**Date :** December 10, 2020

# *Certificate of Analysis – GC Profiling*

## *Sample identification*

**Internal code :** 20L04-PTH03
**Customer identification :** Cinnamon Leaf - CB0105208R
**Type :** Essential oil
**Source :** *Cinnamomum verum*
**Customer :** Plant Therapy

## *Analysis*

**Method:** PC-MAT-014 ISO - 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 :** December 07, 2020

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Light yellow liquid
**Refractive index:** 1.5331 ± 0.0003 (20 °C; method PC-MAT-016)

*ISO 3524:2004 - OIL OF CINNAMON LEAF, SRI LANKA TYPE*

| Compound | Min. % | Max. % | Observed % | Complies? |
|---|---|---|---|---|
| Benzyl benzoate | 2.0 | 4.0 | 3.3 | Yes |
| Eugenyl acetate | 1.3 | 3.0 | 1.5 | Yes |
| (E)-Cinnamyl acetate | 1.1 | 1.8 | 0.9 | No |
| Eugenol | 70.0 | 83.0 | 77.6 | Yes |
| (E)-Cinnamal | 0.8 | 1.5 | 1.2 | Yes |
| **Refractive index** | 1.5270 | 1.5400 | 1.5331 | Yes |

*CONCLUSION*

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

## *Analysis summary – Consolidated contents*

New readers of similar reports are encouraged to read table footnotes at least once.

| Identification | % | Class |
|---|---|---|
| Isovaleral | tr | Aliphatic aldehyde |
| Styrene | 0.02 | Simple phenolic |
| Tricyclene | 0.01 | Monoterpene |
| α-Thujene | 0.08 | Monoterpene |
| α-Pinene | 1.06 | Monoterpene |
| α-Fenchene | 0.01 | Monoterpene |
| Camphene | 0.22 | Monoterpene |
| Benzaldehyde | 0.14 | Simple phenolic |
| β-Pinene | 0.29 | Monoterpene |
| Sabinene | 0.01 | Monoterpene |
| Myrcene | 0.10 | Monoterpene |
| α-Phellandrene | 0.73 | Monoterpene |
| Octanal | 0.02 | Aliphatic aldehyde |
| Δ3-Carene | 0.06 | Monoterpene |
| α-Terpinene | 0.08 | Monoterpene |
| ortho-Cymene | 0.02 | Monoterpene |
| para-Cymene | 0.60 | Monoterpene |
| Limonene | 0.32 | Monoterpene |
| β-Phellandrene | 0.28 | Monoterpene |
| 1,8-Cineole | 0.08 | Monoterpenic ether |
| Benzyl alcohol | 0.01 | Simple phenolic |
| (*Z*)-β-Ocimene | 0.03 | Monoterpene |
| (*E*)-β-Ocimene | 0.04 | Monoterpene |
| γ-Terpinene | tr | Monoterpene |
| Acetophenone | 0.01 | Simple phenolic |
| *cis*-Sabinene hydrate | 0.01 | Monoterpenic alcohol |
| *cis*-Linalool oxide (fur.) | 0.01 | Monoterpenic alcohol |
| Isoterpinolene | 0.01 | Monoterpene |
| Terpinolene | 0.07 | Monoterpene |
| *trans*-Linalool oxide (fur.) | 0.01 | Monoterpenic alcohol |
| para-Cymenene | 0.01 | Monoterpene |
| *trans*-Sabinene hydrate | 0.01 | Monoterpenic alcohol |
| Linalool | 2.21 | Monoterpenic alcohol |
| (3*E*)-2,7-Dimethyl-3,6-octadien-2-ol | 0.04 | Monoterpenic alcohol |
| *cis*-para-Menth-2-en-1-ol | 0.01 | Monoterpenic alcohol |
| *trans*-Pinocarveol | 0.01 | Monoterpenic alcohol |
| Camphor | 0.01 | Monoterpenic ketone |
| Camphene hydrate | 0.01 | Monoterpenic alcohol |
| Hydrocinnamal | 0.04 | Phenylpropanoid |
| Borneol | 0.07 | Monoterpenic alcohol |
| Benzyl acetate | 0.02 | Phenolic ester |
| Terpinen-4-ol | 0.07 | Monoterpenic alcohol |
| Cryptone | 0.01 | Normonoterpenic ketone |
| para-Cymen-8-ol | 0.03 | Monoterpenic alcohol |
| α-Terpineol | 0.25 | Monoterpenic alcohol |

