

**Date :** March 25, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 20C19-PTH05

**Customer identification :** Cedarwood Himalayan - Nepal - C5010799R

**Type :** Essential oil

**Source :** *Cedrus deodara*

**Customer :** Plant Therapy

**ANALYSIS**

**Method:** PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** March 24, 2020

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Light yellow liquid

**Refractive index:**  $1.5133 \pm 0.0003$  (20 °C)

*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	%	Classe
Mesityl oxide	0.03	Aliphatic ketone
$\alpha$ -Pinene	0.09	Monoterpene
Camphene	0.01	Monoterpene
$\alpha$ -Fenchene	0.01	Monoterpene
$\beta$ -Pinene	0.04	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
para-Cymene	0.01	Monoterpene
Limonene	0.04	Monoterpene
Terpinolene	0.01	Monoterpene
para-Cymenene	0.02	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Phenylethyl alcohol	0.02	Simple phenolic
Limona ketone	0.84	Normonoterpenic ketone
$\alpha$ ,4-Dimethyl-3-cyclohexene-1-methanol	0.04	Normonoterpenic alcohol
$\alpha$ ,4-Dimethyl-3-cyclohexene-1-methanol epimer	0.04	Normonoterpenic alcohol
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	tr	Monoterpenic alcohol
4-Methylacetophenone	0.13	Simple phenolic
$\alpha$ -Terpineol	0.06	Monoterpenic alcohol
Unknown	tr	Unknown
$\alpha$ -Longipinene	0.14	Sesquiterpene
Longicyclene	0.01	Sesquiterpene
$\alpha$ -Ylangene	0.07	Sesquiterpene
Unknown	0.03	Terpene derivative
Unknown	0.02	Terpene derivative
Unknown	0.19	Sesquiterpene
(3Z)-Hexenyl (3Z)-hexenoate	0.15	Aliphatic ester
Unknown	0.26	Sesquiterpene
Sativene	0.06	Sesquiterpene
$\beta$ -Longipinene	0.03	Sesquiterpene
Sibirene	0.13	Sesquiterpene
Longifolene	0.70	Sesquiterpene
(Z?)-Vestitenone, or analog	0.12	Terpenic ketone
$\beta$ -Caryophyllene	0.03	Sesquiterpene
Unknown	0.04	Unknown
Himachala-2,4-diene	0.54	Sesquiterpene
Unknown	0.02	Sesquiterpene
Unknown	0.23	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.01	Sesquiterpene
Himachala-2,4-diene isomer	0.23	Sesquiterpene
$\alpha$ -Himachalene	16.13	Sesquiterpene
( <i>E</i> )-Vestitenone	0.48	Terpenic ketone
Unknown	0.25	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.44	Sesquiterpene
Unknown	0.31	Sesquiterpene
Unknown	0.68	Sesquiterpene

