

Date : 2023-11-28

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 23K21-PTH03

**Customer Identification :** Atlas Cedarwood - Morocco - C61108R

**Type :** Essential Oil

**Source :** *Cedrus atlantica*

**Customer :** Plant Therapy

Checked and approved by:

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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 :** Alexis St-Gelais, Ph. D., Chimiste 2013-174

**Date :** 2023-11-28

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.513 \pm 0.0003$  (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
Methyl isobutyl ketone	tr	Aliphatic ketone
Toluene	tr	Simple phenolic
Mesityl oxide	0.08	Aliphatic ketone
$\alpha$ -Pinene	0.03	Monoterpene
Camphene	0.01	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	tr	Monoterpene
Limonene	0.03	Monoterpene
Terpinolene	0.02	Monoterpene
endo-Fenchol	0.01	Monoterpenic alcohol
Limona ketone	0.68	Normonoterpenic ketone
$\alpha$ ,4-Dimethyl-3-cyclohexene-1-methanol	0.05	Normonoterpenic alcohol
$\alpha$ ,4-Dimethyl-3-cyclohexene-1-methanol epimer	0.05	Normonoterpenic alcohol
Borneol	0.02	Monoterpenic alcohol
4-Methylacetophenone	0.12	Simple phenolic
Unknown	0.01	Unknown
$\alpha$ -Longipinene	0.08	Sesquiterpene
Longicyclene	0.01	Sesquiterpene
$\alpha$ -Ylangene	0.06	Sesquiterpene
$\alpha$ -Copaene	0.03	Sesquiterpene
Unknown	0.01	Terpene derivative
Unknown	0.30	Sesquiterpene
Sativene	0.04	Sesquiterpene
(3Z)-Hexenyl (3Z)-hexenoate	0.15	Aliphatic ester
Unknown	0.55	Sesquiterpene
$\beta$ -Elemene	0.07	Sesquiterpene
$\beta$ -Longipinene	0.05	Sesquiterpene
Sibirene	0.59	Sesquiterpene
Longifolene	0.58	Sesquiterpene
(Z?)-Vestitenone, or analog	0.09	Terpenic ketone
$\alpha$ -Cedrene	0.01	Sesquiterpene
$\beta$ -Caryophyllene	0.03	Sesquiterpene
Himachala-2,4-diene	0.49	Sesquiterpene
Unknown	0.03	Sesquiterpene
Unknown	0.13	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.04	Sesquiterpene
Himachala-2,4-diene isomer	0.20	Sesquiterpene
$\alpha$ -Himachalene	15.26	Sesquiterpene

(E)-Vestitenone	0.49	Terpenic ketone
$\alpha$ -Humulene	0.08	Sesquiterpene
Unknown	0.45	Sesquiterpene
(E)- $\beta$ -Farnesene	0.16	Sesquiterpene
Unknown	0.44	Sesquiterpene
Unknown	0.40	Sesquiterpene
$\gamma$ -Himachalene	9.60	Sesquiterpene
11- $\alpha$ H-Himachala-1,4-diene	1.56	Sesquiterpene
Unknown	0.35	Sesquiterpenic ether
$\beta$ -Himachalene	39.96	Sesquiterpene
$\alpha$ -Muurolene	0.16	Sesquiterpene
Cycloisolongifol-5-ol	0.26	Sesquiterpenic alcohol
(Z)- $\alpha$ -Bisabolene	0.04	Sesquiterpene
$\alpha$ -Dehydro-ar-himachalene	1.73	Sesquiterpene
$\gamma$ -Cadinene	0.03	Sesquiterpene
Unknown CEAT IV [m/z 146, 193 (97), 131 (89), 91 (54), 159 (54)...]	0.19	Unknown
<i>trans</i> -Calamenene	0.14	Sesquiterpene
$\gamma$ -Dehydro-ar-himachalene	1.62	Sesquiterpene
$\delta$ -Cadinene	1.54	Sesquiterpene
Unknown	1.36	Sesquiterpene
Unknown	0.22	Sesquiterpene
ar-Himachalene	0.51	Sesquiterpene
$\alpha$ -Calacorene	0.75	Sesquiterpene
(E)- $\alpha$ -Bisabolene	0.53	Sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
(E)-Nerolidol	0.10	Sesquiterpenic alcohol
Himachalene epoxide	0.54	Sesquiterpenic ether
Unknown	0.34	Unknown
Unknown	0.11	Oxygenated sesquiterpene
Longiborneol	0.43	Sesquiterpenic alcohol
$\beta$ -Himachalene oxide	0.44	Sesquiterpenic ether
Unknown	1.06	Oxygenated sesquiterpene
Unknown	0.16	Oxygenated sesquiterpene
1-epi-Cubenol	0.81	Sesquiterpenic alcohol
6-Methyl-6- <i>meta</i> -tolyl-heptan-2-one	0.14	Miscellaneous
Unknown	0.23	Oxygenated sesquiterpene
Himachalol	0.42	Sesquiterpenic alcohol
Unknown	0.15	Oxygenated sesquiterpene
Allohimachalol	0.93	Sesquiterpenic alcohol
$\beta$ -Atlantone	0.36	Sesquiterpenic ketone
(E)-10,11-Dihydroatlantone	0.13	Sesquiterpenic ketone
Deodarone epimer I	0.89	Sesquiterpenic ketone
(Z)- $\gamma$ -Atlantone	0.75	Sesquiterpenic ketone
Deodarone epimer II	0.91	Sesquiterpenic ketone

