

Date : 2023-07-18

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 23G11-PTH03

**Customer Identification :** Kumquat Oil - Brazil - K20105R

**Type :** Essential Oil

**Source :** *Fortunella japonica* [syn. *Citrus japonica*]

**Customer :** Plant Therapy

Checked and approved by:

---

Alexis St-Gelais, Ph. D., Chimiste 2013-174

*Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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. The results only describe the samples that were submitted to the assays.*

## GAS CHROMATOGRAPHIC ANALYSIS

**Method :** PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

**\*ISO**

**Results :** See analysis summary (next page)

**Analyst :** Amélie Simard, Analyste

**Date :** 2023-07-17

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4738 \pm 0.0003$  (20 °C)

**Method :** PC-MAT-016 - Measure of the refractive index of a liquid.

**Analyst :** Cindy Caron B. Sc.

**Date :** 2023-07-17

## CONCLUSION

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

## ANALYSIS SUMMARY - CONSOLIDATED CONTENTS

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

Identification	%	Class
$\alpha$ -Thujene	0.06	Monoterpene
$\alpha$ -Pinene	0.68	Monoterpene
Camphene	0.02	Monoterpene
Sabinene	0.45	Monoterpene
$\beta$ -Pinene	1.24	Monoterpene
Myrcene	1.58	Monoterpene
Pseudolimonene	0.01	Monoterpene
$\alpha$ -Phellandrene	0.03	Monoterpene
Octanal	0.12	Aliphatic aldehyde
$\Delta^3$ -Carene	0.14	Monoterpene
$\alpha$ -Terpinene	0.02	Monoterpene
<i>para</i> -Cymene	0.41	Monoterpene
$\beta$ -Phellandrene	0.24	Monoterpene
Limonene	89.31	Monoterpene
( <i>Z</i> )- $\beta$ -Ocimene	0.01	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.04	Monoterpene
$\gamma$ -Terpinene	1.30	Monoterpene
<i>cis</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Octanol	0.07	Aliphatic alcohol
Terpinolene	0.08	Monoterpene
Linalool	0.44	Monoterpenic alcohol
Nonanal	0.04	Aliphatic aldehyde
( <i>E</i> )-4,8-Dimethylnona-1,3,7-triene	0.01	Terpene derivative
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.06	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.13	Monoterpenic ether
<i>trans</i> -Limonene oxide	0.16	Monoterpenic ether
neo-Isopulegol	0.04	Monoterpenic alcohol
Citronellal	0.28	Monoterpenic aldehyde
Terpinen-4-ol	0.06	Monoterpenic alcohol
$\alpha$ -Terpineol	0.09	Monoterpenic alcohol
Unknown	0.04	Unknown
Decanal	0.16	Aliphatic aldehyde
Octyl acetate	0.02	Aliphatic ester
<i>trans</i> -Carveol	0.07	Monoterpenic alcohol
Nerol	0.05	Monoterpenic alcohol
Citronellol	0.12	Monoterpenic alcohol
Neral	0.13	Monoterpenic aldehyde
Geraniol	0.15	Monoterpenic alcohol
Perillaldehyde	0.02	Monoterpenic aldehyde
Geranial	0.11	Monoterpenic aldehyde

Limonen-10-ol	0.02	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
Citronellyl acetate	0.04	Monoterpenic ester
Neryl acetate	0.01	Monoterpenic ester
$\alpha$ -Copaene	0.03	Sesquiterpene
Geranyl acetate	0.03	Monoterpenic ester
$\beta$ -Cubebene	0.02	Sesquiterpene
$\beta$ -Elemene	0.06	Sesquiterpene
Dodecanal	0.05	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.03	Sesquiterpene
$\beta$ -Copaene	0.04	Sesquiterpene
$\alpha$ -Humulene	0.01	Sesquiterpene
$\gamma$ -Muurolene	0.01	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
Valencene	0.11	Sesquiterpene
$\alpha$ -Muurolene	0.02	Sesquiterpene
$\gamma$ -Cadinene	0.02	Sesquiterpene
$\delta$ -Cadinene	0.05	Sesquiterpene
$\alpha$ -Elemol	0.04	Sesquiterpenic alcohol
Germacrene D-4-ol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
$\beta$ -Sinensal	0.03	Sesquiterpenic aldehyde
$\alpha$ -Sinensal	0.02	Sesquiterpenic aldehyde
Nootkatone	0.02	Sesquiterpenic ketone
Oleic acid	0.02	Aliphatic acid
Tangeretin	0.02	Flavonoid
Nobiletin	0.05	Flavonoid
<b>Consolidated total</b>	<b>98.83</b>	

