

## GC/MS BATCH NUMBER: G20104

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**ESSENTIAL OIL:** GERANIUM BOURBON  
**BOTANICAL NAME:** PELARGONIUM C ASPERUM  
**ORIGIN:** REUNION ISLAND

KEY CONSTITUENTS PRESENT IN THIS BATCH OF OIL	%
CITRONELLOL	23.9
GERANIOL	13.8
CITRONELLYL FORMATE	12.5
ISOMENTHONE	7.6
6,9-GUAIADIENE	6.4
GERANYL FORMATE	6.2
LINALOOL	4.6
GERANYL TIGLATE	1.4
GERMACRENE D	1.3
cis-ROSE OXIDE	1.2
GERANYL PROPIONATE	1.1
GERANYL BUTYRATE	1.1

Comments from Robert Tisserand: Beautiful light, green-rosy odor profile. Meets 14 of 15 ISO standards for Bourbon type Geranium oil.

**Date :** September 21, 2017

*SAMPLE IDENTIFICATION*

**Internal code :** 17114-PTH3-1-DM

**Customer identification :** Geranium Bourbon - Reunion Island - G2010474R

**Type :** Essential oil

**Source :** *Pelargonium graveolens*

**Customer :** Plant Therapy

*ANALYSIS*

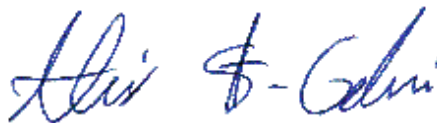
**Method :** PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Identifications double-checked by GC-MS

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

**Analysis date :** 2017-09-21

Checked and approved by :



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

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*This report is digitally signed, it is only considered valid if the digital signature is intact.*

IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
3-Methylpentanol	2.36	855	0.05	0.04	1270	4.80	Aliphatic alcohol
<i>cis</i> -Hex-3-en-1-ol	2.49	865	0.02	0.06	1322	5.60	Aliphatic alcohol
Heptanal	3.03	904	0.02	0.05	1126	2.81*	Aliphatic aldehyde
$\alpha$ -Pinene	3.41	926	0.50	0.48	938	1.19	Monoterpene
Geranic oxide	4.08	966	0.03	0.02	1045	1.95	Monoterp. ether
$\beta$ -Pinene	4.19	972	0.02	0.01	1034	1.85	Monoterpene
Myrcene	4.47	989	0.23	0.20	1111	2.63	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	4.51	991	0.04	0.15	1141	3.00*	Monoterp. ether
6-Methyl-5-hepten-2-one	4.54	993	0.08	0.05	1276	4.88	Aliphatic ketone
$\Delta^3$ -Carene	4.75*	1004	0.10	0.02	1089	2.34	Monoterpene
$\alpha$ -Phellandrene	4.75*	1004	[0.10]	0.06	1104	2.53	Monoterpene
$\alpha$ -Terpinene	4.94	1015	0.01	[0.05]	1126	2.81*	Monoterpene
para-Cymene	5.13	1025	0.08	0.08	1208	3.88	Monoterpene
Limonene	5.16	1027	0.19	0.17	1137	2.95	Monoterpene
$\beta$ -Phellandrene	5.19	1029	0.08	[0.15]	1141	3.00*	Monoterpene
1,8-Cineole	5.23	1030	0.01	[0.15]	1141	3.00*	Monoterp. ether
<i>cis</i> - $\beta$ -Ocimene	5.34	1037	0.14	0.17	1182	3.58*	Monoterpene
<i>trans</i> - $\beta$ -Ocimene	5.52	1047	0.12	0.10	1202	3.79	Monoterpene
$\gamma$ -Terpinene	5.71	1057	0.03	[0.17]	1182	3.58*	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	5.99	1072	0.16	0.14	1374	6.43	Monoterp. alcohol
Terpinolene	6.19	1083	0.04	0.01	1223	4.10	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	6.31	1089	0.06	0.08	1403	6.98	Monoterp. alcohol
6,7-Epoxygeranylacetone	6.53	1100	0.02	0.02	1345	5.96	Monoterp. ether
Linalool	6.72	1107	4.56	4.51	1494	9.15*	Monoterp. alcohol
<i>cis</i> -Rose oxide	6.79	1110	1.16	1.12	1293	5.15	Monoterp. ether
<i>trans</i> -Rose oxide	7.15	1123	0.48	0.48	1304	5.33	Monoterp. ether
Isopulegol	7.82	1147	0.09	[4.51]	1494	9.15*	Monoterp. alcohol
Citronellal	7.98	1153	0.08	0.37	1427	7.54*	Monoterp. aldehyde
Menthone	8.02	1154	0.46	0.41	1386	6.62	Monoterp. ketone
Isomenthone	8.32	1165	7.65	7.82	1409	7.12*	Monoterp. ketone
Menthol	8.86	1185	0.07	0.42	1580	12.34*	Monoterp. alcohol
Isomenthol	9.11	1194	0.13	12.26	1556	11.47*	Monoterp. alcohol
$\alpha$ -Terpineol	9.45	1203	0.31	1.96	1616	14.01*	Monoterp. alcohol
Nerol	10.59	1228	0.61	0.70	1724	20.09	Monoterp. alcohol
Citronellol	11.10	1239	23.91	24.36	1708	19.00	Monoterp. alcohol
Neral	11.19	1241	0.63	0.72	1601	13.18	Monoterp. aldehyde
Geraniol	12.16	1262	13.79	14.02	1778	23.74*	Monoterp. alcohol
<i>trans</i> -Myrtanol	12.32	1266	0.16	0.16	1764	22.75	Monoterp. alcohol
Geranial	12.50	1270	0.19	0.15	1654	16.01	Monoterp. aldehyde
Citronellyl formate	12.84	1277	12.46	[12.26]	1556	11.47*	Monoterp. ester

