

Date : July 30, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20G27-PTH01


**Customer identification** : Cedarwood Himalayan - Nepal - C50108811R

**Type** : Essential oil

**Source** : *Cedrus deodara*

**Customer** : Plant Therapy

ANALYSIS

**Method**: PC-MAT-014  - 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** : July 28, 2020

Checked and approved by :



Alexis St-Gelais, M. Sc., chimiste 2013-174

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Bright yellow/orange liquid

**Refractive index:**  $1.5143 \pm 0.0003$  (20 °C; method PC-MAT-016)

*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
4-Methyl-2-pentanone	0.01	Aliphatic ketone
2-Methyl-3-pentanone	tr	Aliphatic ketone
Toluene	tr	Simple phenolic
1-Methylcyclohexene	tr	Alkene
Mesityl oxide	0.17	Aliphatic ketone
Furfural	0.07	Furan
$\alpha$ -Pinene	0.03	Monoterpene
Camphene	0.01	Monoterpene
$\beta$ -Pinene	0.01	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
para-Cymene	0.01	Monoterpene
Limonene	0.03	Monoterpene
Terpinolene	0.01	Monoterpene
para-Cymenene	0.03	Monoterpene
Unknown	0.01	Oxygenated monoterpene
$\alpha$ -Thujone	tr	Monoterpenic ketone
endo-Fenchol	0.01	Monoterpenic alcohol
Limona ketone	1.72	Normonoterpenic ketone
$\alpha,4$ -Dimethyl-3-cyclohexene-1-methanol epimer	0.05	Normonoterpenic alcohol
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.01	Monoterpenic alcohol
4-Methylacetophenone	0.14	Simple phenolic
$\alpha$ -Terpineol	0.03	Monoterpenic alcohol
Unknown	0.02	Unknown
$\alpha$ -Longipinene	0.07	Sesquiterpene
Longicyclene	0.01	Sesquiterpene
$\alpha$ -Ylangene	0.04	Sesquiterpene
Unknown	0.02	Terpene derivative
Unknown	0.06	Terpene derivative
<i>cis</i> - $\beta$ -Elemene	0.04	Sesquiterpene
Unknown	0.10	Sesquiterpene
(3Z)-Hexenyl (3Z)-hexenoate	0.09	Aliphatic ester
Sativene	0.04	Sesquiterpene
Unknown	0.12	Sesquiterpene
$\beta$ -Longipinene	0.05	Sesquiterpene
Longifolene	0.43	Sesquiterpene
Sibirene	0.08	Sesquiterpene
(Z?)-Vestitenone, or analog	0.41	Terpenic ketone
Unknown	0.06	Unknown
Himachala-2,4-diene	0.35	Sesquiterpene
Unknown	0.55	Sesquiterpene
Unknown	0.72	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.09	Sesquiterpene

