

Date : 2023-11-10

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 23K03-PTH06

**Customer Identification :** Citronella - Indonesia - CE0108R

**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*Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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 :** 2023-11-08

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4682 \pm 0.0003$  (20 °C)

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

**Analyst :** Cindy Caron B. Sc.

**Date :** 2023-11-06

## 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	tr	Aliphatic alcohol
3-Methylcyclopentene	0.01	Alkene
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
3-Methylcyclopentane	0.01	Alkane
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Tricyclene	0.02	Monoterpene
$\alpha$ -Thujene	0.01	Monoterpene
$\alpha$ -Pinene	0.09	Monoterpene
Camphene	0.09	Monoterpene
Sabinene	0.02	Monoterpene
$\beta$ -Pinene	tr	Monoterpene
6-Methyl-5-hepten-2-one	0.09	Aliphatic ketone
Myrcene	0.06	Monoterpene
$\alpha$ -Phellandrene	0.02	Monoterpene
Octanal	0.02	Aliphatic aldehyde
$\alpha$ -Terpinene	0.01	Monoterpene
<i>para</i> -Cymene	0.01	Monoterpene
$\beta$ -Phellandrene	0.03	Monoterpene
Limonene	3.28	Monoterpene
Unknown	0.05	Unknown
( <i>Z</i> )- $\beta$ -Ocimene	0.04	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.04	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.09	Aliphatic aldehyde
$\gamma$ -Terpinene	0.02	Monoterpene
4-Nonanone	0.02	Aliphatic ketone
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.07	Monoterpene
Linalool	0.65	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Unknown	0.02	Oxygenated monoterpene
<i>cis</i> -Rose oxide	0.02	Monoterpenic ether
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
<i>trans</i> -Rose oxide	0.01	Monoterpenic ether
Unknown	0.07	Oxygenated normonoterpene
Isopulegol	1.18	Monoterpenic alcohol
Menthone	0.07	Monoterpenic ketone

iso-Isopulegol	0.38	Monoterpenic alcohol
Citronellal	40.84	Monoterpenic aldehyde
Borneol	0.06	Monoterpenic alcohol
Isoneral	0.03	Monoterpenic aldehyde
neoiso-Isopulegol	0.08	Monoterpenic alcohol
Isopulegol isomer	[0.05]	Monoterpenic alcohol
Terpinen-4-ol	[0.05]	Monoterpenic alcohol
Rosefuran oxide	[0.05]	Monoterpenic ether
Unknown	0.02	Oxygenated monoterpene
$\alpha$ -Terpineol	0.07	Monoterpenic alcohol
(4Z)-Decenal	0.03	Aliphatic aldehyde
<i>trans</i> -Isopiperitenol	0.01	Monoterpenic alcohol
Decanal	0.12	Aliphatic aldehyde
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
Nerol	0.18	Monoterpenic alcohol
Citronellol	9.35	Monoterpenic alcohol
Neral	0.59	Monoterpenic aldehyde
Piperitone	0.02	Monoterpenic ketone
Geraniol	19.70	Monoterpenic alcohol
Geranial	0.86	Monoterpenic aldehyde
Citronellyl formate	0.03	Monoterpenic ester
Geranyl formate	0.02	Monoterpenic ester
Unknown	0.02	Norsesquiterpene
Citronellic acid	0.21	Monoterpenic acid
$\delta$ -Elemene isomer	0.01	Sesquiterpene
8-Hydroxy-neo-menthol	0.10	Monoterpenic alcohol
$\alpha$ -Cubebene	0.02	Sesquiterpene
Citronellyl acetate	1.95	Monoterpenic ester
Eugenol	0.63	Phenylpropanoid
8-Hydroxy-iso-menthol	0.01	Monoterpenic alcohol
Neryl acetate	0.04	Monoterpenic ester
$\alpha$ -Copaene	0.03	Sesquiterpene
$\beta$ -Bourbonene	0.10	Sesquiterpene
<i>cis</i> - $\beta$ -Elemene	0.07	Sesquiterpene
Geranyl acetate	3.23	Monoterpenic ester
$\beta$ -Elemene	1.61	Sesquiterpene
Dodecanal	0.01	Aliphatic aldehyde
$\beta$ -Caryophyllene	0.23	Sesquiterpene
$\beta$ -Copaene	0.03	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.04	Sesquiterpene
Isogermacrene D	0.02	Sesquiterpene
( <i>E</i> )-Isoeugenol	0.03	Phenylpropanoid
$\alpha$ -Humulene	0.12	Sesquiterpene
Methyl ( <i>Z</i> )-isoeugenol	0.03	Phenylpropanoid
( <i>E</i> )- $\beta$ -Farnesene	0.01	Sesquiterpene

