

Date : November 29, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19K15-PTH03-1-CC

Customer identification : Lemon - Argentina - L6011191R

Type : Essential oil

Source : *Citrus x limon*

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 : November 26, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid

Refractive index: 1.4747 ± 0.0003 (20 °C)

ISO 855:2004 - OIL OF LEMON, OBTAINED BY EXPRESSION - EQUATORIAL

| Compound | Min. % | Max. % | Observed % | Complies? |
|-------------------------|--------|--------|------------|-----------|
| Geranyl acetate | tr | 0.30 | 0.28 | Yes |
| Neryl acetate | 0.10 | 0.50 | 0.40 | Yes |
| β-Bisabolene | 0.20 | 0.90 | 0.50 | Yes |
| Geranial | 0.5 | 2.0 | 1.5 | Yes |
| Neral | 0.2 | 1.2 | 0.9 | Yes |
| α-Terpineol | | 0.40 | 0.11 | Yes |
| γ-Terpinene | 6.0 | 12.0 | 8.5 | Yes |
| Limonene | 59.0 | 75.0 | 66.7 | Yes |
| para-Cymene | 0.05 | 0.35 | 0.35 | Yes |
| β-Pinene | 7.0 | 16.0 | 11.3 | Yes |
| Sabinene | 1.4 | 3.0 | 1.7 | Yes |
| α-Pinene | 1.4 | 3.0 | 1.8 | Yes |
| α-Thujene | 0.2 | 0.5 | 0.3 | Yes |
| Refractive index | 1.4730 | 1.4790 | 1.4747 | Yes |

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for Equatorial lemon oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

| Identification | % | Classe |
|---------------------------------|-------|-----------------------|
| Tricyclene | 0.01 | Monoterpene |
| α -Thujene | 0.34 | Monoterpene |
| α -Pinene | 1.84 | Monoterpene |
| Camphene | 0.06 | Monoterpene |
| α -Fenchene | 0.01 | Monoterpene |
| Thuja-2,4(10)-diene | 0.01 | Monoterpene |
| β -Pinene | 11.25 | Monoterpene |
| Sabinene | 1.72 | Monoterpene |
| 6-Methyl-5-hepten-2-one | 0.01 | Aliphatic ketone |
| Myrcene | 1.46 | Monoterpene |
| α -Phellandrene | 0.04 | Monoterpene |
| Octanal | 0.04 | Aliphatic aldehyde |
| α -Terpinene | 0.13 | Monoterpene |
| para-Cymene | 0.35 | Monoterpene |
| Limonene | 66.71 | Monoterpene |
| β -Phellandrene | 0.35 | Monoterpene |
| (Z)- β -Ocimene | 0.05 | Monoterpene |
| (E)- β -Ocimene | 0.10 | Monoterpene |
| γ -Terpinene | 8.53 | Monoterpene |
| cis-Sabinene hydrate | 0.03 | Monoterpenic alcohol |
| Terpinolene | 0.25 | Monoterpene |
| trans-Sabinene hydrate | 0.03 | Monoterpenic alcohol |
| Linalool | 0.06 | Monoterpenic alcohol |
| Nonanal | 0.06 | Aliphatic aldehyde |
| trans-para-Mentha-2,8-dien-1-ol | 0.02 | Monoterpenic alcohol |
| cis-Limonene oxide | 0.01 | Monoterpenic ether |
| trans-Limonene oxide | 0.01 | Monoterpenic ether |
| Camphor | 0.01 | Monoterpenic ketone |
| Citronellal | 0.05 | Monoterpenic aldehyde |
| Borneol | 0.01 | Monoterpenic alcohol |
| Unknown | 0.01 | Unknown |
| Terpinen-4-ol | 0.06 | Monoterpenic alcohol |
| para-Cymen-8-ol | 0.01 | Monoterpenic alcohol |
| Isogeranial | 0.02 | Monoterpenic aldehyde |
| α -Terpineol | 0.11 | Monoterpenic alcohol |
| Decanal | 0.02 | Aliphatic aldehyde |
| 2,3-Epoxyneral? | 0.01 | Monoterpenic aldehyde |
| Nerol | 0.05 | Monoterpenic alcohol |
| 2,3-Epoxygeranial? | 0.04 | Monoterpenic aldehyde |
| Neral | 0.90 | Monoterpenic aldehyde |
| Geraniol | 0.02 | Monoterpenic alcohol |
| Geranial | 1.51 | Monoterpenic aldehyde |
| Limonen-10-ol | 0.03 | Monoterpenic alcohol |
| Undecanal | 0.02 | Aliphatic aldehyde |
| Citronellyl acetate | 0.02 | Monoterpenic ester |
| Neryl acetate | 0.40 | Monoterpenic ester |
| Geranyl acetate | 0.28 | Monoterpenic ester |

