

Date : August 08, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 22H01-PTH01

**Customer identification** : Cedarwood Virginian - U.S - C70109R

**Type** : Essential oil

**Source** : *Juniperus virginiana*

**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 2014-005

**Analysis date** : August 02, 2022

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear viscous liquid

**Refractive index:**  $1.5053 \pm 0.0003$  (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
α-Pinene	0.10	Monoterpene
β-Pinene	0.01	Monoterpene
Myrcene	0.01	Monoterpene
Δ3-Carene	0.01	Monoterpene
para-Cymene	0.01	Monoterpene
Limonene	0.02	Monoterpene
para-Cymenene	0.01	Monoterpene
Terpinolene	0.01	Monoterpene
<i>trans</i> -Pinocarveol	0.01	Monoterpenic alcohol
Camphor	0.01	Monoterpenic ketone
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.05	Monoterpenic alcohol
Myrtenol	0.01	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Carvacrol methyl ether	0.13	Monoterpenic ether
Bornyl acetate	0.01	Monoterpenic ester
Brasila-1,10-diene	0.02	Sesquiterpene
Carvacrol	0.03	Monoterpenic alcohol
α-Terpinyl acetate	0.07	Monoterpenic ester
African-1-ene	0.02	Sesquiterpene
Cyclosativene II	0.03	Sesquiterpene
2-epi-α-Funebrene	0.61	Sesquiterpene
α-Duprezianene	0.78	Sesquiterpene
Isolongifolene	0.04	Sesquiterpene
β-Elemene	1.46	Sesquiterpene
α-Chamipinene	0.14	Sesquiterpene
Unknown	0.21	Sesquiterpene
α-Cedrene	22.17	Sesquiterpene
β-Funebrene	2.69	Sesquiterpene
β-Caryophyllene	0.80	Sesquiterpene
β-Cedrene	5.08	Sesquiterpene
β-Duprezianene	0.84	Sesquiterpene
<i>cis</i> -Thujopsene	18.33	Sesquiterpene
( <i>Z</i> )-β-Farnesene?	0.07	Sesquiterpene
Isobazzanene	0.13	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.09	Sesquiterpene
Prezizaene	0.23	Sesquiterpene
α-Himachalene	0.18	Sesquiterpene
7,8-Dehydro-α-acoradiene?	0.08	Sesquiterpene
Cadina-4,11-diene	0.04	Sesquiterpene
α-Humulene	0.23	Sesquiterpene
Thujopsadiene?	0.03	Sesquiterpene
α-Acoradiene	0.22	Sesquiterpene

β-Acoradiene	0.09	Sesquiterpene
(E)-β-Farnesene	0.49	Sesquiterpene
9-epi-β-Caryophyllene	0.31	Sesquiterpene
Thujopsene isomer	0.38	Sesquiterpene
Unknown	0.27	Sesquiterpene
Unknown	0.36	Sesquiterpene
β-Chamigrene	0.92	Sesquiterpene
γ-Himachalene	0.11	Sesquiterpene
Unknown	0.20	Sesquiterpene
ar-Curcumene	0.30	Sesquiterpene
Valencene	0.12	Sesquiterpene
Pseudowiddrene	1.06	Sesquiterpene
Unknown	0.11	Unknown
α-Chamigrene	1.56	Sesquiterpene
β-Himachalene	0.27	Sesquiterpene
α-Cuprenene	1.21	Sesquiterpene
Cuparene	2.51	Sesquiterpene
1,2-Dihydrocuparene	0.16	Sesquiterpene
α-Alaskene	0.23	Sesquiterpene
Unknown	0.39	Sesquiterpene
α-Dehydro-ar-himachalene	0.02	Sesquiterpene
1,4-Dihydrocuparene	0.48	Sesquiterpene
β-Curcumene	0.14	Sesquiterpene
γ-Cadinene	0.23	Sesquiterpene
7-epi-α-Selinene	0.06	Sesquiterpene
γ-Dehydro-ar-himachalene	0.05	Sesquiterpene
β-Sesquiphellandrene	0.86	Sesquiterpene
γ-Cuprenene	1.20	Sesquiterpene
ar-Himachalene	0.40	Sesquiterpene
Unknown	0.10	Oxygenated sesquiterpene
δ-Cuprenene epimer I	0.20	Sesquiterpene
δ-Cuprenene epimer II	0.14	Sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
Caryophyllenyl alcohol	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
allo-Cedrol	0.30	Sesquiterpenic alcohol
α-Cedrol	19.35	Sesquiterpenic alcohol
Widdrol	2.49	Sesquiterpenic alcohol
β-Himachalene oxide	0.01	Sesquiterpenic ether
epi-Cedrol	0.29	Sesquiterpenic alcohol
Unknown	0.14	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
α-Acorenol	0.31	Sesquiterpenic alcohol
β-Acorenol	0.09	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.20	Oxygenated sesquiterpene
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.31	Oxygenated sesquiterpene
Himachalol	0.09	Sesquiterpenic alcohol
Unknown	0.09	Oxygenated sesquiterpene

