

Date : May 22, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18E08-NAD2-1-CC

Customer identification : Lemon Oil - Argentina - R122257-02

Type : Essential oil

Source : *Citrus x limon*

Customer : TrulQ Global, LLC

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 : May 16, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Bright 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
2-Methyl-3-buten-2-ol	tr	0.01	Aliphatic alcohol
Toluene	tr	0.35*	Simple phenolic
Hexanal	tr	tr	Aliphatic aldehyde
Nonane	tr	tr	Alkane
Tricyclene	0.01	0.01	Monoterpene
α -Thujene	0.35	[0.35]*	Monoterpene
α -Pinene	1.68	1.69	Monoterpene
Camphene	0.06*	0.06	Monoterpene
α -Fenchene	[0.06]*	tr	Monoterpene
Sabinene	13.21*	1.92	Monoterpene
β -Pinene	[13.21]*	11.31	Monoterpene
6-Methyl-5-hepten-2-one	0.02	0.01	Aliphatic ketone
Myrcene	1.45	1.45	Monoterpene
α -Phellandrene	0.02	0.03	Monoterpene
Octanal	0.08	0.06	Aliphatic aldehyde
Δ^3 -Carene	0.01	tr	Monoterpene
α -Terpinene	0.16	0.16	Monoterpene
para-Cymene	67.52*	0.36	Monoterpene
1,8-Cineole	[67.52]*	0.31	Monoterpenic ether
Limonene	[67.52]*	67.03	Monoterpene
(Z)- β -Ocimene	0.05	8.08*	Monoterpene
(E)- β -Ocimene	0.11	0.11	Monoterpene
γ -Terpinene	8.00	[8.08]*	Monoterpene
cis-Sabinene hydrate	0.04	0.04	Monoterpenic alcohol
Octanol	tr	0.01	Aliphatic alcohol
Terpinolene	0.35	0.35	Monoterpene
trans-Sabinene hydrate	0.03	0.03	Monoterpenic alcohol
Linalool	0.11	0.11	Monoterpenic alcohol
Nonanal	0.11	0.10	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.01	tr	Monoterpenic alcohol
cis-Limonene oxide	0.01	0.01	Monoterpenic ether
trans-Limonene oxide	0.01	0.01	Monoterpenic ether
Camphor	0.01	0.01	Monoterpenic ketone
Epoxyterpinolene	tr	tr	Monoterpenic ether
Citronellal	0.06	0.06	Monoterpenic aldehyde
Borneol	0.01	0.23*	Monoterpenic alcohol
Terpinen-4-ol	0.06	0.06	Monoterpenic alcohol
Isogeranial	0.02	0.05*	Monoterpenic aldehyde
α -Terpineol	0.22	[0.23]*	Monoterpenic alcohol
Decanal	0.04	0.04	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?	0.04		Monoterpenic aldehyde
Neral	0.83*	0.83	Monoterpenic aldehyde
Carvone	[0.83]*	tr	Monoterpenic ketone
Geraniol	0.03	0.03	Monoterpenic alcohol
Perillaldehyde	0.02	0.01	Monoterpenic aldehyde

Geranial	1.37	1.39	Monoterpenic aldehyde
Undecanal	0.03	0.03	Aliphatic aldehyde
Unknown	0.01	0.01	Unknown
Citronellyl acetate	0.02	0.02	Monoterpenic ester
Neryl acetate	0.46	0.49	Monoterpenic ester
Geranyl acetate	0.22	0.24	Monoterpenic ester
Dodecanal	0.01	0.06*	Aliphatic aldehyde
β -Caryophyllene	0.25*	0.24	Sesquiterpene
<i>cis</i> - α -Bergamotene	[0.25]*	[0.05]*	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.38	0.35	Sesquiterpene
Neryl propionate	0.02	0.01	Monoterpenic ester
β -Santalene	0.05*	0.02	Sesquiterpene
(<i>E</i>)- β -Farnesene	[0.05]*	0.04	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.02	0.03	Sesquiterpene
Valencene	0.02	0.02	Sesquiterpene
Bicyclogermacrene	0.07	[0.06]*	Sesquiterpene
β -Bisabolene	0.57	0.56	Sesquiterpene
γ -Cadinene	0.01	tr	Sesquiterpene
(<i>Z</i>)- γ -Bisabolene	0.01	0.01	Sesquiterpene
δ -Cadinene	0.01	0.01	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.02	0.01	Sesquiterpene
Unknown	0.03	0.02	Oxygenated sesquiterpene
Unknown	0.02	0.02	Oxygenated sesquiterpene
α -Bisabolol	0.04	0.04	Sesquiterpenic alcohol
Myristic acid	0.04	0.04	Aliphatic acid
Citropten	0.06	0.07	Furanocoumarin
Palmitic acid	0.08	0.08	Aliphatic acid
Bergapten	0.01		Furanocoumarin
Linoleic acid	0.03	0.04	Aliphatic acid
Oleic acid	0.03	0.02	Aliphatic acid
Stearic acid	0.04	0.03	Aliphatic acid
Total identified	98.66%	98.84%	

