

**Date :** 2025-11-12

**CERTIFICATE OF ANALYSIS - GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 25J16-PTH03

**Customer Identification :** Org Bergamot - Italy - BQ0113R

**Type :** Essential Oil

**Source :** *Citrus aurantium* var. *bergamia*

**Customer :** Plant Therapy

Checked and approved by:

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Sylvain Mercier, M. Sc., Chimiste 2014-005

*Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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. The compliance status of the sample is provided to facilitate the reading of the report. The client remains ultimately responsible for reviewing the results presented within this report and to establish compliance of the tested batch against relevant quality criteria.*

*This report is an update of the version first issued on October 20, 2025 to make a correction in the sample identification section.*



Laboratoire  
**PhytoChemia**

## GAS CHROMATOGRAPHIC ANALYSIS

**Method :** PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

**✖ISO**

**Results :** See analysis summary (next page)

**Analyst :** Jean-Christophe Fortin, M. Sc.

**Date :** 2025-10-20

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4644 \pm 0.0003$  (20 °C)

**Method :** PC-MAT-016 - Measure of the refractive index of a liquid.

**Analyst :** Cindy Caron B. Sc.

**Date :** 2025-10-17

## 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                 |
|-----------------------------------------|-------|-----------------------|
| Tricyclene                              | tr    | Monoterpene           |
| $\alpha$ -Thujene                       | 0.29  | Monoterpene           |
| $\alpha$ -Pinene                        | 1.09  | Monoterpene           |
| Camphene                                | 0.04  | Monoterpene           |
| $\beta$ -Pinene                         | 5.65  | Monoterpene           |
| Sabinene                                | 1.02  | Monoterpene           |
| 6-Methyl-5-hepten-2-one                 | 0.02  | Aliphatic ketone      |
| Myrcene                                 | 0.92  | Monoterpene           |
| $\alpha$ -Phellandrene                  | 0.03  | Monoterpene           |
| Octanal                                 | 0.03  | Aliphatic aldehyde    |
| $\alpha$ -Terpinene                     | 0.14  | Monoterpene           |
| <i>para</i> -Cymene                     | 0.67  | Monoterpene           |
| Limonene                                | 40.11 | Monoterpene           |
| $\beta$ -Phellandrene                   | 0.17  | Monoterpene           |
| 1,8-Cineole                             | 0.02  | Monoterpenic ether    |
| (Z)- $\beta$ -Ocimene                   | 0.03  | Monoterpene           |
| (E)- $\beta$ -Ocimene                   | 0.23  | Monoterpene           |
| $\gamma$ -Terpinene                     | 6.64  | Monoterpene           |
| <i>cis</i> -Sabinene hydrate            | 0.04  | Monoterpenic alcohol  |
| <i>cis</i> -Linalool oxide (fur.)       | 0.02  | Monoterpenic alcohol  |
| Octanol                                 | 0.02  | Aliphatic alcohol     |
| Terpinolene                             | 0.31  | Monoterpene           |
| <i>trans</i> -Linalool oxide (fur.)     | 0.01  | Monoterpenic alcohol  |
| <i>trans</i> -Sabinene hydrate          | 0.01  | Monoterpenic alcohol  |
| Linalool                                | 11.95 | Monoterpenic alcohol  |
| Nonanal                                 | 0.02  | Aliphatic aldehyde    |
| <i>trans-para</i> -Mentha-2,8-dien-1-ol | 0.01  | Monoterpenic alcohol  |
| <i>cis</i> -Limonene oxide              | 0.01  | Monoterpenic ether    |
| <i>trans</i> -Limonene oxide            | 0.01  | Monoterpenic ether    |
| Camphor                                 | 0.01  | Monoterpenic ketone   |
| Citronellal                             | 0.01  | Monoterpenic aldehyde |
| Terpinen-4-ol                           | 0.04  | Monoterpenic alcohol  |
| $\alpha$ -Terpineol                     | 0.18  | Monoterpenic alcohol  |
| Decanal                                 | 0.04  | Aliphatic aldehyde    |
| Octyl acetate                           | 0.11  | Aliphatic ester       |
| Nerol                                   | 0.09  | Monoterpenic alcohol  |
| Citronellol                             | 0.02  | Monoterpenic alcohol  |
| Neral                                   | 0.21  | Monoterpenic aldehyde |
| Geraniol                                | 0.05  | Monoterpenic alcohol  |
| Linalyl acetate                         | 25.00 | Monoterpenic ester    |

