

Date : 2023-08-14

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 23H08-PTH01

**Customer Identification :** Rose Otto (Conventional) - Bulgaria - RK0101R

**Type :** Essential Oil

**Source :** *Rosa x damascena*

**Customer :** Plant Therapy

Checked and approved by:

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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 :** Amélie Simard, Analyste

**Date :** 2023-08-14

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4616 \pm 0.0003$  (20 °C)

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

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

**Date :** 2023-08-08

## CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The sample marginally does not comply with the ISO standard for Bulgarian rose essential oil.

## ANALYSIS SUMMARY - CONSOLIDATED CONTENTS

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

Identification	%	Class
Ethanol	0.36	Aliphatic alcohol
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isobutanol	tr	Aliphatic alcohol
Isovaleral	tr	Aliphatic aldehyde
Pentanal	0.02	Aliphatic aldehyde
Acetaldehyde diethyl acetal	tr	Aliphatic acetal
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Pentanol	0.01	Aliphatic alcohol
Hexanal	0.01	Aliphatic aldehyde
(3Z)-Hexenol	0.02	Aliphatic alcohol
Hexanol	0.06	Aliphatic alcohol
Heptanal	0.04	Aliphatic aldehyde
$\alpha$ -Pinene	0.14	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.02	Monoterpene
$\beta$ -Pinene	0.04	Monoterpene
Heptanol	0.01	Aliphatic alcohol
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Myrcene	0.09	Monoterpene
6-Methyl-5-hepten-2-ol	0.01	Aliphatic alcohol
Octanal	0.01	Aliphatic aldehyde
$\alpha$ -Terpinene	0.01	Monoterpene
<i>para</i> -Cymene	0.01	Monoterpene
Limonene	0.02	Monoterpene
1,8-Cineole	0.01	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.01	Monoterpene
$\gamma$ -Terpinene	0.02	Monoterpene
<i>cis</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.01	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	tr	Monoterpenic alcohol
Rosefuran	0.01	Monoterpenic ether
Linalool	0.36	Monoterpenic alcohol
Nonanal	0.03	Aliphatic aldehyde
<i>cis</i> -Rose oxide	0.09	Monoterpenic ether
Phenylethyl alcohol	0.72	Simple phenolic
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
<i>trans</i> -Rose oxide	0.05	Monoterpenic ether

<i>trans-para</i> -Menth-2-en-1-ol	0.01	Monoterpenic alcohol
Isopulegol	0.01	Monoterpenic alcohol
Nerol oxide	0.01	Aliphatic ether
Citronellal	0.03	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.10	Monoterpenic alcohol
Isogeranial	0.01	Monoterpenic aldehyde
$\alpha$ -Terpineol	0.11	Monoterpenic alcohol
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	0.01	Monoterpenic alcohol
Decanal	0.01	Aliphatic aldehyde
Nerol	11.84	Monoterpenic alcohol
Neral	0.29	Monoterpenic aldehyde
Citronellol	34.89	Monoterpenic alcohol
(Z)-Isogeraniol	0.13	Monoterpenic alcohol
(E)-Isogeraniol?	0.11	Monoterpenic alcohol
Geraniol	24.18	Monoterpenic alcohol
Geranial	0.57	Monoterpenic aldehyde
Citronellyl formate	0.05	Monoterpenic ester
Neryl formate	0.05	Monoterpenic ester
Geranyl formate	0.02	Monoterpenic ester
Undecanal	0.01	Aliphatic aldehyde
Methyl geranate	0.02	Monoterpenic ester
Unknown	0.02	Unknown
Citronellyl acetate	0.17	Monoterpenic ester
Eugenol	1.06	Phenylpropanoid
Geranic acid	0.05	Aliphatic acid
$\beta$ -Bourbonene	0.03	Sesquiterpene
Geranyl acetate	0.35	Monoterpenic ester
$\beta$ -Elemene	0.05	Sesquiterpene
Methyleugenol	0.58	Phenylpropanoid
$\beta$ -Caryophyllene	0.23	Sesquiterpene
$\beta$ -Copaene	0.01	Sesquiterpene
$\alpha$ -Guaiene	0.10	Sesquiterpene
$\alpha$ -Humulene	0.09	Sesquiterpene
(E)- $\beta$ -Farnesene	0.01	Sesquiterpene
$\gamma$ -Muurolene	0.01	Sesquiterpene
Germacrene D	0.25	Sesquiterpene
$\beta$ -Selinene	0.01	Sesquiterpene
Unknown	0.02	Unknown
Phenylethyl 2-methylbutyrate	0.02	Phenolic ester
$\alpha$ -Selinene	0.01	Sesquiterpene
Aciphyllene	0.04	Sesquiterpene
$\alpha$ -Muurolene	0.02	Sesquiterpene
Pentadecane	0.08	Alkane

