

GC/MS BATCH NUMBER: C90107

ESSENTIAL OIL: ROMAN CHAMOMILE
BOTANICAL NAME: CHAMAMELUM NOBILE
ORIGIN: UK

| KEY CONSTITUENTS PRESENT IN THIS BATCH OF CLARY SAGE OIL | % |
|--|------|
| 3-METHYLAMYL ANGELATE | 20.9 |
| METHALLYL ANGELATE | 15.4 |
| trans-PINOCARVEOL | 8.6 |
| ISOAMYL ANGELATE | 7.2 |
| 2-METHYLBUTYL ANGELATE | 6.6 |
| ISOBUTYL ANGELATE | 3.9 |
| PINOCARVONE | 2.0 |
| 3-METHYLPENTANOL | 2.0 |
| α -PINENE | 1.9 |
| 2-METHYLBUTYL ISOBUTYRATE | 1.6 |
| 3-METHYLAMYL METHACRYLATE | 1.2 |
| MYRTENAL | 1.2 |
| ISOAMYL ISOBUTYRATE | 1.1 |

Date : July 28, 2016

SAMPLE IDENTIFICATION

Internal code : 16G19-PTH5-1-DM

Customer identification : Roman Chamomile - C9010765R

Type : Essential oil

Source : *Chamaemelum nobile*

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 : 2016-07-28

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-Methylbutyral | 0.57 | 587 | 0.11 | 0.09 | 778 | 0.50 | Aliphatic aldehyde |
| Isopropyl formate | 0.64 | 610 | 0.08 | | | | Aliphatic ester |
| Isoamyl alcohol | 1.12 | 728 | 0.40 | 3.77 | 1147 | 2.41* | Aliphatic alcohol |
| 2-Methylbutyl alcohol | 1.15 | 732 | 0.39 | [3.77] | 1147 | 2.41* | Aliphatic alcohol |
| (E)-2-Penten-1-ol | 1.20 | 739 | 0.02 | | | | Aliphatic alcohol |
| Ethyl isobutyrate | 1.27 | 749 | 0.02 | 0.02 | 831 | 0.58 | Aliphatic ester |
| Methyl 2-methylbutyrate | 1.36 | 762 | 0.02 | 0.01 | 926 | 0.81 | Aliphatic ester |
| Hexanal | 1.66 | 802 | 0.11 | 0.11 | 1020 | 1.26 | Aliphatic aldehyde |
| Butyric acid | 1.89 | 820 | 0.12 | | | | Aliphatic acid |
| Methyl angelate | 1.90 | 821 | 0.07 | 0.06 | 1049 | 1.48 | Aliphatic ester |
| Ethyl 2-methylbutyrate | 2.20 | 846 | 0.04 | 0.04 | 986 | 1.05 | Aliphatic ester |
| 3-Methylpentanol | 2.36 | 858 | 1.97 | 2.09 | 1272 | 4.00* | Aliphatic alcohol |
| cis-Hex-3-en-1-ol | 2.48 | 869 | 0.18 | 1.40 | 1335 | 4.91* | Aliphatic alcohol |
| Isoamyl acetate | 2.63 | 881 | 0.27 | 0.35 | 1058 | 1.56* | Aliphatic ester |
| Hexanol | 2.66 | 883 | 0.04 | 0.04 | 1301 | 4.41 | Aliphatic alcohol |
