

**Date :** November 16, 2022

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 22K03-NSO01


**Customer identification :** EO : Grapefruit, Pink, Lot No: 000065 Botanical Species: Citrus paradisi

**Type :** Essential oil

**Source :** Citrus x paradisi cv. Pink

**Customer :** Natural Sourcing LLC

**ANALYSIS**

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

**Analyst :** Amélie Simard, Analyste

**Analysis date :** November 14, 2022

Checked and approved by :

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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Bright orange liquid

**Refractive index:**  $1.4768 \pm 0.0003$  (20 °C; method PC-MAT-016)

#### 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                 |
|---|-------|-----------------------|
| α-Thujene                                 | 0.01  | Monoterpene           |
| α-Pinene                                  | 0.52  | Monoterpene           |
| Camphene                                  | 0.01  | Monoterpene           |
| Thuja-2,4(10)-diene                       | 0.01  | Monoterpene           |
| β-Pinene                                  | 0.04  | Monoterpene           |
| Sabinene                                  | 0.29  | Monoterpene           |
| Myrcene                                   | 1.86  | Monoterpene           |
| α-Phellandrene                            | 0.03  | Monoterpene           |
| Pseudolimonene                            | 0.01  | Monoterpene           |
| Octanal                                   | 0.21  | Aliphatic aldehyde    |
| para-Cymene                               | 0.02  | Monoterpene           |
| Limonene                                  | 92.51 | Monoterpene           |
| β-Phellandrene                            | 0.53  | Monoterpene           |
| (Z)-β-Ocimene                             | 0.02  | Monoterpene           |
| (E)-β-Ocimene                             | 0.09  | Monoterpene           |
| γ-Terpinene                               | 0.01  | Monoterpene           |
| cis-Sabinene hydrate                      | 0.01  | Monoterpenic alcohol  |
| Octanol                                   | 0.03  | Aliphatic alcohol     |
| Terpinolene                               | 0.02  | Monoterpene           |
| Linalool                                  | 0.08  | Monoterpenic alcohol  |
| Nonanal                                   | 0.05  | Aliphatic aldehyde    |
| Heptyl acetate                            | 0.01  | Aliphatic ester       |
| trans-para-Mentha-2,8-dien-1-ol           | 0.02  | Monoterpenic alcohol  |
| cis-Limonene oxide                        | 0.02  | Monoterpenic ether    |
| trans-Limonene oxide                      | 0.03  | Monoterpenic ether    |
| (E)-Myroxide                              | 0.01  | Monoterpenic ether    |
| Citronellal                               | 0.05  | Monoterpenic aldehyde |
| α-Terpineol                               | 0.06  | Monoterpenic alcohol  |
| Decanal                                   | 0.23  | Aliphatic aldehyde    |
| Octyl acetate                             | 0.03  | Aliphatic ester       |
| trans-Carveol                             | 0.01  | Monoterpenic alcohol  |
| cis-Carveol                               | 0.01  | Monoterpenic alcohol  |
| Neral                                     | 0.05  | Monoterpenic aldehyde |
| Geraniol                                  | 0.01  | Monoterpenic alcohol  |
| Geranial                                  | 0.09  | Monoterpenic aldehyde |
| Undecanal                                 | 0.01  | Aliphatic aldehyde    |
| α-Terpinyl acetate                        | 0.02  | Monoterpenic ester    |
| Limonene hydroperoxide IV                 | 0.02  | Monoterpenic peroxide |
| Neryl acetate                             | 0.01  | Monoterpenic ester    |
| α-Copaene                                 | 0.11  | Sesquiterpene         |
| cis-para-Mentha-6,8-diene-2-hydroperoxide | 0.04  | Monoterpenic peroxide |
| β-Cubebene                                | 0.11  | Sesquiterpene         |
| β-Elemene                                 | 0.03  | Sesquiterpene         |
| Dodecanal                                 | 0.03  | Aliphatic aldehyde    |
| β-Caryophyllene                           | 0.32  | Sesquiterpene         |

