

Date : 2023-11-27

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23K20-PTH02

Customer Identification : Fir Needle - F20112R

Type : Essential Oil

Source : *Abies sibirica*

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

Date : 2023-11-23

PHYSICOCHEMICAL DATA

Refractive index : 1.4702 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-11-22

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	0.01	Simple phenolic
Santene	2.87	Normonoterpene
Unknown	0.03	Normonoterpene
Bornylene	0.01	Monoterpene
Tricyclene	2.30	Monoterpene
α -Thujene	0.08	Monoterpene
α -Pinene	12.00	Monoterpene
α -Fenchene	0.03	Monoterpene
Camphene	23.08	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.04	Monoterpene
Sabinene	0.01	Monoterpene
β -Pinene	2.00	Monoterpene
Myrcene	0.63	Monoterpene
2-Carene	0.01	Monoterpene
α -Phellandrene	0.22	Monoterpene
Pseudolimonene	0.01	Monoterpene
Δ^3 -Carene	11.94	Monoterpene
α -Terpinene	0.12	Monoterpene
<i>para</i> -Cymene	0.09	Monoterpene
β -Phellandrene	3.31	Monoterpene
Limonene	4.55	Monoterpene
(<i>Z</i>)- β -Ocimene	0.01	Monoterpene
γ -Terpinene	0.16	Monoterpene
Unknown	tr	Oxygenated monoterpene
<i>meta</i> -Cymenene	0.01	Monoterpene
Isoterpinolene	0.06	Monoterpene
Terpinolene	1.18	Monoterpene
<i>para</i> -Cymenene	0.07	Monoterpene
Unknown	0.02	Unknown
Linalool	0.05	Monoterpenic alcohol
β -Thujone	0.01	Monoterpenic ketone
endo-Fenchol	0.02	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	0.03	Monoterpenic alcohol
α -Campholenal	0.02	Monoterpenic aldehyde
Cosmene	0.01	Monoterpene
<i>trans</i> -Pinocarveol	0.02	Monoterpenic alcohol
Camphor	0.26	Monoterpenic ketone
Camphene hydrate	0.10	Monoterpenic alcohol

<i>meta</i> -Mentha-4,6-dien-8-ol	0.01	Monoterpenic alcohol
Isoborneol	0.04	Monoterpenic alcohol
Pinocarvone	0.01	Monoterpenic ketone
Borneol	1.56	Monoterpenic alcohol
Isopinocampone	0.02	Monoterpenic ketone
Terpinen-4-ol	0.09	Monoterpenic alcohol
Unknown	0.02	Unknown
Cryptone	0.02	Normonoterpenic ketone
<i>meta</i> -Cymen-8-ol	0.02	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.03	Monoterpenic alcohol
α -Terpineol	0.19	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
Myrtenol	0.03	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Verbenone	0.04	Monoterpenic ketone
endo-Fenchyl acetate	0.03	Monoterpenic ester
Citronellol	0.01	Monoterpenic alcohol
Thymol methyl ether	0.05	Monoterpenic ether
Carvone	0.03	Monoterpenic ketone
Piperitone	0.01	Monoterpenic ketone
Geraniol	0.01	Monoterpenic alcohol
Phellandral	0.03	Monoterpenic aldehyde
iso-Isopulegyl acetate	0.01	Monoterpenic ester
Isobornyl acetate	0.09	Monoterpenic ester
Bornyl acetate	27.35	Monoterpenic ester
2-Undecanone	0.05	Aliphatic ketone
Thymol	0.01	Monoterpenic alcohol
Isohexyl isocaproate	0.03	Aliphatic ester
Unknown	0.02	Unknown
Unknown	0.02	Unknown
α -Longipinene	0.02	Sesquiterpene
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.06	Monoterpenic ester
α -Ylangene	0.01	Sesquiterpene
α -Copaene	0.01	Sesquiterpene
Geranyl acetate	0.22	Monoterpenic ester
Sativene	0.01	Sesquiterpene
β -Longipinene	0.03	Sesquiterpene
Longifolene	0.11	Sesquiterpene
Sibirene	0.04	Sesquiterpene
Dodecanal	0.18	Aliphatic aldehyde
β -Caryophyllene	1.12	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.01	Sesquiterpene
α -Himachalene	0.05	Sesquiterpene
α -Humulene	0.64	Sesquiterpene

