**Date :** February 28, 2022

# *Certificate of Analysis – GC Profiling*

## *Sample identification*

**Internal code :** 22B21-PTH05
**Customer identification :** Dill Weed - D10111219R
**Type :** Essential oil
**Source :** *Anethum graveolens*
**Customer :** Plant Therapy

## *Analysis*

**Method:** PC-MAT-014 ISO - 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 2014-005
**Analysis date :** February 25, 2022

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

*Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.*



Méthode certifiée ISO 17025:2017 Certified method

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear Liquid
**Refractive index:** 1.4819 ± 0.0003 (20 °C; method PC-MAT-016)

*CONCLUSION*

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

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## *Analysis summary – Consolidated contents*

New readers of similar reports are encouraged to read table footnotes at least once.

| Identification | % | Class |
|---|---|---|
| Ethanol | tr | Aliphatic alcohol |
| Isobutyral | tr | Aliphatic aldehyde |
| Isovaleral | tr | Aliphatic aldehyde |
| 2-Methylbutyral | tr | Aliphatic aldehyde |
| Toluene | tr | Simple phenolic |
| Hexanal | tr | Aliphatic aldehyde |
| (3*Z*)-Hexenol | 0.04 | Aliphatic alcohol |
| (2*E*)-Hexenol | 0.03 | Aliphatic alcohol |
| Hexanol | 0.04 | Aliphatic alcohol |
| α-Thujene | 0.12 | Monoterpene |
| α-Pinene | 0.60 | Monoterpene |
| Camphene | 0.01 | Monoterpene |
| α-Fenchene | tr | Monoterpene |
| β-Pinene | 0.04 | Monoterpene |
| Sabinene | 0.06 | Monoterpene |
| Dehydro-1,8-cineole | 0.01 | Monoterpenic ether |
| Myrcene | 0.42 | Monoterpene |
| α-Phellandrene | 22.70 | Monoterpene |
| Δ3-Carene | 0.01 | Monoterpene |
| α-Terpinene | 0.02 | Monoterpene |
| para-Cymene | 0.38 | Monoterpene |
| β-Phellandrene | 2.80 | Monoterpene |
| Limonene | 27.60 | Monoterpene |
| (*Z*)-β-Ocimene | 0.04 | Monoterpene |
| (*E*)-β-Ocimene | 0.01 | Monoterpene |
| γ-Terpinene | 0.02 | Monoterpene |
| *cis*-Sabinene hydrate | 0.01 | Monoterpenic alcohol |
| Fenchone | 0.01 | Monoterpenic ketone |
| Terpinolene | 0.06 | Monoterpene |
| para-Cymenene | 0.04 | Monoterpene |
| Linalool | 0.01 | Monoterpenic alcohol |
| Nonanal | 0.01 | Aliphatic aldehyde |
| *cis*-para-Menth-2-en-1-ol | 0.03 | Monoterpenic alcohol |
| *cis*-Limonene oxide | 0.03 | Monoterpenic ether |
| Nopinone | 0.01 | Normonoterpenic ketone |
| *cis*-para-Mentha-2,8-dien-1-ol | 0.01 | Monoterpenic alcohol |
| *trans*-Limonene oxide | 0.03 | Monoterpenic ether |
| Camphor | 0.01 | Monoterpenic ketone |
| *trans*-para-Menth-2-en-1-ol | 0.01 | Monoterpenic alcohol |
| Unknown | 0.01 | Oxygenated monoterpene |
| Borneol | 0.02 | Monoterpenic alcohol |
| Unknown | 0.01 | Oxygenated monoterpene |
| Terpinen-4-ol | 0.03 | Monoterpenic alcohol |
| Unknown | 0.02 | Oxygenated monoterpene |
| Unknown | 0.07 | Unknown |