Himachala-2,4-diene isomer	0.14	Sesquiterpene
$\alpha$ -Himachalene	10.58	Sesquiterpene
( <i>E</i> )-Vestitenone	2.30	Terpenic ketone
Unknown	0.16	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.18	Sesquiterpene
Unknown	0.36	Sesquiterpene
Unknown	0.41	Sesquiterpene
$\gamma$ -Himachalene	6.61	Sesquiterpene
11- $\alpha$ H-Himachala-1,4-diene	1.40	Sesquiterpene
Unknown	0.19	Sesquiterpenic ether
$\beta$ -Himachalene	27.15	Sesquiterpene
$\alpha$ -Muurolene	0.10	Sesquiterpene
Cycloisolongifol-5-ol	0.07	Sesquiterpenic alcohol
Unknown	0.12	Sesquiterpene
$\alpha$ -Dehydro-ar-himachalene	0.45	Sesquiterpene
$\gamma$ -Cadinene	0.02	Sesquiterpene
<i>trans</i> -Calamenene	0.04	Sesquiterpene
$\gamma$ -Dehydro-ar-himachalene	0.56	Sesquiterpene
Unknown	0.48	Sesquiterpene
Unknown	0.07	Sesquiterpene
ar-Himachalene	0.28	Sesquiterpene
$\alpha$ -Calacorene	0.18	Sesquiterpene
( <i>E</i> )- $\alpha$ -Bisabolene	0.93	Sesquiterpene
Unknown	0.15	Oxygenated sesquiterpene
( <i>E</i> )-Nerolidol	0.08	Sesquiterpenic alcohol
Unknown	0.06	Unknown
Himachalene epoxide	0.19	Sesquiterpenic ether
Unknown	0.10	Oxygenated sesquiterpene
Longiborneol	0.46	Sesquiterpenic alcohol
ar-Dihydroturmerone	0.14	Sesquiterpenic ketone
$\beta$ -Himachalene oxide	0.99	Sesquiterpenic ether
Unknown	0.68	Oxygenated sesquiterpene
