



GC/MS BATCH NUMBER: L70106

ESSENTIAL OIL: LEMON ORGANIC
BOTANICAL NAME: CITRUS X LIMON
ORIGIN: USA

| KEY CONSTITUENTS PRESENT IN THIS BATCH OF LEMON ORGANIC OIL | % |
|---|------|
| LIMONENE | 68.9 |
| β -PINENE | 9.6 |
| γ -TERPINENE | 8.0 |
| SABINENE | 1.7 |
| α -PINENE | 1.6 |
| MYRCENE | 1.5 |
| GERANIAL | 1.1 |

Comments from Robert Tisserand: Fresh, zesty, sharp citrus odor profile. All thirteen key ISO constituents are within range.

Date : March 01, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18B20-PTH2-1-CC

Customer identification : Lemon Organic - USA - L70106712R

Type : Essential oil

Source : *Citrus x limon*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste

Analysis date : March 01, 2018

Checked and approved by :

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

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This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid

Refractive index: 1.4730 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

| Identification | DB-5 (%) | DB-WAX (%) | Classe |
|---------------------------------|----------|------------|-----------------------|
| Toluene | tr | 0.36* | Simple phenolic |
| Hexanal | 0.01 | tr | Aliphatic aldehyde |
| Tricyclene | tr | 0.01 | Monoterpene |
| α -Thujene | 0.35 | [0.36]* | Monoterpene |
| α -Pinene | 1.60 | 1.61 | Monoterpene |
| α -Fenchene | 0.05* | tr | Monoterpene |
| Camphene | [0.05]* | 0.05 | Monoterpene |
| β -Pinene | 11.17* | 9.56 | Monoterpene |
| Sabinene | [11.17]* | 1.65 | Monoterpene |
| 6-Methyl-5-hepten-2-one | 0.01 | 0.01 | Aliphatic ketone |
| Myrcene | 1.52 | 1.54 | Monoterpene |
| α -Phellandrene | 0.04* | 0.03 | Monoterpene |
| Pseudolimonene | [0.04]* | tr | Monoterpene |
| Octanal | 0.07 | 0.06 | Aliphatic aldehyde |
| Δ^3 -Carene | 0.01 | 0.01 | Monoterpene |
| α -Terpinene | 0.16 | 0.16 | Monoterpene |
| para-Cymene | 69.23 | 0.21 | Monoterpene |
| Limonene | [69.23]* | 68.88 | Monoterpene |
| 1,8-Cineole | [69.23]* | 0.31* | Monoterpenic ether |
| β -Phellandrene | [69.23]* | [0.31]* | Monoterpene |
| (Z)- β -Ocimene | 0.08 | 8.05* | Monoterpene |
| (E)- β -Ocimene | 0.08 | 0.08 | Monoterpene |
| γ -Terpinene | 7.99 | [8.05]* | Monoterpene |
| cis-Sabinene hydrate | 0.05 | 0.04 | Monoterpenic alcohol |
| Terpinolene | 0.34 | 0.34 | Monoterpene |
| trans-Sabinene hydrate | 0.04 | 0.04 | Monoterpenic alcohol |
| Linalool | 0.12 | 0.12 | Monoterpenic alcohol |
| Nonanal | 0.09 | 0.08 | Aliphatic aldehyde |
| trans-para-Mentha-2,8-dien-1-ol | 0.01 | 0.01 | Monoterpenic alcohol |
| cis-Limonene oxide | 0.01 | tr | Monoterpenic ether |
| trans-Limonene oxide | 0.01 | tr | Monoterpenic ether |
| Camphor | 0.01 | 0.01 | Monoterpenic ketone |
| Citronellal | 0.09 | 0.08 | Monoterpenic aldehyde |
| Borneol | 0.01 | 0.20* | Monoterpenic alcohol |
| Terpinen-4-ol | 0.03 | 0.03 | Monoterpenic alcohol |
| Isogeranial | 0.01 | 0.05* | Monoterpenic aldehyde |
| α -Terpineol | 0.19 | [0.20]* | Monoterpenic alcohol |
| Decanal | 0.05 | 0.05 | Aliphatic aldehyde |
| 2,3-Epoxyneral? | 0.01 | | Monoterpenic aldehyde |
| Nerol | 0.10 | 0.11 | Monoterpenic alcohol |
| 2,3-Epoxygeranial? | 0.03 | | Monoterpenic aldehyde |
| Carvone | 0.67* | 0.05* | Monoterpenic ketone |
| Neral | [0.67]* | 0.66 | Monoterpenic aldehyde |
| Geraniol | 0.11 | 0.12 | Monoterpenic alcohol |
| Geranial | 1.09* | 1.06 | Monoterpenic aldehyde |
| Perillaldehyde | [1.09]* | 0.01 | Monoterpenic aldehyde |
| Undecanal | 0.02 | 0.02 | Aliphatic aldehyde |
| Citronellyl acetate | 0.04 | 0.03 | Monoterpenic ester |