| 2-Methylbutyl acetate | 2.69 | 885 | 0.04 | [0.35] | 1058 | 1.56* | Aliphatic ester |
| Propyl methacrylate | 2.70 | 886 | 0.11 | 0.09 | 1053 | 1.52 | Aliphatic ester |
| Ethyl angelate? | 2.91 | 902 | 0.11 | | | | Aliphatic ester |
| Isobutyl isobutyrate | 3.17 | 918 | 0.48 | 0.45 | 1033 | 1.35 | Aliphatic ester |
| α-Pinene | 3.34 | 928 | 1.86 | 1.86 | 945 | 0.88 | Monoterpene |
| Prenyl acetate | 3.46 | 935 | 0.35 | 0.49 | 1179 | 2.79 | Aliphatic ester |
| Isobutyl methacrylate | 3.60 | 944 | 0.30 | 0.31 | 1112 | 2.01 | Aliphatic ester |
| Camphene | 3.62 | 946 | 0.64 | 0.63 | 999 | 1.10 | Monoterpene |
| Butyl isobutyrate | 3.72 | 951 | 0.11 | 0.11 | 1104 | 1.92 | Aliphatic ester |
| Angelic acid | 3.88* | 961 | 0.76 | 0.11 | 1704 | 14.98 | Aliphatic acid |
| Methallyl methacrylate | 3.88* | 961 | [0.76] | 0.67 | 1201 | 3.04 | Aliphatic ester |
| Sabinene | 4.04 | 971 | 0.04 | 0.03 | 1066 | 1.63 | Monoterpene |
| β-Pinene | 4.11 | 975 | 0.18 | 0.21 | 1038 | 1.39 | Monoterpene |
| Isoamyl propionate | 4.16 | 978 | 0.09 | | | | Aliphatic ester |
| Methallyl isobutyrate | 4.33 | 989 | 0.02 | 0.02 | 1187 | 2.88 | Aliphatic ester |
| Myrcene | 4.36* | 990 | 0.51 | 0.42 | 1125 | 2.16 | Monoterpene |
| Dehydro-1,8-cineole | 4.36* | 990 | [0.51] | 0.04 | 1135 | 2.27 | Monoterp. ether |
| Propyl angelate | 4.54 | 1001 | 0.79 | 0.81 | 1195 | 2.98* | Aliphatic ester |
| Isobutyl 2-methylbutyrate | 4.67 | 1009 | 0.10 | [3.77] | 1147 | 2.41* | Aliphatic ester |
| Isoamyl isobutyrate | 4.87 | 1020 | 1.10 | [3.77] | 1147 | 2.41* | Aliphatic ester |
| 2-Methylbutyl isobutyrate | 4.93 | 1023 | 1.60 | [3.77] | 1147 | 2.41* | Aliphatic ester |
| para-Cymene | 5.04 | 1029 | 0.05 | 0.05 | 1207 | 3.11 | Monoterpene |
| Limonene | 5.07 | 1031 | 0.10 | 0.04 | 1138 | 2.31 | Monoterpene |
| 1,8-Cineole | 5.14 | 1034 | 0.22 | 0.16 | 1142 | 2.35 | Monoterp. ether |
| Isoamyl methacrylate + 2-Methylbutyl methacrylate | 5.40 | 1049 | 1.25 | 1.30 | 1223 | 3.34 | Aliphatic ester |

