

## GC/MS BATCH NUMBER: LA0102

**ESSENTIAL OIL:** LIME  
**BOTANICAL NAME:** CITRUS AURANTIFOLIA  
**ORIGIN:** MEXICO

KEY CONSTITUENTS PRESENT IN THIS BATCH OF LIME OIL	%
LIMONENE	48.0
β-PINENE	18.1
γ-TERPINENE	9.7
GERANIAL	2.7
SABINENE	2.4
α-PINENE	2.3
β-BISABOLENE	1.9
NERAL	1.6
MYRCENE	1.3
trans-α-BERGAMOTENE	1.3
β-CARYOPHYLLENE	1.0
α-TERPINEOL	0.6
TERPINEN-4-OL	0.5
NERYL ACETATE	0.4
p-CYMENE	0.4
GERANYL ACETATE	0.2
DECANAL	0.1

Comments from Robert Tisserand:  
An excellent quality, complex cold-pressed lime oil. Conforms to 16 of the 18 key constituents of the ISO standard, with slightly low bergamotene and slightly high bisabolene, but I do not consider these a concern.

**Date :** February 11, 2016

*SAMPLE IDENTIFICATION*

**Internal code :** 16B01-PTH6-1-LC

**Customer identification :** Lime Expressed - Mexico - LA010257S1R

**Type :** Essential oil

**Source :** *Citrus aurantifolia*

**Customer :** Plant Therapy

*ANALYSIS*

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

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

**Analysis date :** 0000-00-00

Checked and approved by :

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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	2.77	913	0.01	0.01	925	0.94	Monoterpene
$\alpha$ -Thujene	2.86	919	0.42	0.47	956	1.07	Monoterpene
$\alpha$ -Pinene	2.96	925	2.33	2.24	948	1.03	Monoterpene
Camphene	3.22	941	0.10	0.10	1002	1.29	Monoterpene
$\beta$ -Pinene	3.74*	974	20.18	18.06	1054	1.66	Monoterpene
Sabinene	3.74*	974	[20.18]	2.36	1067	1.78	Monoterpene
Myrcene	4.00	991	1.29	1.27	1124	2.30	Monoterpene
6-Methyl-5-hepten-2-one	4.08	995	0.03	0.01	1291	4.60	Aliphatic ketone
Pseudolimonene	4.25	1005	0.04	0.05	1116	2.21	Monoterpene
Octanal	4.38	1011	0.01	0.02	1238	3.81	Aliphatic aldehyde
$\alpha$ -Terpinene	4.43	1015	0.27	0.27	1130	2.38	Monoterpene
Limonene	4.75*	1033	48.98	47.99	1156	2.71	Monoterpene
para-Cymene	4.75*	1033	[48.98]	0.40	1215	3.47	Monoterpene
1,8-Cineole	4.75*	1033	[48.98]	0.44	1157	2.73	Monoterp. ether
<i>cis</i> - $\beta$ -Ocimene	4.87	1039	0.12	9.83	1198	3.25*	Monoterpene
<i>trans</i> - $\beta$ -Ocimene	5.03	1049	0.33	0.32	1208	3.38	Monoterpene
$\gamma$ -Terpinene	5.24	1060	9.69	[9.83]	1198	3.25*	Monoterpene
<i>cis</i> -Sabinene hydrate	5.56	1080	0.02	0.03	1417	6.58	Monoterp. alcohol
Terpinolene	5.66	1085	0.51	0.52	1229	3.67	Monoterpene
para-Cymenene	5.88	1097	0.02				Monoterpene
Linalool	6.15*	1109	0.23	0.20	1506	8.38	Monoterp. alcohol
Nonanal	6.15*	1109	[0.23]	0.01	1338	5.31	Aliphatic aldehyde
<i>cis</i> - $\beta$ -Terpineol	7.17	1152	0.02	0.01	1573	10.49	Monoterp. alcohol
<i>trans</i> - $\beta$ -Terpineol	7.68	1173	0.01	0.14	1616	12.06*	Monoterp. alcohol
Borneol	7.78	1178	0.02	0.03	1628	12.60	Monoterp. alcohol
Terpinen-4-ol	7.90	1183	0.56	0.51	1536	9.33	Monoterp. alcohol
$\alpha$ -Terpineol	8.53	1202	0.57	0.57	1633	12.86	Monoterp. alcohol
Decanal	8.72	1206	0.14	0.10	1438	6.98	Aliphatic aldehyde
Bornyl formate	9.25	1220	0.01	0.02	1456	7.34	Monoterp. ester
Nerol	9.49	1225	0.08	0.09	1740	18.36	Monoterp. alcohol
Neral	9.93	1237	1.63	1.66	1610	11.74	Monoterp. aldehyde
Geraniol	10.64	1264	0.18	0.21	1795	21.65	Monoterp. alcohol
Geranial	11.29	1280	2.72	2.92	1657	13.97	Monoterp. aldehyde
$\delta$ -Elemene	13.45	1322	0.20	0.22	1414	6.50	Sesquiterpene
Neryl acetate	15.86	1361	0.30	0.55	1664	14.30*	Monoterp. ester
$\beta$ -Elemene	16.72	1375	0.13	0.16	1522	8.91	Sesquiterpene
Geranyl acetate	17.23	1384	0.18	0.20	1698	15.86	Monoterp. ester
$\beta$ -Caryophyllene	18.15*	1398	1.13	1.03	1520	8.81	Sesquiterpene
<i>cis</i> - $\alpha$ -Bergamotene	18.15*	1398	[1.13]	0.13	1511	8.53	Sesquiterpene
Dodecanal	19.36	1413	0.12	0.04	1647	13.51	Aliphatic aldehyde
<i>trans</i> - $\alpha$ -Bergamotene	19.64	1417	1.28	1.26	1526	9.02	Sesquiterpene

