

Date : October 22, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18J16-HBN1-1-CC

Customer identification : Blood Orange Oil - 69541

Type : Essential oil

Source : *Citrus sinensis* cv. Sanguinelli

Customer : Health & Beauty Natural Oils

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 : October 22, 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: 1.4725 ± 0.0003 (20 °C)

ISO 3140:2011 - OIL OF SWEET ORANGE, OBTAINED BY PHYSICAL EXTRACTION OF THE PEEL

Compound	Min. %	Max. %	Observed %	Complies?
β-Sinensal	0.01	0.06	0.03	Yes
Geranial	0.05	0.20	0.08	Yes
Valencene	0.01	0.40	0.14	Yes
Neral	0.03	0.10	0.08	Yes
Linalool	0.15	0.70	0.34	Yes
Decanal	0.1	0.7	0.2	Yes
Nonanal	0.01	0.06	0.04	Yes
Octanal	0.1	0.4	0.2	Yes
Limonene	93.0	96.0	93.5	Yes
Myrcene	1.5	3.5	1.9	Yes
Sabinene	0.2	0.8	0.4	Yes
β-Pinene	0.02	0.15	0.06	Yes
α-Pinene	0.4	0.8	0.5	Yes
Refractive index	1.4700	1.4760	1.4725	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for sweet orange oil.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Toluene	0.01	0.01*	Simple phenolic
Heptanal	0.01		Aliphatic aldehyde
α -Thujene	0.01	[0.01]*	Monoterpene
α -Pinene	0.53	0.52	Monoterpene
β -Pinene	0.45*	0.06	Monoterpene
Sabinene	[0.45]*	0.39	Monoterpene
Myrcene	1.86	1.84	Monoterpene
Octanal	0.22*	0.20	Aliphatic aldehyde
α -Phellandrene	[0.22]*	0.03	Monoterpene
Δ 3-Carene	0.18	0.17	Monoterpene
Limonene	93.55*	92.52*	Monoterpene
(Z)- β -Ocimene	[93.55]*	0.02*	Monoterpene
1,8-Cineole	[93.55]*	[92.52]*	Monoterpenic ether
para-Cymene	[93.55]*	0.04	Monoterpene
(E)- β -Ocimene	0.01	0.02	Monoterpene
γ -Terpinene	0.02	[0.02]*	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Isoterpinolene	0.01*	0.01	Monoterpene
Octanol	[0.01]*	0.02	Aliphatic alcohol
Terpinolene	0.02	0.03	Monoterpene
Linalool	0.37*	0.34	Monoterpenic alcohol
Nonanal	[0.37]*	0.04	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.03	0.04	Monoterpenic alcohol
cis-Limonene oxide	0.05	0.05	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.02	0.01	Monoterpenic alcohol
trans-Limonene oxide	0.04	0.03	Monoterpenic ether
Citronellal	0.05	0.04	Monoterpenic aldehyde
Terpinen-4-ol	0.01	0.01	Monoterpenic alcohol
α -Terpineol	0.06	0.05	Monoterpenic alcohol
Decanal	0.21	0.20	Aliphatic aldehyde
Octyl acetate	0.01	tr	Aliphatic ester
trans-Carveol	0.01	0.04	Monoterpenic alcohol
Nerol	0.01	0.01	Monoterpenic alcohol
Neral	0.08	0.07	Monoterpenic aldehyde
Perillaldehyde	0.01	0.01	Monoterpenic aldehyde
Geranial	0.08	0.07*	Monoterpenic aldehyde
Limonen-10-ol	0.02	0.02	Monoterpenic alcohol
Undecanal	0.01	0.01	Aliphatic aldehyde
Neryl acetate	0.02	0.01	Monoterpenic ester
α -Copaene	0.03	0.02	Sesquiterpene
Geranyl acetate	0.03	0.03	Monoterpenic ester
β -Elemene	0.02	0.01	Sesquiterpene
Dodecanal	0.06	0.06	Aliphatic aldehyde
β -Caryophyllene	0.04	0.03	Sesquiterpene
β -Copaene	0.03	0.03	Sesquiterpene
α -Humulene	0.01	0.01	Sesquiterpene
(E)- β -Farnesene	0.01	0.01	Sesquiterpene
Germacrene D	0.02	0.02	Sesquiterpene

