

Date : December 21, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18L20-PTH07-1-DM

Customer identification : Cedarwood Atlas - Morocco - C610389R

Type : Essential oil

Source : *Cedrus atlantica*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : December 20, 2018

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow green liquid

Refractive index: 1.5108 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Mesityl oxide	0.03	0.03	Aliphatic ketone
α -Pinene	0.04	0.03	Monoterpene
Camphene	0.01	tr	Monoterpene
Myrcene	0.01	0.01	Monoterpene
Limonene	0.02	0.02	Monoterpene
Terpinolene	0.01	0.01	Monoterpene
4-Hydroxy-4-methylcyclohex-2-enone	0.59*	0.01	Aliphatic alcohol
Limona ketone	[0.59]*	0.59	Normoterpenic ketone
α ,4-Dimethyl-3-cyclohexene-1-methanol	0.04		Normoterpenic alcohol
α ,4-Dimethyl-3-cyclohexene-1-methanol epimer	0.03		Normoterpenic alcohol
Borneol	0.01	44.34*	Monoterpenic alcohol
4-Methylacetophenone	0.06	2.29*	Simple phenolic
α -Terpineol	0.04	[44.34]*	Monoterpenic alcohol
α -Longipinene	0.09	0.10	Sesquiterpene
Longicyclene	0.02	0.03	Sesquiterpene
α -Ylangene	0.07	0.05	Sesquiterpene
Unknown	0.15	0.14	Sesquiterpene
Sativene	0.23*	0.04	Sesquiterpene
Unknown	[0.23]*	0.24	Sesquiterpene
Longifolene	1.19*	0.55*	Sesquiterpene
Sibirene	[1.19]*	0.66	Sesquiterpene
α -Cedrene	0.10	[0.55]*	Sesquiterpene
(Z?)-Vestitenone, or analog	0.01	0.01	Terpenic ketone
β -Caryophyllene	0.03	0.03	Sesquiterpene
Himachala-2,4-diene	0.58	0.54	Sesquiterpene
Unknown	0.02		Sesquiterpene
Unknown	0.16		Sesquiterpene
Himachala-2,4-diene isomer	0.22	0.25	Sesquiterpene
α -Himachalene	17.07*	16.56	Sesquiterpene
(E)-Vestitenone	[17.07]*	0.05	Terpenic ketone
Unknown	0.20	0.92	Sesquiterpene
(E)- β -Farnesene	0.32	11.95*	Sesquiterpene
Unknown	0.35	0.38	Sesquiterpene
Unknown	0.44		Sesquiterpene
γ -Himachalene	9.91	[11.95]*	Sesquiterpene
11- α H-Himachala-1,4-diene	1.97	[11.95]	Sesquiterpene
Unknown	0.30	0.27	Sesquiterpenic ether
α -Muurolole	44.71*	0.16	Sesquiterpene
(Z)- α -Bisabolene	[44.71]*	0.08*	Sesquiterpene
Cycloisolongifol-5-ol	[44.71]*	0.16	Sesquiterpenic alcohol
β -Himachalene	[44.71]*	[44.34]*	Sesquiterpene
α -Dehydro-ar-himachalene	0.63*	0.56	Sesquiterpene
γ -Cadinene	[0.63]*	[0.08]*	Sesquiterpene
Unknown	3.70*	0.76	Sesquiterpene
δ -Cadinene	[3.70]*	[2.29]*	Sesquiterpene
<i>trans</i> -Calamenene	[3.70]*	0.04	Sesquiterpene