Unknown	0.13	Oxygenated sesquiterpene
1-epi-Cubenol	0.23	Sesquiterpenic alcohol
6-Methyl-6-meta-tolyl-heptan-2-one	0.01	Miscellaneous
Unknown	0.43	Oxygenated sesquiterpene
Unknown	0.36	Oxygenated sesquiterpene
Himachalol	0.86	Sesquiterpenic alcohol
Allohimachalol	1.14	Sesquiterpenic alcohol
$\beta$ -Atlantone	1.06	Sesquiterpenic ketone
( <i>E</i> )-10,11-Dihydroatlantone	1.39	Sesquiterpenic ketone
( <i>Z</i> )- $\gamma$ -Atlantone	4.51	Sesquiterpenic ketone
Deodarone epimer I	0.62	Sesquiterpenic ketone
Deodarone epimer II	0.70	Sesquiterpenic ketone
( <i>E</i> )- $\gamma$ -Atlantone	5.00	Sesquiterpenic ketone
( <i>Z</i> )- $\alpha$ -Atlantone	2.36	Sesquiterpenic ketone
Unknown	0.28	Oxygenated sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
Unknown	0.20	Oxygenated sesquiterpene
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.20	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene

(E)- $\alpha$ -Atlantone	12.23	Sesquiterpenic ketone
Unknown	0.36	Oxygenated sesquiterpene
Unknown	0.26	Oxygenated sesquiterpene
Unknown	0.26	Oxygenated sesquiterpene
Unknown	0.10	Oxygenated sesquiterpene
<b>Consolidated total</b>	<b>94.39%</b>	

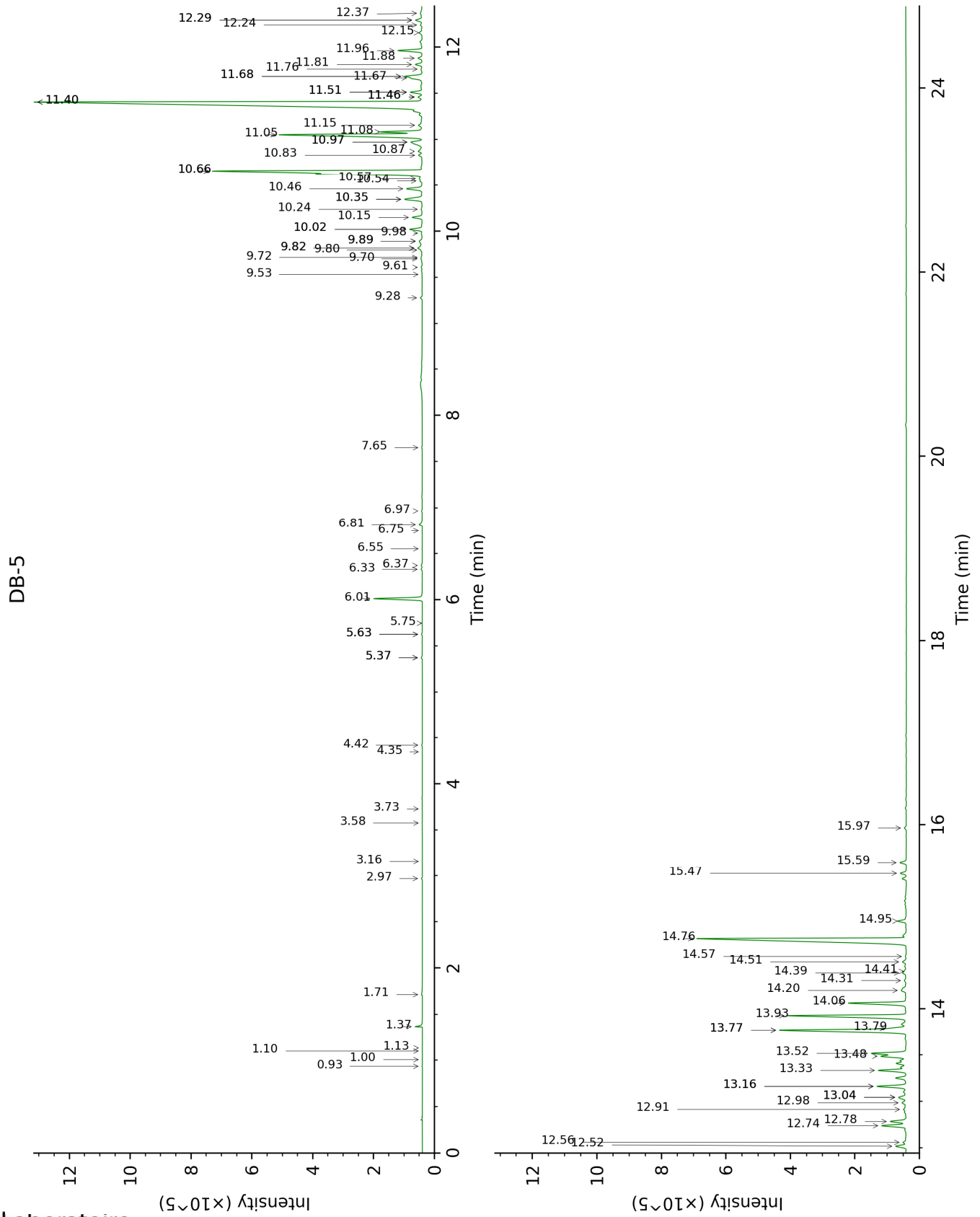
tr: The compound has been detected below 0.005% of total signal.

