



GC/MS BATCH NUMBER: CG0104

ESSENTIAL OIL: CLOVE BUD
BOTANICAL NAME: SYZYGIIUM AROMATICUM
ORIGIN: INDONESIA

| KEY CONSTITUENTS PRESENT IN THIS BATCH CLOVE BUD OF OIL | % |
|--|------|
| EUGENOL | 80.6 |
| EUGENYL ACETATE | 8.5 |
| β -CARYOPHYLLENE | 6.5 |
| DIHYDROEUGENOL | 1.5 |

Comments from Robert Tisserand: Full, rich, spicy odor quality. All three key ISO constituents are within range.

Date : May 11, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18D30-PTH3-1-CC

Customer identification : Clove Bud - Indonesia – GC010479R

Type : Essential oil

Source : *Syzygium aromaticum*

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

Analysis date : May 08, 2018

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: Light yellow liquid

Refractive index: 1.5343 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

| Identification | DB-5 (%) | DB-WAX (%) | Classe |
|-----------------------------------|----------|------------|--------------------------|
| Furfural | 0.02 | 0.03 | Aliphatic alcohol |
| 5-Methylfurfural | 0.01 | 0.02* | Furan |
| 6-Methyl-5-hepten-2-one | 0.01 | 0.01 | Aliphatic ketone |
| Linalool | 0.01 | [0.02]* | Monoterpenic alcohol |
| (E)-4,8-Dimethylnona-1,3,7-triene | 0.01 | 0.01 | Terpene derivative |
| Ethyl benzoate | tr | 0.01 | Phenolic ester |
| Methyl salicylate | 0.09 | 0.09 | Phenolic ester |
| Chavicol | 0.13 | 0.25* | Phenylpropanoid |
| α -Cubebene | 0.05 | 0.05 | Sesquiterpene |
| Eugenol | 82.00 | 80.56* | Phenylpropanoid |
| α -Copaene | [82.00]* | 0.17 | Sesquiterpene |
| Dihydroeugenol | [82.00]* | 1.54 | Phenylpropanoid |
| β -Bourbonene | 0.01 | 0.01 | Sesquiterpene |
| β -Elemene | 0.01 | 6.42* | Sesquiterpene |
| Vanillin | 0.01 | 0.01 | Simple phenolic |
| Isocaryophyllene | 0.02 | 0.01 | Sesquiterpene |
| Methyleugenol | 0.07 | 0.04 | Phenylpropanoid |
| β -Caryophyllene | 6.46 | [6.42]* | Sesquiterpene |
| Caryophylla-4(12),8(13)-diene | 0.02 | 0.02 | Sesquiterpene |
| 9-epi-Isocaryophyllene | 0.94 | 0.01* | Sesquiterpene |
| (E)-Isoeugenol | [0.94]* | [0.25]* | Phenylpropanoid |
| α -Humulene | [0.94]* | 0.79 | Sesquiterpene |
| allo-Aromadendrene | 0.01 | [0.01]* | Sesquiterpene |
| trans-Cadina-1(6),4-diene | 0.02 | 0.02 | Sesquiterpene |
| γ -Muurolene | 0.01 | 0.02 | Sesquiterpene |
| Germacrene D | 0.01 | 0.01 | Sesquiterpene |
| β -Selinene | 0.02 | 0.02 | Sesquiterpene |
| α -Selinene | 0.02* | 0.01 | Sesquiterpene |
| epi-Cubebol | [0.02]* | 0.02* | Sesquiterpenic alcohol |
| α -Muurolene | 0.02* | 0.01 | Sesquiterpene |
| (3Z,6E)- α -Farnesene | [0.02]* | 0.01 | Sesquiterpene |
| γ -Cadinene | 0.04* | 0.02 | Sesquiterpene |
| Cubebol | [0.04]* | 0.01 | Sesquiterpenic alcohol |
| δ -Cadinene | 0.16* | 0.10 | Sesquiterpene |
| cis-Calamenene? | [0.16]* | 0.05 | Sesquiterpene |
| β -Sesquiphellandrene | [0.16]* | 0.02 | Sesquiterpene |
| Eugenyl acetate | 8.49 | 8.40 | Phenylpropanoid ester |
| α -Calacorene | 0.10 | 0.01 | Sesquiterpene |
| Unknown | 0.04 | [0.02]* | Unknown |
| Unknown | 0.03 | 0.03 | Phenylpropanoid |
| (E)-Nerolidol | 0.02 | 0.02* | Sesquiterpenic alcohol |
| Caryophyllenyl alcohol | 0.02 | 0.02 | Sesquiterpenic alcohol |
| Caryophyllene oxide | 0.31* | 0.24 | Sesquiterpenic ether |
| Caryophyllene oxide isomer | [0.31]* | 0.03 | Sesquiterpenic ether |
| Unknown | [0.31]* | 0.03 | Oxygenated sesquiterpene |
| Humulene epoxide I | 0.02 | 0.01 | Sesquiterpenic ether |
| Humulene epoxide II | 0.04 | 0.03 | Sesquiterpenic ether |
| (E)-Isoeugenyl acetate | 0.04 | 0.04 | Phenylpropanoid ester |

