

Date : October 25, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19J18-PTH03-1-SCC

Customer identification : Cedarwood Virginian - USA - C7010587R

Type : Essential oil

Source : *Juniperus virginiana*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-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 : Sarah-Eve Tremblay, M. Sc. A., Chimiste

Analysis date : October 24, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.5050 ± 0.0003 (20 °C)

ISO 4724:2004 - OIL OF CEDARWOOD, VIRGINIAN

Compound	Min. %	Max. %	Observed %	Complies?
Widdrol	2	5	3	Yes
α-Cedrol	16	25	20	Yes
Cuparene	1.5	7.0	1.1	No
cis-Thujopsene	10	25	18	Yes
α-Cedrene + β-funebrene	20	35	31	Yes
β-Cedrene + β-caryophyllene	4	8	6	Yes
Refractive index	1.5010	1.5100	1.5050	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for Virginian cedarwood oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Classe
α -Pinene	0.05	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
para-Cymene	tr	Monoterpene
Limonene	tr	Monoterpene
γ -Terpinene	tr	Monoterpene
Terpinolene	0.01	Monoterpene
Linalool	tr	Monoterpenic alcohol
<i>trans</i> -Pinocarveol	tr	Monoterpenic alcohol
Borneol	tr	Monoterpenic alcohol
α -Phellandren-8-ol	tr	Monoterpenic alcohol
Terpinen-4-ol	tr	Monoterpenic alcohol
α -Terpineol	0.01	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Carvacrol methyl ether	tr	Monoterpenic ether
Brasila-1,10-diene	0.07	Sesquiterpene
Carvacrol	0.02	Monoterpenic alcohol
α -Terpinyl acetate	0.01	Monoterpenic ester
African-1-ene	0.05	Sesquiterpene
Cyclosativene II	0.01	Sesquiterpene
2-epi- α -Funebrene	0.65	Sesquiterpene
α -Duprezianene	0.90	Sesquiterpene
7-epi-Sesquithujene?	0.07	Sesquiterpene
Isolongifolene	0.16	Sesquiterpene
β -Elemene	0.07	Sesquiterpene
α -Funebrene	0.12	Sesquiterpene
α -Chamipinene	0.08	Sesquiterpene
Unknown	0.24	Sesquiterpene
β -Funebrene	2.27	Sesquiterpene
α -Cedrene	28.40	Sesquiterpene
β -Duprezianene	0.81	Sesquiterpene
β -Cedrene	5.30	Sesquiterpene
β -Caryophyllene	0.97	Sesquiterpene
<i>cis</i> -Thujopsene	18.31	Sesquiterpene
(<i>Z</i>)- β -Farnesene?	0.04	Sesquiterpene
Isobazzanene	0.16	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.10	Sesquiterpene
Prezizaene	0.24	Sesquiterpene
α -Himachalene	0.23	Sesquiterpene
7,8-Dehydro- α -acoradiene?	0.06	Sesquiterpene
Cadina-4,11-diene	0.01	Sesquiterpene
α -Humulene	0.05	Sesquiterpene
α -Acoradiene	0.12	Sesquiterpene
9-epi- β -Caryophyllene	0.03	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.23	Sesquiterpene
β -Acoradiene	0.43	Sesquiterpene
Thujopsene isomer	0.23	Sesquiterpene
β -Chamigrene	0.88	Sesquiterpene

