



## GC/MS BATCH NUMBER: GK0102

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**ESSENTIAL OIL:** GRAPEFRUIT ORGANIC  
**BOTANICAL NAME:** CITRUS X PARADISI  
**ORIGIN:** ISREAL

KEY CONSTITUENTS PRESENT IN THIS BATCH OF GRAPEFRUIT ORGANIC OIL	%
LIMONENE	92.9
MYRCENE	1.8

Comments from Robert Tisserand: Exquisite pink Grapefruit odor quality. Does not quite meet the full ISO standards, but this looks like a genuine oil.

**Date :** March 05, 2018

**CERTIFICATE OF ANALYSIS - GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 18C01-PTH2-1-CC

**Customer identification :** Grapefruit Organic - Israel - GK0102191R

**Type :** Essential oil

**Source :** *Citrus x paradisi* cv. Yellow

**Customer :** Plant Therapy


*ANALYSIS*

**Method:** PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** March 05, 2018

Checked and approved by :



Alexis St-Gelais, M. Sc., chimiste 2013-174

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*This report is digitally signed, it is only considered valid if the digital signature is intact.*

*PHYSICOCHEMICAL DATA*

**Physical aspect:** Bright yellow liquid

**Refractive index:**  $1.4745 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
$\alpha$ -Thujene	tr	tr	Monoterpene
$\alpha$ -Pinene	0.51	0.52	Monoterpene
Camphene	tr	tr	Monoterpene
Sabinene	0.36*	0.34	Monoterpene
$\beta$ -Pinene	[0.36]*	0.03	Monoterpene
Myrcene	1.82	1.86	Monoterpene
$\alpha$ -Phellandrene	0.02	0.03	Monoterpene
Octanal	0.39	0.39	Aliphatic aldehyde
Limonene	92.13*	92.92	Monoterpene
para-Cymene	[92.13]*	tr	Monoterpene
1,8-Cineole	[92.13]*	0.25	Monoterpenic ether
(Z)- $\beta$ -Ocimene	[92.13]*	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.12	0.12	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Octanol	0.01	0.01	Aliphatic alcohol
Terpinolene	0.01	0.01	Monoterpene
Linalool	0.08	0.08	Monoterpenic alcohol
Nonanal	0.06	0.05	Aliphatic aldehyde
(E)-4,8-Dimethylnona-1,3,7-triene	0.01	0.02	Terpene derivative
trans-para-Mentha-2,8-dien-1-ol	0.01	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.01	0.01	Monoterpenic ether
trans-Limonene oxide	0.01*	0.01	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	[0.01]*	0.05*	Monoterpenic alcohol
Citronellal	0.10	0.10	Monoterpenic aldehyde
Terpinen-4-ol	0.01	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.04	0.12*	Monoterpenic alcohol
Decanal	0.31	0.30	Aliphatic aldehyde
Octyl acetate	0.03	0.03	Aliphatic ester
trans-Carveol	0.01	0.01	Monoterpenic alcohol
Neral	0.05*	[0.05]*	Monoterpenic aldehyde
Carvone	[0.05]*	0.01	Monoterpenic ketone
(E)-Isogeraniol?	0.01	tr	Monoterpenic alcohol
Geranial	0.08	0.09*	Monoterpenic aldehyde
Unknown	0.01	0.01*	Oxygenated monoterpene
Undecanal	0.01	0.01	Aliphatic aldehyde
$\alpha$ -Terpinyl acetate	0.02	0.02	Monoterpenic ester
Limonene hydroperoxide IV	0.02		Monoterpenic peroxide
Neryl acetate	0.01	0.01	Monoterpenic ester
$\alpha$ -Copaene	0.10	0.10	Sesquiterpene
Geranyl acetate	0.15*	0.07	Monoterpenic ester
$\beta$ -Cubebene	[0.15]*	0.09	Sesquiterpene
$\beta$ -Elemene	0.02	0.25*	Sesquiterpene
Dodecanal	0.04	0.04	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.25	[0.25]*	Sesquiterpene
$\alpha$ -Humulene	0.04	0.03	Sesquiterpene
(E)- $\beta$ -Farnesene	0.01	0.01	Sesquiterpene
Germacrene D	0.09	[0.12]*	Sesquiterpene
Bicyclogermacrene	0.05	[0.09]*	Sesquiterpene

