

Date : May 04, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 21D20-ORA14

**Customer identification :** Sweet Basil - India - 3 years - B093015

**Type :** Essential oil

**Source :** Ocimum basilicum ct. Methylchavicol

**Customer :** Organic Aromas Inc.

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

**Analysis date :** May 04, 2021

Checked and approved by :

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

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#### *P*HYSICO*C*HEMICAL *D*ATA

**Physical aspect:** Faintly yellow liquid

**Refractive index:**  $1.5079 \pm 0.0003$  (20 °C; method PC-MAT-016)

#### *C*ONCLUSION

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                |
|----------------------------------|-------|----------------------|
| Isovaleral                       | tr    | Aliphatic aldehyde   |
| 2-Ethylfuran                     | tr    | Furan                |
| Isoamyl alcohol                  | tr    | Aliphatic alcohol    |
| 2-Methylbutanol                  | tr    | Aliphatic alcohol    |
| Toluene                          | tr    | Simple phenolic      |
| 1-Methylcyclohexene              | tr    | Alkene               |
| (3Z)-Hexenol                     | 0.01  | Aliphatic alcohol    |
| Nonane                           | tr    | Alkane               |
| Tricyclene                       | tr    | Monoterpene          |
| α-Thujene                        | tr    | Monoterpene          |
| α-Pinene                         | 0.06  | Monoterpene          |
| Camphepane                       | tr    | Monoterpene          |
| Benzaldehyde                     | tr    | Simple phenolic      |
| β-Pinene                         | 0.04  | Monoterpene          |
| Sabinene                         | 0.01  | Monoterpene          |
| Octen-3-ol                       | 0.01  | Aliphatic alcohol    |
| 6-Methyl-5-hepten-2-one          | 0.09  | Aliphatic ketone     |
| Myrcene                          | 0.03  | Monoterpene          |
| Octan-3-ol                       | tr    | Aliphatic alcohol    |
| Octanal                          | 0.01  | Aliphatic aldehyde   |
| Δ3-Carene                        | tr    | Monoterpene          |
| (3Z)-Hexenyl acetate             | 0.01  | Aliphatic ester      |
| para-Cymene                      | 0.02  | Monoterpene          |
| Limonene                         | 0.04  | Monoterpene          |
| 1,8-Cineole                      | 0.09  | Monoterpenic ether   |
| 2-Ethylhexanol                   | tr    | Aliphatic alcohol    |
| (Z)-β-Ocimene                    | tr    | Monoterpene          |
| (E)-β-Ocimene                    | 0.07  | Monoterpene          |
| γ-Terpinene                      | tr    | Monoterpene          |
| cis-Sabinene hydrate             | tr    | Monoterpenic alcohol |
| cis-Linalool oxide (fur.)        | 0.10  | Monoterpenic alcohol |
| Octanol                          | 0.03  | Aliphatic alcohol    |
| Fenchone                         | 0.01  | Monoterpenic ketone  |
| Terpinolene                      | tr    | Monoterpene          |
| trans-Linalool oxide (fur.)      | 0.09  | Monoterpenic alcohol |
| trans-Sabinene hydrate           | tr    | Monoterpenic alcohol |
| Linalool                         | 18.16 | Monoterpenic alcohol |
| (Z)-6-Methyl-3,5-heptadien-2-one | 0.03  | Aliphatic ketone     |
| endo-Fenchol                     | tr    | Monoterpenic alcohol |
| Octen-3-yl acetate               | tr    | Aliphatic ester      |
| Camphor                          | 0.01  | Monoterpenic ketone  |
| Isomenthone                      | 0.01  | Monoterpenic ketone  |
| Borneol                          | 0.01  | Monoterpenic alcohol |
| Terpinen-4-ol                    | 0.01  | Monoterpenic alcohol |
| Menthol                          | 0.15  | Monoterpenic alcohol |

