

Date : May 31, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19E22-PTH02-1-SCC

Customer identification : Elemi - Phillipines - EE010394R

Type : Essential oil

Source : *Canarium luzonicum*

Customer : Plant Therapy

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 : Alexis St-Gelais, M. Sc., chimiste

Analysis date : May 30, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid
Refractive index: 1.4812 ± 0.0003 (20 °C)

ISO 10624:1998 - OIL OF ELEMI

| Compound | Min. % | Max. % | Observed % | Complies? |
|-------------------------|--------|--------|------------|-----------|
| Elemicin | 0.5 | 8.0 | 4.8 | Yes |
| α-Elemol | 1 | 25 | 11 | Yes |
| α-Terpineol | 0.4 | 3.0 | 2.6 | Yes |
| Limonene | 40 | 72 | 51 | Yes |
| α-Phellandrene | 10 | 24 | 13 | Yes |
| Sabinene | 3 | 8 | 2 | No |
| Refractive index | 1.4720 | 1.4900 | 1.4812 | Yes |

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for elemi oil.

ANALYSIS SUMMARY

| Identification | DB-5 (%) | DB-WAX (%) | Classe |
|---------------------------------|----------|------------|------------------------|
| Toluene | 0.01 | 0.01 | Simple phenolic |
| α -Thujene | 0.11 | 0.10 | Monoterpene |
| α -Pinene | 0.44 | 0.43 | Monoterpene |
| Camphene | 0.02 | 0.01 | Monoterpene |
| Sabinene | 1.94* | 1.71 | Monoterpene |
| β -Pinene | [1.94]* | 0.19 | Monoterpene |
| 3-Methyl-3-cyclohexenone | 0.03 | 0.04 | Aliphatic ketone |
| Myrcene | 0.50 | 0.49 | Monoterpene |
| Pseudolimonene | 12.80* | 0.04 | Monoterpene |
| α -Phellandrene | [12.80]* | 12.63 | Monoterpene |
| Δ^3 -Carene | 0.04 | 0.03 | Monoterpene |
| α -Terpinene | 0.40 | 0.40 | Monoterpene |
| Carvomenthene | 1.50* | 0.01 | Aliphatic alcohol |
| para-Cymene | [1.50]* | 1.53 | Monoterpene |
| Limonene | 53.10* | 50.55 | Monoterpene |
| β -Phellandrene | [53.10]* | 1.96* | Monoterpene |
| 1,8-Cineole | [53.10]* | [1.96]* | Monoterpenic ether |
| (Z)- β -Ocimene | 0.13 | 0.13 | Monoterpene |
| (E)- β -Ocimene | 0.09 | 0.09 | Monoterpene |
| γ -Terpinene | 0.23 | 0.23 | Monoterpene |
| cis-Sabinene hydrate | 0.03 | 0.03 | Monoterpenic alcohol |
| para-Cymenene | 2.53* | 0.13 | Monoterpene |
| Terpinolene | [2.53]* | 2.41 | Monoterpene |
| trans-Sabinene hydrate | 0.01 | 0.01 | Monoterpenic alcohol |
| Linalool | 0.01 | 0.02 | Monoterpenic alcohol |
| Unknown | 0.02 | 0.31* | Monoterpenic alcohol |
| cis-para-Menth-2-en-1-ol | 0.05* | 0.02 | Monoterpenic alcohol |
| trans-para-Mentha-2,8-dien-1-ol | [0.05]* | 0.02 | Monoterpenic alcohol |
| allo-Ocimene | 0.03* | 0.01 | Monoterpene |
| cis-para-Mentha-2,8-dien-1-ol | [0.03]* | 0.02* | Monoterpenic alcohol |
| trans-Pinocarveol | 0.06* | 0.05 | Monoterpenic alcohol |
| trans-Limonene oxide | [0.06]* | | Monoterpenic ether |
| Epoxyterpinolene | 0.03 | 0.03 | Monoterpenic ether |
| Unknown | 0.01 | 0.04* | Oxygenated monoterpene |
| Unknown | 0.15* | 0.14 | Oxygenated monoterpene |
| trans-2-Caren-4-ol? | [0.15]* | | Monoterpenic alcohol |
| Unknown | 0.22 | 0.22 | Oxygenated monoterpene |
| Terpinen-4-ol | 0.31 | 0.28 | Monoterpenic alcohol |
| Cryptone | 0.03 | 0.05 | Normoterpenic ketone |
| para-Cymen-8-ol | 0.26* | 0.26 | Monoterpenic alcohol |
| Unknown | [0.26]* | 0.01 | Oxygenated monoterpene |
| α -Terpineol | 2.55 | 2.79* | Monoterpenic alcohol |
| α -Phellandrene epoxide | 0.30 | 0.29 | Monoterpenic ether |
| trans-Carveol | 0.09 | 0.06 | Monoterpenic alcohol |
| cis-Carveol | 0.06 | 0.04 | Monoterpenic alcohol |
| Carvone | 0.06 | 0.08 | Monoterpenic ketone |
| Carvotanacetone | 0.03 | [0.02]* | Monoterpenic ketone |
| Piperitone | 0.15* | 0.14 | Monoterpenic ketone |

