Date : 2023-08-10

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 23G26-NPA01
Customer Identification : Cedrus Atlantica - Morocco - NPS00091 - Lot # NP0198
Type : Essential Oil
Source : *Cedrus atlantica*
Customer : Nature Packaged

Checked an 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 2023-08-08 to format it for online publication.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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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 : 2023-08-08

Physicochemical data

Refractive index : 1.5131 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2023-07-26

Conclusion

No adulterant, contaminant or diluent has been detected using this method.

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Analysis Summary - Consolidated Contents

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

Identification	%	Class
Mesityl oxide	0.03	Aliphatic ketone
α-Pinene	0.03	Monoterpene
Camphene	0.01	Monoterpene
3-Methyl-3-cyclohexenone	0.02	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	0.01	Monoterpene
1,8-Cineole	0.01	Monoterpenic ether
Limonene	0.02	Monoterpene
Terpinolene	0.01	Monoterpene
para-Cymenene	0.01	Monoterpene
Phenylethyl alcohol	0.01	Simple phenolic
4-Hydroxy-4-methylcyclohex-2-enone	0.02	Aliphatic alcohol
Limona ketone	0.72	Normonoterpenic ketone
α,4-Dimethyl-3-cyclohexene-1-methanol	0.06	Normonoterpenic alcohol
α,4-Dimethyl-3-cyclohexene-1-methanol epimer	0.06	Normonoterpenic alcohol
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.01	Monoterpenic alcohol
4-Methylacetophenone	0.13	Simple phenolic
α-Terpineol	0.04	Monoterpenic alcohol
Unknown	0.01	Unknown
α-Longipinene	0.09	Sesquiterpene
Longicyclene	0.01	Sesquiterpene
α-Ylangene	0.07	Sesquiterpene
α-Copaene	0.04	Sesquiterpene
Unknown	0.31	Sesquiterpene
Unknown	0.20	Sesquiterpene
Sativene	0.04	Sesquiterpene
β-Elemene	0.46	Sesquiterpene
β-Longipinene	0.05	Sesquiterpene
Longifolene	0.52	Sesquiterpene
Sibirene	0.72	Sesquiterpene
(*Z*?)-Vestitenone, or analog	0.10	Terpenic ketone
α-Cedrene	0.04	Sesquiterpene
β-Caryophyllene	0.05	Sesquiterpene
Himachala-2,4-diene	0.51	Sesquiterpene
Unknown	0.03	Sesquiterpene
Unknown	0.16	Sesquiterpene
trans-α-Bergamotene	0.05	Sesquiterpene
Himachala-2,4-diene isomer	0.17	Sesquiterpene