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

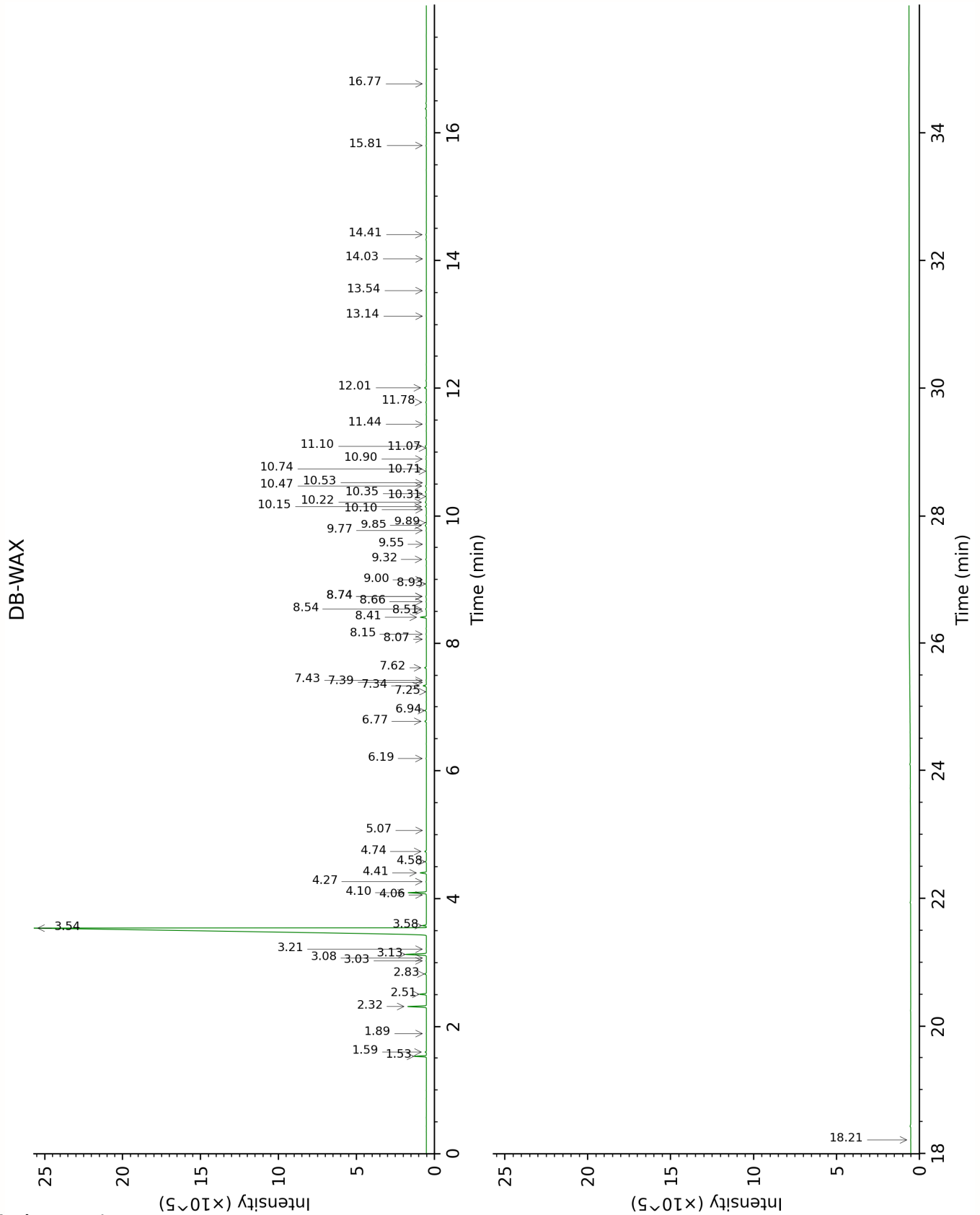
Note: no correction factor was applied

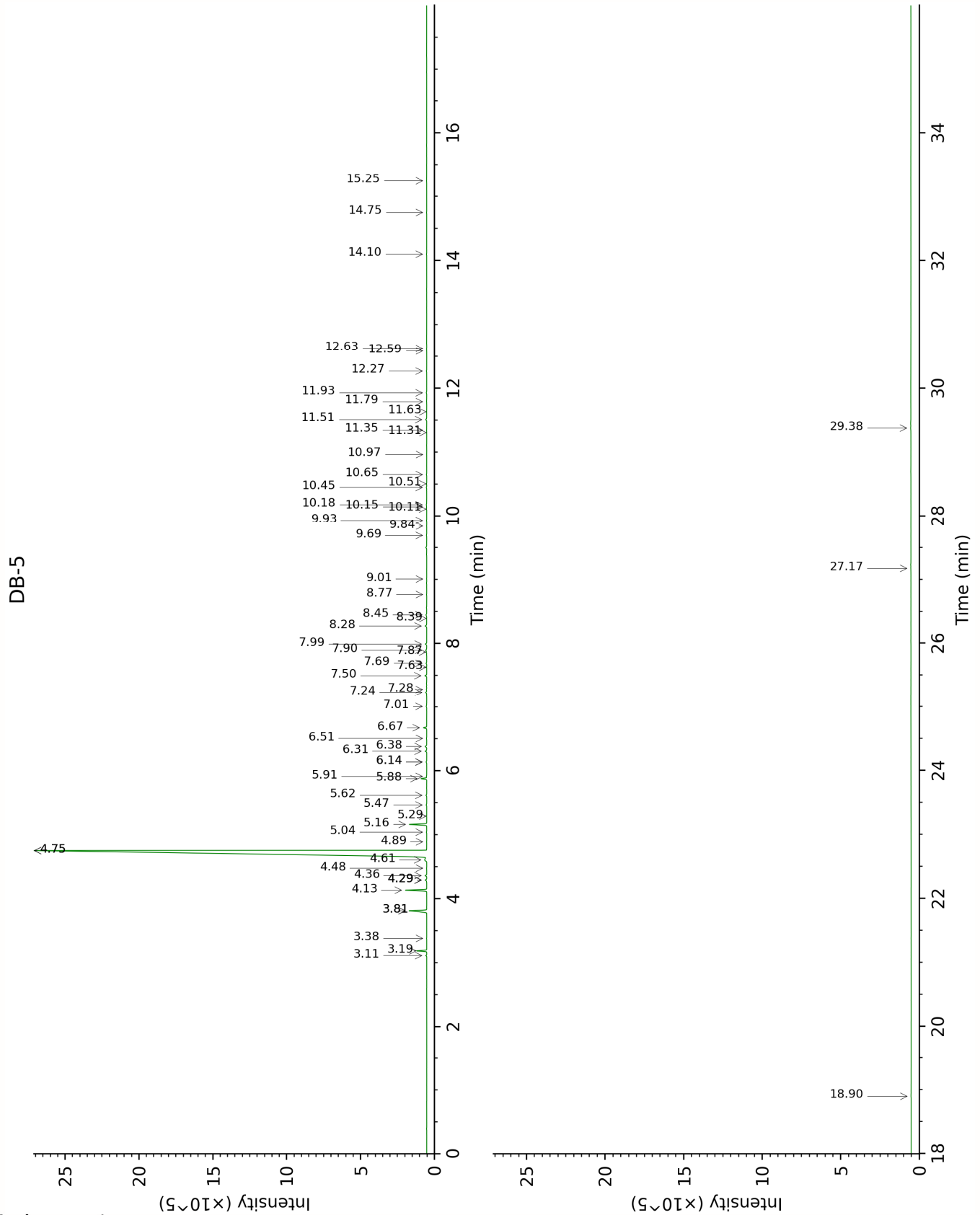
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

**Bracketed value ([xx]):** A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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





## FULL ANALYSIS DATA

<b><math>\alpha</math>-Thujene</b>	<b>Column DB-WAX</b>			<b>Column DB-5</b>		
	1.59	996.7	0.06	3.11	926.0	0.06
$\alpha$ -Pinene	1.53	989.9	0.66	3.19	930.8	0.68
Camphene	1.89	1025.2	0.01	3.38	943.6	0.02
Sabinene	2.51	1083.8	0.45	3.81*	972.0	[1.69]
$\beta$ -Pinene	2.32	1065.5	1.24	3.81*	972.0	[1.69]
Myrcene	3.13	1133.3	1.58	4.14	993.1	1.58
Pseudolimonene	3.08	1128.9	0.01	4.29*	1003.5	[0.15]
$\alpha$ -Phellandrene	3.03	1125.5	0.03	4.29*	1003.5	[0.15]
Octanal	4.74	1254.1	0.12	4.29*	1003.5	[0.15]
$\Delta^3$ -Carene	2.83	1109.7	0.13	4.36	1007.9	0.14
$\alpha$ -Terpinene	3.21	1139.6	0.03	4.48	1015.1	0.02
<i>para</i> -Cymene	4.41	1229.6	0.45	4.61	1023.2	0.41
$\beta$ -Phellandrene	3.58	1168.1	0.24	4.75*	1032.3	[89.52]