$\alpha$ -Humulene	20.72	1431	0.11	0.12	1583	10.80	Sesquiterpene
<i>trans</i> - $\beta$ -Farnesene	21.91	1445	0.11	[0.14]	1616	12.06*	Sesquiterpene
Germacrene D	22.80	1456	0.24	0.27	1620	12.25	Sesquiterpene
Viridiflorene	23.43	1465	0.12	0.10	1613	11.87	Sesquiterpene
$\alpha$ -Selinene	23.98	1472	0.05	0.03	1631	12.76	Sesquiterpene
Valencene	24.82	1483	0.19	0.16	1662	14.18	Sesquiterpene
$\gamma$ -Cadinene	25.56	1492	0.17	[0.55]	1664	14.30*	Sesquiterpene
$\beta$ -Bisabolene	26.01	1498	1.91	1.62	1660	14.09	Sesquiterpene
( <i>E,E</i> )- $\alpha$ -Farnesene	26.29*	1501	1.26	0.97	1695	15.68	Sesquiterpene
$\delta$ -Cadinene	26.29*	1501	[1.26]	0.24	1675	14.76	Sesquiterpene
Germacrene B	28.89*	1532	0.61	0.55	1721	17.15	Sesquiterpene
<i>trans</i> - $\alpha$ -Bisabolene	28.89*	1532	[0.61]	0.04	1707	16.32	Sesquiterpene
$\beta$ -Bisabolol	37.48	1670	0.06	0.05	2073	37.82	Sesquiterp. alcohol
$\alpha$ -Bisabolol	38.24	1687	0.08	0.11	2137	39.81	Sesquiterp. alcohol
Citropten	47.12	1988	0.28				Coumarin
Bergapten	48.76	2056	0.09				Furanocoumarin
<b>Total identified</b>			<b>99.14%</b>	<b>98.71%</b>			

\*: 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 :** Yellow- greenish liquid

**Refractive index :** 1.4845  $\pm$  0.0003 (20 °C)

#### CONCLUSION

No adulterant, contaminant or diluent were detected using this method.



