

Date : February 21, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20B07-PTH01

Customer identification : Orange Sweet - Spain - O2010983R

Type : Essential oil

Source : *Citrus sinensis*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Fanny Charlier, B. Sc.

Analysis date : February 17, 2020

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: 1.4730 ± 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	0.06	Yes
Valencene	0.01	0.40	0.10	Yes
Neral	0.03	0.10	0.08	Yes
Linalool	0.15	0.70	0.42	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	93.3	Yes
Myrcene	1.5	3.5	1.8	Yes
Sabinene	0.2	0.8	0.5	Yes
β-Pinene	0.02	0.15	0.07	Yes
α-Pinene	0.4	0.8	0.5	Yes
Refractive index	1.4700	1.4760	1.4730	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 – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Classe
α -Thujene	0.01	Monoterpene
α -Pinene	0.49	Monoterpene
Camphene	tr	Monoterpene
β -Pinene	0.07	Monoterpene
Sabinene	0.49	Monoterpene
Myrcene	1.79	Monoterpene
Octanal	0.17	Aliphatic aldehyde
α -Phellandrene	0.01	Monoterpene
Δ^3 -Carene	0.18	Monoterpene
Limonene	93.33	Monoterpene
β -Phellandrene	0.28*	Monoterpene
1,8-Cineole	[0.28]*	Monoterpenic ether
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.04	Monoterpene
γ -Terpinene	0.03	Monoterpene
<i>cis</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.14	Aliphatic alcohol
Terpinolene	0.03	Monoterpene
Linalool	0.42	Monoterpenic alcohol
Nonanal	0.04	Aliphatic aldehyde
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.03	Monoterpenic ether
<i>cis</i> -para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.04	Monoterpenic ether
Citronellal	0.04	Monoterpenic aldehyde
Terpinen-4-ol	0.02	Monoterpenic alcohol
α -Terpineol	0.16	Monoterpenic alcohol
Decanal	0.23	Aliphatic aldehyde
<i>trans</i> -Carveol	0.03	Monoterpenic alcohol
Nerol	0.03	Monoterpenic alcohol
<i>cis</i> -Carveol	0.03	Monoterpenic alcohol
Neral	0.08	Monoterpenic aldehyde
Geraniol	0.03	Monoterpenic alcohol
Perillaldehyde	0.02	Monoterpenic aldehyde
Geranial	0.06	Monoterpenic aldehyde
Decanol	0.02	Aliphatic alcohol
Limonen-10-ol	0.02	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
Neryl acetate	0.01	Monoterpenic ester
α -Copaene	0.03	Sesquiterpene
Geranyl acetate	0.03	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
Dodecanal	0.06	Aliphatic aldehyde
β -Caryophyllene	0.04	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
α -Humulene	0.02	Sesquiterpene
(E)- β -Farnesene	0.01	Sesquiterpene

γ-Murolene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
Valencene	0.10	Sesquiterpene
α-Murolene	0.02	Sesquiterpene
γ-Cadinene	0.03	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Caryophyllene oxide	0.02	Sesquiterpenic ether
β-Sinensal	0.03	Sesquiterpenic aldehyde
α-Sinensal	0.07	Sesquiterpenic aldehyde
Myristic acid	0.03	Aliphatic acid
Nootkatone	0.02	Sesquiterpenic ketone
Palmitic acid	0.06	Aliphatic acid
Linoleic acid	0.04	Aliphatic acid
Oleic acid	0.03	Aliphatic acid
Stearic acid	0.01	Aliphatic acid
Tetramethoxyflavone isomer	0.03	Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.08	Flavonoid
Nobiletin	0.05	Flavonoid
α-Terpinene	0.01	Monoterpene
Consolidated total	99.41%	

