

Date : 2023-12-08

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23L01-PTH02

Customer Identification : Citronella - Indonesia - CE0109R

Type : Essential Oil

Source : *Cymbopogon winterianus*

Customer : Plant Therapy

Checked and approved by:

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

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

Date : 2023-12-08

PHYSICOCHEMICAL DATA

Refractive index : 1.4691 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-12-01

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
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Methylcyclopentane	tr	Alkane
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Tricyclene	0.01	Monoterpene
α -Thujene	tr	Monoterpene
α -Pinene	0.07	Monoterpene
Camphene	0.05	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
Sabinene	0.01	Monoterpene
β -Pinene	tr	Monoterpene
6-Methyl-5-hepten-2-one	0.05	Aliphatic ketone
Myrcene	0.06	Monoterpene
α -Phellandrene	0.01	Monoterpene
Octanal	0.02	Aliphatic aldehyde
Δ^3 -Carene	tr	Monoterpene
α -Terpinene	0.01	Monoterpene
<i>para</i> -Cymene	0.01	Monoterpene
β -Phellandrene	0.04	Monoterpene
Limonene	3.33	Monoterpene
Unknown	0.04	Unknown
(<i>Z</i>)- β -Ocimene	0.13	Monoterpene
(<i>E</i>)- β -Ocimene	0.08	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.08	Aliphatic aldehyde
γ -Terpinene	0.02	Monoterpene
4-Nonanone	0.01	Aliphatic ketone
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.06	Monoterpene
<i>trans</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
Linalool	0.68	Monoterpenic alcohol
Unknown	0.01	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 ?	0.01	Normonoterpene
Unknown	0.02	Unknown
<i>cis-para</i> -Mentha-2,8-dien-1-ol	0.05	Monoterpenic alcohol

neo-Isopulegol	0.03	Monoterpenic alcohol
Isopulegol	1.17	Monoterpenic alcohol
Menthone	0.04	Monoterpenic ketone
Citronellal	37.61	Monoterpenic aldehyde
Isomenthone	0.03	Monoterpenic ketone
Unknown	0.02	Oxygenated monoterpene
Borneol	0.03	Monoterpenic alcohol
neiso-Isopulegol	0.08	Monoterpenic alcohol
Rosefuran oxide	0.01	Monoterpenic ether
Isopulegol isomer	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.04	Monoterpenic alcohol
α -Terpineol	0.06	Monoterpenic alcohol
(4Z)-Decenal	0.04	Aliphatic aldehyde
Decanal	0.12	Aliphatic aldehyde
2,3-Epoxyneral?	0.04	Monoterpenic aldehyde
Nerol	0.17	Monoterpenic alcohol
Citronellol	12.80	Monoterpenic alcohol
Neral	0.41	Monoterpenic aldehyde
Piperitone	0.01	Monoterpenic ketone
Geraniol	20.90	Monoterpenic alcohol
Geranial	0.67	Monoterpenic aldehyde
Citronellyl formate	0.02	Monoterpenic ester
Bornyl acetate	0.01	Monoterpenic ester
Geranyl formate	0.03	Monoterpenic ester
Unknown	0.02	Norsesquiterpene
8-Hydroxy-neo-menthol	0.19	Monoterpenic alcohol
Citronellic acid	0.18	Monoterpenic acid
Citronellyl acetate	1.95	Monoterpenic ester
Eugenol	0.84	Phenylpropanoid
8-Hydroxy-iso-menthol	0.03	Monoterpenic alcohol
Neryl acetate	0.11	Monoterpenic ester
α -Copaene	0.03	Sesquiterpene
β -Bourbonene	0.09	Sesquiterpene
<i>cis</i> - β -Elemene	0.05	Sesquiterpene
Geranyl acetate	3.07	Monoterpenic ester
β -Elemene	1.35	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
Dodecanal	0.02	Aliphatic aldehyde
β -Caryophyllene	0.42	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.08	Sesquiterpene
Isogermacrene D	0.02	Sesquiterpene
(<i>E</i>)-Isoeugenol	0.03	Phenylpropanoid
α -Humulene	0.16	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.07	Sesquiterpene

