CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21H05-PTH02
Customer identification : Organic Australian Sandalwood - Australian - SW01042011R
Type : Essential oil
Source : *Santalum spicatum*
Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014 ✳ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Seydou Ka, Ph. D.
Analysis date : August 10, 2021

Checked and approved by :

_____
Alexis St-Gelais, M. Sc., Chimiste 2013-174

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MÉTHODE CERTIFIÉE
✳ISO 17025:2017
CERTIFIED METHOD

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow viscous liquid
Refractive index: 1.5060 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

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ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Toluene	tr	Simple phenolic
Furfural	0.05	Furan
Santene	0.11	Normonoterpene
Unknown	0.01	Normonoterpene
Tricyclene	0.01	Monoterpene
Limonene	tr	Monoterpene
1-Methyl-4-(1-methylpropyl)benzene	tr	Terpene derivative
4-Methylacetophenone	0.01	Simple phenolic
Unknown	0.02	Terpene derivative
Teresantalic acid	0.30	Monoterpenic acid
Unknown	0.05	Terpenic aldehyde
Tricycloekasantalal	0.08	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.06	Terpenic aldehyde
7-epi-Sesquithujene	0.01	Sesquiterpene
γ-4-Dimethylbenzenebutyral	0.05	Simple phenolic
α-Cedrene	0.15	Sesquiterpene
Sesquithujene	0.05	Sesquiterpene
β-Cedrene	0.04	Sesquiterpene
α-Santalene	0.42*	Sesquiterpene
cis-α-Bergamotene	[0.42]*	Sesquiterpene
trans-α-Bergamotene	0.15	Sesquiterpene
Unknown	0.01	Sesquiterpene
epi-β-Santalene	0.27	Sesquiterpene
Geranylacetone	0.03	Monoterpenic ketone
α-Acoradiene	0.07	Sesquiterpene
(E)-β-Farnesene	0.09	Sesquiterpene
β-Santalene	0.42	Sesquiterpene
β-Acoradiene	0.02	Sesquiterpene
10-epi-β-Acoradiene	0.07	Sesquiterpene
γ-Curcumene	0.23	Sesquiterpene
Unknown	0.23	Sesquiterpene
ar-Curcumene	0.34	Sesquiterpene
β-Selinene	0.04	Sesquiterpene
Unknown	0.05	Sesquiterpene
Unknown	0.18	Sesquiterpene
Unknown	0.10	Sesquiterpene
β-Bisabolene	0.17	Sesquiterpene
α-Alaskene	0.04	Sesquiterpene
(3E,6E)-α-Farnesene	0.06	Sesquiterpene
β-Curcumene	0.46	Sesquiterpene
Sesquicineole	0.01	Sesquiterpenic ether
β-Sesquiphellandrene	0.14	Sesquiterpene
8,14-Cedranoxide	0.05	Sesquiterpenic ether
(E)-α-Bisabolene	0.07	Sesquiterpene