|   |               |                         |
|---|---------------|-------------------------|
| α-Humulene                                    | 0.05          | Sesquiterpene           |
| (E)-β-Farnesene                               | 0.03          | Sesquiterpene           |
| Germacrene D                                  | 0.10          | Sesquiterpene           |
| Bicyclogermacrene                             | 0.04          | Sesquiterpene           |
| α-Murolene                                    | 0.02          | Sesquiterpene           |
| Cubebol                                       | 0.02          | Sesquiterpenic alcohol  |
| δ-Cadinene                                    | 0.13          | Sesquiterpene           |
| α-Elemol                                      | 0.03          | Sesquiterpenic alcohol  |
| (E)-Nerolidol                                 | 0.01          | Sesquiterpenic alcohol  |
| Germacrene D-4-ol                             | 0.03          | Sesquiterpenic alcohol  |
| Caryophyllene oxide                           | 0.01          | Sesquiterpenic ether    |
| β-Sinensal                                    | 0.04          | Sesquiterpenic aldehyde |
| Nootkatone                                    | 0.01          | Sesquiterpenic ketone   |
| Bergapten                                     | 0.02          | Furanocoumarin          |
| Osthole                                       | 0.09          | Coumarin                |
| Linoleic acid                                 | 0.04          | Aliphatic acid          |
| Oleic acid                                    | 0.01          | Aliphatic acid          |
| Stearic acid                                  | 0.08          | Aliphatic acid          |
| 7-Methoxy-8-(2-formyl-2-methylpropyl)coumarin | tr            | Coumarin                |
| Isoauraptene                                  | 0.09          | Coumarin                |
| Meranzin                                      | 0.20          | Coumarin                |
| Auraptenol                                    | 0.01          | Coumarin                |
| Meranzin hydrate                              | 0.01          | Coumarin                |
| Unknown                                       | 0.01          | Coumarin                |
| Auraptene                                     | 0.93          | Coumarin                |
| Epoxyaurapten                                 | 0.19          | Coumarin                |
| <b>Consolidated total</b>                     | <b>99.90%</b> |                         |

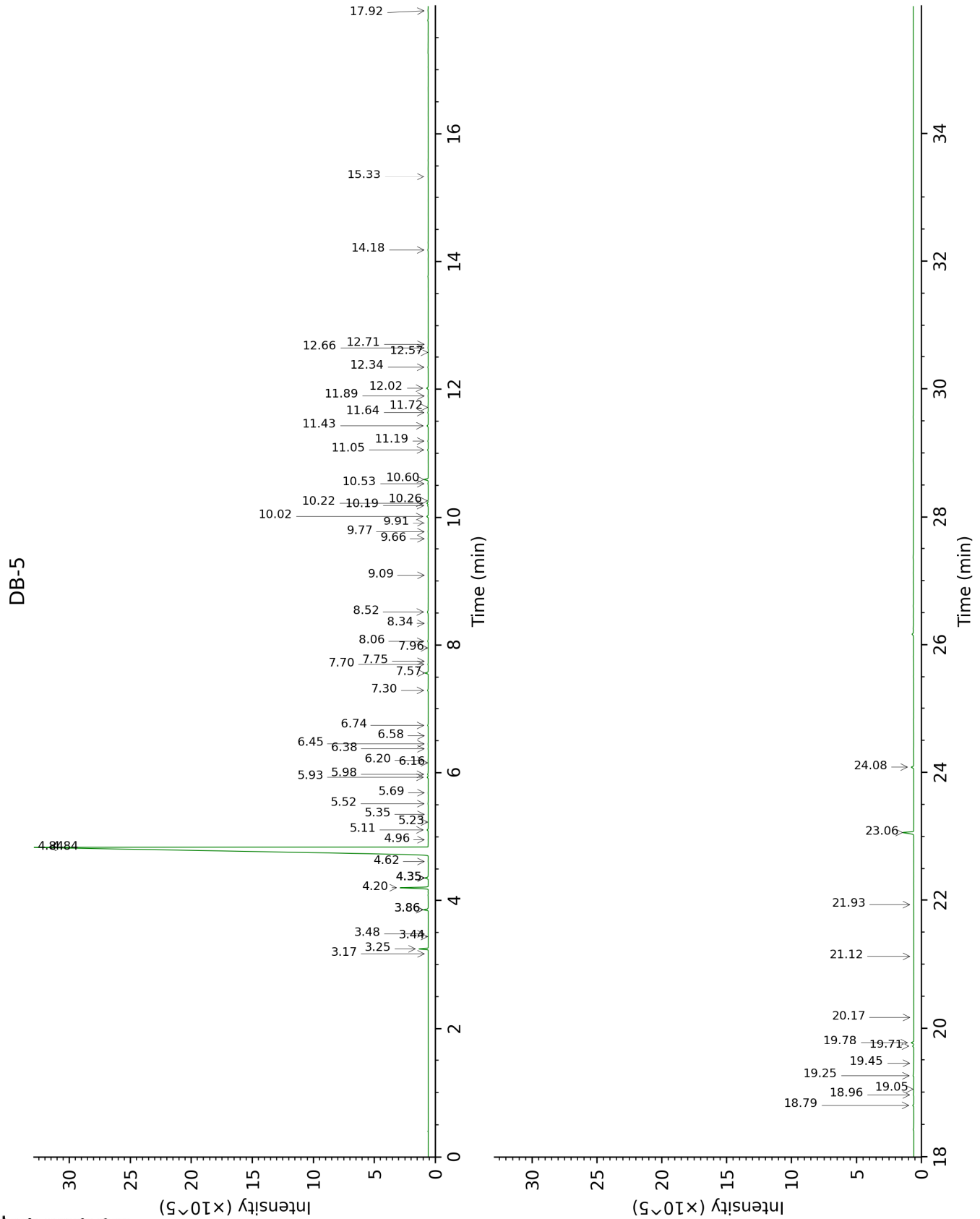
tr: The compound has been detected below 0.005% of total signal.

