

Date : December 12, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19L10-PTH01-1-CC

Customer identification : Lemon Tea Tree - South African - LU010295R

Type : Essential oil

Source : *Leptospermum petersonii* ct. Citral

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Lindsay Girard, B. Sc.

Analysis date : December 10, 2019

Checked and approved by :

Alexis St-Gelais, M. Sc., 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4778 ± 0.0003 (20 °C)

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 | % | Classe |
|-----------------------------------|---------|---------------------------|
| Ethanol | 0.02 | Aliphatic alcohol |
| Methylcyclopentane | 0.01 | Alkane |
| Isovaleral | tr | Aliphatic aldehyde |
| Unknown | 0.06 | Unknown |
| Unknown | 0.02 | Unknown |
| α -Thujene | 0.03 | Monoterpene |
| α -Pinene | 0.48 | Monoterpene |
| Camphene | 0.01 | Monoterpene |
| Sabinene | 0.04 | Monoterpene |
| Unknown | 0.18* | Unknown |
| β -Pinene | [0.18]* | Monoterpene |
| 6-Methyl-5-hepten-2-one | 0.26 | Aliphatic ketone |
| Dehydro-1,8-cineole | 0.18 | Monoterpenic ether |
| Myrcene | 1.74 | Monoterpene |
| 6-Methyl-5-hepten-2-ol | 0.01 | Aliphatic alcohol |
| α -Phellandrene | 0.03 | Monoterpene |
| α -Terpinene | 0.03 | Monoterpene |
| para-Cymene | 0.06 | Monoterpene |
| Limonene | 0.08 | Monoterpene |
| β -Phellandrene | 0.08* | Monoterpene |
| 1,8-Cineole | [0.08]* | Monoterpenic ether |
| (Z)- β -Ocimene | 0.02 | Monoterpene |
| (E)- β -Ocimene | 0.16 | Monoterpene |
| 2,6-Dimethyl-5-heptenal (melonal) | 0.06 | Aliphatic aldehyde |
| γ -Terpinene | 0.09 | Monoterpene |
| Terpinolene | 0.09 | Monoterpene |
| para-Cymenene | 0.03 | Monoterpene |
| Linalool | 1.70 | Monoterpenic alcohol |
| <i>cis</i> -Chrysanthemal? | 0.02 | Monoterpenic aldehyde |
| <i>cis</i> -Rose oxide | 0.03 | Monoterpenic ether |
| <i>trans</i> -Rose oxide | 0.01 | Monoterpenic ether |
| Unknown | 0.06 | Oxygenated normonoterpene |
| Isopulegol | 2.44 | Monoterpenic alcohol |
| exo-Isocitral | 0.06 | Monoterpenic aldehyde |
| Citronellal | 24.34 | Monoterpenic aldehyde |
| iso-Isopulegol | 1.14 | Monoterpenic alcohol |
| Isoneral | 0.28 | Monoterpenic aldehyde |
| neiso-Isopulegol | 0.14 | Monoterpenic alcohol |
| Terpinen-4-ol | 0.06 | Monoterpenic alcohol |
| Unknown | 0.15 | Oxygenated monoterpene |
| Isogeranial | 0.49 | Monoterpenic aldehyde |
| α -Terpineol | 0.05 | Monoterpenic alcohol |
| β -Phellandren-8-ol | 0.06 | Monoterpenic alcohol |
| Unknown | 0.04 | Unknown |
| <i>trans</i> -Isopiperitenol | 0.06 | Monoterpenic alcohol |
| Unknown | 0.10 | Oxygenated monoterpene |
| <i>cis</i> -Isopiperitenol | 0.05 | Monoterpenic alcohol |

