

Date : February 22, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21B15-PTH04


Customer identification : Sandalwood Australian - Australian - S2010785R

Type : Essential oil

Source : *Santalum spicatum*

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

Analysis date : February 19, 2021

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow viscous liquid

Refractive index: 1.5061 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 22769:2009 - OIL OF AUSTRALIAN SANDALWOOD

Compound	Min. %	Max. %	Observed %	Complies?
(Z)- α -Santalol	15.0	25.0	15.1	Yes
epi- α -Bisabolol	2.0	12.5	7.7	Yes
(Z)- β -Santalol	5.0	20.0	5.2	Yes
(Z)-epi- β -Santalol	0.5	3.5	1.4	Yes
(Z)- α -trans-Bergamotol	2.0	10.0	3.1	Yes
(2E,6E)-Farnesol	2.5	15.0	12.7	Yes
(Z)-Nuciferol	2.0	15.0	9.2	Yes
(Z)-Lanceol	1.0	10.0	2.7	Yes
Refractive index	1.5000	1.5170	1.5061	Yes

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
Santene	0.01	Normonoterpene
Teresantalic acid	0.20	Monoterpenic acid
Unknown	0.02	Terpenic aldehyde
Tricycloekasantalal	0.02	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.02	Terpenic aldehyde
7-epi-Sesquithujene	0.01	Sesquiterpene
γ-4-Dimethylbenzenebutyral	0.03	Simple phenolic
α-Cedrene	0.11	Sesquiterpene
cis-α-Bergamotene	0.02	Sesquiterpene
β-Cedrene	0.02	Sesquiterpene
α-Santalene	0.21	Sesquiterpene
trans-α-Bergamotene	0.09	Sesquiterpene
Unknown	0.04	Sesquiterpene
epi-β-Santalene	0.20	Sesquiterpene
Geranylacetone	0.04	Monoterpenic ketone
α-Acoradiene	0.05	Sesquiterpene
(E)-β-Farnesene	0.10	Sesquiterpene
β-Santalene	0.26	Sesquiterpene
β-Acoradiene	0.03	Sesquiterpene
10-epi-β-Acoradiene	0.03	Sesquiterpene
γ-Curcumene	0.02	Sesquiterpene
ar-Curcumene	0.28	Sesquiterpene
Unknown	0.35	Sesquiterpene
Unknown	0.06	Sesquiterpene
Unknown	0.13	Sesquiterpene
α-Alaskene	0.11	Sesquiterpene
(3E,6E)-α-Farnesene	0.07	Sesquiterpene
β-Bisabolene	0.13	Sesquiterpene
β-Sesquiphellandrene	0.14	Sesquiterpene
8,14-Cedranoxide	0.08	Sesquiterpenic ether
(E)-α-Bisabolene	0.09	Sesquiterpene
(E)-Nerolidol	2.34	Sesquiterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.10	Oxygenated sesquiterpene
Dendrolasin	1.10	Sesquiterpenic ether
Helifolen-12-al A	0.05	Sesquiterpenic aldehyde
Guaiol	0.25	Sesquiterpenic alcohol
α-Cedrol	0.33	Sesquiterpenic alcohol
Helifolen-12-al B	0.12	Sesquiterpenic aldehyde
Unknown	0.20	Oxygenated sesquiterpene
Rosifoliol	0.06	Sesquiterpenic alcohol
α-Acorenol	0.24	Sesquiterpenic alcohol
γ-Eudesmol	0.11	Sesquiterpenic alcohol
β-Acorenol	0.39	Sesquiterpenic alcohol

