

Date : April 12, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19D02-ORA05-1-SCC
Customer identification : Organic Rosemary
Type : Essential oil
Source : *Rosmarinus officinalis* ct. 1,8-Cineole
Customer : Organic Aromas Inc.

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : April 09, 2019

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: Faintly yellow liquid

Refractive index: 1.4669 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

| Identification | DB-5 (%) | DB-WAX (%) | Classe |
|-----------------------------|----------|------------|----------------------|
| Isovaleral | tr | tr | Aliphatic aldehyde |
| Toluene | tr | 0.31* | Simple phenolic |
| Hexanal | tr | | Aliphatic aldehyde |
| (2E)-Hexenal | 0.01 | 44.51* | Aliphatic aldehyde |
| (3Z)-Hexenol | 0.04 | 0.04 | Aliphatic alcohol |
| Hexanol | 0.01 | 0.01 | Aliphatic alcohol |
| Bornylene | 0.01 | 0.01 | Monoterpene |
| Hashishene | 0.02 | 11.64* | Monoterpene |
| Tricyclene | 0.14 | 0.14 | Monoterpene |
| α -Thujene | 0.30 | [0.31]* | Monoterpene |
| α -Pinene | 11.68 | [11.64]* | Monoterpene |
| Camphene | 4.21* | 4.11 | Monoterpene |
| α -Fenchene | [4.21]* | 0.09 | Monoterpene |
| Thuja-2,4(10)-diene | 0.02 | 0.15* | Monoterpene |
| Sabinene | 5.73* | [0.15]* | Monoterpene |
| β -Pinene | [5.73]* | 5.63 | Monoterpene |
| Octen-3-ol | 0.18 | 0.17 | Aliphatic alcohol |
| Octan-3-one | 0.07 | 0.11* | Aliphatic ketone |
| Myrcene | 1.19 | 1.18 | Monoterpene |
| α -Phellandrene | 0.12* | 0.08 | Monoterpene |
| Pseudolimonene | [0.12]* | 0.03 | Monoterpene |
| Δ^3 -Carene | 0.37 | 0.37 | Monoterpene |
| α -Terpinene | 0.19 | 0.19 | Monoterpene |
| para-Cymene | 1.68 | 1.72 | Monoterpene |
| Limonene | 47.17* | 2.41 | Monoterpene |
| 1,8-Cineole | [47.17]* | [44.51]* | Monoterpenic ether |
| (Z)- β -Ocimene | 0.03 | 0.03 | Monoterpene |
| (E)- β -Ocimene | 0.06 | [0.11]* | Monoterpene |
| γ -Terpinene | 0.31 | 0.32 | Monoterpene |
| cis-Sabinene hydrate | 0.07 | 0.08* | Monoterpenic alcohol |
| cis-Linalool oxide (fur.) | 0.01 | 0.01 | Monoterpenic alcohol |
| Octanol | 0.01 | 0.02* | Aliphatic alcohol |
| Terpinolene | 0.29* | 0.25 | Monoterpene |
| trans-Linalool oxide (fur.) | [0.29]* | [0.08]* | Monoterpenic alcohol |
| para-Cymenene | [0.29]* | 0.04 | Monoterpene |
| trans-Sabinene hydrate | 0.04 | 0.05 | Monoterpenic alcohol |
| Linalool | 0.65 | 0.67 | Monoterpenic alcohol |
| endo-Fenchol | 0.06 | 3.03* | Monoterpenic alcohol |
| cis-para-Menth-2-en-1-ol | 0.03 | 0.04 | Monoterpenic alcohol |
| Camphor | 12.21 | 12.07 | Monoterpenic ketone |
| Camphene hydrate | 0.09 | 0.05 | Monoterpenic alcohol |
| Pinocamphone | 0.03* | 0.01 | Monoterpenic ketone |
| Isoborneol | [0.03]* | 0.01 | Monoterpenic alcohol |
| Pinocarvone | 0.04 | 0.05 | Monoterpenic ketone |
| Borneol | 2.83 | 4.46* | Monoterpenic alcohol |
| δ -Terpineol | 0.34 | 0.36 | Monoterpenic alcohol |
| Terpinen-4-ol | 0.75 | 0.72 | Monoterpenic alcohol |
| para-Cymen-8-ol | 0.05 | 0.06 | Monoterpenic alcohol |