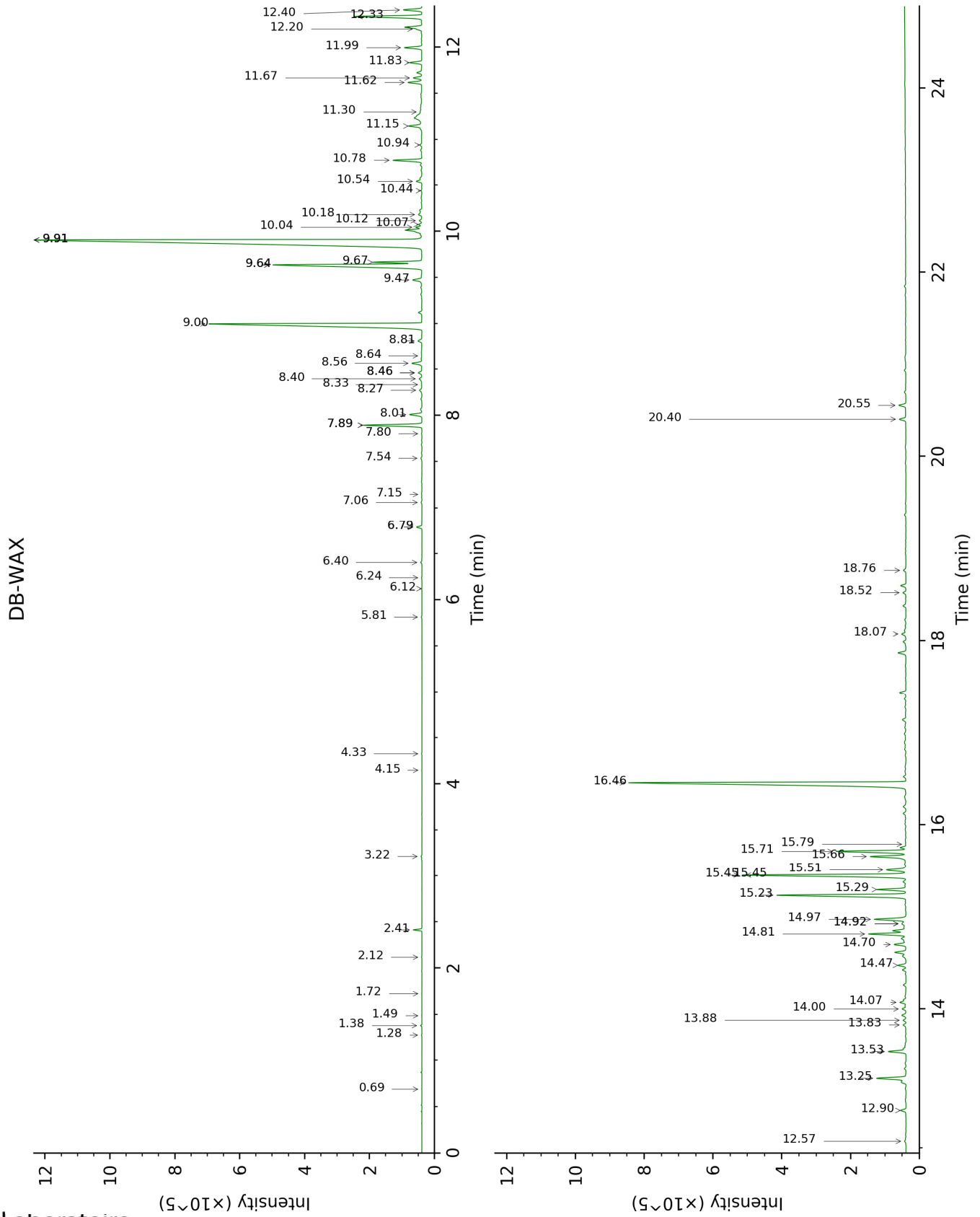
Note: no correction factor was applied

**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.

This page was intentionally left blank. The following pages present the complete data of the analysis.







FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
4-Methyl-2-pentanone	0.93	734	0.01	1.28	972	0.01
2-Methyl-3-pentanone	1.00	744	tr			
Toluene	1.10	758	tr	1.49	1001	tr
1-Methylcyclohexene	1.13	763	tr	0.69	851	tr
Mesityl oxide	1.37	798	0.17	2.41	1094	0.19
Furfural	1.71	830	0.07	6.79*	1415	0.16
α-Pinene	2.97	929	0.03	1.38	989	0.03
Camphene	3.16	942	0.01	1.72	1025	tr
β-Pinene	3.58	970	0.01	2.12	1064	0.01
3-Methyl-3-cyclohexenone	3.73	980	0.01	6.24	1376	0.01
para-Cymene	4.35	1021	0.01	4.15	1226	tr
Limonene	4.42	1025	0.03	3.22	1156	0.02
Terpinolene	5.37*	1086	0.03	4.33	1239	0.01
para-Cymenene	5.37*	1086	[0.03]	6.40	1387	0.03
Unknown [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.63*	1102	0.03	5.81	1345	0.01
α-Thujone	5.63*	1102	[0.03]	6.12	1367	tr
endo-Fenchol	5.75	1110	0.01	8.46*	1542	0.13
Limona ketone	6.01	1127	1.72	7.90*	1498	1.83
α,4-Dimethyl-3-cyclohexene-1-methanol	6.33	1148	0.05			
α,4-Dimethyl-3-cyclohexene-1-methanol epimer	6.37	1150	0.05			
Borneol	6.55	1162	0.01	9.91*	1655	27.60
Terpinen-4-ol	6.75	1175	0.01	8.64	1556	0.01
4-Methylacetophenone	6.81	1179	0.14	10.54	1707	0.18
α-Terpineol	6.97	1189	0.03	9.91*	1655	[27.60]
Unknown [m/z 105, 145 (97), 160 (86), 119 (76), 91 (61)]	7.65	1233	0.02			
α-Longipinene	9.28	1344	0.07	6.79*	1415	[0.16]
Longicyclene	9.53	1361	0.01	7.15	1442	0.01
α-Ylangene	9.61	1367	0.04	7.06	1435	0.02
Unknown [m/z 105, 120 (38), 145 (37), 121 (34), 93 (28), 91 (26)...]	9.70†	1373	0.09			
Unknown [m/z 119, 161 (36), 43 (33), 176 (26), 91 (24), 105 (22)]	9.72†	1374	[0.09]	12.57	1881	0.06
cis-β-Elemene	9.80	1380	0.04	8.33	1532	0.02