γ -Dehydro-ar-himachalene	[3.70]*	0.57	Sesquiterpene
10-epi-Cubebol?	0.12	0.09	Sesquiterpenic alcohol
ar-Himachalene	0.24	0.22	Sesquiterpene
α -Calacorene	0.40	0.38	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.93	0.87	Sesquiterpene
Unknown	0.10	0.16	Oxygenated sesquiterpene
(<i>E</i>)-Nerolidol	0.09	0.48*	Sesquiterpenic alcohol
Unknown	0.31*	0.24*	Unknown
Himachalene epoxide	[0.31]*	0.21	Sesquiterpenic ether
Unknown	0.07	0.05	Oxygenated sesquiterpene
Longiborneol	0.22	0.22	Sesquiterpenic alcohol
β -Himachalene oxide	0.36	0.35	Sesquiterpenic ether
Unknown	0.33	0.26	Oxygenated sesquiterpene
Unknown	0.18	[0.24]*	Oxygenated sesquiterpene
1-epi-Cubenol	0.56	[0.48]*	Sesquiterpenic alcohol
6-Methyl-6-meta-tolyl-heptan-2-one	0.02	0.01	Miscellaneous
Unknown	0.11		Oxygenated sesquiterpene
Unknown	0.03		Oxygenated sesquiterpene
Himachalol	0.75	0.66	Sesquiterpenic alcohol
Allohimachalol	0.57	0.56	Sesquiterpenic alcohol
β -Atlantone	0.13	0.17	Sesquiterpenic ketone
(<i>E</i>)-10,11-Dihydroatlantone	0.28	0.15	Sesquiterpenic ketone
(<i>Z</i>)- γ -Atlantone	1.67*	0.99	Sesquiterpenic ketone
Deodarone epimer I	[1.67]*	1.81*	Sesquiterpenic ketone
Deodarone epimer II	0.68	0.69	Sesquiterpenic ketone
(<i>E</i>)- γ -Atlantone	1.10	[1.81]*	Sesquiterpenic ketone
(<i>Z</i>)- α -Atlantone	0.86	0.85	Sesquiterpenic ketone
Unknown	0.14		Oxygenated sesquiterpene
Unknown	0.08		Oxygenated sesquiterpene
Unknown	0.03		Oxygenated sesquiterpene
Unknown	0.07		Oxygenated sesquiterpene
(<i>E</i>)- α -Atlantone	3.49	3.48	Sesquiterpenic ketone
Unknown	0.17		Oxygenated sesquiterpene
Unknown	0.02	0.02	Oxygenated sesquiterpene
Unknown	0.03		Oxygenated sesquiterpene
Unknown	0.02	0.01	Oxygenated sesquiterpene
Total identified	94.51%	92.70%	

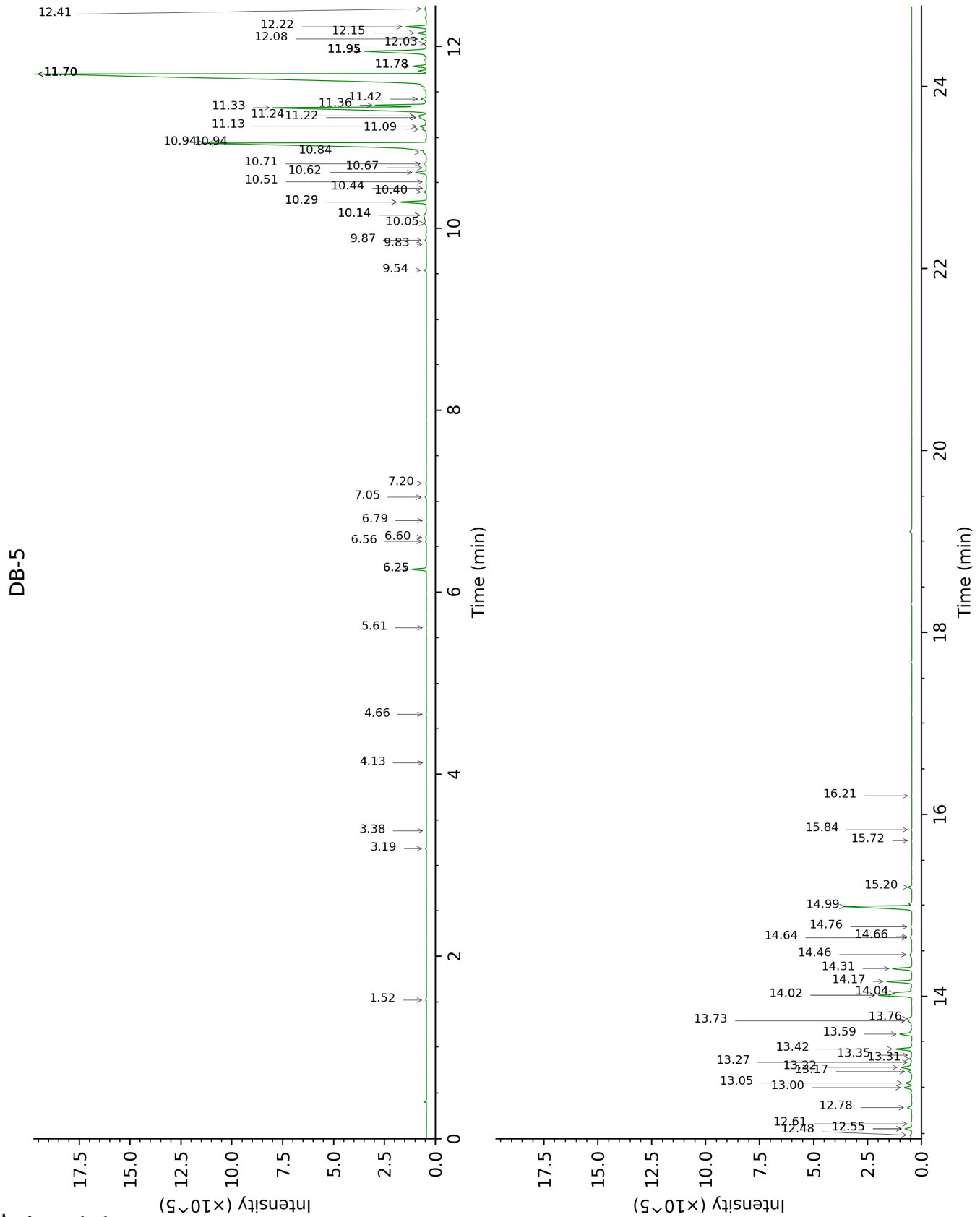
*: Two or more compounds are coeluting on this column

