

GC/MS BATCH NUMBER: G20102

ESSENTIAL OIL: GERANIUM BOURBON
BOTANICAL NAME: PELARGONIUM ASPERUM
ORIGIN: MADAGASCAR

KEY CONSTITUENTS PRESENT IN THIS BATCH OF GERANIUM BOURBON OIL	%
CITRONELLOL	24.9
GERANIOL	13.3
CITRONELLYL FORMATE	10.6
LINALOOL	7.1
ISOMENTHONE	7.1
6,9-GUAIADIENE	6.6
GERANYL FORMATE	5.0
GERANYL TIGLATE	1.5
β-CARYOPHYLLENE	1.1
GERANYL PROPIONATE	1.1
GERANYL BUTYRATE	1.1
cis-ROSE OXIDE	1.1
β-BOURBONENE	1.0

Comments from Robert Tisserand: This oil has a light, airy sweet-green odor profile. It comes from Madagascar, and all 15 constituents meet the ISO standard for Madagascan Geranium oil.

Date : September 17, 2016

SAMPLE IDENTIFICATION

Internal code : 16I06-PTH5-1-DM

Customer identification : Geranium Bourbon - Madagascar - G2010266R

Type : Essential oil

Source : *Pelargonium x asperum*

Customer : Plant Therapy

ANALYSIS

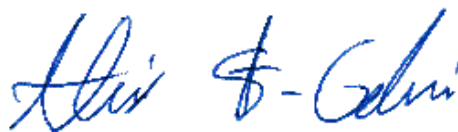
Method : PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Identifications double-checked by GC-MS

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

Analysis date : 2016-09-07

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.	
Ethanol	0.33	496	0.26	0.27	799	0.52	Aliphatic alcohol
3-Methylpentanol	2.37	856	0.04	0.06	1274	3.96*	Aliphatic alcohol
3,3,5-Trimethylcyclohexene	2.50	865	0.02				Normonoterpene
3-Methylamyl formate?	2.99	902	0.01				Aliphatic ester
Tricyclene	3.16*	912	0.02	0.01	927	0.79	Monoterpene
(Z)-Hex-3-en-1-yl formate	3.16*	912	[0.02]				Aliphatic ester
α-Pinene	3.35	924	0.58	0.56	946	0.86	Monoterpene
Geranic oxide	4.02	965	0.07	0.06	1048	1.43	Monoterp. ether
β-Pinene	4.13	971	0.02	0.02	1038	1.36	Monoterpene
Myrcene	4.41*	988	0.21	0.18	1115	1.98	Monoterpene
trans-Dehydroxylinalool oxide	4.41*	988	[0.21]	0.05	1150	2.40	Monoterp. ether
Hexahydroacetophenone	4.44*	990	0.07	0.01	1250	3.62	Aliphatic ketone
Octen-3-ol	4.44*	990	[0.07]	0.10	1405	5.83*	Aliphatic alcohol
6-Methyl-5-hepten-2-one	4.49	993	0.09	[0.06]	1274	3.96*	Aliphatic ketone
α-Phellandrene	4.68	1004	0.07	0.06	1107	1.91	Monoterpene
6-Methyl-5-hepten-2-ol	4.71	1006	0.03	0.04	1430	6.23*	Aliphatic alcohol
cis-Dehydroxylinalool oxide	4.87	1014	0.01				Monoterp. ether
para-Cymene	5.06	1025	0.09	0.12	1207	3.04	Monoterpene
Limonene	5.09	1027	0.19	0.16	1139	2.26	Monoterpene
β-Phellandrene	5.12	1028	0.06	0.12	1144	2.33*	Monoterpene
1,8-Cineole	5.16	1030	0.03	[0.12]	1144	2.33*	Monoterp. ether
cis-β-Ocimene	5.28	1037	0.20	0.23	1185	2.79	Monoterpene
trans-β-Ocimene	5.46	1047	0.17	0.14	1200	2.98	Monoterpene
cis-Linalool oxide (fur.)	5.94	1073	0.16	0.17	1377	5.42	Monoterp. alcohol
Terpinolene	6.12	1083	0.04	0.04	1223	3.26	Monoterpene
trans-Linalool oxide (fur.)	6.26	1090	0.08	[0.10]	1405	5.83*	Monoterp. alcohol
Linalool	6.70*	1109	7.87	7.12	1494	7.45	Monoterp. alcohol
cis-Rose oxide	6.70*	1109	[7.87]	1.07	1295	4.25	Monoterp. ether
(E)-6-Methyl-3,5-heptadien-2-one	6.81	1113	0.05				Aliphatic ketone
trans-Rose oxide	7.06	1122	0.41	0.41	1306	4.41	Monoterp. ether
Isopulegol	7.73	1147	0.07	0.05	1503	7.60	Monoterp. alcohol
Menthone	7.91*	1154	1.03	0.99	1390	5.61	Monoterp. ketone
Citronellal	7.91*	1154	[1.03]	[0.04]	1430	6.23*	Monoterp. aldehyde
Isomenthone	8.20	1165	7.06	7.37	1416	5.98*	Monoterp. ketone
α-Cyclogeraniol?	8.72	1184	0.05	0.05	1618	10.83	Monoterp. alcohol
Terpinen-4-ol	8.76	1186	0.05	0.89	1528	8.15*	Monoterp. alcohol
Menthol	9.03	1196	0.16	0.12	1567	9.30	Monoterp. alcohol
α-Terpineol	9.37	1204	0.57	0.65	1627	11.13*	Monoterp. alcohol
Nerol	10.57	1231	0.61	0.65	1733	15.81	Monoterp. alcohol