(E)- β -Farnesene	0.02	Sesquiterpene
γ -Himachalene	0.03	Sesquiterpene
Unknown	0.08	Sesquiterpene
Unknown	0.05	Unknown
β -Alaskene	0.02	Sesquiterpene
β -Himachalene	0.03	Sesquiterpene
α -Muurolene	0.02	Sesquiterpene
(Z)- α -Bisabolene	0.03	Sesquiterpene
β -Bisabolene	0.18	Sesquiterpene
(Z)- γ -Bisabolene	0.07	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
(E)- γ -Bisabolene	0.10	Sesquiterpene
(E)- α -Bisabolene	0.02	Sesquiterpene
(E)-Nerolidol	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Humulene epoxide II	0.02	Sesquiterpenic ether
Selin-6-en-4 α -ol isomer	0.05	Sesquiterpenic alcohol
α -Bisabolol analog	0.02	Sesquiterpenic alcohol
α -Bisabolol	0.26	Sesquiterpenic alcohol
epi- α -Bisabolol	0.01	Sesquiterpenic alcohol
Manoyl oxide	0.05	Diterpenic ether
13-epi-Manoyl oxide	0.03	Diterpenic ether
Manool	0.05	Diterpenic alcohol
Consolidated total	99.03	

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

Note: no correction factor was applied

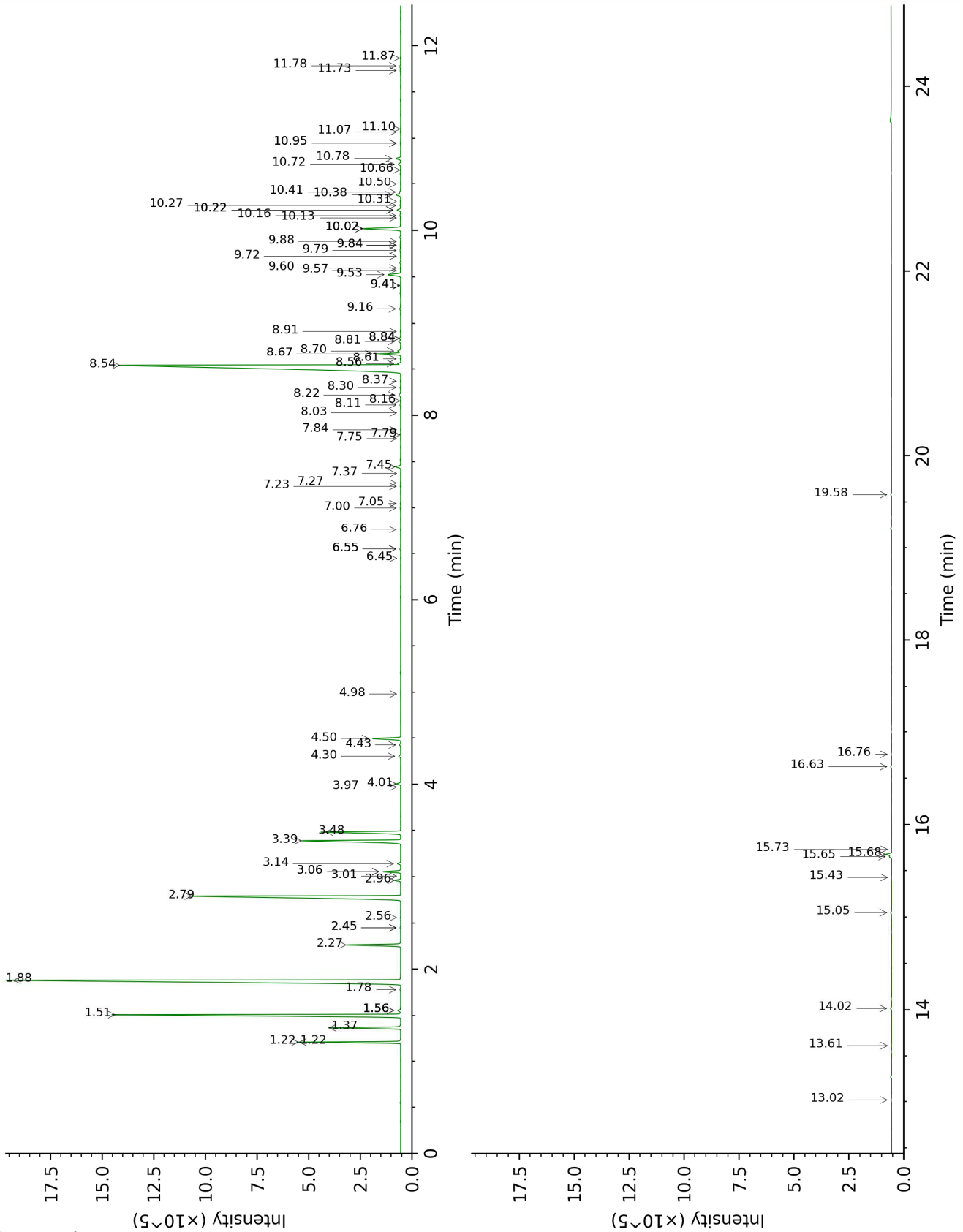
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