| | | |
|---|---|---|
| *cis*-Piperitol | 0.02 | Monoterpenic alcohol |
| *cis*-α-Phellandrene epoxide (IPP vs Me) | 0.03 | Monoterpenic ether |
| Hydrocinnamyl alcohol | 0.06 | Phenylpropanoid |
| Phenylethyl acetate | 0.01 | Phenolic ester |
| (*E*)-Cinnamal | 1.18 | Phenylpropanoid |
| Safrole | 0.88 | Phenylpropanoid |
| (*E*)-Cinnamyl alcohol | 0.06 | Phenylpropanoid |
| α-Cubebene | 0.02 | Sesquiterpene |
| Eugenol | 77.61 | Phenylpropanoid |
| Hydrocinnamyl acetate | 0.07 | Phenylpropanoid ester |
| ortho-Methoxyhydrocinnamal? | 0.03 | Phenylpropanoid |
| α-Copaene | 0.62 | Sesquiterpene |
| β-Cubebene | 0.01 | Sesquiterpene |
| β-Elemene | 0.02 | Sesquiterpene |
| α-Gurjunene | tr | Sesquiterpene |
| Methyleugenol | 0.04 | Phenylpropanoid |
| β-Caryophyllene | 3.73 | Sesquiterpene |
| Caryophylla-4(12),8(13)-diene | tr | Sesquiterpene |
| (*E*)-Cinnamyl acetate | 0.89 | Phenylpropanoid ester |
| α-Humulene | 0.48 | Sesquiterpene |
| (*E*)-Isoeugenol | 0.13 | Phenylpropanoid |
| allo-Aromadendrene | 0.03 | Sesquiterpene |
| *trans*-Cadina-1(6),4-diene | 0.01 | Sesquiterpene |
| γ-Muurolene | 0.02 | Sesquiterpene |
| Germacrene D | 0.01 | Sesquiterpene |
| Unknown | 0.02 | Sesquiterpene |
| ar-Curcumene | 0.01 | Sesquiterpene |
| Bicyclogermacrene | 0.03 | Sesquiterpene |
| Viridiflorene | 0.04 | Sesquiterpene |
| α-Muurolene | 0.02 | Sesquiterpene |
| γ-Cadinene | 0.03 | Sesquiterpene |
| Cubebol | 0.01 | Sesquiterpenic alcohol |
| δ-Cadinene | 0.12 | Sesquiterpene |
| *trans*-Calamenene | 0.03 | Sesquiterpene |
| Eugenyl acetate | 1.52 | Phenylpropanoid ester |
| *trans*-Cadina-1,4-diene | 0.02 | Sesquiterpene |
| (*E*)-ortho-Methoxycinnamal | 0.02 | Phenylpropanoid |
| α-Calacorene | 0.02 | Sesquiterpene |
| Isocaryophyllene epoxide B | 0.02 | Sesquiterpenic ether |
| Spathulenol | 0.04 | Sesquiterpenic alcohol |
| Caryophyllene oxide | 0.32 | Sesquiterpenic ether |
| Humulene epoxide II | 0.05 | Sesquiterpenic ether |
| Tetradecanal | 0.03 | Aliphatic aldehyde |
| 1,10-diepi-Cubenol | 0.01 | Sesquiterpenic alcohol |
| Caryophylladienol I | 0.02 | Sesquiterpenic alcohol |
| Caryophylladienol II | 0.03 | Sesquiterpenic alcohol |
| τ-Cadinol | 0.01 | Sesquiterpenic alcohol |
| τ-Muurolol | 0.02 | Sesquiterpenic alcohol |
| α-Cadinol | 0.01 | Sesquiterpenic alcohol |
| (3*Z*)-Caryophylla-3,8(13)-dien-5β-ol | 0.03 | Sesquiterpenic alcohol |
| (*E*)-Coniferyl alcohol | 0.01 | Phenylpropanoid |
| (*E*)-Coniferaldehyde | 0.01 | Phenylpropanoid |

| | | |
|---|---|---|
| Benzyl benzoate | 3.33 | Phenolic ester |
| Phenylethyl benzoate | 0.04 | Phenolic ester |
| Unknown | 0.01 | Unknown |
| Unknown | 0.01 | Unknown |
| Unknown | 0.01 | Unknown |
| Unknown | 0.06 | Lignan |
| Unknown | 0.02 | Lignan |
| Unknown | 0.02 | Unknown |
| **Consolidated total** | **99.06%** | |

tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

**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.

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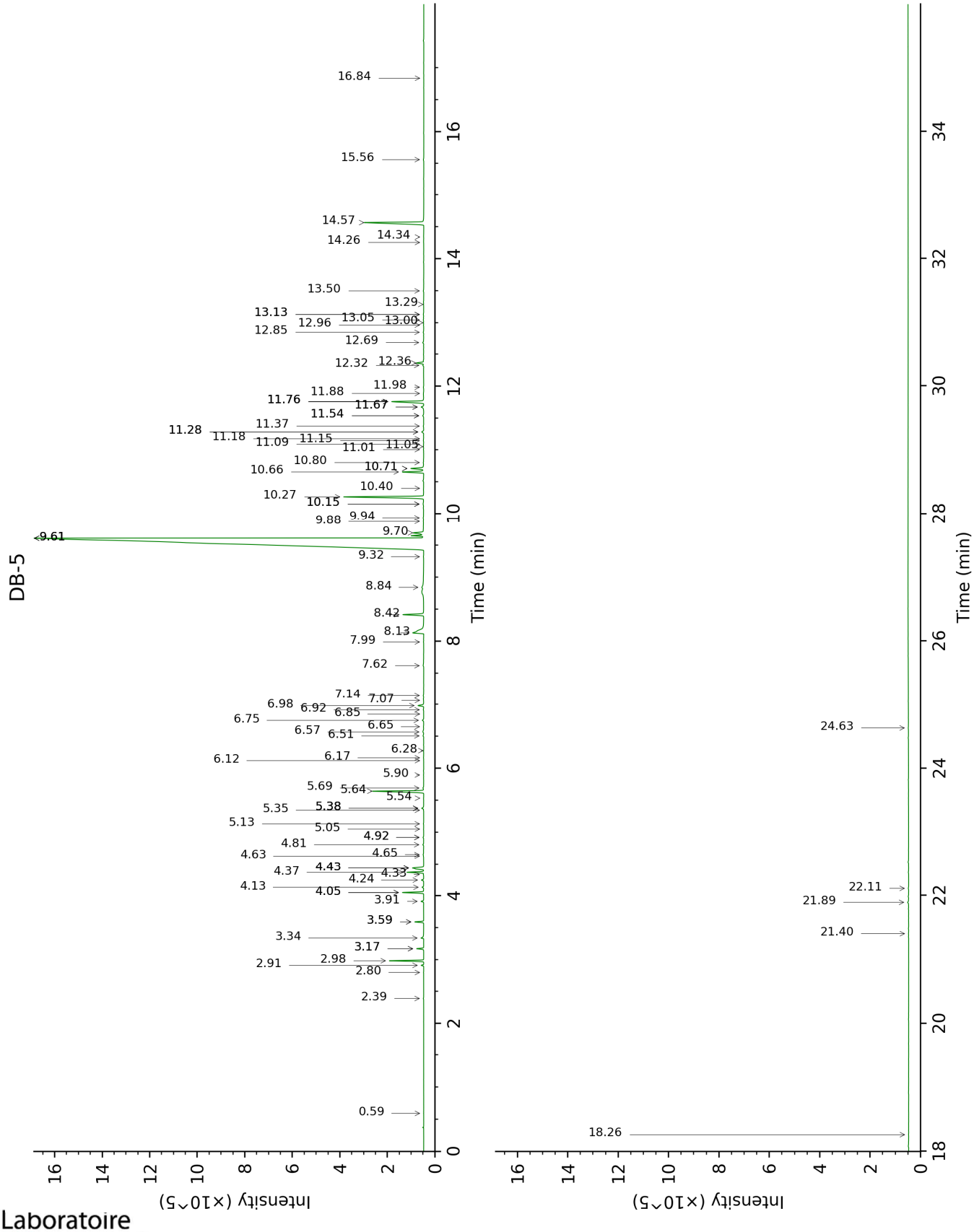
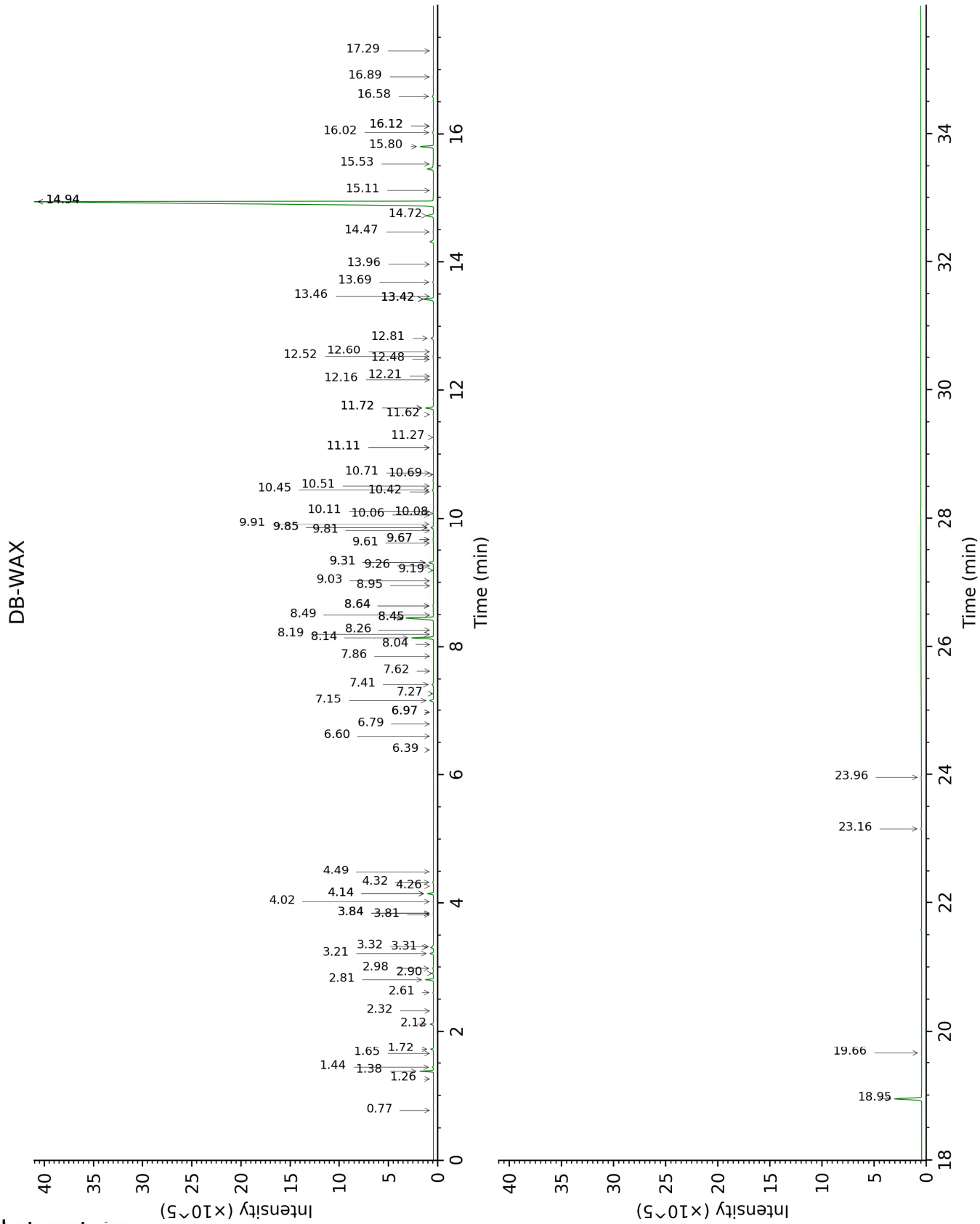