γ-Himachalene	9.15	Sesquiterpene
11-αH-Himachala-1,4-diene	1.81	Sesquiterpene
Unknown	0.21	Sesquiterpenic ether
β-Himachalene	35.93	Sesquiterpene
Cycloisolongifol-5-ol	0.13	Sesquiterpenic alcohol
Unknown	0.12	Sesquiterpene
α-Dehydro-ar-himachalene	0.59	Sesquiterpene
<i>trans</i> -Calamenene	0.06	Sesquiterpene
γ-Dehydro-ar-himachalene	0.56	Sesquiterpene
Unknown	0.66	Sesquiterpene
Unknown	0.05	Sesquiterpene
ar-Himachalene	0.25	Sesquiterpene
α-Calacorene	0.13	Sesquiterpene
( <i>E</i> )-α-Bisabolene	1.16	Sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
( <i>E</i> )-Nerolidol	0.08	Sesquiterpenic alcohol
Himachalene epoxide	0.23	Sesquiterpenic ether
Unknown	0.18	Unknown
Unknown	0.07	Oxygenated sesquiterpene
Longiborneol	0.28	Sesquiterpenic alcohol
ar-Dihydroturmerone	0.01	Sesquiterpenic ketone
β-Himachalene oxide	0.27	Sesquiterpenic ether
Unknown	0.57	Oxygenated sesquiterpene
Unknown	0.19	Oxygenated sesquiterpene
1-epi-Cubenol	0.06	Sesquiterpenic alcohol
6-Methyl-6-meta-tolyl-heptan-2-one	0.09	Miscellaneous
