Date : March 21, 2016

SAMPLE IDENTIFICATION

Internal code : 16C09-CRH3-1-LC
Customer identification : Young Living - Thieves - Lot #15A13006 - Untampered seal
Type : Essential oil
Source : Blend (listed ingredients: *Syzygium aromaticum*, *Citrus limon*, *Cinnamomum verum*, *Eucalyptus radiata*, *Rosmarinus officinalis*)
Customer : Crystal Heck

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 : Alexis St-Gelais, M. Sc., chimiste
Analysis date : 2016-03-19

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.	
Styrene	2.63	890	0.01	0.06	1207	3.10*	Phenylpropanoid
Tricyclene	2.99	915	0.02	0.02	930	0.83	Monoterpene
α-Thujene	3.07	920	0.15	0.20	958	0.94	Monoterpene
α-Pinene	3.17	926	1.66	1.60	950	0.91	Monoterpene
Camphene	3.44*	943	0.40	0.39	1005	1.13	Monoterpene
α-Fenchene	3.44*	943	[0.40]	0.01	995	1.09	Monoterpene
Sabinene	3.87	969	0.66	0.66	1060	1.58	Monoterpene
β-Pinene	3.93*	973	3.61	3.53	1044	1.44	Monoterpene
Benzaldehyde	3.93*	973	[3.61]	0.06	1443	6.60*	Simple phenolic
Myrcene	4.20	989	0.67	0.65	1118	2.08	Monoterpene
6-Methyl-5-hepten-2-one	4.31	996	0.01	0.01	1284	4.17	Aliphatic ketone
α-Phellandrene	4.46*	1005	0.14	0.09	1110	2.00	Monoterpene
Δ3-Carene	4.46*	1005	[0.14]	0.04	1093	1.83	Monoterpene
Octanal	4.60	1013	0.02	0.02	1237	3.53	Aliphatic aldehyde
α-Terpinene	4.65	1015	0.11	0.11	1125	2.15	Monoterpene
meta-Cymene	4.75	1021	tr				Monoterpene
para-Cymene	4.84	1026	0.32	0.62	1213	3.19	Monoterpene
Limonene	4.92	1031	19.36	18.95	1148	2.43	Monoterpene
1,8-Cineole	4.98	1034	10.82	11.15	1154	2.50	Monoterp. ether
cis-β-Ocimene	5.06	1039	0.16	1.54	1192	2.94*	Monoterpene
trans-β-Ocimene	5.23	1048	0.05	[0.06]	1207	3.10*	Monoterpene
Salicylaldehyde	5.33	1054	0.02	0.02	1585	10.13	Simple phenolic
γ-Terpinene	5.42	1059	1.50	[1.54]	1192	2.94*	Monoterpene
cis-Sabinene hydrate	5.71	1075	0.03	0.02	1416	6.11*	Monoterp. alcohol
cis-Linalool oxide (fur.)	5.77	1079	tr	tr	1392	5.73	Monoterp. alcohol
Terpinolene	5.88	1084	0.08	0.08	1226	3.38	Monoterpene
trans-Linalool oxide (fur.)	6.00*	1091	0.01	[0.01]	1416	6.10*	Monoterp. alcohol
para-Cymenene	6.00*	1091	[0.01]	tr	1379	5.54	Monoterpene
Linalool	6.27	1105	0.86	0.89	1506	7.81	Monoterp. alcohol
Nonanal	6.42	1111	0.01	0.01	1343	5.01	Aliphatic aldehyde
Phenylethyl alcohol	6.66	1121	0.07	0.06	1822	21.80	Simple phenolic
cis-Limonene oxide	6.75	1124	0.01	tr	1389	5.68	Monoterp. ether
trans-Limonene oxide	6.92	1131	tr	tr	1400	5.85	Monoterp. ether
1-Terpineol	7.09	1137	tr	tr	1515	8.01	Monoterp. alcohol
Camphor	7.25	1144	0.91	0.91	1430	6.35	Monoterp. ketone
Hydrocinnamaldehyde	7.86	1168	0.03				Phenylpropanoid
Borneol	7.92*	1170	0.26	0.23	1628	11.58	Monoterp. alcohol
δ-Terpineol	7.92*	1170	[0.26]	0.03	1613	10.95	Monoterp. alcohol
Terpinen-4-ol	8.14	1179	0.15	0.16	1536	8.64	Monoterp. alcohol
para-Cymen-8-ol	8.55	1195	0.04	0.03	1780	19.31	Monoterp. alcohol
α-Terpineol	8.69*	1200	1.04	1.10	1634	11.84*	Monoterp. alcohol