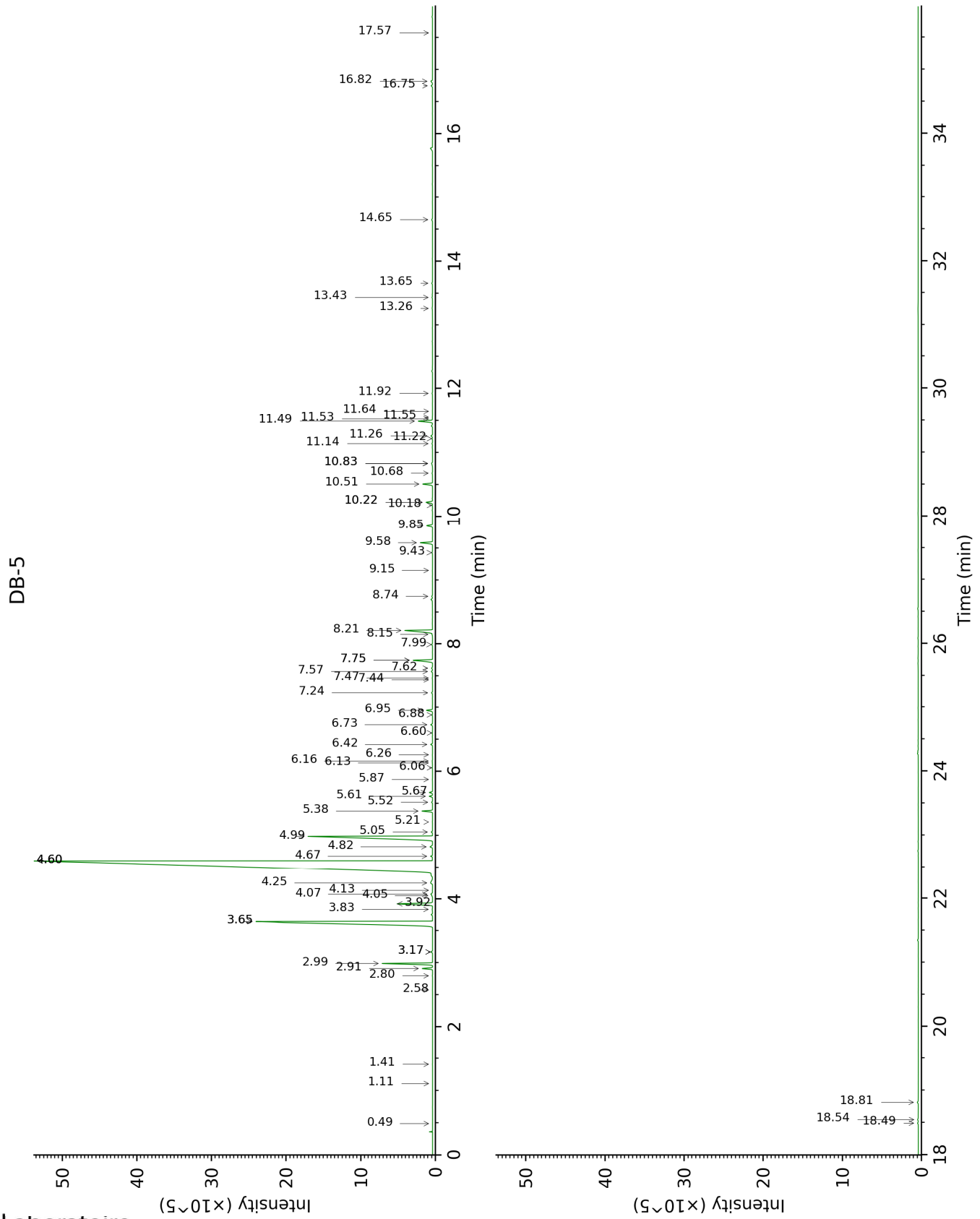
*: Two or more compounds are coeluting on this column