Unknown	0.35	Oxygenated sesquiterpene
Himachalol	1.33	Sesquiterpenic alcohol
Allohimachalol	0.65	Sesquiterpenic alcohol
β-Atlantone	0.31	Sesquiterpenic ketone
( <i>E</i> )-10,11-Dihydroatlantone	0.30	Sesquiterpenic ketone
Unknown	0.16	Oxygenated sesquiterpene
( <i>Z</i> )-γ-Atlantone	1.98	Sesquiterpenic ketone
Deodarone epimer I	0.51	Sesquiterpenic ketone
Deodarone epimer II	0.43	Sesquiterpenic ketone
( <i>E</i> )-γ-Atlantone	2.21	Sesquiterpenic ketone
( <i>Z</i> )-α-Atlantone	2.03	Sesquiterpenic ketone
Unknown	0.29	Oxygenated sesquiterpene
Unknown	0.14	Oxygenated sesquiterpene
Unknown	0.16	Oxygenated sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
Unknown	0.37	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
( <i>E</i> )-α-Atlantone	8.24	Sesquiterpenic ketone
Unknown	0.35	Oxygenated sesquiterpene
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
<b>Consolidated total</b>	<b>95.92%</b>	

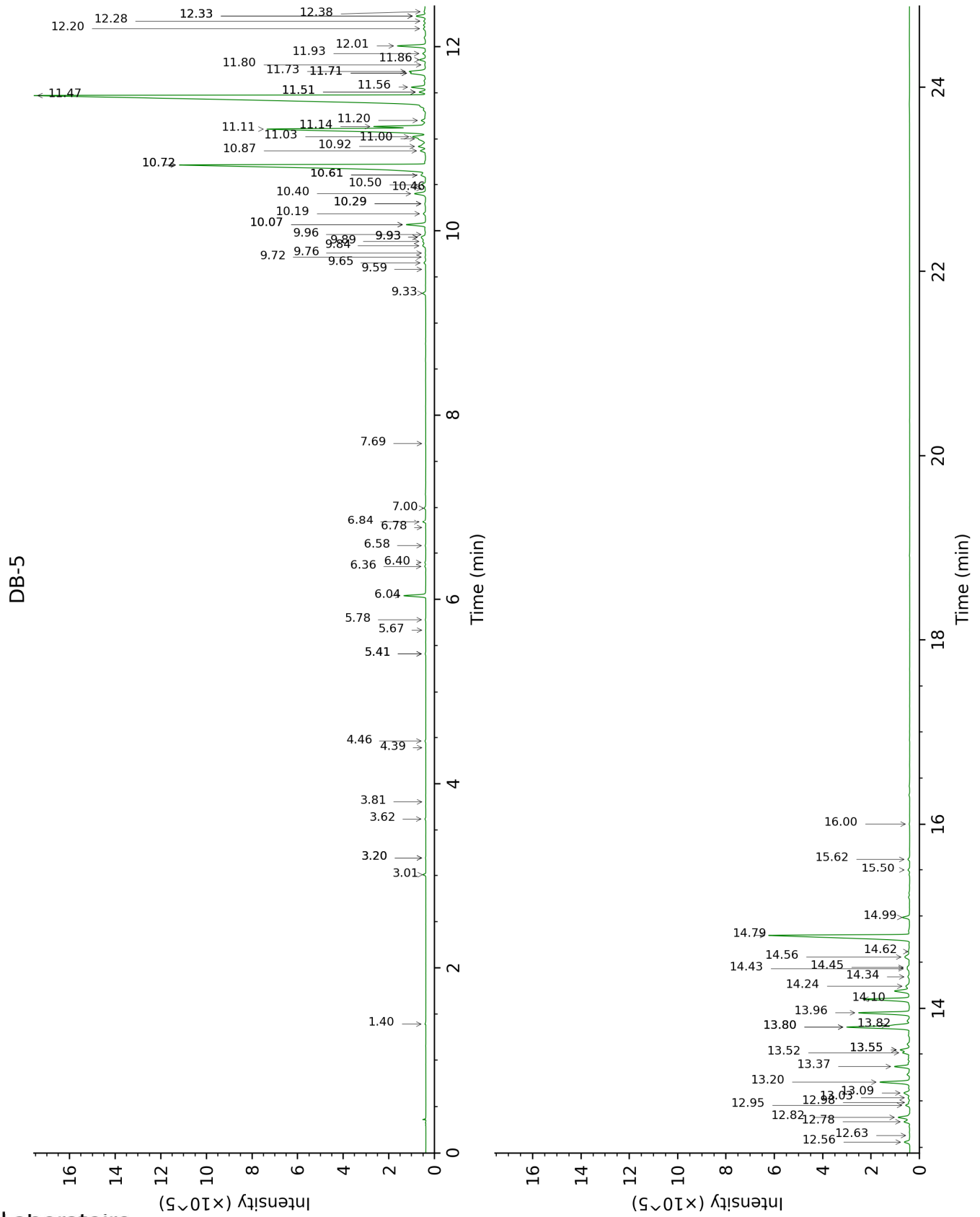
tr: The compound has been detected below 0.005% of total signal.