(*E*)-Vestitenone	0.51	Terpenic ketone
α-Himachalene	15.46	Sesquiterpene
α-Humulene	0.08	Sesquiterpene
Unknown	0.41	Sesquiterpene
(*E*)-β-Farnesene	0.18	Sesquiterpene
Unknown	0.53	Sesquiterpene
Unknown	0.38	Sesquiterpene
γ-Himachalene	9.47	Sesquiterpene
11-αH-Himachala-1,4-diene	1.91	Sesquiterpene
Unknown	0.34	Sesquiterpenic ether
β-Himachalene	39.79	Sesquiterpene
α-Muurolene	0.20	Sesquiterpene
(*Z*)-α-Bisabolene	0.02	Sesquiterpene
Cycloisolongifol-5-ol	0.38	Sesquiterpenic alcohol
γ-Cadinene	0.03	Sesquiterpene
α-Dehydro-ar-himachalene	1.48	Sesquiterpene
δ-Cadinene	2.19	Sesquiterpene
trans-Calamenene	0.11	Sesquiterpene
γ-Dehydro-ar-himachalene	1.46	Sesquiterpene
Unknown	1.35	Sesquiterpene
10-epi-Cubebol?	0.04	Sesquiterpenic alcohol
Unknown	0.18	Sesquiterpene
ar-Himachalene	0.49	Sesquiterpene
α-Calacorene	0.68	Sesquiterpene
(*E*)-α-Bisabolene	0.78	Sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
(*E*)-Nerolidol	0.09	Sesquiterpenic alcohol
Unknown	0.29	Unknown
Himachalene epoxide	0.46	Sesquiterpenic ether
Unknown	0.10	Oxygenated sesquiterpene
Longiborneol	0.36	Sesquiterpenic alcohol
ar-Dihydroturmerone	0.05	Sesquiterpenic ketone
β-Himachalene oxide	0.54	Sesquiterpenic ether
Unknown	0.80	Oxygenated sesquiterpene
Unknown	0.15	Oxygenated sesquiterpene
1-epi-Cubenol	0.74	Sesquiterpenic alcohol
6-Methyl-6-*meta*-tolyl-heptan-2-one	0.19	Miscellaneous
Unknown	0.20	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Himachalol	0.56	Sesquiterpenic alcohol
Allohimachalol	0.84	Sesquiterpenic alcohol
(*E*)-10,11-Dihydroatlantone	0.13	Sesquiterpenic ketone
β-Atlantone	0.32	Sesquiterpenic ketone
Himachalene isomer	0.76	Sesquiterpene
(*Z*)-γ-Atlantone	0.81	Sesquiterpenic ketone

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Deodarone epimer I	0.79	Sesquiterpenic ketone
Deodarone epimer II	0.85	Sesquiterpenic ketone
(*E*)-γ-Atlantone	0.90	Sesquiterpenic ketone
(*Z*)-α-Atlantone	0.71	Sesquiterpenic ketone
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.10	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
(*E*)-α-Atlantone	3.02	Sesquiterpenic ketone
Unknown	0.15	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Consolidated total	**97.66**	

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.