| | | |
|---|---|---|
| Dill ether | 7.79 | Monoterpenic ether |
| Cryptone | 0.11 | Normonoterpenic ketone |
| *cis*-Dihydrocarvone | 0.39 | Monoterpenic ketone |
| *trans*-Dihydrocarvone | 0.87 | Monoterpenic ketone |
| *cis*-α-Phellandrene epoxide (iPr vs Me) | 0.02 | Monoterpenic ether |
| iso-Dihydrocarveol ? | 0.04 | Monoterpenic alcohol |
| *trans*-Carveol | 0.04 | Monoterpenic alcohol |
| neoiso-Dihydrocarveol | 0.06 | Monoterpenic alcohol |
| Carvone | 33.95 | Monoterpenic ketone |
| *cis*-Carveol | 0.07 | Monoterpenic alcohol |
| Piperitone | 0.01 | Monoterpenic ketone |
| Unknown | 0.03 | Unknown |
| Isopiperitenone | 0.03 | Monoterpenic ketone |
| *trans*-Carvone oxide | 0.03 | Monoterpenic ketone |
| para-Menth-5-en-1,2-diol isomer III | 0.03 | Monoterpenic alcohol |
| Unknown | tr | |
| *cis*-Carvyl acetate | 0.01 | Monoterpenic ester |
| β-Caryophyllene | 0.01 | Sesquiterpene |
| (*trans*?)-6-Hydroxy-para-menth-1-en-3-one | tr | Monoterpenic alcohol |
| para-Menth-1-en-9-yl acetate? | 0.02 | Monoterpenic ester |
| Dihydro-β-ionone | 0.02 | Apocarotenoid |
| α-Humulene | 0.01 | Sesquiterpene |
| Germacrene D | 0.06 | Sesquiterpene |
| (*E*)-β-Ionone | 0.01 | Apocarotenoid |
| Myristicin | 0.01 | Phenylpropanoid |
| Unknown | 0.08 | Unknown |
| Unknown | 0.02 | Unknown |
| **Consolidated total** | **99.09%** | |

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.