| | | |
|------------------------------|---------------|-------------------------|
| Unknown | tr | Oxygenated monoterpene |
| Nerol | 0.42 | Monoterpenic alcohol |
| Citronellol | 2.57 | Monoterpenic alcohol |
| Neral | 21.23 | Monoterpenic aldehyde |
| Piperitone | 0.03 | Monoterpenic ketone |
| Unknown | tr | Unknown |
| Geraniol | 2.44 | Monoterpenic alcohol |
| Geranial | 29.50 | Monoterpenic aldehyde |
| Unknown | 0.11 | Oxygenated monoterpene |
| Geranyl formate | 0.01 | Monoterpenic ester |
| Citronellic acid | 0.14 | Monoterpenic acid |
| 8-Hydroxymenthol? | 0.27 | Normonoterpenic alcohol |
| Unknown | 0.05 | Unknown |
| α -Terpinyl acetate | 0.02 | Monoterpenic ester |
| 8-Hydroxy-iso-menthol | 0.13 | Monoterpenic alcohol |
| Eugenol | 0.26 | Phenylpropanoid |
| Citronellyl acetate | 0.15 | Monoterpenic ester |
| Unknown | 0.06 | Unknown |
| Neryl acetate | 0.08 | Monoterpenic ester |
| Geranic acid | 0.06 | Aliphatic acid |
| Geranyl acetate | 0.25 | Monoterpenic ester |
| β -Elemene | 0.46 | Sesquiterpene |
| (Z)-Jasmone | 0.01 | Jasmonate |
| Methyleugenol | 0.04 | Phenylpropanoid |
| β -Caryophyllene | 0.15 | Sesquiterpene |
| Aromadendrene | 0.05 | Sesquiterpene |
| α -Humulene | 0.05 | Sesquiterpene |
| allo-Aromadendrene | 0.08 | Sesquiterpene |
| Germacrene D | 0.26 | Sesquiterpene |
| Bicyclogermacrene | 0.99 | Sesquiterpene |
| (3Z,6E)- α -Farnesene | 0.36 | Sesquiterpene |
| (3E,6E)- α -Farnesene | 0.14 | Sesquiterpene |
| δ -Cadinene | 0.08 | Sesquiterpene |
| Spathulenol | 0.08 | Sesquiterpenic alcohol |
| Caryophyllene oxide | 0.02 | Sesquiterpenic ether |
| Caryophyllene oxide isomer | 0.01 | Sesquiterpenic ether |
| Viridiflorol | 0.03 | Sesquiterpenic alcohol |
| Unknown | 0.01 | Oxygenated diterpene |
| Unknown | 0.01 | Oxygenated diterpene |
| Unknown | 0.06 | Oxygenated diterpene |
| Unknown | 0.01 | Oxygenated diterpene |
| Unknown | 0.01 | Oxygenated diterpene |
| Unknown | 0.15 | Unknown |
| Unknown | 0.26 | Unknown |
| Unknown | 0.03 | Oxygenated diterpene |
| Unknown | 0.04 | Oxygenated diterpene |
| Unknown | 0.01 | Unknown |
| Unknown | 0.05 | Unknown |
| Consolidated total | 96.33% | |