| | | | |
|---------------------------------------|---------------|---------------|------------------------|
| α -Terpineol | 1.61* | [4.46]* | Monoterpenic alcohol |
| Myrtenal | [1.61]* | 0.03 | Monoterpenic aldehyde |
| Myrtenol | 0.03 | 0.03 | Monoterpenic alcohol |
| Verbenone | 0.02* | 0.02 | Monoterpenic ketone |
| Unknown | [0.02]* | 0.01 | Unknown |
| <i>trans</i> -Carveol | 0.01 | 0.01 | Monoterpenic alcohol |
| Bornyl formate | 0.02 | 0.03 | Monoterpenic ester |
| <i>cis</i> -Carveol | 0.01 | 0.01 | Monoterpenic alcohol |
| Carvone | 0.01 | 0.08* | Monoterpenic ketone |
| Linalyl acetate | 0.01 | [0.02]* | Monoterpenic ester |
| <i>trans</i> -Ascaridole glycol | 0.03 | 0.03 | Monoterpenic alcohol |
| Bornyl acetate | 0.99 | 0.99 | Monoterpenic ester |
| Unknown | 0.03 | 0.04 | Monoterpenic alcohol |
| α -Cubebene | 0.05 | 0.05 | Sesquiterpene |
| α -Ylangene | 0.08 | 0.09 | Sesquiterpene |
| α -Copaene | 0.25 | 0.24 | Sesquiterpene |
| Methyleugenol | 0.03* | 0.02 | Phenylpropanoid |
| α -Gurjunene | [0.03]* | 0.01 | Sesquiterpene |
| β -Caryophyllene | 3.03 | [3.03]* | Sesquiterpene |
| β -Gurjunene | 0.02 | 0.03 | Sesquiterpene |
| β -Copaene | 0.06 | 0.05 | Sesquiterpene |
| Aromadendrene | 0.07 | 0.07 | Sesquiterpene |
| α -Humulene | 0.31 | 0.31 | Sesquiterpene |
| <i>trans</i> -Cadina-1(6),4-diene | 0.01 | 0.01 | Sesquiterpene |
| γ -Murolene | 0.21 | 0.23* | Sesquiterpene |
| α -Amorphene | 0.03 | [0.23]* | Sesquiterpene |
| β -Selinene | 0.04 | 0.04 | Sesquiterpene |
| α -Selinene | 0.09 | 0.05 | Sesquiterpene |
| α -Murolene | 0.06 | [0.08]* | Sesquiterpene |
| β -Bisabolene | 0.17 | 0.05 | Sesquiterpene |
| γ -Cadinene | [0.17] | 0.36 | Sesquiterpene |
| δ -Cadinene | 0.29* | [0.36] | Sesquiterpene |
| <i>trans</i> -Calamenene | [0.29]* | 0.04 | Sesquiterpene |
| <i>trans</i> -Cadina-1,4-diene | 0.01 | 0.03 | Sesquiterpene |
| α -Calacorene | 0.02 | 0.01 | Sesquiterpene |
| Caryophyllene oxide | 0.20* | 0.17 | Sesquiterpenic ether |
| Caryophyllene oxide isomer | [0.20]* | 0.02 | Sesquiterpenic ether |
| Humulene epoxide II | 0.02 | 0.02 | Sesquiterpenic ether |
| Caryophylladienol II | 0.02 | 0.02 | Sesquiterpenic alcohol |
| 14-Hydroxy-(<i>Z</i>)-caryophyllene | 0.02 | 0.02 | Sesquiterpenic alcohol |
| 14-Hydroxy-(<i>E</i>)-caryophyllene | 0.02 | 0.03 | Sesquiterpenic alcohol |
| Total identified | 98.88% | 98.42% | |