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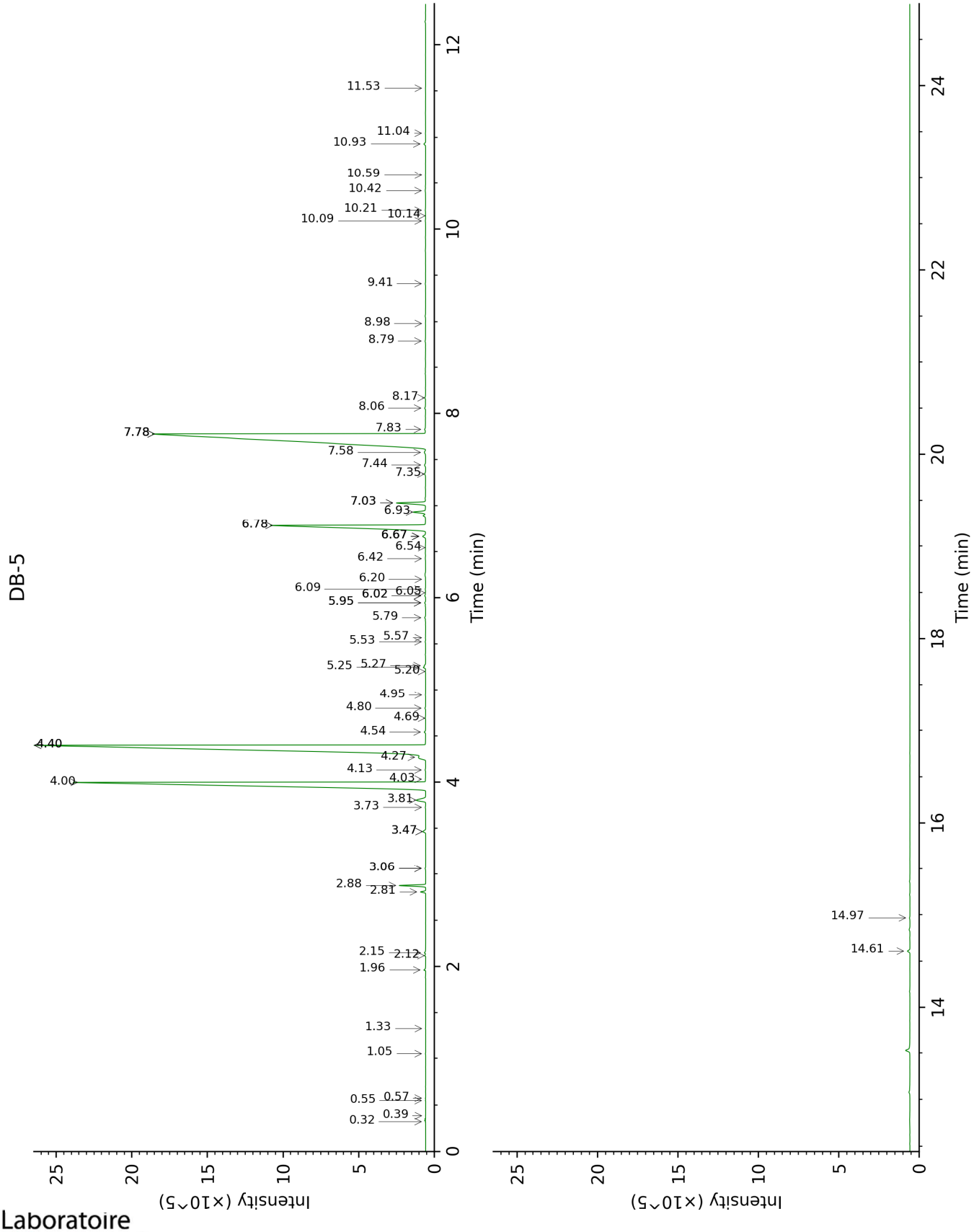
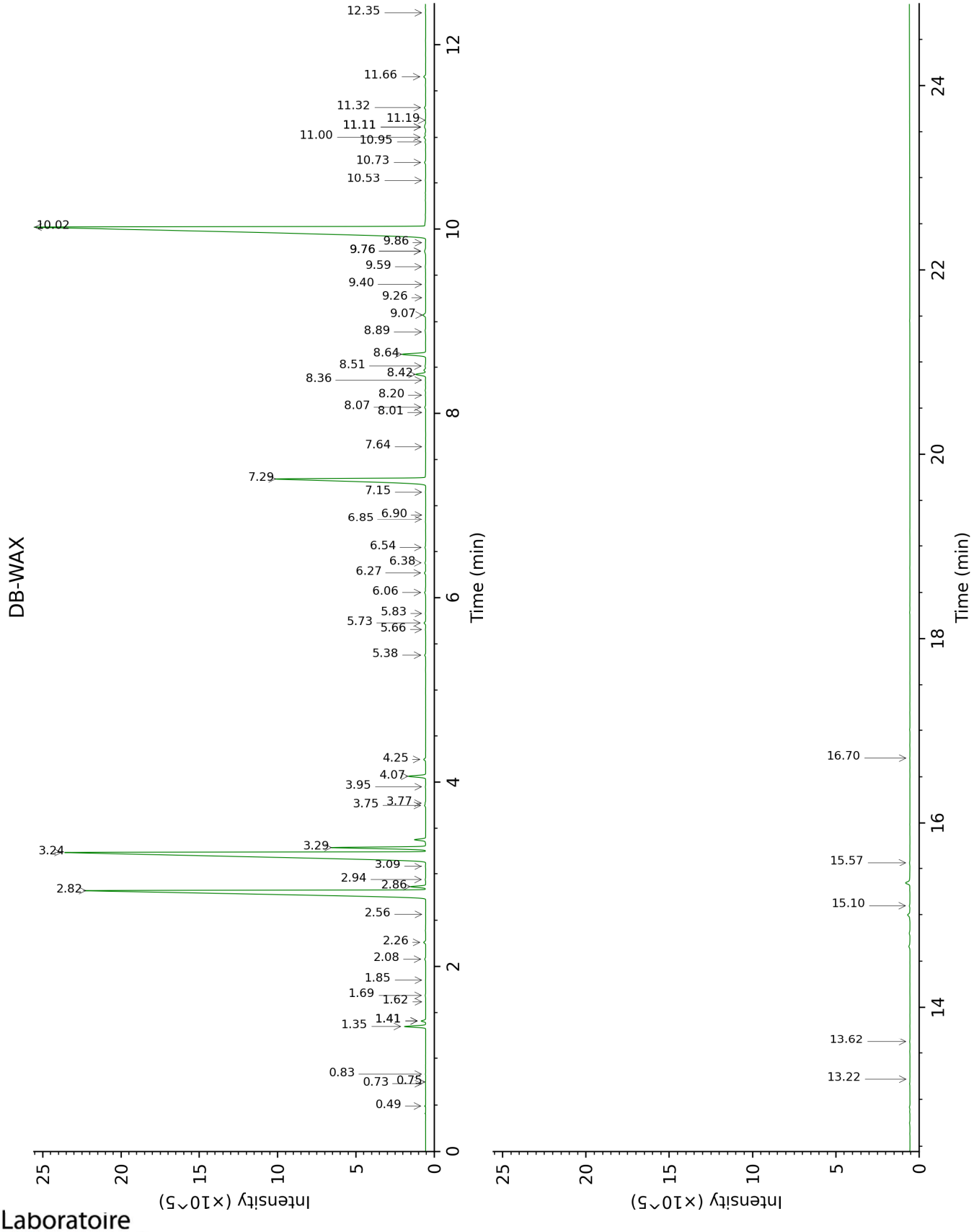