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Methyl salicylate	8.69*	1200	[1.04]	0.01	1682	14.00	Phenolic ester
Decanal	9.15	1212	0.01	[0.06]	1443	6.60*	Aliphatic aldehyde
(*Z*)-Cinnamaldehyde	9.68	1224	0.04				Phenylpropanoid
Nerol	9.98	1231	tr	0.01	1739	16.88	Monoterp. alcohol
Pulegone	10.23	1237	0.01	0.01	1560	9.38	Monoterp. ketone
Neral	10.32	1239	0.28	0.34	1607	10.80*	Monoterp. aldehyde
o-Anisaldehyde	10.44	1242	0.05	0.04	1842	23.16	Simple phenolic
Geraniol	10.93	1254	0.11	0.11	1792	19.97	Monoterp. alcohol
Phenylethyl acetate	11.05	1257	0.02	0.01	1728	16.24	Phenolic ester
Piperitone	11.39	1265	0.04	[1.10]	1634	11.84*	Monoterp. ketone
Geranial	11.73	1273	0.38	0.37	1656	12.80	Monoterp. aldehyde
Bornyl acetate	12.16*	1283	10.70	0.12	1511	7.91	Monoterp. ester
(*E*)-Cinnamaldehyde	12.16*	1283	[10.70]	9.76	1919	28.60	Phenylpropanoid
α-Cubebene	14.87	1333	0.01	0.02	1410	6.00	Sesquiterpene
α-Terpinyl acetate	15.45	1343	0.10	0.10	1622	11.33	Monoterp. ester
Eugenol	16.58*	1361	36.20	36.84	2077	36.84	Phenylpropanoid
α-Copaene	16.58*	1361	[36.20]	0.09	1433	6.41	Sesquiterpene
Neryl acetate	16.81	1364	0.01	0.01	1664	13.19	Monoterp. ester
β-Elemene	17.43	1374	0.02	0.03	1529	8.40*	Sesquiterpene
Geranyl acetate	18.12	1385	0.01	0.01	1696	14.64	Monoterp. ester
β-Caryophyllene	19.22	1403	2.27	2.30	1524	8.26	Sesquiterpene
Vanillin	19.41	1405	0.05	0.05	2446	46.20	Simple phenolic
trans-α-Bergamotene	19.98	1412	0.02	[0.03]	1529	8.40*	Sesquiterpene
Methyleugenol	20.47	1418	0.01				Phenylpropanoid
Aromadendrene	20.71	1421	0.02	0.01	1531	8.47	Sesquiterpene
Coumarine	21.65	1433	0.17	0.15	2284	42.66	Coumarin
α-Humulene	21.78	1434	0.27	0.20	1582	10.03	Sesquiterpene
allo-Aromadendrene	22.03	1437	0.01	0.01	1566	9.51	Sesquiterpene
(*E*)-Cinnamyl acetate	23.08	1450	0.29	0.30	2050	35.92	Phenylpropanoid ester
α-Amorphene	23.61	1457	0.01	0.01	1618	11.11	Sesquiterpene
γ-Muurolene	23.75	1458	0.02	[0.34]	1607	10.80*	Sesquiterpene
Bicyclogermacrene	25.07*	1474	0.02	0.02	1642	12.22	Sesquiterpene
ar-Curcumene	25.07*	1474	[0.02]				Sesquiterpene
α-Muurolene	25.82	1484	0.01	0.01	1646	12.38	Sesquiterpene
γ-Cadinene	26.79	1495	0.01	0.01	1668	13.35	Sesquiterpene
β-Bisabolene	27.06	1499	0.03	0.03	1659	12.94	Sesquiterpene
δ-Cadinene	27.45	1504	0.04	0.05	1674	13.63	Sesquiterpene
trans-Calamenene	27.72	1507	0.02	0.01	1735	16.65	Sesquiterpene
Eugenyl acetate	29.30	1528	3.69	3.79	2170	39.76	Phenylpropanoid ester
(*E*)-o-Methoxycinnamaldehyde	30.08	1538	1.26	1.24	2312	43.33	Phenylpropanoid
Caryophyllene oxide	32.19*	1566	0.15	0.10	1850	23.75	Sesquiterp. ether
Spathulenol	32.19*	1566	[0.15]	0.02	2024	34.95	Sesquiterp. alcohol
(*E*)-Nerolidol	32.19*	1566	[0.15]	0.01	1997	33.33	Sesquiterp. alcohol