α-Murolene	0.03	0.04	Sesquiterpene
Cubebol	0.02	0.01	Sesquiterpenic alcohol
δ-Cadinene	0.13	0.11	Sesquiterpene
α-Elemol	0.02	0.02	Sesquiterpenic alcohol
(E)-Nerolidol	0.01	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	[0.01]*	Sesquiterpenic ether
β-Sinensal	0.02	0.01	Sesquiterpenic aldehyde
(2E,6E)-Farnesal	0.02	0.02	Sesquiterpenic aldehyde
Myristic acid	0.05	0.06	Aliphatic acid
Nootkatone	0.18	0.17	Sesquiterpenic ketone
Palmitic acid	0.07	0.08	Aliphatic acid
Osthole	0.04		Coumarin
Linoleic acid	0.07	0.07	Aliphatic acid
Oleic acid	0.04	0.04	Aliphatic acid
cis-Vaccenic acid?	0.02	0.04	Aliphatic acid
Stearic acid	0.02	0.02	Aliphatic acid
7-Methoxy-8-(2-formyl-2-methylpropyl)coumarin	0.02		Coumarin
Isoauraptene	0.10		Coumarin
Meranzin	0.28		Coumarin
Auraptanol	0.03		Coumarin
Meranzin hydrate	0.01		Coumarin
Unknown	0.01		Coumarin
Auraptene	0.75		Coumarin
Epoxyauraptene	0.28		Coumarin
Tangeretin	0.02		Flavonoid
<b>Total identified</b>	<b>99.21%</b>	<b>98.73%</b>	

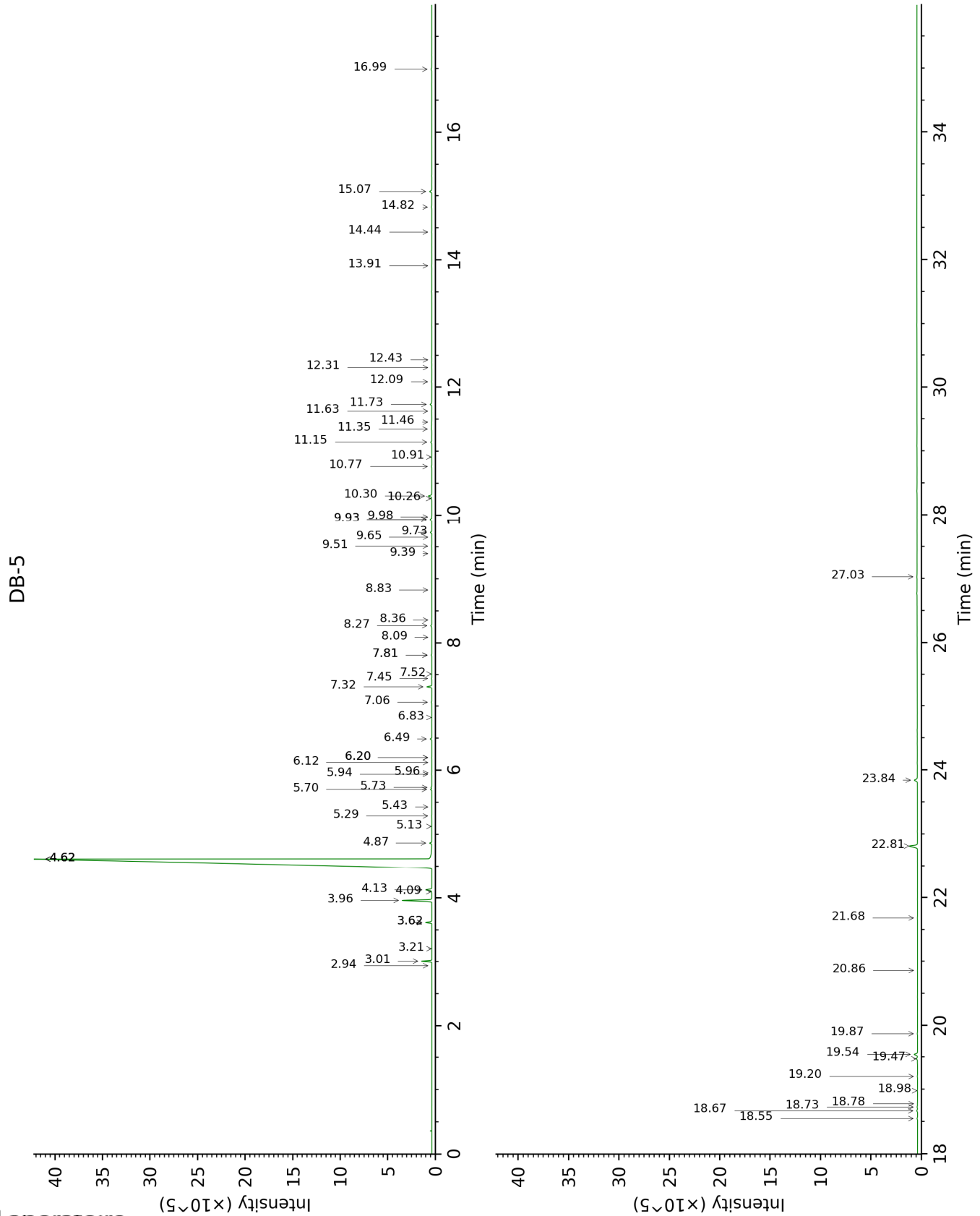
\*: Two or more compounds are coeluting on this column