|                                                   |              |                        |
|---------------------------------------------------|--------------|------------------------|
| Geranial                                          | 0.30         | Monoterpenic aldehyde  |
| Bornyl acetate                                    | 0.02         | Monoterpenic ester     |
| <i>cis-para</i> -Mentha-2,8-diene-1-hydroperoxide | 0.01         | Monoterpenic peroxide  |
| <i>para</i> -Mentha-1,8-diene-4-hydroperoxide     | 0.01         | Monoterpenic peroxide  |
| Hodiendiol derivative                             | 0.01         | Oxygenated monoterpene |
| Linalyl propionate                                | 0.04         | Monoterpenic ester     |
| $\alpha$ -Terpinyl acetate                        | 0.13         | Monoterpenic ester     |
| Unknown                                           | 0.02         | Monoterpenic ester     |
| Unknown                                           | 0.03         | Oxygenated monoterpene |
| Neryl acetate                                     | 0.35         | Monoterpenic ester     |
| Geranyl acetate                                   | 0.27         | Monoterpenic ester     |
| Dodecanal                                         | 0.01         | Aliphatic aldehyde     |
| $\beta$ -Caryophyllene                            | 0.29         | Sesquiterpene          |
| <i>cis</i> - $\alpha$ -Bergamotene                | 0.02         | Sesquiterpene          |
| <i>trans</i> - $\alpha$ -Bergamotene              | 0.26         | Sesquiterpene          |
| $\alpha$ -Humulene                                | 0.03         | Sesquiterpene          |
| ( <i>E</i> )- $\beta$ -Farnesene                  | 0.06         | Sesquiterpene          |
| Germacrene D                                      | 0.04         | Sesquiterpene          |
| Hodiendiol derivative II                          | 0.03         | Oxygenated monoterpene |
| $\beta$ -Bisabolene                               | 0.32         | Sesquiterpene          |
| ( <i>E</i> )- $\alpha$ -Bisabolene                | 0.01         | Sesquiterpene          |
| ( <i>E</i> )-Nerolidol                            | 0.02         | Sesquiterpenic alcohol |
| Caryophyllene oxide                               | 0.01         | Sesquiterpenic ether   |
| $\alpha$ -Bisabolol                               | 0.01         | Sesquiterpenic alcohol |
| Nootkatone                                        | tr           | Sesquiterpenic ketone  |
| <b>Consolidated total</b>                         | <b>97.58</b> |                        |