<i>trans</i> -Cadina-1(6),4-diene	0.04	Sesquiterpene
$\gamma$ -Muurolene	0.16	Sesquiterpene
Germacrene D	1.41	Sesquiterpene
$\beta$ -Selinene	0.05	Sesquiterpene
$\alpha$ -Selinene	0.03	Sesquiterpene
epi-Cubebol	0.09	Sesquiterpenic alcohol
Methyl ( <i>E</i> )-isoeugenol	0.05	Phenylpropanoid
$\alpha$ -Muurolene	0.38	Sesquiterpene
(3 <i>Z</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.01	Sesquiterpene
Germacrene A	0.51	Sesquiterpene
$\gamma$ -Cadinene	0.50	Sesquiterpene
Cubebol	0.09	Sesquiterpenic alcohol
<i>trans</i> -Calamenene	0.01	Sesquiterpene
$\delta$ -Cadinene	1.47	Sesquiterpene
Unknown	0.05	Sesquiterpene
$\alpha$ -Cadinene	0.10	Sesquiterpene
$\alpha$ -Elemol	2.55	Sesquiterpenic alcohol
Geranyl butyrate	0.04	Monoterpenic ester
( <i>E</i> )-Nerolidol	0.02	Sesquiterpenic alcohol
Germacrene D-4-ol	0.90	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Unknown	0.04	Unknown
10-epi-Cubebol	0.04	Sesquiterpenic alcohol
Unknown	0.09	Unknown
$\gamma$ -Eudesmol	0.23	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.22	Sesquiterpenic alcohol
Cubebol	0.03	Sesquiterpenic alcohol
$\tau$ -Muurolol	0.26	Sesquiterpenic alcohol
$\alpha$ -Muurolol	0.06	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.24	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.20	Sesquiterpenic alcohol
Unknown	0.02	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.54	Sesquiterpenic alcohol
Unknown	0.73	Oxygenated sesquiterpene
7-epi- $\gamma$ -Eudesmol	tr	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>Z</i> )-Farnesal	0.02	Sesquiterpenic aldehyde
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	0.07	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesal	0.03	Sesquiterpenic aldehyde
Cryptomeridiol	0.03	Sesquiterpenic alcohol
Geranyl caprylate	0.02	Monoterpenic ester
Unknown	0.01	Oxygenated diterpene
Unknown	0.07	Oxygenated diterpene
Unknown	0.01	Unknown
Unknown	0.03	Unknown

