

Date : 2024-06-03

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24E17-PTH03

Customer Identification : Organic Citronella - Vietnam - CD0108R

Type : Essential Oil

Source : *Cymbopogon winterianus*

Customer : Plant Therapy

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

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

Date : 2024-05-23

PHYSICOCHEMICAL DATA

Refractive index : 1.4721 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2024-05-23

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
Ethanol	0.01	Aliphatic alcohol
Dimethylsulfide	tr	Aliphatic sulfide
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Methylcyclopentane	tr	Alkane
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Hexanal	tr	Aliphatic aldehyde
(3Z)-Hexenol	tr	Aliphatic alcohol
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	tr	Unknown
α -Thujene	tr	Monoterpene
α -Pinene	0.02	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.02	Monoterpene
6-Methyl-5-hepten-2-one	0.06	Aliphatic ketone
Myrcene	0.05	Monoterpene
α -Phellandrene	0.01	Monoterpene
Octanal	0.01	Aliphatic aldehyde
α -Terpinene	0.01	Monoterpene
<i>para</i> -Cymene	0.01	Monoterpene
Limonene	2.66	Monoterpene
β -Phellandrene	0.03	Monoterpene
Unknown	0.04	Unknown
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.02	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.07	Aliphatic aldehyde
γ -Terpinene	0.01	Monoterpene
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.05	Monoterpene
Linalool	0.55	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Unknown	0.02	Oxygenated monoterpene
<i>cis</i> -Rose oxide	0.01	Monoterpenic ether
<i>trans-para</i> -Mentha-2,8-dien-1-ol	tr	Monoterpenic alcohol
<i>trans</i> -Rose oxide	0.01	Monoterpenic ether
Melonol ?	0.06	Normonoterpene

Isopulegol	1.18	Monoterpenic alcohol
Citronellal	31.80	Monoterpenic aldehyde
iso-Isopulegol	0.35	Monoterpenic alcohol
Borneol	0.04	Monoterpenic alcohol
Isoneral	0.01	Monoterpenic aldehyde
neoiso-Isopulegol	0.07	Monoterpenic alcohol
Terpinen-4-ol	[0.06]	Monoterpenic alcohol
Rosefuran oxide	[0.06]	Monoterpenic ether
α -Terpineol	0.05	Monoterpenic alcohol
(4Z)-Decenal	0.03	Aliphatic aldehyde
Decanal	0.10	Aliphatic aldehyde
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
Nerol	0.17	Monoterpenic alcohol
Citronellol	10.57	Monoterpenic alcohol
Neral	0.38	Monoterpenic aldehyde
Piperitone	0.01	Monoterpenic ketone
Geraniol	20.59	Monoterpenic alcohol
Geranial	0.56	Monoterpenic aldehyde
Citronellyl formate	0.03	Monoterpenic ester
Geranyl formate	0.03	Monoterpenic ester
Unknown	0.02	Norsesquiterpene
Citronellic acid	0.19	Monoterpenic acid
8-Hydroxy-neo-menthol	0.23	Monoterpenic alcohol
α -Cubebene	0.02	Sesquiterpene
Eugenol	0.74	Phenylpropanoid
Citronellyl acetate	2.23	Monoterpenic ester
Neryl acetate	0.02	Monoterpenic ester
α -Copaene	0.04	Sesquiterpene
β -Bourbonene	0.17	Sesquiterpene
<i>cis</i> - β -Elemene	0.13	Sesquiterpene
Geranyl acetate	2.66	Monoterpenic ester
β -Elemene	3.46	Sesquiterpene
Dodecanal	0.01	Aliphatic aldehyde
β -Ylangene	0.02	Sesquiterpene
β -Caryophyllene	0.13	Sesquiterpene
β -Copaene	0.04	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.01	Sesquiterpene
Isogermacrene D	0.03	Sesquiterpene
(<i>E</i>)-Isoeugenol	0.04	Phenylpropanoid
α -Humulene	0.15	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.06	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.06	Sesquiterpene
γ -Muurolene	0.26	Sesquiterpene
Germacrene D	1.93	Sesquiterpene
β -Selinene	0.08	Sesquiterpene