|                                  |       |                          |
|----------------------------------|-------|--------------------------|
| $\alpha$ -Terpineol              | 0.07  | Monoterpenic alcohol     |
| Methylchavicol                   | 74.50 | Phenylpropanoid          |
| Octyl acetate                    | 0.02  | Aliphatic ester          |
| Nerol                            | 0.03  | Monoterpenic alcohol     |
| Neral                            | 0.35  | Monoterpenic aldehyde    |
| Piperitone                       | 0.01  | Monoterpenic ketone      |
| Geraniol                         | 0.08  | Monoterpenic alcohol     |
| Geranal                          | 0.57  | Monoterpenic aldehyde    |
| Chavicol                         | 0.03  | Phenylpropanoid          |
| Bornyl acetate                   | 0.02  | Monoterpenic ester       |
| (E)-Anethole                     | 0.01  | Phenylpropanoid          |
| Menthyl acetate                  | 0.01  | Monoterpenic ester       |
| Carvacrol                        | tr    | Monoterpenic alcohol     |
| Eugenol                          | 0.03  | Phenylpropanoid          |
| Neryl acetate                    | 0.02  | Monoterpenic ester       |
| $\alpha$ -Copaene                | 0.03  | Sesquiterpene            |
| $\beta$ -Bourbonene              | 0.01  | Sesquiterpene            |
| Geranyl acetate                  | tr    | Monoterpenic ester       |
| $\beta$ -Elemene                 | 0.09  | Sesquiterpene            |
| Methyleugenol                    | 0.04  | Phenylpropanoid          |
| $\beta$ -Caryophyllene           | 0.31  | Sesquiterpene            |
| trans- $\alpha$ -Bergamotene     | 0.47  | Sesquiterpene            |
| Sesquisabinene A                 | tr    | Sesquiterpene            |
| cis- $\beta$ -Bergamotene?       | 0.05  | Sesquiterpene            |
| $\alpha$ -Humulene               | 0.18  | Sesquiterpene            |
| cis-Muurola-4(15),5-diene        | 0.02  | Sesquiterpene            |
| (E)- $\beta$ -Farnesene          | 0.19  | Sesquiterpene            |
| $\gamma$ -Muurolene              | tr    | Sesquiterpene            |
| Germacrene D                     | 0.09  | Sesquiterpene            |
| $\beta$ -Selinene                | 0.01  | Sesquiterpene            |
| trans- $\beta$ -Bergamotene      | 0.09  | Sesquiterpene            |
| Bicyclogermacrene                | 0.01  | Sesquiterpene            |
| $\alpha$ -Zingiberene            | 0.01  | Sesquiterpene            |
| $\beta$ -Bisabolene              | 0.10  | Sesquiterpene            |
| $\gamma$ -Cadinene               | 0.01  | Sesquiterpene            |
| $\delta$ -Cadinene               | 0.02  | Sesquiterpene            |
| $\beta$ -Sesquiphellandrene      | 0.01  | Sesquiterpene            |
| (E)- $\alpha$ -Bisabolene        | 1.23  | Sesquiterpene            |
| (E)-para-Methoxycinnamaldehyde   | 0.36  | Phenylpropanoid          |
| (E)-Nerolidol                    | 0.04  | Sesquiterpenic alcohol   |
| (E)-para-Methoxycinnamyl alcohol | 0.30  | Phenylpropanoid          |
| Spathulenol                      | 0.03  | Sesquiterpenic alcohol   |
| Caryophyllene oxide              | 0.09  | Sesquiterpenic ether     |
| Caryophyllene oxide isomer       | 0.02  | Sesquiterpenic ether     |
| Unknown                          | 0.02  | Phenylpropanoid          |
| Humulene epoxide II              | 0.04  | Sesquiterpenic ether     |
| 10-epi-Cubenol                   | 0.01  | Sesquiterpenic alcohol   |
| 1-epi-Cubenol                    | tr    | Sesquiterpenic alcohol   |
| $\tau$ -Cadinol                  | 0.01  | Sesquiterpenic alcohol   |
| Unknown                          | 0.04  | Oxygenated sesquiterpene |
| $\alpha$ -Cadinol                | 0.01  | Sesquiterpenic alcohol   |
| $\alpha$ -Bisabolol              | 0.02  | Sesquiterpenic alcohol   |