γ-Murolene	0.19	Sesquiterpene
Germacrene D	1.61	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
α-Selinene	0.06	Sesquiterpene
epi-Cubebol	0.10	Sesquiterpenic alcohol
Methyl (E)-isoeugenol	0.17	Phenylpropanoid
α-Murolene	0.36	Sesquiterpene
Germacrene A	0.38	Sesquiterpene
Cubebol	0.12	Sesquiterpenic alcohol
γ-Cadinene	0.45	Sesquiterpene
trans-Calamenene	0.02	Sesquiterpene
δ-Cadinene	1.41	Sesquiterpene
Unknown	0.03	Sesquiterpene
Unknown	0.03	Unknown
α-Cadinene	0.10	Sesquiterpene
α-Elemol	2.30	Sesquiterpenic alcohol
Geranyl butyrate	0.09	Monoterpenic ester
(E)-Nerolidol	0.01	Sesquiterpenic alcohol
Germacrene D-4-ol	1.00	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
10-epi-Cubebol	0.04	Sesquiterpenic alcohol
γ-Eudesmol	0.18	Sesquiterpenic alcohol
τ-Cadinol	0.20	Sesquiterpenic alcohol
τ-Murolol	0.24	Sesquiterpenic alcohol
α-Murolol	0.06	Sesquiterpenic alcohol
β-Eudesmol	0.18	Sesquiterpenic alcohol
α-Eudesmol	0.17	Sesquiterpenic alcohol
α-Cadinol	0.48	Sesquiterpenic alcohol
Unknown	0.54	Oxygenated sesquiterpene
(2E,6Z)-Farnesal	0.01	Sesquiterpenic aldehyde
(2E,6E)-Farnesol	0.04	Sesquiterpenic alcohol
(2E,6E)-Farnesal	0.02	Sesquiterpenic aldehyde
Cryptomeridiol	0.02	Sesquiterpenic alcohol
Geranyl caprylate	0.01	Monoterpenic ester
Unknown	0.01	Oxygenated diterpene
Unknown	0.08	Oxygenated diterpene
Unknown	0.01	Unknown
Unknown	0.04	Unknown
Unknown	0.13	Unknown
Unknown	0.13	Unknown
Consolidated total	99.15	

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

Note: no correction factor was applied

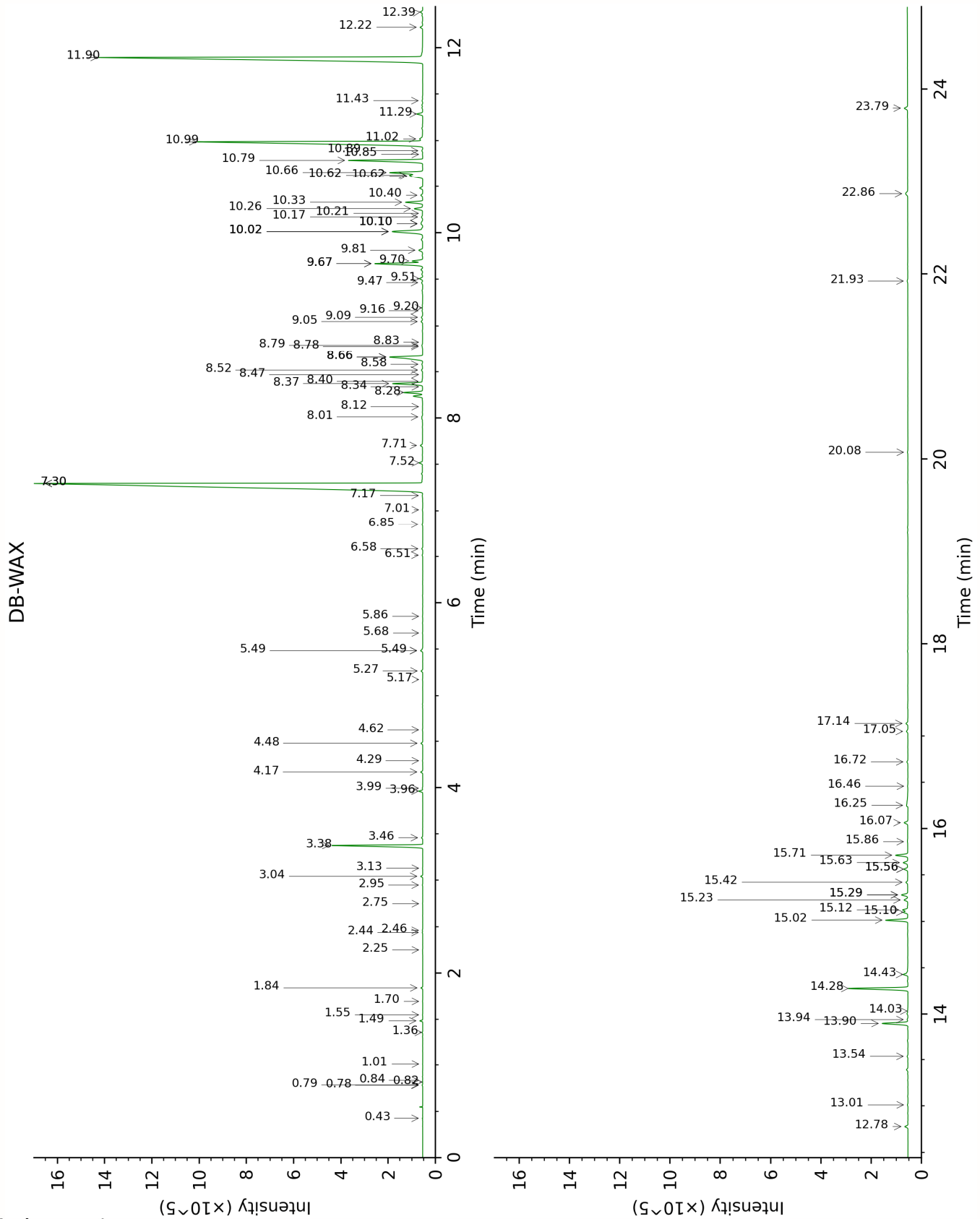
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid