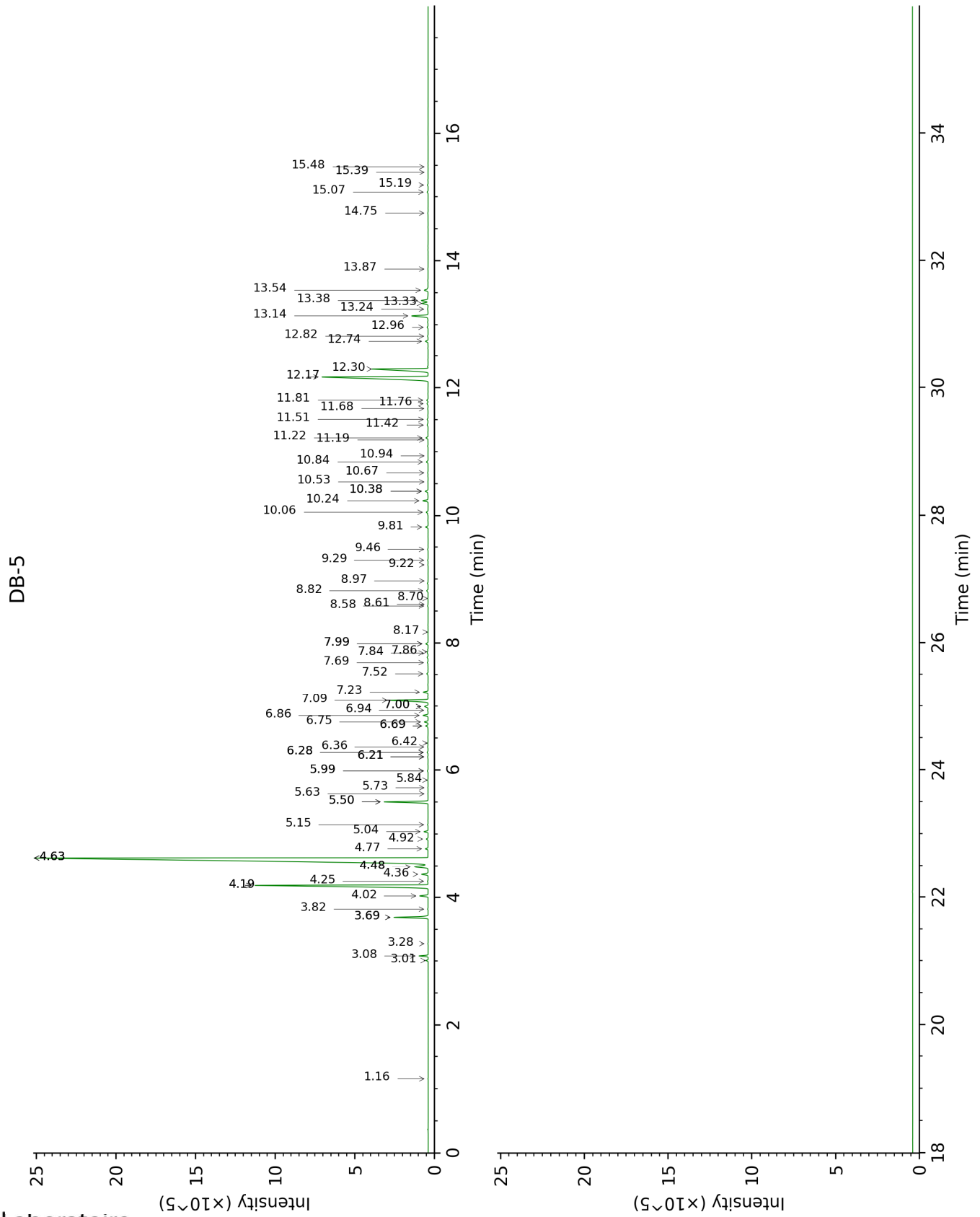
| | | | |
|------------------------------|---------------|---------------|--------------------------|
| Unknown | [0.15]* | 0.02 | Unknown |
| Unknown | 0.01 | 0.02 | Unknown |
| Limonen-10-ol | 0.04 | 0.04 | Monoterpenic alcohol |
| Unknown | 0.01 | | Monoterpenic ester |
| Thymol | 0.03 | 0.02 | Monoterpenic alcohol |
| Carvacrol | 0.12 | 0.07 | Monoterpenic alcohol |
| Unknown | 0.01 | 0.02 | Unknown |
| Unknown | 0.02 | 0.01 | |
| δ-Elemene | 0.03 | [0.04]* | Sesquiterpene |
| α-Cubebene | 0.04 | 0.01 | Sesquiterpene |
| α-Copaene | 0.16 | 0.16 | Sesquiterpene |
| β-Elemene | 0.13 | [0.31] | Sesquiterpene |
| Methyleugenol | 0.33 | 0.33* | Phenylpropanoid |
| β-Caryophyllene | 0.22* | [0.31]* | Sesquiterpene |
| (trans?)-6-Hydroxypiperitone | [0.22]* | 0.04 | Monoterpenic alcohol |
| β-Copaene | 0.02 | 0.01 | Sesquiterpene |
| α-Guaiene | 0.04 | [0.31]* | Sesquiterpene |
| α-Humulene | 0.13 | 0.12 | Sesquiterpene |
| allo-Aromadendrene | 0.01 | 0.02 | Sesquiterpene |
| γ-Murolene | 0.01 | 0.02 | Sesquiterpene |
| Germacrene D | 0.14 | [2.79]* | Sesquiterpene |