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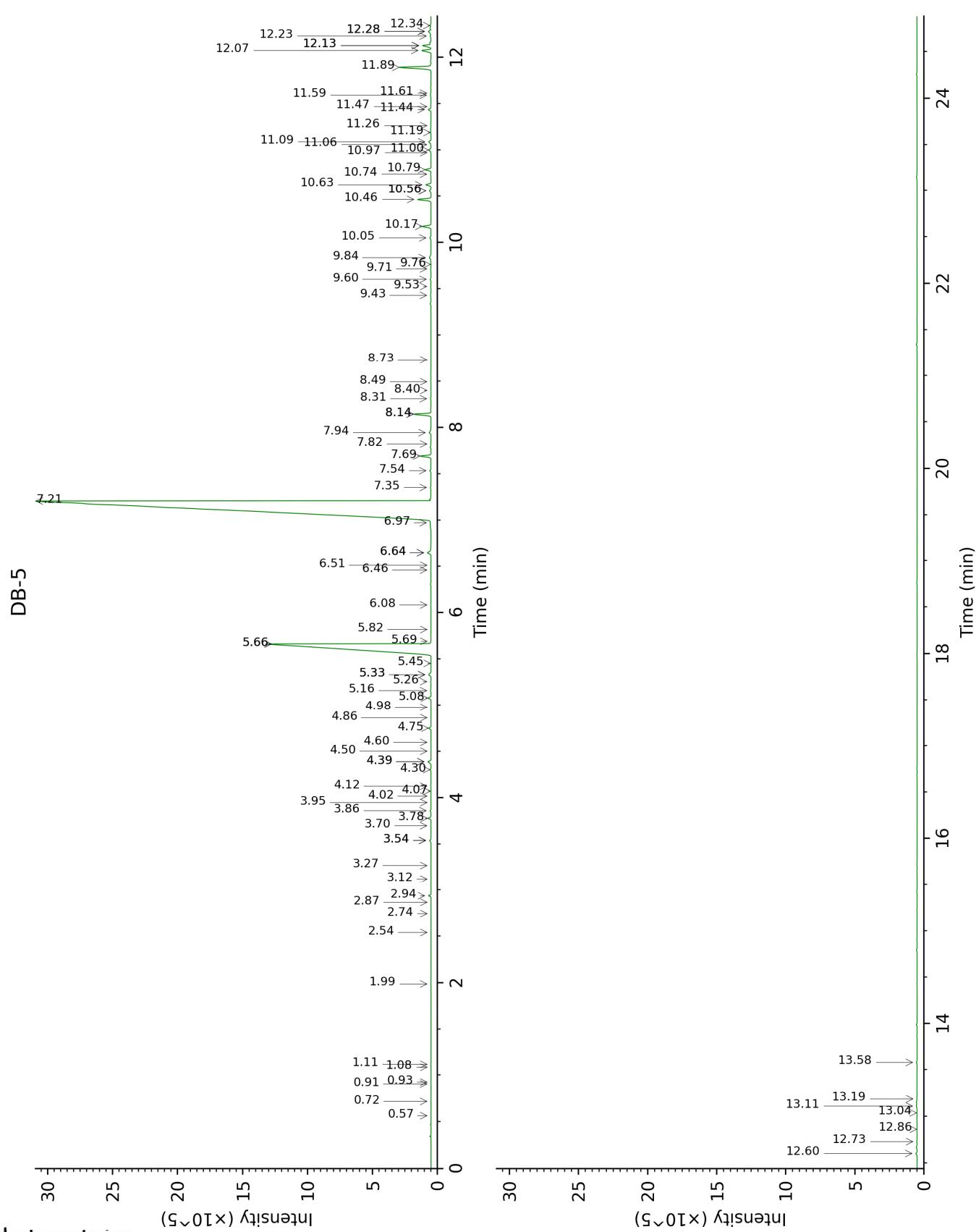
| Consolidated total   | 98.83% |
|--|--------|
| tr: The compound has been detected below 0.005% of total signal. |        |