DB-5
Time (min)
Intensity (×10^5)
11.53
11.04
10.93
10.59
10.42
10.21
10.14
10.09
9.41
8.98
8.79
8.17
8.06
7.83
7.78
7.58
7.44
7.35
7.03
6.93
6.78
6.67
6.54
6.42
6.20
6.09
6.05
6.02
5.95
5.79
5.57
5.53
5.27
5.25
5.20
4.95
4.80
4.69
4.54
4.40
4.27
4.13
4.03
4.00
3.81
3.73
3.47
3.06
2.88
2.81
2.15
2.12
1.96
1.33
1.05
0.57
0.55
0.39
0.32
14.97
14.61


DB-WAX
Time (min)
Intensity (×10^5)
12.35
11.66
11.32
11.19
11.11
11.00
10.95
10.73
10.53
10.02
9.86
9.76
9.59
9.40
9.26
9.07
8.89
8.64
8.51
8.42
8.36
8.20
8.07
8.01
7.64
7.29
7.15
6.90
6.85
6.54
6.38
6.27
6.06
5.83
5.73
5.66
5.38
4.25
4.07
3.95
3.77
3.75
3.29
3.24
3.09
2.94
2.86
2.82
2.56
2.26
2.08
1.85
1.69
1.62
1.41
1.35
0.83
0.75
0.73
0.49
16.70
15.57
15.10
13.62
13.22