(E)- $\gamma$ -Atlantone	0.83	Sesquiterpenic ketone
(Z)- $\alpha$ -Atlantone	0.61	Sesquiterpenic ketone
Unknown	0.11	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
(E)- $\alpha$ -Atlantone	2.93	Sesquiterpenic ketone
Unknown	0.12	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
<b>Consolidated total</b>	<b>96.35</b>	

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

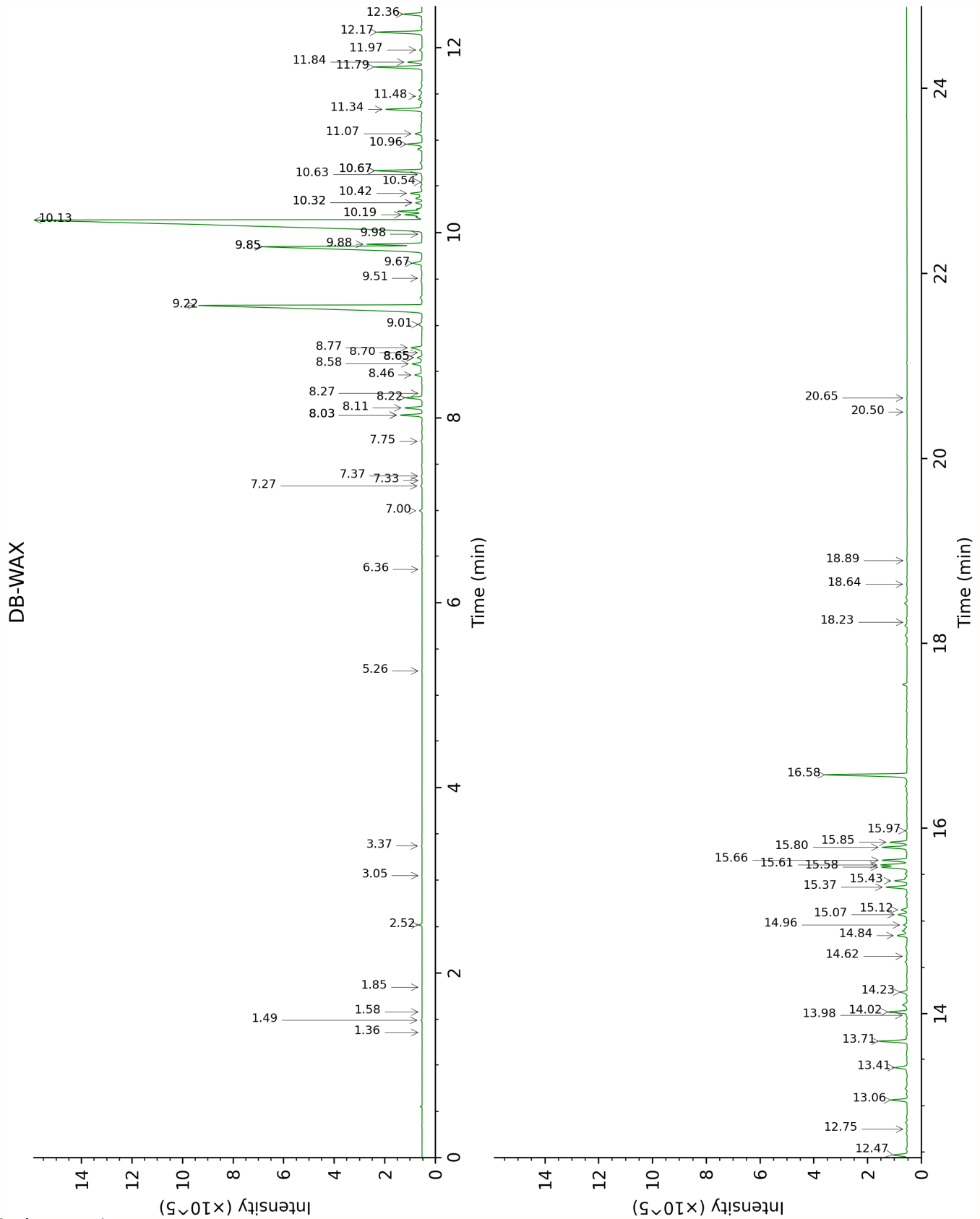
Note: no correction factor was applied

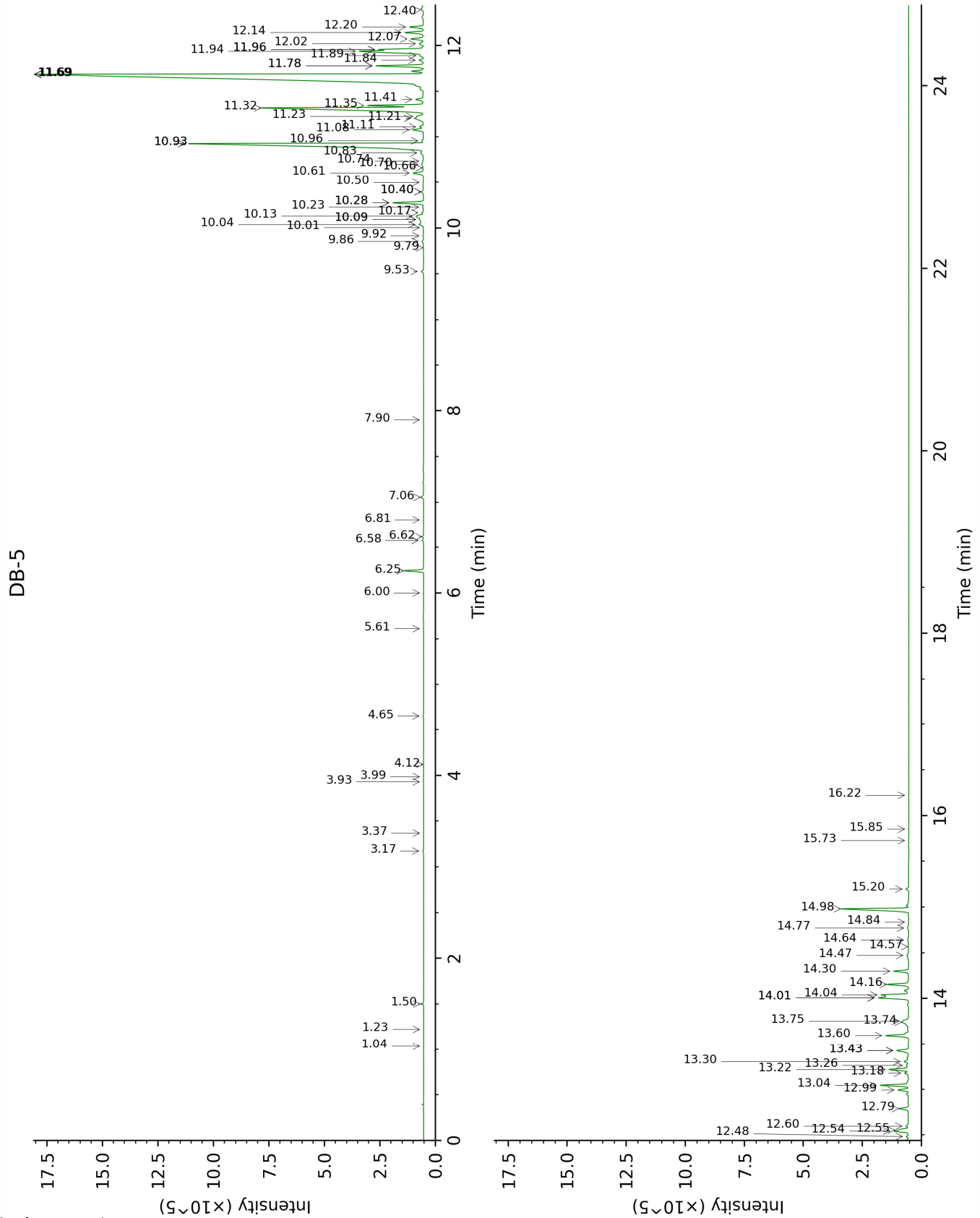
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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