Note: no correction factor was applied

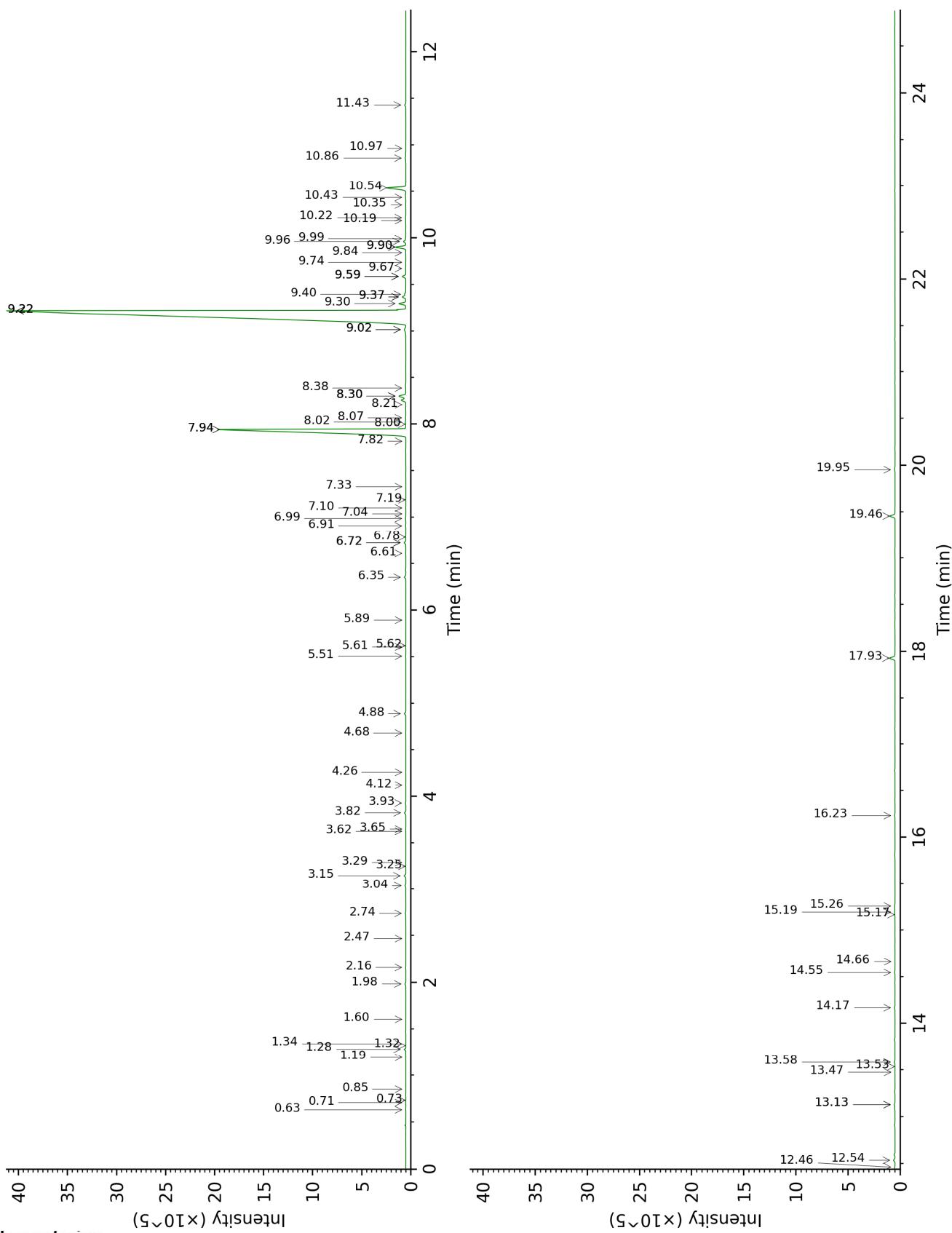
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.



