

GC/MS BATCH NUMBER: SA2101

ESSENTIAL OIL: SANDALWOOD INDIAN
BOTANICAL NAME: SANTALUM ALBUM
ORIGIN: EAST INDIAN

KEY CONSTITUENTS PRESENT IN THIS BATCH OF SANDALWOOD INDIAN OIL	%
(Z)- α -SANTALOL	41.5
(Z)- β -SANTALOL	18.6
(Z)- α -TRANS-BERGAMOTOL	6.2
(Z)-epi- β -SANTALOL	3.6
(E)- α -SANTALAL	2.5
(Z)-LANCEOL	2.2
(Z)-NUCIFEROL	2.1
(Z)- β -CURCUMEN-12-ol	1.4
β -SANTALENE	1.3

Comments from Robert Tisserand: Full, precious-wood odor quality with hints of sawdust and sour cream. Both key ISO constituents are within range.

Date : July 25, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18G23-PTH2-1-CC

Customer identification : Sandalwood Indian - East Indian - SA210168R

Type : Essential oil

Source : *Santalum album*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - 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 : July 24, 2018

Checked and approved by :

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.

This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow viscous liquid

Refractive index: 1.5060 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Santene	0.03	0.03	Monoterpene
Tricyclene	tr	tr	Monoterpene
Limonene	tr		Monoterpene
Unknown	tr		Unknown
4-Methylacetophenone	0.02	0.02	Simple phenolic
Unknown	0.03	1.27*	Terpene derivative
Teresantalic acid	0.26	0.37*	Monoterpenic acid
Unknown	0.01		Terpenic aldehyde
Tricycloekasantalal	0.14	0.19*	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.03	[0.19]*	Terpenic aldehyde
Unknown	0.04		Unknown
7-epi-Sesquithujene	0.02	0.02	Sesquiterpene
γ-4-Dimethylbenzenebutyral	0.01		Simple phenolic
α-Cedrene	0.04	0.02	Sesquiterpene
α-Santalene	0.80	0.78	Sesquiterpene
trans-α-Bergamotene	0.19	0.15	Sesquiterpene
Unknown	0.02		Sesquiterpene
epi-β-Santalene	0.84	0.82	Sesquiterpene
β-Santalene	1.29	[1.27]*	Sesquiterpene
β-Acoradiene	0.05	0.04	Sesquiterpene
10-epi-β-Acoradiene	0.01	0.01	Sesquiterpene
γ-Curcumene	0.09	0.11	Sesquiterpene
α-Curcumene	0.27	0.25	Sesquiterpene
α-Selinene	tr	0.01	Sesquiterpene
Unknown	0.01	0.01	Sesquiterpene
α-Alaskene	0.05	0.05	Sesquiterpene
β-Bisabolene	0.08	0.09	Sesquiterpene
β-Curcumene	0.23	0.10	Sesquiterpene
Unknown	0.45*	0.40	Oxygenated sesquiterpene
Sesquicineole	[0.45]*	[0.19]*	Sesquiterpenic ether
β-Sesquiphellandrene	0.23		Sesquiterpene
8,14-Cedranoxide	0.01	0.01	Sesquiterpenic ether
Unknown	0.44		Sesquiterpene
Unknown	0.22		Sesquiterpene
(E)-Nerolidol	0.08	0.07	Sesquiterpenic alcohol
Dendrolasin	0.11*	0.04	Sesquiterpenic ether
Unknown	[0.11]*	0.01	Oxygenated sesquiterpene
Unknown	[0.11]*	0.01	Oxygenated sesquiterpene
Guaiol	0.06	0.04	Sesquiterpenic alcohol
Unknown	0.14		Oxygenated sesquiterpene
Rosifoliol	0.03	0.10	Sesquiterpenic alcohol
α-Acorenol	0.08	0.06	Sesquiterpenic alcohol
β-Acorenol	0.17	0.20	Sesquiterpenic alcohol
10-epi-β-Acorenol?	0.03		Sesquiterpenic alcohol
β-Eudesmol	0.07	0.08	Sesquiterpenic alcohol
Unknown	0.79*		Oxygenated sesquiterpene