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

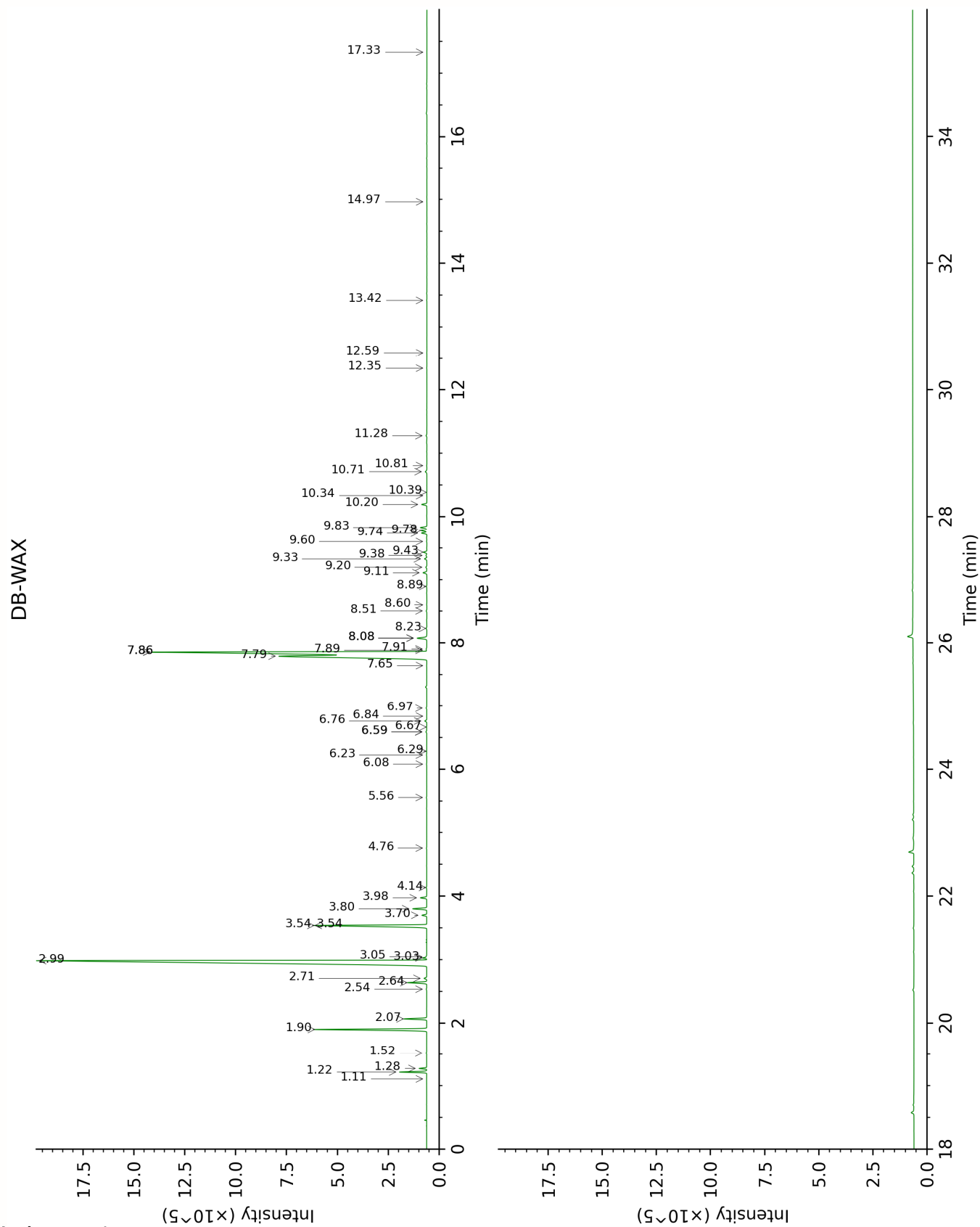
Note: no correction factor was applied

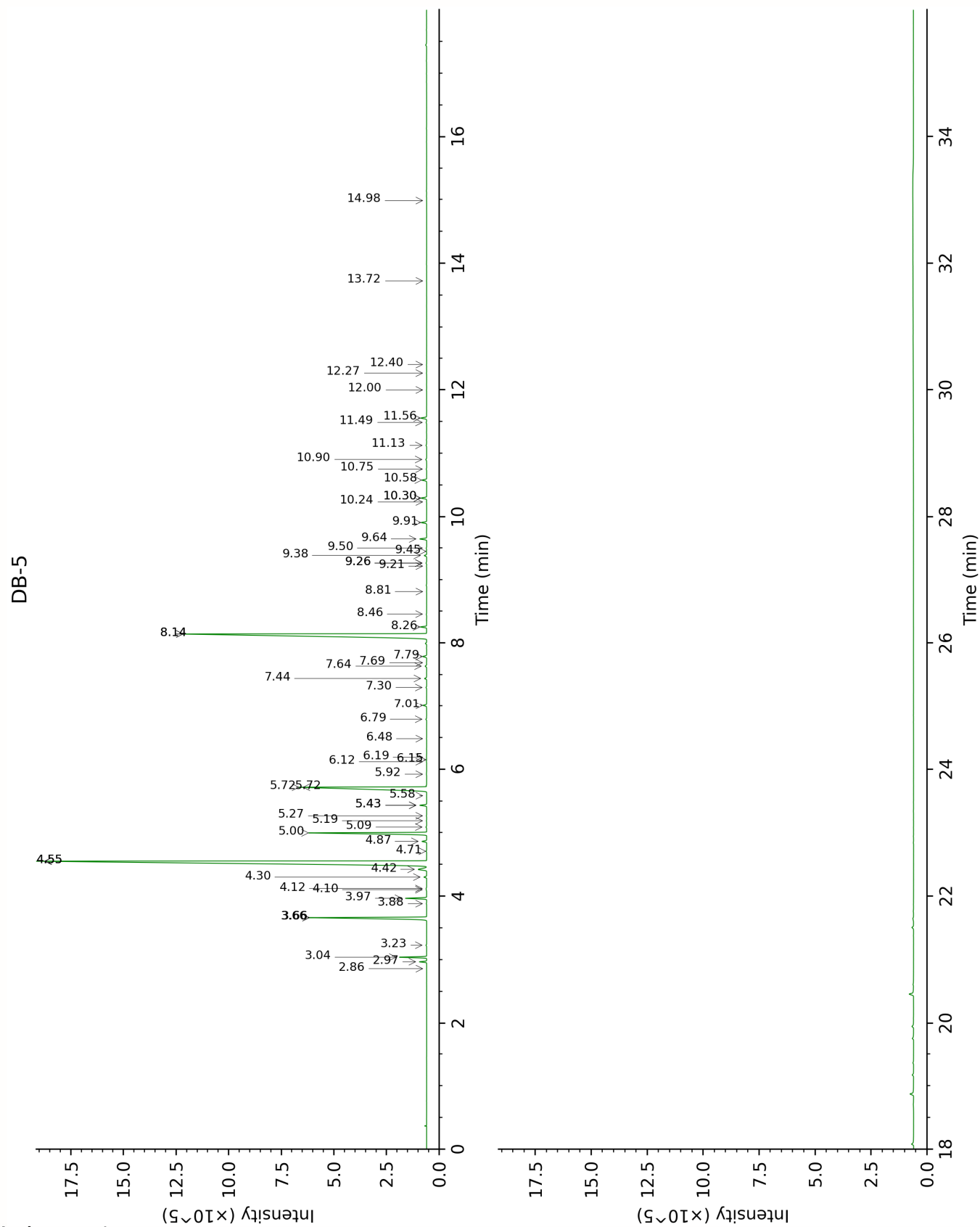
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

**Bracketed value ([xx]):** A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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