Valencene	0.14	0.13	Sesquiterpene
α-Murolene	0.02	[0.07]*	Sesquiterpene
γ-Cadinene	0.02	0.02	Sesquiterpene
δ-Cadinene	0.03	0.04	Sesquiterpene
Caryophyllene oxide	0.01	0.01	Sesquiterpenic ether
Intermedeol?	0.01	0.03*	Sesquiterpenic alcohol
β-Sinensal	0.03	[0.03]*	Sesquiterpenic aldehyde
α-Sinensal	0.01	0.02	Sesquiterpenic aldehyde
Tangeretin	0.16		Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.09		Flavonoid
Nobiletin	0.06		Flavonoid
Myristic acid		0.02	Aliphatic acid
Palmitic acid		0.18	Aliphatic acid
Stearic acid		0.05	Aliphatic acid
cis-Vaccenic acid?		0.04	Aliphatic acid
Linoleic acid		0.05	Aliphatic acid
Oleic acid		0.05	Aliphatic acid
Total identified	98.83%	97.77%	

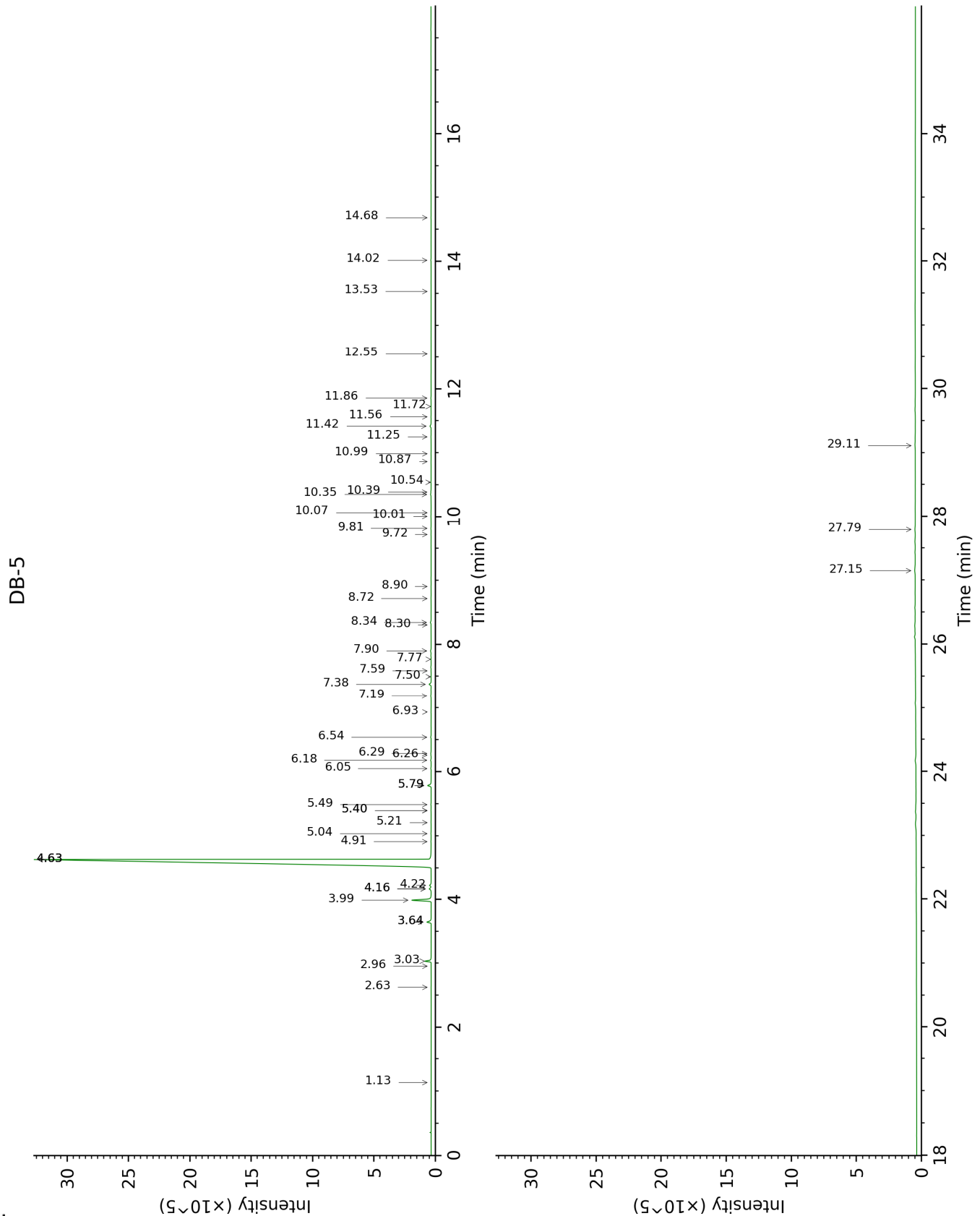
*: Two or more compounds are coeluting on this column

