

GC/MS BATCH NUMBER: G30102

ESSENTIAL OIL: GERANIUM EGYPTIAN
BOTANICAL NAME: PELARGONIUM X ASPERUM
ORIGIN: EGYPTIAN

| KEY CONSTITUENTS PRESENT IN THIS BATCH OF GERANIUM EGYPTIAN OIL | % |
|---|------|
| CITRONELLOL | 31.6 |
| GERANIOL | 15.6 |
| CITRONELLYL FORMATE | 7.1 |
| 10-EPI- γ -EUDESMOL | 5.6 |
| ISOMENTHONE | 5.2 |
| LINALOOL | 4.7 |
| GERANYL FORMATE | 2.9 |
| GERANYL TIGLATE | 1.5 |
| MENTHONE | 1.2 |
| GERMACRENE D | 1.1 |
| β -CARYOPHYLLENE | 1.1 |
| GERANYL BUTYRATE | 1.0 |

Comments from Robert Tisserand: Excellent "sweetgrass" odor profile, and conforms to all 15 key ISO constituents for North African Geranium oil.

Date : March 19, 2016

SAMPLE IDENTIFICATION

Internal code : 16C09-PTH8-1-LC

Customer identification : Geranium Egyptian - Egypt - G30102512R

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

Analysis date : 2016-03-18

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. | |
| 2-Methyl-3-buten-2-ol | 0.43 | 535 | tr | 0.01 | 978 | 1.02 | Aliphatic alcohol |
| Isoamyl alcohol | 1.05 | 727 | 0.02 | 0.02 | 1161 | 2.57* | Aliphatic alcohol |
| 3-Methylpentanol | 2.17 | 852 | 0.03 | 0.09 | 1284 | 4.17* | Aliphatic alcohol |
| <i>cis</i> -Hex-3-en-1-ol | 2.31 | 863 | 0.02 | 0.02 | 1336 | 4.92 | Aliphatic alcohol |
| <i>trans</i> -Hex-2-en-1-ol | 2.43 | 874 | 0.01 | 0.02 | 1366 | 5.36 | Aliphatic alcohol |
| Heptanal | 2.81 | 904 | 0.01 | 0.01 | 1136 | 2.28 | Aliphatic aldehyde |
| α -Pinene | 3.17 | 926 | 0.49 | 0.47 | 950 | 0.90 | Monoterpene |
| Camphene | 3.45 | 943 | tr | tr | 1012 | 1.19 | Monoterpene |
| Geranic oxide | 3.83* | 966 | 0.06 | 0.06 | 1053 | 1.52 | Monoterp. ether |
| Sabinene | 3.83* | 966 | [0.06] | 0.01 | 1060 | 1.57 | Monoterpene |
| β -Pinene | 3.86 | 968 | 0.01 | 0.01 | 1042 | 1.43 | Monoterpene |
| <i>trans</i> -Dehydroxylinalool oxide | 4.20* | 989 | 0.12 | [0.02] | 1161 | 2.57* | Monoterp. ether |
| Myrcene | 4.20* | 989 | [0.12] | 0.09 | 1118 | 2.07 | Monoterpene |
| 6-Methyl-5-hepten-2-one | 4.29 | 995 | 0.05 | [0.09] | 1284 | 4.17* | Aliphatic ketone |