DB-WAX



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FULL ANALYSIS DATA

| Identification                   | Column DB-5 |      |         | Column DB-WAX |      |        |
|----------------------------------|-------------|------|---------|---------------|------|--------|
|                                  | R.T         | R.I  | %       | R.T           | R.I  | %      |
| Isovaleral                       | 0.57        | 640  | tr      | 0.71          | 887  | tr     |
| 2-Ethylfuran                     | 0.72        | 701  | tr      | 0.85          | 919  | tr     |
| Isoamyl alcohol                  | 0.90        | 732  | tr      | 3.29          | 1177 | tr     |
| 2-Methylbutanol                  | 0.92        | 735  | tr      | 3.25          | 1174 | tr     |
| Toluene                          | 1.08        | 759  | tr      | 1.34          | 1001 | tr     |
| 1-Methylcyclohexene              | 1.12        | 764  | tr      | 0.63          | 858  | tr     |
| (3Z)-Hexenol                     | 1.99        | 857  | 0.01    | 5.61          | 1347 | 0.01   |
| Nonane                           | 2.54        | 905  | tr      | 0.73          | 897  | tr     |
| Tricyclene                       | 2.74        | 919  | tr      | 1.19          | 977  | tr     |
| α-Thujene                        | 2.87        | 927  | tr      | 1.32          | 999  | tr     |
| α-Pinene                         | 2.94        | 932  | 0.06    | 1.28          | 992  | 0.06   |
| Camphepane                       | 3.12        | 944  | tr      | 1.60          | 1028 | tr     |
| Benzaldehyde                     | 3.27        | 954  | tr      | 7.19          | 1464 | tr     |
| β-Pinene                         | 3.54*       | 972  | 0.05    | 1.98          | 1066 | 0.04   |
| Sabinene                         | 3.54*       | 972  | [0.05]  | 2.16          | 1084 | 0.01   |
| Octen-3-ol                       | 3.70        | 983  | 0.01    | 6.61          | 1420 | 0.01   |
| 6-Methyl-5-hepten-2-one          | 3.78        | 988  | 0.09    | 4.88          | 1298 | 0.08   |
| Myrcene                          | 3.86        | 994  | 0.03    | 2.74          | 1133 | 0.02   |
| Octan-3-ol                       | 3.95        | 1000 | tr      | 5.89          | 1368 | tr     |
| Octanal                          | 4.02        | 1005 | 0.01    | 4.26          | 1251 | tr     |
| Δ3-Carene                        | 4.07        | 1008 | tr      | 2.47          | 1112 | tr     |
| (3Z)-Hexenyl acetate             | 4.12        | 1011 | 0.01    | 4.68          | 1282 | 0.01   |
| para-Cymene                      | 4.30        | 1023 | 0.02    | 3.93          | 1226 | 0.02   |
| Limonene                         | 4.39*       | 1028 | 0.13    | 3.04          | 1157 | 0.04   |
| 1,8-Cineole                      | 4.39*       | 1028 | [0.13]  | 3.15          | 1166 | 0.09   |
| 2-Ethylhexanol                   | 4.50        | 1035 | tr      | 7.10          | 1458 | 0.01   |
| (Z)-β-Ocimene                    | 4.60        | 1041 | tr      | 3.65          | 1206 | tr     |
| (E)-β-Ocimene                    | 4.75        | 1051 | 0.07    | 3.82          | 1219 | 0.07   |
| γ-Terpinene                      | 4.86        | 1058 | tr      | 3.62          | 1204 | tr     |
| cis-Sabinene hydrate             | 4.98        | 1066 | tr      | 6.72*         | 1429 | 0.09   |
| cis-Linalool oxide (fur.)        | 5.08        | 1072 | 0.10    | 6.35          | 1401 | 0.09   |
| Octanol                          | 5.16        | 1077 | 0.03    | 8.00          | 1526 | 0.01   |
| Fenchone                         | 5.26        | 1083 | 0.01    | 5.51          | 1340 | 0.01   |
| Terpinolene                      | 5.33*       | 1088 | 0.10    | 4.12          | 1241 | tr     |
| trans-Linalool oxide (fur.)      | 5.33*       | 1088 | [0.10]  | 6.72*         | 1429 | [0.09] |
| trans-Sabinene hydrate           | 5.45        | 1096 | tr      | 7.82          | 1511 | tr     |
| Linalool                         | 5.66*       | 1109 | 18.19   | 7.94*         | 1521 | 18.36  |
| (Z)-6-Methyl-3,5-heptadien-2-one | 5.66*       | 1109 | [18.19] | 8.02          | 1528 | 0.03   |
| endo-Fenchol                     | 5.69        | 1111 | tr      | 8.21          | 1542 | tr     |
| Octen-3-yl acetate               | 5.82        | 1119 | tr      | 5.62          | 1348 | tr     |
| Camphor                          | 6.08        | 1136 | 0.01    | 7.04          | 1453 | tr     |
| Isomenthone                      | 6.46        | 1160 | 0.01    | 6.78          | 1434 | 0.01   |
| Borneol                          | 6.51        | 1163 | 0.01    | 9.59*         | 1652 | 0.21   |
| Terpinen-4-ol                    | 6.64*       | 1172 | 0.16    | 8.38          | 1556 | 0.01   |
| Menthol                          | 6.64*       | 1172 | [0.16]  | 9.02*         | 1606 | 0.15   |
| α-Terpineol                      | 6.98        | 1193 | 0.07    | 9.59*         | 1652 | [0.21] |
| Methylchavicol                   | 7.21        | 1208 | 74.50   | 9.22*         | 1622 | 74.79  |