| | | | |
|--|---------------|---------------|------------------------|
| 1-epi-Cubenol | 0.01 | [0.02]* | Sesquiterpenic alcohol |
| Caryophylladienol I | 0.02 | 0.04* | Sesquiterpenic alcohol |
| Caryophylladienol II | 0.04 | [0.04]* | Sesquiterpenic alcohol |
| τ-Cadinol | 0.01 | [80.56]* | Sesquiterpenic alcohol |
| α-Muurolol | 0.01 | 0.07 | Sesquiterpenic alcohol |
| α-Cadinol | 0.04 | tr | Sesquiterpenic alcohol |
| 14-Hydroxy-(E)-caryophyllene | 0.04 | 0.05 | Sesquiterpenic alcohol |
| Trimethoxypropylbenzene analog | 0.01 | 0.01 | Phenylpropanoid |
| (E)-Coniferyl alcohol | 0.05 | 0.03 | Phenylpropanoid |
| (E)-4-(3-Hydroxy-1-propenyl)-2-methoxyphenyl acetate | 0.01 | | Phenylpropanoid ester |
| Total identified | 99.45% | 99.34% | |

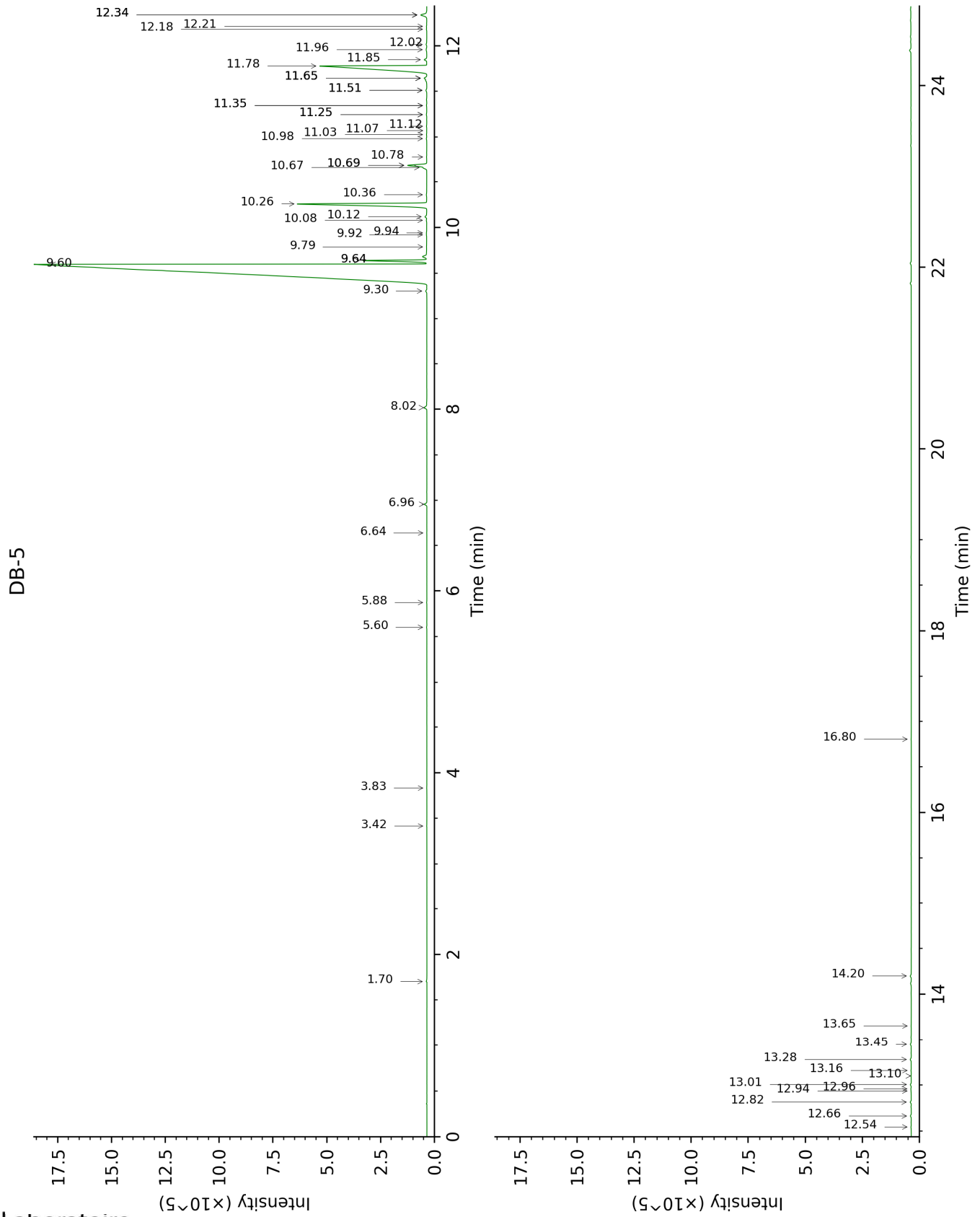
*: Two or more compounds are coeluting on this column