γ-Amorphene	0.07	Sesquiterpene
epi-Cubebol	0.09	Sesquiterpenic alcohol
α-Selinene	0.13	Sesquiterpene
Methyl (E)-isoeugenol	0.09	Phenylpropanoid
α-Muurolene	0.59	Sesquiterpene
Germacrene A	0.78	Sesquiterpene
γ-Cadinene	0.61	Sesquiterpene
Cubebol	0.08	Sesquiterpenic alcohol
trans-Calamenene	0.04	Sesquiterpene
δ-Cadinene	2.26	Sesquiterpene
Unknown	0.05	Sesquiterpene
α-Cadinene	0.15	Sesquiterpene
α-Elemol	5.69	Sesquiterpenic alcohol
Geranyl butyrate	0.01	Monoterpenic ester
(E)-Nerolidol	0.02	Sesquiterpenic alcohol
Germacrene D-4-ol	0.91	Sesquiterpenic alcohol
1,10-diepi-Cubenol	0.05	Sesquiterpenic alcohol
Unknown	0.22	Unknown
γ-Eudesmol	0.47	Sesquiterpenic alcohol
τ-Cadinol	0.29	Sesquiterpenic alcohol
Cubenol	0.04	Sesquiterpenic alcohol
τ-Muurolol	0.36	Sesquiterpenic alcohol
α-Muurolol	0.12	Sesquiterpenic alcohol
β-Eudesmol	0.46	Sesquiterpenic alcohol
α-Eudesmol	0.42	Sesquiterpenic alcohol
α-Cadinol	0.72	Sesquiterpenic alcohol
Unknown	0.97	Oxygenated sesquiterpene
(2E,6Z)-Farnesal	0.04	Sesquiterpenic aldehyde
(2E,6E)-Farnesol	0.20	Sesquiterpenic alcohol
(2E,6E)-Farnesal	0.05	Sesquiterpenic aldehyde
Cryptomeridiol	0.06	Sesquiterpenic alcohol
Geranyl caprylate	0.02	Monoterpenic ester
Unknown	0.01	Oxygenated diterpene
Unknown	0.07	Oxygenated diterpene
Unknown	0.01	Unknown
Citronellyl citronellate	0.01	Monoterpenic ester
Unknown	0.05	Unknown
Unknown	0.16	Unknown
Unknown	0.17	Unknown
Consolidated total	99.16	

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

Note: no correction factor was applied

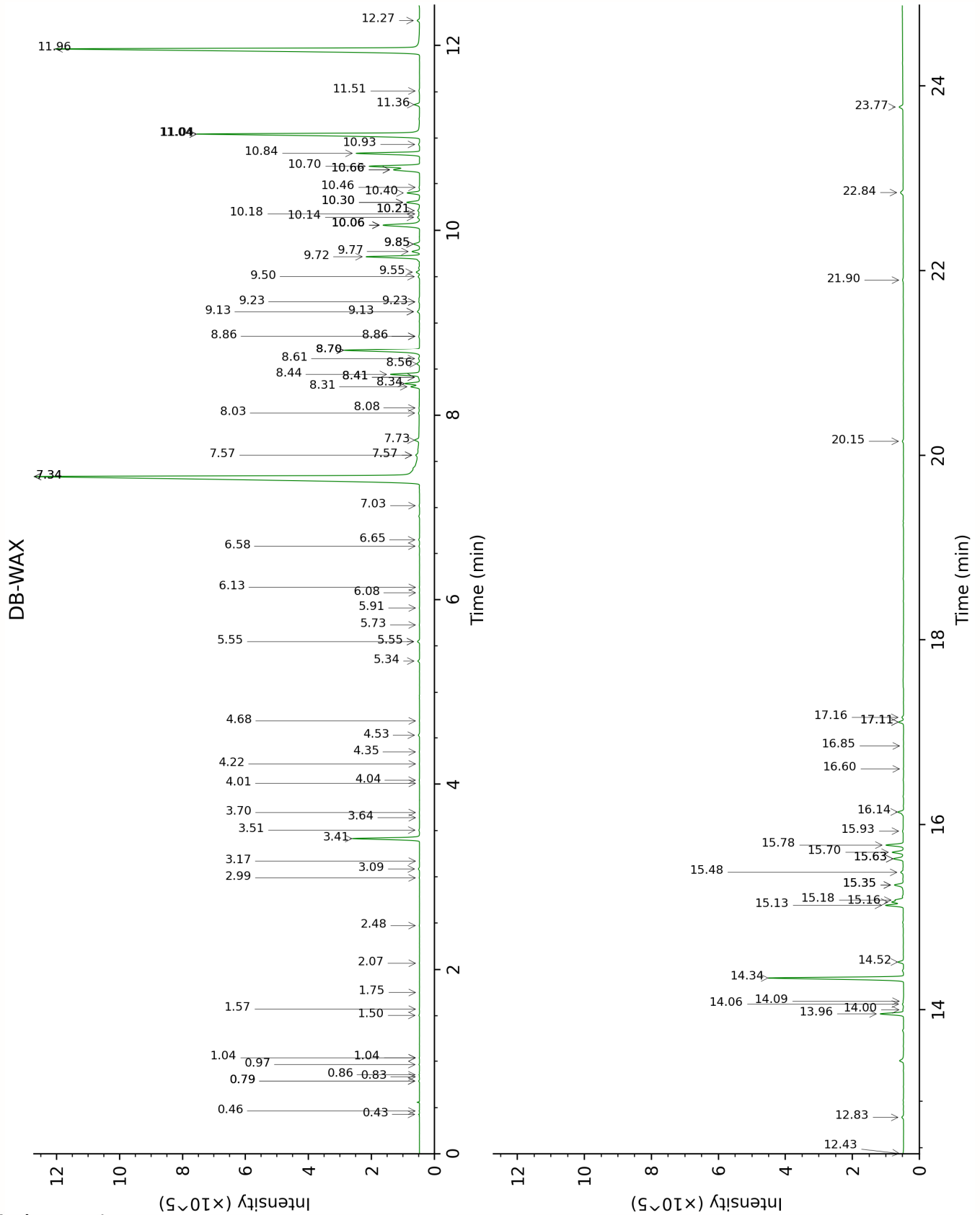
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

