

Date : May 22, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18E09-VIV2-1-CC

Customer identification : Organic lemon oil - France - 180040

Type : Essential oil

Source : *Citrus x limon*

Customer : Viva Naturals

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 : Alexis St-Gelais, M. Sc., chimiste

Analysis date : May 21, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4733 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Hexanal	tr	tr	Aliphatic aldehyde
Octane	0.01	0.01	Alkane
Heptanal	0.01	tr	Aliphatic aldehyde
Tricyclene	0.01	0.01	Monoterpene
α -Thujene	0.37	0.37	Monoterpene
α -Pinene	1.80	1.80	Monoterpene
Camphene	0.06*	0.06	Monoterpene
α -Fenchene	[0.06]*	tr	Monoterpene
β -Pinene	14.75*	12.61	Monoterpene
Sabinene	[14.75]*	2.11	Monoterpene
6-Methyl-5-hepten-2-one	0.01	0.01	Aliphatic ketone
Myrcene	1.40	1.41	Monoterpene
α -Phellandrene	0.02	0.03	Monoterpene
Octanal	0.11*	0.09	Aliphatic aldehyde
Δ^3 -Carene	[0.11]*	0.01	Monoterpene
α -Terpinene	0.15	0.15	Monoterpene
para-Cymene	65.60	0.53	Monoterpene
Limonene	[65.60]*	64.69	Monoterpene
β -Phellandrene	[65.60]*	0.32	Monoterpene
(Z)- β -Ocimene	0.07	8.16*	Monoterpene
(E)- β -Ocimene	0.12	0.13	Monoterpene
γ -Terpinene	8.10	[8.16]*	Monoterpene
cis-Sabinene hydrate	0.05	0.05	Monoterpenic alcohol
Octanol	0.01	0.01*	Aliphatic alcohol
Terpinolene	0.34	0.34	Monoterpene
trans-Sabinene hydrate	0.04	0.04	Monoterpenic alcohol
Linalool	0.10	0.10	Monoterpenic alcohol
Nonanal	0.13	0.12	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	tr	Monoterpenic alcohol
cis-Limonene oxide	0.03	0.03	Monoterpenic ether
trans-Limonene oxide	0.02	0.02	Monoterpenic ether
Camphor	0.01	0.01	Monoterpenic ketone
Epoxyterpinolene	0.01	0.01	Monoterpenic ether
Citronellal	0.07	0.06	Monoterpenic aldehyde
Borneol	0.01	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.03	0.03	Monoterpenic alcohol
Isogeranial	0.01	[0.01]*	Monoterpenic aldehyde
α -Terpineol	0.18	0.19	Monoterpenic alcohol
Decanal	0.06	0.06	Aliphatic aldehyde
trans-Carveol	tr	tr	Monoterpenic alcohol
2,3-Epoxyneral?	0.01		Monoterpenic aldehyde
Nerol	0.04	0.04	Monoterpenic alcohol
2,3-Epoxygeranial?	0.03		Monoterpenic aldehyde
Neral	0.77	0.76	Monoterpenic aldehyde
Geraniol	0.04	0.03	Monoterpenic alcohol
Perillaldehyde	0.02	0.01	Monoterpenic aldehyde
Geranial	1.35	1.34	Monoterpenic aldehyde
Limonen-10-ol	0.01	0.01	Monoterpenic alcohol

Undecanal	0.03	0.03	Aliphatic aldehyde
Citronellyl acetate	0.03	0.02	Monoterpenic ester
Neryl acetate	0.54	0.55	Monoterpenic ester
Geranyl acetate	0.30	0.32	Monoterpenic ester
Dodecanal	0.02	0.02	Aliphatic aldehyde
β -Caryophyllene	0.22*	0.19	Sesquiterpene
<i>cis</i> - α -Bergamotene	[0.22]*	0.05	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.37	0.35	Sesquiterpene
α -Humulene	0.02	0.02	Sesquiterpene
β -Santalene	0.01	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.04	0.03*	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.02	[0.03]*	Sesquiterpene
Valencene	0.04	0.04	Sesquiterpene
Bicyclogermacrene	0.03	0.03	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	tr	0.01	Sesquiterpene
β -Bisabolene	0.56	0.56	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.02	0.02	Sesquiterpene
Caryophyllene oxide isomer	0.06*	tr	Sesquiterpenic ether
Caryophyllene oxide	[0.06]*	0.01	Sesquiterpenic ether
Spathulenol	[0.06]*	0.04	Sesquiterpenic alcohol
Unknown	0.03		Oxygenated sesquiterpene
Unknown	0.03	0.03	Oxygenated sesquiterpene
α -Bisabolol	0.03	0.03	Sesquiterpenic alcohol
Myristic acid	0.05	0.05	Aliphatic acid
Pentadecylic acid	0.12	0.12	Aliphatic acid
Citropten	0.05		Furanocoumarin
Palmitic acid	0.10	0.12	Aliphatic acid
Linoleic acid	0.05	0.05	Aliphatic acid
Oleic acid	0.04	0.06	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.01		Aliphatic acid
Stearic acid	0.03	0.03	Aliphatic acid
Total identified	98.75%	98.56%	