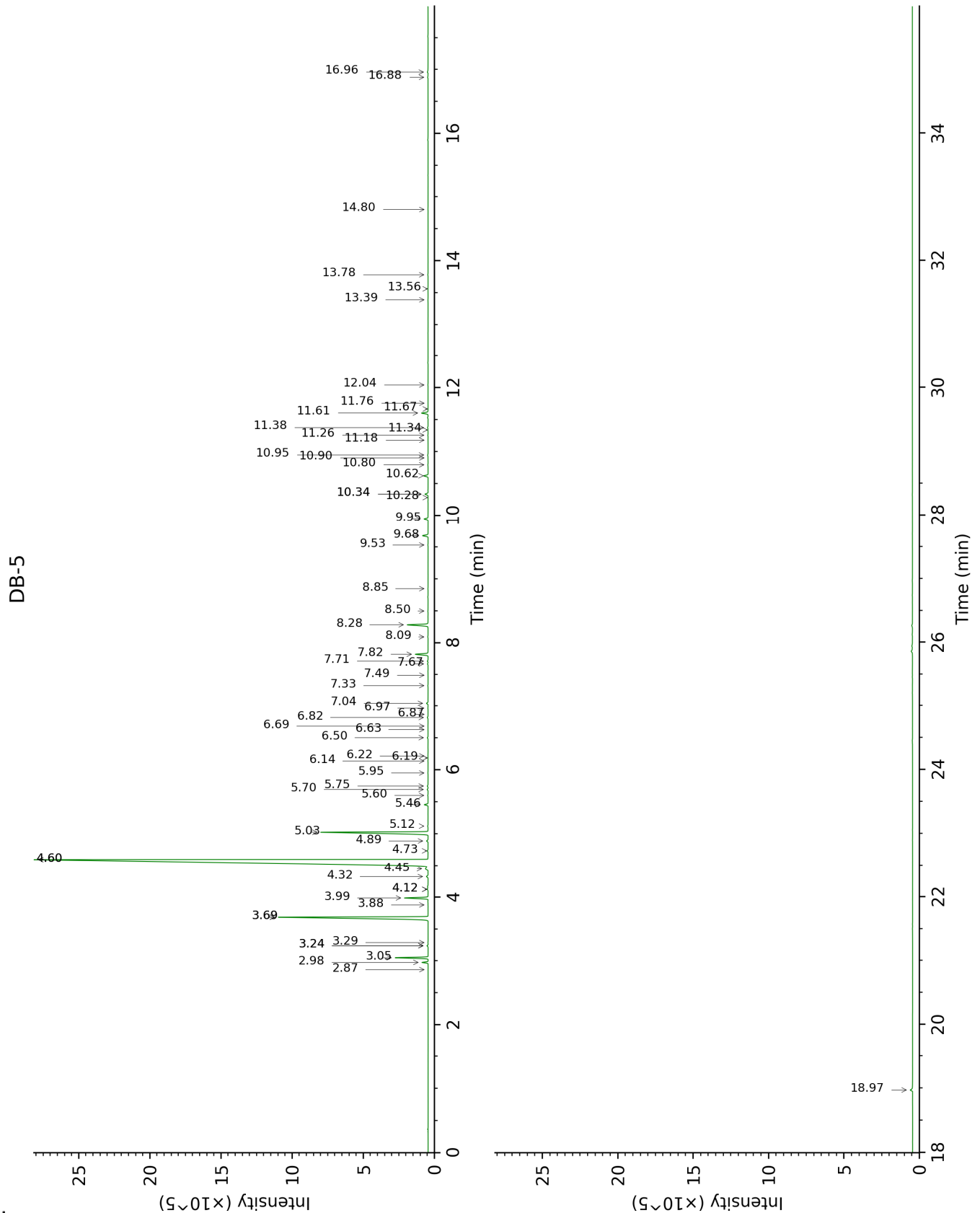
| | | |
|--------------------------------------|---------------|--------------------------|
| Dodecanal | 0.01 | Aliphatic aldehyde |
| <i>cis</i> - α -Bergamotene | 0.03 | Sesquiterpene |
| β -Caryophyllene | 0.19 | Sesquiterpene |
| <i>trans</i> - α -Bergamotene | 0.32 | Sesquiterpene |
| α -Humulene | 0.02 | Sesquiterpene |
| β -Santalene | 0.01 | Sesquiterpene |
| (<i>E</i>)- β -Farnesene | 0.04 | Sesquiterpene |
| Germacrene D | 0.01 | Sesquiterpene |
| <i>trans</i> - β -Bergamotene | 0.02 | Sesquiterpene |
| Valencene | 0.02 | Sesquiterpene |
| Bicyclogermacrene | 0.04 | Sesquiterpene |
| β -Bisabolene | 0.50 | Sesquiterpene |
| (<i>Z</i>)- γ -Bisabolene | 0.01 | Sesquiterpene |
| δ -Cadinene | 0.01 | Sesquiterpene |
| (<i>E</i>)- α -Bisabolene | 0.02 | Sesquiterpene |
| Unknown | 0.02 | Oxygenated sesquiterpene |
| Unknown | 0.01 | Oxygenated sesquiterpene |
| α -Bisabolol | 0.02 | Sesquiterpenic alcohol |
| Myristic acid | 0.02 | Aliphatic acid |
| Citropten | 0.04 | Furanocoumarin |
| Palmitic acid | 0.07 | Aliphatic acid |
| Stearic acid | 0.23 | Aliphatic acid |
| Stearic acid | 0.16 | Aliphatic acid |
| Consolidated total | 98.91% | |