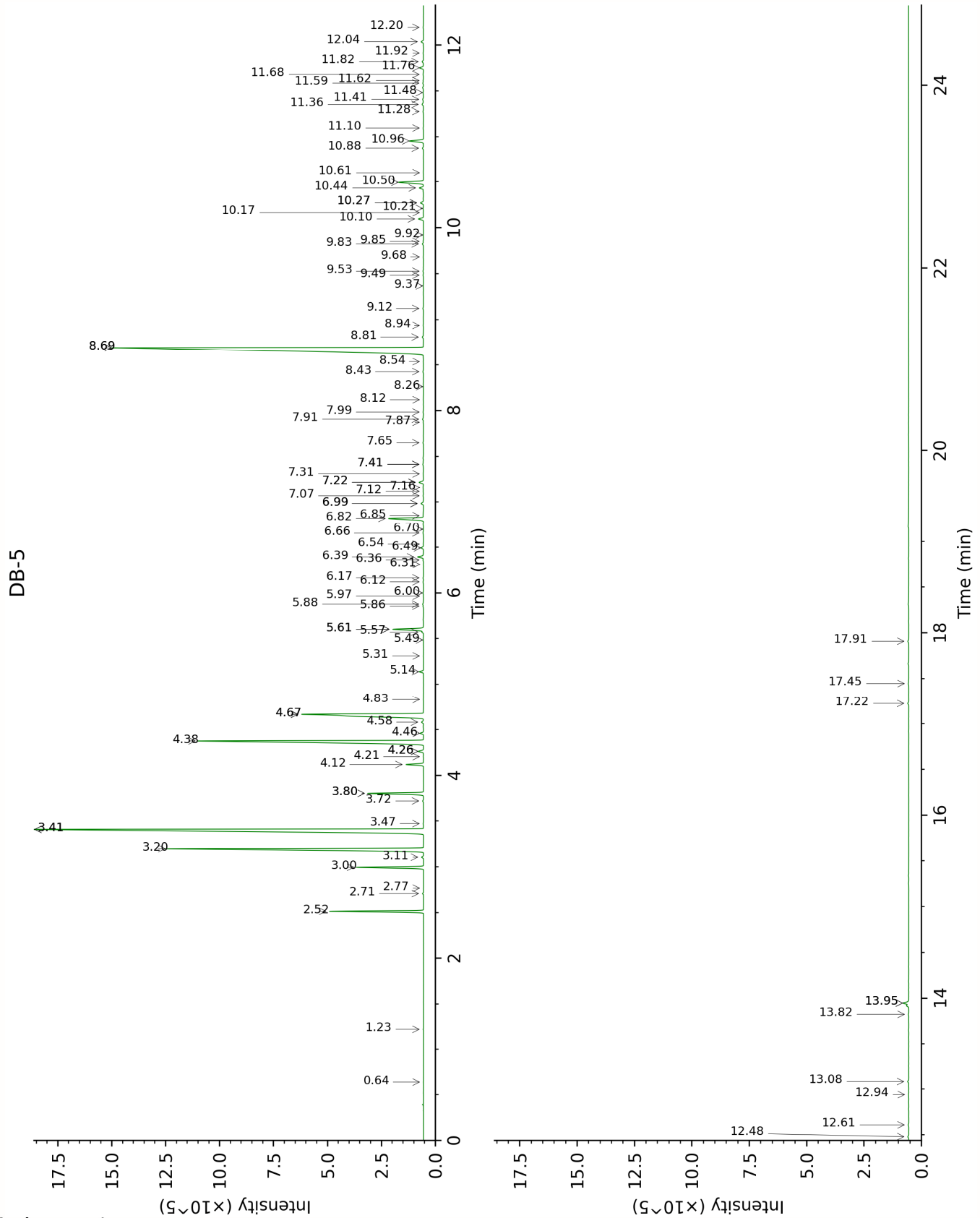
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