| Viridiflorene | 0.09 | 0.06 | Sesquiterpene |
| α-Murolene | 0.07 | 0.09 | Sesquiterpene |
| γ-Cadinene | 0.03 | 0.05 | Sesquiterpene |
| epi-Elemol? | 0.08 | 0.08 | Sesquiterpenic alcohol |
| δ-Cadinene | 0.09 | 0.10 | Sesquiterpene |
| α-Elemol | 10.94 | 11.32* | Sesquiterpenic alcohol |
| Elemicin | 4.84 | 5.14 | Phenylpropanoid |
| Guaiol | 0.18 | 0.25 | Sesquiterpenic alcohol |
| 5,7-diepi-α-Eudesmol | 0.04 | 0.03 | Sesquiterpenic alcohol |
| 10-epi-γ-Eudesmol | 0.07 | [11.32]* | Sesquiterpenic alcohol |
| γ-Eudesmol | 1.16 | 1.16 | Sesquiterpenic alcohol |
| Unknown | 0.06 | 0.05 | Oxygenated sesquiterpene |
| β-Eudesmol | 0.43 | 0.44 | Sesquiterpenic alcohol |
| α-Eudesmol | 0.48 | 0.43 | Sesquiterpenic alcohol |
| Bulnesol | 0.28 | | Sesquiterpenic alcohol |
| Juniper camphor | 0.02 | 0.02 | Sesquiterpenic alcohol |
| Cryptomeridiol analog | 0.02 | | Sesquiterpenic alcohol |
| α-Phellandrene dimer II | 0.07 | 0.07 | Diterpene |
| Cryptomeridiol | 0.05 | 0.05 | Sesquiterpenic alcohol |
| Unknown | 0.01 | | Oxygenated sesquiterpene |
| α-Phellandrene dimer IV | 0.01 | [0.33]* | Diterpene |
| Total identified | 98.49% | 97.83% | |

