Date : November 16, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22K03-NSO02
Customer identification : EO: Orange Sweet Lot # 000066 Botanical Species: Citrus sinensis
Type : Essential oil
Source : *Citrus sinensis*
Customer : Natural Sourcing LLC

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Amélie Simard, Analyste
Analysis date : November 14, 2022

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid
Refractive index: 1.4738 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

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Analysis summary – Consolidated contents

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

Identification	%	Class
α-Thujene	0.01	Monoterpene
α-Pinene	0.50	Monoterpene
Camphene	0.01	Monoterpene
β-Pinene	0.03	Monoterpene
Sabinene	0.34	Monoterpene
Myrcene	1.77	Monoterpene
Pseudolimonene	0.01	Monoterpene
Octanal	0.19	Aliphatic aldehyde
α-Phellandrene	0.04	Monoterpene
Δ3-Carene	0.15	Monoterpene
para-Cymene	0.02	Monoterpene
β-Phellandrene	0.51	Monoterpene
Limonene	93.65	Monoterpene
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
Terpinolene	0.03	Monoterpene
Linalool	0.41	Monoterpenic alcohol
Nonanal	0.06	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
cis-Limonene oxide	0.02	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
trans-Limonene oxide	0.03	Monoterpenic ether
Citronellal	0.05	Monoterpenic aldehyde
Terpinen-4-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.04	Monoterpenic alcohol
cis-Piperitol	0.01	Monoterpenic alcohol
Decanal	0.23	Aliphatic aldehyde
Octyl acetate	0.01	Aliphatic ester
trans-Carveol	0.03	Monoterpenic alcohol
Nerol	0.02	Monoterpenic alcohol
cis-Carveol	0.02	Monoterpenic alcohol
Neral	0.03	Monoterpenic aldehyde
Carvone	0.04	Monoterpenic ketone
Geraniol	0.01	Monoterpenic alcohol
Perillaldehyde	0.01	Monoterpenic aldehyde
Geranial	0.08	Monoterpenic aldehyde
Decanol	0.01	Aliphatic alcohol
Limonen-10-ol	0.01	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
Neryl acetate	0.01	Monoterpenic ester
α-Copaene	0.03	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene

Dodecanal	0.06	Aliphatic aldehyde
β-Caryophyllene	0.03	Sesquiterpene
β-Copaene	0.03	Sesquiterpene
α-Humulene	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.01	Sesquiterpene
γ-Muurolene	0.01	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
Valencene	0.04	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
β-Sinensal	0.05	Sesquiterpenic aldehyde
α-Sinensal	0.03	Sesquiterpenic aldehyde
Nootkatone	0.01	Sesquiterpenic ketone
Stearic acid	0.13	Aliphatic acid
Consolidated total	**99.11%**	

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.