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(*E*)-o-Methoxycinnamyl acetate	38.46	1683	0.02	0.01	2415	45.56	Phenylpropanoid ester
Benzyl benzoate	41.24	1762	0.13	0.11	2489	47.03	Phenolic ester
Total identified			**99.70%**	**99.57%**			

*: 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 : Slightly yellow liquid
Refractive index : 1.5118 ± 0.0003 (20 °C)

Conclusion

Listed ingredients are: *Syzygium aromaticum* (confirmed from eugenyl acetate), *Citrus limon* (confirmed from octanal, nonanal, decanal, geranial/neral and limonene oxides), *Cinnamomum verum* (hard to assess), *Eucalyptus radiata* (confirmed from 1,8-cineole), *Rosmarinus officinalis* (confirmed from camphor, δ-terpineol). The analyzis indicate the presence of additional *Cinnamomum cassia* (from phenylethyl alcohol, (*E*)-o-methoxycinnamaldehyde, and coumarin) and vanillin, which is not present in any of the aforementionned oils.

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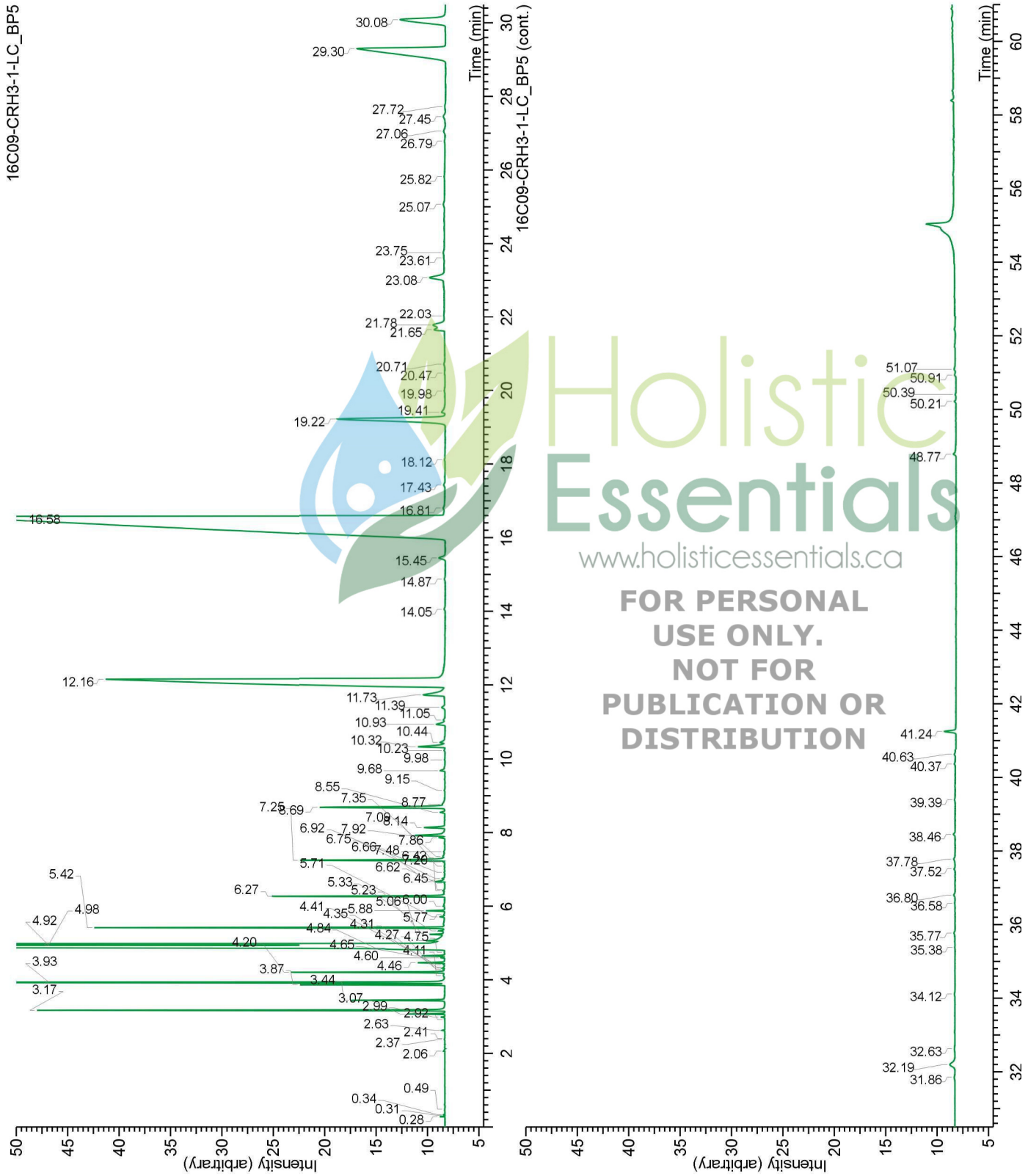