FULL ANALYSIS DATA

| Tricyclene                              | Column DB-WAX |        |         | Column DB-5 |        |         |
|-----------------------------------------|---------------|--------|---------|-------------|--------|---------|
|                                         | 1.11          | 972.4  | tr      | 2.86        | 919.0  | tr      |
| $\alpha$ -Thujene                       | 1.28          | 1001.5 | 0.28    | 2.97        | 926.3  | 0.29    |
| $\alpha$ -Pinene                        | 1.22          | 991.6  | 1.08    | 3.04        | 931.1  | 1.09    |
| Camphene                                | 1.52          | 1028.4 | 0.03    | 3.23        | 943.7  | 0.04    |
| $\beta$ -Pinene                         | 1.90          | 1067.4 | 5.65    | 3.66*       | 972.8  | [6.71]  |
| Sabinene                                | 2.07          | 1084.6 | 1.02    | 3.66*       | 972.8  | [6.71]  |
| 6-Methyl-5-hepten-2-one                 | 4.76          | 1297.6 | 0.02    | 3.88        | 987.6  | 0.02    |
| Myrcene                                 | 2.64          | 1134.8 | 0.91    | 3.97        | 993.3  | 0.92    |
| $\alpha$ -Phellandrene                  | 2.54          | 1126.6 | 0.02    | 4.10        | 1002.3 | 0.03    |
| Octanal                                 | 4.14          | 1251.4 | 0.03    | 4.12        | 1003.6 | 0.03    |
| $\alpha$ -Terpinene                     | 2.71          | 1140.2 | 0.13    | 4.30        | 1015.1 | 0.14    |
| <i>para</i> -Cymene                     | 3.80          | 1226.6 | 0.67    | 4.42        | 1022.8 | 0.67    |
| Limonene                                | 2.99          | 1162.7 | 40.11   | 4.55*       | 1031.0 | [40.70] |
| $\beta$ -Phellandrene                   | 3.03          | 1166.1 | 0.17    | 4.55*       | 1031.0 | [40.70] |
| 1,8-Cineole                             | 3.05          | 1167.5 | 0.02    | 4.55*       | 1031.0 | [40.70] |
| ( <i>Z</i> )- $\beta$ -Ocimene          | 3.54*         | 1207.1 | [6.60]  | 4.71        | 1040.9 | 0.03    |
| ( <i>E</i> )- $\beta$ -Ocimene          | 3.70          | 1219.0 | 0.22    | 4.87        | 1050.8 | 0.23    |
| $\gamma$ -Terpinene                     | 3.54*         | 1207.1 | [6.60]  | 5.00        | 1059.2 | 6.64    |
| <i>cis</i> -Sabinene hydrate            | 6.59*         | 1430.5 | [0.05]  | 5.09        | 1065.1 | 0.04    |
| <i>cis</i> -Linalool oxide (fur.)       | 6.23          | 1403.0 | 0.01    | 5.19        | 1071.4 | 0.02    |
| Octanol                                 | 7.89          | 1529.3 | 0.02    | 5.27        | 1076.3 | 0.02    |
| Terpinolene                             | 3.98          | 1239.4 | 0.31    | 5.43*       | 1086.9 | [0.32]  |
| <i>trans</i> -Linalool oxide (fur.)     | 6.59*         | 1430.5 | [0.05]  | 5.43*       | 1086.9 | [0.32]  |
| <i>trans</i> -Sabinene hydrate          | 7.65          | 1510.4 | 0.01    | 5.58        | 1096.5 | 0.01    |
| Linalool                                | 7.80*†        | 1522.1 | [14.75] | 5.72*       | 1105.0 | [11.97] |
| Nonanal                                 | 5.56          | 1354.0 | 0.02    | 5.72*       | 1105.0 | [11.97] |
| <i>trans-para</i> -Mentha-2,8-dien-1-ol | 8.60          | 1585.6 | 0.01    | 5.92        | 1118.3 | 0.01    |
| <i>cis</i> -Limonene oxide              | 6.08          | 1392.5 | 0.01    | 6.12        | 1131.1 | 0.01    |
| <i>trans</i> -Limonene oxide            | 6.29          | 1407.5 | 0.01    | 6.15        | 1133.1 | 0.01    |
| Camphor                                 | 6.84          | 1449.2 | 0.01    | 6.19        | 1135.7 | 0.01    |
| Citronellal                             | 6.67          | 1436.3 | 0.01    | 6.48        | 1154.7 | 0.01    |
| Terpinen-4-ol                           | 8.23          | 1556.5 | 0.04    | 6.79        | 1174.6 | 0.04    |
| $\alpha$ -Terpineol                     | 9.43          | 1653.1 | 0.18    | 7.01        | 1188.9 | 0.18    |
| Decanal                                 | 6.97          | 1459.0 | 0.04    | 7.30        | 1208.0 | 0.04    |