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(*E*)-Nerolidol	2.30	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
Dendrolasin	1.08	Sesquiterpenic ether
Helifolen-12-al A	0.17	Sesquiterpenic aldehyde
α-Cedrol	0.03	Sesquiterpenic alcohol
Guaiol	0.30	Sesquiterpenic alcohol
Helifolen-12-al B	0.08	Sesquiterpenic aldehyde
Unknown	0.10	Oxygenated sesquiterpene
Rosifoliol	0.04	Sesquiterpenic alcohol
α-Acorenol	0.20	Sesquiterpenic alcohol
γ-Eudesmol	0.15	Sesquiterpenic alcohol
Unknown	0.05	Oxygenated sesquiterpene
β-Acorenol	0.16	Sesquiterpenic alcohol
10-epi-β-Acorenol?	0.08	Sesquiterpenic alcohol
β-Eudesmol	0.03	Sesquiterpenic alcohol
Unknown	0.19	Oxygenated sesquiterpene
α-Bisabolol oxide B, epimer 1	0.46	Sesquiterpenic alcohol
α-Bisabolol oxide B, epimer 2	0.64	Sesquiterpenic alcohol
epi-β-Bisabolol	1.15	Sesquiterpenic alcohol
Bulnesol	0.69	Sesquiterpenic alcohol
β-Bisabolol	0.47	Sesquiterpenic alcohol
epi-Cyclosantalal	1.94	Sesquiterpenic aldehyde
(*E*)-α-Santalal	0.72	Sesquiterpenic aldehyde
(*Z*)-α-Santalol	15.09	Sesquiterpenic alcohol
Cedr-8-en-13-ol	0.50	Sesquiterpenic alcohol
epi-α-Bisabolol	5.94	Sesquiterpenic alcohol
α-Bisabolol	0.15	Sesquiterpenic alcohol
(*E*)-α-Santalol	0.40	Sesquiterpenic alcohol
(*Z*)-α-*trans*-Bergamotol	3.83	Sesquiterpenic alcohol
Unknown	0.77	Oxygenated sesquiterpene
Unknown	0.16	Oxygenated sesquiterpene
(*Z*)-epi-β-Santalol	1.38	Sesquiterpenic alcohol
(*E*)-α-*trans*-Bergamotol	0.85	Sesquiterpenic alcohol
(*Z*)-β-Santalol	5.65	Sesquiterpenic alcohol
Unknown	0.11	Oxygenated sesquiterpene
(*Z*)-γ-Curcumen-12-ol	5.78	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesol	10.97	Sesquiterpenic alcohol
(*Z*)-Nuciferol	9.31	Sesquiterpenic alcohol
(*E*)-β-Santalol	0.15	Sesquiterpenic alcohol
Unknown	0.74	Oxygenated sesquiterpene
(2*E*,6*E*)-Farnesal	0.25	Sesquiterpenic aldehyde
Curcumen-12-ol analog	0.88	Sesquiterpenic alcohol
Unknown	2.45	Oxygenated sesquiterpene
(*Z*)-β-Curcumen-12-ol	6.33	Sesquiterpenic alcohol
12-Hydroxy-(*Z*)-sesquicineole	0.26	Sesquiterpenic alcohol
(*Z*)-Lanceol	2.74	Sesquiterpenic alcohol
Unknown	0.84	Oxygenated sesquiterpene
Unknown	0.99	Oxygenated sesquiterpene
Unknown	0.54	Oxygenated sesquiterpene
Bisabola-2,7(*Z*),10(*Z*)-trien-13-ol?	0.78	Oxygenated sesquiterpene
Unknown	0.45	Oxygenated sesquiterpene

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Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.14	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
(2*E*,6*E*)-Farnesyl acetate	0.15	Sesquiterpenic ester
Unknown	0.23	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
Consolidated total	**95.16%**	