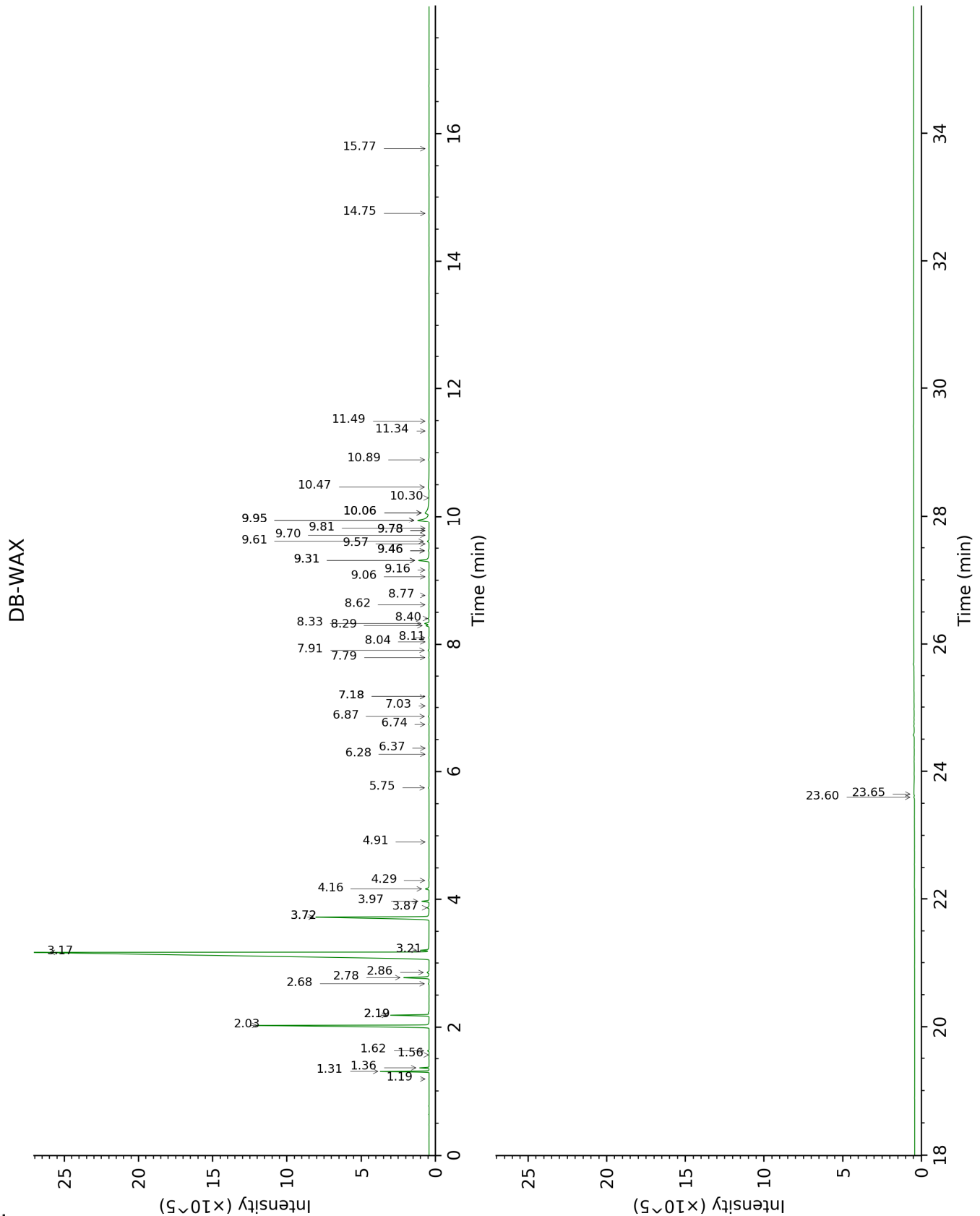
Note: no correction factor was applied

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 | % |
| Tricyclene | 2.86 | 917 | 0.01 | 1.19 | 975 | 0.01 |
| α -Thujene | 2.98 | 924 | 0.34 | 1.36 | 1004 | 0.34 |
| α -Pinene | 3.05 | 929 | 1.84 | 1.31 | 995 | 1.81 |
| Camphene | 3.24* | 941 | 0.07 | 1.62 | 1029 | 0.06 |
| α -Fenchene | 3.24* | 941 | [0.07] | 1.56 | 1023 | 0.01 |
| Thuja-2,4(10)-diene | 3.29 | 945 | 0.01 | 2.19* | 1085 | 1.73 |
| β -Pinene | 3.69* | 971 | 13.00 | 2.03 | 1069 | 11.25 |
| Sabinene | 3.69* | 971 | [13.00] | 2.19* | 1085 | [1.73] |
| 6-Methyl-5-hepten-2-one | 3.88 | 984 | 0.01 | 4.91 | 1302 | 0.01 |
| Myrcene | 3.99 | 991 | 1.46 | 2.78 | 1136 | 1.45 |
| α -Phellandrene | 4.12* | 1000 | 0.08 | 2.68 | 1128 | 0.04 |
| Octanal | 4.12* | 1000 | [0.08] | 4.29 | 1255 | 0.04 |
| α -Terpinene | 4.32 | 1013 | 0.13 | 2.86 | 1142 | 0.15 |
| para-Cymene | 4.45 | 1021 | 0.35 | 3.97 | 1230 | 0.39 |
| Limonene | 4.60* | 1030 | 66.99 | 3.17 | 1168 | 66.71 |
| β -Phellandrene | 4.60* | 1030 | [66.99] | 3.20 | 1170 | 0.35 |
| (Z)- β -Ocimene | 4.73 | 1039 | 0.05 | 3.72* | 1212 | 8.61 |
| (E)- β -Ocimene | 4.89 | 1049 | 0.10 | 3.87 | 1223 | 0.12 |