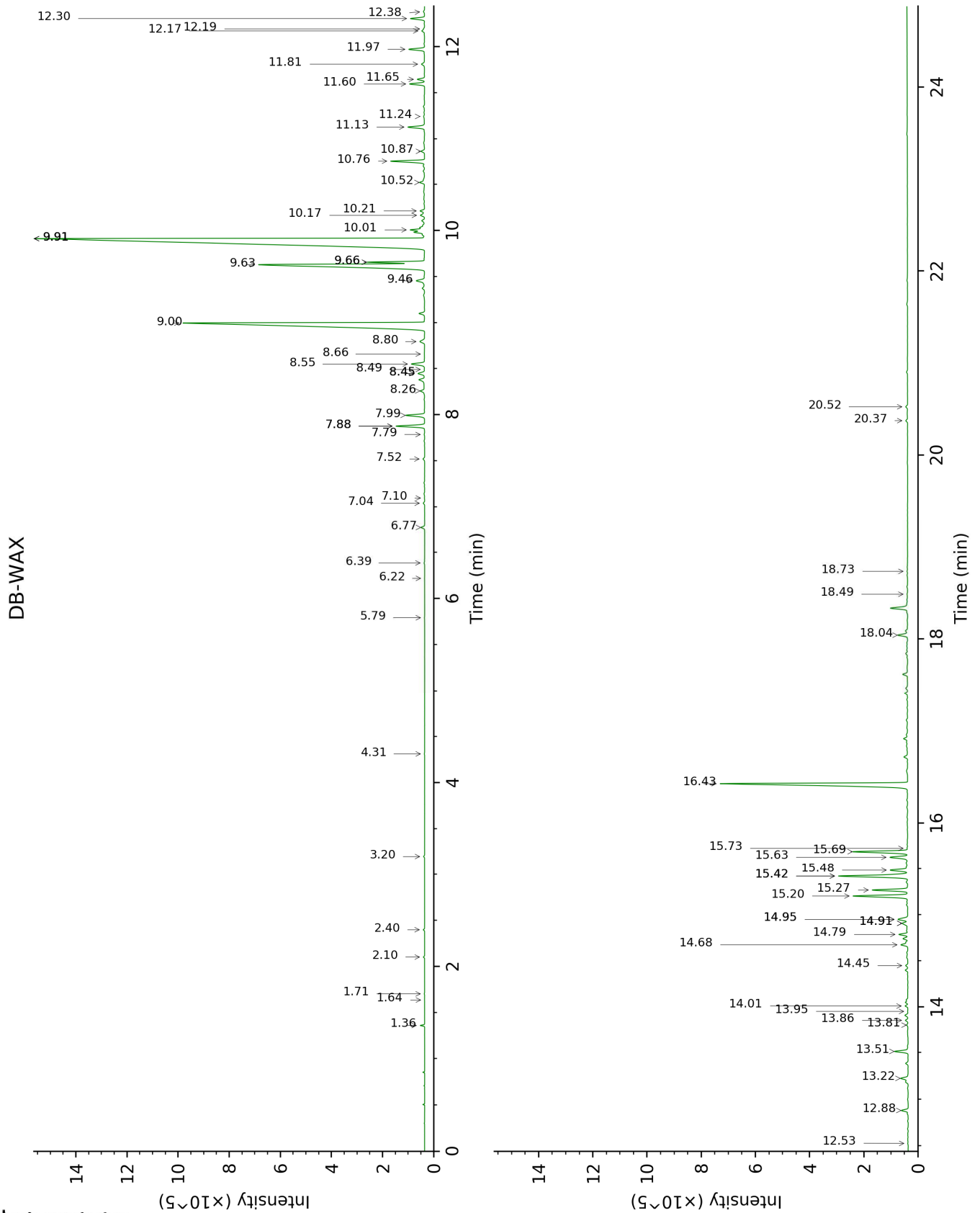
Note: no correction factor was applied

**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	%
Mesityl oxide	1.40	800	0.03	2.40	1095	0.04
α-Pinene	3.01	930	0.09	1.36	992	0.09
Camphene	3.20*	942	0.02	1.71	1027	0.01
α-Fenchene	3.20*	942	[0.02]	1.64	1020	0.01
β-Pinene	3.62	970	0.04	2.10	1066	0.03
3-Methyl-3-cyclohexenone	3.80	982	0.01	6.22	1376	0.01
para-Cymene	4.39	1020	0.01			
Limonene	4.46	1025	0.04	3.20	1157	0.03
Terpinolene	5.41*	1085	0.03	4.31	1239	0.01
para-Cymenene	5.41*	1085	[0.03]	6.39	1388	0.02
Unknown [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.67	1101	0.01	5.79	1345	0.01
Phenylethyl alcohol	5.78	1109	0.02	12.19	1851	0.02
Limona ketone	6.04	1126	0.84	7.88*	1498	1.00
α,4-Dimethyl-3-cyclohexene-1-methanol	6.36	1146	0.04			
α,4-Dimethyl-3-cyclohexene-1-methanol epimer	6.40	1149	0.04			
Borneol	6.58	1161	0.02	9.91*	1658	36.33
Terpinen-4-ol	6.78	1174	tr	8.66	1558	0.01
4-Methylacetophenone	6.84	1178	0.13	10.52	1707	0.19
α-Terpineol	7.00	1188	0.06	9.91*	1658	[36.33]
Unknown [m/z 105, 145 (97), 160 (86), 119 (76), 91 (61)]	7.69	1235	tr			
α-Longipinene	9.33	1352	0.14	6.77	1416	0.12
Longicyclene	9.58	1362	0.01	7.10	1440	0.01
α-Ylangene	9.66	1368	0.07	7.04	1436	0.05
Unknown [m/z 105, 120 (38), 145 (37), 121 (34), 93 (28), 91 (26)...]	9.72	1372	0.03			
Unknown [m/z 119, 161 (36), 43 (33), 176 (26), 91 (24), 105 (22)]	9.76	1375	0.02	12.52	1880	0.02
Unknown epimer I [m/z 131, 146 (36), 91 (22), 145 (19), 202 (18)]	9.84	1380	0.19	8.26	1527	0.19
(3Z)-Hexenyl (3Z)-hexenoate	9.89	1384	0.15	10.17	1678	0.18
Unknown epimer II [m/z 131, 146 (33), 91	9.93*	1387	0.32	8.44*	1542	0.28