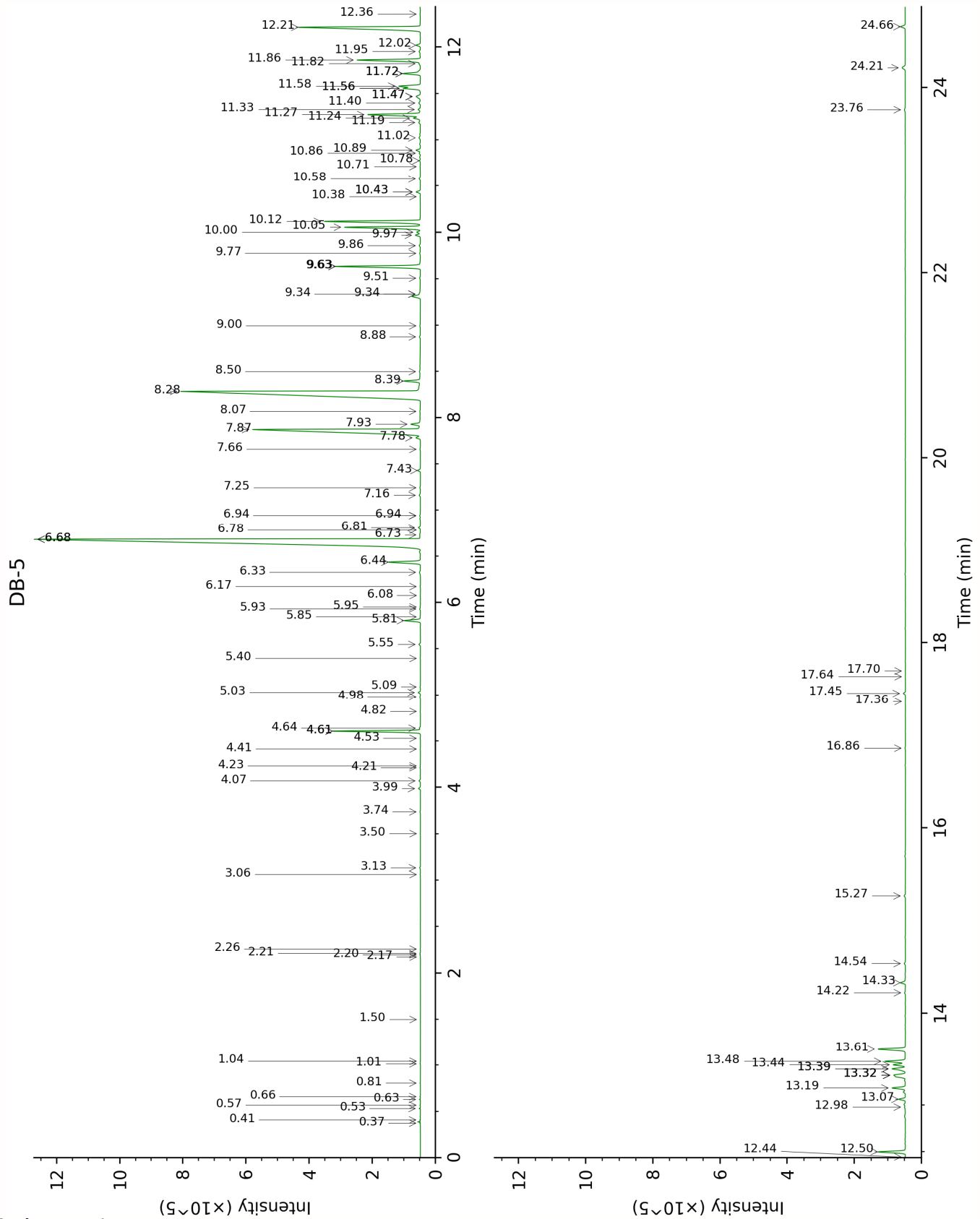
chromatograms in this report to access the full untreated data and perform their own calculations if needed.