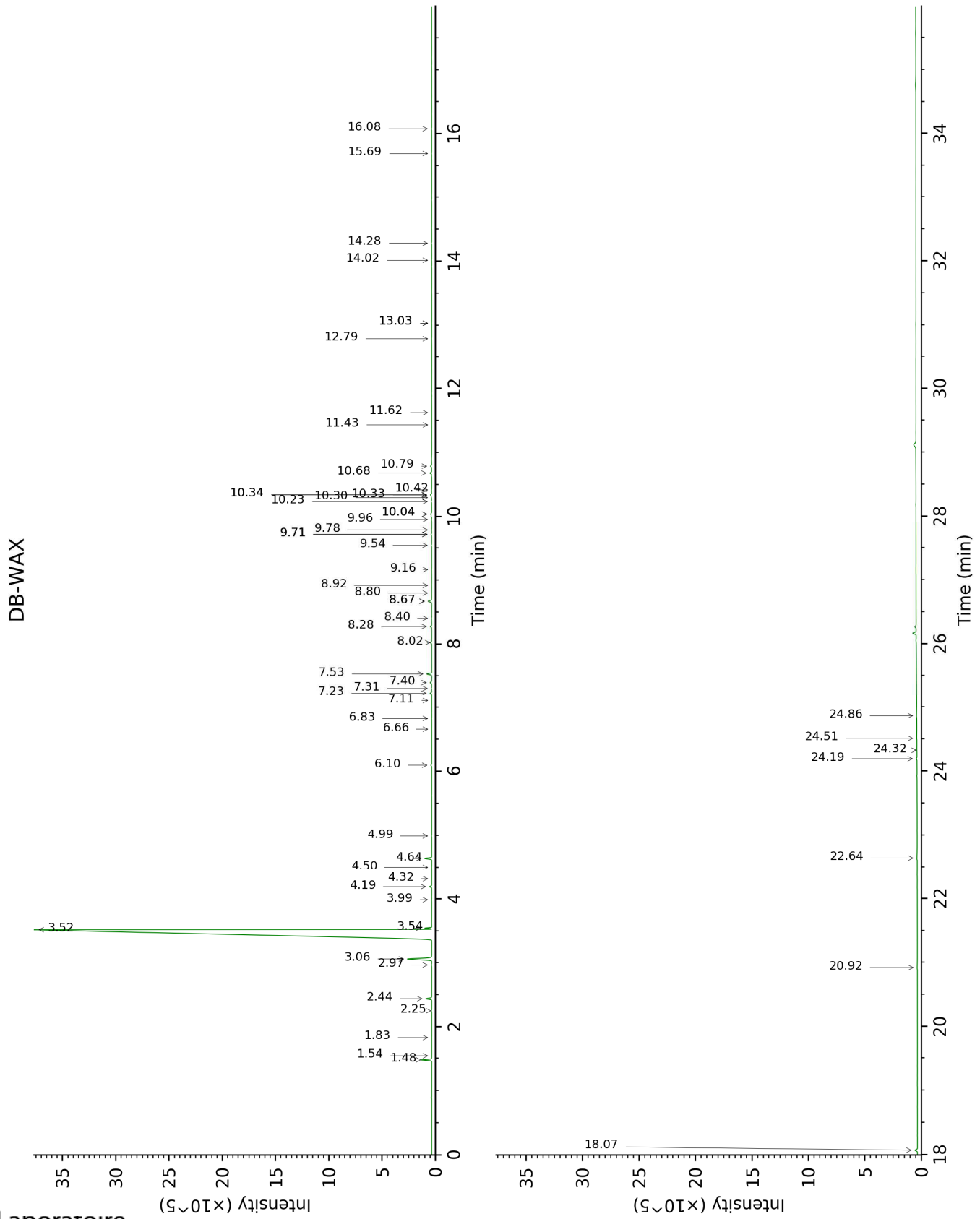
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
$\alpha$ -Thujene	2.94	920	tr	1.54	1002	tr
$\alpha$ -Pinene	3.01	925	0.51	1.48	995	0.52
Camphene	3.21	938	tr	1.83	1030	tr
Sabinene	3.62*	965	0.36	2.44	1086	0.34
$\beta$ -Pinene	3.62*	965	[0.36]	2.25	1069	0.03
Myrcene	3.96	988	1.82	3.06	1135	1.86
$\alpha$ -Phellandrene	4.09	997	0.02	2.97	1128	0.03
Octanal	4.13	999	0.39	4.64	1251	0.39
Limonene	4.62*	1030	92.13	3.52	1170	92.92
para-Cymene	4.62*	1030	[92.13]	4.32	1228	tr
1,8-Cineole	4.62*	1030	[92.13]	3.54	1172	0.25
(Z)- $\beta$ -Ocimene	4.62*	1030	[92.13]	3.99	1204	0.01
(E)- $\beta$ -Ocimene	4.87	1046	0.12	4.19	1219	0.12
cis-Sabinene hydrate	5.13	1062	0.01	7.11	1428	0.01
Octanol	5.29	1072	0.01	8.40	1524	0.01
Terpinolene	5.43	1081	0.01	4.50	1241	0.01
Linalool	5.70	1098	0.08	8.28	1515	0.08
Nonanal	5.73	1100	0.06	6.10	1355	0.05
(E)-4,8-Dimethylnona-1,3,7-triene	5.94	1113	0.01	4.99	1276	0.02
trans-para-Mentha-2,8-dien-1-ol	5.96	1115	0.01	9.16	1583	0.01
cis-Limonene oxide	6.12	1125	0.01	6.66	1395	0.01
