Date : July 08, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21F25-PTH16
Customer identification : Orange Blood - Italy - O1011295R
Type : Essential oil
Source : *Citrus sinensis*
Customer : Plant Therapy

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 : Pamela Lavoie, M.Sc., Chimiste
Analysis date : July 06, 2021

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Bright orange liquid
Refractive index: 1.4736 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

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	0.53	Monoterpene
Camphene	tr	Monoterpene
β-Pinene	0.05	Monoterpene
Sabinene	0.39	Monoterpene
Myrcene	1.86	Monoterpene
α-Phellandrene	0.04	Monoterpene
Octanal	0.20	Aliphatic aldehyde
Δ3-Carene	0.17	Monoterpene
α-Terpinene	0.01	Monoterpene
para-Cymene	0.01	Monoterpene
Limonene	94.26	Monoterpene
β-Phellandrene	0.27	Monoterpene
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	0.02	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.03	Monoterpene
trans-Sabinene hydrate	tr	Monoterpenic alcohol
Linalool	0.31	Monoterpenic alcohol
Nonanal	0.03	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	tr	Monoterpenic alcohol
(*E*)-4,8-Dimethyl-1,3,7-nonatriene	tr	Monoterpene
cis-Limonene oxide	tr	Monoterpenic ether
trans-Limonene oxide	0.01	Monoterpenic ether
Citronellal	0.05	Monoterpenic aldehyde
Terpinen-4-ol	tr	Monoterpenic alcohol
α-Terpineol	0.04	Monoterpenic alcohol
Decanal	0.19	Aliphatic aldehyde
Octyl acetate	0.01	Aliphatic ester
trans-Carveol	0.01	Monoterpenic alcohol
Nerol	0.01	Monoterpenic alcohol
Citronellol	0.01	Monoterpenic alcohol
Neral	0.04	Monoterpenic aldehyde
Geraniol	0.01	Monoterpenic alcohol
Perillaldehyde	0.01	Monoterpenic aldehyde
Geranial	0.05	Monoterpenic aldehyde
Undecanal	0.01	Aliphatic aldehyde
Citronellyl acetate	tr	Monoterpenic ester
Neryl acetate	0.01	Monoterpenic ester
α-Copaene	0.02	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene

Dodecanal	0.04	Aliphatic aldehyde
β-Caryophyllene	0.02	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
α-Humulene	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.01	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
Valencene	0.12	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
β-Sinensal	0.03	Sesquiterpenic aldehyde
α-Sinensal	0.01	Sesquiterpenic aldehyde
Myristic acid	0.02	Aliphatic acid
Nootkatone	0.02	Sesquiterpenic ketone
Palmitic acid	0.06	Aliphatic acid
Linoleic acid	0.06	Aliphatic acid
Oleic acid	0.03	Aliphatic acid
cis-Vaccenic acid?	0.03	Aliphatic acid
Stearic acid	0.04	Aliphatic acid
Tetramethoxyflavone isomer	0.02	Flavonoid
Tangeretin	0.03	Flavonoid
Nobiletin	0.07	Flavonoid
Limonen-10-ol	0.01	Monoterpenic alcohol
Consolidated total	**99.53%**	