*: 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

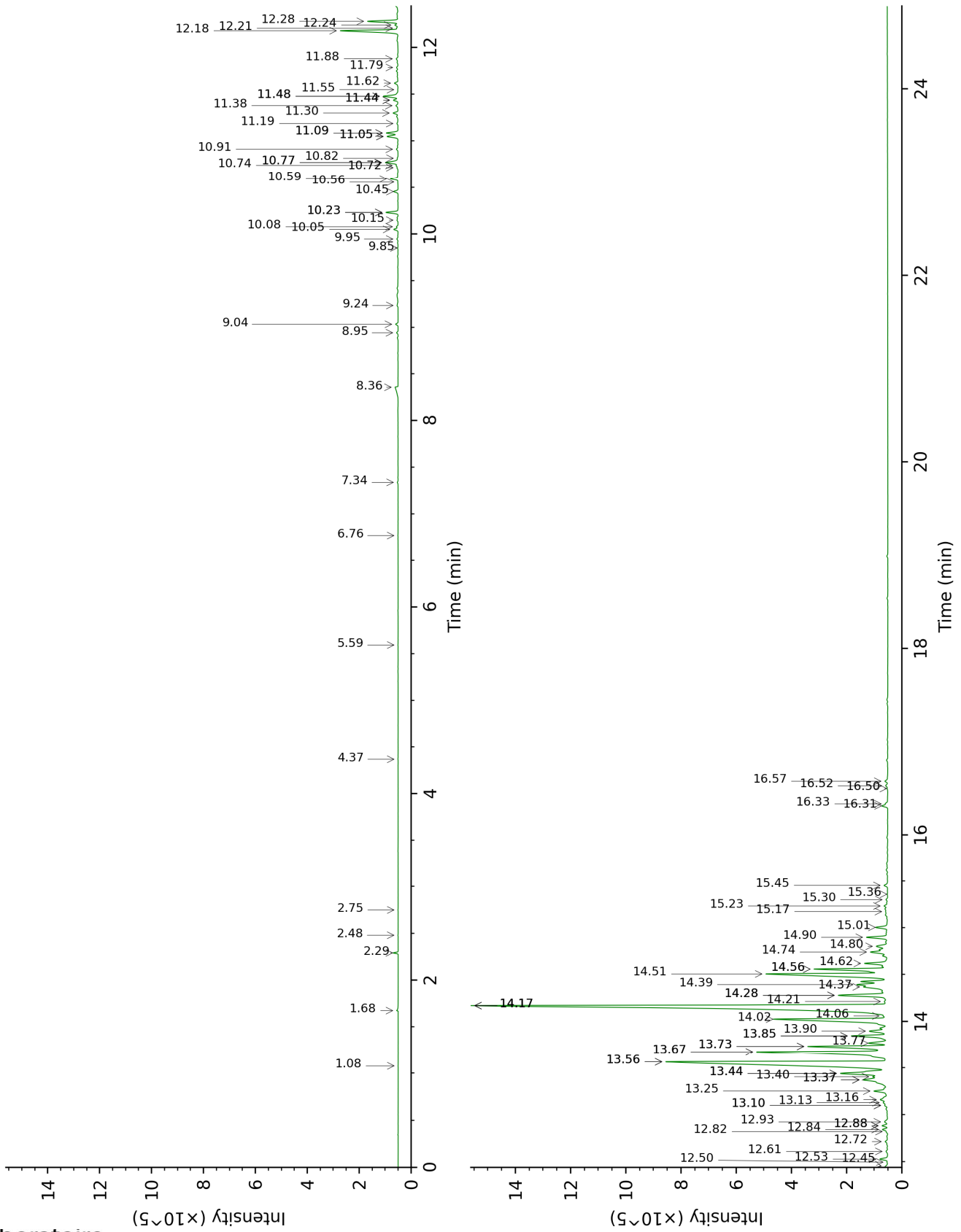tr: The compound has been detected below 0.005% of total signal.
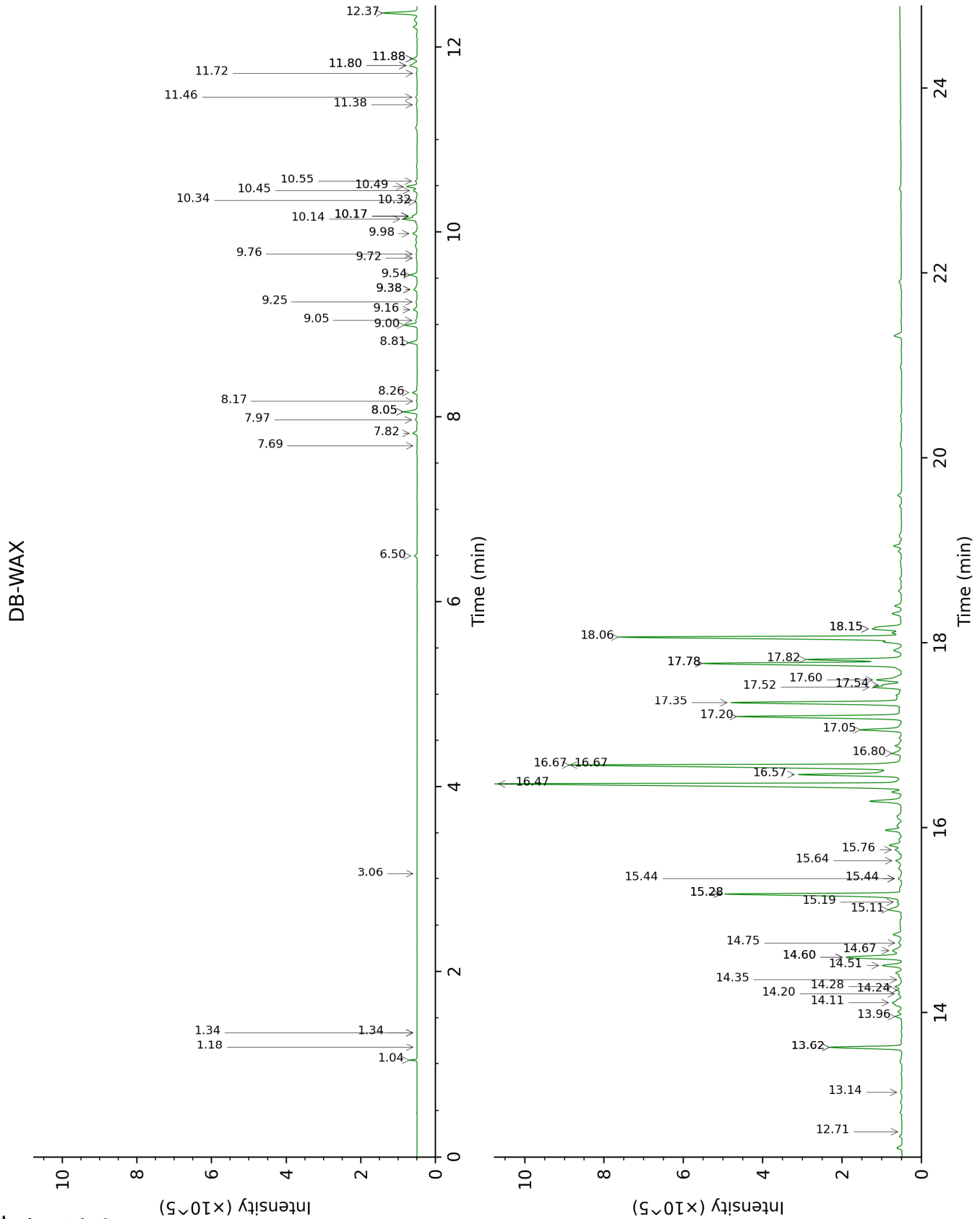
Note: no correction factor was applied