Unknown	0.39	Sesquiterpene
γ -Himachalene	0.03	Sesquiterpene
Unknown	0.15	Sesquiterpene
ar-Curcumene	0.09	Sesquiterpene
Valencene	0.07	Sesquiterpene
Pseudowiddrene	0.05	Sesquiterpene
β -Alaskene	0.16	Sesquiterpene
α -Chamigrene	1.55	Sesquiterpene
Unknown	0.12	Unknown
β -Himachalene	1.39	Sesquiterpene
α -Cuprenene	0.81	Sesquiterpene
Cuparene	1.09	Sesquiterpene
1,2-Dihydrocuparene	0.15	Sesquiterpene
α -Alaskene	0.34	Sesquiterpene
α -Dehydro-ar-himachalene	0.01	Sesquiterpene
1,4-Dihydrocuparene	0.04	Sesquiterpene
Unknown	0.37	Sesquiterpene
β -Curcumene	0.24	Sesquiterpene
7-epi- α -Selinene	0.07	Sesquiterpene
δ -Cadinene	0.03	Sesquiterpene
γ -Dehydro-ar-himachalene	0.06	Sesquiterpene
β -Sesquiphellandrene	1.52*	Sesquiterpene
γ -Cuprenene	[1.52]*	Sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.03	Sesquiterpene
ar-Himachalene	0.01	Sesquiterpene
δ -Cuprenene epimer I	0.15	Sesquiterpene
Unknown	0.25	Oxygenated sesquiterpene
δ -Cuprenene epimer II	0.12	Sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
Caryophyllenyl alcohol	0.12	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
allo-Cedrol	0.14	Sesquiterpenic alcohol
α -Cedrol	19.58	Sesquiterpenic alcohol
Widdrol	2.76	Sesquiterpenic alcohol
β -Himachalene oxide	0.06	Sesquiterpenic ether
epi-Cedrol	0.18	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
10-epi-Cubenol	0.06	Sesquiterpenic alcohol
Unknown	0.11	Oxygenated sesquiterpene
2-epi- α -Cedren-3-one	0.03	Sesquiterpenic ketone
β -Acorenol	0.20	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.15	Oxygenated sesquiterpene
Unknown	0.36	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Himachalol	0.01	Sesquiterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.20	Oxygenated sesquiterpene

Cedrenol analog	0.26	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(<i>E</i>)-caryophyllene	0.05	Sesquiterpenic alcohol
Khusiol	0.10	Sesquiterpenic alcohol
1,7-diepi- α -Cedrenal?	0.02	Sesquiterpenic aldehyde
Cedr-8-en-13-ol	0.38	Sesquiterpenic alcohol
α -Bisabolol	0.43	Sesquiterpenic alcohol
α -Cedrenol	0.12	Sesquiterpenic alcohol
Unknown	0.35	Oxygenated sesquiterpene
Mayurone?	0.16	Norsesquiterpenic ketone
Thujopsenal	0.05	Sesquiterpenic aldehyde
Unknown	0.01	Oxygenated sesquiterpene
Thujopsenal analog	0.05	Sesquiterpenic aldehyde
Unknown	0.03	Oxygenated sesquiterpene
Cuparenal	0.06	Sesquiterpenic aldehyde
Unknown	0.01	Oxygenated sesquiterpene
Cedryl acetate	0.06	Sesquiterpenic ester
Unknown	tr	Oxygenated sesquiterpene
Unknown	0.10	Oxygenated sesquiterpene
β -Acoradienol?	0.23	Sesquiterpenic alcohol
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.14	Oxygenated sesquiterpene
Unknown	0.14	Oxygenated sesquiterpene
Nootkatone analog	0.01	Sesquiterpenic ketone
Manool	0.01	Diterpenic alcohol
7,13-Abietadiene	tr	Diterpene
Consolidated total	97.88%	