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

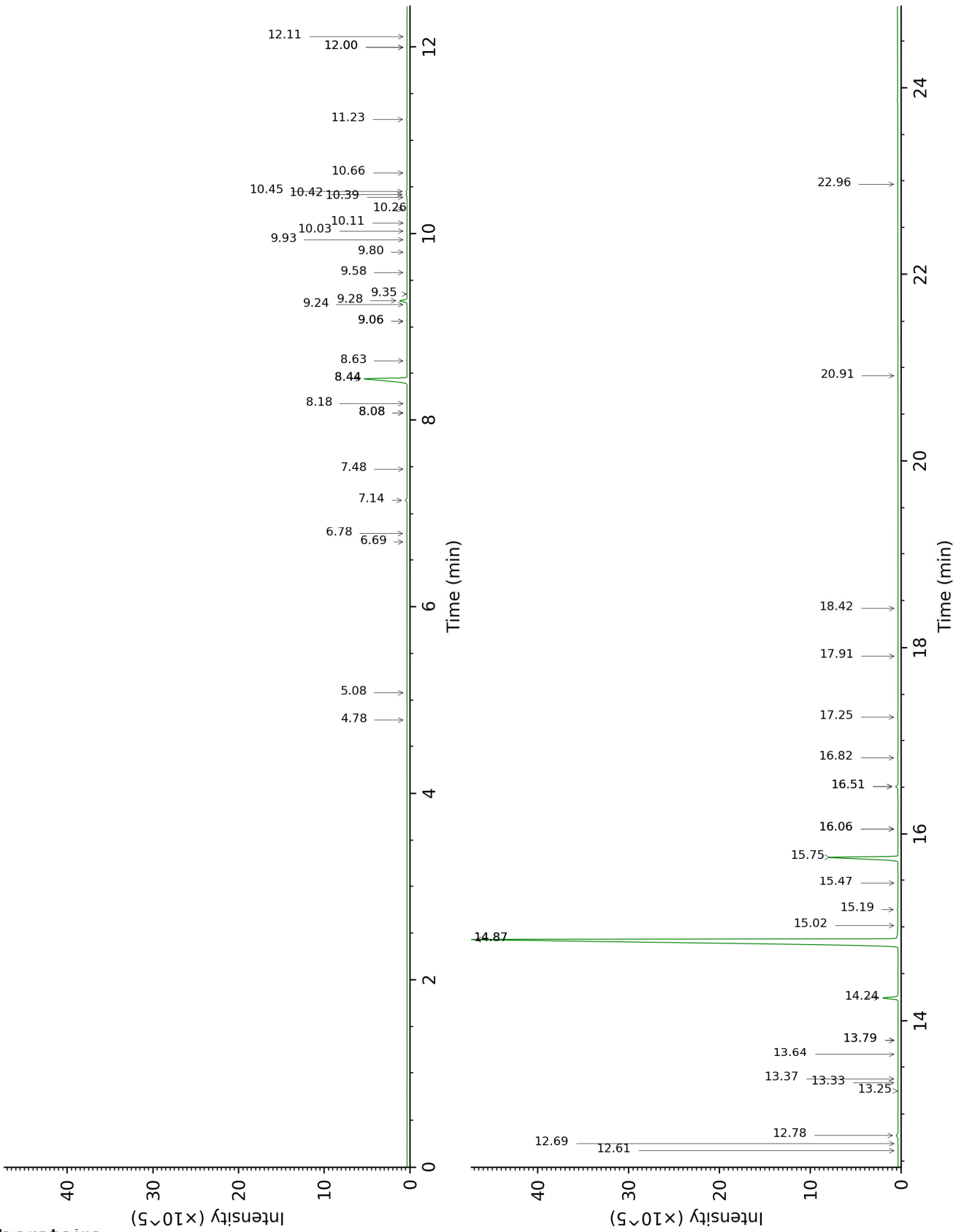
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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DB-WAX