DB-5
Time (min)
Intensity (×10^5)
16.84
15.56
14.57
14.34
14.26
13.50
13.29
13.13
13.05
13.00
12.96
12.85
12.69
12.36
12.32
11.98
11.88
11.76
11.67
11.54
11.37
11.28
11.18
11.09
11.15
11.01
11.05
10.80
10.71
10.66
10.40
10.27
10.15
9.94
9.88
9.70
9.61
9.32
8.84
8.42
8.13
7.99
7.62
7.14
7.07
6.98
6.92
6.85
6.75
6.65
6.57
6.51
6.28
6.17
6.12
5.90
5.69
5.64
5.54
5.38
5.35
5.13
5.05
4.92
4.81
4.65
4.63
4.43
4.37
4.33
4.24
4.13
4.05
3.91
3.59
3.34
3.17
2.98
2.91
2.80
2.39
0.59
24.63
22.11
21.89
21.40
18.26

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*FULL ANALYSIS DATA*

| Identification | Column DB-5 | | | Column DB-WAX | | |
|---|---|---|---|---|---|---|
| | R.T | R.I | % | R.T | R.I | % |
| Isovaleral | 0.59 | 639 | tr | 0.77 | 888 | tr |
| Styrene | 2.39 | 888 | 0.02 | 3.84*† | 1205 | [0.05] |
| Tricyclene | 2.80 | 918 | 0.01 | 1.26 | 970 | 0.01 |
| α-Thujene | 2.91 | 926 | 0.08 | 1.44 | 997 | 0.08 |
| α-Pinene | 2.98 | 930 | 1.06 | 1.38 | 990 | 1.04 |
| α-Fenchene | 3.17* | 943 | 0.24 | 1.65 | 1018 | 0.01 |
| Camphene | 3.17* | 943 | [0.24] | 1.72 | 1025 | 0.22 |
| Benzaldehyde | 3.34 | 954 | 0.14 | 7.41 | 1464 | 0.15 |
| β-Pinene | 3.59* | 970 | 0.30 | 2.12 | 1065 | 0.29 |
| Sabinene | 3.59* | 970 | [0.30] | 2.32 | 1086 | 0.01 |
| Myrcene | 3.91 | 992 | 0.10 | 2.90 | 1133 | 0.10 |
| α-Phellandrene | 4.05* | 1001 | 0.75 | 2.81 | 1125 | 0.73 |
| Octanal | 4.05* | 1001 | [0.75] | 4.49 | 1253 | 0.02 |
| Δ3-Carene | 4.13 | 1006 | 0.06 | 2.61 | 1110 | 0.06 |
| α-Terpinene | 4.24 | 1013 | 0.08 | 2.98 | 1139 | 0.08 |
| ortho-Cymene | 4.33 | 1019 | 0.02 | 4.14* | 1227 | 0.61 |
| para-Cymene | 4.37 | 1021 | 0.60 | 4.14* | 1227 | [0.61] |
| Limonene | 4.43* | 1025 | 0.68 | 3.21 | 1157 | 0.32 |
| β-Phellandrene | 4.43* | 1025 | [0.68] | 3.31 | 1164 | 0.28 |
| 1,8-Cineole | 4.43* | 1025 | [0.68] | 3.32 | 1166 | 0.08 |
| Benzyl alcohol | 4.63 | 1037 | 0.01 | 11.72* | 1810 | 0.91 |
| (*Z*)-β-Ocimene | 4.65 | 1039 | 0.03 | 3.81† | 1203 | 0.05 |
| (*E*)-β-Ocimene | 4.81 | 1049 | 0.04 | 4.02 | 1218 | 0.04 |
| γ-Terpinene | 4.92* | 1056 | 0.03 | 3.84*† | 1205 | [0.05] |
| Acetophenone | 4.92* | 1056 | [0.03] | 8.95 | 1581 | 0.01 |
| *cis*-Sabinene hydrate | 5.05 | 1064 | 0.01 | 6.97* | 1431 | 0.02 |
| *cis*-Linalool oxide (fur.) | 5.13 | 1069 | 0.01 | 6.60 | 1404 | 0.01 |
| Isoterpinolene | 5.35 | 1083 | 0.01 | 4.26 | 1236 | 0.01 |
| Terpinolene | 5.38* | 1085 | 0.09 | 4.32 | 1240 | 0.07 |
| *trans*-Linalool oxide (fur.) | 5.38* | 1085 | [0.09] | 6.97* | 1431 | [0.02] |
| para-Cymenene | 5.38* | 1085 | [0.09] | 6.39 | 1388 | 0.01 |
| *trans*-Sabinene hydrate | 5.54 | 1095 | 0.01 | 8.04 | 1511 | 0.01 |
| Linalool | 5.64 | 1102 | 2.21 | 8.14 | 1519 | 2.19 |
