

Date : 2023-08-11

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23G05-BRA02

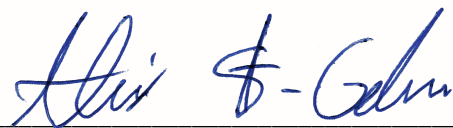
Customer Identification : Balsam Fir Organic - Abies balsamea - Canada - NPS00108 - Lot # NP0211

Type : Essential Oil

Source : Abies balsamea ct. Eastern / Low thymol

Customer : Nature Packaged

Checked and approved by:



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

Notes: 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.

This report is an update from the first version issued on 2023-07-18 to format it for online publication.

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 : 2023-07-17

PHYSICOCHEMICAL DATA

Refractive index : 1.4757 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-07-07

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
Isovaleral	tr	Aliphatic aldehyde
Toluene	0.03	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
Octane	tr	Alkane
Unknown	0.01	Alkene
(3Z)-Hexenol	0.04	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Unknown	0.01	Unknown
Santene	0.95	Normonoterpene
Styrene	0.01	Simple phenolic
Unknown	0.02	Normonoterpene
Bornylene	0.03	Monoterpene
Tricyclene	0.47	Monoterpene
α -Thujene	0.18	Monoterpene
α -Pinene	20.85	Monoterpene
α -Fenchene	0.11	Monoterpene
Camphene	3.15	Monoterpene
Thuja-2,4(10)-diene	0.09	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.06	Monoterpene
Sabinene	0.01	Monoterpene
β -Pinene	27.31	Monoterpene
Unknown	0.01	Monoterpene
Myrcene	1.85	Monoterpene
2-Carene	0.01	Monoterpene
Pseudolimonene	0.05	Monoterpene
α -Phellandrene	0.48	Monoterpene
Δ^3 -Carene	9.17	Monoterpene
α -Terpinene	0.31	Monoterpene
Carvomenthene	0.03	Aliphatic alcohol
<i>para</i> -Cymene	0.39	Monoterpene
Limonene	11.60	Monoterpene
β -Phellandrene	10.22	Monoterpene
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.01	Monoterpene
γ -Terpinene	0.31	Monoterpene
Unknown	0.03	Oxygenated monoterpene
<i>meta</i> -Cymenene	0.03	Monoterpene
Fenchone	0.08	Monoterpenic ketone
Isoterpinolene	0.05	Monoterpene
Terpinolene	1.07	Monoterpene

<i>para</i> -Cymenene	0.18	Monoterpene
γ -Campholenal	0.04	Aliphatic alcohol
α -Pinene oxide	0.02	Monoterpenic ether
Linalool	0.05	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	0.15	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	0.03	Monoterpenic alcohol
α -Campholenal	0.04	Monoterpenic aldehyde
Nopinone	0.03	Normonoterpenic ketone
<i>cis</i> -Limonene oxide	0.01	Monoterpenic ether
<i>trans</i> -Pinocarveol	0.24	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.08	Monoterpenic alcohol
Camphor	0.14	Monoterpenic ketone
Camphene hydrate	0.08	Monoterpenic alcohol
<i>meta</i> -Mentha-4,6-dien-8-ol	0.04	Monoterpenic alcohol
Isoborneol	0.02	Monoterpenic alcohol
Citronellal	0.03	Monoterpenic aldehyde
Pinocamphone	0.11	Monoterpenic ketone
Pinocarvone	0.06	Monoterpenic ketone
Borneol	0.34	Monoterpenic alcohol
Isopinocamphone	0.18	Monoterpenic ketone
Terpinen-4-ol	0.36	Monoterpenic alcohol
Cryptone	0.07	Normonoterpenic ketone
<i>meta</i> -Cymen-8-ol	0.02	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
α -Terpineol	1.15	Monoterpenic alcohol
Myrtenol	0.14	Monoterpenic alcohol
Methylchavicol	0.03	Phenylpropanoid
Verbenone	0.10	Monoterpenic ketone
Unknown	0.03	Unknown
endo-Fenchyl acetate	0.02	Monoterpenic ester
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
Thymol methyl ether	0.27	Monoterpenic ether
Citronellol	0.03	Monoterpenic alcohol
Piperitone	0.07	Monoterpenic ketone
Geraniol	0.01	Monoterpenic alcohol
Phellandral	0.16	Monoterpenic aldehyde
Isopulegyl acetate	0.02	Monoterpenic ester
Bornyl acetate	2.39	Monoterpenic ester
Isobornyl acetate	0.01	Monoterpenic ester
2-Undecanone	0.02	Aliphatic ketone
Isohexyl isocaproate	0.01	Aliphatic ester
Myrtenyl acetate	0.02	Monoterpenic ester
Unknown	0.01	Unknown