δ-Guaiene	0.07	Sesquiterpene
γ-Cadinene	0.05	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Citronellyl butyrate	tr	Monoterpenic ester
α-Elemol	0.10	Sesquiterpenic alcohol
(E)-Nerolidol	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Phenylethyl tiglate	0.02	Phenolic ester
Ethyl dodecanoate	0.02	Aliphatic ester
Ethyl laurate	0.01	Aliphatic ester
Hexadecane	0.03	Alkane
10-epi-γ-Eudesmol	0.02	Sesquiterpenic alcohol
α-Acorenol	0.01	Sesquiterpenic alcohol
γ-Eudesmol	0.10	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
τ-Muurolol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.11	Sesquiterpenic alcohol
α-Eudesmol	0.10	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
(8Z)-Heptadecene	0.09	Alkene
(2E,6Z)-Farnesol	0.08	Sesquiterpenic alcohol
Heptadecane	1.99	Alkane
(2E,6Z)-Farnesal	0.02	Sesquiterpenic aldehyde
(2E,6E)-Farnesol	0.61	Sesquiterpenic alcohol
(2E,6E)-Farnesal	0.03	Sesquiterpenic aldehyde
Benzyl benzoate	0.03	Phenolic ester
(8Z)-Octadecene	0.02	Alkene
Octadecane	0.06	Alkane
Phenylethyl benzoate	0.03	Phenolic ester
Nonadecadiene isomer	0.04	Alkene
(9Z)-Nonadecene	0.83	Alkene
Phenylethyl phenylacetate	0.02	Phenolic ester
Nonadecane	11.65	Alkane
(9Z)-Eicosene	0.04	Alkene
Ethyl palmitate	0.02	Aliphatic ester
Eicosane	1.27	Alkane
Phenylethyl decanoate	0.03	Phenolic ester
(10Z)-Heneicosene	0.05	Alkene
Phenylethyl geranate	0.05	Monoterpenic ester
1-Heneicosene?	0.04	Alkene
Heneicosane	2.70	Alkane
Citronellyl caprate	0.02	Monoterpenic ester
Phenylethyl undecanoate?	0.01	Phenolic ester
Ethyl linolenate	0.01	Aliphatic ester
Stearic acid	0.03	Aliphatic acid

Docosane	0.03	Alkane
1-Tricosene?	0.05	Alkene
Tricosane	0.18	Alkane
Citronellyl laurate	0.01	Monoterpenic ester
Geranyl laurate	0.01	Monoterpenic ester
Tetracosane	0.02	Alkane
Phenylethyl myristate	0.01	Phenolic ester
Pentacosane	0.07	Alkane
Heptacosane	0.05	Alkane
Nonacosane	0.01	Alkane
<b>Consolidated total</b>	<b>98.95</b>	