| (3*E*)-2,7-Dimethyl-3,6-octadien-2-ol | 5.69 | 1105 | 0.04 | 8.26 | 1528 | 0.01 |
| *cis*-para-Menth-2-en-1-ol | 5.90 | 1118 | 0.01 | 8.19 | 1523 | 0.02 |
| *trans*-Pinocarveol | 6.12 | 1132 | 0.01 | 9.19 | 1600 | 0.01 |
| Camphor | 6.17 | 1135 | 0.01 | 7.27 | 1454 | 0.01 |
| Camphene hydrate | 6.28 | 1142 | 0.01 | 8.49 | 1546 | 0.01 |
| Hydrocinnamal | 6.51 | 1157 | 0.04 | 10.51 | 1707 | 0.04 |
| Borneol | 6.57 | 1161 | 0.07 | 9.85* | 1654 | 0.28 |
| Benzyl acetate | 6.65 | 1167 | 0.02 | 10.08 | 1672 | 0.03 |
| Terpinen-4-ol | 6.75 | 1173 | 0.07 | 8.64* | 1557 | 0.08 |
| Cryptone | 6.85 | 1179 | 0.01 | 9.26 | 1606 | 0.01 |
| para-Cymen-8-ol | 6.92 | 1184 | 0.03 | 11.62 | 1801 | 0.04 |
| α-Terpineol | 6.98 | 1188 | 0.25 | 9.85* | 1654 | [0.28] |
| *cis*-Piperitol | 7.06 | 1193 | 0.02 | 9.61 | 1634 | 0.02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *cis*-α-Phellandrene epoxide (IPP vs Me) | 7.14 | 1198 | 0.03 | 11.10* | 1757 | 0.06 |
| Hydrocinnamyl alcohol | 7.62 | 1231 | 0.06 | 13.69 | 1987 | 0.09 |
| Phenylethyl acetate | 7.99 | 1256 | 0.01 | 11.10* | 1757 | [0.06] |
| (*E*)-Cinnamal | 8.13 | 1266 | 1.18 | 13.42* | 1963 | 1.22 |
| Safrole | 8.42 | 1285 | 0.88 | 11.72* | 1810 | [0.91] |
| (*E*)-Cinnamyl alcohol | 8.84 | 1310 | 0.06 | 16.02 | 2216 | 0.10 |
| α-Cubebene | 9.32 | 1344 | 0.02 | 6.79 | 1418 | 0.01 |
| Eugenol | 9.61*† | 1365 | 77.70 | 14.94* | 2107 | 76.03 |
| Hydrocinnamyl acetate | 9.61*† | 1365 | [77.70] | 12.52 | 1880 | 0.07 |
| ortho-Methoxyhydrocinnamal? | 9.61*† | 1365 | [77.70] | 13.96 | 2013 | 0.03 |
| α-Copaene | 9.70 | 1371 | 0.62 | 7.15 | 1445 | 0.42 |
| β-Cubebene | 9.88 | 1384 | 0.01 | 7.86 | 1497 | 0.01 |
| β-Elemene | 9.94 | 1388 | 0.02 | 8.45* | 1542 | 3.64 |
| α-Gurjunene | 10.16* | 1404 | 0.05 | 7.62 | 1479 | tr |
| Methyleugenol | 10.16* | 1404 | [0.05] | 13.42* | 1963 | [1.22] |
| β-Caryophyllene | 10.27 | 1412 | 3.73 | 8.45* | 1542 | [3.64] |
| Caryophylla-4(12),8(13)-diene | 10.40 | 1422 | tr | 8.64* | 1557 | [0.08] |
| (*E*)-Cinnamyl acetate | 10.66 | 1442 | 0.89 | 14.72 | 2085 | 0.93 |
| α-Humulene | 10.71* | 1446 | 0.61 | 9.31* | 1610 | 0.53 |
| (*E*)-Isoeugenol | 10.71* | 1446 | [0.61] | 16.58 | 2273 | 0.13 |
| allo-Aromadendrene | 10.80 | 1453 | 0.03 | 9.03 | 1587 | 0.03 |
| *trans*-Cadina-1(6),4-diene | 11.01 | 1468 | 0.01 | 9.31* | 1610 | [0.53] |
| γ-Muurolene | 11.05 | 1471 | 0.02 | 9.67* | 1639 | 0.06 |
| Germacrene D | 11.09 | 1474 | 0.01 | 9.81 | 1650 | 0.01 |
| Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)] | 11.15 | 1478 | 0.02 | 9.91 | 1658 | 0.02 |
| ar-Curcumene | 11.18 | 1480 | 0.01 | 10.71 | 1724 | 0.01 |
| Bicyclogermacrene | 11.28* | 1488 | 0.11 | 10.11 | 1674 | 0.03 |