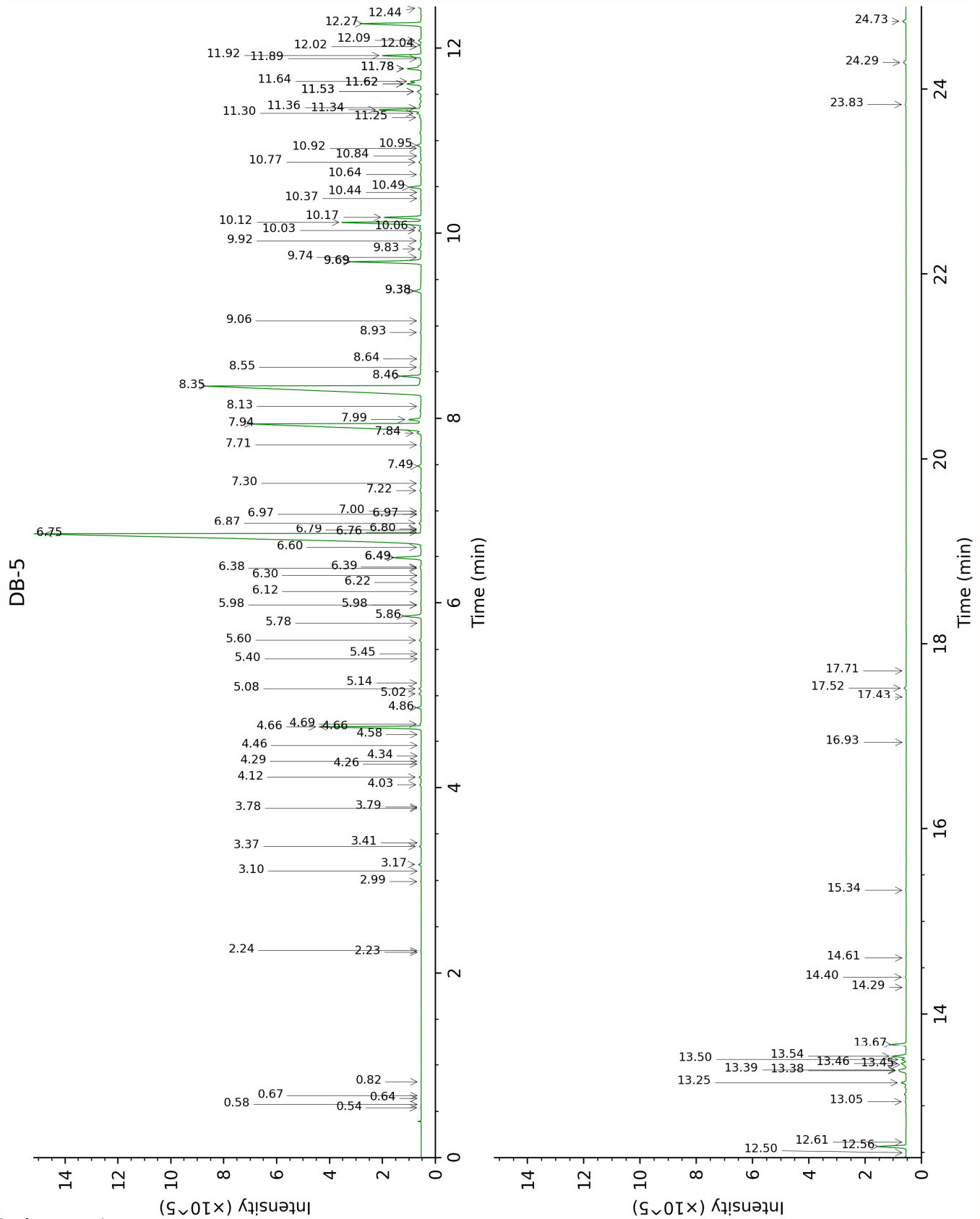
overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