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

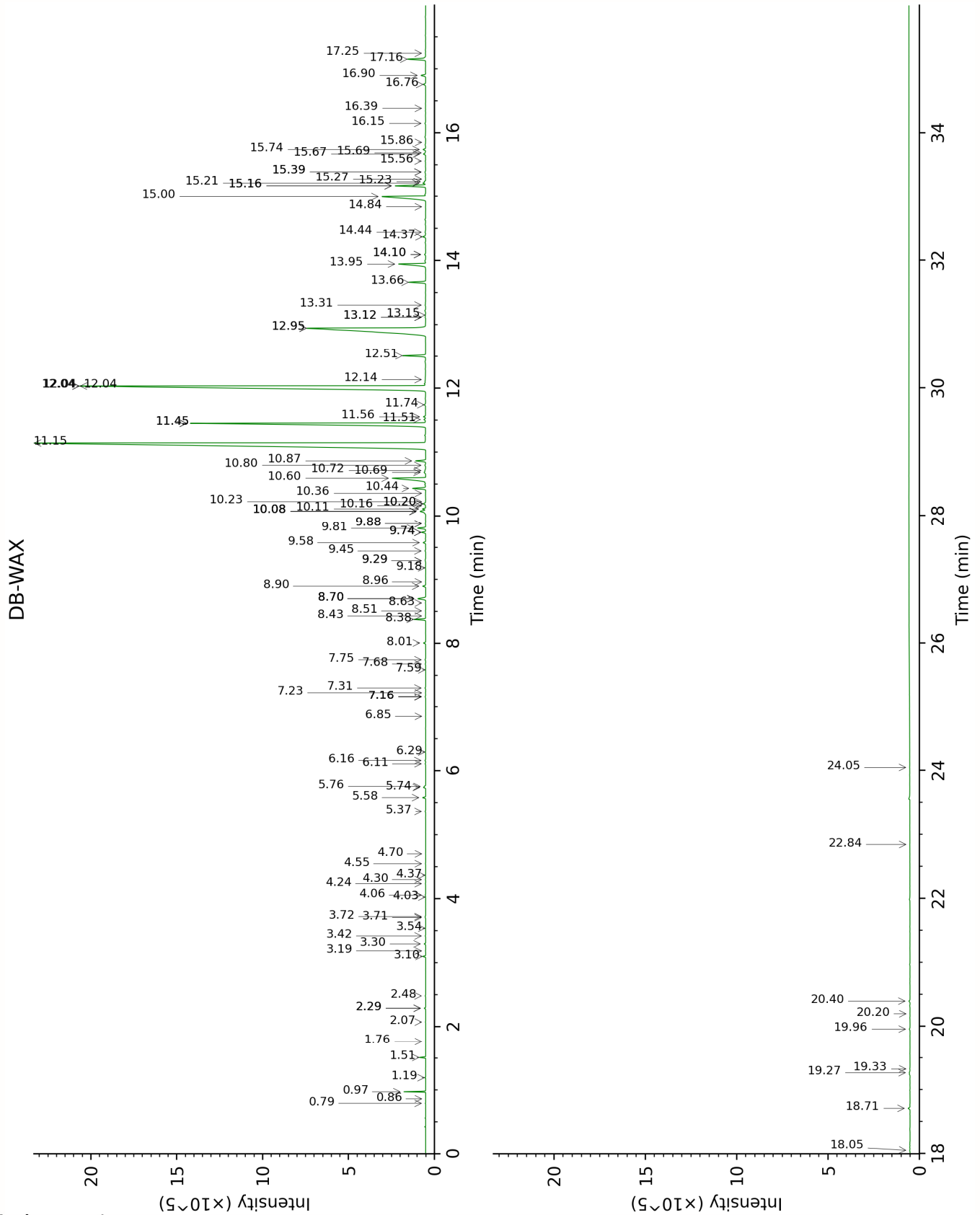
Note: no correction factor was applied