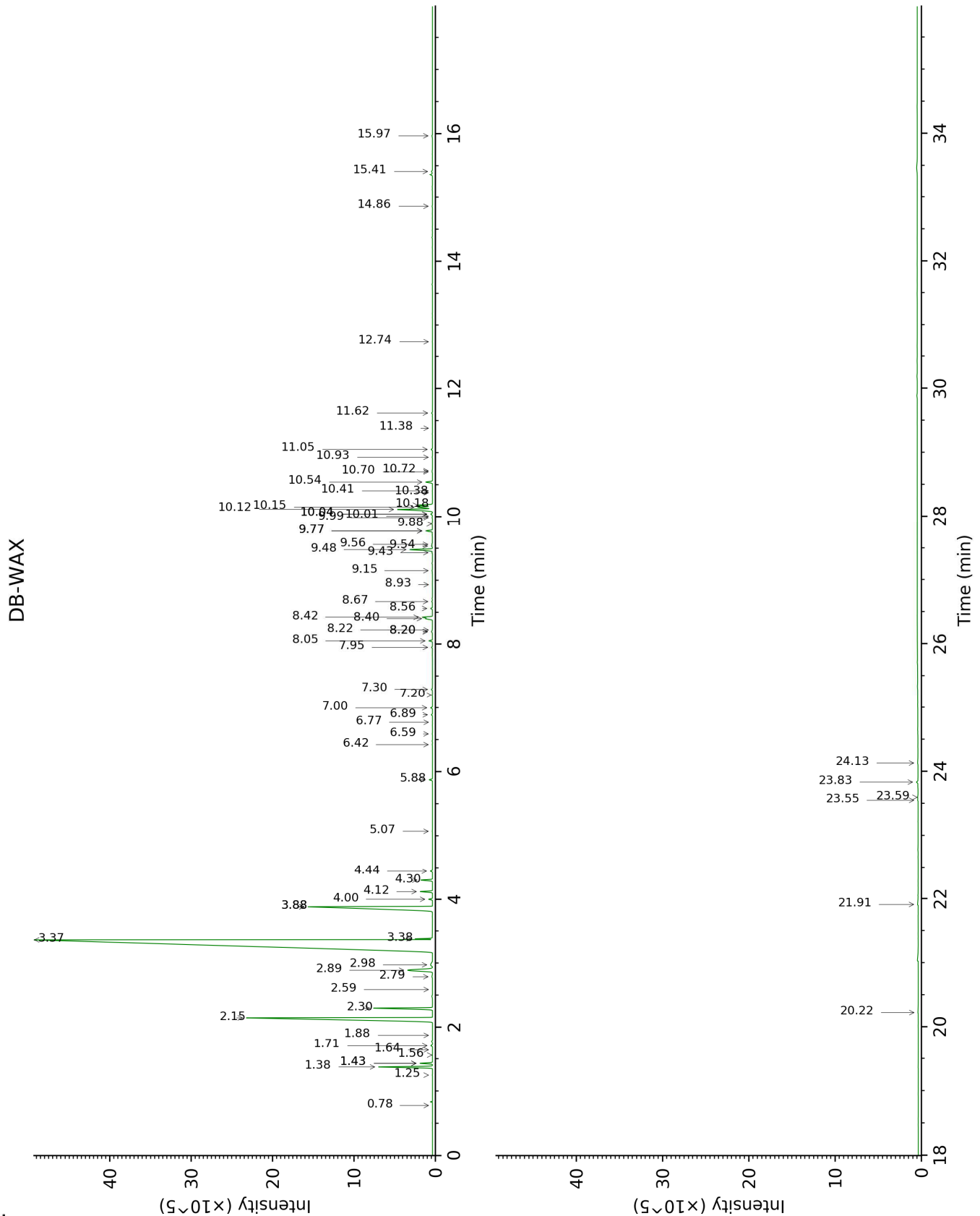
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
2-Methyl-3-buten-2-ol	0.49	604	tr	1.56	1014	0.01
Toluene	1.11	752	tr	1.43*	1001	0.35
Hexanal	1.41	797	tr	1.88	1046	tr
Nonane	2.58	899	tr	0.78	890	tr
Tricyclene	2.80	914	0.01	1.25	972	0.01
α -Thujene	2.91	922	0.35	1.43*	1001	[0.35]
α -Pinene	2.99	927	1.68	1.38	993	1.69
Camphene	3.17*	939	0.06	1.71	1029	0.06
α -Fenchene	3.17*	939	[0.06]	1.64	1022	tr
Sabinene	3.64*	971	13.21	2.30	1087	1.92
β -Pinene	3.64*	971	[13.21]	2.15	1072	11.31
6-Methyl-5-hepten-2-one	3.84	984	0.02	5.07	1295	0.01
Myrcene	3.92	990	1.45	2.89	1136	1.45
α -Phellandrene	4.05	998	0.02	2.79	1128	0.03
Octanal	4.07	1000	0.08	4.44	1251	0.06
Δ 3-Carene	4.13	1004	0.01	2.59	1113	tr
α -Terpinene	4.25	1011	0.16	2.98	1142	0.16
para-Cymene	4.60*	1034	67.52	4.12	1228	0.36
1,8-Cineole	4.60*	1034	[67.52]	3.38	1174	0.31
Limonene	4.60*	1034	[67.52]	3.37	1172	67.03
(Z)- β -Ocimene	4.68	1038	0.05	3.88*	1211	8.08
(E)- β -Ocimene	4.82	1048	0.11	4.00	1219	0.11
γ -Terpinene	4.99	1058	8.00	3.88*	1211	[8.08]
cis-Sabinene hydrate	5.05	1062	0.04	6.89	1428	0.04
Octanol	5.21	1072	tr	8.22	1528	0.01
Terpinolene	5.38	1083	0.35	4.30	1241	0.35
trans-Sabinene hydrate	5.52	1092	0.03	7.95	1507	0.03
Linalool	5.61	1098	0.11	8.06	1515	0.11
Nonanal	5.67	1101	0.11	5.88	1354	0.10
trans-para-Mentha-2,8-dien-1-ol	5.87	1114	0.01	8.93	1583	tr
cis-Limonene oxide	6.06	1126	0.01	6.42	1393	0.01
trans-Limonene oxide	6.13	1131	0.01	6.59	1406	0.01
Camphor	6.16	1133	0.01	7.20	1451	0.01
Epoxyterpinolene	6.26	1139	tr	6.77	1419	tr
Citronellal	6.42	1150	0.06	7.00	1436	0.06
Borneol	6.60	1161	0.01	9.77*	1650	0.23
Terpinen-4-ol	6.73	1170	0.06	8.56	1554	0.06
Isogeranial	6.88	1179	0.02	8.20*	1526	0.05
α -Terpineol	6.95	1184	0.22	9.77*	1650	[0.23]
Decanal	7.24	1202	0.04	7.30	1458	0.04