Unknown	0.08	Oxygenated sesquiterpene
Cedrenol analog	0.28	Sesquiterpenic alcohol
1,7-diepi- $\alpha$ -Cedrenal?	0.05	Sesquiterpenic aldehyde
Khusiol	0.09	Sesquiterpenic alcohol
$\alpha$ -Bisabolol	0.34	Sesquiterpenic alcohol
$\alpha$ -Cedrenol	0.05	Sesquiterpenic alcohol
Mayurone?	0.03	Norsesquiterpenic ketone
Unknown	0.19	Oxygenated sesquiterpene
Thujopsenal	0.14	Sesquiterpenic aldehyde
Unknown	0.05	Oxygenated sesquiterpene
Thujopsenal analog	0.04	Sesquiterpenic aldehyde
Unknown	0.03	Oxygenated sesquiterpene
Cuparenal	0.02	Sesquiterpenic aldehyde
Unknown	0.01	Oxygenated sesquiterpene
Cedryl acetate	0.05	Sesquiterpenic ester
Unknown	0.04	Oxygenated sesquiterpene
$\beta$ -Acoradienol?	0.07	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Nootkatone analog	0.01	Sesquiterpenic ketone
Manool	0.02	Diterpenic alcohol
7,13-Abietadiene	0.11	Diterpene
<b>Consolidated total</b>	<b>95.90%</b>	

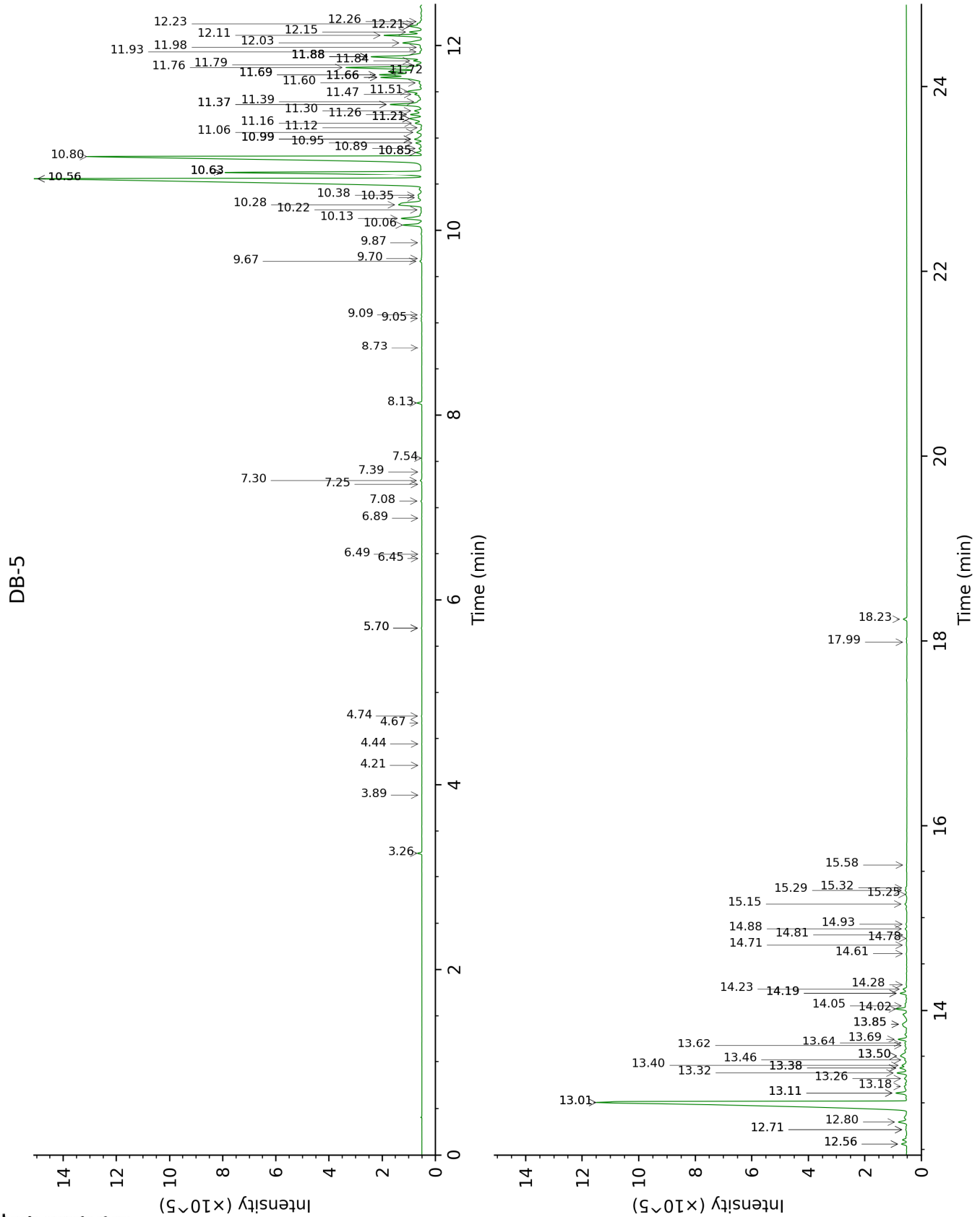
tr: The compound has been detected below 0.005% of total signal.