**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.

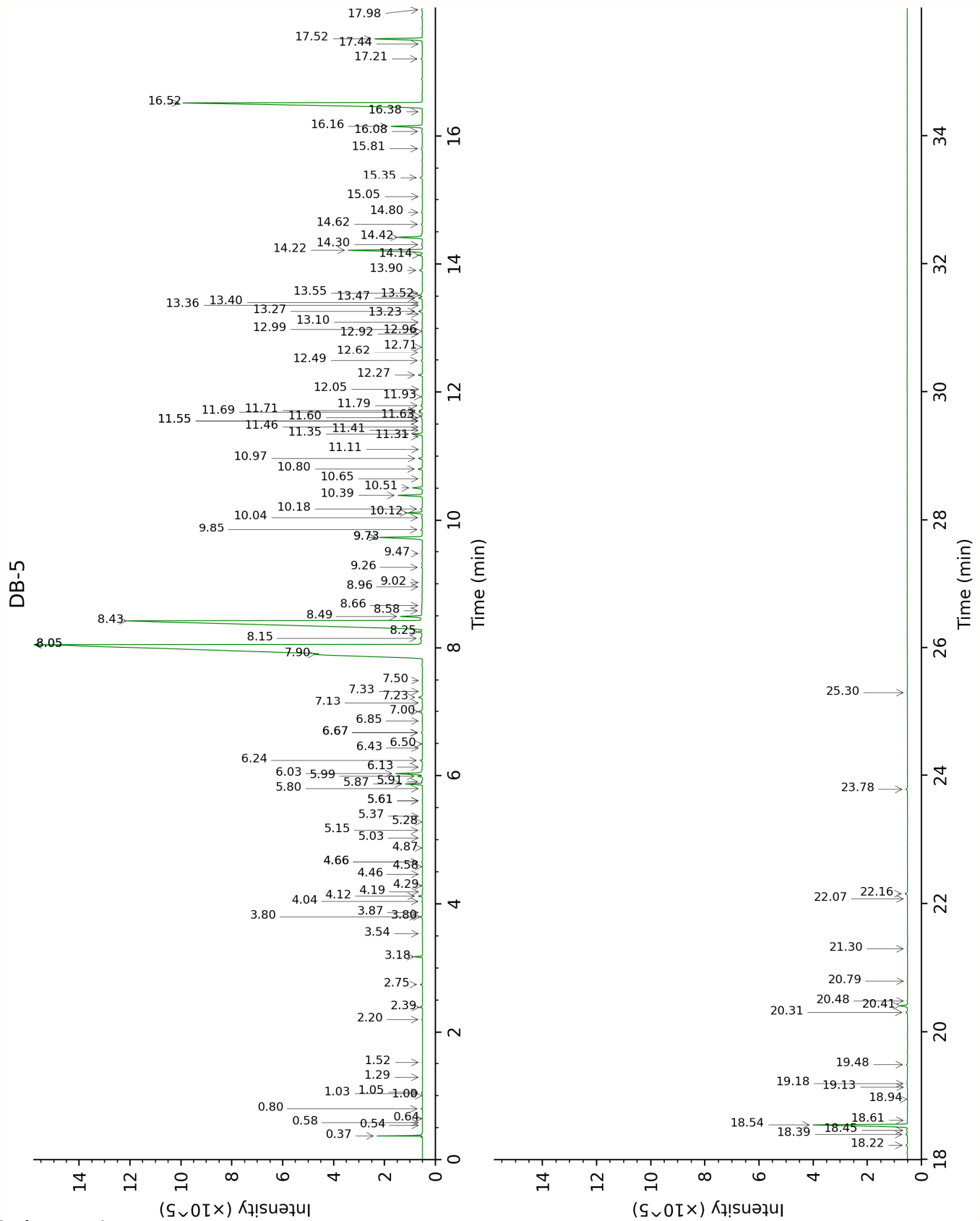
**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

