

GC/MS BATCH NUMBER: R10103

ESSENTIAL OIL: RAVENSARA
BOTANICAL NAME: RAVENSARA AROMATICA
ORIGIN: MADAGASCAR

| KEY CONSTITUENTS PRESENT IN THIS BATCH OF RAVENSARA OIL | % |
|---|------|
| LIMONENE | 15.7 |
| SABINENE | 14.1 |
| GERMACRENE D | 6.7 |
| LINALOOL | 5.6 |
| METHYLEUGENOL | 5.5 |
| α -PINENE | 5.1 |
| Δ^3 -CARENE | 4.6 |
| β -CARYOPHYLLENE | 4.9 |
| MYRCENE | 3.6 |
| β -PINENE | 2.8 |
| TERPINEN-4-OL | 2.8 |
| α -PHELLANDRENE | 2.4 |
| METHYL CHAVICOL (ESTRAGOLE) | 2.2 |
| cis- β -OCIMENE | 1.4 |
| γ -TERPINENE | 1.3 |
| CAMPHENE | 1.3 |
| δ -CADINENE | 1.2 |
| α -COPAENE | 1.2 |

| | |
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| α -TERPINENE | 1.1 |
|---------------------|-----|

Comments from Robert Tisserand: An especially complex Ravensara leaf oil. Constituents are in expected amounts.

Date : February 26, 2016

SAMPLE IDENTIFICATION

Internal code : 16B22-PTH5-1-LC

Customer identification : Ravensara - Madagascar - R1010356R

Type : Essential oil

Source : *Ravensara aromatica*

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 : 2016-02-25

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. | |
| Tricyclene | 2.63 | 912 | 0.02 | 0.02 | 920 | 0.85 | Monoterpene |
| α -Thujene | 2.72 | 918 | 0.89 | 0.92 | 959 | 0.97 | Monoterpene |
| α -Pinene | 2.82 | 925 | 5.12 | 5.10 | 949 | 0.94 | Monoterpene |
| Camphene | 3.07* | 941 | 1.34 | 1.25 | 1013 | 1.18 | Monoterpene |
| α -Fenchene | 3.07* | 941 | [1.34] | 0.06 | 1006 | 1.12 | Monoterpene |
| Sabinene | 3.53 | 970 | 14.06 | 14.02 | 1074 | 1.67 | Monoterpene |
| β -Pinene | 3.56 | 972 | 2.80 | 2.79 | 1051 | 1.49 | Monoterpene |
| Myrcene | 3.86 | 990 | 3.62 | 3.62 | 1123 | 2.16 | Monoterpene |
| 2-Carene | 4.04 | 1001 | 0.02 | 0.02 | 1082 | 1.73 | Monoterpene |
| Δ^3 -Carene | 4.11+* | 1005 | 7.69 | 4.58 | 1102 | 1.91 | Monoterpene |
| α -Phellandrene | 4.11+* | 1005 | [7.69] | 2.42 | 1115 | 2.07 | Monoterpene |
| Pseudolimonene | 4.14† | 1007 | [7.69] | 0.63 | 1118 | 2.11 | Monoterpene |
| α -Terpinene | 4.27 | 1015 | 1.13 | 1.12 | 1128 | 2.22 | Monoterpene |
| meta-Cymene | 4.40 | 1022 | 0.14 | | | | Monoterpene |