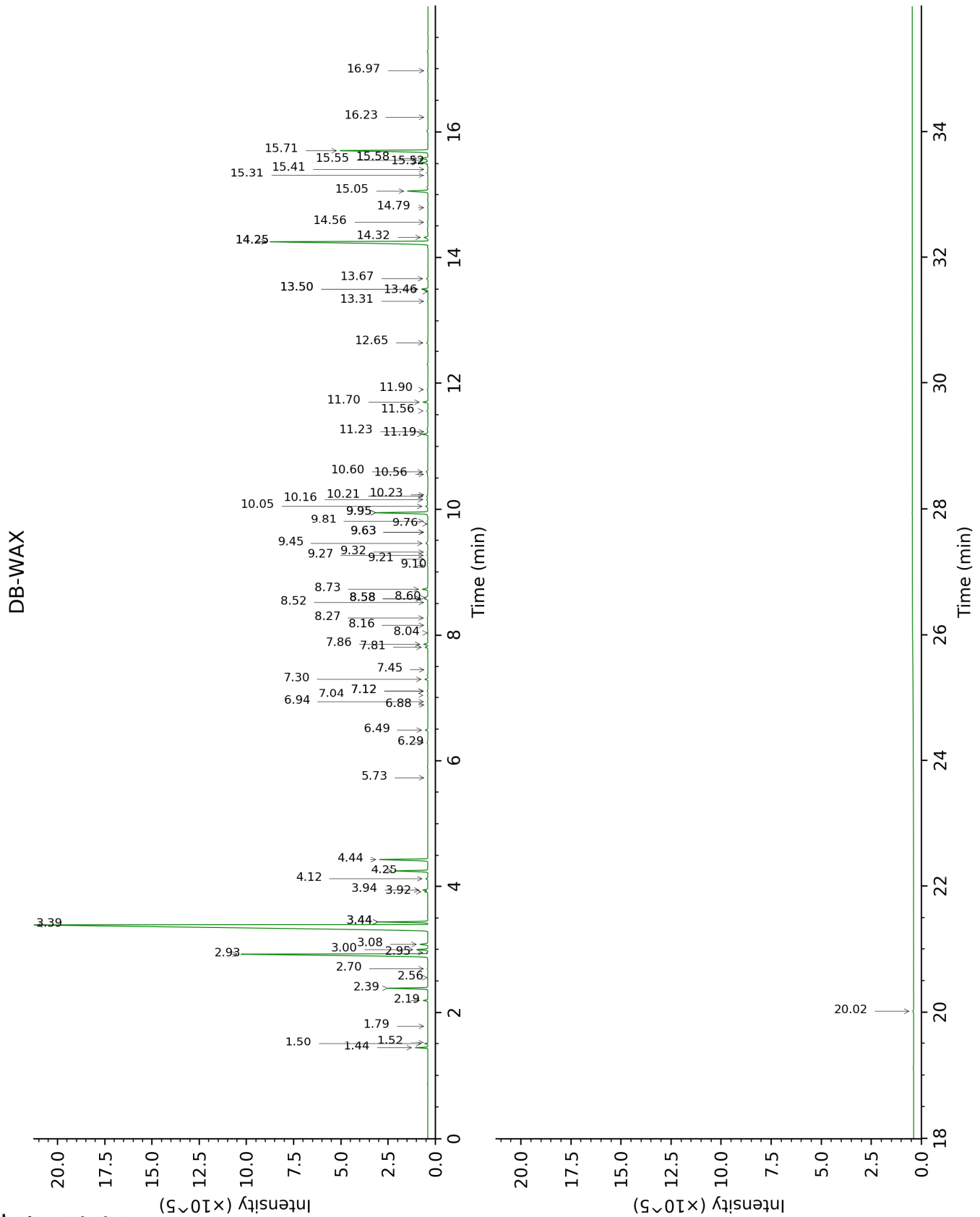
*: Two or more compounds are coeluting on this column