| α -Phellandrene | 4.46* | 1005 | 0.05 | 0.04 | 1110 | 1.99 | Monoterpene |
| Δ 3-Carene | 4.46* | 1005 | [0.05] | 0.03 | 1092 | 1.83 | Monoterpene |
| α -Terpinene | 4.65 | 1015 | 0.01 | 0.01 | 1124 | 2.15 | Monoterpene |
| para-Cymene | 4.82 | 1025 | 0.09 | 0.10 | 1213 | 3.18 | Monoterpene |
| Limonene | 4.86* | 1028 | 0.17 | 0.05 | 1148 | 2.43 | Monoterpene |
| β -Phellandrene | 4.86* | 1028 | [0.17] | 0.04 | 1157 | 2.53* | Monoterpene |
| 1,8-Cineole | 4.89 | 1029 | 0.04 | [0.04] | 1157 | 2.53* | Monoterp. ether |
| <i>cis</i> - β -Ocimene | 5.05 | 1038 | 0.09 | 0.11 | 1190 | 2.91* | Monoterpene |
| <i>trans</i> - β -Ocimene | 5.23 | 1048 | 0.09 | 0.09 | 1207 | 3.10 | Monoterpene |
| γ -Terpinene | 5.37 | 1056 | 0.03 | [0.11] | 1190 | 2.91* | Monoterpene |
| <i>cis</i> -Linalool oxide (fur.) | 5.68 | 1073 | 0.24 | 0.21 | 1389 | 5.69 | Monoterp. alcohol |
| Terpinolene | 5.87 | 1084 | 0.04 | 0.03 | 1226 | 3.38 | Monoterpene |
| <i>trans</i> -Linalool oxide (fur.) | 5.99 | 1091 | 0.11 | 5.09 | 1420 | 6.18* | Monoterp. alcohol |
| para-Cymenene | 6.05 | 1094 | 0.02 | 0.02 | 1379 | 5.54 | Monoterpene |
| 6,7-Epoxymenthene | 6.18 | 1101 | 0.01 | 0.01 | 1349 | 5.10 | Monoterp. ether |
| Linalool | 6.30 | 1106 | 4.72 | 4.95 | 1508 | 7.86 | Monoterp. alcohol |
| <i>cis</i> -Rose oxide | 6.43 | 1112 | 0.97 | 0.94 | 1301 | 4.41 | Monoterp. ether |
| <i>trans</i> -Rose oxide | 6.75 | 1124 | 0.39 | 0.38 | 1313 | 4.57 | Monoterp. ether |
| Camphor | 7.29 | 1145 | 0.10 | 0.19 | 1422 | 6.22* | Monoterp. ketone |
| Menthone | 7.50* | 1154 | 1.33 | 1.17 | 1395 | 5.78 | Monoterp. ketone |
| Citronellal | 7.50* | 1154 | [1.33] | [0.19] | 1422 | 6.22* | Monoterp. aldehyde |
| Isomenthone | 7.76 | 1164 | 5.22 | [5.09] | 1420 | 6.18* | Monoterp. ketone |
| Terpinen-4-ol | 8.15 | 1179 | 0.08 | 0.08 | 1537 | 8.64 | Monoterp. alcohol |
| <i>cis</i> -Hex-3-en-1-yl butyrate | 8.39 | 1189 | 0.13 | 0.10 | 1416 | 6.11 | Aliphatic ester |
| α -Terpineol | 8.69 | 1201 | 0.36 | 0.47 | 1634 | 11.84 | Monoterp. alcohol |
| Nerol | 9.77 | 1227 | 0.29 | 0.34 | 1741 | 16.98* | Monoterp. alcohol |