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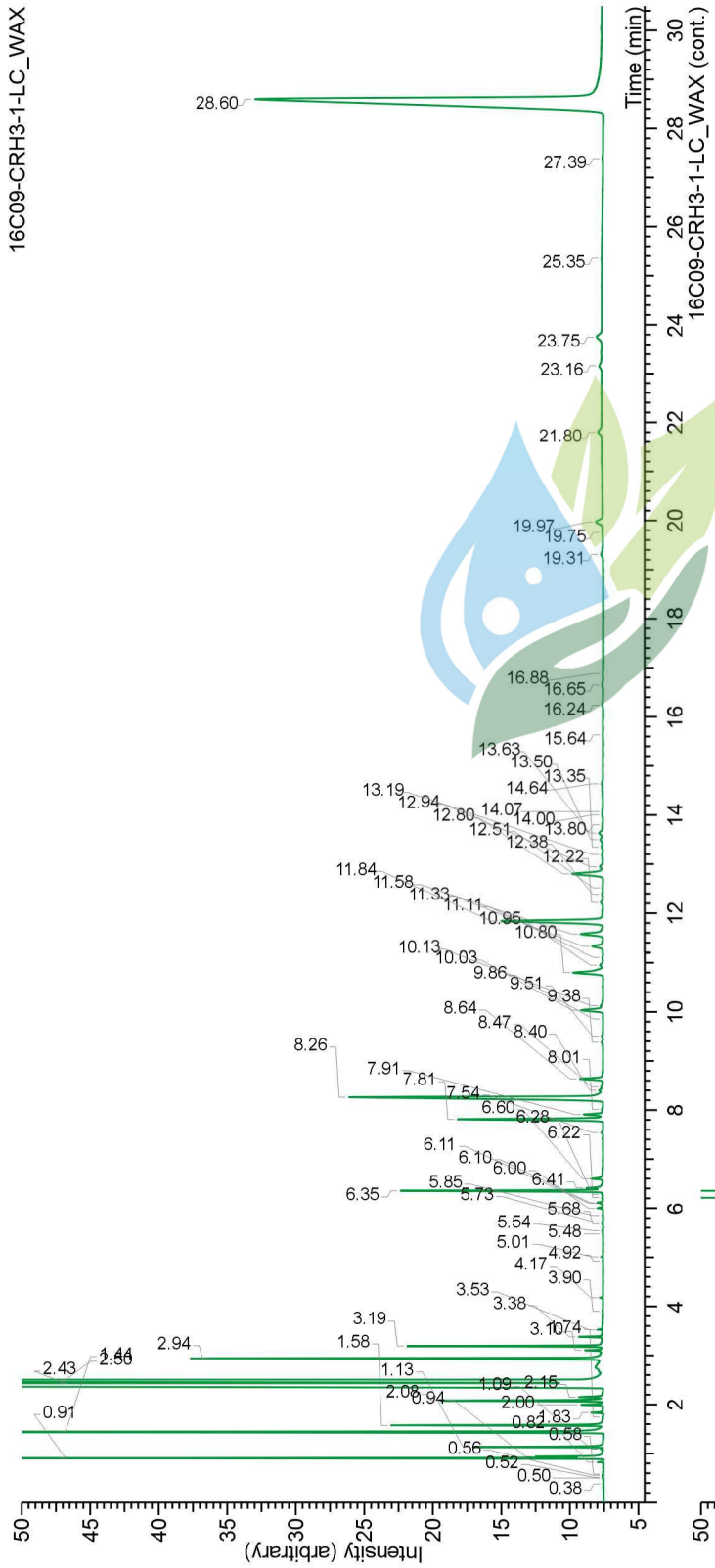