(20), 202 (18)]						
Sativene	9.93*	1387	[0.32]	7.52	1471	0.06
β-Longipinene	9.96	1389	0.03	7.78	1491	0.02
Sibirene	10.07*	1397	0.83	7.88*	1498	[1.00]
Longifolene	10.07*	1397	[0.83]	7.99	1507	0.70
(Z?)-Vestitenone, or analog	10.19	1405	0.12	11.81	1817	0.14
β-Caryophyllene	10.30*	1413	0.07	8.44*	1542	[0.28]
Unknown [m/z 105, 93 (61), 120 (55), 145 (54), 91 (52)...]	10.30*	1413	[0.07]	12.38	1867	0.04
Himachala-2,4-diene	10.40	1421	0.54	8.55	1550	0.52
Unknown [m/z 91, 93 (90), 105 (72), 202 (71), 131 (68), 77 (63), 107 (55), 187 (54)]	10.46	1425	0.02			
Unknown [m/z 105, 91 (70), 93 (65), 43 (61), 120 (57), 145 (50)... 204 (6)]	10.50	1428	0.23			
<i>trans</i> -α-Bergamotene	10.60*	1436	0.34	8.49	1545	0.01
Himachala-2,4-diene isomer	10.60*	1436	[0.34]	8.80	1569	0.23
α-Himachalene	10.72*	1445	16.64	9.00	1584	16.13
( <i>E</i> )-Vestitenone	10.72*	1445	[16.64]	12.30	1860	0.48
Unknown [m/z 187, 131 (78), 202 (76), 105 (74), 91 (74), 117 (53), 145 (52)]	10.87	1456	0.25	10.01	1665	0.47
( <i>E</i> )-β-Farnesene	10.92	1460	0.44	9.66*†	1637	[11.02]
Unknown [m/z 119, 91 (85), 93 (77), 105 (76), 79 (61), 134 (60), 94 (49), 204 (46)]	11.00	1466	0.31	9.46	1621	0.40
Unknown [m/z 131, 202 (78), 91 (74), 105 (68), 187 (68), 119 (53), 145 (52)]	11.03	1468	0.68			
γ-Himachalene	11.11	1474	9.15	9.63†	1635	11.02
11-αH-Himachala-1,4-diene	11.14	1476	1.81	9.66*†	1637	[11.02]
Unknown [m/z 137, 43 (84), 138 (63), 109 (53), 95 (51), 93 (50), 207 (46)... 222 (21)]	11.20	1481	0.21	10.21	1682	0.16
β-Himachalene	11.47	1501	35.93	9.91*	1658	[36.33]
Cycloisolongifol-5-ol	11.51*	1504	0.25	10.87	1736	0.13
Unknown [m/z 105, 119 (89), 91 (69), 159 (62), 131 (42), 93 (41), 202 (38)]	11.51*	1504	[0.25]			
α-Dehydro-ar-	11.56	1508	0.59	11.60	1798	0.52