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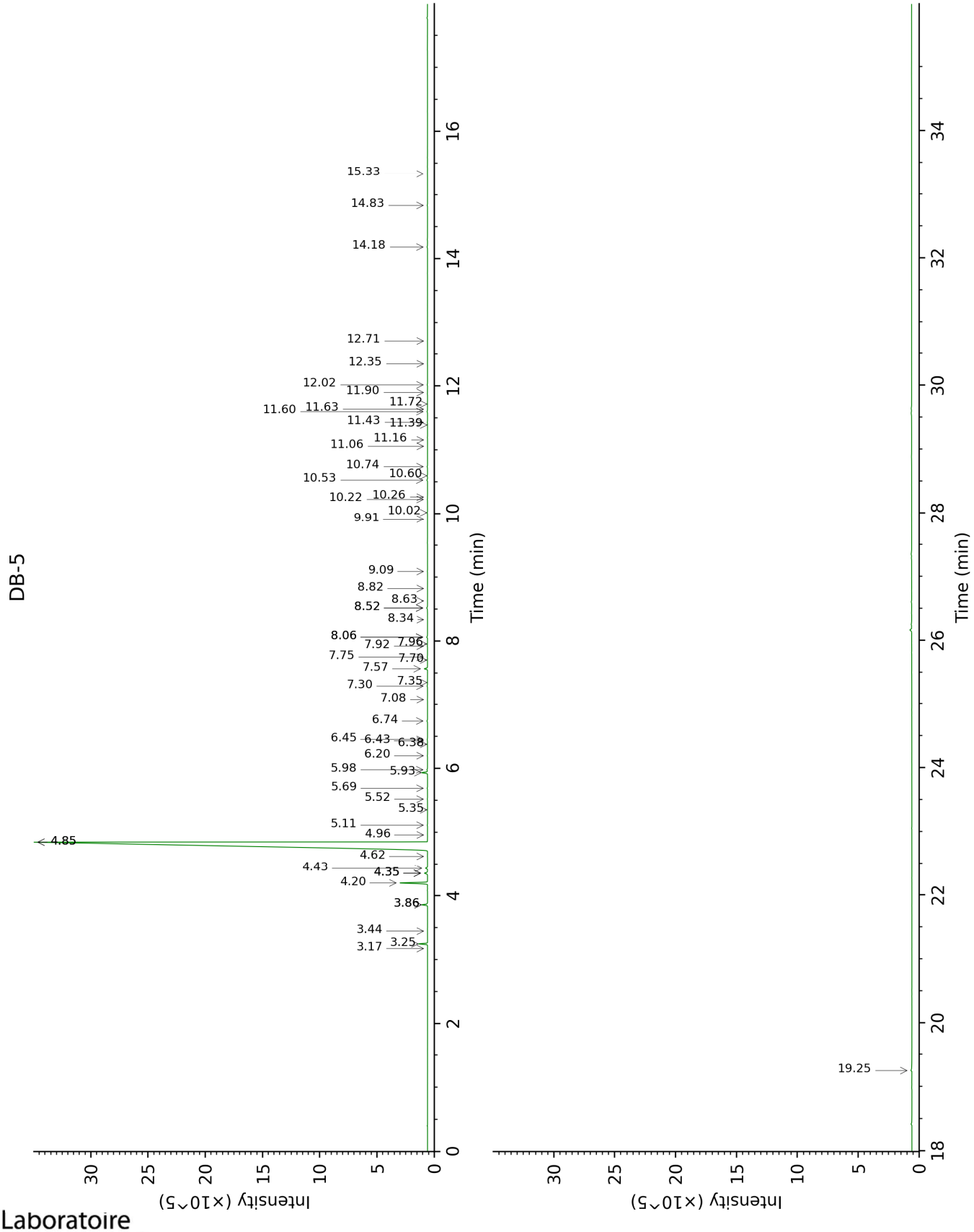
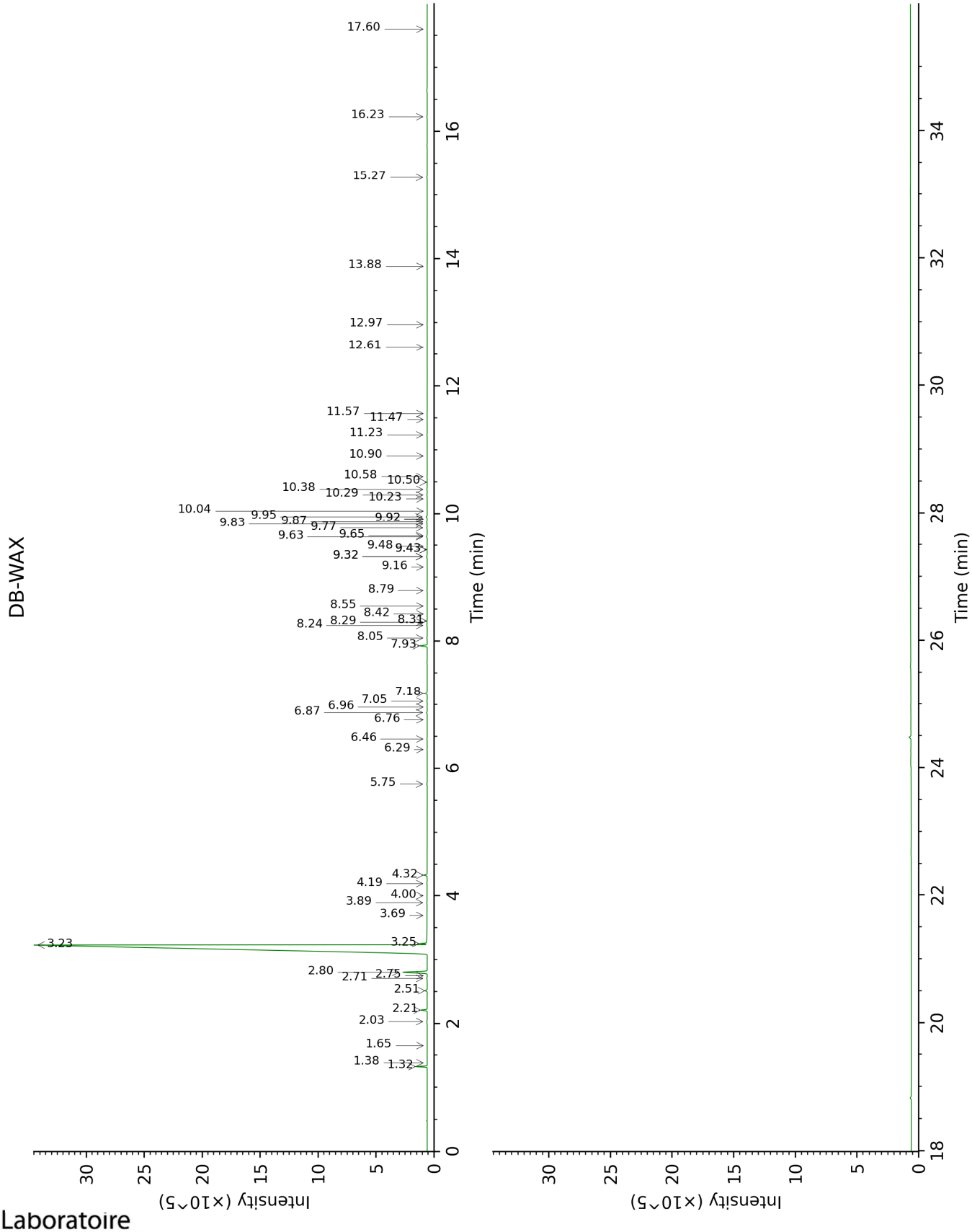