<i>trans</i> -Carveol	7.44	1216	tr	11.38	1785	tr
2,3-Epoxyneral?	7.47	1218	0.01			
Nerol	7.57	1225	0.04	11.05	1757	0.04
2,3-Epoxygeranial?	7.62	1228	0.04			
Neral	7.75*	1236	0.83	9.48	1627	0.83
Carvone	7.75*	1236	[0.83]	10.01	1670	tr
Geraniol	7.99	1253	0.03	11.62	1805	0.03
Perillaldehyde	8.15	1264	0.02	10.72	1729	0.01
Geranial	8.21	1268	1.37	10.12	1678	1.39
Undecanal	8.74	1304	0.03	8.67	1562	0.03
Unknown [m/z 82, 59 (44), 41 (43), 95 (31), 43 (29), 81 (24)...]	9.15	1332	0.01	12.74	1905	0.01
Citronellyl acetate	9.43	1352	0.02	9.43	1623	0.02
Neryl acetate	9.58	1363	0.46	10.18	1684	0.49
Geranyl acetate	9.85	1382	0.22	10.54	1714	0.24
Dodecanal	10.18	1405	0.01	10.04*	1672	0.06
β -Caryophyllene	10.22*	1409	0.25	8.40	1542	0.24
<i>cis</i> - α -Bergamotene	10.22*	1409	[0.25]	8.20*	1526	[0.05]
<i>trans</i> - α -Bergamotene	10.51	1430	0.38	8.42	1543	0.35
Neryl propionate	10.68	1443	0.02	10.93	1746	0.01
β -Santalene	10.83*	1454	0.05	9.15	1600	0.02
(<i>E</i>)- β -Farnesene	10.83*	1454	[0.05]	9.54	1631	0.04
<i>trans</i> - β -Bergamotene	11.14	1477	0.02	9.56	1633	0.03
Valencene	11.22	1483	0.02	9.88	1659	0.02
Bicyclogermacrene	11.26	1486	0.07	10.04*	1672	[0.06]
β -Bisabolene	11.49	1504	0.57	10.15	1681	0.56
γ -Cadinene	11.53	1507	0.01	10.38	1700	tr
(<i>Z</i>)- γ -Bisabolene	11.55	1509	0.01	9.99	1668	0.01
δ -Cadinene	11.64	1516	0.01	10.41	1702	0.01
(<i>E</i>)- α -Bisabolene	11.92	1538	0.02	10.70	1727	0.01
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.26	1646	0.03	14.86	2106	0.02
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.43	1660	0.02	15.97	2218	0.02
α -Bisabolol	13.66	1678	0.04	15.41	2161	0.04
Myristic acid	14.65	1763	0.04	20.22	2696	0.04
Citropten	16.75	1956	0.06	23.83	3171	0.07
Palmitic acid	16.82	1962	0.08	21.91	2910	0.08
Bergapten	17.58	2036	0.01			
Linoleic acid	18.49	2128	0.03	24.13	3214	0.04
Oleic acid	18.54	2134	0.03	23.55	3131	0.02
Stearic acid	18.81	2161	0.04	23.60	3138	0.03
Total identified		98.66%			98.84%	

Total reported	98.71%	98.88%
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*: 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

R.T.: Retention time (minutes)

R.I.: Retention index