α -Bisabolol oxide B, epimer 1	[0.79]*	0.32	Sesquiterpenic alcohol
α -Bisabolol oxide B, epimer 2	[0.79]*	0.19	Sesquiterpenic alcohol
Unknown	0.42		Oxygenated sesquiterpene
Unknown	0.38	0.36	Oxygenated sesquiterpene
Unknown	0.77*	0.56	Oxygenated sesquiterpene
Bulnesol	[0.77]*	0.24	Sesquiterpenic alcohol
epi-Cyclosantalal	0.95*		Sesquiterpenic aldehyde
β -Bisabolol	[0.95]*	0.66	Sesquiterpenic alcohol
(E)- α -Santalal	43.58	2.46	Sesquiterpenic aldehyde
(Z)- α -Santalol	[43.58]	41.52	Sesquiterpenic alcohol
(Z)- α -trans-Bergamotol	6.15	6.23	Sesquiterpenic alcohol
(E)- α -Santalol	0.44	0.38	Sesquiterpenic alcohol
Unknown	0.28		Oxygenated sesquiterpene
(Z)-epi- β -Santalol	3.55	3.19	Sesquiterpenic alcohol
(E)- α -trans-Bergamotol	0.46	0.49*	Sesquiterpenic alcohol
(Z)- β -Santalol	22.96*	18.64	Sesquiterpenic alcohol
Unknown	[22.96]*	0.29	Oxygenated sesquiterpene
Unknown	[22.96]*	0.12	Oxygenated sesquiterpene
(Z)-Nuciferol	[22.96]	2.13	Sesquiterpenic alcohol
Unknown	2.68*		Oxygenated sesquiterpene
(E)- β -Santalol	[2.68]*	[0.49]*	Sesquiterpenic alcohol
(2E,6E)-Farnesal	[2.68]*	[0.37]*	Sesquiterpenic aldehyde
(Z)- β -Curcumen-12-ol	1.42	0.97	Sesquiterpenic alcohol
(Z)-Lanceol	2.24	2.11*	Sesquiterpenic alcohol
(Z)- α -Santalyl acetate	0.05		Sesquiterpenic ester
Unknown	0.20	[2.11]*	Oxygenated sesquiterpene
Unknown	0.13		Oxygenated sesquiterpene
Unknown	0.17		Oxygenated sesquiterpene
(Z)- γ -Curcumen-12-ol		0.24	Sesquiterpenic alcohol
Total identified	91.79%	84.68%	

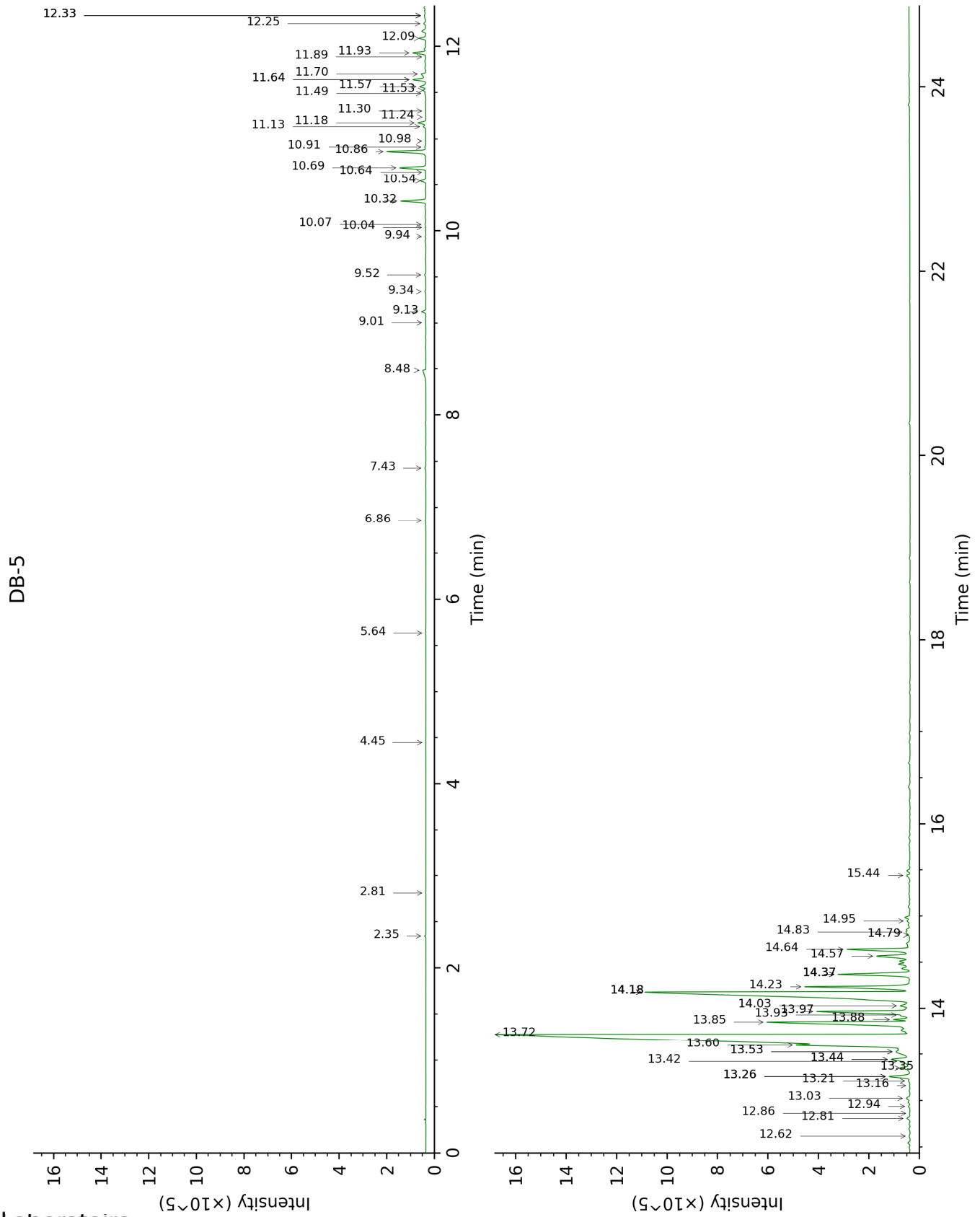
*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