Unknown	0.10	Unknown
Unknown	0.12	Unknown
<b>Consolidated total</b>	<b>98.87</b>	

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

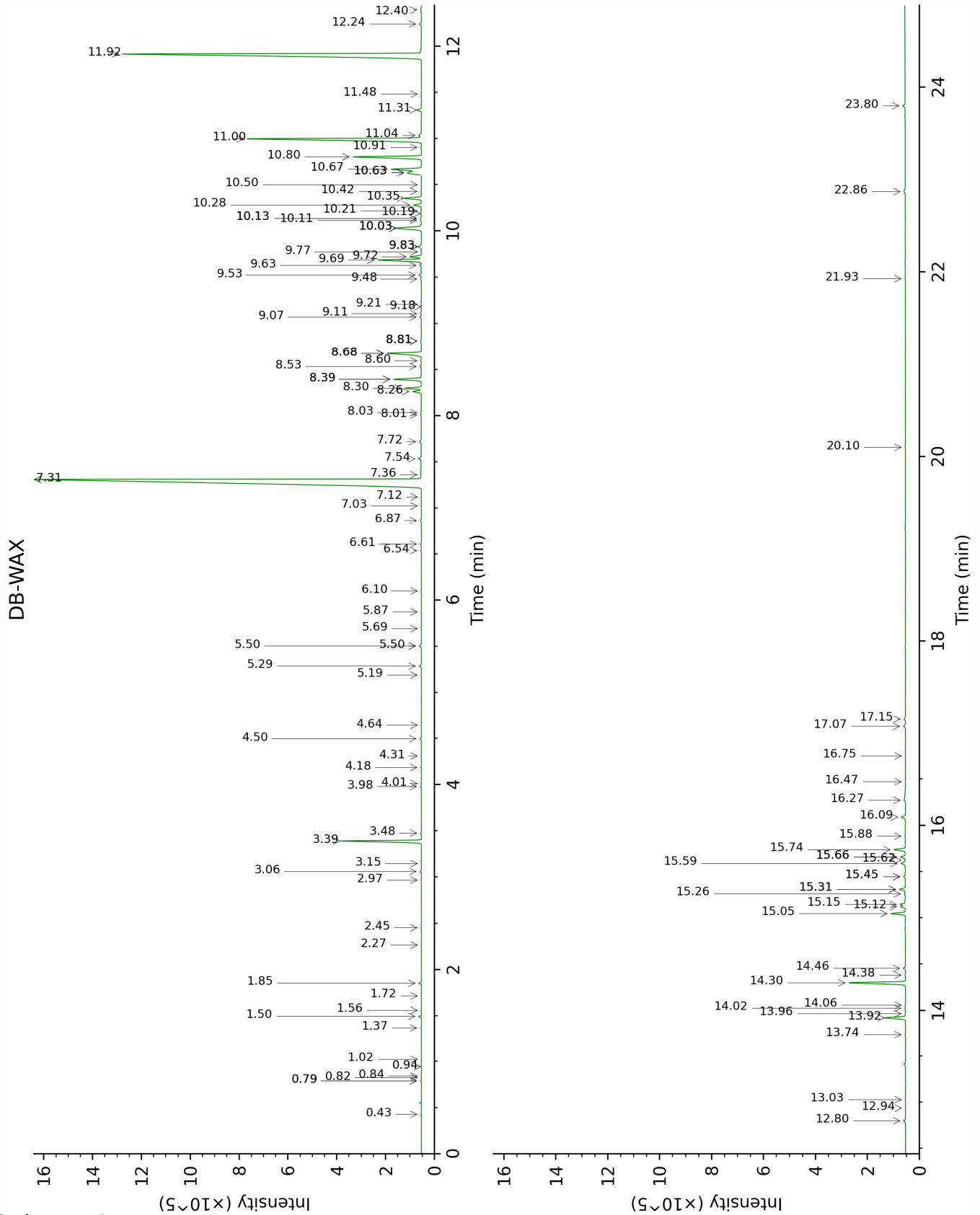