| | | | | | | | |
|--|-------|------|---------|---------|------|--------|--------------------|
| Isobutyl angelate | 5.58 | 1059 | 3.93 | 4.19 | 1238 | 3.54* | Aliphatic ester |
| Prenyl isobutyrate | 5.62 | 1061 | 0.13 | [2.09] | 1272 | 4.00* | Aliphatic ester |
| γ -Terpinene | 5.64 | 1062 | 0.03 | [0.81] | 1195 | 2.98* | Monoterpene |
| Methallyl angelate | 5.90 | 1076 | 15.41 | 15.91 | 1323 | 4.73 | Aliphatic ester |
| 3-Methylamyl propionate? | 6.02* | 1083 | 0.32 | 0.32 | 1251 | 3.71* | Aliphatic ester |
| Butyl angelate | 6.29 | 1098 | 0.36 | 0.36 | 1292 | 4.29 | Aliphatic ester |
| Isobutyl tiglate | 6.35 | 1102 | 0.07 | 0.12 | 1299 | 4.38 | Aliphatic ester |
| Isoamyl 2-methylbutyrate | 6.46 | 1106 | 0.19 | 0.12 | 1234 | 3.49 | Aliphatic ester |
| 2-Methylbutyl 2-methylbutyrate | 6.52 | 1108 | 0.17 | [4.19] | 1238 | 3.54* | Aliphatic ester |
| α -Thujone | 6.68 | 1114 | 0.05 | 0.05 | 1363 | 5.31 | Monoterp. ketone |
| Methallyl tiglate? | 6.75 | 1117 | 0.19 | 0.21 | 1391 | 5.72 | Aliphatic ester |
| 3-Methylamyl isobutyrate | 6.84 | 1120 | 7.81 | 8.02 | 1262 | 3.87 | Aliphatic ester |
| 3-Methylamyl methacrylate | 7.62* | 1149 | 10.40 | [1.40] | 1335 | 4.91* | Aliphatic ester |
| <i>trans</i> -Pinocarveol | 7.62* | 1149 | [10.40] | 8.55 | 1567 | 9.55 | Monoterp. alcohol |
| Isoamyl angelate | 7.69 | 1152 | 7.24 | 8.46 | 1343 | 5.02 | Aliphatic ester |
| 2-Methylbutyl angelate | 7.79 | 1156 | 6.59 | 7.16 | 1347 | 5.08 | Aliphatic ester |
| Camphene hydrate | 7.94* | 1161 | 0.19 | 0.17 | 1520 | 8.14* | Monoterp. alcohol |
| <i>C. nobile</i> biomarker | 8.01 | 1164 | 0.75 | 0.73 | 1409 | 5.98 | Aliphatic ester |
| Isoborneol | 8.10* | 1167 | 2.06 | 0.15 | 1596 | 10.45 | Monoterp. alcohol |
| Pinocarvone | 8.10* | 1167 | [2.06] | 1.99 | 1470 | 7.13 | Monoterp. ketone |
| Isopinocampone | 8.19 | 1170 | 0.19 | 0.12 | 1497 | 7.65 | Monoterp. alcohol |
| Borneol | 8.54 | 1184 | 0.25 | 0.40 | 1618 | 11.12* | Monoterp. alcohol |
| Terpinen-4-ol | 8.62 | 1187 | 0.14 | 0.88 | 1529 | 8.40* | Monoterp. alcohol |
| Isobutyl 3-hydroxy-2-methylenebutyrate | 8.81 | 1194 | 0.08 | 0.05 | 1714 | 15.43 | Aliphatic ester |
| Prenyl angelate | 9.02 | 1201 | 0.12 | 21.09 | 1451 | 6.76* | Aliphatic ester |
| Isoamyl tiglate | 9.14* | 1204 | 0.98 | 0.19 | 1414 | 6.07 | Aliphatic ester |
| Myrtenol | 9.14* | 1204 | [0.98] | 0.60 | 1701 | 14.84 | Monoterp. alcohol |
| Myrtenal | 9.31 | 1208 | 1.19 | [0.88] | 1529 | 8.40* | Monoterp. aldehyde |
| Verbenone | 9.39* | 1210 | 0.65 | 0.43 | 1611 | 10.90 | Monoterp. ketone |
| Methylamyl valerate analog | 9.39* | 1210 | [0.65] | | | | Aliphatic ester |
| 3-Methylamyl angelate | 11.48 | 1257 | 20.86 | [21.09] | 1451 | 6.76* | Aliphatic ester |
| Bornyl acetate | 12.62 | 1283 | 0.08 | 0.25 | 1504 | 7.77* | Monoterp. ester |
| Hexyl angelate | 12.98 | 1291 | 0.04 | [0.40] | 1618 | 11.12* | Aliphatic ester |
| Isoamyl 3-hydroxy-2-methylenebutyrate | 13.45 | 1302 | 0.26 | 0.23 | 1818 | 21.56 | Aliphatic ester |
| 3-Methylamyl tiglate | 13.76 | 1306 | 0.15 | [0.25] | 1504 | 7.77* | Aliphatic ester |
| α -Copaene | 17.32 | 1362 | 0.04 | 0.04 | 1431 | 6.38 | Sesquiterpene |
| Phenylethyl isobutyrate | 19.88 | 1401 | 0.05 | 0.05 | 1798 | 20.33 | Phenolic ester |
| β -Caryophyllene | 20.15 | 1405 | 0.36 | 0.21 | 1524 | 8.25 | Sesquiterpene |
| Aromadendrene | 21.43 | 1421 | 0.06 | 0.05 | 1527 | 8.35 | Sesquiterpene |
| <i>trans</i> - β -Farnesene | 24.06 | 1452 | 0.23 | 0.16 | 1624 | 11.40 | Sesquiterpene |

| | | | | | | | |
|-------------------------------------|---------------|------|------|---------------|------|--------|---------------|
| Germacrene D | 25.06 | 1464 | 0.12 | 0.12 | 1628 | 11.58 | Sesquiterpene |
| β -Selinene | 25.64 | 1471 | 0.15 | [0.40] | 1618 | 11.12* | Sesquiterpene |
| (<i>E,E</i>)- α -Farnesene | 28.60 | 1508 | 0.27 | 0.29 | 1692 | 14.47 | Sesquiterpene |
| Total identified | 96.81% | | | 97.45% | | | |

*: 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 blue liquid

Refractive index : 1.4440 \pm 0.0003 (20 °C)

CONCLUSION

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