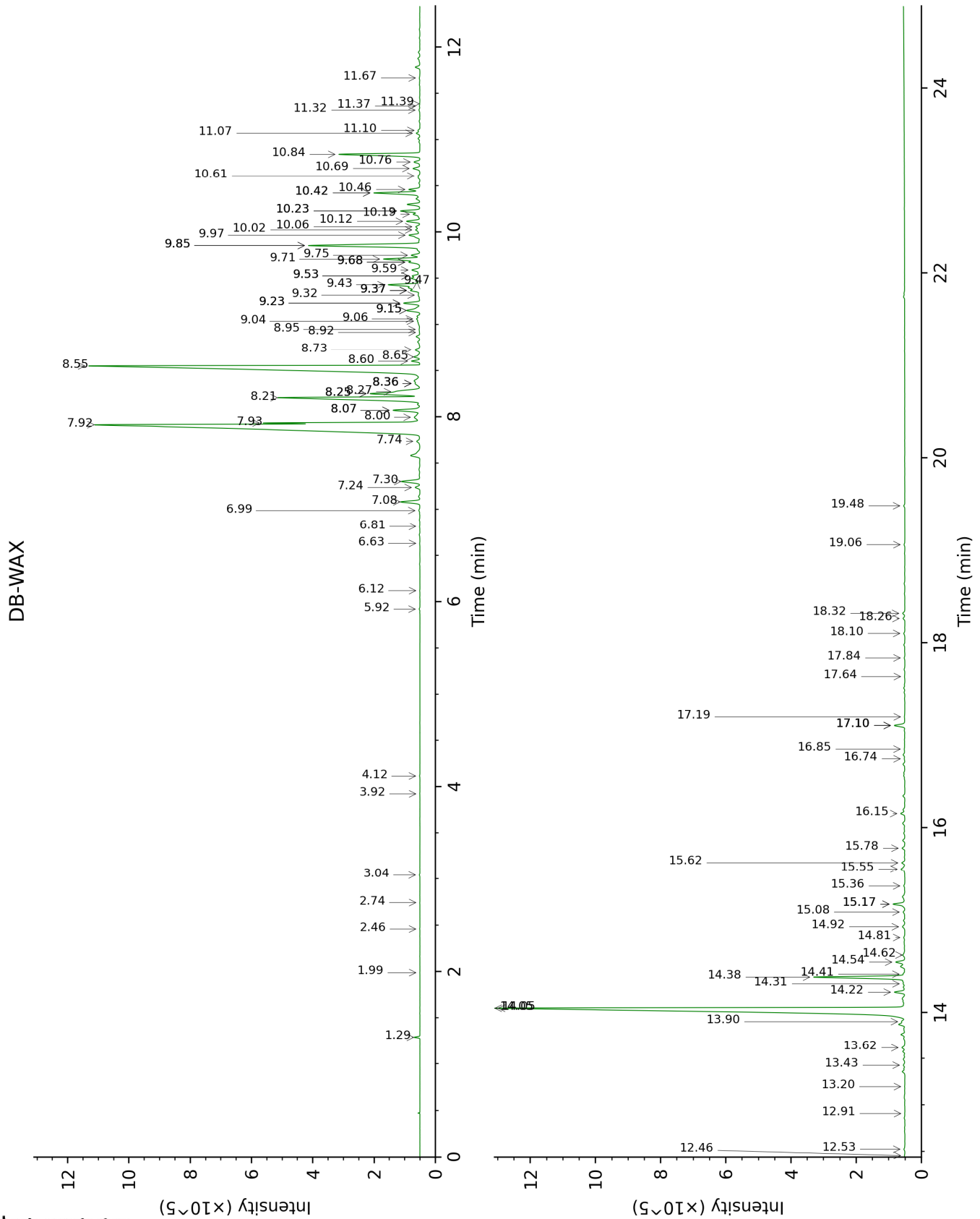
Note: no correction factor was applied

**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	%
α-Pinene	3.26	931	0.10	1.29	992	0.10
β-Pinene	3.89	972	0.01	1.99	1067	tr
Myrcene	4.21	993	0.01	2.74	1134	0.01
Δ3-Carene	4.44	1008	0.01	2.46	1112	0.01
para-Cymene	4.67	1022	0.01	3.92	1226	0.01
Limonene	4.74	1027	0.02	3.04	1158	0.02
para-Cymenene	5.70*	1086	0.02	6.12	1384	0.01
Terpinolene	5.70*	1086	[0.02]	4.12	1241	0.01
trans-Pinocarveol	6.45	1134	0.01	8.92	1599	0.01
Camphor	6.49	1137	0.01	6.99	1449	0.04
Borneol	6.89	1162	0.01	9.53*	1649	0.21
Terpinen-4-ol	7.08	1174	0.03	8.36*†	1555	0.47
para-Cymen-8-ol	7.26	1185	0.01	11.32	1801	0.03
α-Terpineol	7.30	1188	0.05	9.53*	1649	[0.21]
Myrtenol	7.39	1194	0.01	10.61	1739	0.05
Verbenone	7.54	1203	0.01	9.37*†	1636	0.60
Carvacrol methyl ether	8.13	1243	0.13	8.36*†	1555	[0.47]
Bornyl acetate	8.73	1283	0.01	8.07*	1532	0.85
Brasila-1,10-diene	9.05	1304	0.02	5.92	1369	0.02
Carvacrol	9.09	1307	0.03	15.08	2155	0.06
α-Terpinyl acetate	9.67	1348	0.07	9.47	1644	0.06
