

Date : January 22, 2018

SAMPLE IDENTIFICATION

Internal code : 18A10-CHS3-1-CC

Customer identification : Lemon - Spain - C29937ORG

Type : Essential oil

Source : *Citrus x limon*

Customer : American College of Healthcare sciences

ANALYSIS

Method : PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Identifications double-checked by GC-MS

Analyst : Sylvain Mercier, M. Sc., chimiste

Analysis date : 2018-01-22

Checked and approved by :

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

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Tricyclene	3.23	915	0.01	0.01	915	0.94	Monoterpene
α -Thujene	3.32	920	0.39	0.39	953	1.07	Monoterpene
α -Pinene	3.43	927	1.76	1.73	941	1.03	Monoterpene
Camphene	3.72	944	0.05	0.05	993	1.29	Monoterpene
Sabinene	4.16	970	1.83	1.81	1059	1.78	Monoterpene
β -Pinene	4.24	975	10.88	10.76	1041	1.64	Monoterpene
Myrcene	4.50	990	1.56	1.53	1113	2.31	Monoterpene
α -Phellandrene	4.77*	1005	0.04	0.04	1105	2.22	Monoterpene
Δ 3-Carene	4.77*	1005	[0.04]	tr	1090	2.04	Monoterpene
Octanal	4.89	1012	0.07	0.07	1230	3.82	Aliphatic aldehyde
α -Terpinene	4.96	1016	0.17	0.17	1119	2.39	Monoterpene
Limonene	5.30*	1034	67.64	66.19	1148	2.74	Monoterpene
1,8-Cineole	5.30*	1034	[67.64]	0.34	1149	2.75	Monoterp. ether
para-Cymene	5.30*	1034	[67.64]	0.37	1207	3.48	Monoterpene
cis- β -Ocimene	5.38	1038	0.05	8.40	1191	3.25*	Monoterpene
trans- β -Ocimene	5.56	1048	0.10	0.10	1200	3.38	Monoterpene
γ -Terpinene	5.78	1060	8.44	[8.40]	1191	3.25*	Monoterpene
cis-Sabinene hydrate	6.08	1076	0.02	0.02	1406	6.47	Monoterp. alcohol
Terpinolene	6.22	1084	0.37	0.36	1220	3.67	Monoterpene
Linalool	6.72	1107	0.13	0.12	1496	8.37	Monoterp. alcohol
Nonanal	6.80	1110	0.11	0.09	1333	5.32	Aliphatic aldehyde
cis-Limonene oxide	7.37	1130	0.01	0.01	1371	5.88	Monoterp. ether
trans-Limonene oxide	7.49	1134	0.01	0.01	1392	6.23	Monoterp. ether
Citronellal	7.99	1152	0.11	0.10	1411	6.59	Monoterp. aldehyde
Terpinen-4-ol	8.84	1183	0.05	0.05	1525	9.30	Monoterp. alcohol
α -Terpineol	9.53	1204	0.15	0.15	1620	12.81	Monoterp. alcohol
Decanal	9.83	1211	0.05	0.04	1431	6.99	Aliphatic aldehyde
Neral	11.21	1241	0.89	0.91	1597	11.71	Monoterp. aldehyde
Geraniol	11.94	1257	0.02	0.04	1779	21.58	Monoterp. alcohol
Geranial	12.76	1275	1.55	1.64	1644	13.93	Monoterp. aldehyde
Undecanal	14.77	1312	0.03	0.04	1533	9.58	Aliphatic aldehyde
Citronellyl acetate	17.29	1350	0.04	0.04	1604	12.07	Monoterp. ester
Neryl acetate	17.92	1359	0.47	0.47	1653	14.33	Monoterp. ester
Geranyl acetate	19.41	1382	0.33	0.32	1685	15.87	Monoterp. ester
cis- α -Bergamotene	20.68*	1400	0.24	0.04	1500	8.52	Sesquiterpene
β -Caryophyllene	20.68*	1400	[0.24]	0.21	1508	8.77	Sesquiterpene
trans- α -Bergamotene	22.24	1419	0.41	0.39	1515	8.99	Sesquiterpene
α -Humulene	23.50	1434	0.02	0.02	1571	10.78	Sesquiterpene
trans- β -Farnesene	24.58	1447	0.03	0.02	1600	11.86	Sesquiterpene
Bicyclogermacrene	26.96	1475	0.04	0.04	1628	13.17	Sesquiterpene
β -Bisabolene	28.97	1499	0.61	0.54	1646	14.04	Sesquiterpene

Spathulenol	34.10	1572	0.02	0.02	2008	36.04	Sesquiterp. alcohol
α-Bisabolol	39.63	1688	0.03	0.03	2123	39.82	Sesquiterp. alcohol
Citropten	45.83	1894	0.22				Coumarin
Oxypeucedanin	58.63	2478	0.09				Coumarin
Total identified			99.04%	97.68%			

*: Two or more compounds are coeluting on this column

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

Note: no correction factor was applied

OTHER DATA

Physical aspect : Bright yellow liquid

Refractive index : 1.4743 ± 0.0003 (20 °C)