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.

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DB-5

Time (min)

Time (min)

Intensity (×10^5)

Intensity (×10^5)

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DB-WAX

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.08	758	tr	1.34*	999	tr
Furfural	1.68	829	0.05	6.50	1410	0.08
Santene	2.29	882	0.11	1.04	948	0.11
Unknown [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.48	899	0.01	1.34*	999	[tr]
Tricyclene	2.75	918	0.01	1.18	972	tr
Limonene	4.37	1026	tr	3.06	1158	tr
1-Methyl-4-(1-methylpropyl)benzene	5.60	1104	tr			
4-Methylacetophenone	6.76	1179	0.01	10.32	1709	0.03
Unknown [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	7.34	1216	0.02	9.05	1605	0.06
Teresantalic acid	8.36	1284	0.30	15.44*	2181	0.14
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	8.95	1325	0.05			
Tricycloekasantalal	9.04	1332	0.08	10.17*	1696	0.16
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	9.24	1346	0.06	10.17*	1696	[0.16]
7-epi-Sesquithujene	9.85	1389	0.01	7.69	1499	0.01
γ-4-Dimethylbenzenebutyral	9.95	1396	0.05			
α-Cedrene	10.05	1403	0.15	7.82	1509	0.15
Sesquithujene	10.08	1405	0.05	7.97	1521	0.07
β-Cedrene	10.15	1410	0.04	8.17	1536	0.03
α-Santalene	10.23*	1417	0.42	8.05*	1527	0.45
cis-α-Bergamotene	10.23*	1417	[0.42]	8.05*	1527	[0.45]
trans-α-Bergamotene	10.45	1433	0.15	8.26	1544	0.15
Unknown [m/z 93, 91 (80), 79 (68), 123 (68), 121 (56)... 204 (3)]	10.56	1441	0.01			
epi-β-Santalene	10.59	1444	0.27	8.81	1586	0.26
Geranylacetone	10.72	1453	0.03	11.46	1806	0.05
α-Acoradiene	10.74	1455	0.07	9.16	1614	0.14
(*E*)-β-Farnesene	10.77*	1457	0.55	9.38*	1632	0.16
β-Santalene	10.77*	1457	[0.55]	9.00	1601	0.42
β-Acoradiene	10.82	1460	0.02	9.25	1621	0.06
10-epi-β-Acoradiene	10.91	1468	0.07	9.38*	1632	[0.16]
γ-Curcumene	11.05*	1478	0.46	9.54	1645	0.23
Unknown [m/z 119, 91 (24), 105 (16), 121 (16), 93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]	11.05*	1478	[0.46]			
ar-Curcumene	11.09*	1480	0.42	10.49	1723	0.34
β-Selinene	11.09*	1480	[0.42]	9.72	1660	0.04