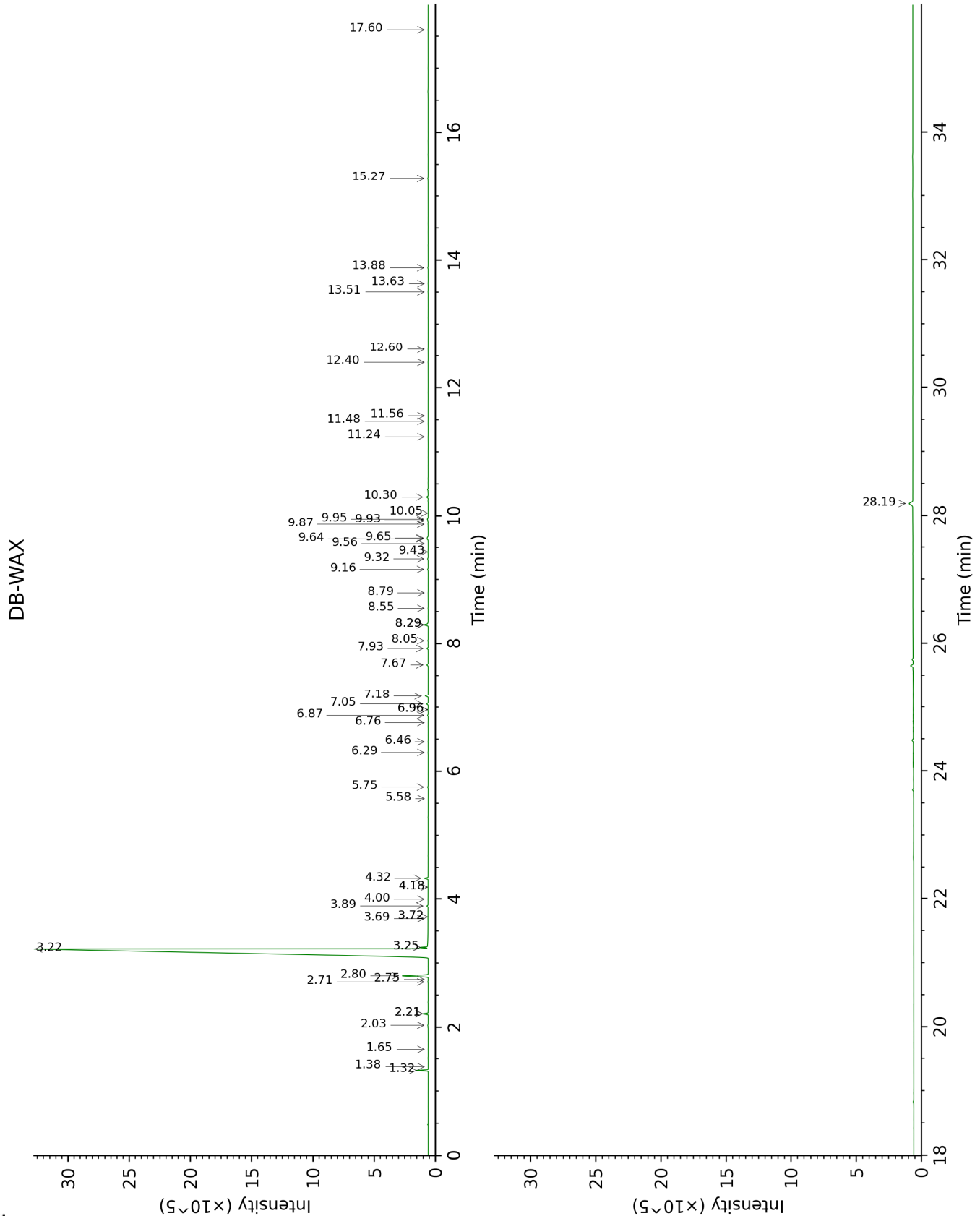
Note: no correction factor was applied

**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  | %      |
| $\alpha$ -Thujene                         | 3.17        | 926  | 0.01    | 1.38          | 1000 | tr     |
| $\alpha$ -Pinene                          | 3.25        | 931  | 0.52    | 1.32          | 993  | 0.53   |
| Camphene                                  | 3.44        | 943  | 0.01    | 1.64          | 1027 | tr     |
| Thuja-2,4(10)-diene                       | 3.48        | 946  | 0.01    | 2.21*         | 1084 | 0.30   |
| $\beta$ -Pinene                           | 3.86*       | 971  | 0.33    | 2.03          | 1066 | 0.04   |
| Sabinene                                  | 3.86*       | 971  | [0.33]  | 2.21*         | 1084 | [0.30] |
| Myrcene                                   | 4.20        | 993  | 1.86    | 2.80          | 1135 | 1.90   |
| $\alpha$ -Phellandrene                    | 4.35*       | 1003 | 0.27    | 2.71          | 1127 | 0.03   |
| Pseudolimonene                            | 4.35*       | 1003 | [0.27]  | 2.74          | 1130 | 0.01   |
| Octanal                                   | 4.35*       | 1003 | [0.27]  | 4.32          | 1254 | 0.21   |
| para-Cymene                               | 4.62        | 1020 | 0.02    | 4.00          | 1229 | 0.01   |
| Limonene                                  | 4.84*       | 1034 | 92.03   | 3.22          | 1169 | 92.51  |
| $\beta$ -Phellandrene                     | 4.84*       | 1034 | [92.03] | 3.25          | 1171 | 0.53   |
| (Z)- $\beta$ -Ocimene                     | 4.96        | 1041 | 0.02    | 3.69          | 1206 | tr     |
| (E)- $\beta$ -Ocimene                     | 5.11        | 1051 | 0.09    | 3.89          | 1221 | 0.07   |
| $\gamma$ -Terpinene                       | 5.23        | 1058 | 0.01    | 3.72          | 1209 | tr     |
| cis-Sabinene hydrate                      | 5.35        | 1066 | 0.01    | 6.76          | 1427 | 0.01   |
| Octanol                                   | 5.52        | 1076 | 0.03    | 8.05          | 1525 | 0.03   |
| Terpinolene                               | 5.69        | 1087 | 0.02    | 4.18          | 1244 | 0.01   |
| Linalool                                  | 5.93        | 1102 | 0.08    | 7.93          | 1515 | 0.09   |
| Nonanal                                   | 5.98        | 1105 | 0.05    | 5.76          | 1353 | 0.05   |
| Heptyl acetate                            | 6.16        | 1116 | 0.01    | 5.58          | 1340 | 0.01   |