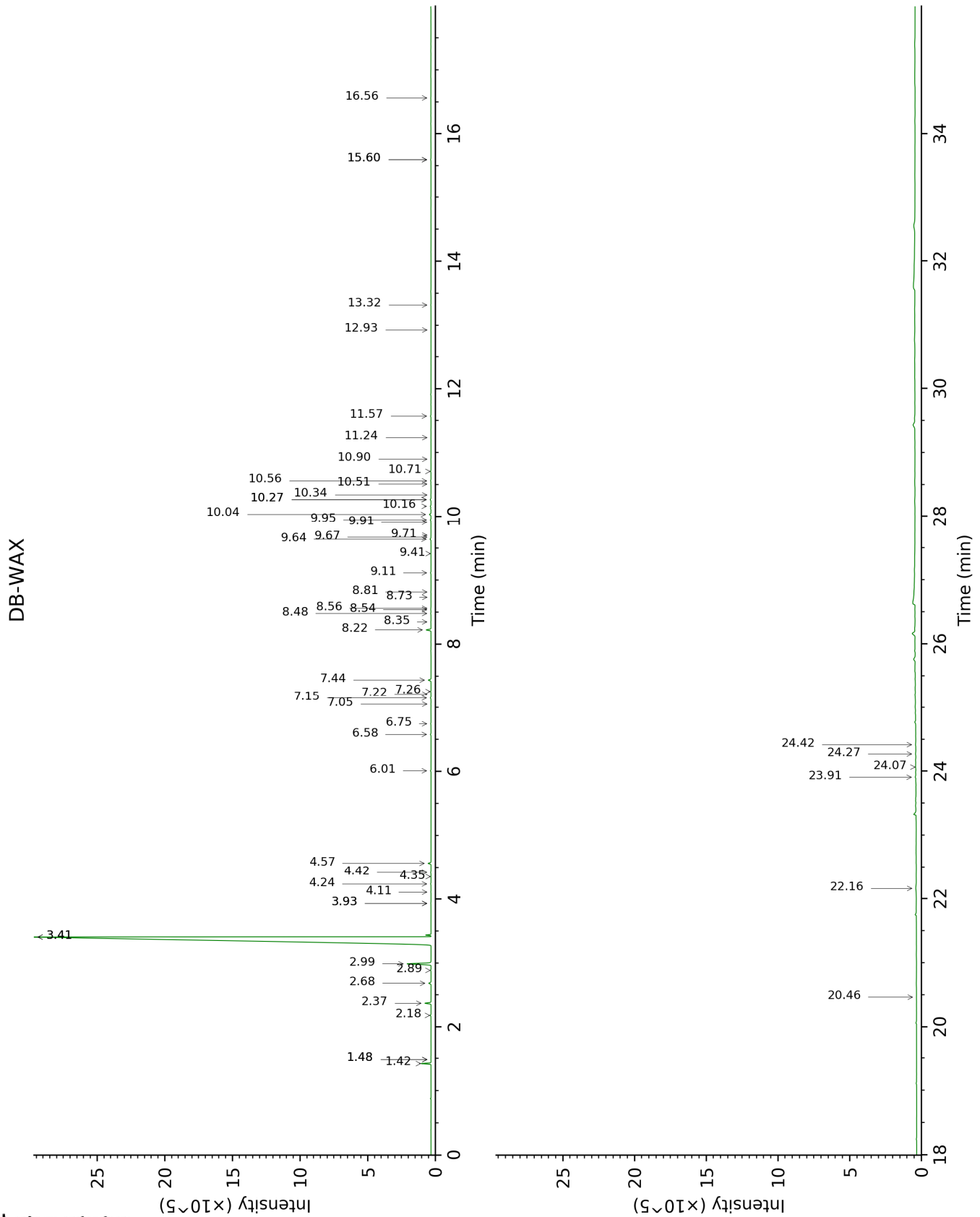
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	757	0.01	1.48*	1001	0.01
Heptanal	2.63	902	0.01			
α -Thujene	2.96	924	0.01	1.48*	1001	[0.01]
α -Pinene	3.03	929	0.53	1.42	992	0.52
β -Pinene	3.64*	969	0.45	2.18	1067	0.06
Sabinene	3.64*	969	[0.45]	2.37	1085	0.39
Myrcene	3.99	991	1.86	2.99	1135	1.84
Octanal	4.16*†	1003	0.22	4.57	1256	0.20
α -Phellandrene	4.16*†	1003	[0.22]	2.89	1127	0.03
Δ^3 -Carene	4.22	1006	0.18	2.68	1111	0.17
Limonene	4.63*	1032	93.55	3.41*†	1167	92.52
(Z)- β -Ocimene	4.63*	1032	[93.55]	3.93*	1208	0.02
1,8-Cineole	4.63*	1032	[93.55]	3.41*†	1167	[92.52]
para-Cymene	4.63*	1032	[93.55]	4.24	1231	0.04
(E)- β -Ocimene	4.91	1049	0.01	4.11	1221	0.02
γ -Terpinene	5.04	1057	0.02	3.93*	1208	[0.02]
cis-Sabinene hydrate	5.21	1067	0.01	7.06	1432	0.01
Isoterpinolene	5.40*	1079	0.01	4.35	1239	0.01
Octanol	5.40*	1079	[0.01]	8.35	1528	0.02
Terpinolene	5.49	1085	0.02	4.42	1244	0.03
Linalool	5.79*	1103	0.37	8.22	1518	0.34
Nonanal	5.79*	1103	[0.37]	6.01	1356	0.04
trans-para-Mentha-2,8-dien-1-ol	6.05	1120	0.03	9.11	1587	0.04
cis-Limonene oxide	6.18	1128	0.05	6.58	1396	0.05
cis-para-Mentha-2,8-dien-1-ol	6.26	1133	0.02	9.67	1632	0.01
trans-Limonene oxide	6.29	1135	0.04	6.75	1409	0.03
Citronellal	6.54	1151	0.05	7.15	1439	0.04
Terpinen-4-ol	6.94	1176	0.01	8.73	1558	0.01
α -Terpineol	7.19	1192	0.06	9.95	1654	0.05
Decanal	7.38	1204	0.21	7.44	1460	0.20
Octyl acetate	7.50	1211	0.01	7.22	1443	tr
trans-Carveol	7.59	1218	0.01	11.57	1788	0.04
Nerol	7.77	1229	0.01	11.24	1760	0.01
Neral	7.90	1238	0.08	9.64	1629	0.07
Perillaldehyde	8.30	1265	0.01	10.90	1732	0.01
Geranial	8.34	1268	0.08	10.27*	1679	0.07
Limonen-10-ol	8.72	1292	0.02	13.32	1944	0.02
Undecanal	8.90	1307	0.01	8.82	1564	0.01
Neryl acetate	9.72	1363	0.02	10.34	1685	0.01
α -Copaene	9.81	1369	0.03	7.26	1447	0.02
Geranyl acetate	10.01	1383	0.03	10.71	1716	0.03
β -Elemene	10.07	1387	0.02	8.56	1544	0.01
Dodecanal	10.35	1407	0.06	10.16	1671	0.06
β -Caryophyllene	10.39	1410	0.04	8.54	1543	0.03
β -Copaene	10.54	1421	0.03	8.48	1538	0.03
α -Humulene	10.86	1445	0.01	9.42	1611	0.01