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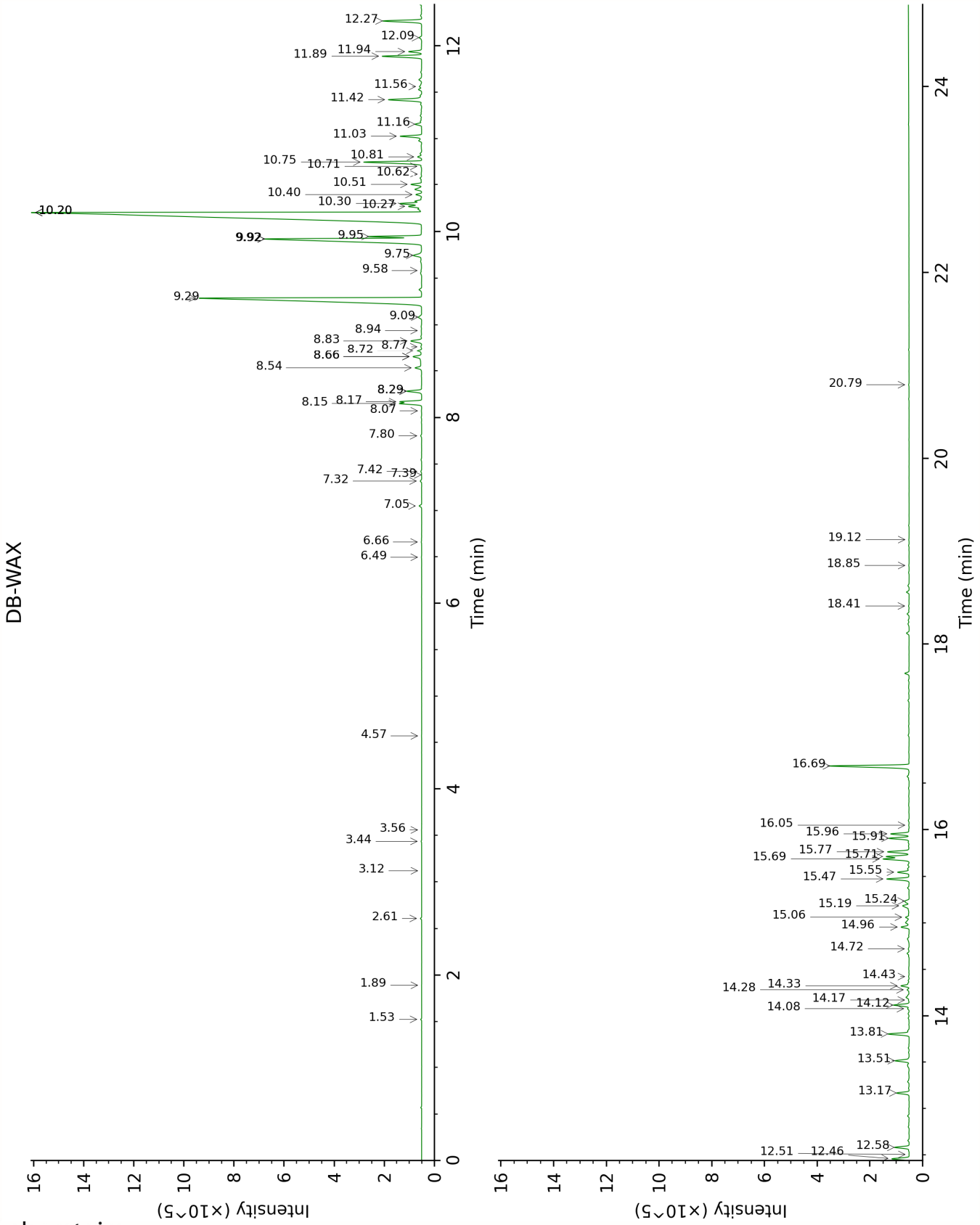
DB-WAX
Time (min)
Intensity (×10^5)
12.27
12.09
11.89
11.94
11.56
11.42
11.16
11.03
10.75
10.81
10.71
10.62
10.51
10.40
10.30
10.27
10.20
9.92
9.95
9.75
9.58
9.29
9.09
8.94
8.83
8.72
8.77
8.66
8.54
8.29
8.15
8.17
8.07