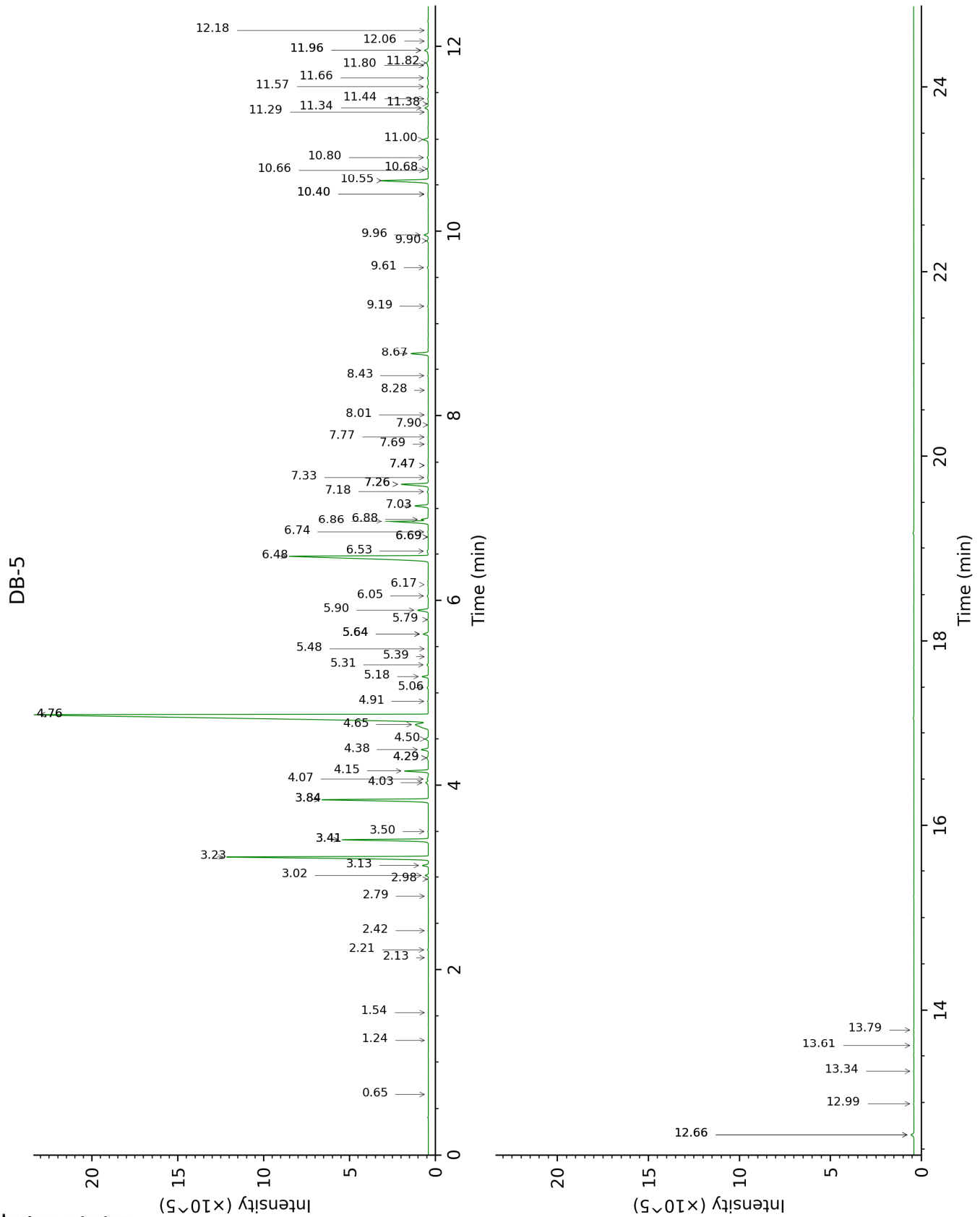
*: Two or more compounds are coeluting on this column