α -Longipinene	0.18	Sesquiterpene
Citronellyl acetate	0.03	Monoterpenic ester
Longicyclene	0.09	Sesquiterpene
α -Ylangene	0.05	Sesquiterpene
α -Copaene	0.03	Sesquiterpene
β -Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.10	Monoterpenic ester
β -Longipinene	0.06	Sesquiterpene
Longifolene	1.19	Sesquiterpene
Methyleugenol	0.03	Phenylpropanoid
β -Caryophyllene	0.17	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.03	Sesquiterpene
α -Himachalene	0.04	Sesquiterpene
α -Humulene	0.09	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.06	Sesquiterpene
γ -Murolene	0.04	Sesquiterpene
Germacrene D	0.07	Sesquiterpene
β -Selinene	0.06	Sesquiterpene
α -Selinene	0.02	Sesquiterpene
β -Himachalene	0.08	Sesquiterpene
α -Murolene	0.01	Sesquiterpene
β -Bisabolene	0.42	Sesquiterpene
δ -Cadinene	0.07	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.05	Sesquiterpene
α -Calacorene	0.02	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.07	Sesquiterpene
(<i>E</i>)-Nerolidol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
τ -Cadinol	0.02	Sesquiterpenic alcohol
α -Cadinol	0.01	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated diterpene
18-Norabieta-8,11,13-triene?	0.02	Norditerpene
Manool	0.06	Diterpenic alcohol
7,13-Abietadiene	0.02	Diterpene
Unknown	0.01	Unknown
(<i>Z</i>)-Abienol	0.12	Diterpenic alcohol
Isopimaral	0.01	Diterpenic aldehyde
Palustral	0.02	Diterpenic aldehyde
Abietal	0.01	Diterpenic aldehyde
Consolidated total	99.37	

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

Note: no correction factor was applied

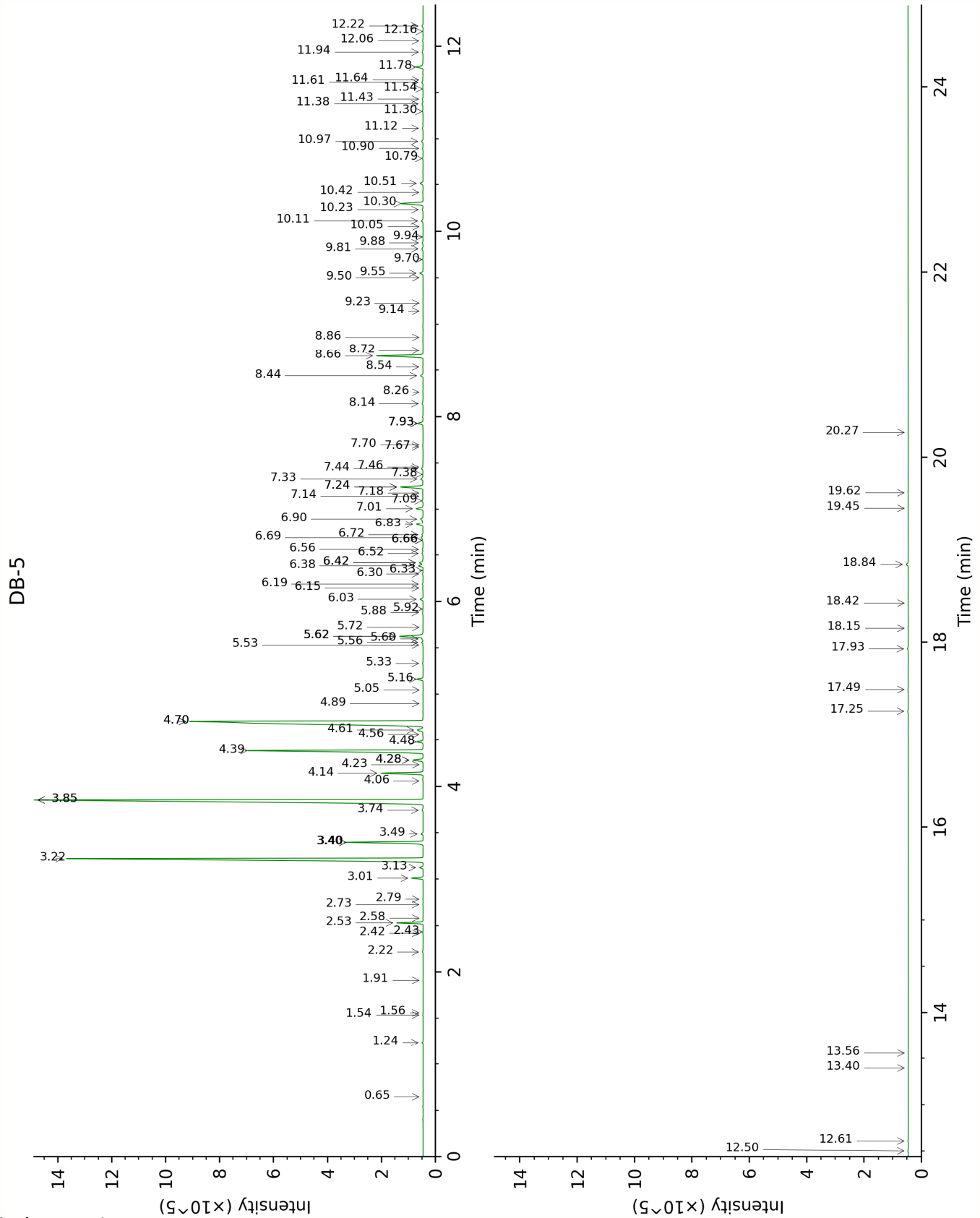
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