| Limonene | 4.54* | 1030 | 18.81 | 15.74 | 1151 | 2.48 | Monoterpene |
| 1,8-Cineole | 4.54* | 1030 | [18.81] | 2.68 | 1155 | 2.53* | Monoterp. ether |
| β -Phellandrene | 4.54* | 1030 | [18.81] | [2.68] | 1155 | 2.53* | Monoterpene |
| para-Cymene | 4.54* | 1030 | [18.81] | 0.58 | 1214 | 3.26 | Monoterpene |
| cis- β -Ocimene | 4.70 | 1039 | 1.41 | 2.77 | 1195 | 3.00† | Monoterpene |
| trans- β -Ocimene | 4.87 | 1048 | 0.17 | 0.17 | 1208 | 3.17 | Monoterpene |
| γ -Terpinene | 5.03 | 1058 | 1.28 | [2.77] | 1196 | 3.02† | Monoterpene |
| cis-Linalool oxide (fur.) | 5.32 | 1074 | 0.02 | 0.02 | 1389 | 5.77 | Monoterp. alcohol |
| cis-Sabinene hydrate | 5.39 | 1078 | 0.22 | 0.24 | 1415 | 6.21* | Monoterp. alcohol |
| Terpinolene | 5.48 | 1083 | 0.49 | 0.50 | 1228 | 3.46 | Monoterpene |
| trans-Linalool oxide (fur.) | 5.62 | 1091 | 0.02 | [0.24] | 1415 | 6.21* | Monoterp. alcohol |
| Linalool | 6.04* | 1111 | 5.70 | 5.61 | 1509 | 8.01* | Monoterp. alcohol |
| trans-Sabinene hydrate | 6.04* | 1111 | [5.70] | 0.15 | 1493 | 7.69 | Monoterp. alcohol |
| cis-para-Menth-2-en-1-ol | 6.38 | 1126 | 0.15 | [5.61] | 1509 | 8.01* | Monoterp. alcohol |
| trans-para-Menth-2-en-1-ol | 6.80 | 1145 | 0.07 | 0.07 | 1566 | 9.73 | Monoterp. alcohol |
| Borneol | 7.53 | 1179 | 0.29 | 0.39 | 1628 | 11.88* | Monoterp. alcohol |
| Terpinen-4-ol | 7.66 | 1185 | 2.75 | 2.69 | 1537 | 8.87 | Monoterp. alcohol |
| Methylchavicol | 8.24* | 1205 | 2.68 | 2.21 | 1592 | 10.51 | Phenylpropanoid |
| α -Terpineol | 8.24* | 1205 | [2.68] | 0.57 | 1633 | 12.11* | Monoterp. alcohol |
| trans-Piperitol | 8.61 | 1215 | 0.03 | 0.03 | 1678 | 14.14 | Monoterp. alcohol |
| Piperitone | 10.04 | 1253 | 0.02 | [0.39] | 1628 | 11.88* | Monoterp. ketone |
| Bornyl acetate | 10.90 | 1276 | 0.23 | 0.31 | 1511 | 8.08 | Monoterp. ester |
| Dihydroedulan I | 11.04 | 1280 | 0.08 | 0.08 | 1446 | 6.79 | Edulan |
| Bicycloelemene | 12.72 | 1314 | 0.01 | 0.04 | 1424 | 6.38* | Sesquiterpene |
| δ -Elemene | 12.91 | 1318 | 0.46 | 0.43 | 1418 | 6.27 | Sesquiterpene |
| α -Cubebene | 13.46 | 1327 | 0.34 | 0.35 | 1409 | 6.09 | Sesquiterpene |
| α -Terpinyl acetate | 14.14 | 1339 | 0.12 | [0.39] | 1628 | 11.88* | Monoterp. ester |

