

Date : October 28, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20J22-PTH01

Customer identification : Chrysanthemum Absolute - CU2100202R

Type : Absolute

Source : *Chrysanthemum indicum*

Customer : Plant Therapy

ANALYSIS

Method: Dilution of a known amount with an appropriate solvent, and addition of a methyl octanoate internal standard for quantitation. Application of a correction factor¹. Analysis with PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : October 26, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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REFERENCE

(1) Cachet, T.; Brevard, H.; Chaintreau, A.; Demyttenaere, J.; French, L.; Gassenmeier, K.; Joulain, D.; Koenig, T.; Leijts, H.; Liddle, P.; et al. IOFI Recommended Practice for the Use of Predicted Relative-Response Factors for the Rapid Quantification of Volatile Flavouring Compounds by GC-FID. *Flavour Fragr. J.* 2016, 31 (3), 191–194.

PHYSICOCHEMICAL DATA

Physical aspect: Orange viscous liquid

Refractive index: 1.5041 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY

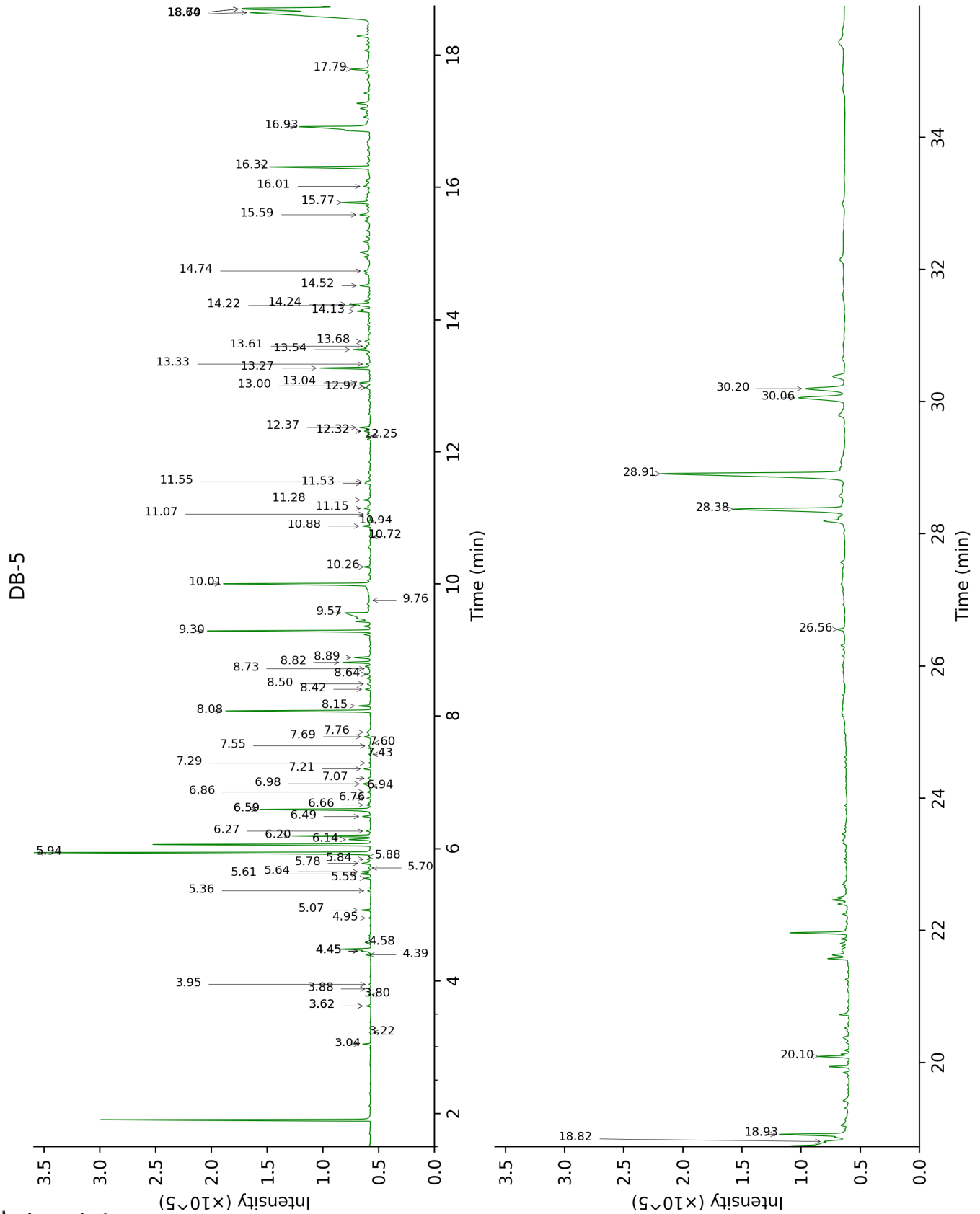
| Identification | (mg/g) | % of total volatiles | Classe |
|----------------------------------|--------|----------------------|------------------------|
| α-Pinene | 0.86 | 0.09 | Monoterpene |
| Camphene | 0.19 | 0.02 | Monoterpene |
| Sabinene | 0.47 | 0.05 | Monoterpene |
| β-Pinene | 0.14 | 0.02 | Monoterpene |
| Octen-3-one | 0.40 | 0.04 | Aliphatic ketone |
| 6-Methyl-5-hepten-2-one | 0.43 | 0.05 | Aliphatic ketone |
| Myrcene | 0.28 | 0.03 | Monoterpene |
| para-Cymene | 0.56 | 0.06 | Monoterpene |
| Limonene | 0.83 | 0.09 | Monoterpene |
| β-Phellandrene | 0.81 | 0.09 | Monoterpene |
| 1,8-Cineole | 4.30 | 0.48 | Monoterpenic ether |
| Benzyl alcohol | 1.23 | 0.14 | Simple phenolic |
| γ-Terpinene | 0.26 | 0.03 | Monoterpene |