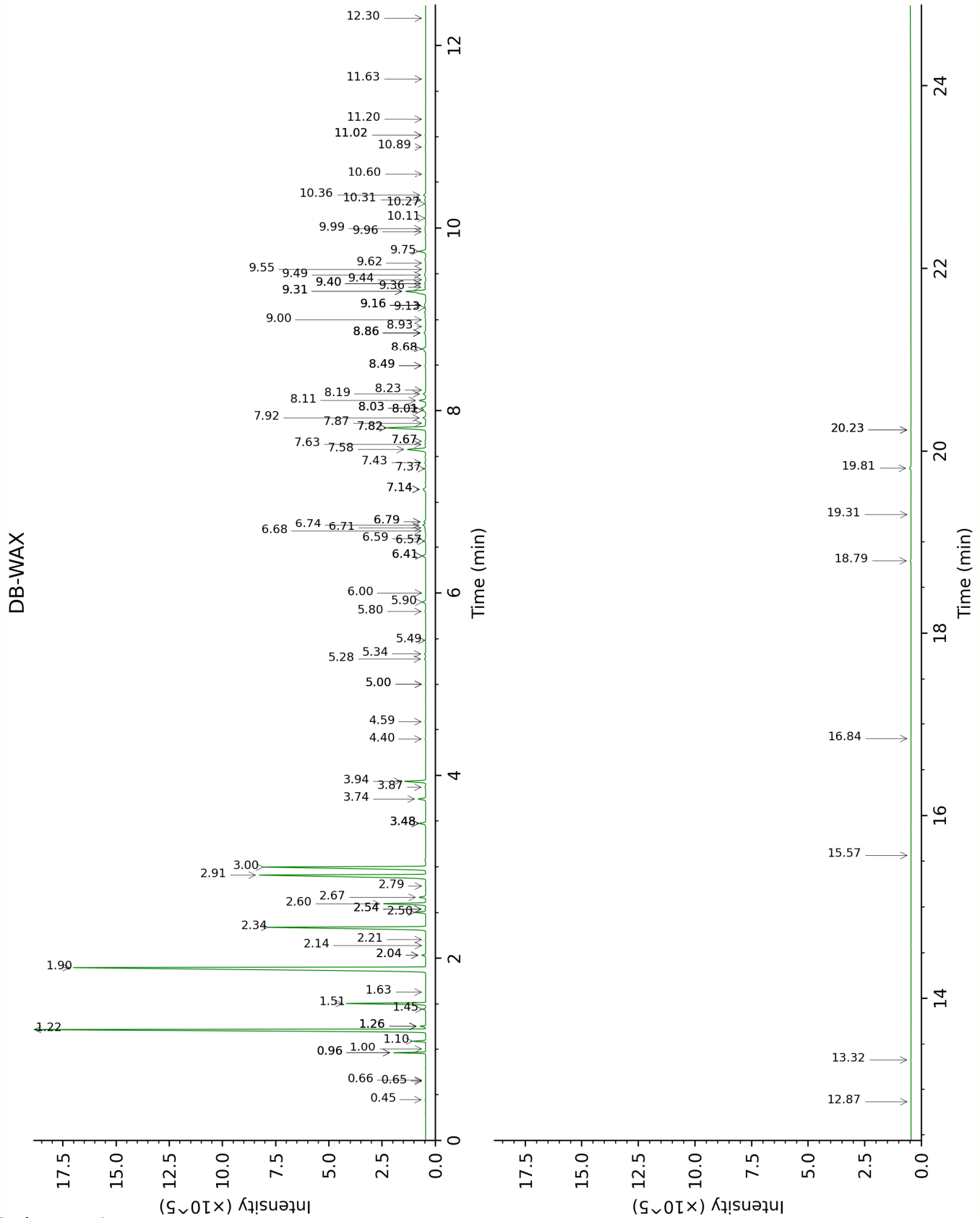
chromatograms in this report to access the full untreated data and perform their own calculations if needed.