| | | | |
|--------------------------------------|---------------|---------------|--------------------------|
| Neryl acetate | 0.64 | 0.68 | Monoterpenic ester |
| Geranyl acetate | 0.45 | 0.45 | Monoterpenic ester |
| β -Caryophyllene | 0.29* | 0.68* | Sesquiterpene |
| Dodecanal | [0.29]* | 0.02 | Aliphatic aldehyde |
| <i>cis</i> - α -Bergamotene | 0.01 | [0.05]* | Sesquiterpene |
| <i>trans</i> - α -Bergamotene | 0.47 | [0.68]* | Sesquiterpene |
| Neryl propionate | 0.03 | 0.01 | Monoterpenic ester |
| β -Santalene | 0.06* | 0.02 | Sesquiterpene |
| (<i>E</i>)- β -Farnesene | [0.06]* | 0.04 | Sesquiterpene |
| <i>trans</i> - β -Bergamotene | 0.04 | 0.03 | Sesquiterpene |
| Valencene | 0.06* | 0.05* | Sesquiterpene |
| Bicyclogermacrene | [0.06]* | [0.05]* | Sesquiterpene |
| (<i>Z</i>)- α -Bisabolene | 0.07 | 0.01 | Sesquiterpene |
| β -Bisabolene | 0.72 | 0.69 | Sesquiterpene |
| (<i>Z</i>)- γ -Bisabolene | 0.01 | [0.05]* | Sesquiterpene |
| (<i>E</i>)- α -Bisabolene | 0.02 | 0.03 | Sesquiterpene |
| Unknown | 0.04 | 0.03 | Oxygenated sesquiterpene |
| Unknown | 0.04 | 0.03 | Oxygenated sesquiterpene |
| α -Bisabolol | 0.04 | 0.05* | Sesquiterpenic alcohol |
| Myristic acid | 0.05 | 0.05 | Aliphatic acid |
| meta-Camphorene | 0.02 | [0.05]* | Diterpene |
| Citropten | 0.07 | | Furanocoumarin |
| Palmitic acid | 0.09 | 0.09 | Aliphatic acid |
| Linoleic acid | 0.03 | 0.03 | Aliphatic acid |
| Oleic acid | 0.07 | 0.08 | Aliphatic acid |
| Stearic acid | 0.03 | 0.04 | Aliphatic acid |
| Unknown | | 0.02 | Sesquiterpene |
| Total identified | 98.73% | 98.72% | |