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

2-Methyl-3-buten-2-ol	Column DB-WAX			Column DB-5		
	1.70	1014.9	0.01	0.54	606.6	0.01
Methylcyclopentane	0.43	664.9	0.01	0.58	618.6	tr
Isovaleral	0.84	886.8	tr	0.64	640.7	tr
2-Methylbutyral	0.82	880.7	tr	0.67	650.8	tr
2-Ethylfuran	1.01	920.9	tr	0.82	700.9	tr
Unknown COCI I [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	0.78	869.1	0.01	2.23	859.7	0.01
Unknown COCI II [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	0.79	870.2	0.01	2.24	861.2	0.01
Tricyclene	1.36	973.5	0.02	2.99	918.9	0.01
α -Thujene	1.55	1001.2	0.01	3.10	926.3	tr
α -Pinene	1.49	992.4	0.08	3.17	931.0	0.07
Camphene	1.84	1028.6	0.05	3.37	943.8	0.05
Thuja-2,4(10)-diene	2.46	1087.2	0.01	3.41	946.4	tr
Sabinene	2.44	1085.0	0.02	3.78	970.8	0.01
β -Pinene	2.25	1067.2	0.01	3.79	971.7	tr
6-Methyl-5-hepten-2-one	5.27	1295.8	0.06	4.03	987.5	0.05
Myrcene	3.04	1133.7	0.06	4.12	992.9	0.06
α -Phellandrene	2.95	1126.5	0.01	4.26	1002.2	0.01
Octanal	4.62	1250.1	0.01	4.29	1004.3	0.02
Δ^3 -Carene	2.75	1111.3	0.01	4.34	1007.8	tr
α -Terpinene	3.13	1140.3	0.01	4.46	1014.9	0.01
<i>para</i> -Cymene	4.29	1226.4	0.01	4.58	1022.3	0.01
β -Phellandrene	3.46	1165.3	0.04	4.66*	1027.4	[3.36]
Limonene	3.38	1158.9	3.33	4.66*	1027.4	[3.36]
Unknown COCI XLIV [m/z 59, 43 (12), 109 (11), 41 (10), 127 (8)...]	6.58	1391.5	0.03	4.69	1029.3	0.04
(Z)- β -Ocimene	3.96	1203.1	0.13	4.86	1040.3	0.13
(E)- β -Ocimene	4.17	1217.8	0.07	5.02	1050.2	0.08
2,6-Dimethyl-5-heptenal (melonal)	5.49*	1313.0	[0.10]	5.08	1053.6	0.08
γ -Terpinene	3.99	1205.3	0.01	5.14	1057.5	0.02
4-Nonanone	5.17	1289.2	0.01	5.40	1073.7	0.01
Octanol	8.34	1521.8	tr	5.45	1077.1	0.01