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

Ethanol	Column DB-WAX			Column DB-5		
	0.97	906.9	0.01	0.37	499.5	0.01
Dimethylsulfide	0.46	701.0	tr	0.41	506.0	tr
2-Methyl-3-buten-2-ol	1.75	1015.5	tr	0.53	607.1	0.01
Methylcyclopentane	0.43	653.7	0.01	0.57	619.5	tr
Isovaleral	0.86	887.4	0.01	0.63	641.2	0.01
2-Methylbutyral	0.83	879.6	0.01	0.66	651.6	0.01
2-Ethylfuran	1.04*	918.3	[0.01]	0.81	702.2	tr
Isoamyl alcohol	3.64	1174.4	0.01	1.01	732.8	0.01
2-Methylbutanol	3.70	1178.6	0.02	1.04	736.8	tr
Hexanal	2.07	1045.7	tr	1.50	800.9	tr
(3Z)-Hexenol	6.08	1350.1	0.01	2.17	858.3	tr
Unknown COCI I [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	0.79*	863.9	[0.02]	2.20	860.3	0.01
Unknown COCI II [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	0.79*	863.9	[0.02]	2.21	861.5	0.01
Unknown ROOF III [m/z 67, 81 (70), 66 (53), 68 (41), 82 (38), 109 (38)...]	1.04*	918.3	[0.01]	2.26	865.4	tr
α -Thujene	1.57	998.2	tr	3.06	926.5	tr
α -Pinene	1.50	990.8	0.02	3.13	931.3	0.02
Benzaldehyde	7.57*	1459.0	[0.23]	3.50	955.7	0.01
Sabinene	2.48	1084.5	0.02	3.74	971.2	0.02
6-Methyl-5-hepten-2-one	5.34	1297.3	0.07	3.99	987.8	0.06
Myrcene	3.09	1132.7	0.05	4.07	993.3	0.05
α -Phellandrene	2.99	1125.4	0.01	4.21	1002.7	0.01
Octanal	4.68	1248.6	0.01	4.23	1004.0	0.01
α -Terpinene	3.17	1139.1	0.01	4.41	1015.4	0.01
<i>para</i> -Cymene	4.35	1225.3	0.01	4.53	1022.7	0.01
Limonene	3.41	1157.4	2.66	4.61*	1027.6	[2.65]
β -Phellandrene	3.51	1164.3	0.03	4.61*	1027.6	[2.65]
Unknown COCI XLIV [m/z 59, 43 (12), 109 (11), 41 (10), 127 (8)...]	6.65	1391.0	0.04	4.64	1029.5	0.04