| cis-Sabinene hydrate | 1.53 | 0.17 | Monoterpenic alcohol |
| Unknown | 0.56 | 0.06 | Unknown |
| trans-Sabinene hydrate | 0.94 | 0.10 | Monoterpenic alcohol |
| iso-Chrysanthenone? | 1.61 | 0.18 | Monoterpenic ketone |
| Linalool | 1.59 | 0.18 | Monoterpenic alcohol |
| 2-Methylbutyl 2-methylbutyrate | 0.52 | 0.06 | Aliphatic ester |
| Phenylethyl alcohol | 1.92 | 0.21 | Simple phenolic |
| Chrysanthenol isomer? | 0.75 | 0.08 | Monoterpenic alcohol |
| Octen-3-yl acetate | 0.48 | 0.05 | Aliphatic ester |
| Chrysanthenone | 59.27 | 6.54 | Monoterpenic ketone |
| trans-Pinocarveol | 3.77 | 0.42 | Monoterpenic alcohol |
| Camphor | 12.35 | 1.36 | Monoterpenic ketone |
| trans-Verbenol | 0.78 | 0.09 | Monoterpenic alcohol |
| Pinocarvone | 1.30 | 0.14 | Monoterpenic ketone |
| cis-Chrysanthenol | 17.52 | 1.93 | Monoterpenic alcohol |
| Borneol | 0.53 | 0.06 | Monoterpenic alcohol |
| Isopinocampone | 0.74 | 0.08 | Monoterpenic ketone |
| Terpinen-4-ol | 0.61 | 0.07 | Monoterpenic alcohol |
| Cryptone | 0.71 | 0.08 | Normonoterpenic ketone |
| Unknown | 0.32 | 0.03 | Unknown |
| α-Terpineol | 2.16 | 0.24 | Monoterpenic alcohol |
| Myrtenol | 0.58 | 0.06 | Monoterpenic alcohol |
| Verbenone | 1.17 | 0.13 | Monoterpenic ketone |
| Unknown | 0.40 | 0.04 | Unknown |
| trans-Carveol | 0.31 | 0.03 | Monoterpenic alcohol |
| cis-para-Mentha-1(7),8-dien-2-ol | 0.47 | 0.05 | Monoterpenic alcohol |
| cis-Carveol | 0.16 | 0.02 | Monoterpenic alcohol |
| trans-Chrysanthenyl acetate | 1.55 | 0.17 | Monoterpenic ester |
| (E)-Ocimenone | 1.84 | 0.20 | Monoterpenic ketone |
| cis-Chrysanthenyl acetate | 24.72 | 2.73 | Monoterpenic ester |
| Unknown | 2.20 | 0.24 | Unknown |
| Bornyl acetate | 0.98 | 0.11 | Monoterpenic ester |
| cis-Verbenyl acetate | 0.91 | 0.10 | Monoterpenic ester |
| Thymol | 0.87 | 0.10 | Monoterpenic alcohol |