| trans-para-Mentha-2,8-dien-1-ol           | 6.20        | 1119 | 0.02    | 8.79          | 1583 | 0.01   |
| cis-Limonene oxide                        | 6.38        | 1130 | 0.02    | 6.29          | 1392 | 0.02   |
| trans-Limonene oxide                      | 6.45        | 1135 | 0.03    | 6.46          | 1405 | 0.02   |
| (E)-Myroxide                              | 6.58        | 1143 | 0.01    | 6.96*         | 1442 | 0.03   |
| Citronellal                               | 6.74        | 1153 | 0.05    | 6.87          | 1436 | 0.05   |
| $\alpha$ -Terpineol                       | 7.30        | 1189 | 0.06    | 9.65          | 1652 | 0.08   |
| Decanal                                   | 7.57        | 1206 | 0.23    | 7.18          | 1458 | 0.21   |
| Octyl acetate                             | 7.70        | 1215 | 0.03    | 6.96*         | 1442 | [0.03] |
| trans-Carveol                             | 7.75        | 1218 | 0.01    | 11.24         | 1785 | 0.01   |
| cis-Carveol                               | 7.96        | 1232 | 0.01    | 11.56         | 1814 | 0.01   |
| Neral                                     | 8.06        | 1239 | 0.05    | 9.32          | 1625 | 0.06   |
| Geraniol                                  | 8.34        | 1258 | 0.01    | 11.48         | 1806 | 0.01   |
| Geranial                                  | 8.52        | 1270 | 0.09    | 9.95          | 1677 | 0.07   |
| Undecanal                                 | 9.09        | 1306 | 0.01    | 8.55          | 1564 | 0.02   |
| $\alpha$ -Terpinyl acetate                | 9.66        | 1346 | 0.02    | 9.56          | 1645 | 0.01   |
| Limonene hydroperoxide IV                 | 9.77        | 1354 | 0.02    |               |      |        |
| Neryl acetate                             | 9.91        | 1364 | 0.01    | 10.05         | 1684 | 0.01   |
| $\alpha$ -Copaene                         | 10.02       | 1371 | 0.11    | 7.05          | 1449 | 0.11   |
| cis-para-Mentha-6,8-diene-2-hydroperoxide | 10.19       | 1383 | 0.04    |               |      |        |
| $\beta$ -Cubebene                         | 10.22       | 1386 | 0.11    | 7.67          | 1495 | 0.11   |
| $\beta$ -Elemene                          | 10.26       | 1388 | 0.03    | 8.30*         | 1544 | 0.34   |
| Dodecanal                                 | 10.53       | 1408 | 0.03    | 9.86          | 1670 | 0.03   |
| $\beta$ -Caryophyllene                    | 10.60       | 1412 | 0.32    | 8.30*         | 1544 | [0.34] |