(Z)- β -Ocimene	4.04	1204.0	0.02	4.82	1040.9	0.01
(E)- β -Ocimene	4.22	1216.3	0.01	4.98	1051.1	0.02
2,6-Dimethyl-5-heptenal (melonal)	5.55*	1312.4	[0.09]	5.03	1054.0	0.07
γ -Terpinene	4.01	1201.6	0.01	5.09	1057.8	0.01
Octanol	8.41*	1522.4	[0.03]	5.40	1077.2	0.01
Terpinolene	4.53	1237.9	0.05	5.55	1086.7	0.05
Linalool	8.34	1517.2	0.57	5.81	1102.8	0.55
Nonanal	6.14	1354.3	0.01	5.85	1105.3	0.01
Unknown COCI VII [m/z 111, 69 (70), 41 (68), 55 (53), 43 (51)... 154 (7)]	5.91	1338.4	0.01	5.93	1110.8	0.02
cis-Rose oxide	5.55*	1312.4	[0.09]	5.95	1112.1	0.01
trans-para-Mentha-2,8-dien-1-ol	9.23*	1585.4	[0.03]	6.08	1120.0	tr
trans-Rose oxide	5.73	1325.2	0.02	6.17	1126.2	0.01
Melonol ?				6.33	1136.0	0.06
Isopulegol	8.44	1524.8	1.22	6.44	1143.0	1.18
Citronellal	7.34*	1442.0	[31.12]	6.68*	1158.8	[32.15]
iso-Isopulegol	8.31	1514.5	0.35	6.68*	1158.8	[32.15]
Borneol	10.06*	1651.6	[2.02]	6.73	1161.8	0.04
Isoneral	8.08	1496.9	0.01	6.78	1165.2	0.01
neoiso-Isopulegol	9.13*	1577.4	[0.11]	6.81	1166.8	0.07
Terpinen-4-ol	8.86*	1557.0	[0.05]	6.94*†	1175.5	[0.04]
Rosefuran oxide	8.86*	1557.0	[0.05]	6.94*†	1175.5	[0.04]
α -Terpineol	10.06*	1651.6	[2.02]	7.16	1189.5	0.05
(4Z)-Decenal	8.02	1492.6	0.03	7.24	1194.8	0.03
Decanal	7.57*	1459.0	[0.23]	7.43	1206.8	0.10
2,3-Epoxyneral?				7.66	1222.0	0.02
Nerol	11.36	1759.5	0.23	7.78	1230.4	0.17
Citronellol	11.04*	1732.8	[11.08]	7.87	1236.3	10.57
Neral	9.77	1628.8	0.32	7.93	1240.1	0.38
Piperitone	10.18	1661.2	0.04	8.07	1249.4	0.01
Geraniol	11.96	1811.0	21.23	8.28	1263.9	20.59
Geranial	10.40	1679.3	0.51	8.40	1271.3	0.56
Citronellyl formate	9.13*	1577.4	[0.11]	8.50	1278.1	0.03
Geranyl formate	10.21*	1664.1	[0.11]	8.88	1303.7	0.03
Unknown CYSC II [m/z 135, 121 (81), 177 (78), 107 (60), 192 (42), 149 (35)]	6.58	1386.1	0.03	9.00	1312.0	0.02
Citronellic acid	17.11*	2300.9	[0.22]	9.34*†	1336.0	[0.05]
8-Hydroxy-neomenthol	14.52	2042.5	0.23	9.34*†	1336.0	[0.05]

α -Cubebene	7.02	1418.8	0.02	9.51	1348.1	0.02
Eugenol	15.13	2101.3	0.74	9.63*	1357.1	[2.97]
Citronellyl acetate	9.72	1624.3	2.23	9.63*	1357.1	[2.97]
Neryl acetate	10.46	1684.2	0.03	9.77	1366.9	0.02
α -Copaene	7.34*	1442.0	[31.12]	9.86	1372.8	0.04
β -Bourbonene	7.73	1471.0	0.19	9.97	1380.6	0.17
<i>cis</i> - β -Elemene	8.56	1533.6	0.12	10.00	1382.9	0.13
Geranyl acetate	10.84	1715.4	2.70	10.06	1386.8	2.66
β -Elemene	8.70*	1544.9	[3.60]	10.12	1391.1	3.46
Dodecanal	10.30*	1671.2	[0.60]	10.38	1410.2	0.01
β -Ylangene	8.41*	1522.4	[0.03]	10.43*	1414.0	[0.15]
β -Caryophyllene	8.70*	1544.9	[3.60]	10.43*	1414.0	[0.15]
β -Copaene	8.61	1537.9	0.04	10.58	1424.6	0.04
<i>trans</i> - α - Bergamotene	8.70*	1544.9	[3.60]	10.71	1434.7	0.01
Isogermacrene D	9.23*	1585.4	[0.03]	10.78	1439.6	0.03
(<i>E</i>)-Isoeugenol	16.85	2273.9	0.01	10.86	1445.6	0.04
α -Humulene	9.55	1610.9	0.15	10.89	1448.0	0.15
(<i>E</i>)- β -Farnesene	9.85*	1635.2	[0.27]	11.02	1458.0	0.06
<i>trans</i> -Cadina-1(6),4- diene	9.50	1607.1	0.06	11.19	1470.2	0.06
γ -Muurolene	9.85*	1635.2	[0.27]	11.24	1473.8	0.26
Germacrene D	10.06*	1651.6	[2.02]	11.27	1476.6	1.93
β -Selinene	10.14	1658.3	0.10	11.33	1480.7	0.08
γ -Amorphene	10.06*	1651.6	[2.02]	11.40	1485.9	0.07
epi-Cubebol	12.27	1837.7	0.09	11.47*	1491.1	[0.22]
α -Selinene	10.21*	1664.1	[0.11]	11.47*	1491.1	[0.22]
Methyl (<i>E</i>)- isoeugenol	15.35*	2122.8	[0.45]	11.56*†	1497.7	[0.59]
α -Muurolene	10.30*	1671.2	[0.60]	11.56*†	1497.7	[0.59]
Germacrene A	10.66*	1700.5	[1.39]	11.58*†	1499.4	[0.75]
γ -Cadinene	10.66*	1700.5	[1.39]	11.72*	1509.8	[0.69]
Cubebol	12.83	1886.6	0.08	11.72*	1509.8	[0.69]
<i>trans</i> -Calamenene	11.51	1771.9	0.04	11.82	1518.2	0.04
δ -Cadinene	10.70	1703.7	2.28	11.86	1521.3	2.26
Unknown OCSA II [m/z 119, 105 (53), 161 (33), 93 (28), 91 (25), 40 (20)...204]	10.93	1723.5	0.04	11.95	1528.5	0.05
α -Cadinene	11.04*	1732.8	[11.08]	12.02	1533.9	0.15
α -Elemol	14.34	2026.2	5.77	12.22	1549.1	5.69
Geranyl butyrate	12.43	1852.0	0.03	12.36	1560.2	0.01
(<i>E</i>)-Nerolidol	14.09	2002.4	0.03	12.44	1566.7	0.02
Germacrene D-4-ol	13.96	1989.4	0.98	12.50	1571.3	0.91
1,10-diepi-Cubebol	14.06	1999.4	0.06	12.98	1609.5	0.05