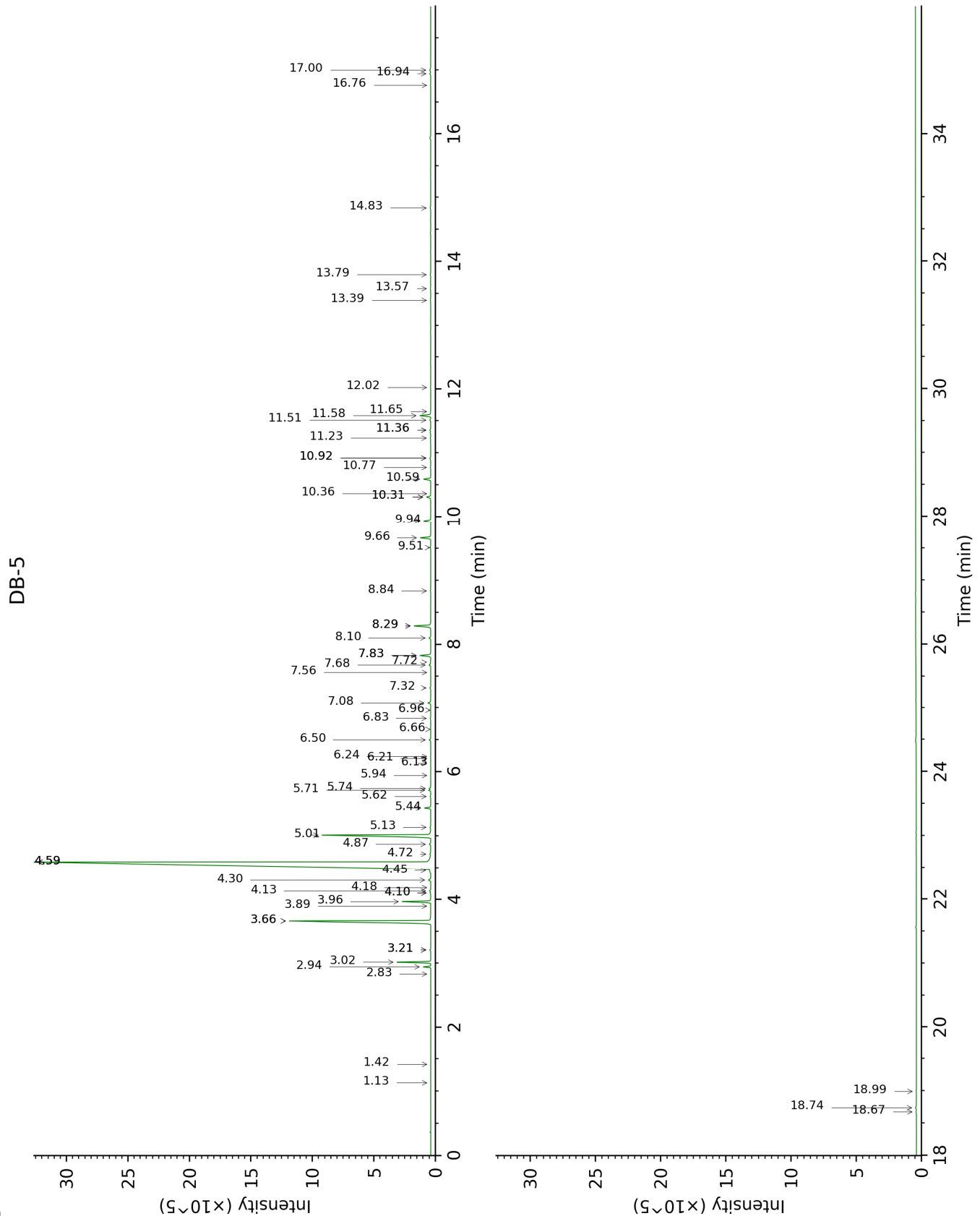
*: Two or more compounds are coeluting on this column