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

Isovaleral	Column DB-5			Column DB-WAX		
	0.65	640.3	tr	0.66	883.0	0.01
Toluene	1.24	758.6	0.03	1.26*	1000.4	[0.20]
Hexanal	1.54	799.2	0.01	1.63	1040.8	0.01
Octane	1.56	802.5	tr	0.45	780.9	0.01
Unknown BOCA I [m/z 109, 67 (32), 81 (14), 41 (12), 124 (10)]	1.91	831.9	0.01	0.65	878.1	tr
(3Z)-Hexenol	2.22	856.9	0.04	5.34	1341.5	0.06
Hexanol	2.42	873.5	0.01	5.00*	1317.4	[0.02]
Unknown BOCA II [m/z 79, 78 (45), 91 (28), 77 (28), 41 (13), 80 (12), 107 (11)... 122 (1)]	2.43	874.6	0.01	1.00	956.0	0.01
Santene	2.53	882.6	0.95	0.96*	949.0	[0.97]
Styrene	2.58	886.7	0.01	3.48*	1205.4	[0.34]
Unknown ABBA I [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.73	898.7	0.02	1.26*	1000.4	[0.20]
Bornylene	2.79	903.5	0.03	0.96*	949.0	[0.97]
Tricyclene	3.01	918.6	0.47	1.10	972.0	0.46
α -Thujene	3.13	926.1	0.18	1.26*	1000.4	[0.20]
α -Pinene	3.22	932.4	20.85	1.22	994.1	20.84
α -Fenchene	3.40*	943.9	[3.28]	1.45	1021.7	0.11
Camphene	3.40*	943.9	[3.28]	1.51	1028.1	3.15
Thuja-2,4(10)-diene	3.49	949.9	0.09	2.04*	1082.5	[0.15]
3,7,7- Trimethylcyclohepta- 1,3,5-triene	3.74	966.7	0.06	2.54*	1128.4	[0.03]
Sabinene	3.85*	973.9	[27.32]	2.04*	1082.5	[0.15]
β -Pinene	3.85*	973.9	[27.32]	1.90	1068.4	27.31
Unknown ABBA II [m/z 91, 119 (65), 109 (51), 134 (47)]	4.06	987.3	0.01	2.79	1149.0	0.01
Myrcene	4.14	992.9	1.85	2.60	1133.2	1.90
2-Carene	4.23	998.9	0.01	2.14	1093.5	0.01
Pseudolimonene	4.28*	1002.1	[0.53]	2.54*	1128.4	[0.03]
α -Phellandrene	4.28*	1002.1	[0.53]	2.50	1125.6	0.48
Δ 3-Carene	4.39	1008.7	9.17	2.34	1112.3	9.17
α -Terpinene	4.48	1014.6	0.31	2.67	1139.0	0.31
Carvomenthene	4.56	1019.5	0.03	2.21	1100.3	0.02