*: 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

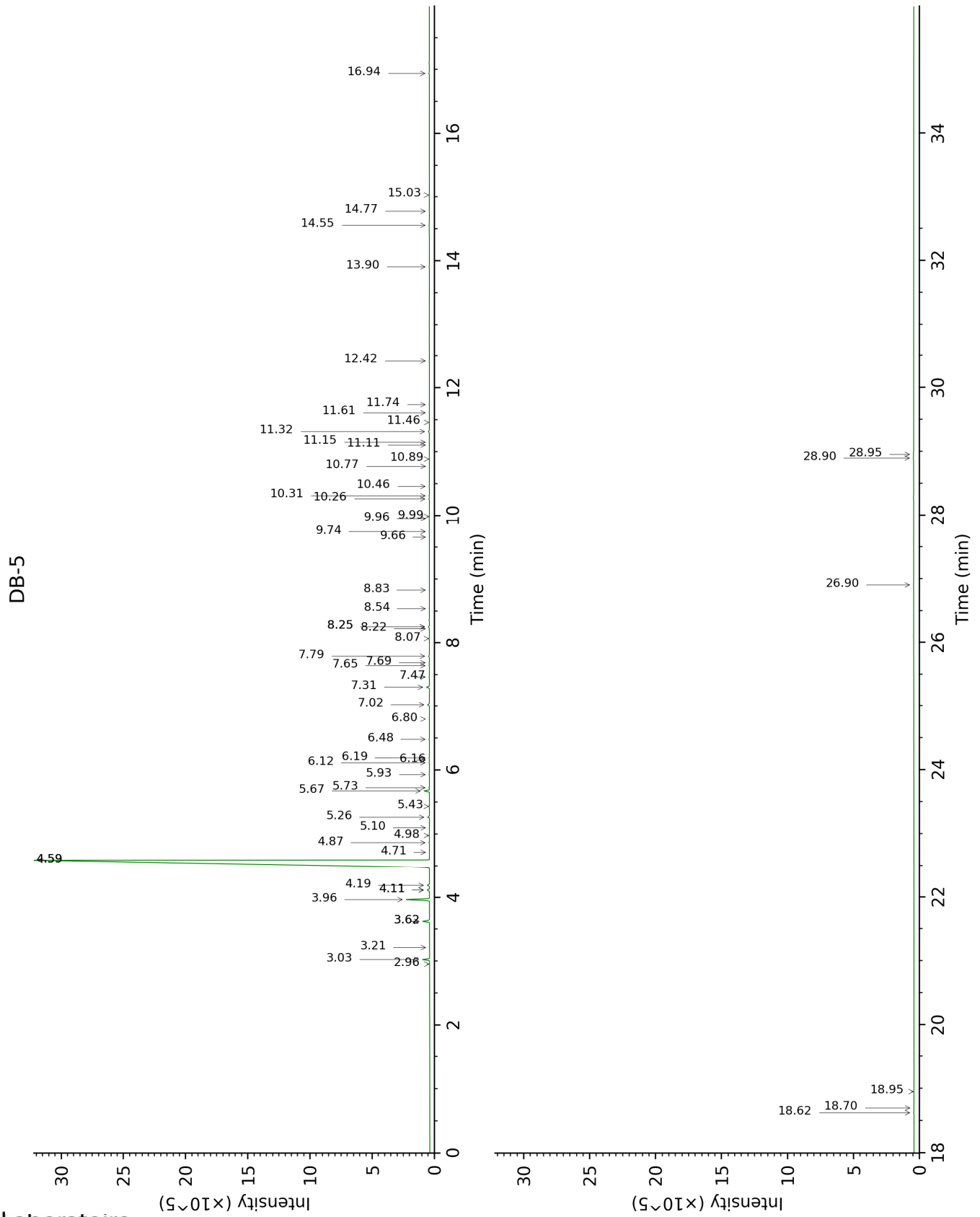
tr: The compound has been detected below 0.005% of total signal.