| | | | | | | | |
|--------------------------------------|--------|------|--------|--------|------|--------|--------------------|
| Citronellol | 10.25 | 1238 | 31.55 | 31.64 | 1726 | 16.11 | Monoterp. alcohol |
| Neral | 10.39 | 1241 | 0.42 | 0.49 | 1608 | 10.82 | Monoterp. aldehyde |
| <i>cis</i> -Isogeraniol | 10.88 | 1253 | 0.02 | [0.34] | 1741 | 16.98* | Monoterp. alcohol |
| Geraniol | 11.21 | 1260 | 15.60 | 15.37 | 1798 | 20.32 | Monoterp. alcohol |
| Citronellyl formate | 11.92* | 1277 | 7.54 | 7.06 | 1565 | 9.50* | Monoterp. ester |
| Geranial | 11.92* | 1277 | [7.54] | 0.78 | 1656 | 12.83 | Monoterp. aldehyde |
| Geranyl formate | 13.11 | 1304 | 2.90 | 2.89 | 1643 | 12.27 | Monoterp. ester |
| α -Cubebene | 14.90 | 1334 | 0.17 | 0.21 | 1412 | 6.03 | Sesquiterpene |
| Citronellyl acetate | 16.10 | 1353 | 0.30 | 0.37 | 1610 | 10.87 | Monoterp. ester |
| α -Copaene | 16.48 | 1359 | 0.51 | 0.48 | 1434 | 6.44 | Sesquiterpene |
| β -Bourbonene | 16.88* | 1365 | 1.07 | 0.97 | 1454 | 6.83 | Sesquiterpene |
| Neryl acetate | 16.88* | 1365 | [1.07] | 0.06 | 1665 | 13.22 | Monoterp. ester |
| β -Cubebene | 16.96 | 1367 | 0.07 | 0.02 | 1478 | 7.27 | Sesquiterpene |
| β -Elemene | 17.58 | 1377 | 0.05 | 0.05 | 1527 | 8.36 | Sesquiterpene |
| Geranyl acetate | 18.08 | 1385 | 0.42 | 0.51 | 1697 | 14.68 | Monoterp. ester |
| β -Caryophyllene | 19.17* | 1402 | 1.23 | 1.07 | 1524 | 8.27 | Sesquiterpene |
| Geranic acid | 19.17* | 1402 | [1.23] | 0.17 | 2269 | 42.31 | Monoterp. acid |
| Aromadendrene | 20.04 | 1413 | 0.12 | 0.05 | 1532 | 8.51 | Sesquiterpene |
| <i>trans</i> - α -Bergamotene | 20.44 | 1418 | 0.06 | 0.07 | 1526 | 8.30 | Sesquiterpene |
| 6,9-Guaiadiene | 21.09 | 1426 | 0.39 | 0.33 | 1540 | 8.74 | Sesquiterpene |
| <i>cis</i> - β -Farnesene | 21.53* | 1431 | 0.41 | 0.39 | 1584 | 10.07* | Sesquiterpene |
| Seychellene | 21.53* | 1431 | [0.41] | 0.35 | 1549 | 9.03 | Sesquiterpene |
| α -Humulene | 21.78 | 1434 | 0.26 | [0.39] | 1584 | 10.07* | Sesquiterpene |
| allo-Aromadendrene | 22.05 | 1437 | 0.19 | [7.06] | 1565 | 9.50* | Sesquiterpene |
| Citronellyl propionate | 22.52 | 1443 | 0.29 | | | | Monoterp. ester |
| <i>trans</i> - β -Farnesene | 22.77 | 1446 | 0.05 | 0.14 | 1615 | 11.00* | Sesquiterpene |
| Neryl propionate | 23.42 | 1454 | 0.23 | 0.33 | 1738 | 16.82 | Monoterp. ester |
| Germacrene D | 23.92* | 1460 | 1.23 | 1.28 | 1625 | 11.43 | Sesquiterpene |
| γ -Murolene | 23.92* | 1460 | [1.23] | [0.14] | 1615 | 11.00* | Sesquiterpene |
| β -Selinene | 24.16 | 1463 | 0.15 | 0.20 | 1629 | 11.60* | Sesquiterpene |
| Viridiflorene | 24.45 | 1467 | 0.10 | 0.19 | 1619 | 11.16 | Sesquiterpene |
| α -Selinene | 24.69 | 1470 | 0.25 | 0.11 | 1631 | 11.72 | Sesquiterpene |
| Geranyl propionate | 25.05* | 1474 | 1.08 | 0.67 | 1761 | 18.13 | Monoterp. ester |
| Bicyclgermacrene | 25.05* | 1474 | [1.08] | 0.27 | 1644 | 12.33 | Sesquiterpene |
| 4- <i>epi-cis</i> -Dihydroagarofuran | 25.47 | 1479 | 0.09 | | | | Sesquiterp. ether |
| Epizonarene | 25.84* | 1484 | 0.24 | [0.20] | 1629 | 11.60* | Sesquiterpene |
| α -Murolene | 25.84* | 1484 | [0.24] | 0.20 | 1647 | 12.46 | Sesquiterpene |
| β -Dihydroagarofuran | 26.33 | 1490 | 0.08 | | | | Sesquiterp. ether |
| γ -Cadinene | 26.81 | 1496 | 0.27 | 0.66 | 1671 | 13.52* | Sesquiterpene |
| δ -Cadinene | 27.51 | 1504 | 0.91 | 0.90 | 1677 | 13.77 | Sesquiterpene |
| Zonarene | 27.77* | 1508 | 0.47 | [0.66] | 1671 | 13.52* | Sesquiterpene |
| <i>trans</i> -Calamenene | 27.77* | 1508 | [0.47] | 0.05 | 1729 | 16.26 | Sesquiterpene |
| Geranyl isobutyrate | 28.21 | 1513 | 0.11 | 0.04 | 1802 | 20.58 | Monoterp. ester |