|                                                                                                  |        |        |         |        |        |         |
|--------------------------------------------------------------------------------------------------|--------|--------|---------|--------|--------|---------|
| Octyl acetate                                                                                    | 6.76   | 1443.5 | 0.10    | 7.44   | 1217.7 | 0.11    |
| Nerol                                                                                            | 10.71  | 1760.6 | 0.10    | 7.64   | 1230.9 | 0.09    |
| Citronellol                                                                                      | 10.39  | 1732.7 | 0.01    | 7.69   | 1234.6 | 0.02    |
| Neral                                                                                            | 9.11   | 1626.4 | 0.22    | 7.79   | 1241.3 | 0.21    |
| Geraniol                                                                                         | 11.28  | 1809.5 | 0.05    | 8.14*  | 1265.6 | [25.05] |
| Linalyl acetate                                                                                  | 7.86*† | 1527.1 | [22.14] | 8.14*  | 1265.6 | [25.05] |
| Geranial                                                                                         | 9.74   | 1677.9 | 0.29    | 8.26   | 1273.2 | 0.30    |
| Bornyl acetate                                                                                   | 7.91   | 1531.1 | 0.04    | 8.46   | 1287.0 | 0.02    |
| <i>cis</i> - <i>para</i> -<br>Mentha-2,8-<br>diene-1-<br>hydroperoxide                           |        |        |         | 8.81   | 1307.6 | 0.01    |
| <i>para</i> -Mentha-<br>1,8-diene-4-<br>hydroperoxide                                            |        |        |         | 9.21   | 1336.2 | 0.01    |
| Hodiendiol<br>derivative                                                                         | 12.59  | 1928.3 | 0.01    | 9.26*  | 1339.6 | [0.04]  |
| Linalyl<br>propionate                                                                            | 8.51   | 1578.2 | 0.04    | 9.26*  | 1339.6 | [0.04]  |
| $\alpha$ -Terpinyl<br>acetate                                                                    | 9.33   | 1644.4 | 0.13    | 9.38   | 1348.1 | 0.13    |
| Unknown MISC<br>VII [m/z 43, 121<br>(52), 93 (48), 79<br>(33), 41 (30), 136<br>(26), 81 (25)...] |        |        |         | 9.45   | 1352.8 | 0.02    |
| Unknown SASC<br>III [m/z 43, 79<br>(46), 71 (30), 94<br>(25), 41 (23), 81<br>(21)... 197 (0)]    | 10.81  | 1768.9 | 0.01    | 9.50   | 1356.5 | 0.03    |
| Neryl acetate                                                                                    | 9.83   | 1685.8 | 0.36    | 9.64   | 1366.7 | 0.35    |
| Geranyl acetate                                                                                  | 10.20  | 1716.2 | 0.27    | 9.91   | 1386.0 | 0.27    |
| Dodecanal                                                                                        | 9.60   | 1666.9 | 0.02    | 10.24  | 1409.2 | 0.01    |
| $\beta$ -Caryophyllene                                                                           | 8.08*  | 1544.5 | [0.55]  | 10.30* | 1413.8 | [0.32]  |
| <i>cis</i> - $\alpha$ -<br>Bergamotene                                                           | 7.86*† | 1527.1 | [22.14] | 10.30* | 1413.8 | [0.32]  |
| <i>trans</i> - $\alpha$ -<br>Bergamotene                                                         | 8.08*  | 1544.5 | [0.55]  | 10.58  | 1435.0 | 0.26    |
| $\alpha$ -Humulene                                                                               | 8.89   | 1608.6 | 0.02    | 10.75  | 1448.0 | 0.03    |
| ( <i>E</i> )- $\beta$ -Farnesene                                                                 | 9.20   | 1633.5 | 0.06    | 10.90  | 1459.4 | 0.06    |
| Germacrene D                                                                                     | 9.38   | 1648.8 | 0.06    | 11.13  | 1476.0 | 0.04    |
| Hodiendiol<br>derivative II                                                                      |        |        |         | 11.49  | 1503.2 | 0.03    |
| $\beta$ -Bisabolene                                                                              | 9.78   | 1681.3 | 0.31    | 11.56  | 1508.5 | 0.32    |

|                           |       |        |      |       |        |      |
|---------------------------|-------|--------|------|-------|--------|------|
| (E)- $\alpha$ -Bisabolene | 10.34 | 1728.2 | 0.01 | 12.00 | 1543.4 | 0.01 |
| (E)-Nerolidol             | 13.42 | 2005.7 | 0.01 | 12.26 | 1564.4 | 0.02 |
| Caryophyllene oxide       | 12.34 | 1905.2 | 0.01 | 12.40 | 1575.1 | 0.01 |
| $\alpha$ -Bisabolol       | 14.97 | 2158.3 | 0.01 | 13.72 | 1683.4 | 0.01 |
| Nootkatone                | 17.33 | 2408.2 | 0.01 | 14.98 | 1792.0 | tr   |
| Total reported            |       | 97.31% |      |       | 98.02% |      |
|                           |       |        |      |       |        |      |

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

[xx]: Duplicate percentage due to coelutions, only the first one is 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