Neryl formate	12.90	1279	0.24				Monoterp. ester
Geranyl formate	14.15	1304	6.23	6.46	1633	14.91	Monoterp. ester
$\alpha$ -Cubebene	15.98	1331	0.07	[7.82]	1409	7.12*	Sesquiterpene
Citronellyl acetate	17.23	1350	0.30	0.27	1607	13.50*	Monoterp. ester
$\alpha$ -Copaene	17.70	1357	0.31	[0.37]	1427	7.54*	Sesquiterpene
$\beta$ -Bourbonene	18.13	1364	0.96	1.01	1449	8.07	Sesquiterpene
$\beta$ -Cubebene	18.66	1372	0.05	0.05	1472	8.62	Sesquiterpene
$\beta$ -Elemene	18.90	1375	0.10	0.82	1521	10.13*	Sesquiterpene
Geranyl acetate	19.33	1382	0.43	0.45	1688	17.80*	Monoterp. ester
$\beta$ -Caryophyllene	20.59	1400	0.99	0.98	1516	9.95	Sesquiterpene
$\beta$ -Copaene	21.50	1411	0.08	0.06	1508	9.68	Sesquiterpene
Aromadendrene	22.09	1418	0.64	[0.82]	1521	10.13*	Sesquiterpene
6,9-Guaiadiene	22.68	1425	6.39	6.36	1535	10.67	Sesquiterpene
Seychellene	23.06	1430	0.43	0.39	1544	10.98	Sesquiterpene
$\alpha$ -Humulene	23.39	1433	0.24	[0.42]	1580	12.34*	Sesquiterpene
allo-Aromadendrene	23.64	1436	0.11	[12.26]	1556	11.47*	Sesquiterpene
Citronellyl propionate	23.98	1441	0.41				Monoterp. ester
Neryl propionate	25.04	1453	0.17	0.44	1736	20.90	Monoterp. ester
Germacrene D	25.61	1460	1.26	[1.96]	1616	14.01*	Sesquiterpene
$\beta$ -Selinene	26.20	1467	0.28	[1.96]	1616	14.01*	Sesquiterpene
Viridiflorene	26.37	1469	0.13	[0.27]	1607	13.50*	Sesquiterpene
Geranyl propionate	26.62	1472	1.10	1.44	1750	21.84*	Monoterp. ester
$\alpha$ -Muurolene	27.51	1483	0.11	0.91	1642	15.37*	Sesquiterpene
$\delta$ -Guaiene	27.76	1486	0.22	[0.91]	1642	15.37*	Sesquiterpene
$\gamma$ -Cadinene	28.66	1496	0.14	0.95	1662	16.46*	Sesquiterpene
( <i>E,E</i> )- $\alpha$ -Farnesene	29.06	1502	0.05	[0.45]	1688	17.80*	Sesquiterpene
$\delta$ -Cadinene	29.32	1505	0.50	0.54	1670	16.84	Sesquiterpene
Zonarene	29.50	1508	0.10	[0.95]	1662	16.46*	Sesquiterpene