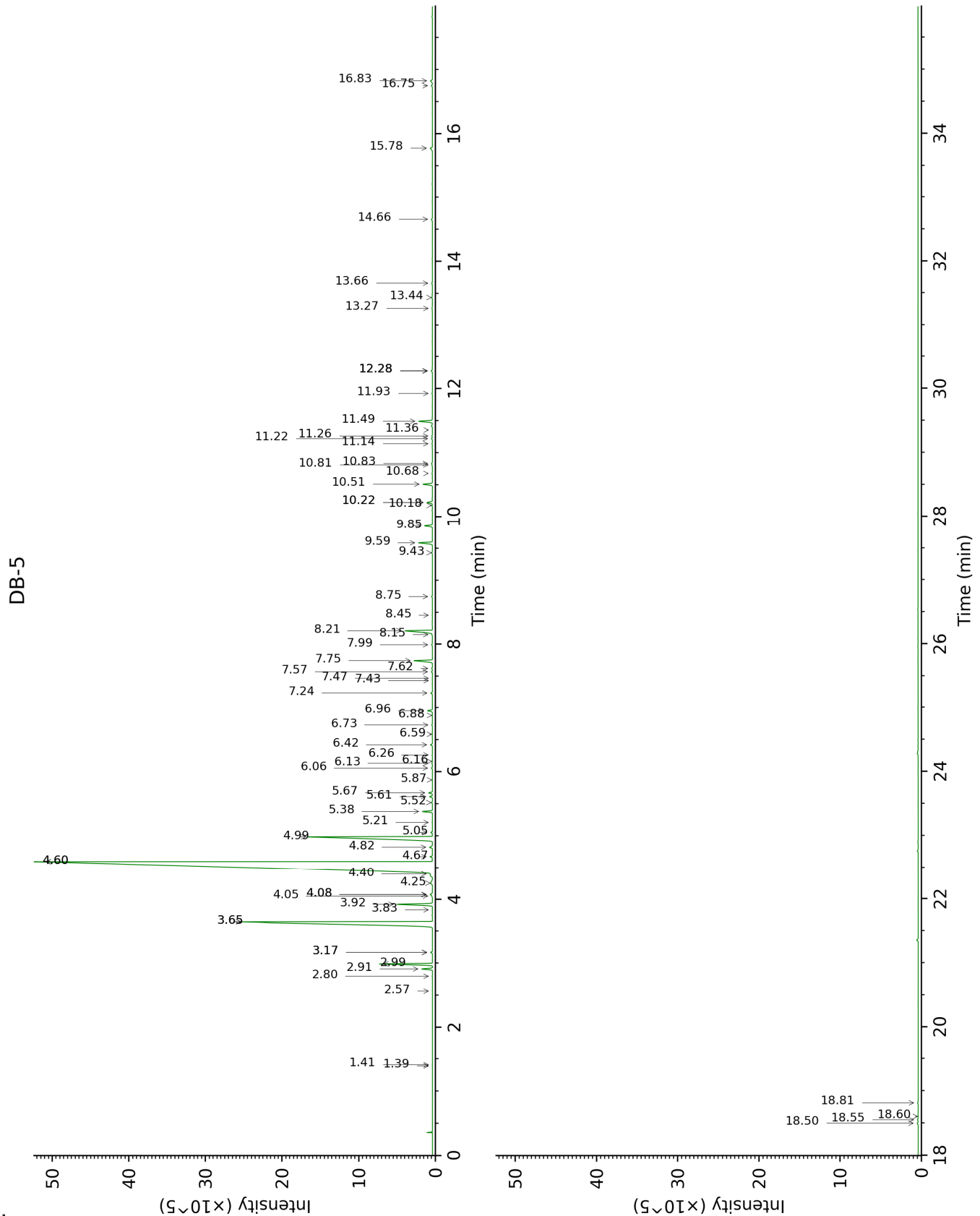
*: Two or more compounds are coeluting on this column