| γ -Terpinene | 5.03 | 1058 | 8.53 | 3.72* | 1212 | [8.61] |
| cis-Sabinene hydrate | 5.12 | 1064 | 0.03 | 6.74 | 1428 | 0.03 |
| Terpinolene | 5.46 | 1085 | 0.25 | 4.16 | 1245 | 0.25 |
| trans-Sabinene hydrate | 5.60 | 1095 | 0.03 | 7.80 | 1506 | 0.02 |
| Linalool | 5.70 | 1101 | 0.06 | 7.91 | 1515 | 0.06 |
| Nonanal | 5.75 | 1104 | 0.06 | 5.75 | 1356 | 0.06 |
| trans-para-Mentha-2,8-dien-1-ol | 5.95 | 1118 | 0.02 | 8.76 | 1582 | 0.02 |
| cis-Limonene oxide | 6.14 | 1130 | 0.01 | 6.28 | 1394 | 0.01 |
| trans-Limonene oxide | 6.19 | 1133 | 0.01 | 6.37 | 1400 | 0.01 |
| Camphor | 6.22 | 1135 | 0.01 | 7.03 | 1449 | 0.01 |
| Citronellal | 6.50 | 1154 | 0.05 | 6.86 | 1437 | 0.05 |
| Borneol | 6.63 | 1162 | 0.01 | 9.57 | 1647 | 0.01 |
| Unknown [m/z 43, 109 (68), 67 (62), 81 (36), 41 (31), 137 (29), 79 (26)...] | 6.69 | 1166 | 0.01 | 7.18* | 1460 | 0.02 |
| Terpinen-4-ol | 6.82 | 1175 | 0.06 | 8.40 | 1554 | 0.08 |
| para-Cymen-8-ol | 6.87 | 1178 | 0.01 | 11.34 | 1797 | 0.01 |
| Isogeranial | 6.97 | 1185 | 0.02 | 8.04 | 1526 | 0.01 |
| α -Terpineol | 7.04 | 1190 | 0.11 | 9.61 | 1650 | 0.14 |
| Decanal | 7.33 | 1209 | 0.02 | 7.18* | 1460 | [0.02] |
| 2,3-Epoxyneral? | 7.49 | 1221 | 0.01 | | | |