Unknown JUCO I [m/z 69, 41 (42), 109 (25), 123 (22), 64 (22), 179 (18)...]				13.07	1616.5	0.22
γ-Eudesmol	15.16*†	2104.7	[0.49]	13.19	1626.6	0.47
τ-Cadinol	15.18*†	2106.7	[0.26]	13.32*	1637.9	[0.68]
Cubenol	14.00	1993.6	0.04	13.32*	1637.9	[0.68]
τ-Muurolol	15.35*	2122.8	[0.45]	13.32*	1637.9	[0.68]
α-Muurolol	15.48	2136.2	0.12	13.39*	1643.7	[0.55]
β-Eudesmol	15.70	2157.5	0.46	13.39*	1643.7	[0.55]
α-Eudesmol	15.63*	2150.6	[0.44]	13.44	1647.3	0.42
α-Cadinol	15.78	2165.1	0.70	13.48	1650.4	0.72
Unknown CYWI V [suspected m/z 59, 93 (79), 161 (61), 107 (47), 81 (44), 121 (37)...]				13.61	1661.4	0.97
(2E,6Z)-Farnesal	15.63*	2150.6	[0.44]	14.22	1712.5	0.04
(2E,6E)-Farnesol	17.16	2306.3	0.07	14.33	1721.9	0.20
(2E,6E)-Farnesal	16.14	2201.1	0.27	14.54	1739.8	0.05
Cryptomeridiol	20.15	2639.0	0.06	15.26	1803.0	0.06
Geranyl caprylate	15.93	2179.9	0.03	16.86	1949.8	0.02
Unknown COCI XXIX [m/z 81, 137 (70), 95 (46), 69 (45), 41 (39), 55 (29)...]				16.60	2248.5	0.01
Unknown COCI XXX [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)]				17.45	2006.6	0.07
Unknown COCI LXIV [m/z 69, 41 (96), 55 (53), 109 (48), 95 (43), 67 (35)...]				17.64	2024.6	0.01
Citronellyl citronellate	17.11*	2300.9	[0.22]	17.70	2030.8	0.01
Unknown CYWI II [m/z 69, 81 (79), 81 (70), 137 (53), 139 (35), 95 (30)...]				21.90	2850.7	0.04
Unknown CYWI III [m/z 69, 81 (84), 137 (53), 83 (30), 95 (27), 41 (19)...]				22.84	2970.8	0.15
Unknown CYWI IV	23.77	3094.0	0.18	24.66	2828.8	0.17

[m/z 69, 81 (64), 95 (29), 137 (19), 41 (19)...]						
Total reported		98.45%			98.98%	

*: 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