DB-5
Intensity (×10^5)
Time (min)
4.85
19.25


DB-WAX
17.60
16.23
15.27
13.88
12.97
12.61
11.57
11.47
11.23
10.90
10.58
10.50
10.38
10.29
10.23
10.04
9.95
9.92
9.83
9.87
9.77
9.63
9.65
9.48
9.43
9.32
9.16
8.79
8.55
8.42
8.24
8.29
8.31
8.05
7.93
7.18
7.05
6.96
6.87
6.76
6.46
6.29
5.75
4.32
4.19
4.00
3.89
3.69
3.23
3.25
2.80
2.71
2.75
2.51
2.21
2.03
1.65
1.38
1.32
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
α-Thujene	3.17	926	0.01	1.38	1000	tr
α-Pinene	3.25	931	0.50	1.32	993	0.50
Camphene	3.44	944	0.01	1.64	1027	tr
β-Pinene	3.86*	971	0.37	2.03	1066	0.03
Sabinene	3.86*	971	[0.37]	2.21	1084	0.34
Myrcene	4.20	993	1.77	2.80	1135	1.80
Pseudolimonene	4.35*	1003	0.24	2.75	1130	0.01
Octanal	4.35*	1003	[0.24]	4.32	1254	0.19
α-Phellandrene	4.35*	1003	[0.24]	2.71	1127	0.04
Δ3-Carene	4.43	1008	0.15	2.51	1112	0.14
para-Cymene	4.62	1020	0.02	4.00	1230	0.01
β-Phellandrene	4.85*	1034	93.68	3.25	1171	0.51
Limonene	4.85*	1034	[93.68]	3.23	1169	93.65
(*Z*)-β-Ocimene	4.96	1041	0.01	3.69	1206	tr
(*E*)-β-Ocimene	5.11	1051	0.02	3.89	1221	0.02
cis-Sabinene hydrate	5.35	1066	0.01	6.76	1427	0.01
Octanol	5.52	1076	0.03	8.05	1525	0.03
Terpinolene	5.69	1087	0.03	4.19	1244	0.02
Linalool	5.93	1102	0.41	7.93	1515	0.45
Nonanal	5.98	1105	0.06	5.75	1353	0.04
trans-para-Mentha-2,8-dien-1-ol	6.20	1119	0.03	8.79	1583	0.02
cis-Limonene oxide	6.38	1130	0.02	6.29	1392	0.02
cis-para-Mentha-2,8-dien-1-ol	6.43	1134	0.01	9.32*	1625	0.07
trans-Limonene oxide	6.45	1135	0.03	6.46	1405	0.03
Citronellal	6.74	1153	0.05	6.87	1436	0.05
Terpinen-4-ol	7.08	1175	0.01	8.42	1554	0.01
α-Terpineol	7.30	1189	0.04	9.63	1650	0.05
cis-Piperitol	7.35	1192	0.01	9.43*	1634	0.02
Decanal	7.57	1206	0.23	7.18	1458	0.22
Octyl acetate	7.70	1215	0.01	6.96	1442	0.01
trans-Carveol	7.75	1218	0.03	11.24	1785	0.03
Nerol	7.92	1230	0.02	10.90	1757	0.01
cis-Carveol	7.96	1232	0.02	11.57	1814	0.02
Neral	8.06*	1239	0.07	9.32*	1625	[0.07]
Carvone	8.06*	1239	[0.07]	9.83	1667	0.04
Geraniol	8.34	1258	0.01	11.48	1806	0.01
Perillaldehyde	8.52*	1270	0.10	10.50	1722	0.01
Geranial	8.52*	1270	[0.10]	9.95	1677	0.08
Decanol	8.63	1277	0.01	10.58	1729	0.02
Limonen-10-ol	8.82	1290	0.01	12.97	1940	0.02
Undecanal	9.09	1306	0.02	8.55	1564	0.02
Neryl acetate	9.91	1364	0.01	10.04	1684	0.01

α-Copaene	10.02	1371	0.03	7.05	1449	0.03
Geranyl acetate	10.22	1386	0.02	10.38	1712	0.05
β-Elemene	10.26	1388	0.01	8.32	1546	0.01
Dodecanal	10.53	1408	0.06	9.87	1670	0.04
β-Caryophyllene	10.60	1413	0.03	8.30	1544	0.03
β-Copaene	10.74	1423	0.03	8.24	1540	0.03
α-Humulene	11.06	1447	0.01	9.16	1612	0.01
(*E*)-β-Farnesene	11.16	1454	0.01	9.43*	1634	[0.02]
γ-Muurolene	11.39	1472	0.01	9.48	1638	0.02
Germacrene D	11.43	1475	0.03	9.65	1652	0.02
Valencene	11.60	1487	0.04	9.77	1662	0.04
Bicyclogermacrene	11.64	1490	0.01	9.92*	1674	0.01
α-Muurolene	11.72	1496	0.01	9.92*	1674	[0.01]
γ-Cadinene	11.90	1510	0.01	10.23	1700	0.02
δ-Cadinene	12.02	1519	0.03	10.30	1705	0.04
α-Elemol	12.35	1545	0.01	13.88	2026	0.01
Caryophyllene oxide	12.71	1574	0.02	12.61	1907	0.01
β-Sinensal	14.18	1693	0.05	15.27	2163	0.04
α-Sinensal	14.83	1749	0.03	16.23	2262	0.03
Nootkatone	15.33	1792	0.01	17.60	2409	0.01
Stearic acid	19.25	2165	0.13			
Total identified		**98.63%**			**99.01%**	
Total reported		**98.63%**			**99.01%**	

*: 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