African-1-ene	9.70	1350	0.02	6.63	1422	0.01
Cyclosativene II	9.87	1362	0.03	6.81	1436	0.01
2-epi-α-Funebrene	10.06	1375	0.61	7.08	1456	0.58
α-Duprezianene	10.13	1380	0.78	7.30	1473	0.63
Isolongifolene	10.22	1387	0.04	7.24	1468	0.15
β-Elemene	10.28	1390	1.46	8.25*†	1546	2.36
α-Chamipinene	10.35	1396	0.14	7.74	1506	0.13
Unknown [m/z 107, 91 (86), 93 (83), 79 (81), 162 (74), 41 (73), 133 (72)... 204 (13)]	10.38	1398	0.21	8.00	1526	0.35
α-Cedrene	10.56*	1411	24.98	7.92	1520	22.17
β-Funebrene	10.56*	1411	[24.98]	7.93	1521	2.69
β-Caryophyllene	10.63*	1416	7.08	8.25*†	1546	[2.36]
β-Cedrene	10.63*	1416	[7.08]	8.21	1543	5.08
β-Duprezianene	10.63*	1416	[7.08]	8.07*	1532	[0.85]
cis-Thujopsene	10.80	1429	18.33	8.55	1570	18.09
(Z)-β-Farnesene?	10.85*	1432	0.19	9.04	1608	0.07
Isobazzanene	10.85*	1432	[0.19]	8.36*†	1555	[0.47]
trans-α-Bergamotene	10.89	1435	0.09	8.27†	1548	[2.36]
Prezizaene	10.95	1440	0.23	8.60	1574	0.20
α-Himachalene	10.99*	1443	0.33	8.73	1584	0.18
7,8-Dehydro-α-acoradiene?	10.99*	1443	[0.33]	9.32	1632	0.08

