**Date :** April 14, 2023

# *Certificate of Analysis – GC Profiling*

## *Sample identification*

**Internal code :** 23D06-PTH01
**Customer identification :** Key Lime - Mexico - K30101R
**Type :** Essential oil
**Source :** *Citrus aurantifolia*
**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 2014-005
**Analysis date :** April 12, 2023

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

*Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.*



Méthode certifiée ISO 17025:2017 Certified method

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Yellow green liquid
**Refractive index:** 1.4851 ± 0.0003 (20 °C; method PC-MAT-016)

*CONCLUSION*

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

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## *Analysis summary – Consolidated contents*

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

| Identification | % | Class |
|---|---|---|
| 2-Methyl-3-buten-2-ol | tr | Aliphatic alcohol |
| Heptanal | 0.01 | Aliphatic aldehyde |
| Tricyclene | 0.02 | Monoterpene |
| α-Thujene | 0.40 | Monoterpene |
| α-Pinene | 2.41 | Monoterpene |
| Camphene | 0.11 | Monoterpene |
| α-Fenchene | tr | Monoterpene |
| Thuja-2,4(10)-diene | 0.01 | Monoterpene |
| Sabinene | 2.50 | Monoterpene |
| β-Pinene | 20.15 | Monoterpene |
| 6-Methyl-5-hepten-2-one | 0.02 | Aliphatic ketone |
| Myrcene | 1.24 | Monoterpene |
| α-Phellandrene | 0.05 | Monoterpene |
| Octanal | 0.03 | Aliphatic aldehyde |
| Pseudolimonene | 0.01 | Monoterpene |
| Δ3-Carene | 0.01 | Monoterpene |
| α-Terpinene | 0.27 | Monoterpene |
| para-Cymene | 0.25 | Monoterpene |
| β-Phellandrene | 0.53 | Monoterpene |
| Limonene | 45.33 | Monoterpene |
| (*Z*)-β-Ocimene | 0.15 | Monoterpene |
| (*E*)-β-Ocimene | 0.37 | Monoterpene |
| γ-Terpinene | 7.39 | Monoterpene |
| *cis*-Sabinene hydrate | 0.04 | Monoterpenic alcohol |
| Terpinolene | 0.42 | Monoterpene |
| *trans*-Sabinene hydrate | 0.04 | Monoterpenic alcohol |
| Linalool | 0.15 | Monoterpenic alcohol |
| Nonanal | 0.02 | Aliphatic aldehyde |
| endo-Fenchol | 0.01 | Monoterpenic alcohol |
| *trans*-para-Mentha-2,8-dien-1-ol | 0.02 | Monoterpenic alcohol |
| 1-Terpineol | 0.02 | Monoterpenic alcohol |
| *cis*-β-Terpineol | 0.01 | Monoterpenic alcohol |
| Citronellal | 0.02 | Monoterpenic aldehyde |
| Borneol | 0.02 | Monoterpenic alcohol |
| Isoneral | 0.02 | Monoterpenic aldehyde |
| Isopinocamphone | 0.02 | Monoterpenic ketone |
| Terpinen-4-ol | 0.50 | Monoterpenic alcohol |
| para-Cymen-8-ol | 0.01 | Monoterpenic alcohol |
| Isogeranial | 0.01 | Monoterpenic aldehyde |
| α-Terpineol | 0.25 | Monoterpenic alcohol |
| Decanal | 0.18 | Aliphatic aldehyde |
| 2,3-Epoxyneral? | 0.02 | Monoterpenic aldehyde |
| Nerol | 0.04 | Monoterpenic alcohol |
| 2,3-Epoxygeranial? | 0.04 | Monoterpenic aldehyde |
| Neral | 1.48 | Monoterpenic aldehyde |