FULL ANALYSIS DATA

| Identification | Column DB-5 | | | Column DB-WAX | | |
|--|-------------|------|---------|---------------|------|--------|
| | R.T | R.I | % | R.T | R.I | % |
| Furfural | 1.70 | 824 | 0.02 | 6.69 | 1413 | 0.03 |
| 5-Methylfurfural | 3.42 | 956 | 0.01 | 8.08* | 1517 | 0.02 |
| 6-Methyl-5-hepten-2-one | 3.83 | 984 | 0.01 | 5.08 | 1296 | 0.01 |
| Linalool | 5.60 | 1097 | 0.01 | 8.08* | 1517 | [0.02] |
| (E)-4,8-Dimethylnona-1,3,7-triene | 5.88 | 1114 | 0.01 | 4.78 | 1275 | 0.01 |
| Ethyl benzoate | 6.64 | 1164 | tr | 9.35 | 1616 | 0.01 |
| Methyl salicylate | 6.96 | 1184 | 0.09 | 10.45 | 1706 | 0.09 |
| Chavicol | 8.02 | 1255 | 0.13 | 16.51* | 2274 | 0.25 |
| α-Cubebene | 9.30 | 1343 | 0.05 | 6.78 | 1420 | 0.05 |
| Eugenol | 9.60† | 1364 | 82.00 | 14.87* | 2107 | 80.56 |
| α-Copaene | 9.64*† | 1367 | [82.00] | 7.14 | 1447 | 0.17 |
| Dihydroeugenol | 9.64*† | 1367 | [82.00] | 14.24 | 2046 | 1.54 |
| β-Bourbonene | 9.79 | 1378 | 0.01 | 7.48 | 1471 | 0.01 |
| β-Elementene | 9.92 | 1387 | 0.01 | 8.44* | 1545 | 6.42 |
| Vanillin | 9.94 | 1389 | 0.01 | 18.42 | 2483 | 0.01 |
| Isocaryophyllene | 10.08 | 1398 | 0.02 | 8.18 | 1524 | 0.01 |
| Methyleugenol | 10.12 | 1401 | 0.07 | 13.33 | 1960 | 0.04 |
| β-Caryophyllene | 10.26 | 1412 | 6.46 | 8.44* | 1545 | [6.42] |
| Caryophylla-4(12),8(13)-diene | 10.36 | 1419 | 0.02 | 8.63 | 1560 | 0.02 |
| 9-epi-Isocaryophyllene | 10.67† | 1442 | 0.94 | 9.06* | 1593 | 0.01 |
| (E)-Isoeugenol | 10.69*† | 1444 | [0.94] | 16.51* | 2274 | [0.25] |
| α-Humulene | 10.69*† | 1444 | [0.94] | 9.28 | 1611 | 0.79 |
| allo-Aromadendrene | 10.78 | 1451 | 0.01 | 9.06* | 1593 | [0.01] |
| trans-Cadina-1(6),4-diene | 10.98 | 1466 | 0.02 | 9.24 | 1607 | 0.02 |
| γ-Murolene | 11.03 | 1469 | 0.01 | 9.58 | 1635 | 0.02 |
| Germacrene D | 11.07 | 1472 | 0.01 | 9.80 | 1653 | 0.01 |
| β-Selinene | 11.12 | 1476 | 0.02 | 9.93 | 1664 | 0.02 |
| α-Selinene | 11.25* | 1485 | 0.02 | 10.03 | 1671 | 0.01 |
| epi-Cubebol | 11.25* | 1485 | [0.02] | 12.00* | 1839 | 0.02 |
| α-Murolene | 11.35* | 1493 | 0.02 | 10.11 | 1678 | 0.01 |
| (3Z,6E)-α-Farnesene | 11.35* | 1493 | [0.02] | 10.26 | 1690 | 0.01 |
| γ-Cadinene | 11.51* | 1506 | 0.04 | 10.39 | 1700 | 0.02 |
| Cubebol | 11.51* | 1506 | [0.04] | 12.61 | 1893 | 0.01 |
| δ-Cadinene | 11.65*† | 1516 | 0.16 | 10.42 | 1703 | 0.10 |
| cis-Calamenene? | 11.65*† | 1516 | [0.16] | 11.23 | 1772 | 0.05 |
| β-Sesquiphellandrene | 11.65*† | 1516 | [0.16] | 10.66 | 1723 | 0.02 |
| Eugenyl acetate | 11.78 | 1526 | 8.49 | 15.75 | 2196 | 8.40 |
| α-Calacorene | 11.85 | 1532 | 0.10 | 12.11 | 1849 | 0.01 |
| Unknown [m/z 164, 135 (98), 93 (86), 107 (83), 79 (69)...] | 11.96 | 1541 | 0.04 | 12.00* | 1839 | [0.02] |
| Unknown [m/z 180, 93 (70), 55 (62), 77 (55), 164 (55), 103 (50)] | 12.02 | 1545 | 0.03 | 20.91 | 2782 | 0.03 |
| (E)-Nerolidol | 12.18 | 1558 | 0.02 | 13.79* | 2002 | 0.02 |
| Caryophyllenyl alcohol | 12.21 | 1561 | 0.02 | 13.64 | 1988 | 0.02 |