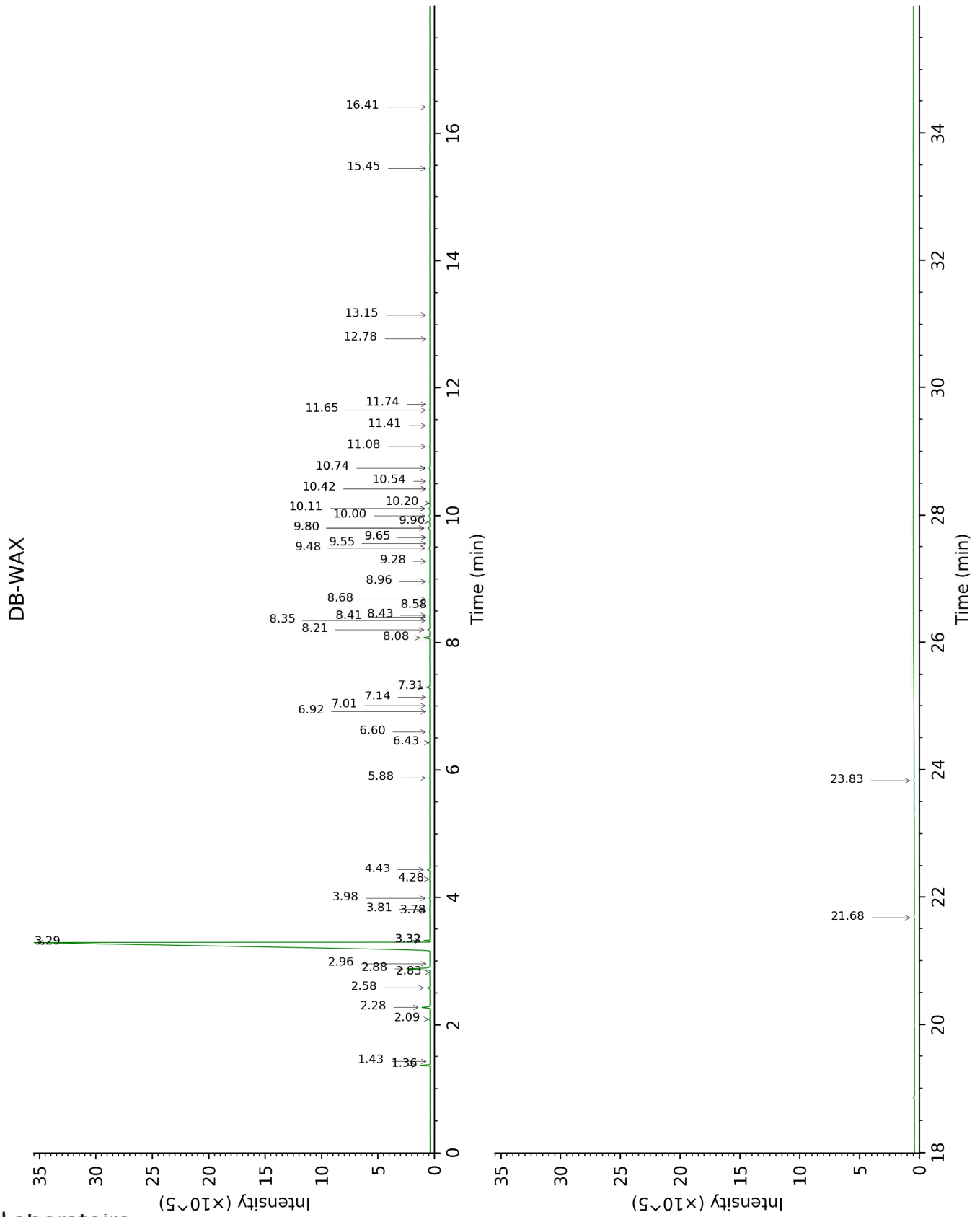
Note: no correction factor was applied

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	%
α -Thujene	2.96	925	0.01	1.42	999	0.01
α -Pinene	3.03	930	0.49	1.36	990	0.49
Camphene	3.22	942	tr			
β -Pinene	3.62*	969	0.54	2.09	1065	0.07
Sabinene	3.62*	969	[0.54]	2.28	1084	0.49
Myrcene	3.96	992	1.79	2.88	1133	1.80
Octanal	4.11*	1002	0.21	4.43	1250	0.17
α -Phellandrene	4.11*	1002	[0.21]	2.82	1129	0.01
Δ^3 -Carene	4.19	1006	0.18	2.58	1110	0.18
Limonene	4.59*	1032	93.62	3.29	1165	93.33
β -Phellandrene	4.59*	1032	[93.62]	3.32*	1168	0.26
1,8-Cineole	4.59*	1032	[93.62]	3.32*	1168	[0.26]
(Z)- β -Ocimene	4.71	1040	0.01	3.78	1203	0.01
(E)- β -Ocimene	4.87	1049	0.04	3.98	1218	0.04
γ -Terpinene	4.98	1056	0.03	3.81	1205	0.03
<i>cis</i> -Sabinene hydrate	5.10	1064	0.01	6.92	1429	0.01
Octanol	5.26	1074	0.14	8.21	1526	0.15
Terpinolene	5.43	1085	0.03	4.28	1239	0.04
Linalool	5.68	1101	0.42	8.08	1516	0.43
Nonanal	5.73	1104	0.04	5.88	1354	0.04
<i>trans</i> -para-Mentha-2,8-dien-1-ol	5.93	1117	0.03	8.96	1584	0.02
<i>cis</i> -Limonene oxide	6.12	1129	0.03	6.43	1393	0.04
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.16	1132	0.02	9.55	1632	0.02
<i>trans</i> -Limonene oxide	6.19	1134	0.04	6.60	1406	0.04
Citronellal	6.48	1153	0.04	7.01	1436	0.04
Terpinen-4-ol	6.80	1174	0.02	8.58	1555	0.02
α -Terpineol	7.02	1189	0.16	9.80*	1652	0.17
Decanal	7.31	1207	0.23	7.31	1458	0.23
<i>trans</i> -Carveol	7.47	1218	0.03	11.41	1786	0.02
Nerol	7.65	1231	0.03	11.08	1758	0.03
<i>cis</i> -Carveol	7.69	1234	0.03	11.74	1815	0.01
Neral	7.79	1241	0.08	9.48	1626	0.09
Geraniol	8.07	1260	0.03	11.65	1807	0.03