| | | |
|---|---|---|
| Geraniol | 0.05 | Monoterpenic alcohol |
| Geranial | 2.33 | Monoterpenic aldehyde |
| *trans*-Ascaridole glycol | 0.01 | Monoterpenic alcohol |
| Unknown | 0.01 | Unknown |
| Undecanal | 0.03 | Aliphatic aldehyde |
| δ-Elemene | 0.47 | Sesquiterpene |
| Citronellyl acetate | 0.01 | Monoterpenic ester |
| Neryl acetate | 0.09 | Monoterpenic ester |
| Geranyl acetate | 0.18 | Monoterpenic ester |
| β-Elemene | 0.24 | Sesquiterpene |
| Dodecanal | 0.12 | Aliphatic aldehyde |
| β-Caryophyllene | 1.22 | Sesquiterpene |
| *cis*-α-Bergamotene | 0.12 | Sesquiterpene |
| α-Santalene | 0.02 | Sesquiterpene |
| γ-Elemene | 0.06 | Sesquiterpene |
| *trans*-α-Bergamotene | 1.51 | Sesquiterpene |
| α-Humulene | 0.16 | Sesquiterpene |
| β-Santalene | 0.01 | Sesquiterpene |
| (*E*)-β-Farnesene | 0.22 | Sesquiterpene |
| Selina-4,11-diene | 0.02 | Sesquiterpene |
| Germacrene D | 0.33 | Sesquiterpene |
| γ-Curcumene | 0.05 | Sesquiterpene |
| *trans*-β-Bergamotene | 0.05 | Sesquiterpene |
| Unknown | 0.06 | Sesquiterpene |
| δ-Selinene | 0.01 | Sesquiterpene |
| Bicyclogermacrene | 0.02 | Sesquiterpene |
| α-Selinene | 0.03 | Sesquiterpene |
| (3*Z*,6*E*)-α-Farnesene | 0.19 | Sesquiterpene |
| (*Z*)-α-Bisabolene | 0.21 | Sesquiterpene |
| (3*E*,6*E*)-α-Farnesene | 1.31 | Sesquiterpene |
| γ-Cadinene | 0.21 | Sesquiterpene |
| β-Bisabolene | 1.79 | Sesquiterpene |
| (*Z*)-γ-Bisabolene | 0.03 | Sesquiterpene |
| δ-Cadinene | 0.02 | Sesquiterpene |
| Selina-4(15),7(11)-diene | 0.02 | Sesquiterpene |
| Selina-3,7(11)-diene | 0.01 | Sesquiterpene |
| (*E*)-α-Bisabolene | 0.07 | Sesquiterpene |
| Germacrene B | 0.66 | Sesquiterpene |
| Caryophyllenyl alcohol | 0.01 | Sesquiterpenic alcohol |
| Caryophyllene oxide | 0.01 | Sesquiterpenic ether |
| Tetradecanal? | 0.06 | Aliphatic aldehyde |
| Alismol | 0.05 | Sesquiterpenic alcohol |
| Unknown | 0.08 | Oxygenated sesquiterpene |
| Unknown | 0.09 | Oxygenated sesquiterpene |
| α-Bisabolol | 0.12 | Sesquiterpenic alcohol |
| (2*E*,6*Z*)-Farnesal | 0.04 | Sesquiterpenic aldehyde |
| (2*E*,6*E*)-Farnesal | 0.03 | Sesquiterpenic aldehyde |
| Myristic acid | 0.01 | Aliphatic acid |
| Citropten | 0.26 | Furanocoumarin |
| Palmitic acid | 0.04 | Aliphatic acid |
| Bergapten | 0.08 | Furanocoumarin |
| Linoleic acid | 0.07 | Aliphatic acid |

| | | |
|---|---|---|
| Oleic acid | 0.02 | Aliphatic acid |
| *cis*-Vaccenic acid? | 0.01 | Aliphatic acid |
| Isopimpinellin | 0.22 | Furanocoumarin |
| Oxypeucedanin | 0.01 | Furanocoumarin |
| **Consolidated total** | **97.76%** | |