FULL ANALYSIS DATA

Methyl isobutyl ketone	Column DB-WAX			Column DB-5		
	1.36	971.8	0.01	1.04	733.9	tr
Toluene	1.58	1002.5	tr	1.22	759.8	tr
Mesityl oxide	2.52	1091.0	0.08	1.50	798.0	0.08
$\alpha$ -Pinene	1.49	991.7	0.03	3.18	931.4	0.03
Camphene	1.85	1027.8	tr	3.37	944.2	0.01
3-Methyl-3-cyclohexenone	6.36	1373.7	0.01	3.93	981.1	0.01
6-Methyl-5-hepten-2-one	5.26	1293.0	0.01	3.99	984.7	0.01
Myrcene	3.05	1132.4	tr	4.12	993.6	tr
Limonene	3.37	1156.6	0.02	4.65	1027.1	0.03
Terpinolene				5.61	1087.1	0.02
endo-Fenchol	8.65*	1542.7	[0.18]	6.00	1111.6	0.01
Limona ketone	8.03*	1495.4	[0.70]	6.25	1127.1	0.68
$\alpha$ ,4-Dimethyl-3-cyclohexene-1-methanol				6.58	1148.1	0.05
$\alpha$ ,4-Dimethyl-3-cyclohexene-1-methanol epimer				6.62	1150.7	0.05
Borneol	9.98	1647.3	0.01	6.81	1162.9	0.02
4-Methylacetophenone	10.67*	1703.1	[1.66]	7.06	1178.6	0.12
Unknown CEDE XXVIII [m/z 105, 145 (97), 160 (86), 119 (76), 91 (61)]				7.90	1233.9	0.01
$\alpha$ -Longipinene	7.00	1419.8	0.09	9.53	1344.5	0.08
Longicyclene	7.33	1443.7	0.01	9.79	1362.6	0.01
$\alpha$ -Ylangene	7.27	1439.3	0.04	9.86	1367.4	0.06
$\alpha$ -Copaene	7.37	1447.2	0.02	9.92	1371.8	0.03
Unknown CULO IV [m/z 119, 161 (36), 43 (33), 176 (26), 91 (24), 105 (22)]	12.75	1881.2	0.03	10.01	1378.0	0.01
Unknown CEDE XXVII epimer I [m/z 131, 146 (36), 91 (22), 145 (19), 202 (18)]	8.46	1528.5	0.30	10.04	1380.3	0.30
Sativene	7.75	1474.7	0.04	10.09*	1384.2	[0.18]
(3Z)-Hexenyl (3Z)-hexenoate	10.32*	1674.3	[0.21]	10.09*	1384.2	[0.18]
Unknown CEDE XXVII	8.58	1537.6	0.53	10.13	1386.9	0.55