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Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.19	1488	0.05	11.88*	1843	0.15
Unknown [m/z 119, 93 (52), 105 (38), 91 (33), 41 (31), 79 (25)... 204 (2)]	11.30	1496	0.18	11.80*	1836	0.34
Unknown [m/z 119, 91 (14), 120 (10), 117 (9)... 200? (2)]	11.38	1502	0.10	11.72	1829	0.03
β-Bisabolene	11.44*	1507	0.16	9.98	1681	0.17
α-Alaskene	11.44*	1507	[0.16]	9.76	1663	0.04
(3*E*,6*E*)-α-Farnesene	11.48*	1510	0.63	10.34	1711	0.06
β-Curcumene	11.48*	1510	[0.63]	10.14	1694	0.46
Sesquicineole	11.55	1516	0.01	10.17*	1696	[0.16]
β-Sesquiphellandrene	11.62	1521	0.14	10.45	1720	0.12
8,14-Cedranoxide	11.79	1534	0.05	11.38	1799	0.04
(*E*)-α-Bisabolene	11.88	1542	0.07	10.55	1728	0.06
(*E*)-Nerolidol	12.18	1565	2.30	13.62*	2002	2.22
Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.21	1567	0.04	11.80*	1836	[0.34]
Unknown [m/z 43, 125 (91), 107 (39), 41 (24), 67 (24), 93 (21)... 220 (4)]	12.24	1570	0.11	11.88*	1843	[0.15]
Dendrolasin	12.28	1573	1.08	12.37	1887	1.05
Helifolen-12-al A	12.45	1586	0.17	12.71	1918	0.01
α-Cedrol	12.50	1590	0.03	14.11	2049	0.67
Guaiol	12.53	1593	0.30	13.96	2035	0.21
Helifolen-12-al B	12.61	1599	0.08	13.14	1958	0.06
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]	12.72	1608	0.10			
Rosifoliol	12.82	1616	0.04	14.20	2058	0.14
α-Acorenol	12.84	1618	0.20	14.28	2066	0.27
γ-Eudesmol	12.88*	1622	0.20	14.75	2112	0.15
Unknown [m/z 41, 91 (78), 67 (76), 119 (70), 55 (61)... 220 (7)]	12.88*	1622	[0.20]	13.62*	2002	[2.22]
β-Acorenol	12.92	1625	0.16	14.67	2104	0.51
10-epi-β-Acorenol?	13.10*	1639	0.11			
β-Eudesmol	13.10*	1639	[0.11]	15.28*	2165	5.97
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.13	1642	0.19			
α-Bisabolol oxide B, epimer 1	13.16	1644	0.46	14.24	2062	0.15
α-Bisabolol oxide B, epimer 2	13.25	1652	0.64	14.35	2073	0.03
epi-β-Bisabolol	13.37*†	1662	1.85	14.60*	2096	2.33
Bulnesol	13.37*†	1662	[1.85]	15.11	2148	0.69
β-Bisabolol	13.40	1664	0.47	14.60*	2096	[2.33]
epi-Cyclosantalal	13.44*	1667	2.66			