trans-Limonene oxide	6.20*	1130	0.01	6.83	1407	0.01
cis-para-Mentha-2,8-dien-1-ol	6.20*	1130	[0.01]	9.71*	1627	0.05
Citronellal	6.49	1148	0.10	7.23	1437	0.10
Terpinen-4-ol	6.83	1170	0.01	8.80	1555	0.01
$\alpha$ -Terpineol	7.06	1185	0.04	10.04*†	1653	0.12
Decanal	7.32	1201	0.31	7.53	1459	0.30
Octyl acetate	7.45	1210	0.03	7.31	1442	0.03
trans-Carveol	7.52	1214	0.01	11.62	1785	0.01
Neral	7.81*	1234	0.05	9.71*	1627	[0.05]
Carvone	7.81*	1234	[0.05]	10.30	1674	0.01
(E)-Isogeraniol?	8.09	1253	0.01	11.43	1769	tr
Geranial	8.27	1265	0.08	10.34*	1678	0.09
Unknown [m/z 43, 43 (84), 72 (81), 97 (90), 95 (60)... 150 (4)]	8.36	1271	0.01	13.03*	1909	0.01
Undecanal	8.83	1302	0.01	8.92	1564	0.01
$\alpha$ -Terpinyl acetate	9.39	1342	0.02	9.96	1646	0.02
Limonene hydroperoxide IV	9.51	1350	0.02			
Neryl acetate	9.65	1360	0.01	10.42	1684	0.01
$\alpha$ -Copaene	9.73	1365	0.10	7.40	1449	0.10
Geranyl acetate	9.93*	1380	0.15	10.79	1715	0.07
$\beta$ -Cubebene	9.93*	1380	[0.15]	8.02	1495	0.09
$\beta$ -Elemene	9.98	1383	0.02	8.67*	1545	0.25