Unknown epimer I [m/z 131, 146 (36), 91 (22), 145 (19), 202 (18)]	9.82*	1382	0.26	8.27	1528	0.10
(3Z)-Hexenyl (3Z)- hexenoate	9.82*	1382	[0.26]	10.12	1672	0.09
Sativene	9.89*	1387	0.20	7.54	1470	0.04
Unknown epimer II [m/z 131, 146 (33), 91 (20), 202 (18)]	9.89*	1387	[0.20]	8.40	1537	0.12
β-Longipinene	9.98	1393	0.05	7.80	1492	0.01
Longifolene	10.02*	1396	0.51	8.01	1507	0.43
Sibirene	10.02*	1396	[0.51]	7.90*	1498	[1.83]
(Z?)-Vestitenone, or analog	10.15	1405	0.41	11.83	1816	0.38
Unknown [m/z 105, 93 (61), 120 (55), 145 (54), 91 (52)...]	10.24	1411	0.06	12.40	1866	0.59
Himachala-2,4-diene	10.35*	1420	0.90	8.56	1550	0.35
Unknown [m/z 91, 93 (90), 105 (72), 202 (71), 131 (68), 77 (63), 107 (55), 187 (54)]	10.35*	1420	[0.90]			
Unknown [m/z 105, 91 (70), 93 (65), 43 (61), 120 (57), 145 (50)... 204 (6)]	10.46	1428	0.72			
<i>trans</i> -α-Bergamotene	10.54	1434	0.09	8.46*	1542	[0.13]
Himachala-2,4-diene isomer	10.57	1436	0.14	8.81	1569	0.14
α-Himachalene	10.66*†	1443	12.69	9.00	1583	10.58
(E)-Vestitenone	10.66*†	1443	[12.69]	12.33	1860	2.30
Unknown [m/z 187, 131 (78), 202 (76), 105 (74), 91 (74), 117 (53), 145 (52)]	10.83	1456	0.16	10.04	1666	0.18
(E)-β-Farnesene	10.87	1459	0.18	9.64*	1634	6.84
Unknown [m/z 119, 91 (85), 93 (77), 105 (76), 79 (61), 134 (60), 94 (49), 204 (46)]	10.97*	1466	0.78	9.47	1621	0.36
Unknown [m/z 131, 202 (78), 91 (74), 105 (68), 187 (68), 119 (53), 145 (52)]	10.97*	1466	[0.78]			
γ-Himachalene	11.05	1472	6.61	9.64*	1634	[6.84]
11-αH-Himachala- 1,4-diene	11.08	1474	1.40	9.67	1636	1.31
Unknown [m/z 137, 43 (84), 138 (63), 109 (53), 95 (51), 93 (50), 207 (46)... 222 (21)]	11.15	1480	0.19	10.18	1677	0.16

β-Himachalene	11.40*	1498	27.25	9.91*	1655	[27.60]
α-Muurolene	11.40*	1498	[27.25]	10.07	1669	0.10
Cycloisolongifol-5-ol	11.46*	1502	0.19	10.94	1741	0.07
Unknown [m/z 105, 119 (89), 91 (69), 159 (62), 131 (42), 93 (41), 202 (38)]	11.46*	1502	[0.19]			
α-Dehydro-ar-himachalene	11.51*	1506	0.48	11.62	1798	0.45
γ-Cadinene	11.51*	1506	[0.48]	10.44	1699	0.02
trans-Calamenene	11.67†	1518	1.08	11.30	1770	0.04
γ-Dehydro-ar-himachalene	11.68*†	1520	[1.08]	11.99	1830	0.56
Unknown [m/z 131, 202 (28), 91 (22), 159 (16), 145 (16), 132 (15), 115 (14)]	11.68*†	1520	[1.08]	11.15	1758	0.48
Unknown [m/z 93, 187 (70), 145 (59), 119 (42), 131 (39), 202 (33)]	11.76	1526	0.07			
ar-Himachalene	11.81	1530	0.28	11.67	1802	0.28
α-Calacorene	11.88	1535	0.18	12.20	1848	0.10
(E)-α-Bisabolene	11.96	1542	0.93	10.78	1727	0.91
Unknown [m/z 189, 91 (85), 43 (74), 105 (67), 133 (66), 107 (63), 135 (52)... 220 (20)]	12.16	1557	0.15	14.07	2019	0.20
(E)-Nerolidol	12.24	1563	0.08	13.88	2000	0.09
Unknown [m/z 96, 95 (18), 83 (15), 125 (13), 119 (12), 55 (12), 41 (11)... 218? (tr)]	12.29*	1568	0.31	14.92*	2100	0.18
Himachalene epoxide	12.29*	1568	[0.31]	12.90	1911	0.19
Unknown [m/z 177, 202 (79), 91 (76), 159 (75), 43 (65), 107 (59), 105 (57)...]	12.37	1574	0.10	14.47	2057	0.25
Longiborneol	12.52	1585	0.46	14.70	2078	0.40
ar-Dihydroturmerone	12.56	1589	0.14	14.00	2012	0.13
β-Himachalene oxide	12.74	1603	0.99	13.25	1942	1.02
Unknown [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	12.78	1606	0.68	13.53	1968	0.59
Unknown [m/z 137, 119 (69), 43 (51), 95 (50), 109 (40)... 222 (1)]	12.91	1617	0.13	14.92*	2100	[0.18]