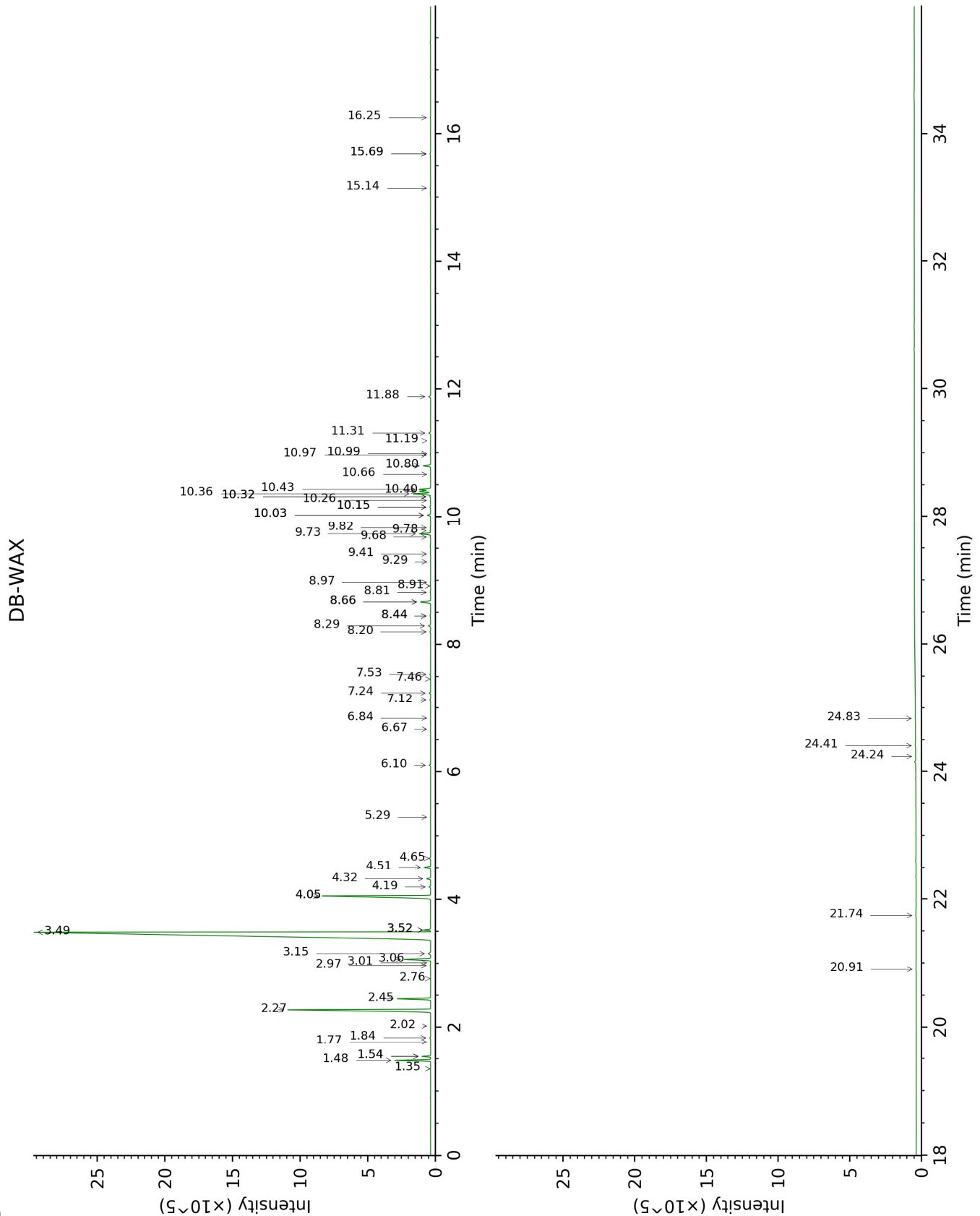
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