| Viridiflorene | 11.28* | 1488 | [0.11] | 9.67* | 1639 | [0.06] |
| α-Muurolene | 11.37 | 1495 | 0.02 | 10.06 | 1670 | 0.01 |
| γ-Cadinene | 11.54* | 1508 | 0.06 | 10.42 | 1700 | 0.03 |
| Cubebol | 11.54* | 1508 | [0.06] | 12.60 | 1887 | 0.01 |
| δ-Cadinene | 11.67* | 1518 | 0.15 | 10.45 | 1702 | 0.12 |
| *trans*-Calamenene | 11.67* | 1518 | [0.15] | 11.26 | 1771 | 0.03 |
| Eugenyl acetate | 11.76* | 1525 | 1.55 | 15.80 | 2193 | 1.52 |
| *trans*-Cadina-1,4-diene | 11.76* | 1525 | [1.55] | 10.69 | 1722 | 0.02 |
| (*E*)-ortho-Methoxycinnamal | 11.76* | 1525 | [1.55] | 17.29 | 2349 | 0.02 |
| α-Calacorene | 11.88 | 1535 | 0.02 | 12.16 | 1848 | 0.02 |
| Isocaryophyllene epoxide B | 11.98 | 1543 | 0.02 | 12.21 | 1853 | 0.01 |
| Spathulenol | 12.32 | 1570 | 0.04 | 14.47 | 2061 | 0.06 |
| Caryophyllene oxide | 12.36 | 1573 | 0.32 | 12.82 | 1907 | 0.31 |
| Humulene epoxide II | 12.69 | 1599 | 0.05 | 13.42* | 1963 | [1.22] |
| Tetradecanal | 12.85 | 1612 | 0.03 | 12.48 | 1876 | 0.03 |
| 1,10-diepi-Cubenol | 12.96 | 1621 | 0.01 | 13.46 | 1966 | 0.01 |
| Caryophylladienol I | 13.00 | 1624 | 0.02 | 16.12* | 2226 | 0.03 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Caryophylladienol II | 13.05 | 1628 | 0.03 | 16.12* | 2226 | [0.03] |
| τ-Cadinol | 13.13* | 1635 | 0.03 | 14.94* | 2107 | [76.03] |
| τ-Muurolol | 13.13* | 1635 | [0.03] | 15.11 | 2124 | 0.02 |
| α-Cadinol | 13.29 | 1648 | 0.01 | 15.53 | 2166 | 0.02 |
| (3*Z*)-Caryophylla-3,8(13)-dien-5β-ol | 13.50 | 1665 | 0.03 | 16.89 | 2305 | 0.04 |
| (*E*)-Coniferyl alcohol | 14.26 | 1729 | 0.01 | 23.16 | 3056 | 0.09 |
| (*E*)-Coniferaldehyde | 14.34 | 1737 | 0.01 | 23.96 | 3166 | 0.03 |
| Benzyl benzoate | 14.57 | 1756 | 3.33 | 18.95 | 2532 | 3.30 |
| Phenylethyl benzoate | 15.56 | 1844 | 0.04 | 19.66 | 2614 | 0.03 |
| Unknown [m/z 93, 92 (57), 136 (34), 91 (23), 77 (13), 134 (11)...] | 16.84 | 1962 | 0.01 | | | |
| Unknown [m/z 69, 91 (57), 41 (49), 181 (32), 169 (25), 167 (22)...] | 18.26 | 2100 | 0.01 | | | |
| Unknown [m/z 151, 93 (44), 153 (29), 92 (21), 179 (18)... 314? (10)] | 21.40 | 2437 | 0.01 | | | |
| Unknown [m/z 326, 148 (67), 147 (41), 117 (30), 91 (22)...] | 21.89 | 2493 | 0.06 | | | |
| Unknown [m/z 326, 150 (54), 161 (42), 202 (41), 201 (28)] | 22.11 | 2519 | 0.02 | | | |
| Unknown [m/z 137, 166 (86), 177 (80), 138 (72), 342 (37), 178 (12)...] | 24.63 | 2830 | 0.02 | | | |
| **Total identified** | | **99.00%** | | | **97.12%** | |
| **Total reported** | | **99.14%** | | | **97.14%** | |

*: 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
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied
R.T.: Retention time (minutes)
R.I.: Retention index