Note: no correction factor was applied

**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.

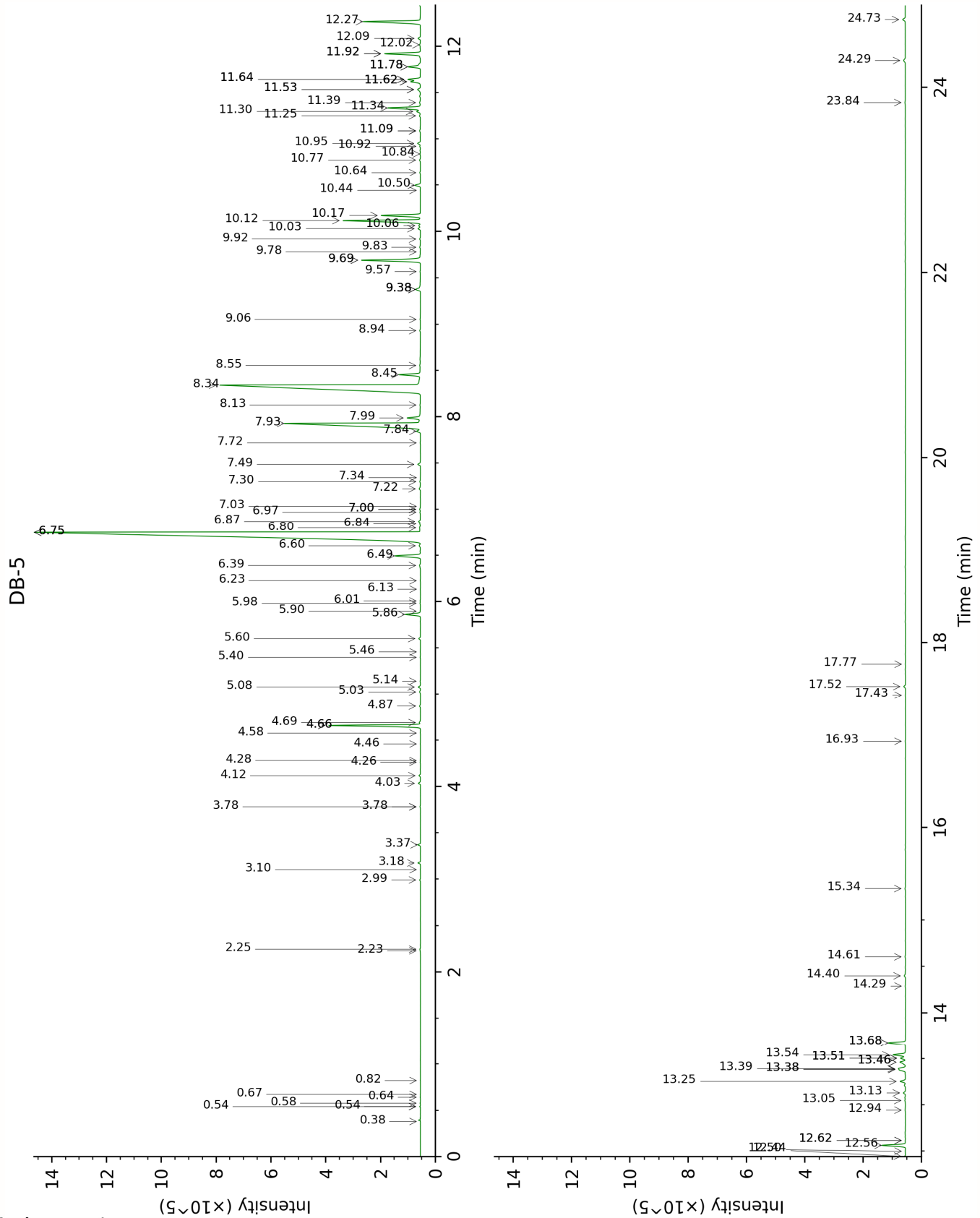
**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