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered

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

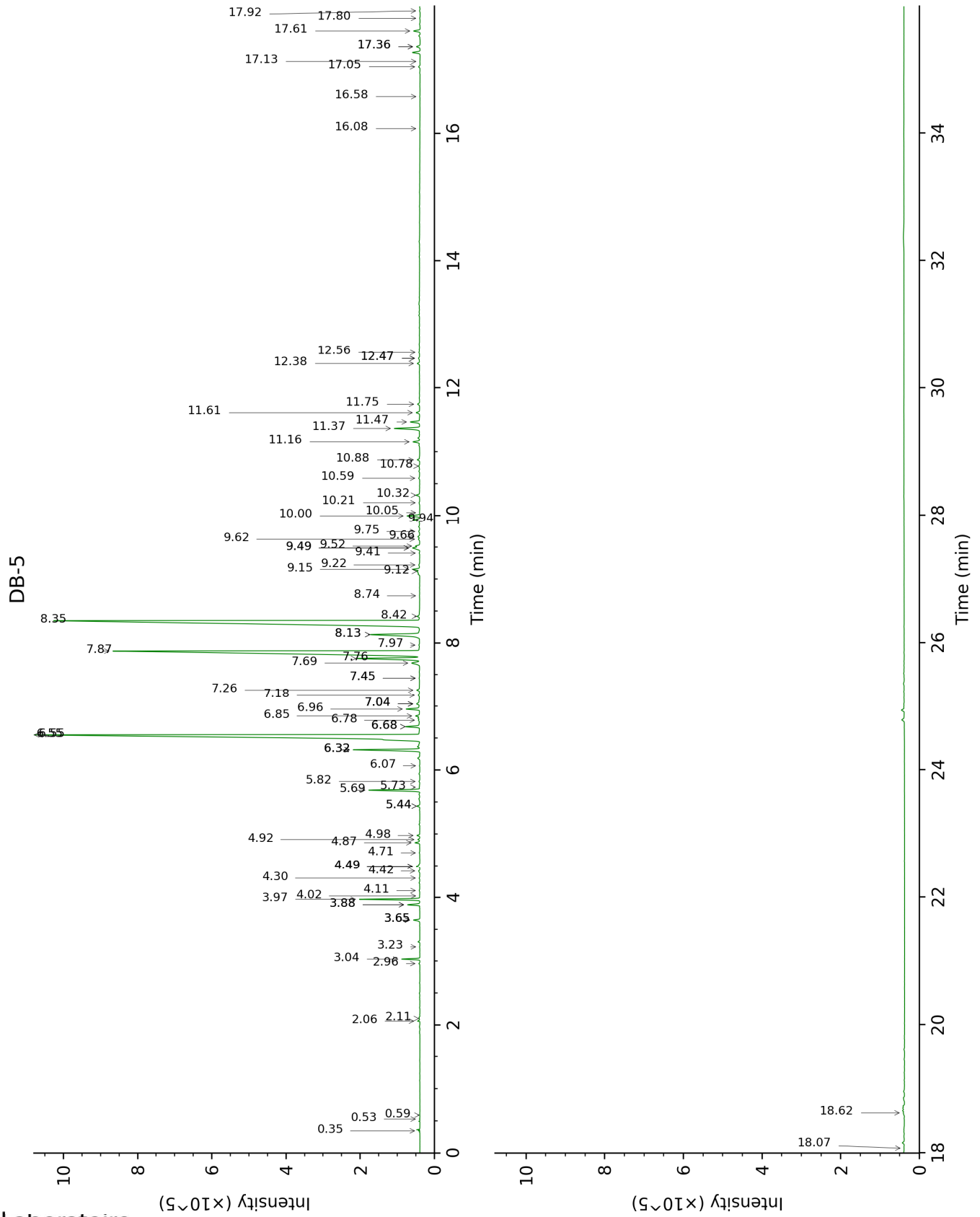
tr: The compound has been detected below 0.005% of total signal.

