

Date : 2024-02-27

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 24B09-NPA08

**Customer Identification :** Orange - Italy - NPS00136 - Lot# NP0301

**Type :** Essential Oil

**Source :** *Citrus sinensis*

**Customer :** Nature Packaged

Checked and approved by:



Sylvain Mercier, M. Sc., Chimiste 2014-005

*Notes: 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.*

This report is an update from the first version issued on 2024-02-22 to format it for online publication.

## 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 :** Benoit Roger, Ph. D.

**Date :** 2024-02-22

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4726 \pm 0.0003$  (20 °C)

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

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

**Date :** 2024-02-12

## 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	tr	Monoterpene
$\alpha$ -Pinene	0.50	Monoterpene
Camphene	tr	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
Sabinene	0.37	Monoterpene
$\beta$ -Pinene	0.05	Monoterpene
Myrcene	1.82	Monoterpene
$\alpha$ -Phellandrene	0.04	Monoterpene
Octanal	0.30	Aliphatic aldehyde
$\Delta^3$ -Carene	0.17	Monoterpene
Limonene	94.25	Monoterpene
(Z)- $\beta$ -Ocimene	tr	Monoterpene
(E)- $\beta$ -Ocimene	0.02	Monoterpene
$\gamma$ -Terpinene	0.02	Monoterpene
<i>cis</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.08	Aliphatic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.03	Monoterpene
Linalool	0.49	Monoterpenic alcohol
Nonanal	0.04	Aliphatic aldehyde
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.01	Monoterpenic ether
<i>trans</i> -Limonene oxide	0.02	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Terpinen-4-ol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.07	Monoterpenic alcohol
Decanal	0.28	Aliphatic aldehyde
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Neral	0.03	Monoterpenic aldehyde
Geranial	0.05	Monoterpenic aldehyde
Decanol	0.03	Aliphatic alcohol
Undecanal	0.01	Aliphatic aldehyde
$\alpha$ -Copaene	0.03	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
$\beta$ -Elemene	0.01	Sesquiterpene
Dodecanal	0.02	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.02	Sesquiterpene
$\beta$ -Copaene	0.02	Sesquiterpene
Germacrene D	0.02	Sesquiterpene

Valencene	0.01	Sesquiterpene
$\delta$ -Cadinene	0.03	Sesquiterpene
$\beta$ -Sinensal	0.03	Sesquiterpenic aldehyde
$\alpha$ -Sinensal	0.01	Sesquiterpenic aldehyde
Stearic acid	0.13	Aliphatic acid
Tangeretin isomer	0.02	Flavonoid
<b>Consolidated total</b>	<b>99.12</b>	