|   |       |               |      |       |               |        |
|---|-------|---------------|------|-------|---------------|--------|
| α-Humulene  | 11.06 | 1447          | 0.05 | 9.16  | 1612          | 0.05   |
| (E)-β-Farnesene   | 11.19 | 1457          | 0.03 | 9.43  | 1634          | 0.03   |
| Germacrene D  | 11.43 | 1475          | 0.10 | 9.64  | 1651          | 0.08   |
| Bicyclogermacrene   | 11.64 | 1490          | 0.04 | 9.93* | 1675          | 0.04   |
| α-Muurolene   | 11.72 | 1496          | 0.02 | 9.93* | 1675          | [0.04] |
| Cubebol   | 11.90 | 1510          | 0.02 | 12.40 | 1888          | 0.01   |
| δ-Cadinene  | 12.02 | 1519          | 0.13 | 10.30 | 1705          | 0.13   |
| α-Elemol  | 12.34 | 1545          | 0.03 | 13.88 | 2026          | 0.03   |
| (E)-Nerolidol   | 12.58 | 1563          | 0.01 | 13.64 | 2003          | 0.01   |
| Germacrene D-4-ol   | 12.66 | 1569          | 0.03 | 13.51 | 1990          | 0.02   |
| Caryophyllene oxide   | 12.71 | 1574          | 0.01 | 12.60 | 1907          | 0.01   |
| β-Sinensal  | 14.18 | 1693          | 0.04 | 15.27 | 2163          | 0.04   |
| Nootkatone  | 15.33 | 1792          | 0.01 | 17.60 | 2410          | 0.01   |
| Bergapten   | 17.92 | 2032          | 0.02 |       |               |        |
| Osthole   | 18.79 | 2118          | 0.09 |       |               |        |
| Linoleic acid   | 18.96 | 2135          | 0.04 |       |               |        |
| Oleic acid  | 19.04 | 2144          | 0.01 |       |               |        |
| Stearic acid  | 19.25 | 2165          | 0.08 |       |               |        |
| 7-Methoxy-8-(2-formyl-2-methylpropyl)coumarin                                   | 19.45 | 2185          | tr   |       |               |        |
| Isoauraptene  | 19.71 | 2213          | 0.09 |       |               |        |
| Meranzin  | 19.78 | 2220          | 0.20 |       |               |        |
| Auraptenol  | 20.17 | 2262          | 0.01 |       |               |        |
| Meranzin hydrate  | 21.12 | 2365          | 0.01 |       |               |        |
| Unknown [m/z 219, 247 (85), 217 (61), 161 (48), 189 (33), 232 (23)... 290 (18)] | 21.93 | 2457          | 0.01 |       |               |        |
| Auraptene   | 23.06 | 2590          | 0.93 | 28.19 | 3771          | 0.50   |
| Epoxyaurapten   | 24.08 | 2716          | 0.19 |       |               |        |
| <b>Total identified</b>   |       | <b>98.91%</b> |      |       | <b>98.52%</b> |        |
| <b>Total reported</b>   |       | <b>98.92%</b> |      |       | <b>98.52%</b> |        |

\*: Two or more compounds are coeluting on this column

[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

R.T.: Retention time (minutes)

R.I.: Retention index