7.80
7.42
7.39
7.32
7.05
6.66
6.49
4.57
3.56
3.44
3.12
2.61
1.89
1.53
20.79
19.12
18.85
18.41
16.69
16.05
15.96
15.91
15.77
15.69
15.71
15.47
15.55
15.19
15.24
15.06
14.96
14.72
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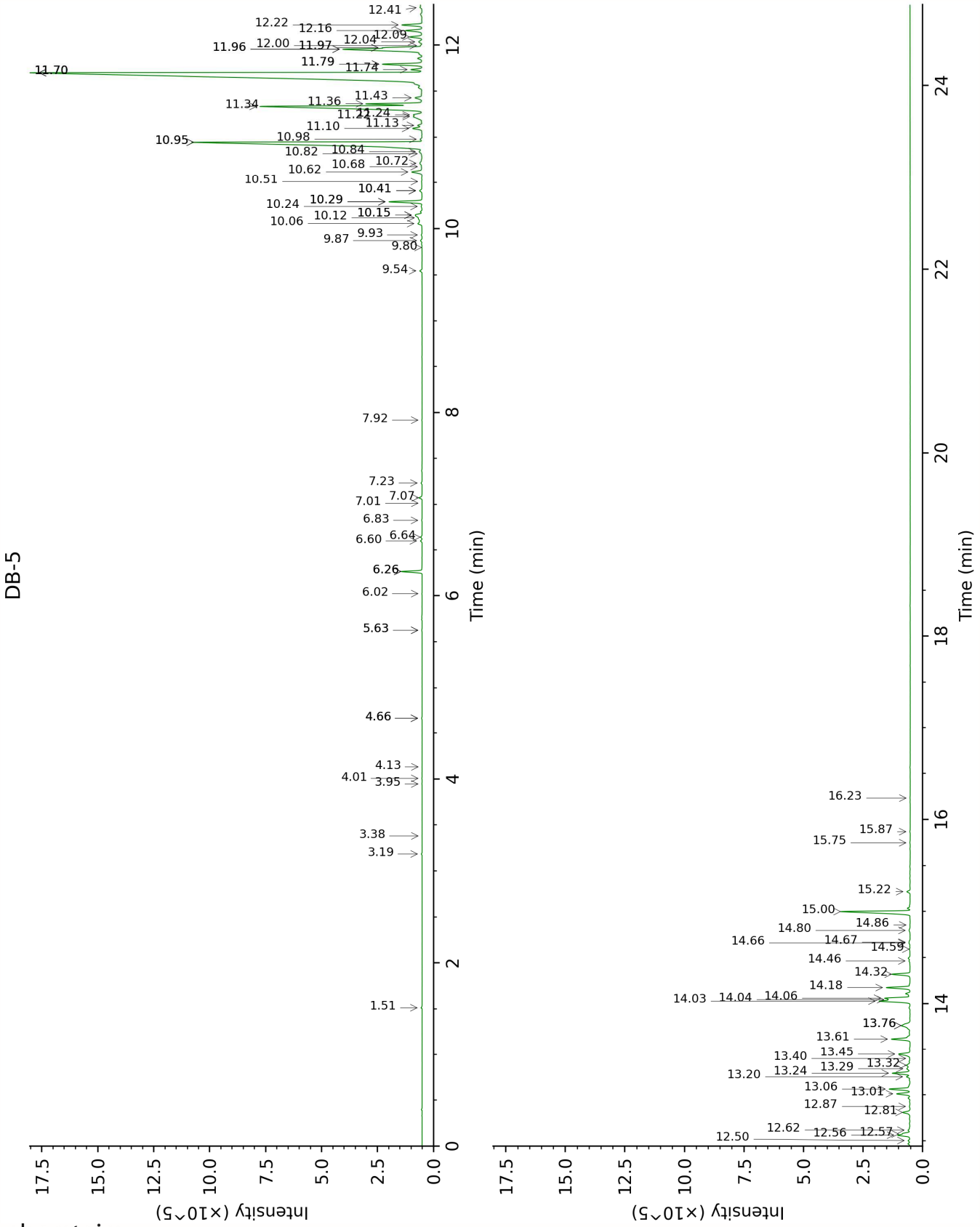
13.81
13.51
13.17
12.51
12.46
12.58