Terpinolene	4.48	1239.8	0.06	5.60	1086.3	0.06
<i>trans</i> -Sabinene hydrate	8.12	1505.2	tr	5.78	1097.7	0.01
Linalool	8.28	1517.1	0.68	5.86	1102.6	0.68
Unknown COCI VII [m/z 111, 69 (70), 41 (68), 55 (53), 43 (51)... 154 (7)]	5.86	1339.4	0.01	5.98*	1110.1	[0.02]
<i>cis</i> -Rose oxide	5.49*	1313.0	[0.10]	5.98*	1110.1	[0.02]
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.16	1585.5	0.03	6.12	1119.4	tr
<i>trans</i> -Rose oxide	5.68	1326.5	0.01	6.22	1125.7	0.01
Melonol ?				6.30	1130.4	0.01
Unknown CYFL III [m/z 81, 70 (98), 67 (63), 82 (53), 41 (46), 69 (46), 109 (43)...]	7.01	1422.7	0.02	6.38	1135.5	0.02
<i>cis-para</i> -Mentha-2,8-dien-1-ol	9.67*	1625.7	[1.99]	6.39	1136.2	0.05
neo-Isopulegol	8.40	1526.2	0.03	6.49*	1142.8	[1.15]
Isopulegol	8.37	1524.4	1.17	6.49*	1142.8	[1.15]
Menthone	6.85	1410.9	0.03	6.60	1149.8	0.04
Citronellal	7.30*	1443.8	[36.75]	6.75	1159.2	37.61
Isomenthone	7.17	1434.1	0.03	6.76	1160.1	0.03
Unknown CYWI I [m/z 93, 108 (98), 95 (50), 91 (49), 79 (40), 94 (40)... 166 (1)]	10.85	1722.1	0.01	6.79	1161.7	0.02
Borneol	10.02*	1653.5	[1.70]	6.80	1162.4	0.03
neoiso-Isopulegol	9.05	1576.5	0.06	6.87	1166.8	0.08
Rosefuran oxide	8.83	1559.3	0.01	6.97*	1173.0	[0.02]
Isopulegol isomer	8.78	1555.8	0.01	6.97*	1173.0	[0.02]
Terpinen-4-ol	8.79	1556.8	0.03	7.00	1175.2	0.04
α -Terpineol	10.02*	1653.5	[1.70]	7.22	1189.3	0.06
(4Z)-Decenal	8.01	1496.8	0.03	7.30	1194.3	0.04
Decanal	7.52	1460.2	0.12	7.49	1206.3	0.12
2,3-Epoxyneral?				7.71	1221.5	0.04
Nerol	11.29	1759.0	0.23	7.84	1230.0	0.17
Citronellol	10.99	1733.7	12.80	7.94*†	1236.7	[12.60]
Neral	9.70	1628.0	0.41	7.99*†	1239.8	[0.55]
Piperitone	10.10*	1660.3	[0.12]	8.13	1249.3	0.01
Geraniol	11.90	1811.0	20.90	8.35*†	1264.0	[20.62]
Geranial	10.33	1678.9	0.67	8.46*†	1271.1	[0.78]
Citronellyl formate	9.09	1580.0	0.06	8.55	1277.4	0.02
Bornyl acetate	8.47	1531.9	0.01	8.64	1283.6	0.01

Geranyl formate	10.10*	1660.3	[0.12]	8.93	1303.0	0.03
Unknown CYSC II [m/z 135, 121 (81), 177 (78), 107 (60), 192 (42), 149 (35)]	6.52	1386.5	0.02	9.06	1311.7	0.02
8-Hydroxy-neo- menthol	14.43	2042.2	0.19	9.38*	1334.3	[0.34]
Citronellic acid	16.25	2223.2	0.18	9.38*	1334.3	[0.34]
Citronellyl acetate	9.67*	1625.7	[1.99]	9.69*	1356.5	[2.79]
Eugenol	15.02	2098.5	0.84	9.69*	1356.5	[2.79]
8-Hydroxy-iso- menthol	15.29*	2125.7	[0.26]	9.74	1359.7	0.03
Neryl acetate	10.40	1685.0	0.09	9.83	1366.1	0.11
α -Copaene	7.30*	1443.8	[36.75]	9.92	1372.2	0.03
β -Bourbonene	7.71	1474.0	0.08	10.03	1380.1	0.09
<i>cis</i> - β -Elemene	8.52	1535.7	0.05	10.06	1382.3	0.05
Geranyl acetate	10.79	1716.7	3.09	10.12	1386.3	3.07
β -Elemene	8.66*	1546.5	[1.80]	10.17	1390.1	1.35
Methyleugenol	13.54	1958.3	0.03	10.37	1404.3	0.02
Dodecanal	10.21	1669.3	0.02	10.44	1409.2	0.02
β -Caryophyllene	8.66*	1546.5	[1.80]	10.50	1413.4	0.42
β -Copaene	8.58	1540.5	0.04	10.64	1424.0	0.03
<i>trans</i> - α - Bergamotene	8.66*	1546.5	[1.80]	10.77	1434.0	0.08
Isogermacrene D	9.20	1587.8	0.02	10.84	1438.9	0.02
(<i>E</i>)-Isoeugenol	16.72	2271.9	0.04	10.92	1445.1	0.03
α -Humulene	9.51	1612.7	0.13	10.95	1447.5	0.16
<i>trans</i> -Cadinene-1(6),4- diene	9.47	1609.2	0.05	11.25	1469.7	0.07
γ -Muurolene	9.82	1637.4	0.18	11.30	1473.1	0.19
Germacrene D	10.02*	1653.5	[1.70]	11.34	1476.0	1.61
β -Selinene	10.10*	1660.3	[0.12]	11.36	1477.6	0.03
α -Selinene	10.17	1666.2	0.06	11.53*	1490.6	[0.19]
epi-Cubebol	12.22	1839.8	0.10	11.53*	1490.6	[0.19]
Methyl (<i>E</i>)- isoeugenol	15.23	2120.2	0.17	11.62*	1496.7	[0.59]
α -Muurolene	10.26	1673.4	0.36	11.62*	1496.7	[0.59]
Germacrene A	10.62	1702.3	0.42	11.64	1498.7	0.38
Cubebol	12.78	1888.8	0.12	11.78*	1509.2	[0.53]
γ -Cadinene	10.62	1703.0	0.45	11.78*	1509.2	[0.53]
<i>trans</i> -Calamenene	11.43	1771.1	0.03	11.89	1517.7	0.02
δ -Cadinene	10.66	1705.6	1.41	11.92	1520.3	1.41
Unknown OCSA II [m/z 119, 105 (53), 161 (33), 93 (28), 91	10.89	1725.5	0.04	12.02	1527.8	0.03