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

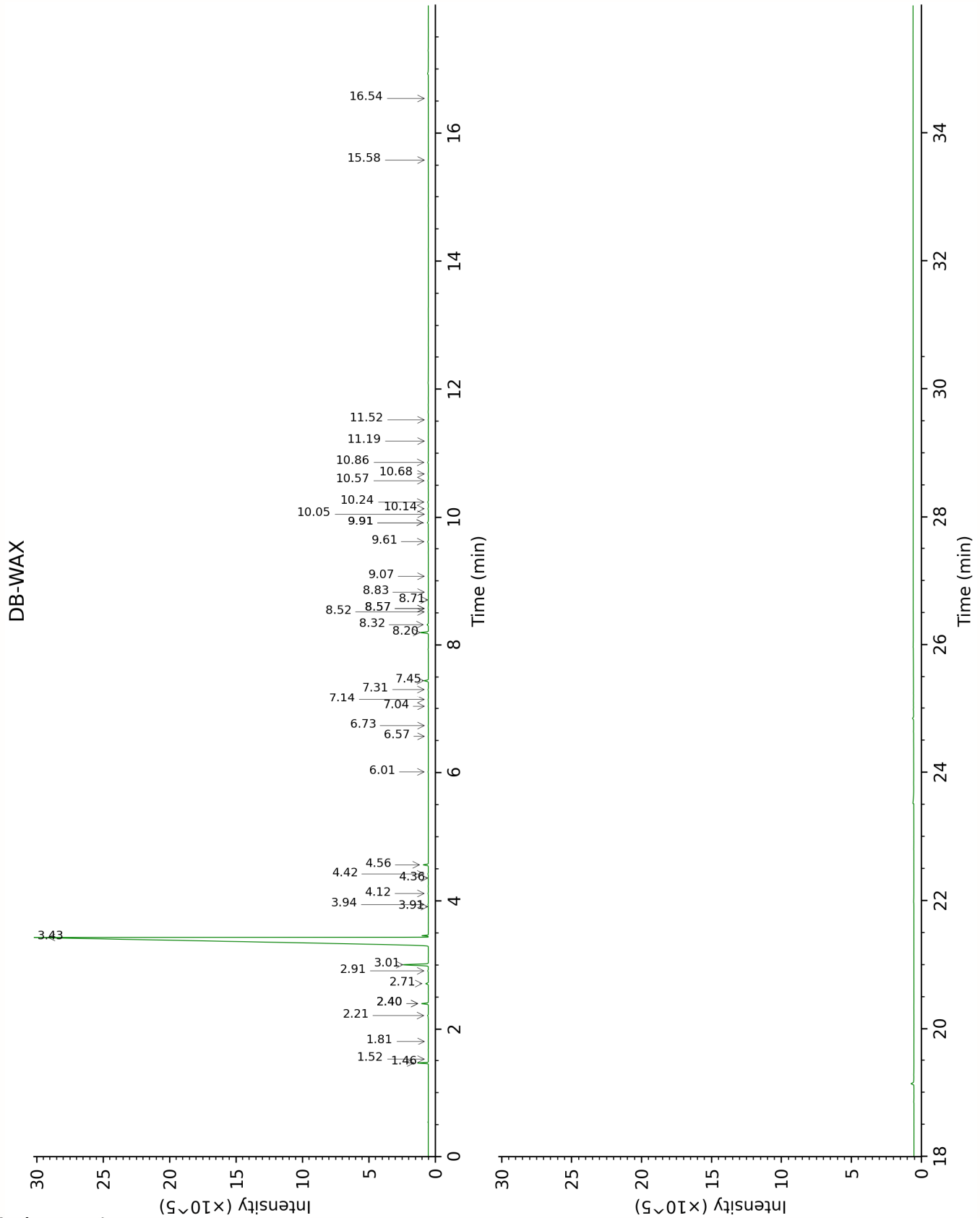
Note: no correction factor was applied

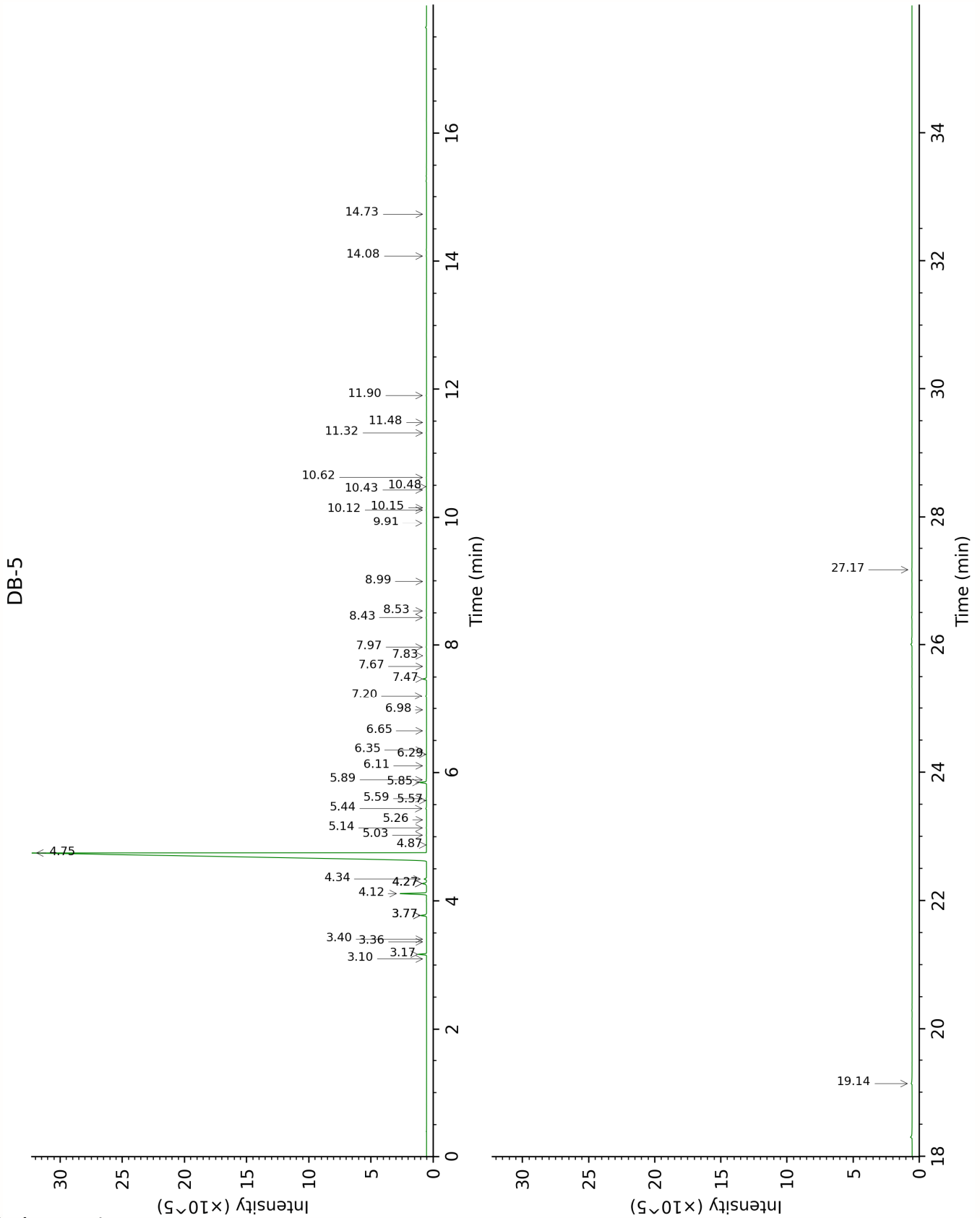
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