DB-5
Time (min)
Intensity (×10^5)
12.41
12.22
12.16
12.09
12.04
12.00
11.97
11.96
11.79
11.74
11.70
11.43
11.36
11.34
11.24
11.13
11.10
10.98
10.95
10.84
10.82
10.72
10.68
10.62
10.51
10.41
10.29
10.24
10.15
10.12
10.06
9.93
9.87
9.80
9.54
7.92
7.23
7.07
7.01
6.83
6.64
6.60
6.26
6.02
5.63
4.66
4.13
4.01
3.95
3.38
3.19
1.51
16.23
15.87
15.75
15.22
15.00
14.86
14.80
14.67
14.66
14.59
14.46
14.32
14.18
14.06
14.04
14.03
13.76
13.61
13.45
13.40
13.32
13.29
13.24
13.20
13.06
13.01
12.87
12.81
12.62
12.57
12.56
12.50

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Mesityl oxide	2.61	1093.0	0.04	1.52	798.0	0.03
α-Pinene	1.53	989.6	0.02	3.19	930.8	0.03
Camphene	1.89	1024.9	tr	3.38	943.7	0.01
3-Methyl-3-cyclohexenone	6.49	1375.3	0.01	3.95	980.8	0.02
6-Methyl-5-hepten-2-one				4.01	984.8	0.01
Myrcene	3.12	1132.4	tr	4.13	993.0	0.01
1,8-Cineole	3.56	1166.3	0.01	4.66*	1026.5	[0.02]
Limonene	3.44	1156.9	0.02	4.66*	1026.5	[0.02]
Terpinolene	4.57	1241.5	0.01	5.63*	1086.7	[0.02]
para-Cymenene	6.66	1387.0	0.01	5.63*	1086.7	[0.02]
Phenylethyl alcohol	12.51	1853.0	0.01	6.02	1111.8	0.01
4-Hydroxy-4-methylcyclohex-2-enone	14.42	2027.6	0.02	6.26*	1127.1	[0.74]
Limona ketone	8.15*†	1497.9	[0.78]	6.26*	1127.1	[0.74]
α,4-Dimethyl-3-cyclohexene-1-methanol				6.60	1148.3	0.06
α,4-Dimethyl-3-cyclohexene-1-methanol epimer				6.64	1150.9	0.06
Borneol	10.20*	1658.7	[39.58]	6.83	1163.0	0.02
Terpinen-4-ol	8.94	1558.7	0.03	7.02	1174.9	0.01
4-Methylacetophenone	10.81	1708.1	0.14	7.07	1178.6	0.13
α-Terpineol	10.20*	1658.7	[39.58]	7.23	1188.8	0.04
Unknown CEDE XXVIII [m/z 105, 145 (97), 160 (86), 119 (76), 91 (61)]				7.92	1233.7	0.01
α-Longipinene	7.05	1416.2	0.09	9.54	1344.5	0.09
Longicyclene	7.39	1440.9	0.01	9.80	1362.3	0.01
α-Ylangene	7.32	1436.0	0.05	9.87	1367.5	0.07
α-Copaene	7.42	1443.7	0.03	9.93	1371.8	0.04
Unknown CEDE XXVII epimer I [m/z 131, 146 (36), 91 (22), 145 (19), 202 (18)]	8.54	1527.4	0.30	10.06	1380.5	0.31
Unknown CEDE XXVII epimer II [m/z 131, 146 (33), 91 (20), 202	8.72	1541.8	0.19	10.12	1384.9	0.20

(18)]						
Sativene	7.80	1471.9	0.04	10.15*	1387.0	[0.50]
β-Elemene	8.66*	1536.7	[0.47]	10.15*	1387.0	[0.50]
β-Longipinene	8.07	1491.8	0.01	10.24	1393.5	0.05
Longifolene	8.28*	1508.1	[0.57]	10.29*	1397.1	[1.24]
Sibirene	8.17*†	1499.4	[0.65]	10.29*	1397.1	[1.24]
(*Z*?)-Vestitenone, or analog	12.09	1816.5	0.10	10.41*	1405.7	[0.14]
α-Cedrene	8.28*	1508.1	[0.57]	10.41*	1405.7	[0.14]
β-Caryophyllene	8.66*	1536.7	[0.47]	10.51	1413.1	0.05
Himachala-2,4-diene	8.83	1550.1	0.48	10.62	1421.3	0.51
Unknown CEDE III [m/z 91, 93 (90), 105 (72), 202 (71), 131 (68), 77 (63), 107 (55), 187 (54)]				10.68	1425.6	0.03
Unknown CEDE IV [m/z 105, 91 (70), 93 (65), 43 (61), 120 (57), 145 (50)... 204 (6)]				10.72	1428.3	0.16
trans-α-Bergamotene	8.77	1545.3	0.03	10.82	1436.0	0.05
Himachala-2,4-diene isomer	9.09	1569.8	0.17	10.84	1437.7	0.17
(*E*)-Vestitenone	12.58	1859.7	0.51	10.95*	1445.3	[15.85]
α-Himachalene	9.29	1585.3	15.46	10.95*	1445.3	[15.85]
α-Humulene	9.58	1608.9	0.03	10.98	1447.7	0.08
Unknown CEDE V [m/z 187, 131 (78), 202 (76), 105 (74), 91 (74), 117 (53), 145 (52)]	10.27	1664.1	0.48	11.10	1456.5	0.41
(*E*)-β-Farnesene	9.92*†	1636.1	[9.64]	11.13	1458.9	0.18
Unknown CEDE VI [m/z 119, 91 (85), 93 (77), 105 (76), 79 (61), 134 (60), 94 (49), 204 (46)]	9.75	1622.0	0.45	11.22	1466.1	0.53
Unknown CEDE VII [m/z 131, 202 (78), 91 (74), 105 (68), 187 (68), 119 (53), 145 (52)]				11.24	1467.4	0.38
γ-Himachalene	9.92*†	1636.1	[9.64]	11.34	1474.3	9.47
11-αH-Himachala-1,4-diene	9.95*†	1638.3	[1.55]	11.36	1476.4	1.91