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

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 | % |
| Toluene | 1.16 | 760 | 0.01 | 1.52 | 1003 | 0.01 |
| α -Thujene | 3.01 | 925 | 0.11 | 1.50 | 1001 | 0.10 |
| α -Pinene | 3.08 | 930 | 0.44 | 1.44 | 993 | 0.43 |
| Camphene | 3.28 | 943 | 0.02 | 1.79 | 1028 | 0.01 |
| Sabinene | 3.69* | 970 | 1.94 | 2.39 | 1086 | 1.71 |
| β -Pinene | 3.69* | 970 | [1.94] | 2.19 | 1068 | 0.19 |
| 3-Methyl-3-cyclohexenone | 3.82 | 978 | 0.03 | 6.29 | 1373 | 0.04 |
| Myrcene | 4.02 | 992 | 0.50 | 3.00 | 1136 | 0.49 |
| Pseudolimonene | 4.19* | 1003 | 12.80 | 2.95 | 1132 | 0.04 |
| α -Phellandrene | 4.19* | 1003 | [12.80] | 2.93 | 1130 | 12.63 |
| Δ^3 -Carene | 4.25 | 1007 | 0.04 | 2.70 | 1112 | 0.03 |
| α -Terpinene | 4.36 | 1014 | 0.40 | 3.08 | 1142 | 0.40 |
| Carvomenthene | 4.48* | 1021 | 1.50 | 2.56 | 1102 | 0.01 |
| para-Cymene | 4.48* | 1021 | [1.50] | 4.24 | 1230 | 1.53 |
| Limonene | 4.63* | 1030 | 53.10 | 3.39 | 1166 | 50.55 |
| β -Phellandrene | 4.63* | 1030 | [53.10] | 3.44* | 1170 | 1.96 |
| 1,8-Cineole | 4.63* | 1030 | [53.10] | 3.44* | 1170 | [1.96] |
| (Z)- β -Ocimene | 4.77 | 1039 | 0.13 | 3.92 | 1206 | 0.13 |
| (E)- β -Ocimene | 4.92 | 1049 | 0.09 | 4.12 | 1221 | 0.09 |
| γ -Terpinene | 5.04 | 1056 | 0.23 | 3.94 | 1208 | 0.23 |
| cis-Sabinene hydrate | 5.15 | 1063 | 0.03 | 7.04 | 1429 | 0.03 |
| para-Cymenene | 5.50* | 1086 | 2.53 | 6.49 | 1388 | 0.13 |
| Terpinolene | 5.50* | 1086 | [2.53] | 4.44 | 1244 | 2.41 |
| trans-Sabinene hydrate | 5.63 | 1094 | 0.01 | 8.04 | 1503 | 0.01 |
| Linalool | 5.73 | 1100 | 0.01 | 8.16 | 1512 | 0.02 |
| Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32), 152 (32), 137 (31), 134 (24)] | 5.84 | 1107 | 0.02 | 8.58*† | 1545 | 0.31 |
| cis-para-Menth-2-en-1-ol | 5.99* | 1117 | 0.05 | 8.27 | 1521 | 0.02 |
| trans-para-Mentha-2,8-dien-1-ol | 5.99* | 1117 | [0.05] | 9.10 | 1586 | 0.02 |
| allo-Ocimene | 6.21* | 1131 | 0.03 | 5.73 | 1333 | 0.01 |
| cis-para-Mentha-2,8-dien-1-ol | 6.21* | 1131 | [0.03] | 9.63* | 1628 | 0.02 |
| trans-Pinocarveol | 6.28* | 1135 | 0.06 | 9.32 | 1602 | 0.05 |
| trans-Limonene oxide | 6.28* | 1135 | [0.06] | | | |
| Epoxyterpinolene | 6.36 | 1141 | 0.03 | 6.94 | 1421 | 0.03 |
| Unknown [m/z 95, 43 (74), 109 (72), | 6.42 | 1145 | 0.01 | 7.12* | 1434 | 0.04 |