Citronellol	11.09*	1242	24.86	25.38	1716	15.02	Monoterp. alcohol
Neral	11.09*	1242	[24.86]	0.35	1606	10.48*	Monoterp. aldehyde
<i>cis</i> -Isogeraniol	11.29	1247	0.05	0.13	1741	16.28*	Monoterp. alcohol
Piperitone	11.66	1255	0.07	[0.65]	1627	11.13*	Monoterp. ketone
Geraniol	12.17	1267	13.33	13.95	1787	18.92*	Monoterp. alcohol
<i>trans</i> -Isogeraniol	12.33	1269	0.08				Monoterp. alcohol
Citronellyl formate	12.69*	1278	10.63	10.79	1561	9.12*	Monoterp. ester
Geranial	12.69*	1278	[10.63]	0.64	1651	12.18	Monoterp. aldehyde
Neryl formate	12.75	1279	0.24				Monoterp. ester
Geranyl formate	13.99	1303	5.01	5.27	1640	11.65*	Monoterp. ester
α -Cubebene	15.72	1330	0.08	[7.37]	1416	5.98*	Sesquiterpene
Citronellyl acetate	17.05*	1350	0.22	[0.35]	1606	10.48*	Monoterp. ester
α -Ylangene	17.05*	1350	[0.22]	[7.37]	1416	5.98*	Sesquiterpene
Phenylethyl propionate	17.16	1352	0.07				Phenolic ester
α -Copaene	17.40	1355	0.35	0.33	1438	6.40	Sesquiterpene
β -Bourbonene	17.83	1362	1.01	0.96	1459	6.78*	Sesquiterpene
β -Elemene	18.63	1374	0.10	[0.89]	1528	8.15*	Sesquiterpene
Geranyl acetate	19.16	1382	0.40	0.37	1693	14.03	Monoterp. ester
α -Gurjunene	20.02	1395	0.10	[0.96]	1459	6.78*	Sesquiterpene
β -Caryophyllene	20.27	1398	1.14	1.05	1532	8.26	Sesquiterpene
Phenylethyl isobutyrate	20.51	1401	0.09	0.07	1801	19.74	Phenolic ester
β -Copaene	21.16	1409	0.08	0.04	1518	7.88	Sesquiterpene
<i>trans</i> - α -Bergamotene	21.77*	1417	0.68	[0.89]	1528	8.15*	Sesquiterpene
α -Guaiene	21.77*	1417	[0.68]	[0.89]	1528	8.15*	Sesquiterpene
6,9-Guaiadiene	22.35*	1424	6.58	6.55	1547	8.72	Sesquiterpene
Aromadendrene	22.35*	1424	[6.58]	[0.89]	1528	8.15*	Sesquiterpene
Guaiadiene analog	22.72	1428	0.41				Sesquiterpene
α -Humulene	23.05	1432	0.27	0.35	1588	9.94	Sesquiterpene
allo-Aromadendrene	23.73	1440	0.38	[10.79]	1561	9.12*	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	24.67*	1452	0.23	0.10	1595	10.15	Sesquiterpene
Calamenene analog	24.67*	1452	[0.23]				Sesquiterpene
Germacrene D	25.24	1459	0.83	0.92	1630	11.27*	Sesquiterpene
β -Selinene	25.82	1466	0.21	[0.92]	1630	11.27*	Sesquiterpene
Geranyl propionate	26.39	1472	1.10	1.38	1760	17.38	Monoterp. ester
Eremophilene	26.90	1478	0.12	0.08	1626	11.07	Sesquiterpene
α -Muurolene	27.25	1482	0.21	[5.27]	1640	11.65*	Sesquiterpene
<i>cis</i> - α -Bisabolene	27.37	1483	0.16	0.23	1674	13.19	Sesquiterpene
γ -Cadinene	28.27	1494	0.12	0.39	1672	13.11*	Sesquiterpene
δ -Cadinene	28.94	1504	0.48	0.48	1681	13.50	Sesquiterpene
Zonarene	29.11	1506	0.09	[0.39]	1672	13.11*	Sesquiterpene
<i>trans</i> -Calamenene	29.31	1509	0.13	[0.13]	1741	16.28*	Sesquiterpene
Geranyl isobutyrate	29.60	1513	0.32	[13.95]	1787	18.92*	Monoterp. ester
Furopelargone A	30.72	1528	0.11				Sesquiterp. ketone
Citronellyl butyrate	31.13	1534	0.45	0.45	1750	16.78	Monoterp. ester