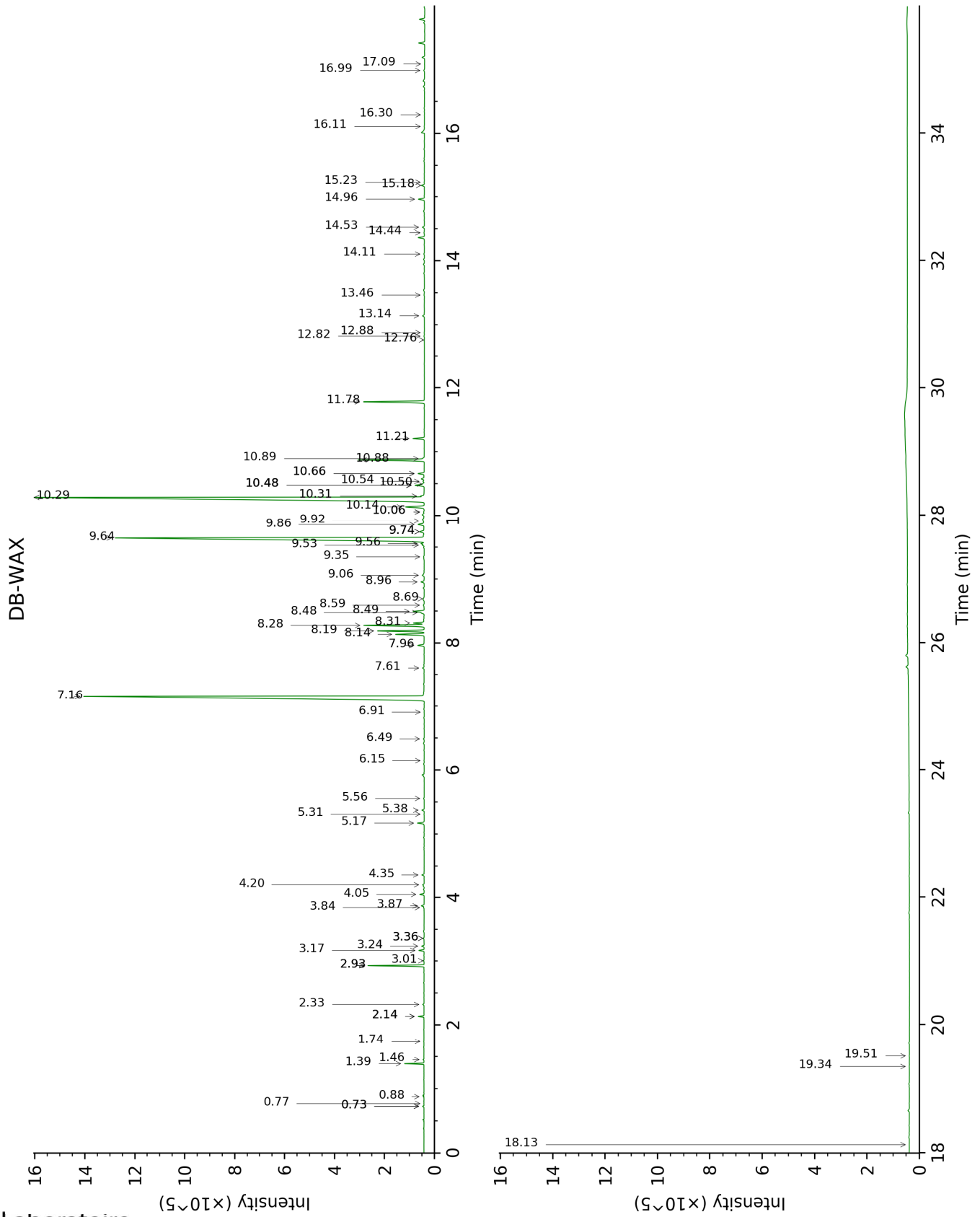
Note: no correction factor was applied

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.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