(E)-β-Farnesene	10.99	1454	0.01	9.70	1634	0.01
Germacrene D	11.25	1473	0.02	9.91	1650	0.02
Valencene	11.42	1485	0.14	10.04	1661	0.13
α-Muurolene	11.56	1496	0.02	10.27*	1679	[0.07]
γ-Cadinene	11.72	1508	0.02	10.51	1699	0.02
δ-Cadinene	11.86	1518	0.03	10.56	1704	0.04
Caryophyllene oxide	12.55	1572	0.01	12.93	1908	0.01
Intermedeol?	13.53	1650	0.01	15.60*	2163	0.03
β-Sinensal	14.02	1690	0.03	15.60*	2163	[0.03]
α-Sinensal	14.68	1747	0.01	16.56	2262	0.02
Tangeretin	27.15	3144	0.16			
3,3',4',5,6,7,8- Heptamethoxyflavone	27.79	3210	0.09			
Nobiletin	29.11	3320	0.06			
Myristic acid				20.46	2702	0.02
Palmitic acid				22.16	2917	0.18
Stearic acid				23.91	3154	0.05
cis-Vaccenic acid?				24.07	3176	0.04
Linoleic acid				24.27	3205	0.05
Oleic acid				24.42	3226	0.05
Total identified		98.83%			97.77%	
Total reported		98.83%			97.77%	

*: 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