**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		
	0.94	909.1	tr	0.38	501.8	tr
3-Methylcyclopentene	0.43	665.1	0.01	0.54*	608.4	[0.01]
2-Methyl-3-buten-2-ol	1.72	1015.4	tr	0.54*	608.4	[0.01]
3-Methylcyclopentane				0.58	620.7	0.01
Isovaleral	0.84	887.5	tr	0.64	642.2	tr
2-Methylbutyral	0.82	881.1	tr	0.67	652.5	tr
2-Ethylfuran	1.02	920.9	tr	0.82	702.5	tr
Unknown COCI I [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	0.79*	869.6	[0.03]	2.23	860.5	0.01
Unknown COCI II [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	0.79*	869.6	[0.03]	2.25	861.9	0.01
Tricyclene	1.37	973.3	0.02	2.99	919.5	0.02
$\alpha$ -Thujene	1.56	1000.7	tr	3.10	926.8	0.01
$\alpha$ -Pinene	1.50	992.4	0.08	3.18	931.5	0.09
Camphene	1.85	1028.2	0.08	3.37	944.4	0.09
Sabinene	2.45	1084.7	0.02	3.78*	971.2	[0.03]
$\beta$ -Pinene	2.27	1067.1	tr	3.78*	971.2	[0.03]
6-Methyl-5-hepten-2-one	5.29	1294.6	0.09	4.03	987.8	0.09
Myrcene	3.06	1133.1	0.05	4.12	993.3	0.06
$\alpha$ -Phellandrene	2.97	1126.1	0.02	4.26	1002.7	0.02
Octanal	4.64	1248.9	0.02	4.28	1004.0	0.02
$\alpha$ -Terpinene	3.15	1139.6	0.01	4.46	1015.2	0.01
<i>para</i> -Cymene	4.31	1225.4	0.01	4.58	1022.5	0.01
$\beta$ -Phellandrene	3.48	1164.5	0.03	4.66*	1027.6	[3.28]
Limonene	3.39	1158.0	3.28	4.66*	1027.6	[3.28]
Unknown COCI XLIV [m/z 59, 43 (12), 109 (11), 41 (10), 127 (8)...]	6.61	1391.1	0.04	4.69	1029.6	0.05
(Z)- $\beta$ -Ocimene	3.98	1202.1	0.04	4.87	1040.7	0.04
(E)- $\beta$ -Ocimene	4.18	1216.7	0.03	5.03	1050.5	0.04
2,6-Dimethyl-5-heptenal (melonal)	5.50*	1313.2	[0.10]	5.08	1053.9	0.09

γ-Terpinene	4.01	1204.4	0.02	5.14	1057.8	0.02
4-Nonanone	5.19	1287.7	0.02	5.40	1073.8	0.02
Octanol	8.39*	1523.2	[1.25]	5.46	1077.5	0.01
Terpinolene	4.50	1238.6	0.07	5.60	1086.5	0.07
Linalool	8.30	1515.8	0.66	5.86	1102.7	0.65
Nonanal	6.10	1355.2	0.01	5.90	1104.9	0.01
Unknown COCI VII [m/z 111, 69 (70), 41 (68), 55 (53), 43 (51)... 154 (7)]	5.87	1339.3	0.02	5.98	1110.3	0.02
cis-Rose oxide	5.50*	1313.2	[0.10]	6.01	1111.9	0.02
trans-para-Mentha- 2,8-dien-1-ol	9.21	1585.6	0.02	6.13	1120.0	0.01
trans-Rose oxide	5.69	1326.5	0.01	6.23	1125.8	0.01
Unknown COCI VIII [m/z 41, 69 (87), 82 (66), 67 (55), 109 (46)... 142 (18)]	9.63	1618.8	0.07	6.39	1136.3	0.07
Isopulegol	8.39*	1523.2	[1.25]	6.49	1142.8	1.18
Menthone	6.87	1410.1	0.06	6.60	1149.8	0.07
iso-Isopulegol	8.26	1513.0	0.38	6.75*	1159.0	[41.46]
Citronellal	7.31	1442.6	40.84	6.75*	1159.0	[41.46]
Borneol	10.03*	1650.9	[1.49]	6.80	1162.2	0.06
Isoneral	8.03	1495.6	0.03	6.84	1165.0	0.03
neoiso-Isopulegol	9.07	1575.0	0.06	6.87	1166.8	0.08
Isopulegol isomer	8.81*	1555.3	[0.05]	6.97*†	1173.2	[0.03]
Terpinen-4-ol	8.81*	1555.3	[0.05]	7.00*†	1175.2	[0.04]
Rosefuran oxide	8.81*	1555.3	[0.05]	7.00*†	1175.2	[0.04]
Unknown CYFL V [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)]	9.83*	1634.9	[0.18]	7.03*†	1177.3	[0.01]
α-Terpineol	10.03*	1650.9	[1.49]	7.22	1189.3	0.07
(4Z)-Decenal	8.01	1493.7	0.03	7.30	1194.3	0.03
trans-Isopiperitenol	10.63*	1699.6	[1.04]	7.34	1197.0	0.01
Decanal	7.54	1459.0	0.11	7.49	1206.1	0.12
2,3-Epoxyneral?				7.72	1221.6	0.02
Nerol	11.31	1756.6	0.21	7.84	1229.9	0.18
Citronellol	11.00	1730.5	9.63	7.93	1235.6	9.35
Neral	9.72	1626.2	0.51	7.99	1239.5	0.59
Piperitone	10.13*	1659.3	[0.05]	8.13	1248.8	0.02
Geraniol	11.92	1808.1	20.26	8.34	1263.1	19.70
Geranial	10.35	1676.8	0.80	8.45	1270.7	0.86
Citronellyl formate	9.11	1578.0	0.04	8.55	1277.2	0.03
Geranyl formate	10.13*	1659.3	[0.05]	8.94	1302.8	0.02