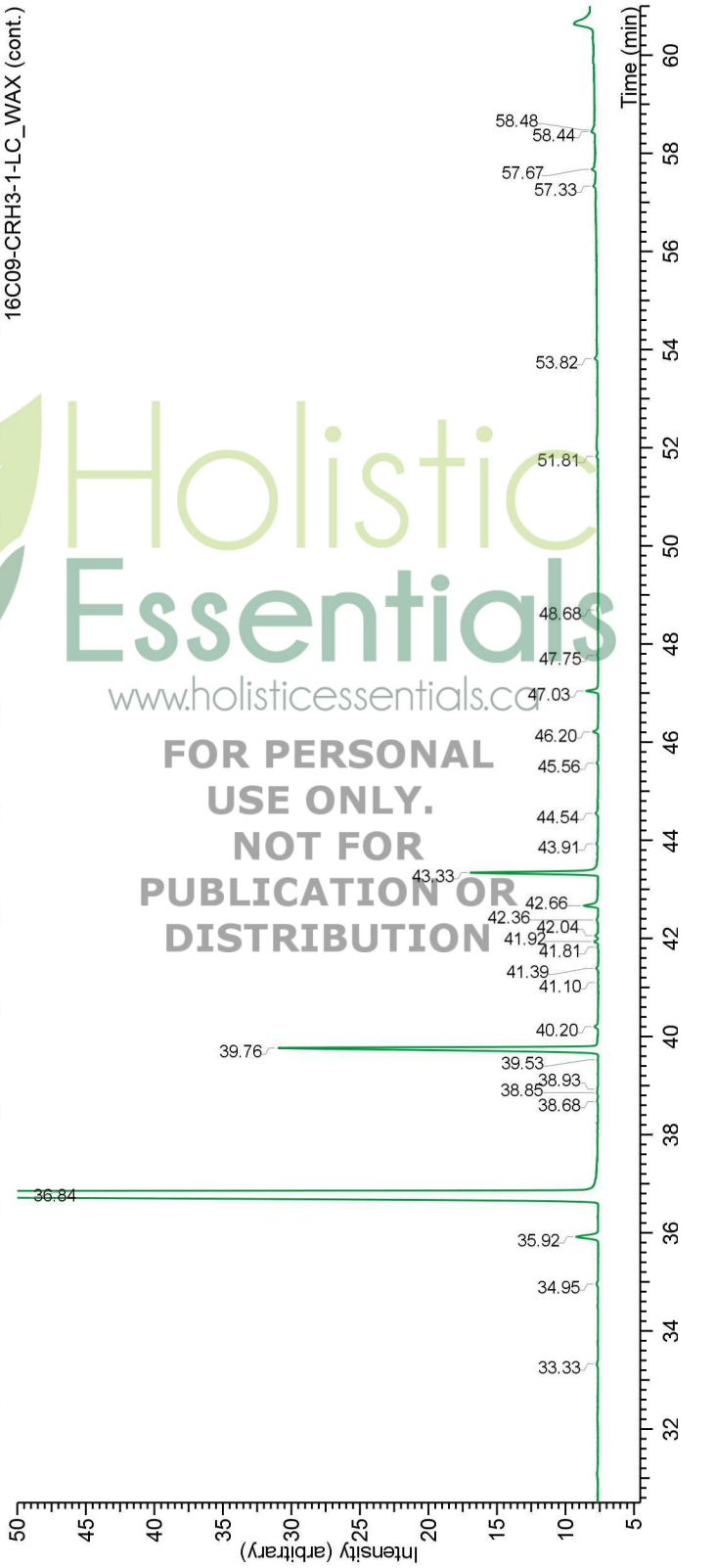

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