| Identification | Column DB-5 | | | Column DB-WAX | | |
|---------------------------------|-------------|------|---------|---------------|------|--------|
| | R.T | R.I | % | R.T | R.I | % |
| Toluene | 1.13 | 753 | tr | 1.54* | 1002 | 0.36 |
| Hexanal | 1.42 | 795 | 0.01 | 2.02 | 1048 | tr |
| Tricyclene | 2.83 | 913 | tr | 1.35 | 975 | 0.01 |
| α -Thujene | 2.94 | 921 | 0.35 | 1.54* | 1002 | [0.36] |
| α -Pinene | 3.02 | 926 | 1.60 | 1.48 | 996 | 1.61 |
| α -Fenchene | 3.21* | 938 | 0.05 | 1.77 | 1024 | tr |
| Camphene | 3.21* | 938 | [0.05] | 1.84 | 1030 | 0.05 |
| β -Pinene | 3.66* | 968 | 11.17 | 2.28 | 1071 | 9.56 |
| Sabinene | 3.66* | 968 | [11.17] | 2.45 | 1087 | 1.65 |
| 6-Methyl-5-hepten-2-one | 3.89 | 984 | 0.01 | 5.29 | 1297 | 0.01 |
| Myrcene | 3.96 | 988 | 1.52 | 3.06 | 1135 | 1.54 |
| α -Phellandrene | 4.10* | 998 | 0.04 | 2.97 | 1128 | 0.03 |
| Pseudolimonene | 4.10* | 998 | [0.04] | 3.01 | 1131 | tr |
| Octanal | 4.13 | 1000 | 0.07 | 4.65 | 1252 | 0.06 |
| Δ 3-Carene | 4.18 | 1003 | 0.01 | 2.76 | 1112 | 0.01 |
| α -Terpinene | 4.30 | 1010 | 0.16 | 3.15 | 1142 | 0.16 |
| para-Cymene | 4.45† | 1020 | 69.23 | 4.32 | 1228 | 0.21 |
| Limonene | 4.59*† | 1028 | [69.23] | 3.49 | 1167 | 68.88 |
| 1,8-Cineole | 4.59*† | 1028 | [69.23] | 3.52* | 1170 | 0.31 |
| β -Phellandrene | 4.59*† | 1028 | [69.23] | 3.52* | 1170 | [0.31] |
| (Z)- β -Ocimene | 4.72 | 1036 | 0.08 | 4.05* | 1209 | 8.05 |
| (E)- β -Ocimene | 4.87 | 1046 | 0.08 | 4.19 | 1219 | 0.08 |
| γ -Terpinene | 5.01 | 1055 | 7.99 | 4.05* | 1209 | [8.05] |
| cis-Sabinene hydrate | 5.13 | 1062 | 0.05 | 7.12 | 1429 | 0.04 |
| Terpinolene | 5.44 | 1082 | 0.34 | 4.51 | 1242 | 0.34 |
| trans-Sabinene hydrate | 5.62 | 1093 | 0.04 | 8.20 | 1509 | 0.04 |
| Linalool | 5.71 | 1099 | 0.12 | 8.29 | 1516 | 0.12 |
| Nonanal | 5.74 | 1101 | 0.09 | 6.10 | 1355 | 0.08 |
| trans-para-Mentha-2,8-dien-1-ol | 5.94 | 1114 | 0.01 | 9.29 | 1593 | 0.01 |
| cis-Limonene oxide | 6.13 | 1126 | 0.01 | 6.67 | 1395 | tr |
| trans-Limonene oxide | 6.21 | 1130 | 0.01 | 6.84 | 1408 | tr |
| Camphor | 6.24 | 1132 | 0.01 | 7.46 | 1454 | 0.01 |
| Citronellal | 6.50 | 1149 | 0.09 | 7.24 | 1437 | 0.08 |
| Borneol | 6.66 | 1160 | 0.01 | 10.03* | 1652 | 0.20 |
| Terpinen-4-ol | 6.83 | 1170 | 0.03 | 8.81 | 1556 | 0.03 |
| Isogeranial | 6.96 | 1178 | 0.01 | 8.44* | 1528 | 0.05 |
| α -Terpineol | 7.08 | 1186 | 0.19 | 10.03* | 1652 | [0.20] |
| Decanal | 7.32 | 1202 | 0.05 | 7.53 | 1459 | 0.05 |
| 2,3-Epoxyneral? | 7.56 | 1218 | 0.01 | | | |
| Nerol | 7.68 | 1225 | 0.10 | 11.31 | 1758 | 0.11 |
| 2,3-Epoxygeranial? | 7.72 | 1228 | 0.03 | | | |