| Identification | Column DB-5 | | | Column DB-WAX | | |
|--|-------------|------|--------|---------------|------|--------|
| | R.T | R.I | % | R.T | R.I | % |
| Ethanol | 0.35 | 522 | 0.02 | 0.88 | 906 | 0.02 |
| Methylcyclopentane | 0.53 | 616 | 0.01 | | | |
| Isovaleral | 0.59 | 640 | tr | 0.77 | 882 | tr |
| Unknown [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)] | 2.06 | 855 | 0.06 | 0.73* | 867 | 0.05 |
| Unknown [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)] | 2.11 | 859 | 0.02 | 0.73* | 867 | [0.05] |
| α-Thujene | 2.96 | 924 | 0.03 | 1.46 | 998 | 0.02 |
| α-Pinene | 3.04 | 929 | 0.48 | 1.39 | 990 | 0.49 |
| Camphene | 3.23 | 941 | 0.01 | 1.74 | 1026 | tr |
| Sabinene | 3.65* | 969 | 0.22 | 2.32 | 1084 | 0.04 |
| Unknown [m/z 99, 81 (96), 43 (58), 55 (56), 41 (43)...] | 3.65* | 969 | [0.22] | 2.14* | 1066 | 0.18 |
| β-Pinene | 3.65* | 969 | [0.22] | 2.14* | 1066 | [0.18] |
| 6-Methyl-5-hepten-2-one | 3.88* | 985 | 0.41 | 5.17 | 1299 | 0.26 |
| Dehydro-1,8-cineole | 3.88* | 985 | [0.41] | 3.17 | 1152 | 0.18 |
| Myrcene | 3.97 | 991 | 1.74 | 2.93* | 1134 | 1.78 |
| 6-Methyl-5-hepten-2-ol | 4.02 | 994 | 0.01 | 6.91 | 1424 | 0.01 |
| α-Phellandrene | 4.11 | 1000 | 0.03 | 2.93* | 1134 | [1.78] |
| α-Terpinene | 4.30 | 1013 | 0.03 | 3.01 | 1140 | 0.02 |
| para-Cymene | 4.42 | 1020 | 0.06 | 4.20 | 1230 | 0.06 |
| Limonene | 4.49*† | 1025 | 0.16 | 3.24 | 1157 | 0.08 |
| β-Phellandrene | 4.49*† | 1025 | [0.16] | 3.36* | 1167 | 0.03 |
| 1,8-Cineole | 4.49*† | 1025 | [0.16] | 3.36* | 1167 | [0.03] |
| (Z)-β-Ocimene | 4.71 | 1038 | 0.02 | 3.84 | 1204 | 0.02 |
| (E)-β-Ocimene | 4.86 | 1048 | 0.16 | 4.05 | 1219 | 0.16 |
| 2,6-Dimethyl-5-heptenal (melonal) | 4.92 | 1052 | 0.06 | 5.38 | 1314 | 0.09 |
| γ-Terpinene | 4.98 | 1056 | 0.09 | 3.87 | 1206 | 0.11 |
| Terpinolene | 5.44* | 1085 | 0.09 | 4.35 | 1241 | 0.09 |
| para-Cymenene | 5.44* | 1085 | [0.09] | 6.49 | 1394 | 0.03 |
| Linalool | 5.69 | 1101 | 1.70 | 8.19 | 1520 | 1.74 |
| cis-Chrysanthamal? | 5.73 | 1104 | 0.02 | 6.15 | 1369 | 0.01 |
| cis-Rose oxide | 5.82 | 1110 | 0.03 | 5.31 | 1309 | 0.01 |
| trans-Rose oxide | 6.07 | 1126 | 0.01 | 5.56 | 1327 | 0.03 |
| Unknown [m/z 41, 69 (87), 82 (66), 67 (55), 109 (46)... 142 (18)] | 6.32*† | 1143 | 2.48 | 9.53 | 1625 | 0.06 |
| Isopulegol | 6.32*† | 1143 | [2.48] | 8.28 | 1527 | 2.44 |

