

Date : May 14, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 20E04-BKB02

**Customer identification :** Cedarwood Virginia - USA - CV1904

**Type :** Essential oil

**Source :** *Juniperus virginiana*

**Customer :** Be Kind Botanicals, Inc.

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 :** May 08, 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:** Orange/red liquid

**Refractive index:**  $1.5049 \pm 0.0003$  (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
$\alpha$ -Pinene	0.01	Monoterpene
para-Cymene	tr	Monoterpene
Limonene	tr	Monoterpene
para-Cymenene	0.01	Monoterpene
<i>trans</i> -Pinocarveol	0.01	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	tr	Monoterpenic alcohol
Pinocamphone	tr	Monoterpenic ketone
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.02	Monoterpenic alcohol
para-Cymen-8-ol	tr	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
$\alpha$ -Terpineol	0.02	Monoterpenic alcohol
Verbenone	0.03	Monoterpenic ketone
<i>trans</i> -Carveol	tr	Monoterpenic alcohol
Carvacrol methyl ether	0.02	Monoterpenic ether
Bornyl acetate	0.01	Monoterpenic ester
Brasila-1,10-diene	0.04	Sesquiterpene
Carvacrol	0.03	Monoterpenic alcohol
African-1-ene	0.04	Sesquiterpene
2-epi- $\alpha$ -Funebrene	0.32	Sesquiterpene
$\alpha$ -Duprezianene	0.59	Sesquiterpene
Isolongifolene	0.09	Sesquiterpene
$\beta$ -Elemene	0.10	Sesquiterpene
$\alpha$ -Funebrene	0.18	Sesquiterpene
Unknown	0.14	Sesquiterpene
$\alpha$ -Chamipinene	0.11	Sesquiterpene
$\alpha$ -Cedrene	26.03	Sesquiterpene
$\beta$ -Funebrene	0.88	Sesquiterpene
$\beta$ -Cedrene	5.32	Sesquiterpene
$\beta$ -Caryophyllene	0.28	Sesquiterpene
$\beta$ -Duprezianene	0.52	Sesquiterpene
<i>cis</i> -Thujopsene	32.14	Sesquiterpene
Isobazzanene	0.15	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.07	Sesquiterpene
$\beta$ -Barbatene	0.06	Sesquiterpene
Prezizaene	0.11	Sesquiterpene
7,8-Dehydro- $\alpha$ -acoradiene?	0.08	Sesquiterpene
$\alpha$ -Himachalene	0.42	Sesquiterpene
$\alpha$ -Humulene	0.12	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.24	Sesquiterpene
$\alpha$ -Acoradiene	0.39	Sesquiterpene
9-epi- $\beta$ -Caryophyllene	0.23	Sesquiterpene
$\beta$ -Acoradiene	0.17	Sesquiterpene
Unknown	0.19	Sesquiterpene
$\beta$ -Chamigrene	0.80	Sesquiterpene

γ-Himachalene	0.12	Sesquiterpene
Widdra-2,4(14)-diene?	0.07	Sesquiterpene
Unknown	0.06	Sesquiterpene
ar-Curcumene	0.10	Sesquiterpene
Pseudowiddrene	1.04	Sesquiterpene
α-Chamigrene	0.47	Sesquiterpene
α-Cuprenene	0.70	Sesquiterpene
β-Himachalene	0.29	Sesquiterpene
Cuparene	1.33	Sesquiterpene
1,2-Dihydrocuparene	0.18	Sesquiterpene
α-Alaskene	0.07	Sesquiterpene
Unknown	0.22	Sesquiterpene
1,4-Dihydrocuparene	0.04	Sesquiterpene
β-Curcumene	0.04	Sesquiterpene
α-Dehydro-ar-himachalene	0.03	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
γ-Dehydro-ar-himachalene	0.03	Sesquiterpene
β-Sesquiphellandrene	0.11	Sesquiterpene
γ-Cuprenene	0.17	Sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
ar-Himachalene	0.01	Sesquiterpene
δ-Cuprenene epimer I	0.08	Sesquiterpene
Unknown	0.19	Oxygenated sesquiterpene
δ-Cuprenene epimer II	0.06	Sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Caryophyllenyl alcohol	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
allo-Cedrol	0.14	Sesquiterpenic alcohol
α-Cedrol	13.55	Sesquiterpenic alcohol
Widdrol	2.10	Sesquiterpenic alcohol
β-Himachalene oxide	0.06	Sesquiterpenic ether
epi-Cedrol	0.11	Sesquiterpenic alcohol
10-epi-Cubenol	0.08	Sesquiterpenic alcohol
Unknown	0.10	Oxygenated sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
α-Acorenol	0.05	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
β-Acorenol	0.19	Sesquiterpenic alcohol
Unknown	0.29	Oxygenated sesquiterpene
Unknown	0.14	Unknown
Unknown	0.15	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
Himachalol	0.07	Sesquiterpenic alcohol
Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Cedrenol analog	0.23	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(E)-caryophyllene	0.07	Sesquiterpenic alcohol
1,7-diepi-α-Cedrenal?	0.05	Sesquiterpenic aldehyde
Khusiol	0.29	Sesquiterpenic alcohol
Cedr-8-en-13-ol	0.18	Sesquiterpenic alcohol