Neryl butyrate	31.85	1543	0.10				Monoterp. ester
Myrtenyl isovalerate	32.42	1551	0.15				Monoterp. ester
Geranyl butyrate	33.56*	1567	1.27	1.09	1837	21.87	Monoterp. ester
Caryophyllene oxide	33.56*	1567	[1.27]	0.32	1844	22.31*	Sesquiterp. ether
Furopelargone B	34.24	1576	0.65	0.56	1993	31.97	Sesquiterp. ketone
Phenylethyl tiglate	35.06	1587	0.52	0.54	2082	36.29	Phenolic ester
Geranyl 2-methylbutyrate	35.68	1597	0.38	[0.32]	1844	22.31*	Monoterp. ester
Geranyl isovalerate	35.81	1600	0.16	0.14	1853	22.98	Monoterp. ester
1-epi-Cubenol	36.11	1607	0.07				Sesquiterp. alcohol
1,10-diepi-Cubenol	36.42	1615	0.07	0.14	1958	29.96*	Sesquiterp. alcohol
Cubenol	36.78	1624	0.09	[0.14]	1958	29.96*	Sesquiterp. alcohol
β-Eudesmol	37.92	1651	0.17	0.18	2116	37.41	Sesquiterp. alcohol
Citronellyl tiglate	38.53	1666	0.30	0.25	1945	29.15	Monoterp. ester
Geranyl tiglate	39.89	1699	1.45	1.37	2043	34.87*	Monoterp. ester
Geranyl caproate isomer	40.43	1716	0.24	0.05	2007	32.81	Monoterp. ester
Geranyl caproate	41.59	1753	0.07	[1.37]	2043	34.87*	Monoterp. ester
Citronellyl heptanoate	43.46	1815	0.02				Monoterp. ester
Geranyl heptanoate	44.43	1850	0.04				Monoterp. ester
Total identified			96.58%	96.67%			

*: 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 : 1.4635 ± 0.0003 (20 °C)

CONCLUSION

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