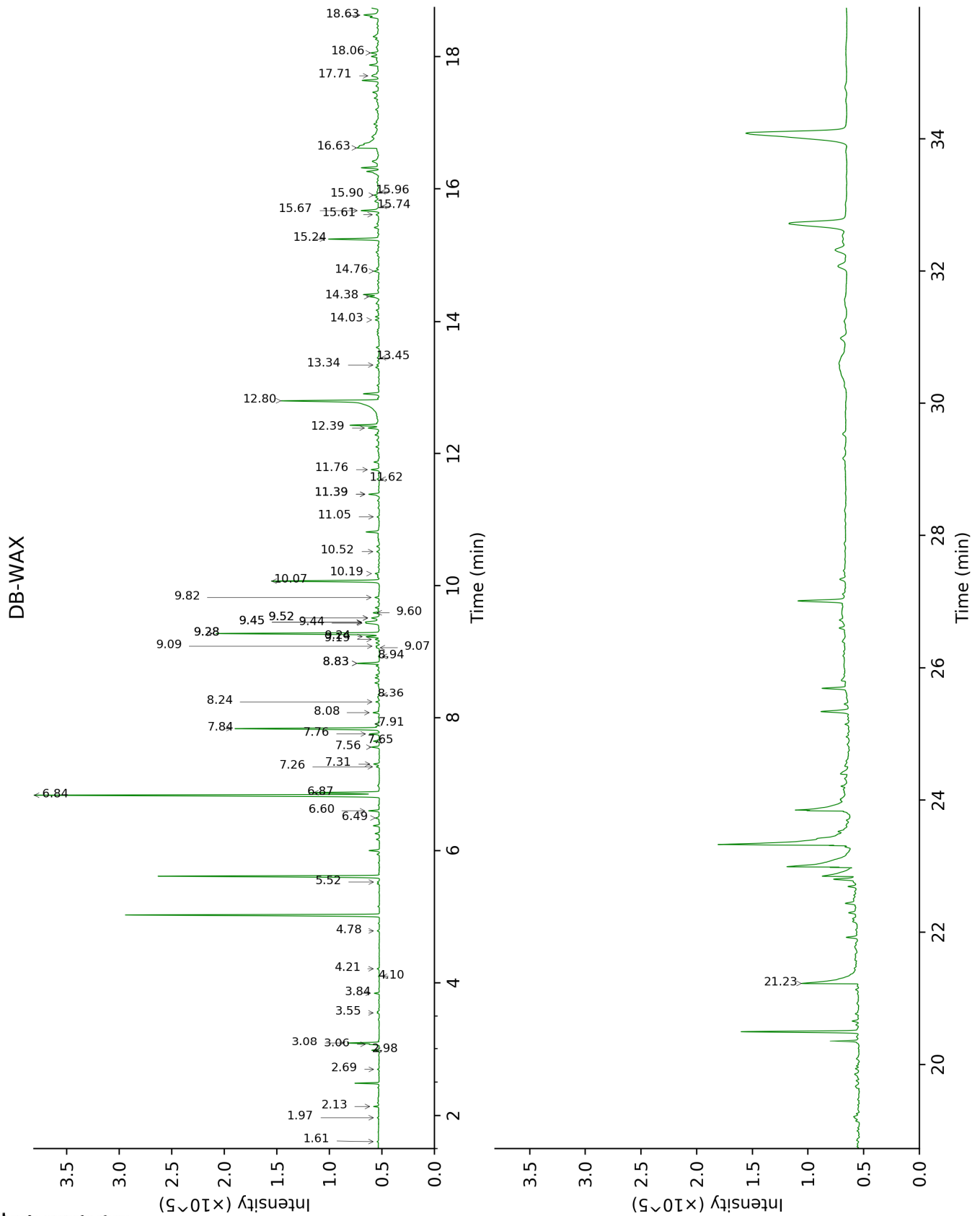
| | | | |
|--|--------------------|---------------|--------------------------|
| Unknown | 0.54 | 0.06 | Oxygenated monoterpene |
| Unknown | 5.48 | 0.61 | Unknown |
| Unknown | 3.36 | 0.37 | Unknown |
| Unknown | 28.70 | 3.17 | Unknown |
| <i>trans</i> -Chrysanthemic acid | 17.96 | 1.98 | Monoterpenic acid |
| Unknown | 0.30 | 0.03 | Unknown |
| Unknown | 32.50 | 3.59 | Unknown |
| β -Caryophyllene | 0.95 | 0.10 | Sesquiterpene |
| α -Humulene | 0.35 | 0.04 | Sesquiterpene |
| (<i>E</i>)- β -Farnesene | 1.16 | 0.13 | Sesquiterpene |
| 4,5-diepi-Aristolochene | 0.46 | 0.05 | Sesquiterpene |
| 5-epi-Aristolochene? | 0.56 | 0.06 | Sesquiterpene |
| β -Selinene | 1.06 | 0.12 | Sesquiterpene |
| α -Selinene | 1.58 | 0.17 | Sesquiterpene |
| β -Bisabolene | 1.00 | 0.11 | Sesquiterpene |
| (3 <i>E</i> ,6 <i>E</i>)- α -Farnesene | 0.76 | 0.08 | Sesquiterpene |
| (<i>E</i>)-Nerolidol | 0.64 | 0.07 | Sesquiterpenic alcohol |
| Spathulenol | 0.73 | 0.08 | Sesquiterpenic alcohol |
| Germacrene D-4-ol | 0.44 | 0.05 | Sesquiterpenic alcohol |
| Caryophyllene oxide | 2.08 | 0.23 | Sesquiterpenic ether |
| Muurola-4,10(14)-dien-1 β -ol? | 1.18 | 0.13 | Sesquiterpenic alcohol |
| Caryophylladienol I | 0.55 | 0.06 | Sesquiterpenic alcohol |
| Caryophylladienol II | 1.93 | 0.21 | Sesquiterpenic alcohol |