α-Cedrenol	0.06	Sesquiterpenic alcohol
α-Bisabolol	0.40	Sesquiterpenic alcohol
Unknown	0.24	Oxygenated sesquiterpene
Mayurone?	0.07	Norsesquiterpenic ketone
Thujopsenal	0.26	Sesquiterpenic aldehyde
Unknown	0.10	Oxygenated sesquiterpene
Thujopsenal analog	0.13	Sesquiterpenic aldehyde
Unknown	0.05	Oxygenated sesquiterpene
Cuparenal	0.06	Sesquiterpenic aldehyde
Unknown	0.02	Oxygenated sesquiterpene
Cedryl acetate	0.02	Sesquiterpenic ester
Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.24	Oxygenated sesquiterpene
Unknown	0.17	Oxygenated sesquiterpene
Unknown	0.14	Oxygenated sesquiterpene
Nootkatone analog	0.07	Sesquiterpenic ketone
Manool	0.01	Diterpenic alcohol
7,13-Abietadiene	0.01	Diterpene
<b>Consolidated total</b>	<b>96.04%</b>	

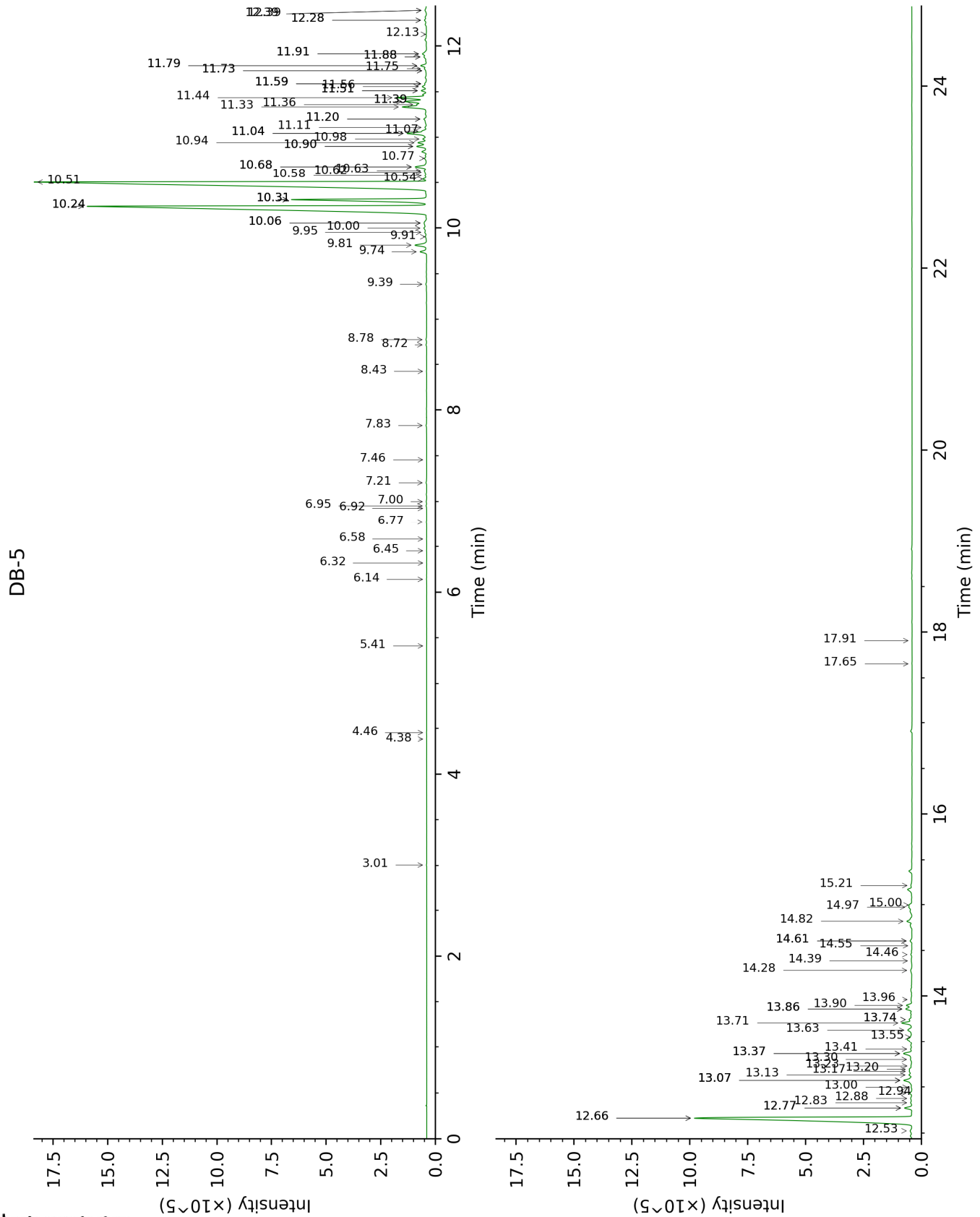
tr: The compound has been detected below 0.005% of total signal.