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

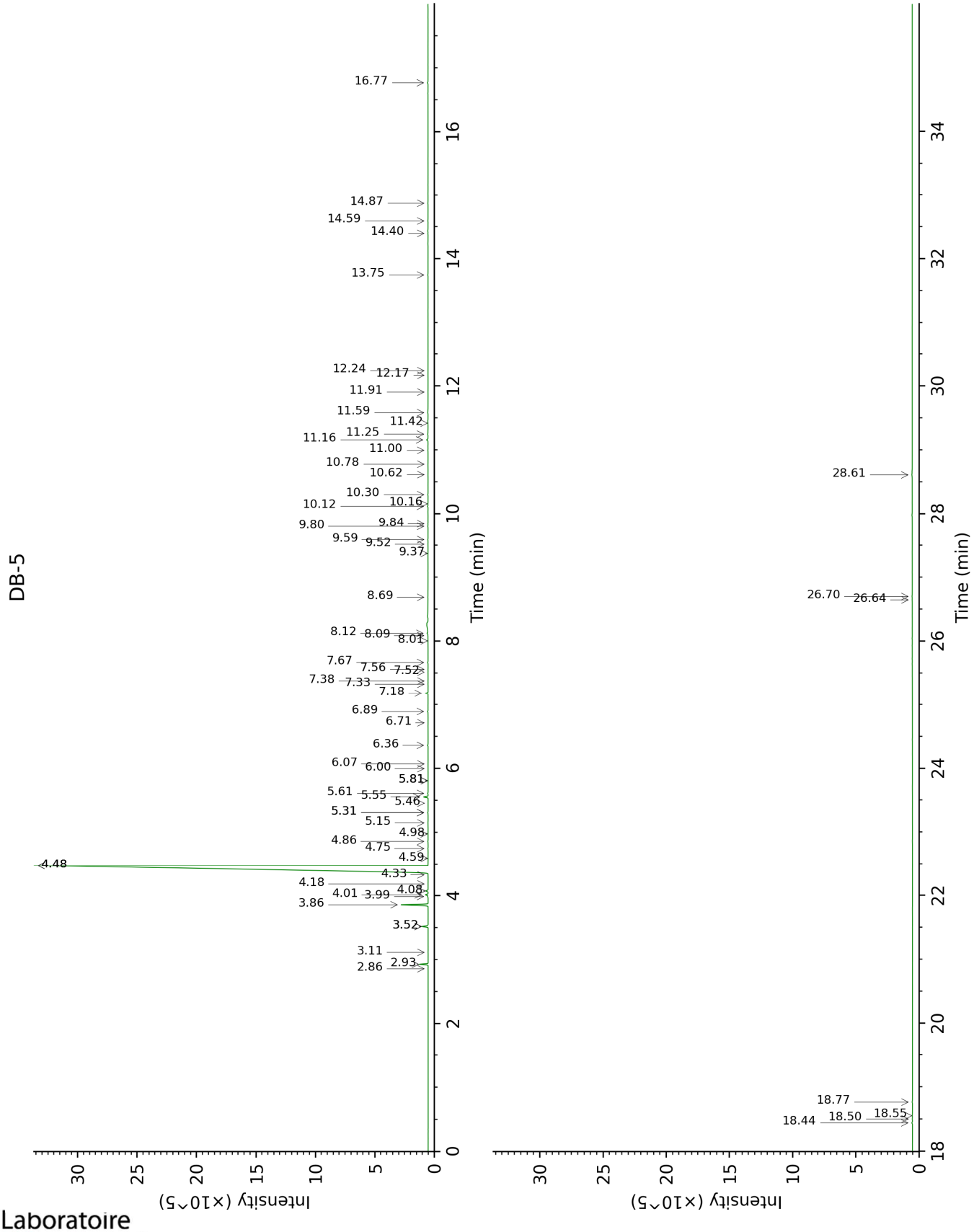
Note: no correction factor was applied

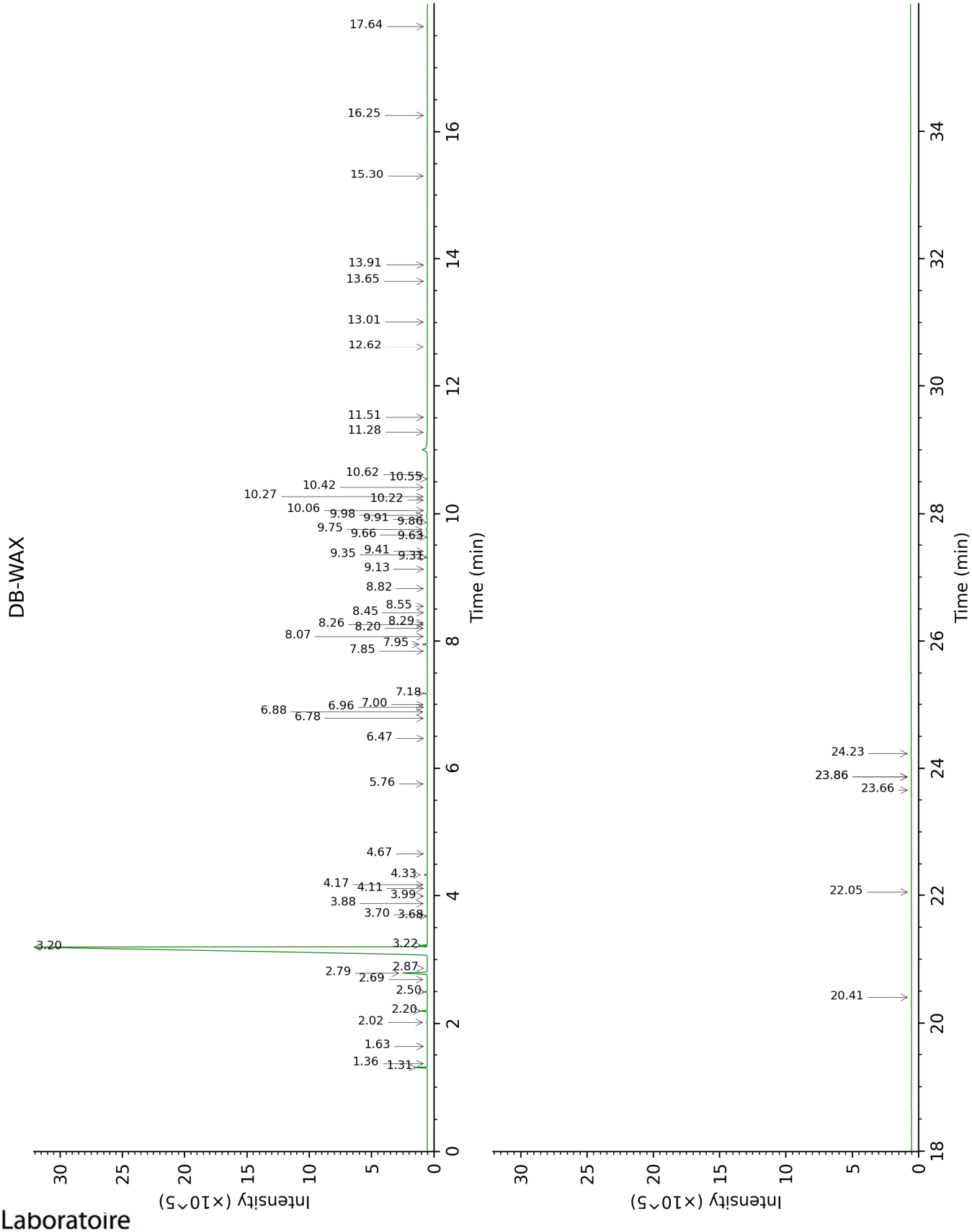
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Time (min)
Intensity (×10^5)
16.77
14.87
14.59
14.40
13.75
12.24
12.17
11.91
11.59
11.42
11.16
11.25
11.00
10.78
10.62
10.30
10.12
10.16
9.80
9.84
9.59
9.52
9.37
8.69
8.12
8.09
8.01
7.67
7.56
7.52
7.38
7.33
7.18
6.89
6.71
6.36
6.07
6.00
5.81
5.61
5.55
5.46
5.31
5.15
4.98
4.86
4.75
4.59
4.48
4.33
4.18
4.08
4.01
3.99
3.86
3.52
3.11
2.93
2.86
28.61
26.70
26.64
18.77
18.55
18.50
18.44


