

## GC/MS BATCH NUMBER: CA3100

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**ESSENTIAL OIL:** CARDAMOM  
**BOTANICAL NAME:** Elettaria cardamomum  
**ORIGIN:** GUATEMALA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF CARDAMOM OIL	%
$\alpha$ -TERPINYL ACETATE	37.6
1,8-CINEOLE	30.7
LINALYL ACETATE	5.4
SABINENE	5.0
LINALOOL	4.4
LIMONENE	2.4
MYRCENE	2.1
$\alpha$ -TERPINEOL	1.9
$\alpha$ -PINENE	1.8
(E)-NEROLIDOL	1.1

Comments from Robert Tisserand: Fresh and spicy, Cardamon has a low cineole content compared with some essential oils. Of the 11 key ISO constituents, terpinen-4-ol is very slightly below range, which not a concern.

**Date :** January 4, 2016

*SAMPLE IDENTIFICATION*

**Internal code :** 15L14-PTH4-1-LC

**Customer identification :** Cardamom - Guatemala - CA310043R

**Type :** Essential oil

**Source :** *Elettaria cardamomum*

**Customer :** Plant Therapy

*ANALYSIS*

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

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

**Analysis date :** 2016-01-03

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.	
Isovaleral	0.51	561	0.02	0.02	782	0.57	Aliphatic aldehyde
2-Methylbutyral	0.53	569	0.01	0.01	764	0.56	Aliphatic aldehyde
$\alpha$ -Thujene	2.68	915	0.23	0.23	958	1.03	Monoterpene
$\alpha$ -Pinene	2.77	921	1.82	1.81	948	0.99	Monoterpene
Camphene	3.02*	937	0.04	0.01	994	1.19	Monoterpene
$\alpha$ -Fenchene	3.02*	937	[0.04]	tr	988	1.16	Monoterpene
Sabinene	3.45	965	4.99	5.05	1065	1.76	Monoterpene
$\beta$ -Pinene	3.49	968	0.43	0.41	1043	1.57	Monoterpene
Myrcene	3.79	988	2.12	2.09	1122	2.31	Monoterpene
6-Methyl-5-hepten-2-one	3.86	992	0.03	0.02	1291	4.53	Aliphatic ketone
$\Delta$ 3-Carene	4.02	1002	0.01	tr	1095	2.01	Monoterpene
Octanal	4.15	1010	0.17	0.16	1243	3.85	Aliphatic aldehyde
$\alpha$ -Terpinene	4.20	1013	0.06	0.06	1126	2.35	Monoterpene
1,8-Cineole	4.53*	1032	32.83	30.73	1158	2.74	Monoterp. ether
para-Cymene	4.53*	1032	[32.83]	0.18	1216	3.48	Monoterpene
Limonene	4.53*	1032	[32.83]	2.39	1146	2.60	Monoterpene
<i>cis</i> - $\beta$ -Ocimene	4.62	1037	0.10	0.18	1194	3.17*	Monoterpene
<i>trans</i> - $\beta$ -Ocimene	4.79	1047	0.05	0.05	1209	3.38	Monoterpene
$\gamma$ -Terpinene	4.95	1056	0.16	[0.18]	1194	3.17*	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	5.23	1073	0.01	0.01	1395	6.07	Monoterp. alcohol
<i>cis</i> -Sabinene hydrate	5.28	1075	0.50	0.52	1418	6.51	Monoterp. alcohol
Terpinolene	5.40	1083	0.06	0.07	1228	3.64	Monoterpene
Octanol	5.44	1085	0.04	0.02	1509	8.43	Aliphatic alcohol
6,7-Epoxyterpinene	5.64	1097	0.04	0.04	1363	5.60	Monoterp. ether
Linalool	5.90	1109	4.44	9.52	1514	8.60†	Monoterp. alcohol
<i>trans</i> -Sabinene hydrate	5.96	1112	0.15	0.28	1499	8.15	Monoterp. alcohol
endo-Fenchol	6.24	1125	0.03	0.05	1517	8.68	Monoterp. alcohol
Borneol	7.33*	1175	0.11	0.13	1633	12.89*	Monoterp. alcohol
$\delta$ -Terpineol	7.33*	1175	[0.11]	0.42	1611	11.85*	Monoterp. alcohol
Terpinen-4-ol	7.46	1181	0.63	0.64	1538	9.38	Monoterp. alcohol
$\alpha$ -Terpineol	8.02	1204	1.88	1.87	1636	13.03	Monoterp. alcohol
$\gamma$ -Terpineol	8.32	1212	0.68	37.45	1631	12.78*	Monoterp. alcohol
<i>trans</i> -Piperitol	8.39	1214	0.10	0.08	1679	15.04	Monoterp. alcohol
Neral	9.34	1240	0.34	[0.42]	1611	11.85*	Monoterp. aldehyde
Linalyl acetate	9.64	1248	5.42	[9.52]	1513	8.56†	Monoterp. ester
Geraniol	9.96	1257	0.95	1.02	1798	21.91	Monoterp. alcohol
Geranial	10.57	1273	0.54	0.53	1659	14.10	Monoterp. aldehyde
Terpinen-4-yl acetate	11.34	1294	0.01				Monoterp. ester
$\delta$ -Terpinyl acetate	12.11	1310	0.11	0.10	1580	10.71	Monoterp. ester
$\alpha$ -Terpinyl acetate	14.24	1347	37.55	[37.45]	1631	12.78*	Monoterp. ester
Geranyl acetate	16.26	1383	0.57	0.51	1702	16.14	Monoterp. ester

$\beta$ -Caryophyllene	17.10	1398	0.02	0.02	1525	8.97	Sesquiterpene
$\beta$ -Selinene	22.04	1463	0.17	[37.45]	1631	12.78*	Sesquiterpene
$\alpha$ -Selinene	22.63	1471	0.08	[0.13]	1633	12.89*	Sesquiterpene
$\gamma$ -Cadinene	24.31	1493	0.05	0.05	1665	14.39	Sesquiterpene
Germacrene B	27.37	1530	0.04	0.04	1718	17.09	Sesquiterpene
( <i>E</i> )-Nerolidol	30.09	1563	1.09	1.04	1993	34.92	Sesquiterp. alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	38.71	1719	0.20	0.23	2296	43.88	Sesquiterp. alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesyl acetate	42.44	1835	0.06	0.07	2195	41.47	Sesquiterp. ester
<b>Total identified</b>			<b>98.94%</b>	<b>98.11%</b>			

\*: 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

Note: no correction factor was applied

#### OTHER DATA

**Physical aspect** : Clear liquid

**Refractive index** :  $1.4632 \pm 0.0003$  (20 °C)

#### CONCLUSION

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