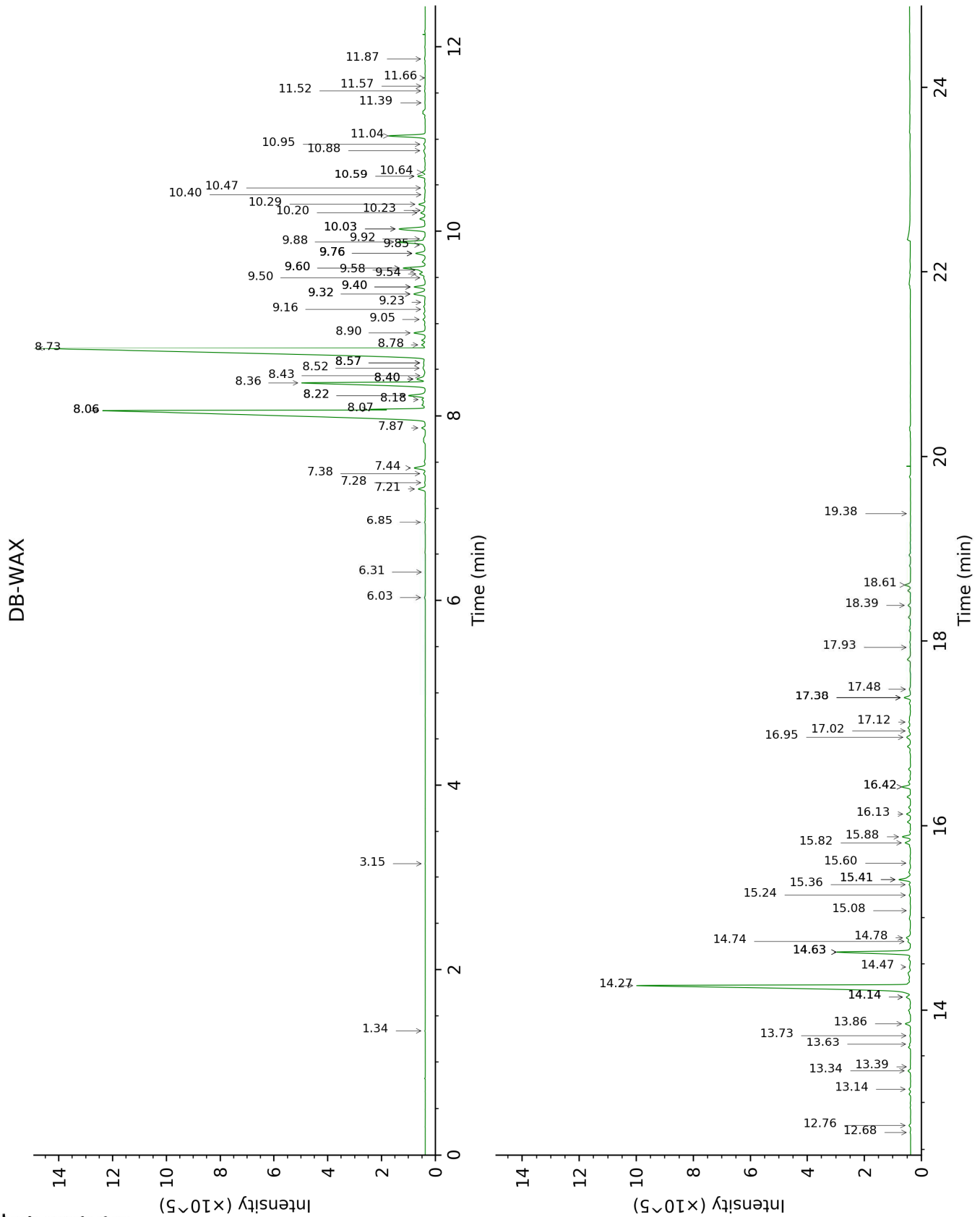
Note: no correction factor was applied

**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	%
$\alpha$ -Pinene	3.01	930	0.01	1.34	990	0.01
para-Cymene	4.38	1020	tr			
Limonene	4.46	1024	tr	3.15	1156	0.01
para-Cymenene	5.41	1085	0.01	6.31	1385	tr
<i>trans</i> -Pinocarveol	6.14	1132	0.01	9.16	1601	0.02
meta-Mentha-4,6-dien-8-ol	6.32	1143	tr	9.32*	1614	0.54
Pinocamphone	6.45	1152	tr	7.28	1457	0.03
Borneol	6.58	1160	0.01	9.76*	1650	0.39
Terpinen-4-ol	6.77	1173	0.02	8.57*	1555	0.12
para-Cymen-8-ol	6.92	1183	tr	11.58	1801	0.02
Unknown [m/z 93, 59 (85), 81 (36), 92 (35), 43 (34), 121 (20), 136 (16)...]	6.95	1184	0.02			
$\alpha$ -Terpineol	7.00	1188	0.02	9.76*	1650	[0.39]
Verbenone	7.21	1201	0.03	9.60*	1637	0.83
<i>trans</i> -Carveol	7.46	1218	tr	11.39	1786	0.02
Carvacrol methyl ether	7.83	1244	0.02	8.57*	1555	[0.12]
Bornyl acetate	8.42	1285	0.01	8.22*	1528	0.66
Brasila-1,10-diene	8.78	1305	0.04	6.03	1365	0.03
Carvacrol	8.72	1306	0.03	15.36	2154	0.05
African-1-ene	9.39	1347	0.04	6.85	1425	0.03