**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		
	0.97	906.2	0.38	0.37	499.7	0.36
2-Methyl-3-buten-2-ol	1.76	1012.8	tr	0.54	605.0	tr
Isobutanol	2.29*	1062.9	[0.04]	0.58	619.3	tr
Isovaleral	0.86	886.4	tr	0.64	640.3	tr
Pentanal	1.19	939.3	0.02	0.80	691.7	0.02
Acetaldehyde diethyl acetal	0.79	863.2	0.01	1.00	727.1	tr
Isoamyl alcohol	3.71	1177.8	0.01	1.03	731.6	0.01
2-Methylbutanol	3.72	1179.0	0.02	1.05	734.5	0.01
Pentanol	4.30	1222.0	0.01	1.29	766.7	0.01
Hexanal	2.07	1042.2	0.01	1.52	798.5	0.01
(3Z)-Hexenol	6.11	1347.8	0.02	2.20	856.5	0.02
Hexanol	5.74	1321.3	0.07	2.39	872.1	0.06
Heptanal	3.30	1146.0	0.04	2.74	901.2	0.04
α-Pinene	1.51	987.3	0.15	3.18	930.2	0.14
Benzaldehyde	7.68	1462.7	0.02	3.54	953.8	0.01
Sabinene	2.48	1081.4	0.02	3.80*	971.1	[0.06]
β-Pinene	2.29*	1062.9	[0.04]	3.80*	971.1	[0.06]
Heptanol	7.16*	1424.1	[0.02]	3.87	975.5	0.01
6-Methyl-5-hepten-2-one	5.37	1294.4	0.02	4.04	986.9	0.02
Myrcene	3.10	1130.8	0.08	4.12	992.3	0.09
6-Methyl-5-hepten-2-ol	7.23	1429.3	0.01	4.19	996.7	0.01
Octanal	4.70	1251.4	0.01	4.29	1003.0	0.01
α-Terpinene	3.19	1137.5	0.01	4.46	1014.2	0.01
para-Cymene	4.37	1227.0	0.01	4.58	1021.6	0.01
Limonene	3.42	1155.6	0.02	4.66*	1026.2	[0.03]
1,8-Cineole	3.54	1164.9	0.01	4.66*	1026.2	[0.03]
(Z)-β-Ocimene	4.03	1202.1	0.01	4.87	1039.7	0.01
(E)-β-Ocimene	4.24	1217.4	0.01	5.03	1049.5	0.01
γ-Terpinene	4.06	1204.4	0.02	5.15	1056.9	0.02
cis-Sabinene hydrate	7.16*	1424.1	[0.02]	5.28	1065.1	0.01
cis-Linalool oxide (fur.)	6.85	1401.4	0.01	5.37	1070.7	0.01
Terpinolene	4.55	1240.1	0.01	5.61*	1085.6	[0.01]
trans-Linalool oxide (fur.)	7.16*	1424.1	[0.02]	5.61*	1085.6	[0.01]
Rosefuran	6.29	1361.0	0.01	5.80	1097.5	0.01
Linalool	8.38	1515.3	0.36	5.87	1102.1	0.36
Nonanal	6.16	1351.5	0.03	5.91	1104.2	0.03