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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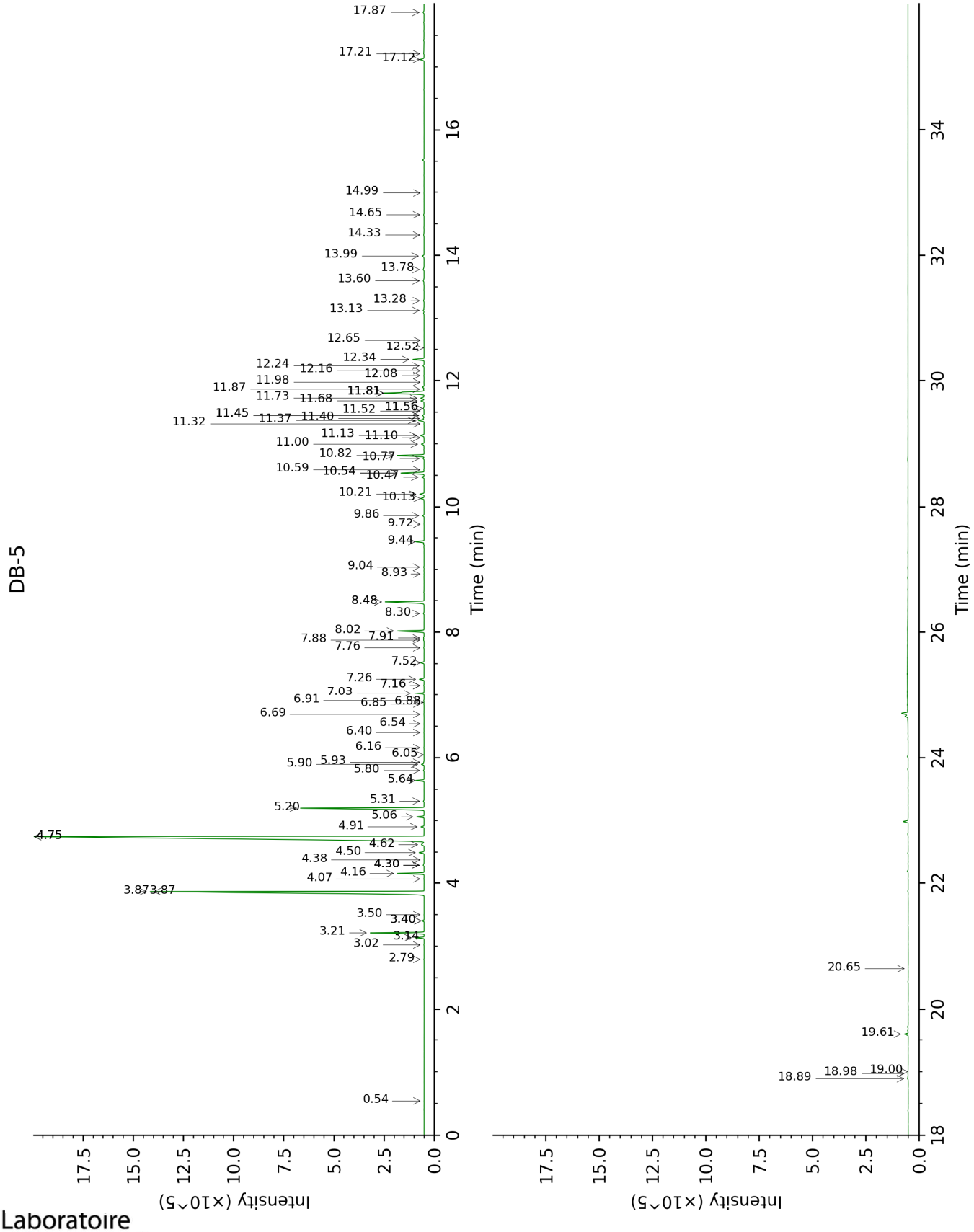
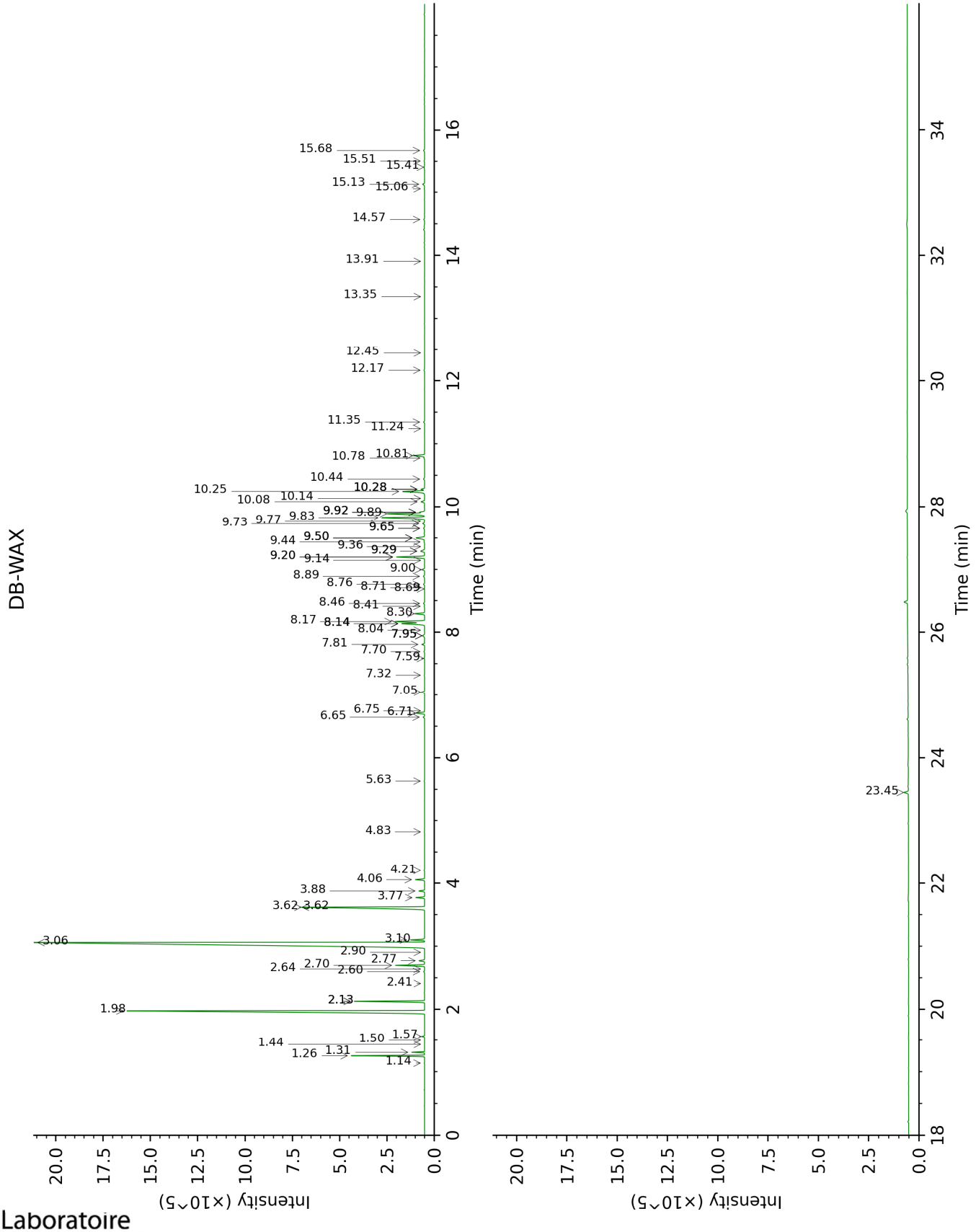