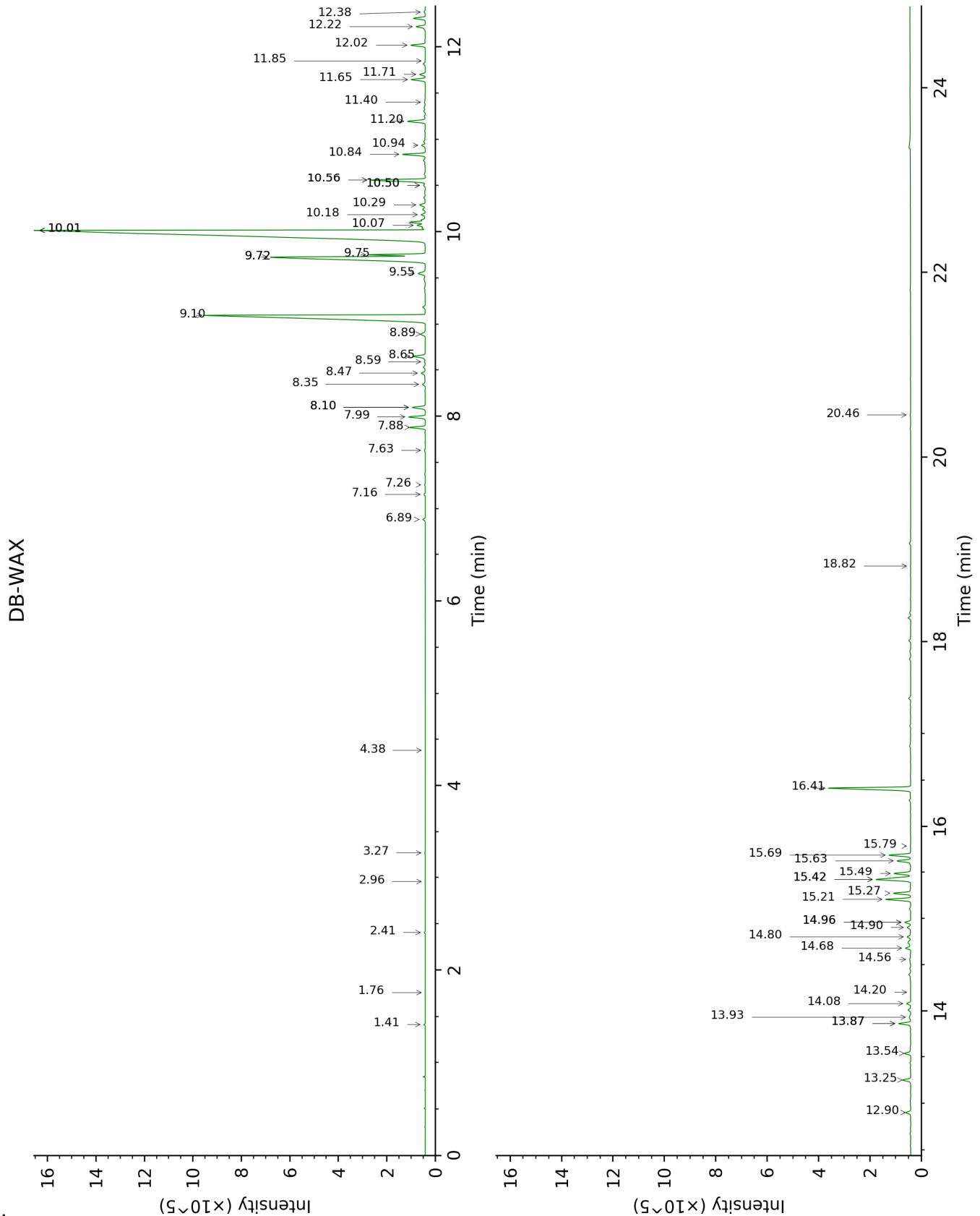
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Mesityl oxide	1.52	795	0.03	2.41	1088	0.03
α-Pinene	3.19	929	0.04	1.41	990	0.03
Camphene	3.38	942	0.01	1.76	1026	tr
Myrcene	4.13	990	0.01	2.96	1132	0.01
Limonene	4.66	1024	0.02	3.27	1157	0.02
Terpinolene	5.61	1085	0.01	4.38	1242	0.01
4-Hydroxy-4-methylcyclohex-2-enone	6.25*	1126	0.59	14.20	2029	0.01
Limona ketone	6.25*	1126	[0.59]	7.88	1493	0.59
α,4-Dimethyl-3-cyclohexene-1-methanol	6.56	1146	0.04			
α,4-Dimethyl-3-cyclohexene-1-methanol epimer	6.60	1148	0.03			
Borneol	6.79	1161	0.01	10.01*	1660	44.34
4-Methylacetophenone	7.05	1177	0.06	10.56*	1704	2.29
α-Terpineol	7.20	1187	0.04	10.01*	1660	[44.34]
α-Longipinene	9.54	1342	0.09	6.89	1420	0.10
Longicyclene	9.83	1363	0.02	7.26	1447	0.03
α-Ylangene	9.87	1366	0.07	7.16	1439	0.05
Unknown epimer I [m/z 131, 146 (36), 91 (22), 145 (19), 202 (18)]	10.05	1379	0.15	8.34	1529	0.14
Sativene	10.14*	1385	0.23	7.63	1475	0.04
Unknown epimer II [m/z 131, 146 (33), 91 (20), 202 (18)]	10.14*	1385	[0.23]	8.47	1538	0.24
Longifolene	10.29*	1396	1.19	8.10*	1510	0.55
Sibirene	10.29*	1396	[1.19]	7.99	1502	0.66
α-Cedrene	10.40	1404	0.10	8.10*	1510	[0.55]
(Z?)-Vestitenone, or analog	10.44	1407	0.01	11.85	1814	0.01
β-Caryophyllene	10.51	1412	0.03	8.59	1547	0.03
Himachala-2,4-diene	10.62	1420	0.58	8.65	1552	0.54
Unknown [m/z 91, 93 (90), 105 (72), 202 (71), 131 (68), 77 (63), 107 (55), 187 (54)]	10.67	1424	0.02			
Unknown [m/z 105, 91 (70), 93 (65), 43 (61), 120 (57), 145 (50)... 204 (6)]	10.72	1427	0.16			
Himachala-2,4-diene isomer	10.84	1437	0.22	8.90	1571	0.25