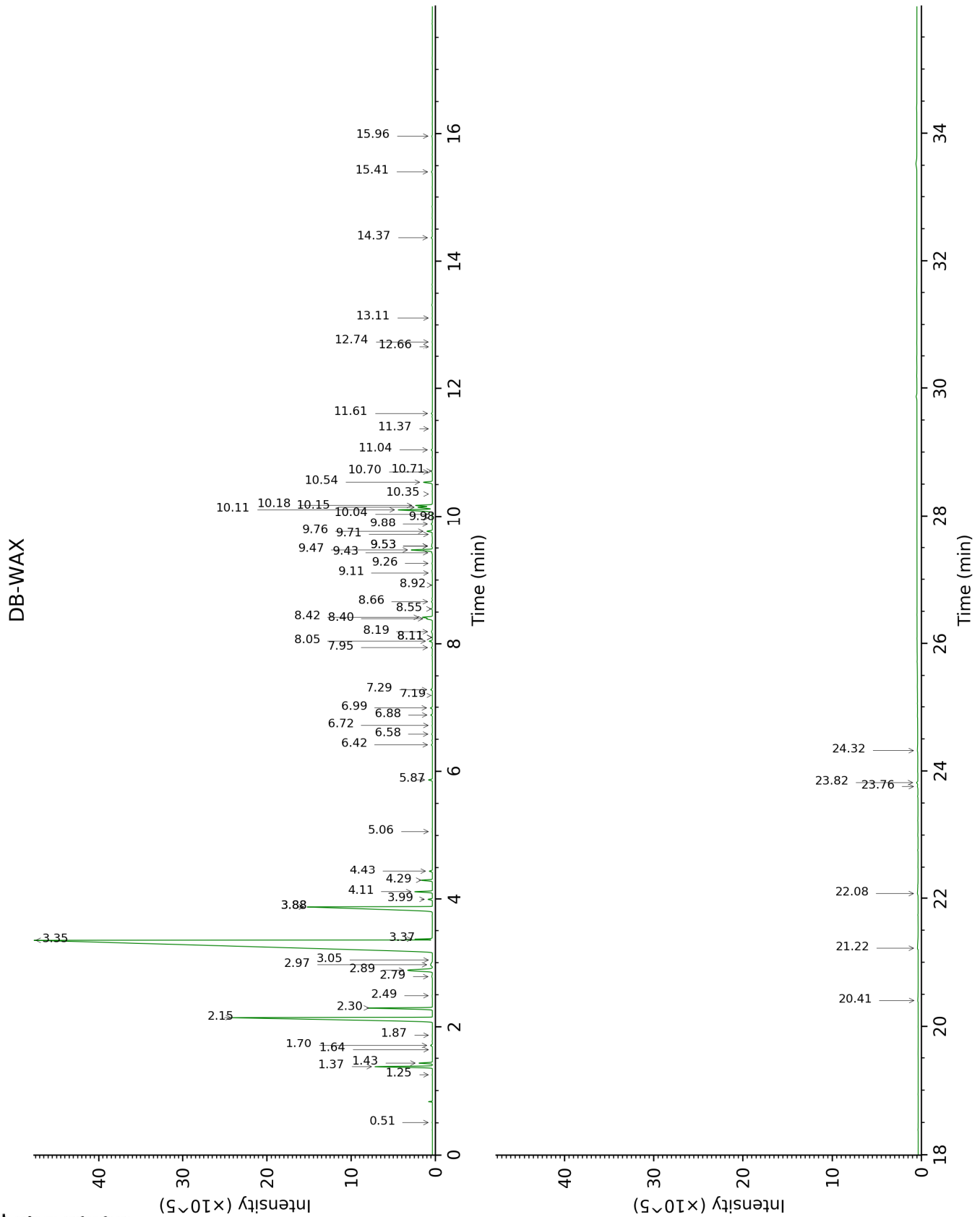
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Hexanal	1.39	797	tr	1.87	1049	tr
Octane	1.41	800	0.01	0.51	788	0.01
Heptanal	2.57	901	0.01	3.05	1152	tr
Tricyclene	2.80	917	0.01	1.25	977	0.01
α -Thujene	2.91	925	0.37	1.43	1005	0.37
α -Pinene	2.99	930	1.80	1.37	998	1.80
Camphene	3.17*	942	0.06	1.70	1032	0.06
α -Fenchene	3.17*	942	[0.06]	1.64	1026	tr
β -Pinene	3.65*	974	14.75	2.15	1076	12.61
Sabinene	3.65*	974	[14.75]	2.30	1091	2.11
6-Methyl-5-hepten-2-one	3.84	987	0.01	5.06	1301	0.01
Myrcene	3.92	993	1.40	2.89	1140	1.41
α -Phellandrene	4.05	1001	0.02	2.79	1132	0.03
Octanal	4.08*	1003	0.11	4.43	1256	0.09
Δ 3-Carene	4.08*	1003	[0.11]	2.49	1109	0.01
α -Terpinene	4.25	1014	0.15	2.97	1146	0.15
para-Cymene	4.40†	1024	65.60	4.11	1232	0.53
Limonene	4.60*†	1036	[65.60]	3.35	1176	64.69
β -Phellandrene	4.60*†	1036	[65.60]	3.37	1177	0.32
(Z)- β -Ocimene	4.67	1041	0.07	3.88*	1215	8.16
(E)- β -Ocimene	4.82	1050	0.12	3.99	1224	0.13
γ -Terpinene	4.99	1061	8.10	3.88*	1215	[8.16]
cis-Sabinene hydrate	5.05	1065	0.05	6.88	1433	0.05
Octanol	5.21	1075	0.01	8.10*	1525	0.01
Terpinolene	5.38	1086	0.34	4.29	1245	0.34
trans-Sabinene hydrate	5.52	1095	0.04	7.95	1513	0.04
Linalool	5.61	1100	0.10	8.05	1520	0.10
Nonanal	5.67	1104	0.13	5.87	1359	0.12
trans-para-Mentha-2,8-dien-1-ol	5.87	1117	0.01	8.92	1589	tr
cis-Limonene oxide	6.06	1129	0.03	6.42	1398	0.03
trans-Limonene oxide	6.13	1134	0.02	6.58	1411	0.02
Camphor	6.16	1136	0.01	7.19	1456	0.01
Epoxyterpinolene	6.26	1142	0.01	6.72	1421	0.01
Citronellal	6.42	1152	0.07	6.99	1441	0.06
Borneol	6.59	1163	0.01	9.71	1652	0.01
Terpinen-4-ol	6.73	1172	0.03	8.55	1560	0.03
Isogeranial	6.88	1182	0.01	8.10*	1525	[0.01]
α -Terpineol	6.96	1187	0.18	9.76	1656	0.19
Decanal	7.24	1205	0.06	7.29	1463	0.06
trans-Carveol	7.44	1218	tr	11.37	1792	tr
2,3-Epoxyneral?	7.47	1221	0.01			