himachalene						
<i>trans</i> -Calamenene	11.71*	1519	0.63	11.24	1768	0.06
$\gamma$ -Dehydro-ar-himachalene	11.71*	1519	[0.63]	11.97	1831	0.56
Unknown [m/z 131, 202 (28), 91 (22), 159 (16), 145 (16), 132 (15), 115 (14)]	11.73	1521	0.66	11.13	1758	0.63
Unknown [m/z 93, 187 (70), 145 (59), 119 (42), 131 (39), 202 (33)]	11.80	1526	0.05			
ar-Himachalene	11.86	1531	0.25	11.65	1803	0.24
$\alpha$ -Calacorene	11.93	1536	0.13	12.17	1849	0.11
( <i>E</i> )- $\alpha$ -Bisabolene	12.01	1543	1.16	10.76	1728	1.17
Unknown [m/z 189, 91 (85), 43 (74), 105 (67), 133 (66), 107 (63), 135 (52)... 220 (20)]	12.20	1557	0.11	14.01	2018	0.10
( <i>E</i> )-Nerolidol	12.28	1564	0.08	13.86	2003	0.09
Himachalene epoxide	12.33*	1568	0.41	12.88	1912	0.23
Unknown [m/z 96, 95 (18), 83 (15), 125 (13), 119 (12), 55 (12), 41 (11)... 218? (tr)]	12.33*	1568	[0.41]	14.91*†	2104	0.69
Unknown [m/z 177, 202 (79), 91 (76), 159 (75), 43 (65), 107 (59), 105 (57)...]	12.38	1572	0.07	14.45	2059	0.08
Longiborneol	12.56	1586	0.28	14.68	2081	0.26
ar-Dihydroturmerone	12.63	1591	0.01	13.95	2012	0.01
$\beta$ -Himachalene oxide	12.78	1603	0.27	13.22	1944	0.30
Unknown [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	12.82	1607	0.57	13.51	1970	0.49
Unknown [m/z 137, 119 (69), 43 (51), 95 (50), 109 (40)... 222 (1)]	12.95	1617	0.19	14.95*†	2108	[0.69]
1-epi-Cubenol	12.98	1620	0.06	13.81	1998	0.05
6-Methyl-6-metatolyl-heptan-2-one	13.03	1624	0.09	15.73	2186	0.02
Unknown [m/z 119, 163 (80), 107 (64), 95 (61), 93 (57), 91 (53)... 220 (11)]	13.08	1628	0.35			
Himachalol	13.20	1638	1.33	15.27	2140	1.17
Allohimachalol	13.37	1652	0.65	15.63	2176	0.67

$\beta$ -Atlantone	13.52	1664	0.31	14.91*†	2104	[0.69]
(E)-10,11-Dihydroatlantone	13.55*	1667	0.46	14.79	2092	0.30
Unknown [m/z 83, 55 (19), 119 (14), 120 (10), 84 (6)... 218 (1)]	13.55*	1667	[0.46]	14.95*†	2108	[0.69]
(Z)- $\gamma$ -Atlantone	13.80*	1688	2.82	15.20	2133	1.98
Deodarone epimer I	13.80*	1688	[2.82]	15.42*	2155	2.72
Deodarone epimer II	13.82	1689	0.43	15.48	2161	0.64
(E)- $\gamma$ -Atlantone	13.96	1700	2.21	15.42*	2155	[2.72]
(Z)- $\alpha$ -Atlantone	14.10	1713	2.03	15.69	2182	1.88
Unknown [m/z 105, 119 (89), 59 (68), 120 (65), 43 (65), 93 (62), 121 (61)...]	14.24	1725	0.29			
Unknown [m/z 91, 79 (83), 105 (68), 109 (63), 41 (590), 93 (58), 107 (57)...]	14.34	1734	0.14	18.04	2432	0.38
Unknown [m/z 83, 91 (28), 105 (25), 55 (21), 43 (17), 119 (17)...]	14.43	1742	0.16			
Unknown [m/z 43, 105 (99), 119 (90), 91 (87), 147 (76), 41 (69), 93 (63)...]	14.45	1743	0.12			
Unknown [m/z 83, 55 (17), 91 (14), 105 (9), 216 (6)...]	14.56	1753	0.37			
Unknown [m/z 91, 105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...]	14.62	1758	0.11	18.49	2482	0.02
(E)- $\alpha$ -Atlantone	14.79	1773	8.24	16.43	2258	8.18
Unknown [m/z 95, 43 (59), 69, (57), 67 (43), 163 (42), 94 (37), 107 (37)... 178 (26), 218 (2)]	14.99	1790	0.35			
Unknown [m/z 83, 134 (28), 119 (19), 55 (18), 91 (14), 43 (11), 109 (10)... 216 (4), 249? (0)]	15.50	1836	0.07	20.37	2704	0.07
Unknown [m/z 83, 134 (30), 119 (19), 55 (18), 91 (12)... 216 (4)...]	15.62	1847	0.08	20.52	2722	0.07
Unknown [m/z 173, 83 (83), 91 (80), 201 (79), 115 (65)... 216 (31)]	16.00	1882	0.02	18.73	2510	0.02

<b>Total identified</b>	<b>90.72%</b>	<b>89.74%</b>
<b>Total reported</b>	<b>96.38%</b>	<b>92.88%</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