(*E*)-α-Santalal	13.44*	1667	[2.66]	14.51	2088	0.72
(*Z*)-α-Santalol	13.56*	1678	15.59	16.47	2288	15.09
Cedr-8-en-13-ol	13.56*	1678	[15.59]	16.67*	2309	13.02
epi-α-Bisabolol	13.67*†	1687	10.32	15.28*	2165	[5.97]
α-Bisabolol	13.67*†	1687	[10.32]	15.19	2156	0.15
(*E*)-α-Santalol	13.73*†	1692	[10.32]	16.80	2323	0.40
(*Z*)-α-*trans*-Bergamotol	13.73*†	1692	[10.32]	16.57	2298	3.83
Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.77	1695	0.77			
Unknown [m/z 43, 125 (55), 93 (46), 107 (45), 67 (34), 41 (32)... 220 (2)]	13.84*	1701	1.53			
(*Z*)-epi-β-Santalol	13.84*	1701	[1.53]	17.05	2350	1.38
(*E*)-α-*trans*-Bergamotol	13.90	1705	0.85	17.60	2410	1.04
(*Z*)-β-Santalol	14.02	1716	5.65	17.20	2366	5.45
Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	14.06	1719	0.11	15.44*	2181	[0.14]
(*Z*)-γ-Curcumen-12-ol	14.17*	1729	26.06	17.35	2382	5.78
(2*E*,6*E*)-Farnesol	14.17*	1729	[26.06]	16.67*	2309	[13.02]
(*Z*)-Nuciferol	14.17*	1729	[26.06]	18.06	2461	9.31
(*E*)-β-Santalol	14.21	1733	0.15	17.54	2404	0.49
Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.28*	1739	2.18	18.15*	2471	1.51
(2*E*,6*E*)-Farnesal	14.28*	1739	[2.18]	15.64	2202	0.25
Curcumen-12-ol analog	14.37†	1746	3.33	17.52	2401	0.88
Unknown [m/z 119, 93 (70), 111 (61), 110 (60), 109 (45), 95 (43)... 220 (17), 238 (16)]	14.39†	1748	[3.33]			
(*Z*)-β-Curcumen-12-ol	14.51	1758	6.33	17.78*	2430	7.33
12-Hydroxy-(*Z*)-sesquicineole	14.56*	1763	3.00			
(*Z*)-Lanceol	14.56*	1763	[3.00]	17.82	2434	2.74
Unknown [m/z 93, 107 (80), 43 (74), 91 (55), 41 (49), 79 (48), 119 (48)... 236 (3)]	14.62†	1768	1.83			
Unknown [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	14.74†	1779	[1.83]	17.78*	2430	[7.33]
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	14.80	1784	0.54			
Bisabola-2,7(*Z*),10(*Z*)-trien-13-ol?	14.90	1792	0.78	18.15*	2471	[1.51]
Unknown [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	15.00	1802	0.45			
Unknown [m/z 119, 145 (62), 105 (52), 91 (52), 121 (38)...]	15.17	1817	0.09			

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	R.T.	R.I.	%	R.T.	R.I.	%
Unknown [m/z 43, 81 (61), 41 (49), 93 (47), 119 (39), 141 (35)...]	15.23	1822	0.14			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]	15.30	1828	0.05			
Unknown [m/z 141, 43 (87), 123 (55), 81 (37)... 236 (t)]	15.36	1834	0.01			
(2*E*,6*E*)-Farnesyl acetate	15.45	1842	0.15	15.76	2214	0.26
Unknown [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	16.31	1921	0.23			
Unknown [m/z 93, 109 (98), 43 (97), 68 (83), 95 (74), 110 (72), 81 (71)...220 (8)]	16.33	1923	0.08			
Unknown [m/z 43, 107 (24), 93 (23), 125 (23), 95 (23), 119 (23)...220 (1)]	16.50	1939	0.02			
Unknown [m/z 43, 107 (23), 119 (23), 93 (22), 125 (22), 132 (22)...220 (1)]	16.52	1942	0.09			
Unknown [m/z 93, 94 (86), 91 (48), 121 (42), 79 (42), 107 (37)...218 (2)]	16.57	1946	0.12			
Total identified	**91.10%**			**88.62%**		
Total reported	**96.50%**			**88.72%**		

*: 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

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