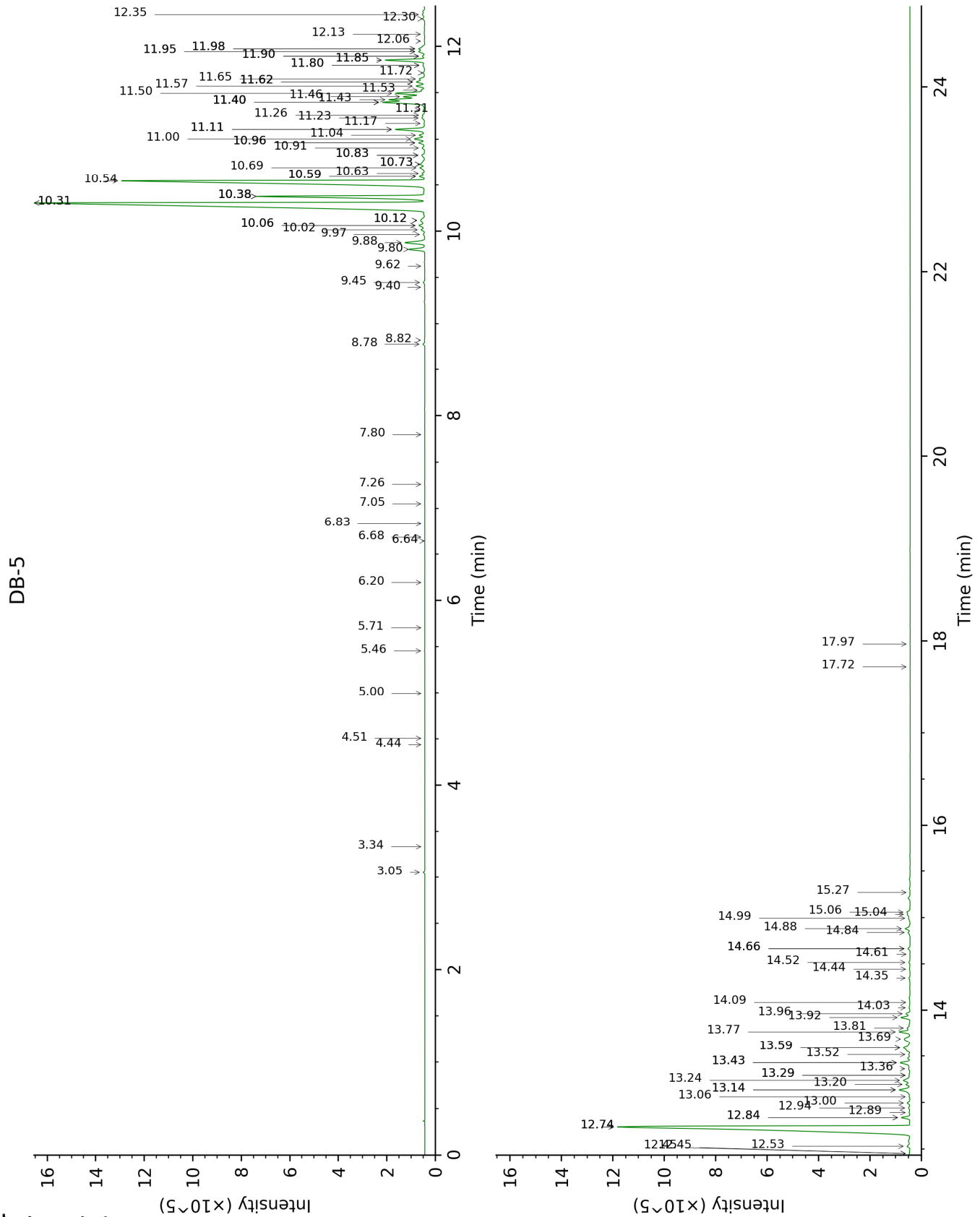
*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered [xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