Unknown CEDE VIII [m/z 137, 43 (84), 138 (63), 109 (53), 95 (51), 93 (50), 207 (46)... 222 (21)]	10.50	1682.9	0.37	11.43	1481.2	0.34
β-Himachalene	10.20*	1658.7	[39.58]	11.70*†	1501.5	[39.48]
α-Muurolene	10.40	1674.2	0.20	11.70*†	1501.5	[39.48]
(*Z*)-α-Bisabolene	10.62	1692.5	0.02	11.70*†	1501.5	[39.48]
Cycloisolongifol-5-ol	11.16	1737.5	0.24	11.74	1504.0	0.38
γ-Cadinene	10.71	1699.6	0.03	11.80*	1508.7	[1.55]
α-Dehydro-ar-himachalene	11.89	1799.1	1.48	11.80*	1508.7	[1.55]
δ-Cadinene	10.75	1703.4	2.19	11.96*†	1521.4	[4.11]
trans-Calamenene	11.56	1771.3	0.11	11.96*†	1521.4	[4.11]
γ-Dehydro-ar-himachalene	12.27	1832.1	1.46	11.97*†	1522.6	[0.88]
Unknown CEDE IX [m/z 131, 202 (28), 91 (22), 159 (16), 145 (16), 132 (15), 115 (14)]	11.42	1759.5	1.35	11.97*†	1522.6	[0.88]
10-epi-Cubebol?	14.08	1995.2	0.05	12.00	1524.5	0.04
Unknown CEAT II [m/z 93, 187 (70), 145 (59), 119 (42), 131 (39), 202 (33)]				12.04	1527.7	0.18
ar-Himachalene	11.94	1803.4	0.45	12.09	1531.8	0.49
α-Calacorene	12.46	1849.0	0.62	12.16	1537.3	0.68
(*E*)-α-Bisabolene	11.03	1726.7	0.77	12.22	1542.1	0.78
Unknown CEDE X [m/z 189, 91 (85), 43 (74), 105 (67), 133 (66), 107 (63), 135 (52)... 220 (20)]	14.33	2018.3	0.29	12.41	1557.2	0.11
(*E*)-Nerolidol	14.17	2003.9	0.02	12.50	1564.1	0.09
Unknown CEDE XI [m/z 96, 95 (18), 83 (15), 125 (13), 119 (12), 55 (12), 41 (11)... 218? (tr)]				12.56*†	1568.7	[0.52]
Himachalene epoxide	13.17	1911.8	0.46	12.57*†	1569.7	[0.23]
Unknown CEDE XII [m/z 177, 202 (79), 91 (76), 159 (75), 43 (65),	14.72	2055.6	0.04	12.62	1573.0	0.10

