.80	1690	0.04	15.41	2161	0.03
α-Sinensal	14.45	1746	0.02	16.37	2260	0.02
Myristic acid	14.66	1764	0.06	20.41	2719	0.05
Palmitic acid	16.82	1962	0.06	22.12	2937	0.06
Linoleic acid	18.49	2128	0.04	24.33	3242	0.03
Oleic acid	18.55	2134	0.02	23.75	3160	0.04
cis-Vaccenic acid?	18.60	2140	0.01	23.99*	3193	0.04
Stearic acid	18.81	2162	0.04	23.99*	3193	[0.04]
Tetramethoxyflavone isomer	26.70	3131	0.02			
Tangeretin	26.76	3138	0.04			
3,3',4',5,6,7,8-Heptamethoxyflavone	28.71	3324	0.10			
Nobiletin	28.76	3328	0.04			
Total identified		99.28%			99.24%	
Total reported		99.28%			99.24%	

*: 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