epimer II [m/z 131, 146 (33), 91 (20), 202 (18)]						
β-Elemene	8.65*	1542.7	[0.18]	10.17	1389.4	0.07
β-Longipinene	8.03*	1495.4	[0.70]	10.23	1393.7	0.05
Sibirene	8.11	1501.4	0.59	10.28*	1397.1	[1.16]
Longifolene	8.22	1509.7	0.58	10.28*	1397.1	[1.16]
(Z?)-Vestitenone, or analog	11.98	1813.3	0.09	10.40*	1405.5	[0.11]
α-Cedrene	8.27	1513.3	0.01	10.40*	1405.5	[0.11]
β-Caryophyllene	8.70	1546.9	0.03	10.50	1413.1	0.03
Himachala-2,4-diene	8.76	1551.5	0.49	10.61	1421.2	0.49
Unknown CEDE III [m/z 91, 93 (90), 105 (72), 202 (71), 131 (68), 77 (63), 107 (55), 187 (54)]				10.66	1425.4	0.03
Unknown CEDE IV [m/z 105, 91 (70), 93 (65), 43 (61), 120 (57), 145 (50)... 204 (6)]				10.70	1428.2	0.13
trans-α-Bergamotene	8.65*	1542.7	[0.18]	10.74	1430.9	0.04
Himachala-2,4-diene isomer	9.01	1570.6	0.17	10.83	1437.5	0.20
α-Himachalene	9.22	1586.3	15.26	10.93*	1445.1	[15.78]
(E)-Vestitenone	12.47	1856.7	0.49	10.93*	1445.1	[15.78]
α-Humulene	9.51	1609.3	0.03	10.96	1447.5	0.08
Unknown CEDE V [m/z 187, 131 (78), 202 (76), 105 (74), 91 (74), 117 (53), 145 (52)]	10.19	1664.0	0.59	11.08	1456.3	0.45
(E)-β-Farnesene	9.85*	1636.5	[9.27]	11.11	1458.8	0.16
Unknown CEDE VI [m/z 119, 91 (85), 93 (77), 105 (76), 79 (61), 134 (60), 94 (49), 204 (46)]	9.67	1622.3	0.44	11.21*†	1465.7	[0.60]
Unknown CEDE VII [m/z 131, 202 (78), 91 (74), 105 (68), 187 (68), 119 (53), 145 (52)]				11.23*†	1467.2	[0.25]
γ-Himachalene	9.85*	1636.5	[9.27]	11.32*†	1474.1	[9.21]
11-αH-Himachala-	9.88	1638.6	1.56	11.35*†	1476.1	[1.94]

1,4-diene						
Unknown CEDE VIII [m/z 137, 43 (84), 138 (63), 109 (53), 95 (51), 93 (50), 207 (46)... 222 (21)]	10.42	1682.5	0.45	11.41	1481.0	0.35
$\beta$ -Himachalene	10.14	1659.4	39.96	11.69*	1501.4	[40.41]
$\alpha$ -Muurolene	10.32*	1674.3	[0.21]	11.69*	1501.4	[40.41]
Cycloisolongifol-5-ol	11.07	1736.5	0.26	11.69*	1501.4	[40.41]
(Z)- $\alpha$ -Bisabolene	10.54	1692.1	0.04	11.69*	1501.4	[40.41]
$\alpha$ -Dehydro-ar- himachalene	11.79	1797.2	1.73	11.78*	1508.5	[1.79]
$\gamma$ -Cadinene	10.63	1699.6	0.03	11.78*	1508.5	[1.79]
Unknown CEAT IV [m/z 146, 193 (97), 131 (89), 91 (54), 159 (54)...]				11.84	1513.4	0.19
<i>trans</i> -Calamenene	11.48	1770.4	0.14	11.89	1517.2	0.14
$\gamma$ -Dehydro-ar- himachalene	12.17	1830.1	1.62	11.94*†	1520.9	[3.31]
$\delta$ -Cadinene	10.67*	1703.1	[1.66]	11.96*†	1522.4	[1.27]
Unknown CEDE IX [m/z 131, 202 (28), 91 (22), 159 (16), 145 (16), 132 (15), 115 (14)]	11.34	1758.6	1.36	11.96*†	1522.4	[1.27]
Unknown CEAT II [m/z 93, 187 (70), 145 (59), 119 (42), 131 (39), 202 (33)]				12.02	1527.4	0.22
ar-Himachalene	11.84	1801.8	0.48	12.07	1531.5	0.51
$\alpha$ -Calacorene	12.36	1847.1	0.67	12.14	1537.0	0.75
(E)- $\alpha$ -Bisabolene	10.96	1727.0	0.51	12.20	1541.7	0.53
Unknown CEDE X [m/z 189, 91 (85), 43 (74), 105 (67), 133 (66), 107 (63), 135 (52)... 220 (20)]	14.24	2018.3	0.26	12.40	1556.8	0.12
(E)-Nerolidol	13.98	1994.3	0.04	12.48	1563.6	0.10
Himachalene epoxide	13.06	1909.6	0.54	12.54*†	1568.3	[0.60]
Unknown CEDE XI [m/z 96, 95 (18), 83 (15), 125 (13), 119 (12), 55 (12), 41 (11)...]				12.56*†	1569.2	[0.28]