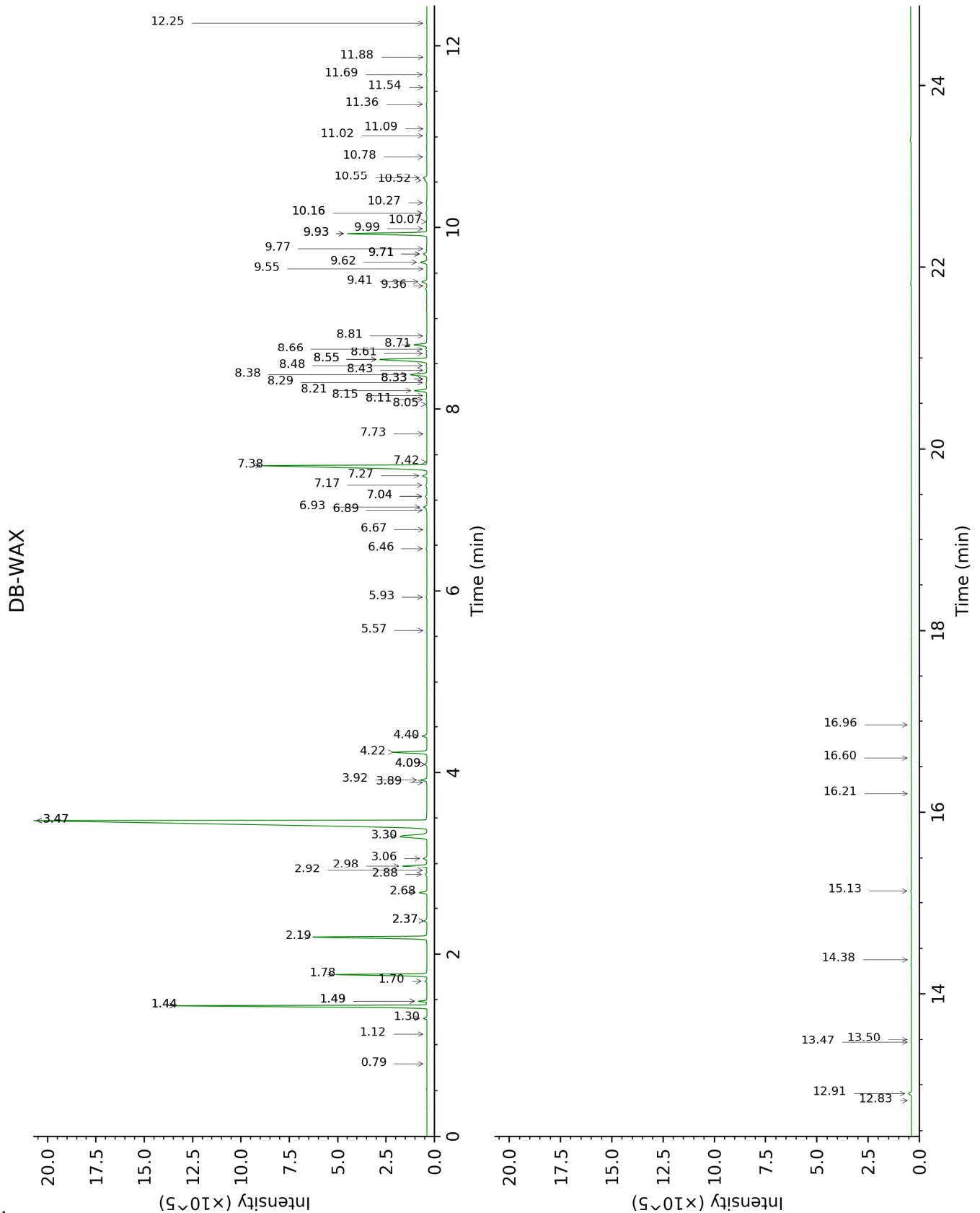
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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 | % |
| Isovaleral | 0.65 | 642 | tr | 0.79 | 888 | tr |
| Toluene | 1.24 | 757 | tr | 1.49* | 998 | 0.31 |
| Hexanal | 1.54 | 798 | tr | | | |
| (2E)-Hexenal | 2.13 | 848 | 0.01 | 3.47* | 1172 | 44.51 |
| (3Z)-Hexenol | 2.22 | 855 | 0.04 | 5.93 | 1350 | 0.04 |
| Hexanol | 2.42 | 872 | 0.01 | 5.57 | 1323 | 0.01 |
| Bornylene | 2.79 | 902 | 0.01 | 1.12 | 944 | 0.01 |
| Hashishene | 2.98 | 914 | 0.02 | 1.44* | 994 | 11.64 |
| Tricyclene | 3.02 | 917 | 0.14 | 1.30 | 972 | 0.14 |
| α -Thujene | 3.13 | 924 | 0.30 | 1.49* | 998 | [0.31] |
| α -Pinene | 3.23 | 930 | 11.68 | 1.44* | 994 | [11.64] |
| Camphene | 3.41* | 943 | 4.21 | 1.78 | 1027 | 4.11 |
| α -Fenchene | 3.41* | 943 | [4.21] | 1.70 | 1020 | 0.09 |
| Thuja-2,4(10)-diene | 3.50 | 949 | 0.02 | 2.37* | 1084 | 0.15 |
| Sabinene | 3.84* | 971 | 5.73 | 2.37* | 1084 | [0.15] |
| β -Pinene | 3.84* | 971 | [5.73] | 2.19 | 1067 | 5.63 |
| Octen-3-ol | 4.03 | 983 | 0.18 | 6.93 | 1422 | 0.17 |
| Octan-3-one | 4.07 | 986 | 0.07 | 4.09* | 1218 | 0.11 |
| Myrcene | 4.15 | 992 | 1.19 | 2.98 | 1133 | 1.18 |
| α -Phellandrene | 4.30* | 1001 | 0.12 | 2.88 | 1126 | 0.08 |