<i>cis</i> -Rose oxide	5.58	1309.9	0.10	5.99	1109.7	0.09
Phenylethyl alcohol	12.51	1853.5	0.80	6.03	1112.3	0.72
<i>trans-para</i> -Mentha-2,8-dien-1-ol	9.30*	1585.8	[0.02]	6.13	1118.8	0.01
<i>trans</i> -Rose oxide	5.76	1322.4	0.04	6.24	1125.3	0.05
<i>trans-para</i> -Menth-2-en-1-ol	9.30*	1585.8	[0.02]	6.43	1137.7	0.01
Isopulegol	8.43	1519.4	0.02	6.50	1141.7	0.01
Nerol oxide	7.16*	1424.1	[0.02]	6.67*	1152.9	[0.04]
Citronellal	7.31	1435.0	0.03	6.67*	1152.9	[0.04]
Borneol	10.08*	1648.5	[0.30]	6.85	1164.6	0.01
Terpinen-4-ol	8.90	1555.3	0.10	7.00	1173.8	0.10
Isogeraniol	8.51	1525.6	0.01	7.14	1182.5	0.01
$\alpha$ -Terpineol	10.11	1651.6	0.11	7.23	1188.8	0.11
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	13.15	1910.6	0.01	7.32	1194.6	0.01
Decanal	7.59	1456.0	0.01	7.50	1205.5	0.01
Nerol	11.45*	1762.2	[11.85]	7.90*†	1232.7	[5.39]
Neral	9.81	1626.8	0.29	8.05*†	1242.8	[41.52]
Citronellol	11.15	1736.4	34.89	8.05*†	1242.8	[41.52]
( <i>Z</i> )-Isogeraniol	11.51	1767.1	0.07	8.15	1249.4	0.13
( <i>E</i> )-Isogeraniol?	11.56	1770.7	0.08	8.25	1256.0	0.11
Geraniol	12.04*	1812.0	[24.23]	8.42	1267.6	24.18
Geraniol	10.44	1677.5	0.46	8.49	1272.2	0.57
Citronellyl formate	9.18	1577.2	0.01	8.58	1278.1	0.05
Neryl formate	9.74*	1621.5	[0.14]	8.66	1283.6	0.05
Geranyl formate	10.20*	1658.1	[0.10]	8.96	1303.0	0.02
Undecanal	8.96	1560.4	0.01	9.02	1307.7	0.01
Methyl geranate	10.08*	1648.5	[0.30]	9.26	1324.4	0.02
Unknown MISC LVII [m/z 43, 59 (52), 139 (51), 69 (43), 41 (42), 55 (37)...]	15.56	2137.0	0.02	9.47	1339.5	0.02
Citronellyl acetate	9.74*	1621.5	[0.14]	9.73*	1357.2	[1.23]
Eugenol	15.16*	2098.0	[1.11]	9.73*	1357.2	[1.23]
Geranic acid	17.25	2307.4	0.01	9.85	1365.7	0.05
$\beta$ -Bourbonene	7.75	1467.6	0.03	10.04	1379.6	0.03
Geranyl acetate	10.87	1713.1	0.35	10.12	1384.9	0.35

β-Elemene	8.70*	1540.2	[0.36]	10.18	1389.1	0.05
Methyleugenol	13.66	1956.9	0.58	10.39	1404.2	0.58
β-Caryophyllene	8.70*	1540.2	[0.36]	10.51	1412.9	0.23
β-Copaene	8.64	1535.1	0.01	10.65	1423.4	0.01
α-Guaiene	8.70*	1540.2	[0.36]	10.80	1434.7	0.10
α-Humulene	9.58	1608.5	0.09	10.97	1446.9	0.09
(E)-β-Farnesene	9.88*	1632.6	[0.02]	11.11	1457.4	0.01
γ-Murolene	9.88*	1632.6	[0.02]	11.31	1472.2	0.01
Germacrene D	10.08*	1648.5	[0.30]	11.35	1475.0	0.25
β-Selinene	10.16	1655.7	0.01	11.41	1479.5	0.01
Unknown PRME XIV [m/z 43, 58 (75), 57 (58), 71 (55), 41 (41), 59 (31)...]				11.46	1483.3	0.02
Phenylethyl 2- methylbutyrate	13.12*	1907.5	[0.02]	11.55*	1490.3	[0.03]
α-Selinene	10.23	1660.7	0.01	11.55*	1490.3	[0.03]
Aciphyllene	10.08*	1648.5	[0.30]	11.60	1494.2	0.04
α-Murolene	10.36	1671.3	0.01	11.63	1495.9	0.02
Pentadecane	8.01	1487.0	0.07	11.69	1500.5	0.08
δ-Guaiene	10.20*	1658.1	[0.10]	11.71	1502.4	0.07
γ-Cadinene	10.69	1698.0	0.09	11.79	1508.4	0.05
δ-Cadinene	10.72	1700.4	0.04	11.93	1519.2	0.03
Citronellyl butyrate	11.45*	1762.2	[11.85]	12.05	1528.3	tr
α-Elemol	14.37	2022.7	0.11	12.27	1545.7	0.10
(E)-Nerolidol	14.10*	1996.7	[0.04]	12.49	1563.4	0.04
Caryophyllene oxide	13.12*	1907.5	[0.02]	12.62	1573.7	0.02
Phenylethyl tiglate	15.39*	2120.2	[0.04]	12.71	1580.5	0.02
Ethyl dodecanoate	12.04*	1812.0	[24.23]	12.92	1596.6	0.02
Ethyl laurate	12.14	1820.9	0.02	12.96	1599.8	0.01
Hexadecane	9.45	1598.1	0.03	12.99	1602.1	0.03
10-epi-γ- Eudesmol	14.44	2029.4	0.03	13.10	1611.2	0.02
α-Acorenol	14.84	2066.6	0.01	13.23	1621.8	0.01
γ-Eudesmol	15.21	2102.1	0.10	13.27	1625.2	0.10
τ-Cadinol	15.27	2108.3	0.01	13.36	1632.9	0.01
τ-Murolol	15.39*	2120.2	[0.04]	13.40	1636.4	0.02
β-Eudesmol	15.74	2154.7	0.10	13.48	1642.2	0.11
α-Eudesmol	15.67	2147.7	0.09	13.52	1645.8	0.10
α-Cadinol	15.86	2165.6	0.01	13.55	1648.3	0.02

