

GC/MS BATCH NUMBER: G20103

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

KEY CONSTITUENTS PRESENT IN THIS BATCH OF GERANIUM BOURBON OIL	%
CITRONELLOL	24.5
GERANIOL	13.2
CITRONELLYL FORMATE	10.8
6,9-GUAIADIENE	7.0
ISOMENTHONE	6.4
GERANYL FORMATE	5.9
LINALOOL	4.8
GERANYL TIGLATE	1.7
β-CARYOPHYLLENE	1.3
GERMACRENE D	1.2
GERANYL PROPIONATE	1.1
β-BOURBONENE	1.1

Comments from Robert Tisserand: A beautiful, green-floral Geranium oil, which meets 14 of 15 ISO standards for the Bourbon type. Linalool is slightly low - not a concern.

Date : February 28, 2017

SAMPLE IDENTIFICATION

Internal code : 17B13-PTH6-1-DM

Customer identification : Geranium Bourbon - Madagascar - G20103612R

Type : Essential oil

Source : *Pelargonium x asperum*

Customer : Plant Therapy

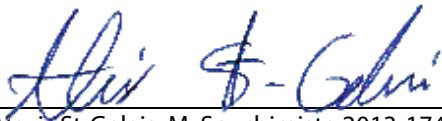
ANALYSIS

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

Analyst : Sylvain Mercier, M. Sc., chimiste

Analysis date : 2017-02-27

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.	
3-Methylpentanol	2.41	852	0.04	0.03	1275	4.98	Aliphatic alcohol
<i>cis</i> -Hex-3-en-1-ol	2.55	862	0.02	0.02	1324	5.74	Aliphatic alcohol
Heptanal	3.11	903	0.02	0.02	1133	2.93	Aliphatic aldehyde
Tricyclene	3.31	914	0.01	0.01	930	1.15	Monoterpene
α -Pinene	3.50	926	0.44	0.41	955	1.26	Monoterpene
Camphene	3.79	943	tr	tr	998	1.58	Monoterpene
Geranic oxide	4.17	966	0.04	0.05	1051	2.05	Monoterp. ether
β -Pinene	4.28	972	0.02	0.01	1040	1.96	Monoterpene
Myrcene	4.55	988	0.16	0.14	1118	2.72	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	4.57	989	0.03	0.04	1157	3.25	Monoterp. ether
6-Methyl-5-hepten-2-one	4.63	993	0.06	0.04	1279	5.03	Aliphatic ketone
α -Phellandrene	4.82*	1003	0.08	0.07	1111	2.64	Monoterpene
Δ^3 -Carene	4.82*	1003	[0.08]	0.02	1097	2.44	Monoterpene
α -Terpinene	5.01	1014	0.01	tr	1125	2.82	Monoterpene
para-Cymene	5.19	1023	0.07	0.08	1210	4.00	Monoterpene
Limonene	5.24	1026	0.16	0.15	1143	3.06	Monoterpene
β -Phellandrene	5.27	1028	0.07	0.08	1149	3.14*	Monoterpene
1,8-Cineole	5.32	1031	0.02	[0.08]	1149	3.14*	Monoterp. ether
<i>cis</i> - β -Ocimene	5.42	1036	0.14	0.15	1189	3.68*	Monoterpene
<i>trans</i> - β -Ocimene	5.60	1046	0.12	0.10	1203	3.89	Monoterpene
γ -Terpinene	5.78	1056	0.01	[0.15]	1189	3.68*	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	6.06	1071	0.14	0.13	1379	6.64	Monoterp. alcohol
Terpinolene	6.27	1082	0.03	0.03	1225	4.21	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	6.39	1089	0.07	0.08	1404	7.14	Monoterp. alcohol
para-Cymenene	6.45	1092	0.02	0.02	1368	6.45	Monoterpene
6,7-Epoxyterpinene	6.60	1098	0.01	0.02	1349	6.15	Monoterp. ether
Linalool	6.74	1103	4.77	4.82	1497	9.49*	Monoterp. alcohol
<i>cis</i> -Rose oxide	6.89	1108	0.93	0.92	1296	5.28	Monoterp. ether
<i>trans</i> -Rose oxide	7.25	1122	0.43	0.37	1307	5.47	Monoterp. ether
Isopulegol	7.88	1144	0.03	[4.82]	1497	9.49*	Monoterp. alcohol
Citronellal	7.91	1146	0.04	0.04	1419	7.51	Monoterp. aldehyde
Menthone	8.10	1153	0.93	0.86	1391	6.82	Monoterp. ketone
Isomenthone	8.41	1164	6.41	6.51	1413	7.35	Monoterp. ketone
Terpinen-4-ol	8.84	1180	0.03	0.03	1526	10.58	Monoterp. alcohol
Menthol	9.12	1190	0.16	0.46	1581	12.63*	Monoterp. alcohol
α -Terpineol	9.45	1198	0.40	0.73	1621	14.64*	Monoterp. alcohol
Nerol	10.62	1224	0.63	0.78	1729	20.87	Monoterp. alcohol
Citronellol	11.09	1234	24.51	24.80	1712	19.71	Monoterp. alcohol
Neral	11.31	1239	0.44	0.53	1602	13.57	Monoterp. aldehyde
Geraniol	12.16	1258	13.17	13.16	1785	24.62*	Monoterp. alcohol