Dodecanal	10.26	1404	0.04	10.24	1669	0.04
β-Caryophyllene	10.30	1406	0.25	8.67*	1545	[0.25]
α-Humulene	10.76	1441	0.04	9.54	1613	0.03
(E)-β-Farnesene	10.91	1452	0.01	9.78	1632	0.01
Germacrene D	11.15	1469	0.09	10.04*†	1653	[0.12]
Bicyclogermacrene	11.35	1484	0.05	10.34*	1678	[0.09]
α-Murolene	11.46	1492	0.03	10.33	1676	0.04
Cubebol	11.63	1505	0.02	12.79	1887	0.01
δ-Cadinene	11.73	1513	0.13	10.68	1706	0.11
α-Elemol	12.09	1541	0.02	14.28	2026	0.02
(E)-Nerolidol	12.31	1558	0.01	14.02	2000	0.01
Caryophyllene oxide	12.43	1568	0.01	13.03*	1909	[0.01]
β-Sinensal	13.91	1688	0.02	15.69	2164	0.01
(2E,6E)-Farnesal	14.44	1733	0.02	16.08	2203	0.02
Myristic acid	14.82	1766	0.05	20.92	2749	0.06
Nootkatone	15.07	1787	0.18	18.07	2415	0.17
Palmitic acid	16.99	1963	0.07	22.64	2970	0.08
Osthole	18.55	2117	0.04			
Linoleic acid	18.67	2129	0.07	24.86	3280	0.07
Oleic acid	18.72	2135	0.04	24.51	3229	0.04
cis-Vaccenic acid?	18.78	2140	0.02	24.19	3183	0.04
Stearic acid	18.98	2161	0.02	24.32	3202	0.02
7-Methoxy-8-(2-formyl-2-methylpropyl)coumarin	19.20	2184	0.02			
Isoauraptene	19.47	2213	0.10			
Meranzin	19.54	2220	0.28			
Auraptenol	19.87	2256	0.03			
Meranzin hydrate	20.86	2364	0.01			
Unknown [m/z 219, 247 (85), 217 (61), 161 (48), 189 (33), 232 (23)... 290 (18)]	21.68	2458	0.01			
Auraptene	22.81	2593	0.75			
Epoxyaurapten	23.84	2722	0.28			
Tangeretin	27.03	3134	0.02			
<b>Total identified</b>		<b>99.21%</b>			<b>98.73%</b>	
<b>Total reported</b>		<b>99.23%</b>			<b>98.73%</b>	

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

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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