(8Z)-Heptadecene	10.80	1707.3	0.04	13.90	1677.6	0.09
(2E,6Z)-Farnesol	16.76	2256.9	0.09	14.14	1697.1	0.08
Heptadecane	10.60	1690.4	1.94	14.22	1703.4	1.99
(2E,6Z)-Farnesal	15.69	2149.5	0.02	14.30	1710.9	0.02
(2E,6E)-Farnesol	17.16	2297.7	0.70	14.42	1720.8	0.61
(2E,6E)-Farnesal	16.15	2195.3	0.03	14.62	1738.3	0.03
Benzyl benzoate	19.27	2526.0	0.04	14.80	1754.3	0.03
(8Z)-Octadecene	12.04*	1812.0	[24.23]	15.05	1775.5	0.02
Octadecane	11.74	1786.5	0.06	15.35	1801.7	0.06
Phenylethyl benzoate	19.96	2604.6	0.03	15.81	1842.9	0.03
Nonadecadiene isomer	13.31	1924.7	0.03	16.08	1867.3	0.04
(9Z)-Nonadecene	12.95*	1892.0	[12.39]	16.16	1874.5	0.83
Phenylethyl phenylacetate				16.38	1895.1	0.02
Nonadecane	12.95*	1892.0	[12.39]	16.52	1907.8	11.65
(9Z)-Eicosene	14.10*	1996.7	[0.04]	17.21	1973.0	0.04
Ethyl palmitate	16.39	2219.1	0.01	17.44	1995.0	0.02
Eicosane	13.95	1982.7	1.28	17.52	2002.7	1.27
Phenylethyl decanoate				17.98	2048.5	0.03
(10Z)-Heneicosene	15.16*	2098.0	[1.11]	18.22	2072.1	0.05
Phenylethyl geranate				18.39	2088.9	0.05
1-Heneicosene?	15.23	2104.3	0.05	18.45	2095.1	0.04
Heneicosane	15.00	2081.7	2.70	18.54	2103.7	2.70
Citronellyl caprate				18.61	2111.0	0.02
Phenylethyl undecanoate?				18.94	2144.9	0.01
Ethyl linolenate				19.13	2164.5	0.01
Stearic acid	24.05	3111.5	0.01	19.18	2170.3	0.03
Docosane				19.48	2200.9	0.03
1-Tricosene?				20.31	2289.9	0.05
Tricosane	16.90	2271.2	0.18	20.41	2300.8	0.18
Citronellyl laurate	19.33	2532.7	0.01	20.48	2309.2	0.01
Geranyl laurate	20.20	2632.2	0.01	20.79	2343.9	0.01
Tetracosane	18.05	2392.1	0.02	21.30	2400.3	0.02
Phenylethyl myristate	22.84	2954.4	tr	22.08	2490.9	0.01

Pentacosane	18.71	2463.5	0.08	22.16	2500.2	0.07
Heptacosane	20.40	2655.0	0.04	23.78	2699.8	0.05
Nonacosane				25.30	2899.3	0.01
Total reported		98.29%			98.84%	

\*: 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