<i>para</i> -Cymene	4.61	1022.5	0.39	3.74	1226.0	0.38
Limonene	4.70*	1028.3	[21.74]	2.91	1158.8	11.60
β -Phellandrene	4.70*	1028.3	[21.74]	3.00	1166.0	10.22
(Z)- β -Ocimene	4.89	1040.4	0.01	3.48*	1205.4	[0.34]
(E)- β -Ocimene	5.05	1050.0	0.01			
γ -Terpinene	5.16	1057.3	0.31	3.48*	1205.4	[0.34]
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.33	1067.9	0.03	4.40	1276.5	0.03
<i>meta</i> -Cymenene	5.53	1080.3	0.03	5.80	1375.4	0.05
Fenchone	5.56	1082.1	0.08	5.28	1337.4	0.07
Isoterpinolene	5.60	1084.4	0.05	3.87	1235.9	0.04
Terpinolene	5.62*	1086.1	[1.27]	3.94	1240.8	1.07
<i>para</i> -Cymenene	5.62*	1086.1	[1.27]	5.90	1382.9	0.18
γ -Campholenal	5.62*	1086.1	[1.27]	4.59	1291.3	0.04
α -Pinene oxide	5.72	1092.2	0.02	5.00*	1317.4	[0.02]
Linalool	5.88	1102.2	0.05	7.63	1512.5	0.04
Nonanal	5.92	1104.6	0.01	5.48	1352.4	0.02
endo-Fenchol	6.02	1111.2	0.15	7.92	1535.2	0.15
<i>cis-para</i> -Menth-2-en- 1-ol	6.15	1118.9	0.03	7.67*	1515.2	[0.05]
α -Campholenal	6.19	1121.6	0.04	6.57	1432.1	0.04
Nopinone	6.30	1128.5	0.03	7.82*	1526.7	[2.41]
<i>cis</i> -Limonene oxide	6.34	1131.0	0.01	6.00	1390.1	0.01
<i>trans</i> -Pinocarveol	6.38	1134.1	0.24	8.68*	1595.0	[0.25]
<i>trans-para</i> -Menth-2-en- 1-ol	6.42*	1136.2	[0.22]	8.50*	1580.1	[0.05]
Camphor	6.42*	1136.2	[0.22]	6.74*†	1445.3	[0.18]
Camphene hydrate	6.52	1142.6	0.08	8.03*†	1543.5	[0.30]
<i>meta</i> -Mentha-4,6- dien-8-ol	6.56	1145.4	0.04	8.86*	1608.8	[0.12]
Isoborneol	6.66*	1151.6	[0.04]	8.93	1614.6	0.02
Citronellal	6.66*	1151.6	[0.04]	6.59	1434.0	0.03
Pinocamphone	6.69	1153.5	0.11	6.79*	1448.6	[0.10]
Pinocarvone	6.72	1155.5	0.06	7.44	1497.3	0.06
Borneol	6.83	1162.7	0.34	9.31*	1646.2	[1.52]
Isopinocamphone	6.90	1166.7	0.18	7.14*	1475.3	[0.21]
Terpinen-4-ol	7.01	1173.8	0.36	8.11	1550.2	0.36
Cryptone	7.09	1179.2	0.07	8.68*	1595.0	[0.25]
<i>meta</i> -Cymen-8-ol	7.14	1182.4	0.02	11.02*	1790.7	[0.03]
<i>para</i> -Cymen-8-ol	7.18	1184.5	0.04	11.02*	1790.7	[0.03]
Myrtenal	7.24*	1188.7	[1.17]	8.23	1559.2	0.02
α -Terpineol	7.24*	1188.7	[1.17]	9.31*	1646.2	[1.52]