| | | | | | | |
|--|--------|------|--------|--------|------|--------|
| 82 (62), 110 (50)... 152 (14)] | | | | | | |
| Unknown [m/z 95, 110 (38), 81 (21), 79 (16)... 152 (7)] | 6.69* | 1162 | 0.15 | 7.81 | 1486 | 0.14 |
| <i>trans</i> -2-Caren-4- ol? | 6.69* | 1162 | [0.15] | | | |
| Unknown [m/z 95, 110 (43), 81 (28), 41 (15)... 152 (8)] | 6.76 | 1166 | 0.22 | 7.86 | 1489 | 0.22 |
| Terpinen-4-ol | 6.86 | 1173 | 0.31 | 8.73 | 1557 | 0.28 |
| Cryptone | 6.94 | 1178 | 0.03 | 9.26 | 1598 | 0.05 |
| <i>para</i> -Cymen-8-ol | 7.00* | 1182 | 0.26 | 11.70 | 1800 | 0.26 |
| Unknown [m/z 109, 82 (77), 41 (56), 119 (55), 91 (54)... 152 (17)] | 7.00* | 1182 | [0.26] | 7.45 | 1459 | 0.01 |
| α -Terpineol | 7.09 | 1188 | 2.55 | 9.95* | 1654 | 2.79 |
| α -Phellandrene epoxide | 7.23 | 1198 | 0.30 | 11.19 | 1757 | 0.29 |
| <i>trans</i> -Carveol | 7.52 | 1217 | 0.09 | 11.56 | 1788 | 0.06 |
| <i>cis</i> -Carveol | 7.69 | 1229 | 0.06 | 11.90 | 1818 | 0.04 |
| Carvone | 7.84 | 1239 | 0.06 | 10.21 | 1675 | 0.08 |
| Carvotanacetone | 7.86 | 1240 | 0.03 | 9.63* | 1628 | [0.02] |
| Piperitone | 7.99* | 1249 | 0.15 | 10.05 | 1662 | 0.14 |
| Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...] | 7.99* | 1249 | [0.15] | 11.23 | 1760 | 0.02 |
| Unknown [m/z 43, 56 (54), 69 (40), 155 (40), 41 (35), 55 (33)...] | 8.17 | 1262 | 0.01 | 10.24 | 1677 | 0.02 |
| Limonen-10-ol | 8.58 | 1290 | 0.04 | 13.31 | 1944 | 0.04 |
| Unknown [m/z 93, 43 (60), 108 (58), 69 (36), 41 (35)... 150 (5), 184 (1)] | 8.61 | 1292 | 0.01 | | | |
| Thymol | 8.70 | 1298 | 0.03 | 15.31 | 2136 | 0.02 |
| Carvacrol | 8.82 | 1306 | 0.12 | 15.55 | 2160 | 0.07 |
| Unknown [m/z 111, 126 (93), 43 (90), 71 (60)...] | 8.97 | 1313 | 0.01 | 15.41 | 2146 | 0.02 |
| Unknown [m/z 43, 97 (99), 107 (47), 41 (35), 55 (30)...] | 9.22 | 1330 | 0.02 | 13.46 | 1959 | 0.01 |
| δ -Elemene | 9.30 | 1336 | 0.03 | 7.12* | 1434 | [0.04] |
| α -Cubebene | 9.46 | 1348 | 0.04 | 6.88 | 1417 | 0.01 |
| α -Copaene | 9.81 | 1372 | 0.16 | 7.30 | 1448 | 0.16 |
| β -Elemene | 10.06 | 1390 | 0.13 | 8.60† | 1546 | [0.31] |
| Methyleugenol | 10.24 | 1402 | 0.33 | 13.50* | 1962 | 0.33 |
| β -Caryophyllene | 10.38* | 1413 | 0.22 | 8.58*† | 1545 | [0.31] |