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FULL ANALYSIS DATA

<b><math>\alpha</math>-Thujene</b>	<b>Column DB-WAX</b>			<b>Column DB-5</b>		
	1.52	1001.3	0.01	3.10	926.5	tr
$\alpha$ -Pinene	1.46	992.3	0.50	3.17	931.2	0.50
Camphene	1.81	1029.0	tr	3.36	944.0	tr
Thuja-2,4(10)-diene	2.40*	1084.8	[0.38]	3.40	946.7	tr
Sabinene	2.40*	1084.8	[0.38]	3.78*	971.1	[0.42]
$\beta$ -Pinene	2.21	1067.1	0.05	3.78*	971.1	[0.42]
Myrcene	3.01	1134.3	1.84	4.12	993.5	1.82
$\alpha$ -Phellandrene	2.91	1127.0	0.04	4.27*	1003.9	[0.33]
Octanal	4.56	1250.2	0.30	4.27*	1003.9	[0.33]
$\Delta$ 3-Carene	2.71	1112.0	0.17	4.34	1008.3	0.17
Limonene	3.43	1166.8	93.87	4.75	1033.7	94.25
(Z)- $\beta$ -Ocimene	3.91	1203.4	0.01	4.87	1041.5	tr
(E)- $\beta$ -Ocimene	4.12	1218.2	0.02	5.03	1051.1	0.02
$\gamma$ -Terpinene	3.94	1205.8	0.02	5.14	1058.1	0.02
cis-Sabinene hydrate	7.04	1427.7	0.01	5.26	1066.0	0.01
Octanol	8.32	1524.2	0.08	5.44	1076.9	0.08
Isoterpinolene	4.36	1235.4	tr	5.57	1084.8	0.01
Terpinolene	4.42	1240.0	0.03	5.60	1086.6	0.03
Linalool	8.20	1514.7	0.51	5.85	1102.5	0.49
Nonanal	6.01	1353.0	0.02	5.89	1105.0	0.04
trans-para-Mentha-2,8-dien-1-ol	9.07	1582.9	0.01	6.11	1118.9	0.01
cis-Limonene oxide	6.57	1393.0	tr	6.29	1130.3	0.01
trans-Limonene oxide	6.73	1405.2	0.01	6.35	1134.6	0.02
Citronellal	7.14	1435.6	0.02	6.65	1153.7	0.02
Terpinen-4-ol	8.70	1554.3	0.01	6.98	1174.6	0.01
$\alpha$ -Terpineol	9.92*	1650.5	[0.09]	7.20	1188.8	0.07
Decanal	7.45	1458.2	0.28	7.47	1206.0	0.28
trans-Carveol	11.52	1784.7	0.01	7.67	1219.1	0.01
Nerol	11.19	1756.6	0.01	7.84	1230.2	0.01
Neral	9.61	1625.8	0.05	7.97	1239.2	0.03
Geranial	10.24	1677.0	0.04	8.43	1270.0	0.05
Decanol	10.86	1728.4	0.04	8.53	1276.9	0.03
Undecanal	8.83	1563.6	0.01	8.99	1307.7	0.01
$\alpha$ -Copaene	7.31	1447.9	0.02	9.91	1372.1	0.03
Geranyl acetate	10.68	1713.1	0.03	10.12	1386.9	0.02
$\beta$ -Elemene	8.57*	1543.8	[0.02]	10.15	1389.5	0.01
Dodecanal	10.14	1668.5	0.03	10.43	1409.3	0.02



β-Caryophyllene	8.57*	1543.8	[0.02]	10.48	1413.1	0.02
β-Copaene	8.52	1539.7	0.02	10.62	1423.7	0.02
Germacrene D	9.92*	1650.5	[0.09]	11.32	1475.3	0.02
Valencene	10.05	1661.6	0.01	11.48	1487.5	0.01
δ-Cadinene	10.57	1704.1	0.03	11.90	1519.5	0.03
β-Sinensal	15.58	2163.2	tr	14.08	1694.8	0.03
α-Sinensal	16.54	2261.6	0.01	14.73	1750.6	0.01
Stearic acid				19.14	2168.7	0.13
Tangeretin isomer				27.17	3139.7	0.02
Total reported		98.61%			99.11%	

\*: 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.

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index