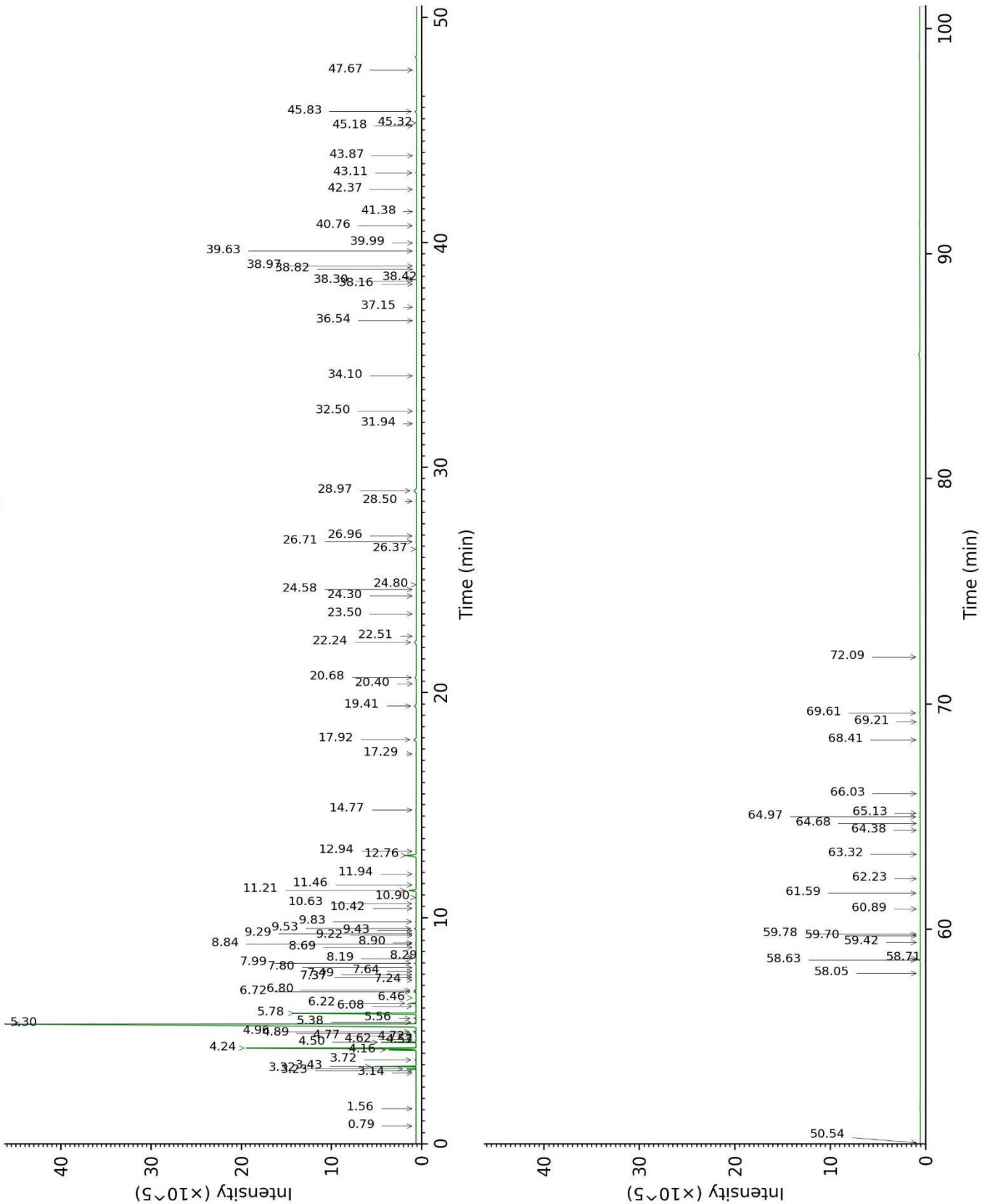
COMPLIANCE WITH ISO 855:2004 (CITRUS XLIMON, EXPRESSION)

Compound	%	ISO 855:2004 : Mediterranean type				Satisfied?
		Spain type		Italy type		
		% min	% max	% min	% max	
α-Thujene	0.4	0.2	0.5	0.2	0.5	Yes
α-Pinene	1.8	1.5	3.0	1.5	3.0	Yes
Sabinene	1.8	1.5	3.0	1.5	3.0	Yes
β-Pinene	10.8	10.0	16.5	10.0	16.5	Yes
Limonene	66.2	60.0	70.0	60.0	68.0	Yes
para-Cymene	0.37	tr	0.4	0.05	0.35	Spain
γ-Terpinene	8.4	8.0	12.0	8.0	12.0	Yes
α-Terpineol	0.15	0.09	0.35	0.10	0.30	Yes
Neral	0.9	0.4	1.0	0.6	1.2	Yes
Geranial	1.6	0.6	2.0	0.8	2.0	Yes
Neryl acetate	0.47	0.30	0.60	0.20	0.50	Yes
Geranyl acetate	0.33	0.20	0.65	0.30	0.65	Yes
β-Bisabolene	0.61	0.45	0.90	0.45	0.9	Yes
Refractive index	1.4743	1.473	1.476	1.473	1.476	Yes

CONCLUSION

No adulterant, contaminant or diluent were detected using this method. The oil complies with the ISO standard for Spanish expressed lemon oil.

18A10-CHS3-1-CC_BP5



18A10-CHS3-1-CC_WAX