Perillaldehyde	8.22	1271	0.02	10.74*	1730	0.07
Geranial	8.25*	1273	0.08	10.11*	1677	0.08
Decanol	8.25*	1273	[0.08]	10.74*	1730	[0.07]
Limonen-10-ol	8.54	1293	0.02	13.15	1941	0.02
Undecanal	8.83	1307	0.02	8.68	1563	0.02
Neryl acetate	9.66	1366	0.01	10.20	1684	0.01
α -Copaene	9.74	1372	0.03	7.14	1446	0.02
Geranyl acetate	9.96	1387	0.03	10.54	1712	0.03
β -Elemene	9.99	1390	0.02	8.41	1542	0.03
Dodecanal	10.26	1409	0.06	10.00	1668	0.08
β -Caryophyllene	10.31	1413	0.04	8.43	1544	0.01
β -Copaene	10.46	1424	0.03	8.35	1537	0.03
α -Humulene	10.77	1447	0.02	9.28	1610	0.01

(E)-β-Farnesene	10.89	1456	0.01	9.65*	1640	0.02
γ-Muurolene	11.11	1472	0.01	9.65*	1640	[0.02]
Germacrene D	11.15	1475	0.02	9.80*	1652	[0.17]
Valencene	11.32	1488	0.10	9.90	1660	0.09
α-Muurolene	11.46	1498	0.02	10.11*	1677	[0.08]
γ-Cadinene	11.61	1510	0.03	10.42*	1702	0.03
δ-Cadinene	11.74	1520	0.03	10.42*	1702	[0.03]
Caryophyllene oxide	12.42	1574	0.02	12.78	1906	0.01
β-Sinensal	13.90	1694	0.03	15.45	2162	0.03
α-Sinensal	14.56	1750	0.07	16.41	2260	0.03
Myristic acid	14.77	1769	0.03			
Nootkatone	15.03	1791	0.02			
Palmitic acid	16.94	1967	0.06	21.68	2868	0.07
Linoleic acid	18.62	2132	0.04			
Oleic acid	18.70	2140	0.03	23.83	3156	0.06
Stearic acid	18.95	2166	0.01			
Tetramethoxyflavone isomer	26.90	3125	0.03			
3,3',4',5,6,7,8-Heptamethoxyflavone	28.90	3305	0.08			
Nobiletin	28.96	3309	0.05			
α-Terpinene				2.96	1140	0.01
Total identified		99.42%			99.05%	
Total reported		99.42%			99.05%	

*: Two or more compounds are coeluting on this column

[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

R.T.: Retention time (minutes)

R.I.: Retention index