2-epi- $\alpha$ -Funebrene	9.74	1372	0.32	7.21	1452	0.28
$\alpha$ -Duprezianene	9.81	1378	0.59	7.44	1469	0.47
Isolongifolene	9.91	1384	0.09	7.38	1464	0.07
$\beta$ -Elemene	9.95	1388	0.10	8.40*†	1542	0.45
$\alpha$ -Funebrene	10.00	1391	0.18	7.87	1501	0.12
Unknown [m/z 107, 91 (86), 93 (83), 79 (81), 162 (74), 41 (73), 133 (72)... 204 (13)]	10.06*	1395	0.25	8.18	1525	0.14
$\alpha$ -Chamipinene	10.06*	1395	[0.25]	8.06*	1515	26.02
$\alpha$ -Cedrene	10.24*	1408	26.91	8.06*	1515	[26.02]
$\beta$ -Funebrene	10.24*	1408	[26.91]	8.07	1517	0.88
$\beta$ -Cedrene	10.31*	1413	6.12	8.36	1539	5.32
$\beta$ -Caryophyllene	10.31*	1413	[6.12]	8.40*†	1542	[0.45]
$\beta$ -Duprezianene	10.31*	1413	[6.12]	8.22*	1528	[0.66]
<i>cis</i> -Thujopsene	10.50	1428	32.14	8.73	1568	32.34
Isobazzanene	10.54	1430	0.15	8.52	1551	0.17
<i>trans</i> - $\alpha$ -Bergamotene	10.58	1433	0.07	8.43†	1545	[0.45]
$\beta$ -Barbatene	10.62	1436	0.06	9.05	1592	0.09
Prezizaene	10.64	1437	0.11	8.78	1571	0.13
7,8-Dehydro- $\alpha$ -acoradiene?	10.68*	1440	0.58	9.50	1629	0.08