Nerol	7.57	1228	0.04	11.04	1764	0.04
2,3-Epoxygeranial?	7.62	1231	0.03			
Neral	7.75	1239	0.77	9.47	1633	0.76
Geraniol	7.99	1256	0.04	11.61	1812	0.03
Perillaldehyde	8.15	1266	0.02	10.70	1734	0.01
Geranial	8.21	1271	1.35	10.11	1685	1.34
Limonen-10-ol	8.45	1287	0.01	13.11	1948	0.01
Undecanal	8.75	1307	0.03	8.66	1568	0.03
Citronellyl acetate	9.43	1355	0.03	9.43	1629	0.02
Neryl acetate	9.59	1366	0.54	10.18	1690	0.55
Geranyl acetate	9.85	1385	0.30	10.54	1721	0.32
Dodecanal	10.18	1408	0.02	9.98	1674	0.02
β -Caryophyllene	10.22*	1412	0.22	8.40	1548	0.19
<i>cis</i> - α -Bergamotene	10.22*	1412	[0.22]	8.19	1532	0.05
<i>trans</i> - α -Bergamotene	10.51	1433	0.37	8.42	1550	0.35
α -Humulene	10.68	1446	0.02	9.26	1616	0.02
β -Santalene	10.81	1456	0.01	9.11	1603	0.01
(<i>E</i>)- β -Farnesene	10.83	1457	0.04	9.53*	1638	0.03
<i>trans</i> - β -Bergamotene	11.14	1480	0.02	9.53*	1638	[0.03]
Valencene	11.22	1486	0.04	9.88	1666	0.04
Bicyclogermacrene	11.26	1489	0.03	10.04	1679	0.03
(<i>Z</i>)- α -Bisabolene	11.36	1496	tr	10.35	1705	0.01
β -Bisabolene	11.49	1507	0.56	10.15	1688	0.56
(<i>E</i>)- α -Bisabolene	11.93	1541	0.02	10.71	1735	0.02
Caryophyllene oxide isomer	12.28*	1569	0.06	12.66	1906	tr
Caryophyllene oxide	12.28*	1569	[0.06]	12.74	1913	0.01
Spathulenol	12.28*	1569	[0.06]	14.37	2067	0.04
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.26	1648	0.03			
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.44	1662	0.03	15.96	2228	0.03
α -Bisabolol	13.66	1681	0.03	15.41	2170	0.03
Myristic acid	14.66	1767	0.05	20.41	2732	0.05
Pentadecylic acid	15.78	1867	0.12	21.22	2834	0.12
Citropten	16.75	1958	0.05			
Palmitic acid	16.83	1966	0.10	22.08	2946	0.12
Linoleic acid	18.50	2131	0.05	24.32	3256	0.05
Oleic acid	18.55	2137	0.04	23.82	3184	0.06
<i>cis</i> -Vaccenic acid?	18.60	2142	0.01			
Stearic acid	18.81	2164	0.03	23.76	3176	0.03
Total identified		98.75%			98.56%	
Total reported		98.81%			98.59%	

*: 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