| | | | | | | |
|--|--------|---------------|--------|--------|---------------|--------|
| Nerol | 7.71 | 1232 | 0.05 | 10.89 | 1758 | 0.05 |
| 2,3-Epoxygeranial? | 7.67 | 1233 | 0.04 | | | |
| Neral | 7.82 | 1239 | 0.90 | 9.31* | 1626 | 0.91 |
| Geraniol | 8.09 | 1257 | 0.02 | 11.50 | 1810 | 0.03 |
| Geranial | 8.28 | 1270 | 1.51 | 9.95* | 1678 | 1.44 |
| Limonen-10-ol | 8.50 | 1284 | 0.03 | | | |
| Undecanal | 8.85 | 1308 | 0.02 | 8.62 | 1571 | 0.02 |
| Citronellyl acetate | 9.53 | 1356 | 0.02 | 9.31* | 1626 | [0.91] |
| Neryl acetate | 9.68 | 1366 | 0.40 | 10.06* | 1688 | 0.99 |
| Geranyl acetate | 9.95 | 1385 | 0.28 | 10.47 | 1721 | 0.30 |
| Dodecanal | 10.28 | 1409 | 0.01 | 9.81 | 1667 | 0.01 |
| <i>cis</i> - α -Bergamotene | 10.34* | 1413 | 0.24 | 8.10 | 1531 | 0.03 |
| β -Caryophyllene | 10.34* | 1413 | [0.24] | 8.29 | 1545 | 0.19 |
| <i>trans</i> - α -Bergamotene | 10.62 | 1434 | 0.32 | 8.33 | 1548 | 0.31 |
| α -Humulene | 10.80 | 1447 | 0.02 | 9.16 | 1614 | 0.02 |
| β -Santalene | 10.90 | 1455 | 0.01 | 9.06 | 1605 | 0.02 |
| (<i>E</i>)- β -Farnesene | 10.95 | 1458 | 0.04 | 9.46* | 1638 | 0.08 |
| Germacrene D | 11.18 | 1475 | 0.01 | 9.70 | 1658 | 0.01 |
| <i>trans</i> - β -Bergamotene | 11.26 | 1481 | 0.02 | 9.46* | 1638 | [0.08] |
| Valencene | 11.34 | 1487 | 0.02 | 9.78* | 1664 | 0.02 |
| Bicyclogermacrene | 11.38 | 1490 | 0.04 | 9.95* | 1678 | [1.44] |
| β -Bisabolene | 11.61 | 1507 | 0.50 | 10.06* | 1688 | [0.99] |
| (<i>Z</i>)- γ -Bisabolene | 11.67 | 1512 | 0.01 | 9.78* | 1664 | [0.02] |
| δ -Cadinene | 11.76 | 1519 | 0.01 | 10.30 | 1707 | 0.02 |
| (<i>E</i>)- α -Bisabolene | 12.04 | 1541 | 0.02 | | | |
| Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222] | 13.39 | 1649 | 0.02 | 14.75 | 2114 | 0.03 |
| Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222] | 13.56 | 1663 | 0.01 | 15.77 | 2218 | 0.01 |
| α -Bisabolol | 13.78 | 1681 | 0.02 | | | |
| Myristic acid | 14.80 | 1769 | 0.02 | | | |
| Citropten | 16.88 | 1959 | 0.04 | 23.60 | 3169 | 0.06 |
| Palmitic acid | 16.96 | 1967 | 0.07 | | | |
| Stearic acid | 18.97 | 2168 | 0.23 | | | |
| Stearic acid | | | | 23.65 | 3176 | 0.16 |
| Total identified | | 98.68% | | | 98.53% | |
| Total reported | | 98.73% | | | 98.57% | |

*: Two or more compounds are coeluting on this column

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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index