| Neointermedeol | 8.39 | 0.93 | Sesquiterpenic alcohol |
| Unknown | 1.01 | 0.11 | Unknown |
| Unknown | 3.59 | 0.40 | Oxygenated sesquiterpene |
| Cyperol | 0.97 | 0.11 | Sesquiterpenic alcohol |
| Shyobunol | 1.44 | 0.16 | Sesquiterpenic alcohol |
| Unknown | 2.75 | 0.30 | Oxygenated sesquiterpene |
| Unknown | 1.61 | 0.18 | Oxygenated sesquiterpene |
| Oplopanone | 4.09 | 0.45 | Sesquiterpenic alcohol |
| Unknown | 2.44 | 0.27 | Unknown |
| Myristic acid | 2.52 | 0.28 | Aliphatic acid |
| Phytone | 2.33 | 0.26 | Terpenic ketone |
| Unknown | 6.44 | 0.71 | Oxygenated sesquiterpene |
| Unknown | 1.38 | 0.15 | Unknown |
| Unknown | 22.28 | 2.46 | Unknown |
| Palmitic acid | 22.88 | 2.53 | Aliphatic acid |
| Unknown | 4.60 | 0.51 | Unknown |
| Linoleic acid | 67.88 | 7.49 | Aliphatic acid |
| Ethyl linoleate | 1.49 | 0.16 | Aliphatic ester |
| Oleic acid | 47.76 | 5.27 | Aliphatic acid |
| Ethyl linolenate | 6.30 | 0.70 | Aliphatic ester |
| Stearic acid | 17.05 | 1.88 | Aliphatic acid |
| Unknown | 6.85 | 0.76 | Unknown |
| Sesamin | 2.39 | 0.26 | Lignan |
| β -Amyrin | 37.16 | 4.10 | Triterpenic alcohol |
| α -Amyrin | 74.90 | 8.27 | Triterpenic alcohol |
| Amyrin isomer? | 18.15 | 2.00 | Triterpenic alcohol |
| Unknown | 19.53 | 2.16 | Unknown |
| Consolidated total | 649.30 mg/g | 71.70% | |