| Pseudolimonene | 4.30* | 1001 | [0.12] | 2.92 | 1129 | 0.03 |
| Δ^3 -Carene | 4.38 | 1007 | 0.37 | 2.68 | 1110 | 0.37 |
| α -Terpinene | 4.50 | 1014 | 0.19 | 3.06 | 1140 | 0.19 |
| para-Cymene | 4.65 | 1024 | 1.68 | 4.22 | 1227 | 1.72 |
| Limonene | 4.76* | 1030 | 47.17 | 3.30 | 1158 | 2.41 |
| 1,8-Cineole | 4.76* | 1030 | [47.17] | 3.47* | 1172 | [44.51] |
| (Z)- β -Ocimene | 4.90 | 1040 | 0.03 | 3.89 | 1203 | 0.03 |
| (E)- β -Ocimene | 5.06 | 1049 | 0.06 | 4.09* | 1218 | [0.11] |
| γ -Terpinene | 5.18 | 1057 | 0.31 | 3.92 | 1205 | 0.32 |
| cis-Sabinene hydrate | 5.31 | 1065 | 0.07 | 7.04* | 1430 | 0.08 |
| cis-Linalool oxide (fur.) | 5.39 | 1070 | 0.01 | 6.67 | 1403 | 0.01 |
| Octanol | 5.48 | 1076 | 0.01 | 8.33* | 1527 | 0.02 |
| Terpinolene | 5.64* | 1086 | 0.29 | 4.40 | 1240 | 0.25 |
| trans-Linalool oxide (fur.) | 5.64* | 1086 | [0.29] | 7.04* | 1430 | [0.08] |
| para-Cymenene | 5.64* | 1086 | [0.29] | 6.46 | 1388 | 0.04 |
| trans-Sabinene hydrate | 5.79 | 1096 | 0.04 | 8.11 | 1509 | 0.05 |
| Linalool | 5.90 | 1102 | 0.65 | 8.20 | 1517 | 0.67 |
| endo-Fenchol | 6.05 | 1112 | 0.06 | 8.55* | 1543 | 3.03 |
| cis-para-Menth-2-en-1-ol | 6.17 | 1120 | 0.03 | 8.29 | 1524 | 0.04 |
| Camphor | 6.48 | 1140 | 12.21 | 7.38 | 1455 | 12.07 |
| Camphene hydrate | 6.53 | 1143 | 0.09 | 8.61 | 1548 | 0.05 |