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|   |        |      |        |        |      |         |
|---|--------|------|--------|--------|------|---------|
| Octyl acetate   | 7.35   | 1218 | 0.02   | 6.91   | 1443 | 0.01    |
| Nerol   | 7.54   | 1230 | 0.03   | 10.86  | 1759 | 0.04    |
| Neral   | 7.69   | 1241 | 0.35   | 9.30   | 1628 | 0.37    |
| Piperitone  | 7.82   | 1250 | 0.01   | 9.74   | 1664 | 0.01    |
| Geraniol  | 7.94   | 1258 | 0.08   | 11.43  | 1808 | 0.07    |
| Geranal   | 8.14*  | 1271 | 0.60   | 9.90*  | 1678 | 0.58    |
| Chavicol  | 8.14*  | 1271 | [0.60] | 16.23  | 2270 | 0.03    |
| Bornyl acetate  | 8.31   | 1282 | 0.02   | 8.07   | 1531 | 0.02    |
| (E)-Anethole  | 8.40   | 1288 | 0.01   | 10.97  | 1768 | 0.01    |
| Menthyl acetate   | 8.49   | 1295 | 0.01   | 7.94*  | 1521 | [18.36] |
| Carvacrol   | 8.73   | 1311 | tr     | 15.17  | 2160 | 0.01    |
| Eugenol   | 9.43   | 1361 | 0.03   | 14.55  | 2097 | 0.03    |
| Neryl acetate   | 9.53   | 1367 | 0.02   | 9.99   | 1685 | 0.01    |
| $\alpha$ -Copaene                                       | 9.60   | 1373 | 0.03   | 6.99   | 1449 | 0.02    |
| $\beta$ -Bourbonene                                     | 9.72   | 1381 | 0.01   | 7.33   | 1475 | 0.01    |
| Geranyl acetate   | 9.76   | 1384 | tr     | 10.35  | 1715 | 0.01    |
| $\beta$ -Elemene  | 9.84   | 1389 | 0.09   | 8.30*  | 1549 | 0.76    |
| Methyleugenol   | 10.05  | 1404 | 0.04   | 13.13* | 1962 | 0.05    |
| $\beta$ -Caryophyllene                                  | 10.17  | 1414 | 0.31   | 8.30*  | 1549 | [0.76]  |
| trans- $\alpha$ -Bergamotene                            | 10.46  | 1435 | 0.47   | 8.30*  | 1549 | [0.76]  |
| Sesquisabinene A  | 10.56* | 1442 | 0.05   | 9.02*  | 1606 | [0.15]  |
| cis- $\beta$ -Bergamotene?                              | 10.56* | 1442 | [0.05] |        |      |         |
| $\alpha$ -Humulene                                      | 10.63  | 1448 | 0.18   | 9.22*  | 1622 | [74.79] |
| cis-Muurola-4(15),5-diene                               | 10.74  | 1456 | 0.02   | 9.22*  | 1622 | [74.79] |
| (E)- $\beta$ -Farnesene                                 | 10.79  | 1460 | 0.19   | 9.37*  | 1634 | 0.21    |
| $\gamma$ -Muurolene                                     | 10.97  | 1473 | tr     | 9.40   | 1636 | 0.07    |
| Germacrene D  | 11.00  | 1476 | 0.09   | 9.59*  | 1652 | [0.21]  |
| $\beta$ -Selinene                                       | 11.06  | 1480 | 0.01   | 9.67   | 1659 | 0.02    |