| | | | | | | |
|---|--------|------|---------|--------|------|--------|
| exo-Isocitral | 6.32*† | 1143 | [2.48] | 7.61 | 1476 | 0.06 |
| Citronellal | 6.55* | 1158 | 25.72 | 7.16 | 1443 | 24.34 |
| iso-Isopulegol | 6.55* | 1158 | [25.72] | 8.14 | 1516 | 1.14 |
| Isoneal | 6.68* | 1167 | 0.51 | 7.96 | 1503 | 0.28 |
| neoiso-Isopulegol | 6.68* | 1167 | [0.51] | 8.96 | 1579 | 0.14 |
| Terpinen-4-ol | 6.78 | 1174 | 0.06 | 8.59 | 1552 | 0.06 |
| Unknown [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)] | 6.85 | 1178 | 0.15 | 9.74* | 1642 | 0.22 |
| Isogeranial | 6.96 | 1185 | 0.49 | 8.31 | 1530 | 0.45 |
| α-Terpineol | 7.04* | 1191 | 0.14 | 9.92 | 1656 | 0.05 |
| β-Phellandren-8-ol | 7.04* | 1191 | [0.14] | 10.90 | 1737 | 0.06 |
| Unknown [m/z 43, 81 (47), 67 (45), 69 (944), 41 (42), 59 (40), 55 (39)...] | 7.04* | 1191 | [0.14] | | | |
| trans-Isopiperitenol | 7.18 | 1200 | 0.06 | 10.50 | 1704 | 0.05 |
| Unknown [m/z 84, 41 (83), 83 (79), 91 (76), 93 (67), 119 (64), 137 (63), 109 (54), 108 (54)... 152 (4)] | 7.26 | 1206 | 0.10 | | | |
| cis-Isopiperitenol | 7.45* | 1219 | 0.02 | 10.48* | 1702 | 0.41 |
| Unknown [m/z 69, 55 (65), 43 (47), 41 (44), 83 (42), 75 (37), 125 (36)... 154 (1)] | 7.45* | 1219 | [0.02] | | | |
| Nerol | 7.69 | 1232 | 0.42 | 11.21 | 1764 | 0.45 |
| Citronellol | 7.76 | 1237 | 2.57 | 10.88 | 1735 | 2.63 |
| Neral | 7.87 | 1244 | 21.23 | 9.64 | 1634 | 21.41 |
| Piperitone | 7.97 | 1251 | 0.03 | 10.06* | 1668 | 0.02 |
| Unknown [m/z 59, 41 (68), 43 (53), 97 (44), 69 (35)...] | 8.13* | 1262 | 2.44 | 10.48* | 1702 | [0.41] |
| Geraniol | 8.13* | 1262 | [2.44] | 11.78 | 1813 | 2.44 |
| Geranial | 8.35 | 1276 | 29.50 | 10.29 | 1686 | 29.89 |
| Unknown [m/z 43, 69 (77), 41 (70), 109 (54)... 152 (6)] | 8.42 | 1280 | 0.11 | 13.14 | 1934 | 0.08 |
| Geranyl formate | 8.74 | 1302 | 0.01 | 10.06* | 1668 | [0.02] |
| Citronellic acid | 9.12 | 1328 | 0.14 | | | |
| 8-Hydroxymenthol? | 9.15 | 1330 | 0.27 | | | |
| Unknown [m/z 82, 59 (44), 41 (43), 95 (31), 43 (29), 81 (24)...] | 9.22 | 1335 | 0.05 | 12.88 | 1910 | 0.01 |
| α-Terpinyl acetate | 9.41 | 1348 | 0.02 | 9.74* | 1642 | [0.22] |
| 8-Hydroxy-iso-menthol | 9.49* | 1354 | 0.36 | 15.18 | 2127 | 0.13 |
| Eugenol | 9.49* | 1354 | [0.36] | 14.96 | 2106 | 0.26 |