| | | | | | | |
|--|--------|------|--------|--------|------|--------|
| Pinocamphone | 6.69* | 1153 | 0.03 | 7.42 | 1458 | 0.01 |
| Isoborneol | 6.69* | 1153 | [0.03] | 9.55 | 1622 | 0.01 |
| Pinocarvone | 6.74 | 1157 | 0.04 | 8.05 | 1505 | 0.05 |
| Borneol | 6.86 | 1164 | 2.83 | 9.93* | 1653 | 4.46 |
| δ-Terpineol | 6.88 | 1166 | 0.34 | 9.62 | 1628 | 0.36 |
| Terpinen-4-ol | 7.03 | 1175 | 0.75 | 8.72 | 1556 | 0.72 |
| para-Cymen-8-ol | 7.18 | 1185 | 0.05 | 11.68 | 1799 | 0.06 |
| α-Terpineol | 7.26* | 1190 | 1.61 | 9.93* | 1653 | [4.46] |
| Myrtenal | 7.26* | 1190 | [1.61] | 8.81 | 1564 | 0.03 |
| Myrtenol | 7.34 | 1195 | 0.03 | 11.02 | 1742 | 0.03 |
| Verbenone | 7.47* | 1204 | 0.02 | 9.77 | 1639 | 0.02 |
| Unknown [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)] | 7.47* | 1204 | [0.02] | 11.09 | 1749 | 0.01 |
| trans-Carveol | 7.69 | 1219 | 0.01 | 11.54 | 1787 | 0.01 |
| Bornyl formate | 7.77 | 1224 | 0.02 | 8.15 | 1513 | 0.03 |
| cis-Carveol | 7.90 | 1233 | 0.01 | 11.88 | 1816 | 0.01 |
| Carvone | 8.01 | 1241 | 0.01 | 10.16* | 1671 | 0.08 |
| Linalyl acetate | 8.28 | 1259 | 0.01 | 8.33* | 1527 | [0.02] |
| trans-Ascaridole glycol | 8.43 | 1270 | 0.03 | 14.38 | 2045 | 0.03 |
| Bornyl acetate | 8.67 | 1286 | 0.99 | 8.38 | 1530 | 0.99 |
| Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)] | 9.19 | 1317 | 0.03 | 15.13 | 2119 | 0.04 |
| α-Cubebene | 9.61 | 1346 | 0.05 | 6.89 | 1419 | 0.05 |
| α-Ylangene | 9.90 | 1367 | 0.08 | 7.17 | 1439 | 0.09 |
| α-Copaene | 9.96 | 1371 | 0.25 | 7.27 | 1447 | 0.24 |
| Methyleugenol | 10.40* | 1402 | 0.03 | 13.47 | 1959 | 0.02 |
| α-Gurjunene | 10.40* | 1402 | [0.03] | 7.73 | 1481 | 0.01 |
| β-Caryophyllene | 10.55 | 1414 | 3.03 | 8.55* | 1543 | [3.03] |
| β-Gurjunene | 10.66 | 1422 | 0.02 | 8.43 | 1534 | 0.03 |
| β-Copaene | 10.68 | 1424 | 0.06 | 8.48 | 1538 | 0.05 |
| Aromadendrene | 10.80 | 1433 | 0.07 | 8.66 | 1552 | 0.07 |
| α-Humulene | 11.00 | 1447 | 0.31 | 9.41 | 1610 | 0.31 |
| trans-Cadina- 1(6),4-diene | 11.29 | 1469 | 0.01 | 9.36 | 1607 | 0.01 |
| γ-Murolene | 11.34 | 1473 | 0.21 | 9.71* | 1635 | 0.23 |
| α-Amorphene | 11.38 | 1476 | 0.03 | 9.71* | 1635 | [0.23] |
| β-Selinene | 11.44 | 1480 | 0.04 | 9.99 | 1657 | 0.04 |
| α-Selinene | 11.57 | 1490 | 0.09 | 10.07 | 1663 | 0.05 |
| α-Murolene | 11.66 | 1497 | 0.06 | 10.16* | 1671 | [0.08] |
| β-Bisabolene | 11.80† | 1507 | 0.17 | 10.27 | 1680 | 0.05 |
| γ-Cadinene | 11.82† | 1509 | [0.17] | 10.52† | 1700 | 0.36 |
| δ-Cadinene | 11.96* | 1520 | 0.29 | 10.55† | 1703 | [0.36] |
| trans-Calamenene | 11.96* | 1520 | [0.29] | 11.36 | 1771 | 0.04 |
| trans-Cadina-1,4- diene | 12.06 | 1528 | 0.01 | 10.78 | 1723 | 0.03 |
| α-Calacorene | 12.18 | 1537 | 0.02 | 12.25 | 1849 | 0.01 |

| | | | | | | |
|------------------------------|--------|---------------|--------|-------|---------------|------|
| Caryophyllene oxide | 12.66* | 1575 | 0.20 | 12.91 | 1908 | 0.17 |
| Caryophyllene oxide isomer | 12.66* | 1575 | [0.20] | 12.83 | 1900 | 0.02 |
| Humulene epoxide II | 12.99 | 1601 | 0.02 | 13.50 | 1962 | 0.02 |
| Caryophylladienol II | 13.34 | 1630 | 0.02 | 16.21 | 2227 | 0.02 |
| 14-Hydroxy-(Z)-caryophyllene | 13.61 | 1652 | 0.02 | 16.60 | 2268 | 0.02 |
| 14-Hydroxy-(E)-caryophyllene | 13.79 | 1667 | 0.02 | 16.96 | 2306 | 0.03 |
| Total identified | | 98.88% | | | 98.42% | |
| Total reported | | 98.91% | | | 98.47% | |

*: 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)
R.I.: Retention index