Individual compounds contents were corrected following the method of Cachet et al., 2016 (Flavour and Fragrance Journal guidelines).
Unknown compounds are expressed in equivalents of internal standard without correction.

About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.





FULL ANALYSIS DATA

| Identification | Column DB-5 | | | Column DB-WAX | | |
|---|-------------|------|---------|---------------|------|---------|
| | R.T | R.I | mg/g | R.T | R.I | mg/g |
| α-Pinene | 3.04 | 932 | 0.86 | 1.32 | 1005 | 0.82 |
| Camphene | 3.22 | 945 | 0.19 | 1.61 | 1036 | 0.17 |
| Sabinene | 3.62* | 972 | 0.65 | 2.14 | 1091 | 0.47 |
| β-Pinene | 3.62* | 972 | [0.65] | 1.97 | 1073 | 0.14 |
| Octen-3-one | 3.80 | 983 | 0.40 | 4.21 | 1258 | 0.40 |
| 6-Methyl-5-hepten-2-one | 3.88 | 989 | 0.43 | 4.78 | 1301 | 0.38 |
| Myrcene | 3.95 | 994 | 0.28 | 2.69 | 1138 | 0.21 |
| para-Cymene | 4.39 | 1022 | 0.56 | 3.84 | 1230 | 0.55 |
| Limonene | 4.45*† | 1026 | 5.69 | 2.98 | 1162 | 0.83 |
| β-Phellandrene | 4.45*† | 1026 | [5.69] | 3.06 | 1169 | 0.81 |
| 1,8-Cineole | 4.45*† | 1026 | [6.47] | 3.08 | 1170 | 4.30 |
| Benzyl alcohol | 4.58 | 1034 | 1.23 | 11.39* | 1817 | 2.02 |
| γ-Terpinene | 4.95 | 1057 | 0.26 | 3.55 | 1208 | 0.27 |
| cis-Sabinene hydrate | 5.07 | 1065 | 1.53 | 6.60 | 1430 | 1.40 |
| Unknown [m/z 107, 150 (58), 91 (49), 79 (29), 105 (19), 135 (180)...] | 5.36 | 1083 | 0.56 | | | |
| trans-Sabinene hydrate | 5.55 | 1095 | 0.94 | 7.65 | 1509 | 0.99 |
| iso-Chrysanthenone? | 5.61 | 1099 | 1.61 | 6.49 | 1422 | 0.54 |
| Linalool | 5.64 | 1102 | 1.59 | 7.76 | 1518 | 1.37 |
| 2-Methylbutyl 2-methylbutyrate | 5.70 | 1105 | 0.52 | 4.10 | 1249 | 0.23 |
| Phenylethyl alcohol | 5.78 | 1110 | 1.92 | 11.76 | 1850 | 1.35 |
| Chrysanthenol isomer? | 5.84 | 1114 | 0.75 | | | |
| Octen-3-yl acetate | 5.88 | 1117 | 0.48 | 5.52 | 1350 | 0.41 |
| Chrysanthenone | 5.94 | 1121 | 59.27 | 6.84† | 1447 | 69.85 |
| trans-Pinocarveol | 6.14 | 1134 | 3.77 | 8.83* | 1602 | 3.55 |
| Camphor | 6.20 | 1137 | 12.35 | 6.87† | 1450 | [68.34] |
| trans-Verbenol | 6.27 | 1142 | 0.78 | 9.19 | 1631 | 0.70 |
| Pinocarpone | 6.49 | 1156 | 1.30 | 7.56 | 1502 | 1.36 |
| cis-Chrysanthenol | 6.60* | 1163 | 18.44 | 10.07 | 1703 | 17.52 |
| Borneol | 6.60* | 1163 | [18.06] | 9.45* | 1652 | 2.69 |
| Isopinocampone | 6.66 | 1167 | 0.74 | 7.26 | 1480 | 0.49 |
| Terpinen-4-ol | 6.76 | 1174 | 0.61 | 8.24 | 1555 | 0.58 |
| Cryptone | 6.86 | 1180 | 0.71 | 8.83* | 1602 | [3.65] |
| Unknown [m/z 82, 80 (46), 91 (41), 79 (32), 107 (32)...] | 6.94 | 1185 | 0.32 | | | |
| α-Terpineol | 6.98 | 1188 | 2.16 | 9.45* | 1652 | [2.69] |