Unknown CYSC II [m/z 135, 121 (81), 177 (78), 107 (60), 192 (42), 149 (35)]	6.54	1386.2	0.04	9.06	1311.1	0.02
Citronellic acid	16.27	2219.5	0.21	9.38*	1333.8	[0.28]
δ-Elemene isomer	7.12	1428.8	0.01	9.38*	1333.8	[0.28]
8-Hydroxy-neo- menthol	14.46	2039.4	0.10	9.38*	1333.8	[0.28]
α-Cubebene	7.02	1421.6	0.02	9.57	1347.3	0.02
Citronellyl acetate	9.69	1623.4	1.95	9.69*	1355.9	[2.54]
Eugenol	15.05	2096.2	0.63	9.69*	1355.9	[2.54]
8-Hydroxy-iso- menthol	15.31*	2122.3	[0.27]	9.78	1362.2	0.01
Neryl acetate	10.42	1682.6	0.03	9.83	1365.6	0.04
α-Copaene	7.36	1446.4	0.02	9.92	1371.8	0.03
β-Bourbonene	7.72	1472.6	0.09	10.03	1379.7	0.10
cis-β-Elemene	8.53	1533.7	0.06	10.06	1382.0	0.07
Geranyl acetate	10.80	1714.1	3.26	10.12	1385.8	3.23
β-Elemene	8.68*	1544.7	[1.82]	10.17	1389.7	1.61
Dodecanal	10.21	1665.8	0.02	10.44	1408.9	0.01
β-Caryophyllene	8.68*	1544.7	[1.82]	10.50	1412.9	0.23
β-Copaene	8.60	1538.5	0.03	10.64	1423.5	0.03
trans-α- Bergamotene	8.68*	1544.7	[1.82]	10.77	1433.6	0.04
Isogermacrene D	9.18	1583.5	tr	10.84	1438.6	0.02
(E)-Isoeugenol	16.75	2269.2	0.01	10.92	1444.6	0.03
α-Humulene	9.52	1610.5	0.11	10.95	1447.0	0.12
Methyl (Z)- isoeugenol	14.38	2032.3	0.03	11.09*	1457.0	[0.04]
(E)-β-Farnesene	9.77	1630.5	0.01	11.09*	1457.0	[0.04]
trans-Cadina-1(6),4- diene	9.48	1607.0	0.04	11.25	1469.1	0.04
γ-Murolene	9.83*	1634.9	[0.18]	11.30	1472.5	0.16
Germacrene D	10.03*	1650.9	[1.49]	11.34	1475.3	1.41
β-Selinene	10.11	1657.7	0.04	11.39	1479.6	0.05
α-Selinene	10.19	1663.6	0.03	11.53*	1490.0	[0.16]
epi-Cubebol	12.24	1836.5	0.09	11.53*	1490.0	[0.16]
Methyl (E)- isoeugenol	15.26	2117.5	0.05	11.62*	1496.4	[0.41]
α-Murolene	10.28	1670.8	0.38	11.62*	1496.4	[0.41]
(3Z,6E)-α-Farnesene	10.50	1688.4	0.01	11.64*	1498.2	[0.52]
Germacrene A	10.63*	1699.6	[1.04]	11.64*	1498.2	[0.52]
γ-Cadinene	10.63*	1699.6	[1.04]	11.78*	1508.5	[0.59]
Cubebol	12.80	1885.6	0.09	11.78*	1508.5	[0.59]
trans-Calamenene	11.48	1771.0	0.01	11.92*	1519.6	[1.49]