α-Himachalene	10.94*	1444	17.07	9.10	1587	16.56
(E)-Vestitenone	10.94*	1444	[17.07]	12.38	1861	0.05
Unknown [m/z 187, 131 (78), 202 (76), 105 (74), 91 (74), 117 (53), 145 (52)]	11.09	1456	0.20	10.07	1665	0.92
(E)-β-Farnesene	11.13	1458	0.32	9.72*†	1637	11.95
Unknown [m/z 119, 91 (85), 93 (77), 105 (76), 79 (61), 134 (60), 94 (49), 204 (46)]	11.22	1465	0.35	9.55	1623	0.38
Unknown [m/z 131, 202 (78), 91 (74), 105 (68), 187 (68), 119 (53), 145 (52)]	11.24	1467	0.44			
γ-Himachalene	11.33	1473	9.91	9.72*†	1637	[11.95]
11-αH-Himachala-1,4-diene	11.36	1476	1.97	9.75†	1639	[11.95]
Unknown [m/z 137, 43 (84), 138 (63), 109 (53), 95 (51), 93 (50), 207 (46)... 222 (21)]	11.42	1481	0.30	10.29	1682	0.27
α-Muurolene	11.70*†	1501	44.71	10.18	1674	0.16
(Z)-α-Bisabolene	11.70*†	1501	[44.71]	10.50*	1700	0.08
Cycloisolongifol-5-ol	11.70*†	1501	[44.71]	10.94	1737	0.16
β-Himachalene	11.70*†	1501	[44.71]	10.01*	1660	[44.34]
α-Dehydro-arhimachalene	11.78*	1508	0.63	11.65	1797	0.56
γ-Cadinene	11.78*	1508	[0.63]	10.50*	1700	[0.08]
Unknown [m/z 131, 202 (28), 91 (22), 159 (16), 145 (16), 132 (15), 115 (14)]	11.95*	1521	3.70	11.20	1759	0.76
δ-Cadinene	11.95*	1521	[3.70]	10.56*	1704	[2.29]
trans-Calamenene	11.95*	1521	[3.70]	11.40	1776	0.04
γ-Dehydro-arhimachalene	11.95*	1521	[3.70]	12.02	1830	0.57
10-epi-Cubebol?	12.03	1527	0.12	13.93	2003	0.09
ar-Himachalene	12.08	1531	0.24	11.70	1802	0.22
α-Calacorene	12.15	1537	0.40	12.22	1847	0.38
(E)-α-Bisabolene	12.22	1542	0.93	10.84	1728	0.87
Unknown [m/z 189, 91 (85), 43 (74), 105 (67), 133 (66), 107 (63), 135 (52)... 220 (20)]	12.41	1558	0.10	14.08	2018	0.16
(E)-Nerolidol	12.48	1563	0.09	13.87*	1997	0.48
Unknown [m/z 96, 95 (18), 83 (15), 125 (13), 119 (12), 55 (12), 41 (11)... 218? (tr)]	12.55*	1569	0.31	14.96*	2102	0.24