α-Himachalene	10.68*	1440	[0.58]	8.90	1581	0.42
α-Humulene	10.77	1448	0.12	9.23	1607	0.05
(E)-β-Farnesene	10.90*†	1457	0.86	9.54	1632	0.24
α-Acoradiene	10.90*†	1457	[0.86]	9.32*	1614	[0.54]
9-epi-β-Caryophyllene	10.94†	1460	[0.86]	9.40*	1620	0.40
β-Acoradiene	10.98	1463	0.17	9.40*	1620	[0.40]
Unknown [m/z 91, 105 (93), 161 (77), 93 (73), 119 (71), 133 (69)... 204 (31)]	11.04*	1468	0.99			
β-Chamigrene	11.04*	1468	[0.99]	9.60*	1637	[0.83]
γ-Himachalene	11.07	1470	0.12	9.58	1635	0.14
Widdra-2,4(14)-diene?	11.11	1473	0.07	9.76*	1650	[0.39]
Unknown [m/z 189, 91 (95), 105 (93), 133 (84), 119 (75), 41 (59), 93 (46)... 204 (33)]	11.20*	1480	0.23	9.85	1657	0.06
ar-Curcumene	11.20*	1480	[0.23]	10.64	1722	0.10
Pseudowiddrene	11.33†	1490	1.52	9.88	1660	1.04
α-Chamigrene	11.36†	1491	[1.52]	10.03*	1671	1.18
α-Cuprenene	11.39*	1494	0.99	10.03*	1671	[1.18]
β-Himachalene	11.39*	1494	[0.99]	9.76*	1650	[0.39]
Cuparene	11.44	1497	1.33	11.04	1756	1.29
1,2-Dihydrocuparene	11.51*	1503	0.23	10.20	1685	0.18
α-Alaskene	11.51*	1503	[0.23]	9.92	1662	0.07
Unknown [m/z 121, 123 (45), 91 (24), 107 (24), 122 (24), 95 (23)... 204 (11)]	11.56	1506	0.22	10.29	1693	0.23
1,4-Dihydrocuparene	11.59*	1509	0.09	10.47	1708	0.04
β-Curcumene	11.59*	1509	[0.09]	10.23	1687	0.04
α-Dehydro-ar-himachalene	11.59*	1509	[0.09]	11.52	1797	0.03
δ-Cadinene	11.73*	1520	0.04	10.40	1701	0.01
γ-Dehydro-ar-himachalene	11.73*	1520	[0.04]	11.87	1827	0.03
β-Sesquiphellandrene	11.75	1522	0.11	10.59*	1718	0.28
γ-Cuprenene	11.79*	1524	0.27	10.59*	1718	[0.28]
Unknown [m/z 91, 107 (97), 105 (93), 41 (92), 109 (78), 43 (78), 121 (76), 135 (75)... 220 (21)]	11.79*	1524	[0.27]			
ar-Himachalene	11.88*	1532	0.14	11.66	1809	0.01
δ-Cuprenene epimer I	11.88*	1532	[0.14]	10.88	1742	0.08

Unknown [m/z 43, 95 (81), 207 (61), 41 (55), 55 (50)... 222 (3)]	11.92*	1534	0.26	13.86	2008	0.19
δ-Cuprenene epimer II	11.92*	1534	[0.26]	10.95	1748	0.06
Unknown [m/z 91, 119 (98), 121 (91), 105 (85), 43 (82), 41 (76)... 205 (37), 220 (16)]	12.13	1551	0.02	13.39	1964	0.01
Unknown [m/z 95, 191 (52), 107 (50), 121 (32), 81 (31)...]	12.28*	1563	0.11	14.14*	2036	0.18
Caryophyllenyl alcohol	12.28*	1563	[0.11]	13.63	1986	0.04
Caryophyllene oxide	12.39*	1572	0.12	12.76	1906	0.06
Caryophyllene oxide isomer	12.39*	1572	[0.12]	12.68	1899	0.02
allo-Cedrol	12.53	1582	0.14	14.14*	2036	[0.18]
α-Cedrol	12.66*	1593	15.65	14.27	2047	13.55
Widdrol	12.66*	1593	[15.65]	14.63*	2082	2.66
β-Himachalene oxide	12.77*	1602	0.32	13.14	1942	0.06
epi-Cedrol	12.77*	1602	[0.32]	14.74	2093	0.11
10-epi-Cubenol	12.83	1606	0.08	13.73	1996	0.03
Unknown [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	12.88	1610	0.10	13.34	1960	0.09
Unknown [m/z 107, 41 (86), 123 (85), 82 (79), 95 (77), 93 (76), 91 (73), 69 (71)... 220 (13)]	12.94	1615	0.12	14.63*	2082	[2.66]
α-Acorenol	13.00	1620	0.05	14.47	2067	0.07
Unknown [m/z 132, 175 (22), 119 (18), 91 (18), 157 (18)... 219 (10)]	13.08*	1627	0.53	15.60	2178	0.03
β-Acorenol	13.08*	1627	[0.53]	14.78	2097	0.19
Unknown [m/z 105, 93 (78), 95 (75), 131 (72), 119 (71), 132 (70), 91 (67), 120 (49)... 202 (39), 220 (9)]	13.08*	1627	[0.53]	15.88	2207	0.29
Unknown [m/z 43, 91 (87), 71 (83), 93 (77), 95 (75), 135	13.13	1632	0.14			