<i>trans</i> -Calamenene	29.68	1510	0.11	0.09	1730	20.47	Sesquiterpene
Geranyl isobutyrate	29.85	1513	0.30	[14.02]	1778	23.74*	Monoterp. ester
Furopelargone A	30.45	1521	0.09				Sesquiterp. ketone
Citronellyl butyrate	31.40	1534	0.48	[1.44]	1750	21.84*	Monoterp. ester
Neryl butyrate	32.06	1544	0.13				Monoterp. ester
$\alpha$ -Elemol	32.92	1556	0.03	0.03	2009	37.47	Sesquiterp. alcohol
Geranyl butyrate	33.74*	1567	1.17	1.07	1825	27.01	Monoterp. ester
Caryophyllene oxide	33.74*	1567	[1.17]	0.05	1850	28.91	Sesquiterp. ether
Spathulenol	34.17	1573	0.04	0.04	2019	37.77	Sesquiterp. alcohol
Furopelargone B	34.42	1577	0.66	0.78	1975	36.01*	Sesquiterp. ketone
Viridiflorol	34.88	1583	0.07	[0.78]	1975	36.01*	Sesquiterp. alcohol
Phenylethyl tiglate	35.21	1588	0.56	0.57	2071	39.41	Phenolic ester
10- <i>epi</i> - $\gamma$ -Eudesmol	35.83	1597	0.33	0.35	1946	34.71	Sesquiterp. alcohol
Geranyl isovalerate	36.00	1600	0.15	0.20	1840	28.12	Monoterp. ester
1- <i>epi</i> -Cubenol	36.60	1615	0.08	[0.78]	1975	36.01*	Sesquiterp. alcohol
Hinesol	36.99	1624	0.06	0.08	2117	40.79*	Sesquiterp. alcohol

τ-Muurolol	37.60	1639	0.04	0.06	2078	39.64	Sesquiterp. alcohol
α-Muurolol	37.73	1643	0.03	[0.08]	2117	40.79*	Sesquiterp. alcohol
α-Eudesmol	37.86	1646	0.03	0.04	2125	41.01	Sesquiterp. alcohol
Geranyl valerate	38.36	1658	0.06	0.06	1923	33.63	Monoterp. ester
Citronellyl tiglate	38.67	1666	0.31	0.34	1933	34.08	Monoterp. ester
Geranyl tiglate	40.02	1699	1.36	1.53	2028	38.06*	Monoterp. ester
Geranyl caproate isomer	40.56	1716	0.18	[1.53]	2028	38.06*	Monoterp. ester
Geranyl caproate	41.72	1753	0.05	[1.53]	2028	38.06*	Monoterp. ester
<b>Total identified</b>			<b>97.13%</b>	<b>97.79%</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 :** Light green liquid

**Refractive index :**  $1.4638 \pm 0.0003$  (20 °C)

#### CONCLUSION

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