10-epi-β-Acorenol?	0.12	Sesquiterpenic alcohol
Unknown	0.45	Oxygenated sesquiterpene
α-Bisabolol oxide B, epimer 1	0.14	Sesquiterpenic alcohol
α-Bisabolol oxide B, epimer 2	0.03	Sesquiterpenic alcohol
epi-β-Bisabolol	0.56	Sesquiterpenic alcohol
Bulnesol	0.44	Sesquiterpenic alcohol
β-Bisabolol	1.11	Sesquiterpenic alcohol
(E)-α-Santalal	0.60	Sesquiterpenic aldehyde
epi-Cyclosantalal	2.34	Sesquiterpenic aldehyde
(Z)-α-Santalol	15.06	Sesquiterpenic alcohol
Cedr-8-en-13-ol	0.51	Sesquiterpenic alcohol
epi-α-Bisabolol	7.72	Sesquiterpenic alcohol
(Z)-α-trans-Bergamotol	3.13	Sesquiterpenic alcohol
Unknown	0.45	Oxygenated sesquiterpene
(E)-α-Santalol	0.46	Sesquiterpenic alcohol
Unknown	0.15	Oxygenated sesquiterpene
(Z)-epi-β-Santalol	1.39	Sesquiterpenic alcohol
(E)-α-trans-Bergamotol	1.11	Sesquiterpenic alcohol
Unknown	0.43	Oxygenated sesquiterpene
(Z)-β-Santalol	5.16	Sesquiterpenic alcohol
(Z)-γ-Curcumen-12-ol	5.53	Sesquiterpenic alcohol
(2E,6E)-Farnesol	12.70	Sesquiterpenic alcohol
(Z)-Nuciferol	9.19	Sesquiterpenic alcohol
(E)-β-Santalol	0.51	Sesquiterpenic alcohol
Unknown	0.82	Oxygenated sesquiterpene
Unknown	1.01	Oxygenated sesquiterpene
Curcumen-12-ol analog	1.01	Sesquiterpenic alcohol
Unknown	1.50	Oxygenated sesquiterpene
(Z)-β-Curcumen-12-ol	6.37	Sesquiterpenic alcohol
12-Hydroxy-(Z)-sesquicineole	0.23	Sesquiterpenic alcohol
(Z)-Lanceol	2.67	Sesquiterpenic alcohol
Unknown	1.15	Oxygenated sesquiterpene
Unknown	0.91	Oxygenated sesquiterpene
Unknown	0.53	Oxygenated sesquiterpene
Bisabola-2,7(Z),10(Z)-trien-13-ol?	0.85	Oxygenated sesquiterpene
Unknown	0.46	Oxygenated sesquiterpene
Unknown	0.17	Oxygenated sesquiterpene
Unknown	0.19	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
(2E,6E)-Farnesyl acetate	0.09	Sesquiterpenic ester
Unknown	0.10	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Consolidated total	95.81%	

Note: no correction factor was applied

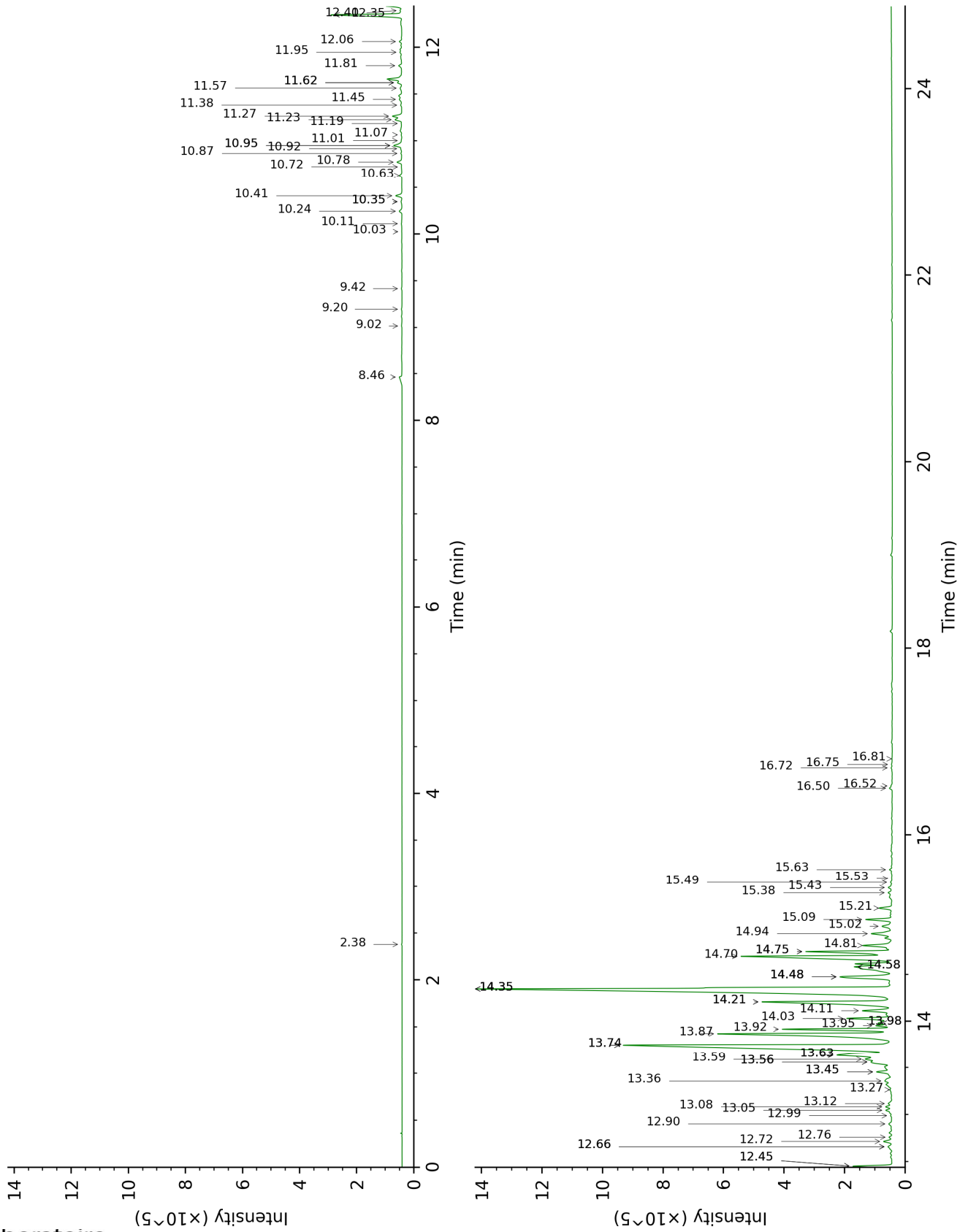
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid

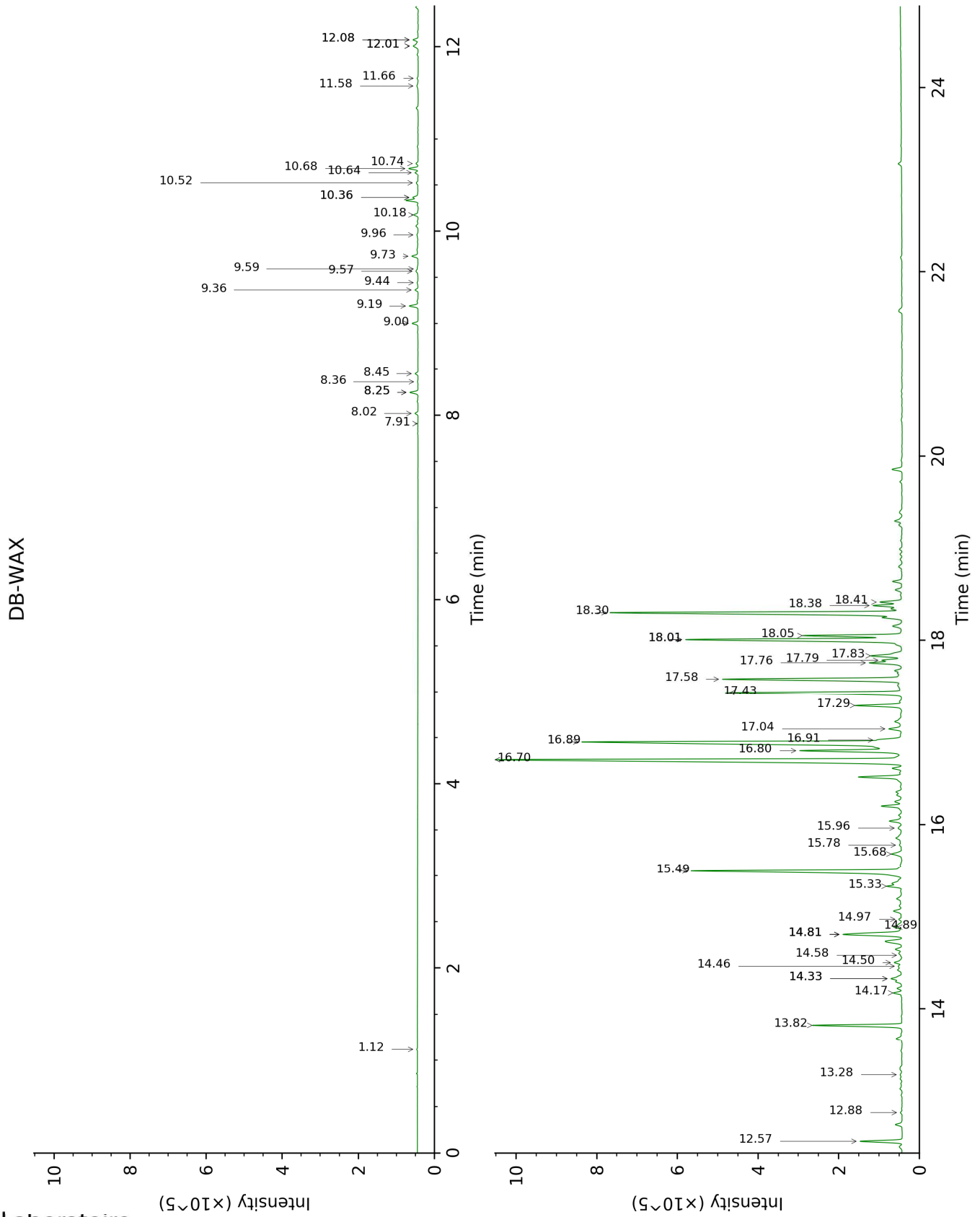
overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

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.