| | | | | | | |
|--|--------|---------------|--------|--------|---------------|---------|
| (<i>trans?</i>)-6-Hydroxypiperitone | 10.38* | 1413 | [0.22] | 16.97 | 2306 | 0.04 |
| β-Copaene | 10.53 | 1424 | 0.02 | 8.52 | 1540 | 0.01 |
| α-Guaiene | 10.67 | 1435 | 0.04 | 8.58*† | 1545 | [0.31] |
| α-Humulene | 10.84 | 1448 | 0.13 | 9.45 | 1614 | 0.12 |
| allo-Aromadendrene | 10.94 | 1455 | 0.01 | 9.20 | 1594 | 0.02 |
| γ-Murolene | 11.19 | 1473 | 0.01 | 9.76 | 1638 | 0.02 |
| Germacrene D | 11.22 | 1476 | 0.14 | 9.95* | 1654 | [2.79] |
| Viridiflorene | 11.42 | 1491 | 0.09 | 9.82 | 1643 | 0.06 |
| α-Murolene | 11.51 | 1497 | 0.07 | 10.16 | 1671 | 0.09 |
| γ-Cadinene | 11.68 | 1510 | 0.03 | 10.56 | 1703 | 0.05 |
| epi-Elemol? | 11.76 | 1516 | 0.08 | 13.67 | 1978 | 0.08 |
| δ-Cadinene | 11.81 | 1521 | 0.09 | 10.60 | 1707 | 0.10 |
| α-Elemol | 12.17 | 1549 | 10.94 | 14.25* | 2033 | 11.32 |
| Elemicin | 12.30 | 1559 | 4.84 | 15.71 | 2176 | 5.14 |
| Guaiol | 12.74 | 1594 | 0.18 | 14.32 | 2040 | 0.25 |
| 5,7-diepi-α-Eudesmol | 12.82 | 1600 | 0.04 | 14.79 | 2085 | 0.03 |
| 10-epi-γ-Eudesmol | 12.96 | 1612 | 0.07 | 14.25* | 2033 | [11.32] |
| γ-Eudesmol | 13.14 | 1626 | 1.16 | 15.06 | 2110 | 1.16 |
| Unknown [m/z 59, 161 (53), 81 (47), 204 (40), 107 (36), 95 (33), 93 (33)... 222 (1)] | 13.24 | 1635 | 0.06 | 14.56 | 2063 | 0.05 |
| β-Eudesmol | 13.33 | 1642 | 0.43 | 15.58 | 2163 | 0.44 |
| α-Eudesmol | 13.38 | 1646 | 0.48 | 15.52 | 2156 | 0.43 |
| Bulnesol | 13.54 | 1660 | 0.28 | | | |
| Juniper camphor | 13.87 | 1687 | 0.02 | 16.24 | 2230 | 0.02 |
| Cryptomeridiol analog | 14.75 | 1762 | 0.02 | | | |
| α-Phellandrene dimer II | 15.07 | 1790 | 0.07 | 12.65 | 1884 | 0.07 |
| Cryptomeridiol | 15.18 | 1800 | 0.05 | 20.02 | 2650 | 0.05 |
| Unknown [m/z 159, 93 (87), 146 (72), 43 (72), 119 (48), 121 (48), 59 (25)... 220 (31)] | 15.40 | 1819 | 0.01 | | | |
| α-Phellandrene dimer IV | 15.48 | 1827 | 0.01 | 13.50* | 1962 | [0.33] |
| Total identified | | 98.49% | | | 97.83% | |
| Total reported | | 98.85% | | | 98.32% | |

*: 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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index