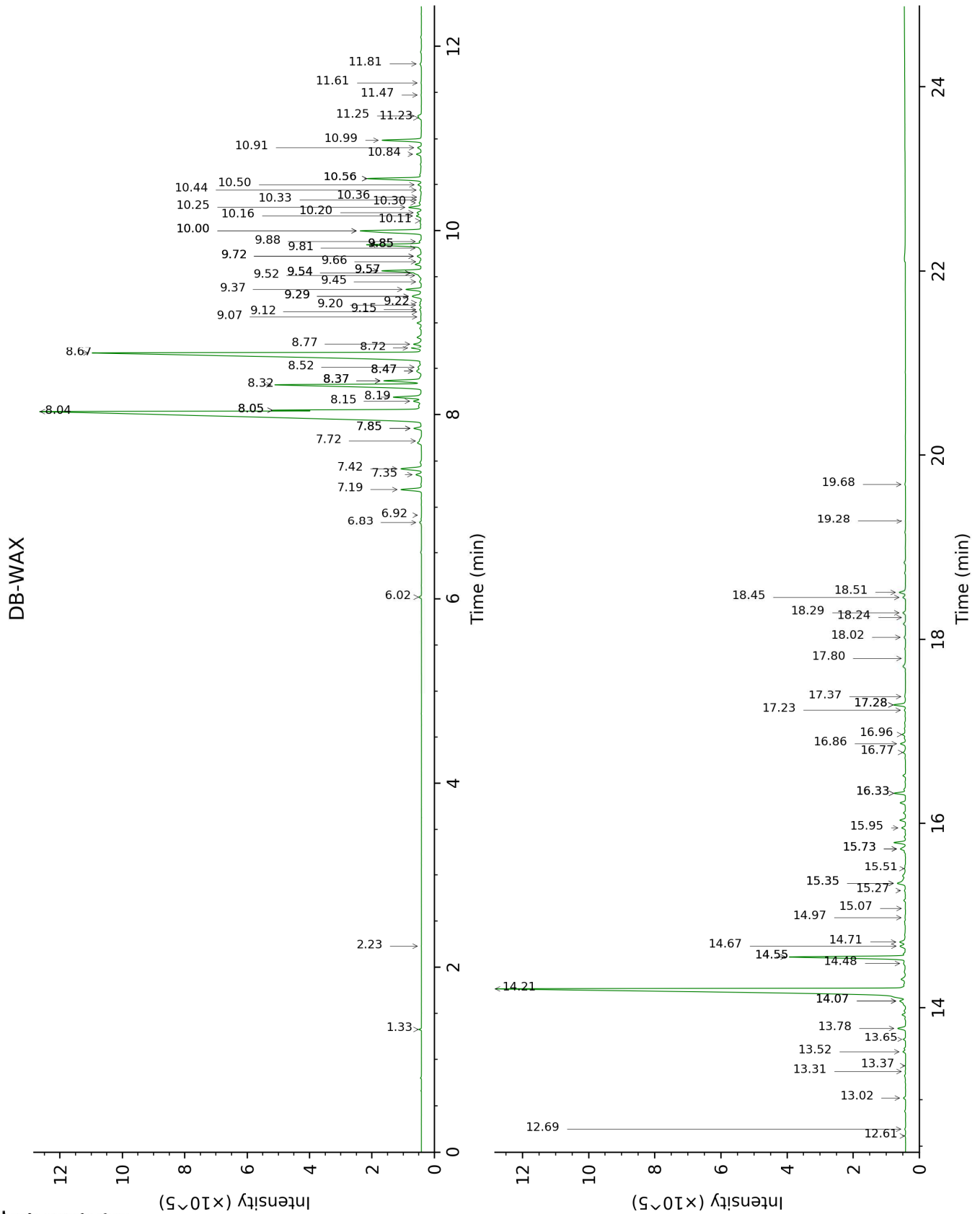
Note: no correction factor was applied

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	3.05	930	0.05	1.33	994	0.04
Thuja-2,4(10)-diene	3.34	948	tr	2.23	1086	tr
para-Cymene	4.44	1020	tr			
Limonene	4.51	1025	tr			
γ-Terpinene	5.00	1056	tr			
Terpinolene	5.46	1085	0.01			
Linalool	5.71	1101	tr	8.05*	1522	2.27
trans-Pinocarveol	6.20	1133	tr	9.12	1607	0.01
Borneol	6.64	1162	tr	9.72*	1656	0.13
α-Phellandren-8-ol	6.68	1165	tr	10.11	1687	0.02
Terpinen-4-ol	6.83	1175	tr	8.52	1559	0.14
α-Terpineol	7.05	1189	0.01	9.72*	1656	[0.13]
Verbenone	7.26	1203	0.01	9.57*†	1643	[1.27]
Carvacrol methyl ether	7.80	1240	tr	8.47*	1556	0.21
Brasila-1,10-diene	8.78	1302	0.07	6.02	1370	0.06
Carvacrol	8.82	1305	0.02	15.27	2160	0.04
α-Terpinyl acetate	9.40	1346	0.01	9.66	1651	0.04
African-1-ene	9.45	1349	0.05	6.83	1430	0.06
Cyclosativene II	9.62	1362	0.01	6.92	1436	tr
2-epi-α-Funebrene	9.80	1375	0.65	7.19	1457	0.63
α-Duprezianene	9.88	1380	0.90	7.42	1474	0.70
7-epi-Sesquithujene?	9.97	1386	0.07	7.72	1496	0.08
Isolongifolene	10.02	1390	0.16	7.35	1469	0.16
β-Elemene	10.06*	1393	0.29	8.37*	1547	1.15
α-Funebrene	10.06*	1393	[0.29]	7.85*	1507	0.21
α-Champipene	10.12*	1397	0.32	7.85*	1507	[0.21]
Unknown [m/z 107, 91 (86), 93 (83), 79 (81), 162 (74), 41 (73), 133 (72)... 204 (13)]	10.12*	1397	[0.32]	8.15	1530	0.24
β-Funebrene	10.31*	1410	30.67	8.05*	1522	[2.27]
α-Cedrene	10.31*	1410	[30.67]	8.04	1521	28.40
β-Duprezianene	10.38*	1416	7.08	8.19	1534	0.81
β-Cedrene	10.38*	1416	[7.08]	8.32	1544	5.30
β-Caryophyllene	10.38*	1416	[7.08]	8.37*	1547	[1.15]
cis-Thujopsene	10.54	1428	18.31	8.67	1571	18.25
(Z)-β-Farnesene?	10.59*	1432	0.20	9.15	1609	0.04
Isobazzanene	10.59*	1432	[0.20]	8.47*	1556	[0.21]
trans-α-Bergamotene	10.63	1435	0.10	8.37*	1547	[1.15]
Prezizaene	10.69	1439	0.24	8.72	1575	0.25
α-Himachalene	10.73*	1442	0.30	8.77	1579	0.23