| | | | | | | |
|--|--------|---------------|--------|--------|---------------|--------|
| Carvone | 7.83* | 1235 | 0.67 | 10.32* | 1675 | 0.05 |
| Neral | 7.83* | 1235 | [0.67] | 9.73 | 1628 | 0.66 |
| Geraniol | 8.10 | 1254 | 0.11 | 11.88 | 1807 | 0.12 |
| Geranial | 8.29* | 1266 | 1.09 | 10.36 | 1679 | 1.06 |
| Perillaldehyde | 8.29* | 1266 | [1.09] | 10.99 | 1732 | 0.01 |
| Undecanal | 8.84 | 1303 | 0.02 | 8.91 | 1564 | 0.02 |
| Citronellyl acetate | 9.51 | 1350 | 0.04 | 9.68 | 1624 | 0.03 |
| Neryl acetate | 9.66 | 1361 | 0.64 | 10.43 | 1685 | 0.68 |
| Geranyl acetate | 9.94 | 1380 | 0.45 | 10.80 | 1715 | 0.45 |
| β -Caryophyllene | 10.31* | 1407 | 0.29 | 8.66* | 1545 | 0.68 |
| Dodecanal | 10.31* | 1407 | [0.29] | 10.26 | 1671 | 0.02 |
| <i>cis</i> - α -Bergamotene | 10.36 | 1411 | 0.01 | 8.44* | 1528 | [0.05] |
| <i>trans</i> - α -Bergamotene | 10.59 | 1428 | 0.47 | 8.66* | 1545 | [0.68] |
| Neryl propionate | 10.77 | 1441 | 0.03 | 11.19 | 1748 | 0.01 |
| β -Santalene | 10.92* | 1452 | 0.06 | 9.41 | 1603 | 0.02 |
| (<i>E</i>)- β -Farnesene | 10.92* | 1452 | [0.06] | 9.78 | 1632 | 0.04 |
| <i>trans</i> - β -Bergamotene | 11.23 | 1475 | 0.04 | 9.82 | 1636 | 0.03 |
| Valencene | 11.36* | 1484 | 0.06 | 10.15* | 1662 | 0.05 |
| Bicyclogermacrene | 11.36* | 1484 | [0.06] | 10.32* | 1675 | [0.05] |
| (<i>Z</i>)- α -Bisabolene | 11.51 | 1496 | 0.07 | 10.66 | 1704 | 0.01 |
| β -Bisabolene | 11.58 | 1501 | 0.72 | 10.40 | 1682 | 0.69 |
| (<i>Z</i>)- γ -Bisabolene | 11.65 | 1506 | 0.01 | 10.15* | 1662 | [0.05] |
| (<i>E</i>)- α -Bisabolene | 12.02 | 1536 | 0.02 | 10.97 | 1730 | 0.03 |
| Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222] | 13.39 | 1645 | 0.04 | 15.14 | 2109 | 0.03 |
| Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222] | 13.58 | 1660 | 0.04 | 16.26 | 2221 | 0.03 |
| α -Bisabolol | 13.79 | 1678 | 0.04 | 15.69* | 2164 | 0.05 |
| Myristic acid | 14.83 | 1767 | 0.05 | 20.91 | 2747 | 0.05 |
| meta-Camphorene | 16.76 | 1942 | 0.02 | 15.69* | 2164 | [0.05] |
| Citropten | 16.94 | 1959 | 0.07 | | | |
| Palmitic acid | 17.00 | 1964 | 0.09 | 21.74 | 2853 | 0.09 |
| Linoleic acid | 18.67 | 2130 | 0.03 | 24.24 | 3189 | 0.03 |
| Oleic acid | 18.74 | 2136 | 0.07 | 24.41 | 3213 | 0.08 |
| Stearic acid | 18.99 | 2162 | 0.03 | 24.83 | 3274 | 0.04 |
| Unknown [m/z 41, 69 (90), 79 (78), 93 (72), 91 (70)...204] | | | | 8.97 | 1568 | 0.02 |
| Total identified | | 98.73% | | | 98.72% | |
| Total reported | | 98.81% | | | 98.79% | |

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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)