(74)...						
Unknown [m/z 132, 91 (24), 119 (22), 105 (21), 133 (17), 117 (16)... 219 (3)]	13.17	1635	0.15			
Unknown [m/z 123, 81 (77), 95 (77), 107 (72), 41 (72), 93 (66), 55 (64)... 220? (13)]	13.20	1637	0.11			
Himachalol	13.23	1640	0.07	15.24	2143	0.05
Unknown [m/z 41, 91 (96), 79 (88), 69 (82), 123 (80), 93 (80)... 220 (8)]	13.30	1646	0.09	17.48	2375	0.05
Unknown [m/z 43, 81 (84), 41 (64), 67 (62), 95 (58), 79 (58)... 204 (48), 220 (2)]	13.37*	1651	0.50	15.41*	2160	0.42
Cedrenol analog	13.37*	1651	[0.50]	16.42*	2263	0.31
14-Hydroxy-9-epi-(E)-caryophyllene	13.42	1655	0.07	16.42*	2263	[0.31]
1,7-diepi- $\alpha$ -Cedrenal?	13.55	1666	0.05	15.08	2126	0.01
Khusiol	13.63	1672	0.29	16.13	2232	0.14
Cedr-8-en-13-ol	13.71†	1679	0.63	16.96	2319	0.18
$\alpha$ -Cedrenol	13.74*†	1682	[0.63]	17.02	2326	0.06
$\alpha$ -Bisabolol	13.74*†	1682	[0.63]	15.41*	2160	[0.42]
Unknown [m/z 91, 105 (87), 123 (74), 135 (70), 107 (60), 79 (59)... 220 (13)]	13.86*	1692	0.32			
Mayurone?	13.86*	1692	[0.32]	17.12	2337	0.07
Thujopsenal	13.90	1695	0.26	15.82	2200	0.21
Unknown [m/z 105, 69 (77), 91 (66), 119 (65), 111 (56), 107 (45), 55 (45)... 220? (2)]	13.96	1700	0.10	17.38*	2365	0.22
Thujopsenal analog	14.28	1728	0.13	17.38*	2365	[0.22]
Unknown [m/z 105, 91 (83), 79 (78), 135 (67), 107 (56), 67 (53)... 220 (9)]	14.39	1737	0.05			
Cuparenal	14.46	1743	0.06			
Unknown [m/z 105, 69 (79), 111 (66), 119 (60), 91 (50), 55 (41)... 203 (11), 220 (1)]	14.55	1751	0.02			
Cedryl acetate	14.61*	1756	0.10	14.63*	2082	[2.66]
Unknown [m/z 91,	14.61*	1756	[0.10]	18.39	2476	0.09

105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...						
Unknown [m/z 121, 136 (47), 119 (27), 91 (27), 105 (22), 41 (21)... 220 (4)]	14.82	1774	0.24			
Unknown [m/z 121, 136 (53), 91 (22), 93 (19), 79 (15), 105 (13)... 220 (3)]	14.98	1788	0.17	18.61	2501	0.20
Unknown [m/z 120, 121 (93), 93 (85), 105 (74), 119 (68), 91 (58), 123 (49)... 220 (8)]	15.00	1790	0.14			
Nootkatone analog	15.21	1809	0.07	17.93	2425	0.03
Manool	17.65	2038	0.01	19.38	2590	0.01
7,13-Abietadiene	17.91	2064	0.01	17.38*	2365	[0.22]
<b>Total identified</b>		<b>95.00%</b>			<b>93.55%</b>	
<b>Total reported</b>		<b>96.69%</b>			<b>94.93%</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