DB-WAX
17.64
16.25
15.30
13.91
13.65
13.01
12.62
11.51
11.28
10.62
10.55
10.42
10.27
10.22
10.06
9.98
9.91
9.86
9.75
9.66
9.63
9.35
9.41
9.31
9.13
8.82
8.55
8.45
8.29
8.26
8.20
8.07
7.95
7.85
7.18
7.00
6.96
6.88
6.78
6.47
5.76
4.67
4.33
4.17
4.11
3.99
3.88
3.70
3.68
3.22
3.20
2.87
2.79
2.69
2.50
2.20
2.02
1.63
1.36
1.31
24.23
23.86
23.66
22.05
20.41
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	2.86	926	0.01	1.36	999	0.01
α-Pinene	2.93	930	0.53	1.31	991	0.53
Camphene	3.11	943	tr	1.63	1026	tr
β-Pinene	3.52*	970	0.44	2.02	1065	0.05
Sabinene	3.52*	970	[0.44]	2.20	1084	0.39
Myrcene	3.86	993	1.86	2.79	1134	1.87
α-Phellandrene	3.99	1002	0.04	2.69	1126	0.04
Octanal	4.01	1004	0.20	4.33	1254	0.20
Δ3-Carene	4.08	1008	0.17	2.50	1111	0.17
α-Terpinene	4.18	1015	0.01	2.86	1140	tr
para-Cymene	4.33	1024	0.01	3.99	1229	0.02
Limonene	4.48*	1033	94.58	3.20	1167	94.26
β-Phellandrene	4.48*	1033	[94.58]	3.22	1169	0.27
(*Z*)-β-Ocimene	4.60	1041	0.01	3.68	1206	0.01
(*E*)-β-Ocimene	4.75	1051	0.02	3.88	1220	0.02
γ-Terpinene	4.86	1058	0.02	3.70	1207	0.02
cis-Sabinene hydrate	4.98	1065	0.01	6.78	1430	0.01
Octanol	5.15	1076	0.01	8.07	1527	0.01
Isoterpinolene	5.31*	1086	0.04	4.11	1238	0.01
Terpinolene	5.31*	1086	[0.04]	4.17	1243	0.03
trans-Sabinene hydrate	5.46	1096	tr	7.85	1510	tr
Linalool	5.56	1102	0.31	7.95	1518	0.32
Nonanal	5.61	1106	0.03	5.76	1355	0.03
trans-para-Mentha-2,8-dien-1-ol	5.81*	1119	0.01	8.82	1585	tr
(*E*)-4,8-Dimethyl-1,3,7-nonatriene	5.81*	1119	[0.01]	4.67	1280	tr
cis-Limonene oxide	6.00	1131	tr			
trans-Limonene oxide	6.07	1136	0.01	6.47	1407	0.01
Citronellal	6.36	1155	0.05	6.88	1438	0.04
Terpinen-4-ol	6.71	1178	tr	8.45	1556	0.01
α-Terpineol	6.89	1189	0.04	9.66	1653	0.04
Decanal	7.18	1208	0.19	7.18	1459	0.19
Octyl acetate	7.33	1218	0.01	6.96	1443	tr
trans-Carveol	7.38	1221	0.01	11.28	1788	tr
Nerol	7.52	1231	0.01			
Citronellol	7.56	1234	0.01	10.62	1732	0.01
Neral	7.67	1241	0.04	9.35	1628	0.04
Geraniol	8.01	1264	0.01	11.51	1808	0.01
Perillaldehyde	8.09	1270	0.01	10.55	1726	0.01
Geranial	8.12	1272	0.05	9.98	1678	0.08
Undecanal	8.69	1307	0.01	8.55	1564	0.01
Citronellyl acetate	9.37	1356	tr	9.31	1624	tr
Neryl acetate	9.52	1366	0.01	10.06	1685	0.01
α-Copaene	9.59	1372	0.02	7.00	1446	0.02
Geranyl acetate	9.80	1386	0.02	10.42	1715	0.03

β-Elemene	9.84	1389	0.01	8.29	1544	0.01
Dodecanal	10.12	1409	0.04	9.86	1669	0.05
β-Caryophyllene	10.16	1412	0.02	8.26	1542	0.02
β-Copaene	10.30	1423	0.02	8.20	1537	0.02
α-Humulene	10.62	1447	0.01	9.13	1610	0.01
(*E*)-β-Farnesene	10.78	1459	0.01	9.41	1632	0.02
Germacrene D	11.00	1475	0.01	9.63	1650	0.02
Valencene	11.16	1487	0.12	9.75	1660	0.12
α-Muurolene	11.25	1494	0.03	9.92	1673	0.04
γ-Cadinene	11.42	1507	0.02	10.22	1698	0.01
δ-Cadinene	11.59	1520	0.03	10.27	1703	0.02
α-Elemol	11.91	1545	0.01	13.91	2026	0.01
(*E*)-Nerolidol	12.17	1566	0.01	13.65	2002	0.01
Caryophyllene oxide	12.24	1572	0.02	12.62	1906	0.01
β-Sinensal	13.75	1695	0.03	15.30	2162	0.03
α-Sinensal	14.40	1752	0.01	16.26	2260	0.01
Myristic acid	14.59	1768	0.02	20.41	2729	0.02
Nootkatone	14.87	1793	0.02	17.64	2409	0.02
Palmitic acid	16.76	1968	0.06	22.05	2936	0.07
Linoleic acid	18.44	2134	0.06	24.23	3232	0.07
Oleic acid	18.50	2141	0.03	23.86*	3181	0.06
cis-Vaccenic acid?	18.55	2146	0.03	23.86*	3181	[0.06]
Stearic acid	18.77	2168	0.04	23.66	3152	0.06
Tetramethoxyflavone isomer	26.64	3134	0.02			
Tangeretin	26.70	3140	0.03			
Nobiletin	28.61	3325	0.07			
Limonen-10-ol				13.01	1943	0.01
Total identified		**99.56%**			**99.49%**	
Total reported		**99.56%**			**99.49%**	

*: 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