7,8-Dehydro-α-acoradiene?	10.73*	1442	[0.30]	9.45	1633	0.06
Cadina-4,11-diene	10.83*	1450	0.16	9.07	1602	0.01

α-Humulene	10.83*	1450	[0.16]	9.20	1613	0.05
α-Acoradiene	10.91	1455	0.12	9.29*	1620	0.37
9-epi-β-Caryophyllene	10.96*	1460	0.26	9.22	1615	0.03
(E)-β-Farnesene	10.96*	1460	[0.26]	9.54*†	1641	1.27
β-Acoradiene	11.00	1463	0.43	9.36	1626	0.43
Thujopsene isomer	11.04	1466	0.23	9.29*	1620	[0.37]
β-Chamigrene	11.11*	1470	1.27	9.57*†	1643	[1.27]
Unknown [m/z 91, 105 (93), 161 (77), 93 (73), 119 (71), 133 (69)... 204 (31)]	11.11*	1470	[1.27]			
γ-Himachalene	11.17	1475	0.03	9.52	1639	0.06
Unknown [m/z 189, 91 (95), 105 (93), 133 (84), 119 (75), 41 (59), 93 (46)... 204 (33)]	11.23	1480	0.15	9.85*	1666	1.61
ar-Curcumene	11.26	1482	0.09	10.50	1720	0.09
Valencene	11.31	1486	0.07	9.81	1663	0.03
Pseudowiddrene	11.40*	1492	1.89	9.88	1669	0.05
β-Alaskene	11.40*	1492	[1.89]	9.54*†	1641	[1.27]
α-Chamigrene	11.40*	1492	[1.89]	10.00*	1678	2.37
Unknown [m/z 203, 119 (83), 145 (51), 135 (51)]	11.40*	1492	[1.89]	11.25	1784	0.12
β-Himachalene	11.43	1494	1.39	9.85*	1666	[1.61]
α-Cuprenene	11.46	1497	0.81	10.00*	1678	[2.37]
Cuparene	11.50†	1500	1.33	10.99	1762	1.09
1,2-Dihydrocuparene	11.53†	1502	[1.33]	10.16	1692	0.15
α-Alaskene	11.57	1506	0.34	9.85*	1666	[1.61]
α-Dehydro-ar-himachalene	11.62*	1509	0.39	11.48	1804	0.01
1,4-Dihydrocuparene	11.62*	1509	[0.39]	10.44	1715	0.04
Unknown [m/z 121, 123 (45), 91 (24), 107 (24), 122 (24), 95 (23)... 204 (11)]	11.62*	1509	[0.39]	10.25	1699	0.37
β-Curcumene	11.65	1511	0.24	10.20	1695	0.14
7-epi-α-Selinene	11.72	1517	0.07	10.30	1703	0.07
δ-Cadinene	11.80*	1523	0.11	10.33	1706	0.03
γ-Dehydro-ar-himachalene	11.80*	1523	[0.11]	11.81	1834	0.06
β-Sesquiphellandrene	11.85*	1527	1.52	10.56*	1726	1.54
γ-Cuprenene	11.85*	1527	[1.52]	10.56*	1726	[1.54]
Unknown [m/z 91, 107 (97), 105 (93), 41 (92), 109 (78), 43 (78), 121 (76), 135	11.90*	1531	0.09			