Himachalene epoxide	12.55*	1569	[0.31]	12.90	1908	0.21
Unknown [m/z 177, 202 (79), 91 (76), 159 (75), 43 (65), 107 (59), 105 (57)...]	12.61	1573	0.07	14.56	2063	0.05
Longiborneol	12.78	1587	0.22	14.68	2075	0.22
β -Himachalene oxide	13.00	1604	0.36	13.25	1940	0.35
Unknown [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	13.05	1608	0.33	13.54	1966	0.26
Unknown [m/z 137, 119 (69), 43 (51), 95 (50), 109 (40)... 222 (1)]	13.17	1618	0.18	14.96*	2102	[0.24]
1-epi-Cubenol	13.22	1622	0.56	13.87*	1997	[0.48]
6-Methyl-6-metatolyl-heptan-2-one	13.27	1627	0.02	15.79	2185	0.01
Unknown [m/z 119, 163 (80), 107 (64), 95 (61), 93 (57), 91 (53)... 220 (11)]	13.31	1630	0.11			
Unknown [m/z 119, 91 (44), 94 (36), 107 (35), 93 (29)... 202 (19)...]	13.35	1633	0.03			
Himachalol	13.42	1639	0.75	15.27	2133	0.66
Allohimachalol	13.59	1653	0.57	15.63	2169	0.56
β -Atlantone	13.74	1665	0.13	14.90	2097	0.17
(<i>E</i>)-10,11-Dihydroatlantone	13.76	1667	0.28	14.80	2087	0.15
(<i>Z</i>)- γ -Atlantone	14.02*	1688	1.67	15.21	2127	0.99
Deodarone epimer I	14.02*	1688	[1.67]	15.42*	2148	1.81
Deodarone epimer II	14.04	1690	0.68	15.49	2155	0.69
(<i>E</i>)- γ -Atlantone	14.17	1701	1.10	15.42*	2148	[1.81]
(<i>Z</i>)- α -Atlantone	14.31	1713	0.86	15.69	2175	0.85
Unknown [m/z 105, 119 (89), 59 (68), 120 (65), 43 (65), 93 (62), 121 (61)...]	14.46	1726	0.14			
Unknown [m/z 83, 91 (28), 105 (25), 55 (21), 43 (17), 119 (17)...]	14.64	1742	0.08			
Unknown [m/z 43, 105 (99), 119 (90), 91 (87), 147 (76), 41 (69), 93 (63)...]	14.66	1744	0.03			
Unknown [m/z 83, 55 (17), 91 (14), 105 (9), 216 (6)...]	14.76	1753	0.07			

(E)- α -Atlantone	14.99	1772	3.49	16.41	2249	3.48
Unknown [m/z 95, 43 (59), 69, (57), 67 (43), 163 (42), 94 (37), 107 (37)... 178 (26), 218 (2)]	15.20	1791	0.17			
Unknown [m/z 83, 134 (28), 119 (19), 55 (18), 91 (14), 43 (11), 109 (10)... 216 (4), 249? (0)]	15.72	1837	0.02	20.46	2706	0.02
Unknown [m/z 83, 134 (30), 119 (19), 55 (18), 91 (12)... 216 (4)...]	15.84	1848	0.03			
Unknown [m/z 173, 83 (83), 91 (80), 201 (79), 115 (65)... 216 (31)]	16.21	1882	0.02	18.82	2512	0.01
Total identified		94.51%			92.70%	
Total reported		97.50%			95.34%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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