1-epi-Cubenol	12.98	1623	0.23	13.83	1996	0.11
6-Methyl-6-metatolyl-heptan-2-one	13.04*	1628	0.44	15.79	2186	0.01
Unknown [m/z 119, 163 (80), 107 (64), 95 (61), 93 (57), 91 (53)... 220 (11)]	13.04*	1628	[0.44]			
Unknown [m/z 119, 91 (44), 94 (36), 107 (35), 93 (29)... 202 (19)...]	13.16*	1638	1.22			
Himachalol	13.16*	1638	[1.22]	15.29	2137	0.86
Allohimachalol	13.33	1652	1.14	15.66	2172	1.20
$\beta$ -Atlantone	13.48	1664	1.06	14.97	2105	1.09
(E)-10,11-Dihydroatlantone	13.52	1667	1.39	14.81	2089	1.19
(Z)- $\gamma$ -Atlantone	13.77*†	1688	5.86	15.23	2131	4.51
Deodarone epimer I	13.77*†	1688	[5.86]	15.45*	2152	5.62
Deodarone epimer II	13.79†	1690	[5.86]	15.51	2158	0.70
(E)- $\gamma$ -Atlantone	13.93	1701	5.00	15.45*	2152	[5.62]
(Z)- $\alpha$ -Atlantone	14.06	1713	2.36	15.71	2178	2.25
Unknown [m/z 105, 119 (89), 59 (68), 120 (65), 43 (65), 93 (62), 121 (61)...]	14.20	1725	0.28			
Unknown [m/z 91, 79 (83), 105 (68), 109 (63), 41 (590), 93 (58), 107 (57)...]	14.31	1734	0.12	18.07	2426	0.16
Unknown [m/z 83, 91 (28), 105 (25), 55 (21), 43 (17), 119 (17)...]	14.39	1741	0.20			
Unknown [m/z 43, 105 (99), 119 (90), 91 (87), 147 (76), 41 (69), 93 (63)...]	14.41	1742	0.07			
Unknown [m/z 83, 55 (17), 91 (14), 105 (9), 216 (6)...]	14.51	1751	0.20			
Unknown [m/z 91, 105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...]	14.57	1756	0.06	18.52	2476	0.10
(E)- $\alpha$ -Atlantone	14.76	1773	12.23	16.46	2254	12.53
Unknown [m/z 95, 43 (59), 69, (57), 67 (43), 163 (42), 94 (37), 107 (37)... 178 (26), 218 (2)]	14.95	1790	0.36			
Unknown [m/z 83, 134 (28), 119 (19), 55 (18), 91 (14), 43 (11),	15.47	1836	0.26	20.40	2694	0.22

109 (10)... 216 (4), 249? (0)]						
Unknown [m/z 83, 134 (30), 119 (19), 55 (18), 91 (12)... 216 (4)...]	15.59	1847	0.26	20.55	2713	0.22
Unknown [m/z 173, 83 (83), 91 (80), 201 (79), 115 (65)... 216 (31)]	15.97	1881	0.10	18.76	2503	0.09
<b>Total identified</b>	<b>90.12%</b>			<b>87.38%</b>		
<b>Total reported</b>	<b>94.41%</b>			<b>91.28%</b>		

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not 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