DB-5
Time (min)
Intensity (×10^5)
17.87
17.21
17.12
14.99
14.65
14.33
13.99
13.78
13.60
13.28
13.13
12.65
12.52
12.34
12.24
12.16
12.08
11.98
11.87
11.81
11.73
11.68
11.52
11.56
11.45
11.37
11.40
11.32
11.13
11.10
11.00
10.82
10.77
10.59
10.54
10.47
10.21
10.13
9.86
9.72
9.44
9.04
8.93
8.48
8.30
8.02
7.91
7.88
7.76
7.52
7.26
7.16
7.03
6.91
6.85
6.88
6.69
6.54
6.40
6.16
6.05
5.90
5.93
5.80
5.64
5.31
5.20
5.06
4.91
4.75
4.62
4.50
4.38
4.30
4.16
4.07
3.87
3.87
3.50
3.40
3.21
3.14
3.02
2.79
0.54
20.65
19.61
18.89
18.98
19.00

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*FULL ANALYSIS DATA*

| Identification | Column DB-5 | | | Column DB-WAX | | |
|---|---|---|---|---|---|---|
| | R.T | R.I | % | R.T | R.I | % |
| 2-Methyl-3-buten-2-ol | 0.54 | 606 | tr | 1.44 | 1012 | tr |
| Heptanal | 2.79 | 904 | 0.01 | 2.90 | 1151 | 0.01 |
| Tricyclene | 3.02 | 919 | 0.02 | 1.14 | 971 | 0.01 |
| α-Thujene | 3.14 | 926 | 0.40 | 1.31 | 999 | 0.40 |
| α-Pinene | 3.21 | 931 | 2.41 | 1.26 | 991 | 2.42 |
| Camphene | 3.40* | 944 | 0.12 | 1.57 | 1026 | 0.11 |
| α-Fenchene | 3.40* | 944 | [0.12] | 1.50 | 1019 | tr |
| Thuja-2,4(10)-diene | 3.50 | 950 | 0.01 | 2.13* | 1084 | 2.75 |
| Sabinene | 3.87* | 974 | 22.66 | 2.13* | 1084 | [2.75] |
| β-Pinene | 3.87* | 974 | [22.66] | 1.98 | 1068 | 20.15 |
| 6-Methyl-5-hepten-2-one | 4.07 | 988 | 0.02 | 4.83 | 1302 | 0.01 |
| Myrcene | 4.16 | 993 | 1.24 | 2.70 | 1134 | 1.27 |
| α-Phellandrene | 4.30* | 1002 | 0.08 | 2.60 | 1126 | 0.05 |
| Octanal | 4.30* | 1002 | [0.08] | 4.21 | 1254 | 0.03 |
| Pseudolimonene | 4.30* | 1002 | [0.08] | 2.64 | 1129 | 0.01 |
| Δ3-Carene | 4.38 | 1008 | 0.01 | 2.41 | 1110 | 0.01 |
| α-Terpinene | 4.50 | 1015 | 0.27 | 2.77 | 1140 | 0.27 |
| para-Cymene | 4.62 | 1023 | 0.25 | 3.88 | 1229 | 0.26 |
| β-Phellandrene | 4.75* | 1031 | 45.34 | 3.10 | 1167 | 0.53 |
| Limonene | 4.75* | 1031 | [45.34] | 3.06 | 1164 | 45.33 |
| (*Z*)-β-Ocimene | 4.91 | 1041 | 0.15 | 3.62* | 1209 | 7.63 |
| (*E*)-β-Ocimene | 5.06 | 1050 | 0.37 | 3.77 | 1221 | 0.39 |
| γ-Terpinene | 5.20 | 1059 | 7.39 | 3.62* | 1209 | [7.63] |
| *cis*-Sabinene hydrate | 5.31 | 1066 | 0.04 | 6.65 | 1428 | 0.08 |
| Terpinolene | 5.64 | 1086 | 0.42 | 4.06 | 1243 | 0.42 |
| *trans*-Sabinene hydrate | 5.80 | 1096 | 0.04 | 7.70 | 1507 | 0.04 |
| Linalool | 5.90 | 1102 | 0.15 | 7.81 | 1516 | 0.14 |
| Nonanal | 5.93 | 1105 | 0.02 | 5.63 | 1354 | 0.02 |
| endo-Fenchol | 6.05 | 1112 | 0.01 | 8.14*† | 1542 | 2.98 |
| *trans*-para-Mentha-2,8-dien-1-ol | 6.16 | 1119 | 0.02 | 8.69 | 1585 | 0.01 |
| 1-Terpineol | 6.40 | 1135 | 0.02 | 8.04 | 1534 | 0.01 |
| *cis*-β-Terpineol | 6.54 | 1143 | 0.01 | 8.71 | 1586 | 0.01 |
| Citronellal | 6.69 | 1153 | 0.02 | 6.75 | 1436 | 0.01 |
| Borneol | 6.85 | 1163 | 0.02 | 9.50* | 1651 | 0.62 |
| Isoneral | 6.88 | 1165 | 0.02 | 7.59 | 1499 | 0.02 |
| Isopinocamphone | 6.91 | 1167 | 0.02 | 7.32 | 1479 | 0.02 |
| Terpinen-4-ol | 7.03 | 1174 | 0.50 | 8.30 | 1554 | 0.50 |