(75)... 220 (21)]						
(E)- γ -Bisabolene	11.90*	1531	[0.09]	10.36	1708	0.03
α -Himachalene	11.95*	1535	0.28	11.61	1815	0.01
δ -Cuprenene epimer I	11.95*	1535	[0.28]	10.84	1749	0.15
Unknown [m/z 43, 95 (81), 207 (61), 41 (55), 55 (50)... 222 (3)]	11.98*	1537	0.33	13.78	2014	0.25
δ -Cuprenene epimer II	11.98*	1537	[0.33]	10.91	1755	0.12
Unknown [m/z 106, 41 (86), 43 (84), 149 (75), 69 (75), 91 (63), 93 (61)... 220 (1)]	12.06	1544	0.02	11.23	1783	0.07
Unknown [m/z 91, 119 (98), 121 (91), 105 (85), 43 (82), 41 (76)... 205 (37), 220 (16)]	12.13	1550	0.01	13.31	1970	0.01
Unknown [m/z 95, 191 (52), 107 (50), 121 (32), 81 (31)...]	12.30	1563	0.09	14.07*	2042	0.22
Caryophyllenyl alcohol	12.35	1566	0.12	13.52	1989	0.07
Caryophyllene oxide	12.45*	1575	0.05	12.69	1912	0.03
Caryophyllene oxide isomer	12.45*	1575	[0.05]	12.61	1905	0.02
allo-Cedrol	12.53	1581	0.14	14.07*	2042	[0.22]
α -Cedrol	12.74*	1597	22.34	14.20	2055	19.58
Widdrol	12.74*	1597	[22.34]	14.55*	2088	3.24
β -Himachalene oxide	12.84*	1605	0.31	13.02	1943	0.06
epi-Cedrol	12.84*	1605	[0.31]	14.67	2100	0.18
Unknown [m/z 138, 110 (77), 137 (75), 107 (62), 91 (61), 93 (60), 109 (57)... 220 (34)]	12.89	1610	0.04	13.37	1975	0.01
10-epi-Cubenol	12.94	1614	0.06	13.66	2002	0.08
Unknown [m/z 107, 41 (86), 123 (85), 82 (79), 95 (77), 93 (76), 91 (73), 69 (71)... 220 (13)]	13.00	1618	0.11	14.55*	2088	[3.24]
2-epi- α -Cedren-3-one	13.06	1624	0.03			
β -Acorenol	13.14*	1630	0.57	14.71	2104	0.20
Unknown [m/z 132, 175 (22), 119 (18), 91 (18), 157 (18)...]	13.14*	1630	[0.57]	15.51	2184	0.04