| | | | | | | |
|--|--------|---------------|--------|--------|---------------|---------|
| Caryophyllene oxide | 12.34* | 1571 | 0.31 | 12.78 | 1908 | 0.24 |
| Caryophyllene oxide isomer | 12.34* | 1571 | [0.31] | 12.69 | 1900 | 0.03 |
| Unknown [m/z 161, 187 (32), 105 (30), 205 (24)... 222 (3)] | 12.34* | 1571 | [0.31] | 15.02 | 2122 | 0.03 |
| Humulene epoxide I | 12.54 | 1587 | 0.02 | 13.25 | 1952 | 0.01 |
| Humulene epoxide II | 12.66 | 1596 | 0.04 | 13.37 | 1964 | 0.03 |
| (E)-Isoeugenyl acetate | 12.82 | 1608 | 0.04 | 17.25 | 2354 | 0.04 |
| 1-epi-Cubenol | 12.94 | 1619 | 0.01 | 13.79* | 2002 | [0.02] |
| Caryophylladienol I | 12.96 | 1620 | 0.02 | 16.06* | 2227 | 0.04 |
| Caryophylladienol II | 13.01 | 1624 | 0.04 | 16.06* | 2227 | [0.04] |
| τ-Cadinol | 13.10 | 1632 | 0.01 | 14.87* | 2107 | [80.56] |
| α-Muurolol | 13.16 | 1637 | 0.01 | 15.19 | 2139 | 0.07 |
| α-Cadinol | 13.28 | 1647 | 0.04 | 15.47 | 2167 | tr |
| 14-Hydroxy-(E)-caryophyllene | 13.45 | 1661 | 0.04 | 16.82 | 2307 | 0.05 |
| Trimethoxypropylbenzene analog | 13.65 | 1678 | 0.01 | 17.91 | 2426 | 0.01 |
| (E)-Coniferyl alcohol | 14.20 | 1724 | 0.05 | 22.96 | 3051 | 0.03 |
| (E)-4-(3-Hydroxy-1-propenyl)-2-methoxyphenyl acetate | 16.80 | 1961 | 0.01 | | | |
| Total identified | | 99.45% | | | 99.34% | |
| Total reported | | 99.53% | | | 99.40% | |

*: 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