| | | | | | | |
|---|-------|------|-------|--------|------|---------|
| Myrtenol | 7.07 | 1193 | 0.58 | 10.52 | 1741 | 0.49 |
| Verbenone | 7.21 | 1202 | 1.17 | 9.28* | 1638 | 26.40 |
| Unknown [m/z 109, 81 (40), 41 (37), 69 (32), 79 (30), 91 (25)...] | 7.29 | 1208 | 0.40 | | | |
| <i>trans</i> -Carveol | 7.43 | 1217 | 0.31 | 11.05 | 1787 | 0.37 |
| <i>cis</i> -para-Mentha-1(7),8-dien-2-ol | 7.55 | 1226 | 0.47 | 11.62 | 1837 | 0.39 |
| <i>cis</i> -Carveol | 7.60 | 1229 | 0.16 | 11.39* | 1817 | [2.08] |
| <i>trans</i> -Chrysanthenyl acetate | 7.69 | 1235 | 1.55 | 7.31 | 1483 | 1.15 |
| (<i>E</i>)-Ocimenone | 7.76 | 1240 | 1.84 | 9.52* | 1658 | 1.79 |
| <i>cis</i> -Chrysanthenyl acetate | 8.08 | 1262 | 24.72 | 7.84 | 1524 | 24.95 |
| Unknown [m/z 82, 109 (35), 135 (22), 127 (19), 54 (16), 43 (14)...] | 8.15 | 1267 | 2.20 | | | |
| Bornyl acetate | 8.42 | 1285 | 0.98 | 7.91 | 1529 | 0.72 |
| <i>cis</i> -Verbenyl acetate | 8.50 | 1290 | 0.91 | 8.36 | 1564 | 0.31 |
| Thymol | 8.64 | 1300 | 0.87 | 14.76 | 2134 | 0.87 |
| Unknown [m/z 109, 43 (84), 134 (43), 41 (28), 151 (26), 91 (24)...] | 8.73 | 1302 | 0.54 | 9.07 | 1621 | 0.58 |
| Unknown [m/z 107, 91 (43), 105 (17), 122 (16), 79 (15), 41 (11)...] | 8.82 | 1309 | 5.48 | | | |
| Unknown [m/z 107, 69 (69), 98 (67), 91 (59), 41 (53), 67 (45)...] | 8.89 | 1314 | 3.36 | | | |
| Unknown [m/z 107, 108 (64), 122 (43), 93 (31), 81 (29), 67 (26)...] | 9.30 | 1343 | 28.70 | 9.28* | 1638 | [29.12] |
| <i>trans</i> -Chrysanthemic acid | 9.57 | 1362 | 17.96 | 16.63 | 2328 | 18.31 |
| Unknown [m/z 139, 69 (63), 83 (53), 43 (49), 41 (39)...] | 9.76 | 1376 | 0.30 | 15.74 | 2234 | 0.17 |
| Unknown [m/z 150, 91 (88), 107 (74), 135 (70), 79 (50), 77 (38)...] | 10.00 | 1393 | 32.50 | 12.80 | 1944 | 34.74 |
| β -Caryophyllene | 10.26 | 1412 | 0.95 | 8.08 | 1543 | 0.88 |