δ-Cadinene	10.67	1702.9	1.47	11.92*	1519.6	[1.49]
Unknown OCSA II [m/z 119, 105 (53), 161 (33), 93 (28), 91 (25), 40 (20)...204]	10.91	1722.6	0.03	12.02	1527.1	0.05
α-Cadinene	11.04	1733.5	0.16	12.09	1532.5	0.10
α-Elemol	14.30	2024.4	2.57	12.27	1546.6	2.55
Geranyl butyrate	12.40	1850.9	0.04	12.44	1560.5	0.04
(E)-Nerolidol	14.06	2001.3	0.03	12.50	1564.9	0.02
Germacrene D-4-ol	13.92	1988.3	0.94	12.56	1569.9	0.90
Caryophyllene oxide	13.03	1906.4	0.02	12.62*	1574.1	[0.02]
Caryophyllene oxide isomer	12.94	1898.0	0.01	12.62*	1574.1	[0.02]
Unknown PEFR I [m/z 107, 135 (87), 93 (51), 91 (38), 41 (35), 43 (31), 105 (23), 204 (20)]				12.94	1599.7	0.04
10-epi-Cubenol	14.02	1998.2	0.05	13.05	1608.1	0.04
Unknown JUCO I [m/z 69, 41 (42), 109 (25), 123 (22), 64 (22), 179 (18)...]	13.74	1971.7	0.03	13.13	1614.8	0.09
γ-Eudesmol	15.15	2106.2	0.22	13.25	1625.0	0.23
τ-Cadinol	15.12	2103.7	0.22	13.38*†	1635.8	[0.22]
Cubenol	13.96	1992.5	0.03	13.38*†	1635.8	[0.22]
τ-Muurolol	15.31*	2122.3	[0.27]	13.39*†	1636.4	[0.27]
α-Muurolol	15.44*	2135.9	[0.08]	13.46*	1642.1	[0.30]
β-Eudesmol	15.66*	2157.1	[0.22]	13.46*	1642.1	[0.30]
α-Eudesmol	15.59	2150.2	0.20	13.50*	1645.7	[0.21]
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	15.44*	2135.9	[0.08]	13.50*	1645.7	[0.21]
α-Cadinol	15.74	2165.1	0.51	13.54	1648.7	0.54
Unknown CYWI V [suspected m/z 59, 93 (79), 161 (61), 107 (47), 81 (44), 121 (37)...]				13.68*	1659.8	[0.71]
7-epi-γ-Eudesmol	15.66*	2157.1	[0.22]	13.68*	1659.8	[0.71]
(2E,6Z)-Farnesal	15.62	2153.7	0.01	14.29	1710.8	0.02
(2E,6E)-Farnesol	17.07	2303.1	0.09	14.40	1720.3	0.07

(2E,6E)-Farnesal	16.09	2200.7	0.20	14.60	1738.0	0.03
Cryptomeridiol	20.10	2646.4	0.02	15.34	1801.8	0.03
Geranyl caprylate	15.88	2179.6	0.02	16.93	1947.8	0.02
Unknown COCI XXIX [m/z 81, 137 (70), 95 (46), 69 (45), 41 (39), 55 (29)...]	16.47	2240.4	0.02	17.43	1995.6	0.01
Unknown COCI XXX [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)]	17.15	2311.4	0.08	17.52	2004.6	0.07
Unknown COCI LXIV [m/z 69, 41 (96), 55 (53), 109 (48), 95 (43), 67 (35)...]				17.77	2028.5	0.01
Unknown CYWI II [m/z 69, 81 (79), 81 (70), 137 (53), 139 (35), 95 (30)...]	21.93	2874.5	0.03	23.84	2709.2	0.03
Unknown CYWI III [m/z 69, 81 (84), 137 (53), 83 (30), 95 (27), 41 (19)...]	22.86	2998.8	0.10	24.29	2768.0	0.10
Unknown CYWI IV [m/z 69, 81 (64), 95 (29), 137 (19), 41 (19)...]	23.80	3127.4	0.12	24.73	2826.0	0.12
Total reported		98.83%			99.02%	

\*: 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