(25), 40 (20)...204]						
Unknown OCSA III [m/z 93, 107 (82), 108 (53), 119 (45), 43 (44), 135 (40)...222]				12.04	1529.2	0.03
α -Cadinene	11.02	1736.3	0.18	12.08	1533.1	0.10
α -Elemol	14.28	2027.8	2.33	12.27	1547.2	2.30
Geranyl butyrate	12.39	1854.2	0.10	12.44	1561.0	0.09
(E)-Nerolidol	14.03	2004.4	0.02	12.50	1565.4	0.01
Germacrene D-4-ol	13.90	1991.7	1.04	12.56	1570.7	1.00
Caryophyllene oxide	13.01	1910.1	0.02	12.61	1574.4	0.02
10-epi-Cubenol	13.94	1995.6	0.04	13.05	1608.7	0.04
γ -Eudesmol	15.12	2109.5	0.20	13.25	1625.7	0.18
τ -Cadinol	15.10	2107.0	0.17	13.38	1636.4	0.20
τ -Muurolol	15.29*	2125.7	[0.26]	13.39	1637.0	0.24
α -Muurolol	15.42	2139.3	0.08	13.45	1641.7	0.06
β -Eudesmol	15.64	2160.4	0.19	13.46	1642.8	0.18
α -Eudesmol	15.56*	2153.5	[0.16]	13.50	1646.4	0.17
α -Cadinol	15.72	2168.4	0.48	13.54	1649.4	0.48
Unknown CYWI V [suspected m/z 59, 93 (79), 161 (61), 107 (47), 81 (44), 121 (37)...]				13.67	1660.3	0.54
(2E,6Z)-Farnesal	15.56*	2153.5	[0.16]	14.29	1711.5	0.01
(2E,6E)-Farnesol	17.05	2306.5	0.07	14.40	1721.0	0.04
(2E,6E)-Farnesal	16.07	2203.9	0.16	14.61	1739.0	0.02
Cryptomeridiol	20.08	2648.4	0.02	15.34	1802.3	0.02
Geranyl caprylate	15.86	2183.0	0.01	16.93	1949.0	0.01
Unknown COCI XXIX [m/z 81, 137 (70), 95 (46), 69 (45), 41 (39), 55 (29)...]	16.46	2244.7	0.01	17.43	1996.1	0.01
Unknown COCI XXX [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)]	17.14	2315.7	0.08	17.52	2005.4	0.08
Unknown COCI LXIV [m/z 69, 41 (96), 55 (53), 109 (48), 95 (43), 67 (35)...]				17.71	2023.8	0.01
Unknown CYWI II [m/z 69, 81 (79), 81	21.93	2878.4	0.03	23.83	2709.3	0.04

(70), 137 (53), 139 (35), 95 (30)...						
Unknown CYWI III [m/z 69, 81 (84), 137 (53), 83 (30), 95 (27), 41 (19)...	22.86	3002.0	0.13	24.29	2767.9	0.13
Unknown CYWI IV [m/z 69, 81 (64), 95 (29), 137 (19), 41 (19)...	23.79	3129.1	0.15	24.73	2826.2	0.13
Total reported		98.06%			98.88%	

*: 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