Cadina-4,11-diene	10.99*	1443	[0.33]	8.95	1601	0.04
$\alpha$ -Humulene	11.06	1448	0.23	9.06	1610	0.10
Thujopsadiene?	11.12	1452	0.03	9.97	1685	0.41
$\alpha$ -Acoradiene	11.16	1456	0.22	9.15*	1618	0.53
$\beta$ -Acoradiene	11.21*	1459	0.54	9.23*	1624	0.48
( <i>E</i> )- $\beta$ -Farnesene	11.21*	1459	[0.54]	9.37*†	1636	[0.60]
9-epi- $\beta$ -Caryophyllene	11.21*	1459	[0.54]	9.15*	1618	[0.53]
Thujopsene isomer	11.26	1463	0.38	9.23*	1624	[0.48]
Unknown [m/z 118, 69 (82), 91 (51), 117 (40)... 202 (25)]	11.30	1466	0.27	8.65	1577	0.21
Unknown [m/z 91, 105 (93), 161 (77), 93 (73), 119 (71), 133 (69)... 204 (31)]	11.37*	1471	1.28			
$\beta$ -Chamigrene	11.37*	1471	[1.28]	9.43	1641	0.92
$\gamma$ -Himachalene	11.40	1473	0.11	9.37*†	1636	[0.60]
Unknown [m/z 189, 91 (95), 105 (93), 133 (84), 119 (75), 41 (59), 93 (46)... 204 (33)]	11.48†	1479	0.80	9.68*	1661	0.32
ar-Curcumene	11.51†	1481	[0.80]	10.46	1726	0.30
Valencene	11.60	1488	0.12	9.68*	1661	[0.32]
Pseudowiddrene	11.66*†	1492	2.99	9.71	1664	1.06
Unknown [m/z 203, 119 (83), 145 (51), 135 (51)]	11.66*†	1492	[2.99]	11.07	1779	0.11
$\alpha$ -Chamigrene	11.69*†	1494	[2.99]	9.85*	1676	3.77
$\beta$ -Himachalene	11.69*†	1494	[2.99]	9.59	1654	0.27
$\alpha$ -Cuprenene	11.72	1497	1.21	9.85*	1676	[3.77]
Cuparene	11.76	1500	2.51	10.84	1760	2.40
1,2-Dihydrocuparene	11.79	1502	0.16	10.02	1690	0.16
$\alpha$ -Alaskene	11.84	1506	0.23	9.75	1667	0.25
Unknown [m/z 121, 123 (45), 91 (24), 107 (24), 122 (24), 95 (23)... 204 (11)]	11.88*	1509	2.17	10.12	1697	0.39
$\alpha$ -Dehydro-ar-himachalene	11.88*	1509	[2.17]	11.36	1804	0.02
1,4-Dihydrocuparene	11.88*	1509	[2.17]	10.23*	1706	0.54
$\beta$ -Curcumene	11.88*	1509	[2.17]	10.06	1692	0.14
$\gamma$ -Cadinene	11.88*	1509	[2.17]	10.19	1704	0.23
7-epi- $\alpha$ -Selinene	11.93	1513	0.06	10.23*	1706	[0.54]
$\gamma$ -Dehydro-ar-himachalene	11.98	1517	0.05	11.67	1831	0.03
$\beta$ -Sesquiphellandrene	12.03	1521	0.86	10.42*	1723	1.33
$\gamma$ -Cuprenene	12.11	1527	1.20	10.42*	1723	[1.33]

ar-Himachalene	12.15	1530	0.40	11.39	1806	0.01
Unknown [m/z 43, 95 (81), 207 (61), 41 (55), 55 (50)... 222 (3)]	12.21*	1535	0.46	13.62	2010	0.10
δ-Cuprenene epimer I	12.21*	1535	[0.46]	10.69	1746	0.20
δ-Cuprenene epimer II	12.24	1537	0.14	10.76	1752	0.18
Unknown [m/z 106, 41 (86), 43 (84), 149 (75), 69 (75), 91 (63), 93 (61)... 220 (1)]	12.26	1539	0.05	11.10	1782	0.05
Unknown [m/z 95, 191 (52), 107 (50), 121 (32), 81 (31)...]	12.56*	1562	0.17	13.90	2038	0.09
Caryophyllenyl alcohol	12.56*	1562	[0.17]	13.43	1993	0.05
Caryophyllene oxide	12.72*	1575	0.06	12.53	1909	0.04
Caryophyllene oxide isomer	12.72*	1575	[0.06]	12.46	1902	0.01
allo-Cedrol	12.80	1581	0.30	14.05*	2052	19.91
α-Cedrol	13.01*	1597	21.85	14.05*	2052	[19.91]
Widdrol	13.01*	1597	[21.85]	14.38	2085	2.49
β-Himachalene oxide	13.11*	1605	0.37	12.91	1944	0.01
epi-Cedrol	13.11*	1605	[0.37]	14.54	2100	0.29
Unknown [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	13.18	1611	0.14	13.20	1971	0.01
Unknown [m/z 107, 41 (86), 123 (85), 82 (79), 95 (77), 93 (76), 91 (73), 69 (71)... 220 (13)]	13.26	1618	0.11	14.41	2088	0.04
α-Acorenol	13.32	1623	0.31	14.22	2069	0.29
β-Acorenol	13.38*	1628	0.25	14.62	2108	0.09
Unknown [m/z 132, 175 (22), 119 (18), 91 (18), 157 (18)... 219 (10)]	13.38*	1628	[0.25]	15.36	2184	0.03
Unknown [m/z 105, 93 (78), 95 (75), 131 (72), 119 (71), 132 (70), 91 (67), 120 (49)... 202 (39), 220 (9)]	13.40	1630	0.20	15.62	2210	0.09
Unknown [m/z 132, 91 (24), 119 (22),	13.46	1635	0.07			