| para-Cymen-8-ol | 7.16* | 1183 | 0.02 | 11.24 | 1797 | 0.01 |
| Isogeranial | 7.16* | 1183 | [0.02] | 7.95* | 1527 | 0.15 |
| α-Terpineol | 7.26 | 1189 | 0.25 | 9.50* | 1651 | [0.62] |
| Decanal | 7.52 | 1206 | 0.18 | 7.05 | 1458 | 0.17 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2,3-Epoxyneral? | 7.76 | 1222 | 0.02 | | | |
| Nerol | 7.88 | 1230 | 0.04 | 10.78 | 1758 | 0.04 |
| 2,3-Epoxygeranial? | 7.91 | 1232 | 0.04 | | | |
| Neral | 8.02 | 1239 | 1.48 | 9.20* | 1626 | 1.50 |
| Geraniol | 8.30 | 1258 | 0.05 | 11.35 | 1806 | 0.06 |
| Geranial | 8.48* | 1270 | 2.33 | 9.83 | 1678 | 2.33 |
| *trans*-Ascaridole glycol | 8.48* | 1270 | [2.33] | 13.91 | 2042 | 0.01 |
| Unknown [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...] | 8.93 | 1300 | 0.01 | | | |
| Undecanal | 9.04 | 1307 | 0.03 | 8.42 | 1564 | 0.03 |
| δ-Elemene | 9.44 | 1336 | 0.47 | 6.71 | 1433 | 0.47 |
| Citronellyl acetate | 9.72 | 1355 | 0.01 | 9.20* | 1626 | [1.50] |
| Neryl acetate | 9.86 | 1366 | 0.09 | 9.92*† | 1685 | [2.46] |
| Geranyl acetate | 10.14 | 1385 | 0.18 | 10.28* | 1715 | 0.19 |
| β-Elemene | 10.20 | 1390 | 0.24 | 8.14*† | 1542 | [2.98] |
| Dodecanal | 10.47 | 1409 | 0.12 | 9.73 | 1669 | 0.11 |
| β-Caryophyllene | 10.54* | 1413 | 1.39 | 8.14*† | 1542 | [2.98] |
| *cis*-α-Bergamotene | 10.54* | 1413 | [1.39] | 7.95* | 1527 | [0.15] |
| α-Santalene | 10.59 | 1417 | 0.02 | 7.95* | 1527 | [0.15] |
| γ-Elemene | 10.77 | 1431 | 0.06 | 8.76 | 1591 | 0.06 |
| *trans*-α-Bergamotene | 10.82 | 1434 | 1.51 | 8.17† | 1545 | [2.98] |
| α-Humulene | 11.00 | 1448 | 0.16 | 9.00 | 1609 | 0.15 |
| β-Santalene | 11.10 | 1455 | 0.01 | 8.89 | 1601 | 0.08 |
| (*E*)-β-Farnesene | 11.14 | 1458 | 0.22 | 9.29* | 1633 | 0.29 |
| Selina-4,11-diene | 11.32 | 1472 | 0.02 | 9.14 | 1622 | tr |
| Germacrene D | 11.37 | 1476 | 0.33 | 9.50* | 1651 | [0.62] |
| γ-Curcumene | 11.40 | 1478 | 0.05 | 9.44 | 1645 | 0.04 |
| *trans*-β-Bergamotene | 11.45* | 1481 | 0.12 | 9.29* | 1633 | [0.29] |
| Unknown [m/z 41, 69 (90), 79 (78), 93 (72), 91 (70)...204] | 11.45* | 1481 | [0.12] | 8.46 | 1567 | 0.06 |
| δ-Selinene | 11.52 | 1486 | 0.01 | 9.36 | 1639 | 0.01 |
| Bicyclogermacrene | 11.56* | 1490 | 0.07 | 9.77 | 1672 | 0.02 |
| α-Selinene | 11.56* | 1490 | [0.07] | 9.65* | 1663 | 0.06 |
| (3*Z*,6*E*)-α-Farnesene | 11.68 | 1499 | 0.19 | 9.92*† | 1685 | [2.46] |
| (*Z*)-α-Bisabolene | 11.73 | 1502 | 0.21 | 9.92*† | 1685 | [2.46] |
| (3*E*,6*E*)-α-Farnesene | 11.81* | 1508 | 3.31 | 10.25 | 1712 | 1.31 |
| γ-Cadinene | 11.81* | 1508 | [3.31] | 10.08 | 1698 | 0.21 |
| β-Bisabolene | 11.81* | 1508 | [3.31] | 9.89† | 1683 | 2.46 |
| (*Z*)-γ-Bisabolene | 11.87 | 1513 | 0.03 | 9.65* | 1663 | [0.06] |
| δ-Cadinene | 11.98 | 1522 | 0.02 | 10.14 | 1703 | 0.01 |
| Selina-4(15),7(11)-diene | 12.08 | 1530 | 0.02 | 10.28* | 1715 | [0.19] |
| Selina-3,7(11)-diene | 12.16 | 1536 | 0.01 | 10.28* | 1715 | [0.19] |