| | | | | | | | |
|-------------------------------------|--------|------|---------------|---------------|------|-------|---------------------|
| <i>trans</i> - γ -Bisabolene | 28.47 | 1517 | 0.11 | 0.09 | 1684 | 14.09 | Sesquiterpene |
| α -Agarofuran | 29.16 | 1526 | 0.36 | 0.28 | 1767 | 18.54 | Sesquiterp. ether |
| Citronellyl butyrate | 29.72 | 1533 | 0.53 | 0.47 | 1747 | 17.30 | Monoterp. ester |
| Caryophyllene oxide | 31.24 | 1553 | 0.07 | 0.14 | 1850 | 23.74 | Sesquiterp. ether |
| Spathulenol | 32.19 | 1565 | 0.36 | | | | Sesquiterp. alcohol |
| Geranyl butyrate | 32.44 | 1569 | 1.02 | 1.03 | 1835 | 22.67 | Monoterp. ester |
| Phenylethyl tiglate | 33.89 | 1588 | 0.98 | 0.93 | 2083 | 37.07 | Phenolic ester |
| 10- <i>epi</i> - γ -Eudesmol | 34.90 | 1601 | 5.58 | 5.69 | 1990 | 32.89 | Sesquiterp. alcohol |
| 1,10- <i>diepi</i> -Cubenol | 35.66 | 1617 | 0.13 | 0.14 | 1960 | 31.16 | Sesquiterp. alcohol |
| Hinesol | 35.80 | 1621 | 0.28 | 0.30 | 2112 | 38.06 | Sesquiterp. alcohol |
| Cubenol | 36.08 | 1627 | 0.17 | 0.20 | 1957 | 30.97 | Sesquiterp. alcohol |
| τ -Cadinol | 36.28 | 1632 | 0.26 | 0.26 | 2077 | 36.87 | Sesquiterp. alcohol |
| τ -Muurolol | 36.41 | 1635 | 0.05 | 0.05 | 2092 | 37.40 | Sesquiterp. alcohol |
| α -Muurolol | 36.58 | 1639 | 0.24 | 0.23 | 2106 | 37.84 | Sesquiterp. alcohol |
| β -Eudesmol | 36.62* | 1640 | 0.53 | 0.31 | 2116 | 38.23 | Sesquiterp. alcohol |
| α -Eudesmol | 36.62* | 1640 | [0.53] | 0.27 | 2127 | 38.60 | Sesquiterp. alcohol |
| α -Cadinol | 36.87 | 1645 | 0.15 | 0.20 | 2130 | 38.70 | Sesquiterp. alcohol |
| Geranyl valerate | 37.52 | 1661 | 0.21 | 0.17 | 1931 | 29.32 | Monoterp. ester |
| Citronellyl tiglate | 37.80 | 1667 | 0.31 | 0.30 | 1940 | 29.91 | Monoterp. ester |
| Geranyl tiglate | 39.19 | 1700 | 1.50 | 1.54 | 2037 | 35.45 | Monoterp. ester |
| Geranyl caproate isomer | 39.79 | 1718 | 0.21 | 0.25 | 2023 | 34.89 | Monoterp. ester |
| Geranyl caproate | 40.98 | 1754 | 0.11 | 0.10 | 2027 | 35.09 | Monoterp. ester |
| Geranyl caprylate | 46.42 | 1948 | 0.06 | 0.09 | 2229 | 41.37 | Monoterp. ester |
| Total identified | | | 97.45% | 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 : Yellow liquid

Refractive index : 1.4680 \pm 0.0003 (20 °C)

CONCLUSION

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