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.

DB-WAX





FULL ANALYSIS DATA

Isovaleral	Column DB-WAX			Column DB-5		
				0.64	641.6	tr
Toluene	1.56*	1000.4	[0.12]	1.23	759.9	0.01
Santene	1.22*	949.9	[2.86]	2.52	883.9	2.87
Unknown ABBA I [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	1.56*	1000.4	[0.12]	2.71	899.7	0.03
Bornylene	1.22*	949.9	[2.86]	2.77	904.6	0.01
Tricyclene	1.37	973.3	2.30	3.00	919.7	2.30
α -Thujene	1.56*	1000.4	[0.12]	3.11	927.0	0.08
α -Pinene	1.51	994.7	11.95	3.20	933.1	12.00
α -Fenchene	1.78	1021.6	0.03	3.41*	946.9	[23.20]
Camphene	1.88	1031.1	23.08	3.41*	946.9	[23.20]
Thuja-2,4(10)-diene 3,7,7-	2.45*	1084.4	[0.03]	3.47	951.0	0.02
Trimethylcyclohepta- 1,3,5-triene	3.06*	1132.8	[0.67]	3.72	967.3	0.04
Sabinene	2.45*	1084.4	[0.03]	3.80*	972.7	[2.01]
β -Pinene	2.26	1067.0	2.00	3.80*	972.7	[2.01]
Myrcene	3.06*	1132.8	[0.67]	4.12	993.4	0.63
2-Carene	2.56	1095.0	0.01	4.20	999.1	0.01
α -Phellandrene	2.96	1125.8	0.22	4.26*	1002.9	[0.22]
Pseudolimonene	3.01	1129.1	0.01	4.26*	1002.9	[0.22]
Δ 3-Carene	2.79	1112.9	11.92	4.38	1010.1	11.94
α -Terpinene	3.14	1139.3	0.13	4.46	1015.3	0.12
<i>para</i> -Cymene	4.30	1225.0	0.09	4.58	1022.9	0.09
β -Phellandrene	3.48	1165.2	3.31	4.67*	1028.3	[7.83]
Limonene	3.39	1158.1	4.55	4.67*	1028.3	[7.83]
(Z)- β -Ocimene	3.97	1201.4	0.01	4.83	1038.4	0.01
γ -Terpinene	4.01	1204.0	0.17	5.14	1057.7	0.16
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	4.98	1273.1	0.01	5.31	1068.5	tr
<i>meta</i> -Cymenene	6.45	1380.1	0.01	5.49	1079.3	0.01
Isoterpinolene	4.43	1233.7	0.05	5.57	1084.7	0.06
Terpinolene	4.50	1238.6	1.18	5.60*	1086.7	[1.25]
<i>para</i> -Cymenene	6.55*	1387.2	[0.03]	5.60*	1086.7	[1.25]
Unknown PIMA 3 [m/z 79, 94 (87), 77 (25), 91 (21), 93 (16), 95 (12), 138 (8)]				5.86	1102.4	0.02