Limonene	3.54	1165.1	89.31	4.75*	1032.3	[89.52]
( <i>Z</i> )- $\beta$ -Ocimene	4.06	1204.5	0.01	4.89	1040.9	0.01
( <i>E</i> )- $\beta$ -Ocimene	4.27	1219.6	0.03	5.04	1050.3	0.04
$\gamma$ -Terpinene	4.10	1207.0	1.30	5.16	1057.8	1.30
<i>cis</i> -Sabinene hydrate	7.25	1430.6	0.02	5.29	1065.9	0.02
Octanol	8.54	1527.8	0.06	5.47	1076.8	0.07
Terpinolene	4.58	1242.4	0.07	5.62	1086.3	0.08
Linalool	8.41	1518.0	0.44	5.88	1102.5	0.44
Nonanal	6.19	1353.8	0.03	5.91	1104.7	0.04
( <i>E</i> )-4,8-Dimethylnona-1,3,7-triene	5.07	1278.2	0.01	6.14*	1119.0	[0.07]
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.32	1587.5	0.06	6.14*	1119.0	[0.07]
<i>cis</i> -Limonene oxide	6.77	1395.6	0.13	6.31	1129.8	0.13
<i>trans</i> -Limonene oxide	6.94	1408.1	0.11	6.38	1134.5	0.16
neo-Isopulegol	8.51	1525.4	0.01	6.51	1142.5	0.04
Citronellal	7.34	1437.5	0.25	6.67	1153.2	0.28
Terpinen-4-ol	8.93	1558.0	0.04	7.01	1174.5	0.06
$\alpha$ -Terpineol	10.15	1654.6	0.09	7.24	1188.9	0.09
Unknown MISC XXXI [m/z 121, 79 (98), 93 (87), 94 (73), 91 (63), 105 (45)...]	8.15	1497.6	0.04	7.28	1191.7	0.04
Decanal	7.62	1458.4	0.14	7.50	1205.7	0.16