| | | | | | | |
|---|---|---|---|---|---|---|
| (*E*)-α-Bisabolene | 12.24 | 1542 | 0.07 | 10.44 | 1729 | 0.08 |
| Germacrene B | 12.34 | 1550 | 0.66 | 10.82 | 1761 | 0.66 |
| Caryophyllenyl alcohol | 12.52 | 1564 | 0.01 | 13.35 | 1988 | 0.01 |
| Caryophyllene oxide | 12.66 | 1574 | 0.01 | 12.45 | 1904 | 0.01 |
| Tetradecanal? | 13.13 | 1612 | 0.06 | 12.17 | 1880 | 0.05 |
| Alismol | 13.28 | 1625 | 0.05 | 15.41 | 2191 | 0.03 |
| Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222] | 13.60 | 1651 | 0.08 | 14.57 | 2106 | 0.05 |
| Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222] | 13.78 | 1666 | 0.09 | 15.68 | 2219 | 0.06 |
| α-Bisabolol | 13.99 | 1683 | 0.12 | 15.13 | 2163 | 0.13 |
| (2*E*,6*Z*)-Farnesal | 14.33 | 1711 | 0.04 | 15.06 | 2156 | 0.02 |
| (2*E*,6*E*)-Farnesal | 14.65 | 1739 | 0.03 | 15.51 | 2201 | 0.03 |
| Myristic acid | 14.99 | 1769 | 0.01 | | | |
| Citropten | 17.12 | 1963 | 0.26 | 23.45 | 3158 | 0.27 |
| Palmitic acid | 17.21 | 1972 | 0.04 | | | |
| Bergapten | 17.87 | 2035 | 0.08 | | | |
| Linoleic acid | 18.89 | 2138 | 0.07 | | | |
| Oleic acid | 18.98 | 2147 | 0.02 | | | |
| *cis*-Vaccenic acid? | 19.00 | 2150 | 0.01 | | | |
| Isopimpinellin | 19.61 | 2212 | 0.22 | | | |
| Oxypeucedanin | 20.65 | 2325 | 0.01 | | | |
| **Total identified** | | **97.14%** | | | **97.58%** | |
| **Total reported** | | **97.32%** | | | **97.75%** | |

*: 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