Unknown (m/z = 55, 56 (95), 41 (60), 68 (52), 67 (50), 81 (46), 69 (41), 95 (37)...)	12.31	1261	0.10	0.10	1549	11.45	
<i>trans</i> -Myrtenol	12.46	1265	0.20	0.14	1770	23.65	Monoterp. alcohol
Citronellyl formate	13.01*	1277	11.11	10.82	1558	11.81	Monoterp. ester
Geranial	13.01*	1277	[11.11]	0.67	1646	15.98	Monoterp. aldehyde
Neryl formate	13.06	1278	0.20				Monoterp. ester
Geranyl formate	14.32	1302	5.08	5.14	1635	15.37*	Monoterp. ester
α -Cubebene	16.24	1331	0.10	0.13	1406	7.19	Sesquiterpene
Citronellyl acetate	17.51	1350	0.36	0.59	1599	13.45	Monoterp. ester
α -Copaene	17.96	1357	0.37	0.42	1427	7.70	Sesquiterpene
β -Bourbonene	18.40	1364	1.05	1.03	1448	8.23	Sesquiterpene
Geranic acid	18.82	1370	0.16	0.28	2255	44.47	Monoterp. acid
β -Elemene	19.15	1375	0.11	0.80	1520	10.34*	Sesquiterpene
Geranyl acetate	19.63	1382	0.35	0.43	1690	18.30	Monoterp. ester
β -Caryophyllene	20.86	1399	1.33	1.39	1516	10.19	Sesquiterpene
β -Copaene	21.77	1410	0.10	[0.80]	1520	10.34*	Sesquiterpene
Aromadendrene	22.40	1418	0.69	[0.80]	1520	10.34*	Sesquiterpene
6,9-Guaiadiene	23.01	1425	7.00	6.96	1535	10.93	Sesquiterpene
Seychellene	23.38*	1429	0.47	0.37	1543	11.23	Sesquiterpene
<i>cis</i> - β -Farnesene	23.38*	1429	[0.47]	0.04	1588	12.89	Sesquiterpene
α -Humulene	23.65	1433	0.33	[0.46]	1581	12.63*	Sesquiterpene
allo-Aromadendrene	23.91	1436	0.12	0.13	1560	11.87	Sesquiterpene
Citronellyl propionate	24.33	1441	0.43				Monoterp. ester
Neryl propionate	25.27	1452	0.08	0.35	1747	22.13*	Monoterp. ester
γ -Muurolene	25.34	1453	0.17	0.14	1609	13.98	Sesquiterpene
Germacrene D	25.86	1459	1.22	1.29	1616	14.34	Sesquiterpene
β -Selinene	26.46	1466	0.26	[0.73]	1621	14.64*	Sesquiterpene
Viridiflorene	26.64	1469	0.18	0.16	1627	14.92	Sesquiterpene
Geranyl propionate	26.96	1472	1.06	1.03	1751	22.40	Monoterp. ester
Eremophilene	27.55	1480	0.13	0.14	1640	15.64	Sesquiterpene
<i>cis</i> - α -Bisabolene	27.85	1483	0.12	0.12	1658	16.63	Sesquiterpene
α -Muurolene	28.01	1485	0.18	[5.14]	1635	15.37*	Sesquiterpene
γ -Cadinene	28.88	1496	0.17	0.76	1663	16.86*	Sesquiterpene
δ -Cadinene	29.56	1506	0.58	0.54	1669	17.22	Sesquiterpene
Zonarene	29.77	1508	0.15	[0.76]	1663	16.86*	Sesquiterpene
<i>trans</i> -Calamenene	29.87	1510	0.15	[0.35]	1747	22.13*	Sesquiterpene
Geranyl isobutyrate	30.25	1515	0.30	[13.16]	1785	24.62*	Monoterp. ester
Furopelargone A	30.66	1521	0.09				Sesquiterp. ketone
Citronellyl butyrate	31.75	1536	0.55	0.57	1736	21.37	Monoterp. ester
Spathulenol	33.99*	1567	1.31	0.09	2020	38.05	Sesquiterp. alcohol
Caryophyllene oxide	33.99*	1567	[1.31]	0.20	1844	28.95	Sesquiterp. ether
Geranyl butyrate	33.99*	1567	[1.31]	1.11	1826	27.60	Monoterp. ester

Europelargone B	34.54	1575	0.64	0.64	1979	36.53	Sesquiterp. ketone
Phenylethyl tiglate	35.26	1585	0.62	0.67	2076	39.82	Phenolic ester
Geranyl 2-methylbutyrate	36.04	1599	0.51	0.48	1831	27.95	Monoterp. ester
1,10-diepi-Cubenol	36.65	1614	0.11	0.12	1953	35.34	Sesquiterp. alcohol
τ -Cadinol	37.42	1632	0.04	0.02	2070	39.63	Sesquiterp. alcohol
τ -Muurolol	37.56	1636	0.07	0.06	2096	40.45	Sesquiterp. alcohol
α -Muurolol	37.70	1639	0.03	0.04	2108	40.77	Sesquiterp. alcohol
α -Eudesmol	37.97*	1646	0.15	0.10	2123	41.15	Sesquiterp. alcohol
β -Eudesmol	37.97*	1646	[0.15]	0.09	2119	41.04	Sesquiterp. alcohol
α -Cadinol	38.12	1650	0.06	0.06	2126	41.25	Sesquiterp. alcohol
Geranyl valerate	38.52	1659	0.08	0.11	1925	34.07	Monoterp. ester
Citronellyl tiglate	38.79	1666	0.38	0.43	1934	34.49	Monoterp. ester
Geranyl tiglate	40.12	1700	1.65	1.77	2031	38.40*	Monoterp. ester
Geranyl caproate isomer	40.68	1718	0.19	[1.77]	2031	38.40*	Monoterp. ester
Geranyl caproate	41.83	1754	0.10	0.08	2035	38.51	Monoterp. ester
Geranyl caprylate	47.18	1949	0.06	0.04	2207	43.33	Monoterp. ester
Total identified			95.62%	96.26%			

*: 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 yellow-green liquid

Refractive index : 1.4648 \pm 0.0003 (20 °C)

CONCLUSION

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