*FULL ANALYSIS DATA*

| Identification | Column DB-5 | | | Column DB-WAX | | |
|---|---|---|---|---|---|---|
| | R.T | R.I | % | R.T | R.I | % |
| Ethanol | 0.32 | 499 | tr | 0.83 | 909 | tr |
| Isobutyral | 0.39 | 536 | tr | 0.49 | 784 | 0.01 |
| Isovaleral | 0.55 | 640 | tr | 0.75 | 888 | tr |
| 2-Methylbutyral | 0.58 | 651 | tr | 0.73 | 881 | tr |
| Toluene | 1.05 | 757 | tr | 1.41* | 1001 | 0.12 |
| Hexanal | 1.33 | 800 | tr | 1.85 | 1044 | tr |
| (3*Z*)-Hexenol | 1.96 | 857 | 0.04 | 5.73 | 1349 | 0.06 |
| (2*E*)-Hexenol | 2.12 | 871 | 0.03 | 6.06 | 1372 | 0.05 |
| Hexanol | 2.15 | 873 | 0.04 | 5.38 | 1324 | 0.04 |
| α-Thujene | 2.81 | 925 | 0.12 | 1.41* | 1001 | [0.12] |
| α-Pinene | 2.88 | 929 | 0.60 | 1.35 | 992 | 0.59 |
| Camphene | 3.06* | 942 | 0.02 | 1.69 | 1028 | 0.01 |
| α-Fenchene | 3.06* | 942 | [0.02] | 1.62 | 1022 | tr |
| β-Pinene | 3.47* | 969 | 0.10 | 2.08 | 1067 | 0.04 |
| Sabinene | 3.47* | 969 | [0.10] | 2.26 | 1085 | 0.06 |
| Dehydro-1,8-cineole | 3.73 | 987 | 0.01 | 3.09 | 1153 | 0.01 |
| Myrcene | 3.81 | 992 | 0.42 | 2.86 | 1135 | 0.42 |
| α-Phellandrene | 4.00 | 1005 | 22.70 | 2.82 | 1132 | 22.25 |
| Δ3-Carene | 4.03 | 1008 | 0.01 | 2.56 | 1112 | tr |
| α-Terpinene | 4.13 | 1014 | 0.02 | 2.94 | 1141 | 0.02 |
| para-Cymene | 4.27 | 1022 | 0.38 | 4.06 | 1228 | 0.55 |
| β-Phellandrene | 4.40* | 1031 | 30.71 | 3.29 | 1169 | 2.80 |
| Limonene | 4.40* | 1031 | [30.71] | 3.24 | 1165 | 27.60 |
| (*Z*)-β-Ocimene | 4.54 | 1040 | 0.04 | 3.75 | 1205 | 0.04 |
| (*E*)-β-Ocimene | 4.69 | 1049 | 0.01 | 3.95 | 1220 | 0.01 |
| γ-Terpinene | 4.80 | 1056 | 0.02 | 3.77 | 1207 | 0.02 |
| *cis*-Sabinene hydrate | 4.94 | 1065 | 0.01 | 6.85 | 1430 | 0.01 |
| Fenchone | 5.20 | 1082 | 0.01 | 5.66 | 1344 | 0.01 |
| Terpinolene | 5.25 | 1084 | 0.06 | 4.25 | 1242 | 0.07 |
| para-Cymenene | 5.27 | 1086 | 0.04 | 6.27 | 1388 | 0.04 |
| Linalool | 5.53 | 1102 | 0.01 | 8.01 | 1517 | tr |
| Nonanal | 5.57 | 1105 | 0.01 | 5.83 | 1356 | 0.01 |
| *cis*-para-Menth-2-en-1-ol | 5.79 | 1119 | 0.03 | 8.07 | 1521 | 0.03 |
| *cis*-Limonene oxide | 5.95* | 1129 | 0.03 | 6.38 | 1395 | 0.03 |
| Nopinone | 5.95* | 1129 | [0.03] | 8.20 | 1531 | 0.01 |
| *cis*-para-Mentha-2,8-dien-1-ol | 6.02* | 1134 | 0.03 | 9.40 | 1626 | 0.01 |
| *trans*-Limonene oxide | 6.02* | 1134 | [0.03] | 6.54 | 1407 | 0.03 |
| Camphor | 6.06 | 1136 | 0.01 | 7.15 | 1452 | 0.01 |
| *trans*-para-Menth-2-en-1-ol | 6.10 | 1139 | 0.01 | 8.89 | 1585 | 0.01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Unknown [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)] | 6.20 | 1145 | 0.01 | 6.90 | 1434 | tr |
| Borneol | 6.42 | 1160 | 0.02 | 9.76* | 1655 | 0.07 |
| Unknown [m/z 95, 110 (43), 81 (28), 41 (15)... 152 (8)] | 6.54 | 1167 | 0.01 | 7.64 | 1489 | 0.01 |
| Terpinen-4-ol | 6.66* | 1175 | 0.11 | 8.51 | 1556 | 0.03 |
| Unknown [m/z 69, 84 (62), 41 (30), 123 (26), 97 (24), 109 (23)...] | 6.66* | 1175 | [0.11] | 9.59 | 1641 | 0.02 |
| Unknown [m/z 109, 71 (66), 43 (55), 93 (55), 69 (43), 91 (43)...] | 6.66* | 1175 | [0.11] | | | |
| Dill ether | 6.78* | 1183 | 7.80 | 7.29 | 1463 | 7.79 |
| Cryptone | 6.78* | 1183 | [7.80] | 9.07 | 1599 | 0.11 |
| *cis*-Dihydrocarvone | 6.94 | 1193 | 0.39 | 8.42 | 1549 | 0.36 |
| *trans*-Dihydrocarvone | 7.03* | 1199 | 0.88 | 8.64 | 1566 | 0.87 |
| *cis*-α-Phellandrene epoxide (iPr vs Me) | 7.03* | 1199 | [0.88] | 10.95 | 1754 | 0.02 |
| iso-Dihydrocarveol ? | 7.35 | 1220 | 0.04 | 10.73 | 1735 | 0.04 |
| *trans*-Carveol | 7.44 | 1226 | 0.04 | 11.32 | 1786 | 0.05 |
| neoiso-Dihydrocarveol | 7.58 | 1235 | 0.06 | 11.00 | 1758 | 0.06 |
| Carvone | 7.78* | 1249 | 33.88 | 10.02 | 1676 | 33.95 |
| *cis*-Carveol | 7.78* | 1249 | [33.88] | 11.66 | 1815 | 0.07 |
| Piperitone | 7.78* | 1249 | [33.88] | 9.86 | 1663 | 0.01 |
| Unknown [m/z 43, 97 (55), 107 (44), 41 (38), 109 (32), 55 (27)...] | 7.83 | 1252 | 0.03 | | | |
| Isopiperitenone | 8.06 | 1268 | 0.03 | 11.11* | 1768 | 0.07 |
| *trans*-Carvone oxide | 8.17 | 1275 | 0.03 | 11.11* | 1768 | [0.07] |
| para-Menth-5-en-1,2-diol isomer III | 8.79 | 1317 | 0.03 | 15.10 | 2139 | 0.02 |
| Unknown [m/z 43, 97 (99), 107 | 8.98 | 1331 | tr | 13.22 | 1957 | tr |