| | | | | | | |
|---|--------|------|--------|-------|------|--------|
| α-Humulene | 10.72 | 1446 | 0.35 | 8.94 | 1610 | 0.22 |
| (E)-β-Farnesene | 10.88 | 1458 | 1.16 | 9.24 | 1634 | 1.99 |
| 4,5-diepi-Aristolochene | 10.94 | 1462 | 0.46 | 9.09 | 1623 | 0.49 |
| 5-epi-Aristolochene? | 11.07 | 1472 | 0.56 | 9.44 | 1651 | 2.00 |
| β-Selinene | 11.15 | 1478 | 1.06 | 9.52* | 1658 | [1.48] |
| α-Selinene | 11.28 | 1488 | 1.58 | 9.60 | 1664 | 0.92 |
| β-Bisabolene | 11.53 | 1507 | 1.00 | 9.82 | 1683 | 0.65 |
| (3E,6E)-α-Farnesene | 11.55 | 1509 | 0.76 | 10.18 | 1713 | 0.60 |
| (E)-Nerolidol | 12.25 | 1563 | 0.64 | 13.44 | 2005 | 0.42 |
| Spathulenol | 12.32* | 1569 | 1.19 | 14.03 | 2061 | 0.73 |
| Germacrene D-4-ol | 12.32* | 1569 | [1.18] | 13.34 | 1994 | 0.44 |
| Caryophyllene oxide | 12.37 | 1573 | 2.08 | 12.39 | 1906 | 1.95 |
| Muuroala-4,10(14)-dien-1β-ol? | 12.97 | 1621 | 1.18 | | | |
| Caryophylladienol I | 13.00 | 1623 | 0.55 | 15.61 | 2220 | 0.58 |
| Caryophylladienol II | 13.04 | 1627 | 1.93 | 15.67 | 2227 | 3.44 |
| Neointermedeol | 13.26 | 1646 | 8.39 | 15.24 | 2183 | 8.13 |
| Unknown [m/z 82, 43 (77), 95 (61), 67 (40), 109 (37), 93 (36)...] | 13.33 | 1651 | 1.01 | | | |
| Unknown [m/z 57, 85 (97), 68 (47), 93 (28), 120 (25), 41 (24)...220 (1)] | 13.54 | 1669 | 3.59 | | | |
| Cyperol | 13.61 | 1674 | 0.97 | 15.96 | 2257 | 0.71 |
| Shyobunol | 13.68 | 1680 | 1.44 | 15.90 | 2251 | 0.86 |
| Unknown [m/z 69, 123 (45), 71 (44), 41 (37), 81 (36), 109 (33)...220 (1)] | 14.13 | 1718 | 2.75 | | | |
| Unknown [m/z 83, 55 (13), 84 (6), 149 (4), 68 (4)...218 (1)] | 14.22 | 1726 | 1.61 | | | |
| Oplopanone | 14.24 | 1728 | 4.09 | 17.71 | 2448 | 2.19 |
| Unknown [m/z 108, 43 (81), 93 (68), 95 (63), 123 (35), 79 (34)...] | 14.52 | 1752 | 2.44 | | | |
| Myristic acid | 14.74 | 1771 | 2.52 | | | |
| Phytone | 15.59 | 1847 | 2.33 | 14.38 | 2095 | 1.76 |

| | | | | | | |
|--|--------|------|---------|-------|------|-------|
| Unknown [m/z 109, 69 (48), 135 (40), 43 (39), 79 (25), 41 (23)....220 (4)] | 15.77 | 1864 | 6.44 | | | |
| Unknown [m/z 83, 55 (18), 71 (16), 82 (15), 84 (10), 43 (7)....] | 16.01 | 1886 | 1.38 | | | |
| Unknown [m/z 109, 110 (78), 69 (37), 83 (24), 43 (24), 95 (22)....] | 16.32 | 1914 | 22.28 | | | |
| Palmitic acid | 16.92 | 1972 | 22.88 | 21.23 | 2873 | 27.37 |
| Unknown [m/z 82, 109 (45), 43 (29), 153 (25), 67 (23), 135 (11)....] | 17.79 | 2056 | 4.60 | | | |
| Linoleic acid | 18.64 | 2143 | 67.88 | | | |
| Ethyl linoleate | 18.70* | 2149 | 48.79 | 18.06 | 2487 | 1.49 |
| Oleic acid | 18.70* | 2149 | [49.27] | | | |
| Ethyl linolenate | 18.82 | 2161 | 6.30 | 18.63 | 2553 | 3.36 |
| Stearic acid | 18.93 | 2173 | 17.05 | | | |
| Unknown [m/z 43, 156 (34), 135 (32), 155 (30), 91 (27), 229 (25)....] | 20.10 | 2297 | 6.85 | | | |
| Sesamin | 26.56 | 3109 | 2.39 | | | |
| β-Amyrin | 28.38 | 3292 | 37.16 | | | |
| α-Amyrin | 28.92 | 3332 | 74.90 | | | |
| Amyrin isomer? | 30.06 | 3412 | 18.15 | | | |
| Unknown [m/z 189, 207 (69), 121 (53), 95 (53), 135 (44), 109 (43)....] | 30.20 | 3420 | 19.53 | | | |

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

Individual compounds contents were corrected following the method of Cachet et al., 2016 (Flavour and Fragrance Journal guidelines).

Unknown compounds are expressed in equivalents of internal standard without correction.

R.T.: Retention time (minutes)

R.I.: Retention index