| trans- $\beta$ -Bergamotene                             | 11.09  | 1482 | 0.09   | 9.37*  | 1634 | [0.21]  |
| Bicyclogermacrene                                       | 11.19  | 1490 | 0.01   | 9.84   | 1673 | 0.01    |
| $\alpha$ -Zingiberene                                   | 11.26  | 1495 | 0.01   | 9.90*  | 1678 | [0.58]  |
| $\beta$ -Bisabolene                                     | 11.44  | 1508 | 0.10   | 9.96   | 1683 | 0.14    |
| $\gamma$ -Cadinene                                      | 11.47  | 1511 | 0.01   | 10.19  | 1701 | 0.01    |
| $\delta$ -Cadinene                                      | 11.59  | 1520 | 0.02   | 10.22  | 1704 | 0.02    |
| $\beta$ -Sesquiphellandrene                             | 11.61  | 1522 | 0.01   | 10.43  | 1722 | 0.01    |
| (E)- $\alpha$ -Bisabolene                               | 11.89  | 1544 | 1.23   | 10.54  | 1731 | 1.18    |
| (E)-para-Methoxycinnamaldehyde                          | 12.07  | 1558 | 0.36   | 17.93  | 2454 | 0.34    |
| (E)-Nerolidol   | 12.13* | 1562 | 0.32   | 13.58  | 2004 | 0.04    |
| (E)-para-Methoxycinnamyl alcohol                        | 12.13* | 1562 | [0.32] | 19.46  | 2632 | 0.30    |
| Spathulenol   | 12.23  | 1570 | 0.03   | 14.17  | 2061 | 0.04    |
| Caryophyllene oxide                                     | 12.28* | 1574 | 0.12   | 12.54  | 1906 | 0.09    |
| Caryophyllene oxide isomer                              | 12.28* | 1574 | [0.12] | 12.46  | 1900 | 0.02    |
| Unknown [m/z 137, 109 (18), 77 (16), 94 (14), 180 (13)] | 12.34  | 1580 | 0.02   | 19.95  | 2691 | 0.05    |
| Humulene epoxide II                                     | 12.60  | 1600 | 0.04   | 13.13* | 1962 | [0.05]  |
| 10-epi-Cubenol  | 12.73  | 1610 | 0.01   | 13.47  | 1994 | 0.01    |
| 1-epi-Cubenol   | 12.86  | 1621 | tr     | 13.53  | 1999 | tr      |

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|   |       |               |      |       |               |      |
|---|-------|---------------|------|-------|---------------|------|
| t-Cadinol   | 13.04 | 1636          | 0.01 | 14.66 | 2109          | tr   |
| Unknown [m/z 119, 91 (44), 94 (36), 107 (35), 93 (29)... 202 (19)...] | 13.11 | 1642          | 0.04 |       |               |      |
| α-Cadinol   | 13.19 | 1648          | 0.01 | 15.26 | 2169          | 0.02 |
| α-Bisabolol   | 13.58 | 1680          | 0.02 | 15.19 | 2162          | 0.02 |
| <b>Total identified</b>   |       | <b>98.77%</b> |      |       | <b>98.87%</b> |      |
| <b>Total reported</b>   |       | <b>98.83%</b> |      |       | <b>98.92%</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