DB-5





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Santene	2.38	883	0.01	1.12	947	0.01
Teresantalic acid	8.46	1286	0.20	15.78	2194	0.09
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	9.02	1319	0.02			
Tricycloekasantalal (1S,5S,6R)-2,6-	9.20	1332	0.02	10.36*	1697	0.18
Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	9.42	1347	0.02	10.36*	1697	[0.18]
7-epi-Sesquithujene	10.02	1390	0.01	7.91	1503	0.01
γ-4-Dimethylbenzenebutyral	10.11	1396	0.03			
α-Cedrene	10.24	1405	0.11	8.02	1512	0.09
cis-α-Bergamotene	10.35*	1413	0.04	8.25*	1529	0.24
β-Cedrene	10.35*	1413	[0.04]	8.36	1538	0.02
α-Santalene	10.41	1418	0.21	8.25*	1529	[0.24]
trans-α-Bergamotene	10.63	1434	0.09	8.45	1545	0.08
Unknown [m/z 93, 91 (80), 79 (68), 123 (68), 121 (56)... 204 (3)]	10.72	1441	0.04			
epi-β-Santalene	10.78	1445	0.20	9.00	1588	0.17
Geranylacetone	10.87	1452	0.04	11.66	1807	0.04
α-Acoradiene	10.92	1456	0.05	9.36	1616	0.09
(E)-β-Farnesene	10.95*	1458	0.37	9.57	1633	0.10
β-Santalene	10.95*	1458	[0.37]	9.19	1602	0.26
β-Acoradiene	11.00	1462	0.03	9.44	1623	0.04
10-epi-β-Acoradiene	11.07	1466	0.03	9.59	1635	0.04
γ-Curcumene	11.19	1476	0.02	9.73	1646	0.20
ar-Curcumene	11.23	1478	0.28	10.68	1724	0.26
Unknown [m/z 119, 91 (24), 105 (16), 121 (16), 93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]	11.27	1481	0.35			
Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.38	1490	0.06	12.08*	1844	0.16
Unknown [m/z 119, 93 (52), 105 (38), 91 (33), 41 (31), 79 (25)... 204 (2)]	11.45	1495	0.13	12.01*	1838	0.24
α-Alaskene	11.57	1504	0.11	9.96	1664	0.07
(3E,6E)-α-Farnesene	11.62*	1508	0.16	10.52	1711	0.07
β-Bisabolene	11.62*	1508	[0.16]	10.18	1682	0.13
β-Sesquiphellandrene	11.81	1522	0.14	10.64	1721	0.09
8,14-Cedranoxide	11.95	1534	0.08	11.58	1800	0.09
(E)-α-Bisabolene	12.06	1542	0.09	10.74	1729	0.06
(E)-Nerolidol	12.35	1565	2.34	13.82	2003	2.31

Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.40	1569	0.06	12.01*	1838	[0.24]
Unknown [m/z 43, 125 (91), 107 (39), 41 (24), 67 (24), 93 (21)... 220 (4)]	12.45*	1573	1.21	12.08*	1844	[0.16]
Dendrolasin	12.45*	1573	[1.21]	12.57	1887	1.10
Helifolen-12-al A	12.66*	1589	0.26	12.88	1915	0.05
Guaiol	12.66*	1589	[0.26]	14.17	2036	0.25
α -Cedrol	12.72	1594	0.33	14.33*	2051	0.44
Helifolen-12-al B	12.76	1597	0.12	13.28	1953	0.08
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]	12.90	1608	0.20			
Rosifoliol	12.99	1616	0.06	14.33*	2051	[0.44]
α -Acorenol	13.05	1620	0.24	14.50	2067	0.29
γ -Eudesmol	13.08†	1624	0.42	14.97	2113	0.11
β -Acorenol	13.12†	1626	[0.42]	14.89	2105	0.39
10-epi- β -Acorenol?	13.26	1638	0.12			
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.36	1646	0.45			
α -Bisabolol oxide B, epimer 1	13.45*	1654	0.71	14.46	2064	0.14
α -Bisabolol oxide B, epimer 2	13.45*	1654	[0.71]	14.58	2075	0.03
epi- β -Bisabolol	13.56*	1663	0.99	14.81*	2097	2.27
Bulnesol	13.56*	1663	[0.99]	15.33	2148	0.44
β -Bisabolol	13.59	1665	1.11	14.81*	2097	[2.27]
(<i>E</i>)- α -Santalal	13.63*	1669	2.94	14.81*	2097	[2.27]
epi-Cyclosantalal	13.63*	1669	[2.94]			
(<i>Z</i>)- α -Santalol	13.74*	1678	15.48	16.70	2289	15.06
Cedr-8-en-13-ol	13.74*	1678	[15.48]	16.92	2312	0.51
epi- α -Bisabolol	13.87	1688	7.72	15.50	2165	6.85
(<i>Z</i>)- α - <i>trans</i> -Bergamotol	13.92	1692	3.13	16.80	2299	3.11
Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.95	1695	0.45			
(<i>E</i>)- α -Santalol	13.98*	1698	0.61	17.04	2324	0.46
Unknown [m/z 43, 125 (55), 93 (46), 107 (45), 67 (34), 41 (32)... 220 (2)]	13.98*	1698	[0.61]			
(<i>Z</i>)-epi- β -Santalol	14.03	1702	1.39	17.29	2352	1.34
(<i>E</i>)- α - <i>trans</i> -Bergamotol	14.11	1709	1.11	17.83	2411	1.20
Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	14.21*	1717	5.64	15.68	2184	0.43
(<i>Z</i>)- β -Santalol	14.21*	1717	[5.64]	17.43	2367	5.16
(<i>Z</i>)- γ -Curcumen-12-ol	14.35*	1729	25.36	17.58	2383	5.53
(2 <i>E</i> ,6 <i>E</i>)-Farnesol	14.35*	1729	[25.36]	16.90	2309	12.70
(<i>Z</i>)-Nuciferol	14.35*	1729	[25.36]	18.30	2462	9.19
(<i>E</i>)- β -Santalol	14.48*	1740	2.33	17.79	2405	0.51

Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.48*	1740	[2.33]	18.38	2471	0.82
Unknown [m/z 119, 93 (73), 110 (64), 111 (62), 95 (50), 81 (45), 109 943), 105 (43)... 220 (17), 238 (20)]	14.48*	1740	[2.33]			
Curcumen-12-ol analog	14.58*	1749	2.52	17.76	2402	1.01
Unknown [m/z 119, 93 (70), 111 (61), 110 (60), 109 (45), 95 (43)... 220 (17), 238 (16)]	14.58*	1749	[2.52]			
(Z)- β -Curcumen-12-ol	14.70	1759	6.37	18.01*	2430	7.06
12-Hydroxy-(Z)-sesquicineole	14.75*	1763	2.90			
(Z)-Lanceol	14.75*	1763	[2.90]	18.05	2435	2.67
Unknown [m/z 93, 107 (80), 43 (74), 91 (55), 41 (49), 79 (48), 119 (48)... 236 (3)]	14.81	1769	1.15			
Unknown [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	14.94	1780	0.91	18.01*	2430	[7.06]
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	15.02	1787	0.53			
Bisabola-2,7(Z),10(Z)-trien-13-ol?	15.09	1793	0.85	18.42	2475	0.67
Unknown [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	15.21	1804	0.46			
Unknown [m/z 119, 145 (62), 105 (52), 91 (52), 121 (38)...]	15.38	1818	0.17			
Unknown [m/z 43, 81 (61), 41 (49), 93 (47), 119 (39), 141 (35)...]	15.43	1824	0.19			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]	15.49	1829	0.06			
Unknown [m/z 141, 43 (87), 123 (55), 81 (37)... 236 (t)]	15.53	1833	0.04			
(2E,6E)-Farnesyl acetate	15.63	1841	0.09	15.96	2213	0.17
Unknown [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	16.50	1921	0.10			
Unknown [m/z 93, 109 (98), 43 (97), 68 (83), 95 (74), 110 (72), 81 (71)...220 (8)]	16.52	1923	0.03			
Unknown [m/z 43, 107 (24), 93 (23), 125 (23), 95 (23), 119 (23)...220 (1)]	16.72	1942	0.04			

Unknown [m/z 43, 107 (23), 119 (23), 93 (22), 125 (22), 132 (22)...220 (1)]	16.75	1945	0.03	
Unknown [m/z 93, 94 (86), 91 (48), 121 (42), 79 (42), 107 (37)...218 (2)]	16.81	1951	0.01	
Total identified		88.65%		83.88%
Total reported		94.13%		85.12%

*: 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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index