107 (59), 105 (57)...]						
Longiborneol	14.96	2077.7	0.31	12.81	1588.1	0.36
ar-Dihydroturmerone	14.28	2014.2	0.07	12.87	1593.2	0.05
β-Himachalene oxide	13.51	1943.3	0.54	13.01	1604.0	0.54
Unknown CEDE XIII [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	13.81	1970.1	0.78	13.06	1608.3	0.80
Unknown CEDE XIV [m/z 137, 119 (69), 43 (51), 95 (50), 109)40)... 222 (1)]	15.24	2104.9	0.24	13.20	1619.3	0.15
1-epi-Cubenol	14.12	1998.8	0.58	13.24	1622.6	0.74
6-Methyl-6-*meta*-tolyl-heptan-2-one	16.05	2184.9	0.02	13.28	1626.5	0.19
Unknown CEDE XV [m/z 119, 163 (80), 107 (64), 95 (61), 93 (57), 91 (53)... 220 (11)]				13.32	1629.6	0.20
Unknown CEDE XVI [m/z 119, 91 (44), 94 (36), 107 (35), 93 (29)... 202 (19)...]				13.40	1635.7	0.02
Himachalol	15.55	2135.3	0.41	13.44	1639.7	0.56
Allohimachalol	15.91	2170.9	0.71	13.61†	1653.7	0.74
(*E*)-10,11-Dihydroatlantone	15.06	2087.9	0.13	13.76*	1665.8	[0.71]
β-Atlantone	15.18	2099.9	0.32	13.76*	1665.8	[0.71]
Himachalene isomer	10.30	1666.5	0.76			
(*Z*)-γ-Atlantone	15.47	2128.2	0.81	14.03*†	1687.7	[1.24]
Deodarone epimer I	15.71	2151.7	0.79	14.04*†	1689.0	[0.33]
Deodarone epimer II	15.76	2156.7	0.85	14.06*†	1690.3	[0.88]
(*E*)-γ-Atlantone	15.69	2149.2	0.97	14.18	1699.9	0.90
(*Z*)-α-Atlantone	15.96	2175.5	0.66	14.32	1712.3	0.71
Unknown CEDE XVII [m/z 105, 119 (89), 59 (68), 120 (65), 43 (65), 93 (62), 121 (61)...]				14.46	1724.8	0.06
Unknown CEDE XVIII [m/z 91, 79 (83), 105 (68), 109 (63), 41 (590), 93 (58), 107 (57)...]	18.41	2431.3	0.02	14.59	1735.9	0.05

Unknown CEDE XIX [m/z 83, 91 (28), 105 (25), 55 (21), 43 (17), 119 (17)...]				14.66	1741.7	0.05
Unknown CEDE XX [m/z 43, 105 (99), 119 (90), 91 (87), 147 (76), 41 (69), 93 (63)...]				14.67	1742.4	0.05
Unknown CEDE XXI [m/z 83, 55 (17), 91 (14), 105 (9), 216 (6)...]				14.80	1753.5	0.10
Unknown CEDE XXII [m/z 91, 105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...]	18.85	2478.9	0.01	14.86	1758.6	0.02
(*E*)-α-Atlantone	16.69	2249.4	3.11	15.00	1771.2	3.02
Unknown CEDE XXIII [m/z 95, 43 (59), 69, (57), 67 (43), 163 (42), 94 (37), 107 (37)... 178 (26), 218 (2)]				15.22	1790.0	0.15
Unknown CEDE XXIV [m/z 83, 134 (28), 119 (19), 55 (18), 91 (14), 43 (11), 109 (10)... 216 (4), 249? (0)]	20.79	2702.1	0.02	15.75	1837.5	0.03
Unknown CEDE XXV [m/z 83, 134 (30), 119 (19), 55 (18), 91 (12)... 216 (4)...]				15.87	1848.5	0.02
Unknown CEDE XXVI [m/z 173, 83 (83), 91 (80), 201 (79), 115 (65)... 216 (31)]	19.12	2509.9	0.02	16.23	1881.6	0.02
Total reported		94.31%			96.95%	

*: 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