218? (tr)]						
Unknown CEDE XII [m/z 177, 202 (79), 91 (76), 159 (75), 43 (65), 107 (59), 105 (57)...]	14.62	2055.1	0.04	12.60	1572.6	0.11
Longiborneol	14.84	2076.5	0.38	12.79	1587.6	0.43
β-Himachalene oxide	13.41	1941.7	0.46	12.99	1603.6	0.44
Unknown CEDE XIII [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	13.71	1968.6	1.00	13.04	1607.8	1.06
Unknown CEDE XIV [m/z 137, 119 (69), 43 (51), 95 (50), 109 (40)... 222 (1)]	15.12	2103.7	0.24	13.18	1618.8	0.16
1-epi-Cubenol	14.02	1997.8	0.64	13.22	1622.0	0.81
6-Methyl-6- <i>meta</i> - tolyl-heptan-2-one	15.98	2188.9	0.06	13.26	1625.7	0.14
Unknown CEDE XV [m/z 119, 163 (80), 107 (64), 95 (61), 93 (57), 91 (53)... 220 (11)]				13.30	1629.2	0.23
Himachalol	15.43	2134.9	0.42	13.43*	1639.2	[0.57]
Unknown CEDE XVI [m/z 119, 91 (44), 94 (36), 107 (35), 93 (29)... 202 (19)...]				13.43*	1639.2	[0.57]
Allohimachalol	15.80	2171.0	0.88	13.60	1653.2	0.93
β-Atlantone	15.07	2098.5	0.36	13.74*†	1665.4	[0.34]
( <i>E</i> )-10,11- Dihydroatlantone	14.96	2087.5	0.13	13.75*†	1666.1	[0.22]
Deodarone epimer I	15.58	2149.6	0.89	14.01*	1687.3	[1.58]
( <i>Z</i> )-γ-Atlantone	15.37	2128.1	0.75	14.01*	1687.3	[1.58]
Deodarone epimer II	15.66	2157.1	0.88	14.04	1689.9	0.91
( <i>E</i> )-γ-Atlantone	15.61	2152.0	0.86	14.16	1699.4	0.83
( <i>Z</i> )-α-Atlantone	15.85	2176.4	0.58	14.30	1711.7	0.61
Unknown CEDE XVII [m/z 105, 119 (89), 59 (68), 120 (65), 43 (65), 93 (62), 121 (61)...]				14.47	1726.6	0.11
Unknown CEDE XVIII [m/z 91, 79 (83), 105 (68), 109 (63), 41	18.23	2429.5	0.02	14.57	1734.9	0.04

(590), 93 (58), 107 (57)...						
Unknown CEDE XIX [m/z 83, 91 (28), 105 (25), 55 (21), 43 (17), 119 (17)...				14.64	1741.1	0.09
Unknown CEDE XXI [m/z 83, 55 (17), 91 (14), 105 (9), 216 (6)...				14.77	1752.5	0.08
Unknown CEDE XXII [m/z 91, 105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...	18.64	2475.4	0.03	14.84	1758.1	0.02
(E)- $\alpha$ -Atlantone	16.58	2251.3	3.01	14.98	1770.7	2.93
Unknown CEDE XXIII [m/z 95, 43 (59), 69, (57), 67 (43), 163 (42), 94 (37), 107 (37)... 178 (26), 218 (2)]				15.20	1789.4	0.12
Unknown CEDE XXIV [m/z 83, 134 (28), 119 (19), 55 (18), 91 (14), 43 (11), 109 (10)... 216 (4), 249? (0)]	20.50	2695.0	0.01	15.73	1836.9	0.02
Unknown CEDE XXV [m/z 83, 134 (30), 119 (19), 55 (18), 91 (12)... 216 (4)...	20.65	2713.8	0.01	15.85	1848.1	0.01
Unknown CEDE XXVI [m/z 173, 83 (83), 91 (80), 201 (79), 115 (65)... 216 (31)]	18.89	2504.5	0.01	16.22	1881.8	0.01
Total reported		93.32%			96.49%	

\*: 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