Octyl acetate	7.39	1441.5	0.01	7.63	1214.6	0.02
trans-Carveol	11.78	1789.9	0.07	7.69	1218.7	0.07
Nerol	11.44	1761.2	0.02	7.87	1230.4	0.05
Citronellol	11.10	1732.2	0.10	7.90	1232.3	0.12
Neral	9.85	1630.1	0.11	7.99	1238.7	0.13
Geraniol	12.01	1809.7	0.16	8.28	1257.6	0.15
Perillaldehyde	11.07	1729.8	0.02	8.39	1265.6	0.02
Geranial	10.47	1680.5	0.08	8.45	1269.3	0.11
Limonen-10-ol	13.54	1945.1	0.03	8.77	1290.5	0.02
Undecanal	9.00	1563.0	0.01	9.01	1306.8	0.02
Citronellyl acetate	9.77	1623.8	0.03	9.69	1354.9	0.04
Neryl acetate	10.52	1684.5	0.02	9.84	1365.3	0.01
$\alpha$ -Copaene	7.43	1443.9	0.03	9.93	1371.8	0.03
Geranyl acetate	10.90	1715.5	0.04	10.11	1384.5	0.03
$\beta$ -Cubebene	8.07	1491.4	0.03	10.15	1386.9	0.02
$\beta$ -Elemene	8.74*	1543.0	[0.06]	10.18	1389.1	0.06
Dodecanal	10.31	1667.4	0.04	10.45	1408.6	0.05
$\beta$ -Caryophyllene	8.74*	1543.0	[0.06]	10.51	1412.8	0.03
$\beta$ -Copaene	8.66	1536.7	0.03	10.65	1423.6	0.04
$\alpha$ -Humulene	9.55	1606.4	0.01	10.97	1446.8	0.01
$\gamma$ -Murolene	9.89	1633.9	0.02	11.31	1472.3	0.01
Germacrene D	10.10	1650.8	0.02	11.35	1475.1	0.02
Valencene	10.22	1660.1	0.10	11.51	1487.3	0.11
$\alpha$ -Murolene	10.35	1670.8	0.03	11.64	1496.5	0.02
$\gamma$ -Cadinene	10.71	1699.7	0.02	11.79	1508.4	0.02
$\delta$ -Cadinene	10.74	1702.5	0.04	11.93	1519.3	0.05
$\alpha$ -Elemol	14.41	2025.9	0.04	12.27	1546.0	0.04
Germacrene D-4-ol	14.03	1990.4	0.01	12.59	1570.9	0.01
Caryophyllene oxide	13.14	1909.1	0.02	12.63	1574.1	0.01
$\beta$ -Sinensal	15.81	2160.8	0.04	14.10	1693.9	0.03
$\alpha$ -Sinensal	16.77	2258.0	0.02	14.75	1749.7	0.02
Nootkatone	18.22	2410.1	0.02	15.25	1792.4	0.02
Oleic acid				18.90	2140.8	0.02
Tangeretin				27.17	3135.4	0.02
Nobiletin				29.38	3322.9	0.05
Total reported		98.45%			98.81%	

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is taken into account in the consolidated 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.

Essential Oil, *Fortunella japonica* [syn. *Citrus japonica*]  
Internal code: 23G11-PTH03

Kumquat Oil - Brazil - K20105R

Report prepared for:  
Plant Therapy

Note: no correction factor was applied  
R.T.: Retention time (minutes)  
R.I.: Retention index