| | | | | | | |
|---|---|---|---|---|---|---|
| (47), 41 (35), 55 (30)...] | | | | | | |
| *cis*-Carvyl acetate | 9.41 | 1361 | 0.01 | 10.53 | 1718 | 0.01 |
| β-Caryophyllene | 10.09 | 1410 | 0.01 | 8.36 | 1544 | 0.01 |
| (*trans*?)-6-Hydroxy-para-menth-1-en-3-one | 10.14 | 1414 | tr | 16.70 | 2305 | 0.01 |
| para-Menth-1-en-9-yl acetate? | 10.20 | 1418 | 0.02 | | | |
| Dihydro-β-ionone | 10.42 | 1434 | 0.02 | 11.19 | 1774 | 0.01 |
| α-Humulene | 10.59 | 1447 | 0.01 | 9.26 | 1614 | tr |
| Germacrene D | 10.93 | 1472 | 0.06 | 9.76* | 1655 | [0.07] |
| (*E*)-β-Ionone | 11.04 | 1481 | 0.01 | 12.35 | 1876 | 0.01 |
| Myristicin | 11.53 | 1518 | 0.01 | 15.57 | 2186 | 0.02 |
| Unknown [m/z 92, 93 (36), 105 (33), 134 (29), 91 (27), 119 (19), 77 (13)...] | 14.61 | 1771 | 0.08 | | | |
| Unknown [m/z 93, 119 (46), 134 (36), 43 (29), 95 (18), 91 (16)...] | 14.97 | 1803 | 0.02 | 13.62 | 1994 | 0.01 |
| **Total identified** | | **98.99%** | | | **98.57%** | |
| **Total reported** | | **99.14%** | | | **98.61%** | |

*: 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