| | | | | | | | |
|-----------------------------------|--------|------|---------------|---------------|------|--------|---------------------|
| α -Ylangene | 14.49 | 1345 | 0.03 | [0.04] | 1424 | 6.38* | Sesquiterpene |
| α -Copaene | 14.92 | 1353 | 1.18 | 1.17 | 1432 | 6.54 | Sesquiterpene |
| Eugenol | 15.27* | 1359 | 0.21 | 0.32 | 2073 | 36.99* | Phenylpropanoid |
| β -Bourbonene | 15.27* | 1359 | [0.21] | 0.04 | 1452 | 6.90 | Sesquiterpene |
| β -Cubebene | 15.79 | 1368 | 0.61 | 0.65 | 1477 | 7.38 | Sesquiterpene |
| β -Elemene | 16.07 | 1373 | 0.49 | 0.47 | 1525 | 8.52 | Sesquiterpene |
| β -Caryophyllene | 17.52 | 1397 | 4.87 | 4.79 | 1524 | 8.49 | Sesquiterpene |
| Methyleugenol | 19.02 | 1417 | 5.52 | 5.46 | 1947 | 30.76 | Phenylpropanoid |
| <i>cis</i> - β -Farnesene | 19.60 | 1425 | 0.09 | 1.00 | 1584 | 10.28* | Sesquiterpene |
| α -Humulene | 19.98 | 1430 | 0.96 | [1.00] | 1584 | 10.28* | Sesquiterpene |
| allo-Aromadendrene | 20.16 | 1432 | 0.39 | 0.38 | 1562 | 9.59 | Sesquiterpene |
| <i>trans</i> - β -Farnesene | 21.17 | 1445 | 0.04 | 0.04 | 1618 | 11.49 | Sesquiterpene |
| Germacrene D | 22.15* | 1458 | 6.82 | 6.66 | 1625 | 11.77 | Sesquiterpene |
| γ -Muurolene | 22.15* | 1458 | [6.82] | 0.29 | 1612 | 11.23 | Sesquiterpene |
| β -Selinene | 22.71 | 1465 | 0.18 | [0.57] | 1633 | 12.11* | Sesquiterpene |
| Bicyclogermacrene | 23.12* | 1471 | 0.39 | 0.34 | 1642 | 12.52 | Sesquiterpene |
| α -Selinene | 23.12* | 1471 | [0.39] | 0.05 | 1637 | 12.30 | Sesquiterpene |
| Valencene | 23.95* | 1482 | 0.68 | 0.39 | 1664 | 13.50 | Sesquiterpene |
| 4- <i>epi</i> -Cubebol | 23.95* | 1482 | [0.68] | 0.13 | 1809 | 21.42 | Sesquiterp. alcohol |
| α -Muurolene | 23.95* | 1482 | [0.68] | 0.14 | 1645 | 12.67 | Sesquiterpene |
| γ -Cadinene | 24.87 | 1494 | 0.20 | 0.19 | 1668 | 13.68 | Sesquiterpene |
| δ -Cadinene | 25.51* | 1500 | 1.24 | 1.10 | 1675 | 14.00 | Sesquiterpene |
| Cubebol | 25.51* | 1500 | [1.24] | 0.08 | 1856 | 24.73 | Sesquiterp. alcohol |
| <i>trans</i> -Calamenene | 25.90 | 1505 | 0.03 | 0.02 | 1739 | 17.29 | Sesquiterpene |
| Methyl (<i>E</i>)-isoeugenol | 26.54 | 1513 | 0.19 | 0.17 | 2101 | 38.05 | Phenylpropanoid |
| Germacrene B | 27.93 | 1529 | 0.15 | 0.14 | 1721 | 16.23 | Sesquiterpene |
| α -Elemol | 29.16 | 1544 | 0.86 | 0.87 | 2001 | 34.12 | Sesquiterp. alcohol |
| Caryophyllene oxide | 30.25 | 1557 | 0.10 | 0.08 | 1848 | 24.17 | Sesquiterp. ether |
| Spathulenol | 30.78* | 1563 | 0.06 | 0.03 | 2022 | 35.21 | Sesquiterp. alcohol |
| (<i>E</i>)-Nerolidol | 30.78* | 1563 | [0.06] | 0.03 | 1994 | 33.65 | Sesquiterp. alcohol |
| Elemicin | 30.92 | 1565 | 0.25 | 0.34 | 2161 | 39.79 | Phenylpropanoid |
| Guaiol | 32.70 | 1586 | 0.12 | 0.13 | 2006 | 34.40 | Sesquiterp. alcohol |
| 1,10- <i>diepi</i> -Cubenol | 34.23 | 1612 | 0.04 | 0.03 | 1952 | 31.09 | Sesquiterp. alcohol |
| γ -Eudesmol | 34.71 | 1622 | 0.15 | [0.32] | 2073 | 36.99* | Sesquiterp. alcohol |
| Cubenol | 34.96 | 1627 | 0.11 | 0.13 | 1960 | 31.61 | Sesquiterp. alcohol |
| τ -Cadinol | 35.44 | 1637 | 0.06 | 0.08 | 2076 | 37.12 | Sesquiterp. alcohol |
| τ -Muurolol | 35.55 | 1640 | 0.09 | 0.09 | 2091 | 37.65 | Sesquiterp. alcohol |
| β -Eudesmol | 35.80* | 1645 | 0.33 | 0.14 | 2114 | 38.48 | Sesquiterp. alcohol |
| α -Muurolol | 35.80* | 1645 | [0.33] | 0.13 | 2111 | 38.36 | Sesquiterp. alcohol |
| α -Cadinol | 36.09 | 1651 | 0.17 | 0.19 | 2131 | 38.95 | Sesquiterp. alcohol |
| Total identified | | | 98.79% | 98.47% | | | |

*: 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 : Faintly yellow liquid

Refractive index : 1.4850 ± 0.0003 (20 °C)

CONCLUSION

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