Linalool	8.30	1516.1	0.04	5.88	1103.8	0.05
β-Thujone	6.55*	1387.2	[0.03]	5.97	1109.3	0.01
endo-Fenchol	8.61	1539.9	0.03	6.00	1111.5	0.02
<i>cis-para</i> -Menth-2-en-1-ol	8.37	1521.3	0.03	6.12	1119.3	0.03
α-Campholenal	7.23	1437.0	0.02	6.17	1122.0	0.02
Cosmene	6.76	1402.5	0.02	6.31	1131.4	0.01
<i>trans</i> -Pinocarveol	9.41*	1601.0	[0.04]	6.36	1134.4	0.02
Camphor	7.45	1452.5	0.25	6.40	1136.6	0.26
Camphene hydrate	8.70	1546.8	0.14	6.49	1142.9	0.10
<i>meta</i> -Mentha-4,6-dien-8-ol	9.57	1614.1	0.01	6.54	1145.5	0.01
Isoborneol	9.60	1616.3	0.02	6.66	1153.3	0.04
Pinocarvone	8.16	1505.0	0.02	6.70	1155.9	0.01
Borneol	10.02*	1650.3	[1.79]	6.82	1163.8	1.56
Isopinocampone	7.84	1481.7	0.01	6.85	1165.7	0.02
Terpinen-4-ol	8.81	1554.7	0.09	6.99*	1174.2	[0.12]
Unknown SCTE II [m/z 109, 71 (66), 43 (55), 93 (55), 69 (43), 91 (43)...]				6.99*	1174.2	[0.12]
Cryptone	9.41*	1601.0	[0.04]	7.07	1179.6	0.02
<i>meta</i> -Cymen-8-ol	11.73	1792.1	0.03	7.12	1182.7	0.02
<i>para</i> -Cymen-8-ol	11.78	1796.5	0.06	7.16	1185.4	0.03
α-Terpineol	10.02*	1650.3	[1.79]	7.22*	1188.9	[0.21]
Myrtenal	8.91	1562.9	0.02	7.22*	1188.9	[0.21]
Myrtenol	11.10	1739.1	0.01	7.31	1194.8	0.03
Unknown PINI IV [m/z 109, 91 (100), 81 (88), 94 (75), 119 (74), 96 (73), 41 (63)... 150 (2)]	11.07	1736.4	0.02	7.41*	1201.4	[0.06]
Verbenone	9.84*	1635.8	[0.04]	7.41*	1201.4	[0.06]
endo-Fenchyl acetate	7.05	1423.3	0.02	7.65	1217.1	0.03
Citronellol	10.95*	1726.1	[0.02]	7.87	1232.0	0.01
Thymol methyl ether	8.67*	1544.4	[1.10]	7.91	1234.2	0.05
Carvone	10.27	1670.2	0.03	7.99	1239.4	0.03
Piperitone	10.14	1659.4	0.01	8.12	1248.4	0.01
Geraniol	11.87	1803.8	0.03	8.26	1257.9	0.01
Phellandral	10.22*	1666.2	[0.17]	8.43	1268.9	0.03
iso-Isopulegyl acetate				8.54	1276.2	0.01
Isobornyl acetate	8.56	1535.9	0.09	8.69*	1286.7	[27.52]
Bornyl acetate	8.54	1534.5	27.35	8.69*	1286.7	[27.52]