219 (10)] Unknown [m/z 105, 93 (78), 95 (75), 131 (72), 119 (71), 132 (70), 91 (67), 120 (49)... 202 (39), 220 (9)]	13.20	1635	0.15	15.73*	2206	0.19
Unknown [m/z 132, 91 (24), 119 (22), 105 (21), 133 (17), 117 (16)... 219 (3)]	13.24	1638	0.36			
Unknown [m/z 123, 81 (77), 95 (77), 107 (72), 41 (72), 93 (66), 55 (64)... 220? (13)]	13.29*	1643	0.05			
Himachalol	13.29*	1643	[0.05]	15.08	2141	0.01
Unknown [m/z 41, 91 (96), 79 (88), 69 (82), 123 (80), 93 (80)... 220 (8)]	13.36	1648	0.06	17.23	2364	0.03
Unknown [m/z 43, 81 (84), 41 (64), 67 (62), 95 (58), 79 (58)... 204 (48), 220 (2)]	13.43*	1654	0.46	15.35*	2168	0.42
Cedrenol analog	13.43*	1654	[0.46]	16.33*	2269	0.31
14-Hydroxy-9-epi-(E)-caryophyllene	13.52	1661	0.05	16.33*	2269	[0.31]
Khusiol	13.59*	1667	0.33	15.95	2230	0.10
1,7-diepi- α -Cedrenal?	13.59*	1667	[0.33]	14.98	2130	0.02
Cedr-8-en-13-ol	13.69	1675	0.38	16.77	2315	0.08
α -Bisabolol	13.77	1682	0.43	15.35*	2168	[0.42]
α -Cedrenol	13.81	1685	0.12	16.86	2325	0.16
Unknown [m/z 91, 105 (87), 123 (74), 135 (70), 107 (60), 79 (59)... 220 (13)]	13.92	1695	0.35			
Mayurone?	13.96	1698	0.16	16.96	2336	0.09
Thujopsenal	14.03	1704	0.05	15.73*	2206	[0.19]
Unknown [m/z 105, 69 (77), 91 (66), 119 (65), 111 (56), 107 (45), 55 (45)... 220? (2)]	14.08	1708	0.01	17.37	2380	0.04
Thujopsenal analog	14.35	1731	0.05	17.28*	2371	0.34
Unknown [m/z 105, 91 (83), 79 (78), 135 (67), 107 (56), 67 (53)... 220 (9)]	14.44	1740	0.03			
Cuparenal	14.52	1746	0.06			
Unknown [m/z 105,	14.60	1754	0.01			

69 (79), 111 (66), 119 (60), 91 (50), 55 (41)... 203 (11), 220 (1)]						
Cedryl acetate	14.66*	1759	0.08	14.48	2082	0.06
Unknown [m/z 91, 105 (74), 93 (67), 79 (59), 133 (54), 41 (47), 107 (46)...]	14.66*	1759	[0.08]	18.24	2476	tr
Unknown [m/z 121, 136 (47), 119 (27), 91 (27), 105 (22), 41 (21)... 220 (4)]	14.84	1774	0.10	18.29	2482	0.08
β-Acoradienol?	14.88	1778	0.23	18.02	2452	0.04
Unknown [m/z 189, 91 (48), 133 (40), 105 (40), 41 (34), 187 (34)... 220 (5)]	14.99	1787	0.08	18.51	2506	0.20
Unknown [m/z 148, 141 (99), 91 (74), 105 (52), 41 (42), 121 (42), 133 (37)... 218 (32)]	15.04	1791	0.14	19.68	2643	0.02
Unknown [m/z 121, 136 (53), 91 (22), 93 (19), 79 (15), 105 (13)... 220 (3)]	15.06	1793	0.14	18.46	2500	0.08
Nootkatone analog	15.27	1812	0.01	17.80	2426	0.01
Manool	17.72	2042	0.01	19.28	2596	0.01
7,13-Abietadiene	17.97	2066	tr	17.28*	2371	[0.34]
Total identified		97.05%			94.63%	
Total reported		98.89%			96.19%	

*: 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