105 (21), 133 (17), 117 (16)... 219 (3)]						
Unknown [m/z 123, 81 (77), 95 (77), 107 (72), 41 (72), 93 (66), 55 (64)... 220? (13)]	13.50*	1638	0.40			
Himachalol	13.50*	1638	[0.40]	14.92	2139	0.09
Unknown [m/z 41, 91 (96), 79 (88), 69 (82), 123 (80), 93 (80)... 220 (8)]	13.62	1647	0.09	17.10*	2367	0.31
Unknown [m/z 43, 81 (84), 41 (64), 67 (62), 95 (58), 79 (58)... 204 (48), 220 (2)]	13.64	1650	0.08	15.17*	2164	0.38
Cedrenol analog	13.69	1654	0.28	16.15	2265	0.13
1,7-diepi- $\alpha$ - Cedrenal?	13.85*	1667	0.31	14.81	2127	0.05
Khusiol	13.85*	1667	[0.31]	15.78	2226	0.09
$\alpha$ -Bisabolol	14.02	1680	0.34	15.17*	2164	[0.38]
$\alpha$ -Cedrenol	14.05	1683	0.05	16.74	2328	0.02
Mayurone?	14.19*	1694	0.22	16.85	2339	0.03
Unknown [m/z 91, 105 (87), 123 (74), 135 (70), 107 (60), 79 (59)... 220 (13)]	14.19*	1694	[0.22]			
Thujopsenal	14.23	1698	0.14	15.55	2202	0.16
Unknown [m/z 105, 69 (77), 91 (66), 119 (65), 111 (56), 107 (45), 55 (45)... 220? (2)]	14.28	1702	0.05	17.19	2377	0.02
Thujopsenal analog	14.61	1731	0.04	17.10*	2367	[0.31]
Unknown [m/z 105, 91 (83), 79 (78), 135 (67), 107 (56), 67 (53)... 220 (9)]	14.70	1739	0.03			
Cuparenal	14.78	1745	0.02			
Unknown [m/z 105, 69 (79), 111 (66), 119 (60), 91 (50), 55 (41)... 203 (11), 220 (1)]	14.82	1748	0.01			
Cedryl acetate	14.88	1754	0.05	14.31	2078	0.05
Unknown [m/z 91, 105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...]	14.93	1758	0.04	18.10	2478	0.04
$\beta$ -Acoradienol?	15.15	1777	0.07	17.84	2448	0.02
Unknown [m/z 189, 91 (48), 133 (40),	15.25	1786	0.04	18.32	2502	0.07

105 (40), 41 (34), 187 (34)... 220 (5)]						
Unknown [m/z 148, 141 (99), 91 (74), 105 (52), 41 (42), 121 (42), 133 (37)... 218 (32)]	15.30	1790	0.06	19.48	2639	0.03
Unknown [m/z 121, 136 (53), 91 (22), 93 (19), 79 (15), 105 (13)... 220 (3)]	15.32	1792	0.04	18.26	2496	0.05
Nootkatone analog	15.58	1815	0.01	17.64	2426	0.02
Manool	17.99	2041	0.02	19.06	2588	0.02
7,13-Abietadiene	18.23	2066	0.11	17.10*	2367	[0.31]
<b>Total identified</b>		<b>95.56%</b>			<b>93.24%</b>	
<b>Total reported</b>		<b>97.83%</b>			<b>94.90%</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