2-Undecanone	8.84*	1557.2	[0.06]	8.81	1294.5	0.05
Thymol	15.43	2134.5	0.01	8.94	1303.0	0.01
Isohexyl isocaproate	7.75	1474.8	0.01	9.12	1315.9	0.03
Unknown CASA XXVII [m/z 135, 91 (76), 43 (59), 77 (39), 93 (33)...]				9.37	1333.2	0.02
Unknown ABBA III [m/z 121, 93 (84), 43 (81), 79 (48), 117 (40), 56 (37)...]				9.49	1341.4	0.02
α -Longipinene	7.00	1419.9	0.03	9.53	1344.5	0.02
Citronellyl acetate	9.72	1626.4	0.02	9.68	1355.4	0.02
Neryl acetate	10.41	1681.8	0.04	9.83	1365.4	0.06
α -Ylangene	7.27	1439.6	0.02	9.85	1367.3	0.01
α -Copaene	7.37	1447.2	0.01	9.92	1372.2	0.01
Geranyl acetate	10.78	1712.3	0.22	10.10	1384.4	0.22
Sativene	7.79	1477.8	0.01	10.17	1389.3	0.01
β -Longipinene	8.03	1495.2	0.01	10.21	1392.5	0.03
Longifolene	8.22	1509.8	0.11	10.27*	1396.8	[0.14]
Sibirene	8.11	1501.7	0.04	10.27*	1396.8	[0.14]
Dodecanal	10.22*	1666.2	[0.17]	10.44	1408.5	0.18
β -Caryophyllene	8.67*	1544.4	[1.10]	10.50	1413.1	1.12
Caryophylla- 4(12),8(13)-diene	8.84*	1557.2	[0.06]	10.61	1421.2	0.01
α -Himachalene	9.16	1581.6	0.06	10.88	1441.2	0.05
α -Humulene	9.52	1610.5	0.64	10.96	1447.1	0.64
(E)- β -Farnesene	9.79	1631.4	0.06	11.10	1457.6	0.02
γ -Himachalene	9.84*	1635.8	[0.04]	11.28	1471.0	0.03
Unknown BOSE VII [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	10.16	1661.4	0.05	11.36	1476.7	0.08
Unknown PRME XIV [m/z 43, 58 (75), 57 (58), 71 (55), 41 (41), 59 (31)...]				11.41	1480.8	0.05
β -Alaskene	9.88	1639.2	0.02	11.48	1486.3	0.02
β -Himachalene	10.02*	1650.3	[1.79]	11.59	1494.0	0.03
α -Muurolene	10.31	1673.8	0.02	11.62	1496.1	0.02
(Z)- α -Bisabolene	10.50	1688.8	0.02	11.68	1501.1	0.03
β -Bisabolene	10.38	1679.5	0.24	11.76	1506.6	0.18
(Z)- γ -Bisabolene	10.22*	1666.2	[0.17]	11.82	1511.8	0.07
δ -Cadinene	10.66	1701.8	0.02	11.92	1519.2	0.02
(E)- γ -Bisabolene	10.72	1707.1	0.11	12.04	1528.9	0.10

(E)- α -Bisabolene	10.95*	1726.1	[0.02]	12.20	1541.2	0.02
(E)-Nerolidol	14.02	1997.3	0.06	12.48	1563.2	0.05
Caryophyllene oxide	13.02	1905.5	0.04	12.61	1573.4	0.03
Humulene epoxide II	13.61	1960.0	0.01	12.94	1599.4	0.02
Selin-6-en-4 α -ol isomer	15.05	2096.6	0.05	13.08	1610.9	0.05
α -Bisabolol analog	15.66	2156.9	0.10	13.82	1672.1	0.02
α -Bisabolol	15.68	2159.4	0.26	13.95*	1682.3	[0.27]
epi- α -Bisabolol	15.73	2164.6	0.01	13.95*	1682.3	[0.27]
Manoyl oxide	16.76	2270.2	0.03	17.22	1975.9	0.05
13-epi-Manoyl oxide	16.63	2256.4	0.05	17.45	1997.1	0.03
Manool	19.58	2584.2	0.04	17.91	2042.7	0.05
Total reported		98.72%			99.16%	

*: 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