Myrtenol	7.33	1194.2	0.14	10.36	1733.5	0.13
Methylchavicol	7.38	1197.4	0.03	8.86*	1608.8	[0.12]
Verbenone	7.44	1201.3	0.10	9.16*	1633.6	[0.11]
Unknown ABBA V [m/z 93, 121 (98), 79 (64), 91 (41), 77 (35), 124 (24)...]	7.46	1202.4	0.03	10.60	1753.8	0.03
endo-Fenchyl acetate	7.67	1216.8	0.02	6.41*	1420.0	[0.21]
<i>trans</i> -Carveol	7.70	1218.2	0.02	10.89	1779.5	0.03
Thymol methyl ether	7.93*	1233.7	[0.30]	8.01*†	1541.7	[0.17]
Citronellol	7.93*	1233.7	[0.30]	10.27	1725.5	0.03
Piperitone	8.14	1247.9	0.07	9.40*	1653.0	[0.07]
Geraniol	8.26	1256.1	0.01	11.20	1805.7	0.02
Phellandral	8.44	1268.0	0.16	9.49	1660.8	0.11
Isopulegyl acetate	8.54	1274.4	0.02	7.67*	1515.2	[0.05]
Bornyl acetate	8.66	1282.4	2.39	7.82*	1526.7	[2.41]
Isobornyl acetate	8.72	1286.4	0.01	7.86	1530.6	0.03
2-Undecanone	8.86	1296.0	0.02	8.19	1555.8	0.14
Isohexyl isocaproate	9.14	1315.4	0.01	7.14*	1475.3	[0.21]
Myrtenyl acetate	9.23	1321.4	0.02	9.13	1631.4	0.02
Unknown ABBA III [m/z 121, 93 (84), 43 (81), 79 (48), 117 (40), 56 (37)...]	9.50	1340.7	0.01			
α -Longipinene	9.55	1344.1	0.18	6.41*	1420.0	[0.21]
Citronellyl acetate	9.70	1354.5	0.03	9.00	1620.6	0.03
Longicyclene	9.81	1362.6	0.09	6.71*†	1443.1	[0.05]
α -Ylangene	9.88	1367.0	0.05	6.68	1440.5	0.04
α -Copaene	9.94	1371.5	0.03	6.79*	1448.6	[0.10]
β -Bourbonene	10.05	1379.3	0.01	7.14*	1475.3	[0.21]
Geranyl acetate	10.11	1383.7	0.10	10.11	1711.9	0.03
β -Longipinene	10.23	1392.2	0.06	7.37	1492.3	0.04
Longifolene	10.30	1396.8	1.19	7.58	1508.2	1.21
Methyleugenol	10.42	1405.2	0.03	12.86	1958.2	0.01
β -Caryophyllene	10.51	1412.4	0.17	8.01*†	1541.7	[0.17]
<i>trans</i> - α - Bergamotene	10.79	1433.0	0.03	8.03*†	1543.5	[0.30]
α -Himachalene	10.90	1441.0	0.04	8.50*	1580.1	[0.05]
α -Humulene	10.97	1446.6	0.09	8.86*	1608.8	[0.12]
(<i>E</i>)- β -Farnesene	11.12	1457.2	0.06	9.16*	1633.6	[0.11]
γ -Murolene	11.30	1470.7	0.04	9.16*	1633.6	[0.11]
Germacrene D	11.38	1476.7	0.07	9.36	1649.9	0.06
β -Selinene	11.43	1480.6	0.06	9.44	1656.5	0.02
α -Selinene	11.54	1488.7	0.02	9.55	1665.8	0.01

β-Himachalene	11.61	1494.0	0.08	9.40*	1653.0	[0.07]
α-Muurolene	11.64	1495.9	0.01	9.62	1671.4	0.03
β-Bisabolene	11.78	1506.3	0.42	9.75	1682.0	0.41
δ-Cadinene	11.94	1518.9	0.07	9.99	1702.4	0.07
(E)-γ-Bisabolene	12.06	1528.4	0.05	9.96	1699.6	0.04
α-Calacorene	12.16	1536.4	0.02	11.64	1845.1	0.01
(E)-α-Bisabolene	12.22	1541.0	0.07	10.31	1729.0	0.08
(E)-Nerolidol	12.50	1563.4	0.03	13.32	2001.4	0.03
Caryophyllene oxide	12.61	1571.7	0.02	12.30	1905.1	0.01
τ-Cadinol	13.40	1635.1	0.02			
α-Cadinol	13.56	1648.4	0.01			
Unknown PISI V [m/z 105, 91 (100), 81 (89), 79 (86), 109 (86), 257 (83)... 275 (12)...]	17.25	1976.3	0.04	15.57	2227.0	0.01
18-Norabieta- 8,11,13-triene?	17.49	1999.3	0.02			
Manool	17.93	2042.5	0.06	18.79	2591.1	0.05
7,13-Abietadiene	18.15	2064.5	0.02	16.84	2365.4	0.02
Unknown PISY I [m/z 191, 81 (47), 95 (41), 69 (39), 109 (32), 93 (32)...]	18.42	2091.4	0.01	19.31	2653.7	0.01
(Z)-Abienol	18.84	2133.9	0.12	19.81	2716.6	0.10
Isopimaral	19.45	2197.4	0.01	20.23*	2770.0	[0.02]
Palustral	19.62	2215.1	0.02	20.23*	2770.0	[0.02]
Abietal	20.27	2285.2	0.01			
Total reported		99.29%			98.72%	

*: 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