| | | | | | | |
|---|--------|------|--------|--------|------|--------|
| Citronellyl acetate | 9.52 | 1356 | 0.15 | 9.56 | 1627 | 0.12 |
| Unknown [m/z 81, 59 (99), 41 (82), 85 (79), 43 (74), 71 (60)...] | 9.62 | 1364 | 0.06 | | | |
| Neryl acetate | 9.66 | 1366 | 0.08 | 10.31 | 1688 | 0.15 |
| Geranic acid | 9.75 | 1372 | 0.06 | 16.99 | 2312 | 0.05 |
| Geranyl acetate | 9.94 | 1385 | 0.25 | 10.66* | 1717 | 0.25 |
| β-Elemene | 10.00 | 1390 | 0.46 | 8.50 | 1544 | 0.48 |
| (Z)-Jasmone | 10.05 | 1393 | 0.01 | | | |
| Methyleugenol | 10.20 | 1404 | 0.04 | 13.46 | 1963 | 0.03 |
| β-Caryophyllene | 10.32 | 1413 | 0.15 | 8.48 | 1542 | 0.11 |
| Aromadendrene | 10.59 | 1433 | 0.05 | 8.69 | 1559 | 0.06 |
| α-Humulene | 10.78 | 1447 | 0.05 | 9.35 | 1610 | 0.03 |
| allo-Aromadendrene | 10.88 | 1454 | 0.08 | 9.06 | 1587 | 0.10 |
| Germacrene D | 11.16 | 1475 | 0.26 | 9.86 | 1652 | 0.32 |
| Bicyclogermacrene | 11.37 | 1490 | 0.99 | 10.14 | 1674 | 0.86 |
| (3Z,6E)-α-Farnesene | 11.47 | 1498 | 0.36 | 10.48* | 1702 | [0.41] |
| (3E,6E)-α-Farnesene | 11.61 | 1509 | 0.14 | 10.66* | 1717 | [0.25] |
| δ-Cadinene | 11.75 | 1519 | 0.08 | 10.54 | 1707 | 0.06 |
| Spathulenol | 12.38 | 1569 | 0.08 | 14.53 | 2063 | 0.09 |
| Caryophyllene oxide | 12.47* | 1576 | 0.05 | 12.82 | 1904 | 0.02 |
| Caryophyllene oxide isomer | 12.47* | 1576 | [0.05] | 12.76 | 1899 | 0.01 |
| Viridiflorol | 12.56 | 1583 | 0.03 | 14.11 | 2023 | 0.03 |
| Unknown [m/z 81, 93 (70), 121 (64), 69 (64), 41 (56), 205 (50)... 290 (19)] | 16.08 | 1885 | 0.01 | 14.44 | 2055 | 0.03 |
| Unknown [m/z 81, 137 (85), 95 (48), 69 (44)... 308? (t)] | 16.58 | 1932 | 0.01 | 15.23 | 2132 | 0.01 |
| Unknown [m/z 81, 137 (60), 69 (47), 95 (41), 41 (39), 55 (25)... 308? (t)] | 17.04 | 1977 | 0.06 | 16.11 | 2221 | 0.02 |
| Unknown [m/z 81, 137 (94), 95 (46), 69 (38), 41 (36)...] | 17.13 | 1985 | 0.01 | 16.30 | 2239 | 0.01 |
| Unknown [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)] | 17.36* | 2007 | 0.16 | 17.09 | 2322 | 0.01 |
| Unknown [m/z 81, 137 (99), 69 (73), 95 (63), 41 (35), 55 (26)...] | 17.36* | 2007 | [0.16] | | | |
| Unknown [m/z 69, 41 (90), 95 (49), 109 (43), 219 (43), 55 | 17.61 | 2032 | 0.26 | | | |

| | | | | | | |
|---|-------|---------------|------|-------|---------------|------|
| (30)... | | | | | | |
| Unknown [m/z 69, 81 (88), 43 (85), 95 (60)... 308 (t)] | 17.80 | 2052 | 0.03 | 19.34 | 2572 | 0.01 |
| Unknown [m/z 81, 95 (49), 69 (48), 137 (47), 43 (36)... 308 (1)] | 17.92 | 2064 | 0.04 | 19.51 | 2591 | 0.01 |
| Unknown [m/z 69, 81 (63), 83 (56), 41 (39), 95 (31)... | 18.07 | 2078 | 0.01 | 18.13 | 2435 | 0.01 |
| Unknown [m/z 69, 41 (38), 151 (36), 123 (34), 82 (24), 43 (23), 109 (21)... | 18.62 | 2135 | 0.05 | | | |
| Total identified | | 95.40% | | | 95.21% | |
| Total reported | | 96.45% | | | 95.48% | |

*: 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