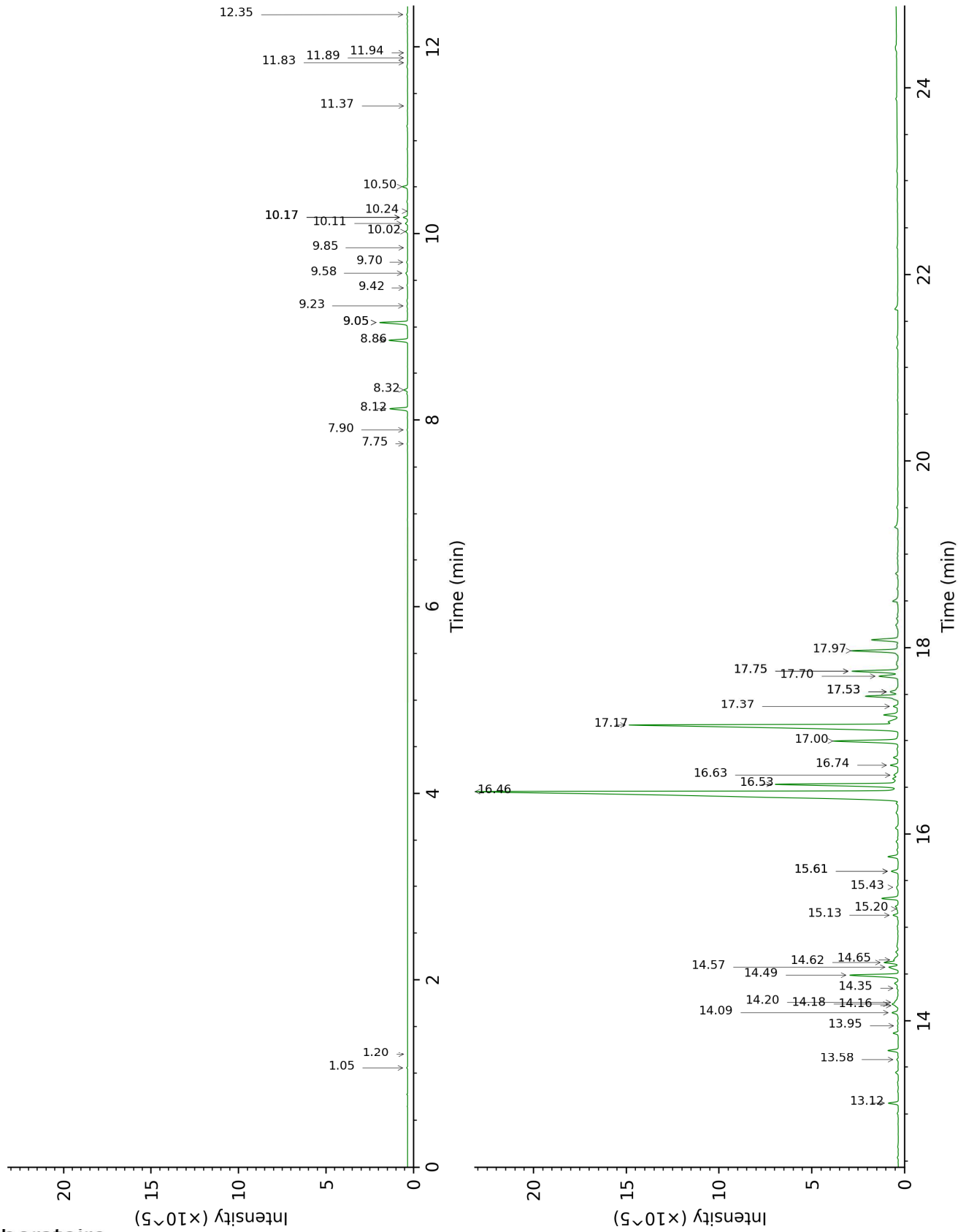
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

This page was intentionally left blank. The following pages present the complete data of the analysis.



DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Santene	2.35	881	0.03	1.06	949	0.03
Tricyclene	2.81	917	tr	1.20	973	tr
Limonene	4.45	1026	tr			
Unknown [m/z 79, 94 (87), 77 (25), 91 (21), 93 (16), 95 (12), 138 (8)]	5.64	1101	tr			
4-Methylacetophenone	6.86	1179	0.02	10.24	1703	0.02
Unknown [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	7.43	1217	0.03	9.05*	1606	1.27
Teresantalic acid	8.48	1288	0.26	15.61*	2201	0.37
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	9.01	1324	0.01			
Tricycloekasantalal (1S,5S,6R)-2,6-	9.13	1332	0.14	10.17*	1698	0.19
Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	9.34	1348	0.03	10.17*	1698	[0.19]
Unknown [m/z 93, 160 (81), 91 (58), 94 (53), 134 (53)...]	9.52	1360	0.04			
7-epi-Sesquithujene	9.94	1390	0.02	7.75	1504	0.02
γ-4-Dimethylbenzenebutyral	10.04	1397	0.01			
α-Cedrene	10.07	1399	0.04	7.90	1516	0.02
α-Santalene	10.32	1418	0.80	8.12	1533	0.78
trans-α-Bergamotene	10.54	1434	0.19	8.32	1549	0.15
Unknown [m/z 93, 91 (80), 79 (68), 123 (68), 121 (56)... 204 (3)]	10.64	1441	0.02			
epi-β-Santalene	10.69	1445	0.84	8.86	1591	0.82
β-Santalene	10.86	1458	1.29	9.05*	1606	[1.27]
β-Acoradiene	10.91	1462	0.05	9.23	1620	0.04
10-epi-β-Acoradiene	10.98	1467	0.01	9.42	1636	0.01
γ-Curcumene	11.13	1478	0.09	9.58	1649	0.11
ar-Curcumene	11.18	1481	0.27	10.50	1725	0.25
α-Selinene	11.24	1486	tr	9.85	1671	0.01
Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.30	1491	0.01	11.89	1846	0.01
α-Alaskene	11.49	1505	0.05	9.70	1659	0.05
β-Bisabolene	11.53	1508	0.08	10.02	1686	0.09
β-Curcumene	11.57	1511	0.23	10.11	1693	0.10
Unknown [m/z 121, 93 (56), 91 (12), 94 (11), 122 (10)...220]	11.64*	1517	0.45	13.12	1958	0.40
Sesquicineole	11.64*	1517	[0.45]	10.17*	1698	[0.19]
β-Sesquiphellandrene	11.70	1522	0.23			
8,14-Cedranoxide	11.89	1536	0.01	11.37	1800	0.01

Unknown [m/z 121, 93 (91), 79 (57), 91 (25), 43 (23), 77 (18)...202 (8)]	11.93	1540	0.44			
Unknown [m/z 121, 93 (79), 79 (51), 91 (21), 77 (16), 43 (15)...202 (5)]	12.09	1552	0.22			
(E)-Nerolidol	12.25	1565	0.08	13.58	2001	0.07
Dendrolasin	12.33*	1572	0.11	12.35	1887	0.04
Unknown [m/z 43, 125 (91), 107 (39), 41 (24), 67 (24), 93 (21)... 220 (4)]	12.33*	1572	[0.11]	11.94	1850	0.01
Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.33*	1572	[0.11]	11.83	1841	0.01
Guaiol	12.62	1594	0.06	13.95	2036	0.04
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]	12.81	1609	0.14			
Rosifoliol	12.86	1614	0.03	14.16	2058	0.10
α-Acorenol	12.94	1620	0.08	14.35	2076	0.06
β-Acorenol	13.03	1627	0.17	14.65	2105	0.20
10-epi-β-Acorenol?	13.16	1638	0.03			
β-Eudesmol	13.21	1643	0.07	15.20	2160	0.08
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.26*	1646	0.79			
α-Bisabolol oxide B, epimer 1	13.26*	1646	[0.79]	14.18	2059	0.32
α-Bisabolol oxide B, epimer 2	13.26*	1646	[0.79]	14.20	2061	0.19
Unknown [m/z 93, 121 (97), 91 (30), 92 (27), 79 (26), 94 (21), 105 (19), 122 (18)... 222 (9)]	13.35	1654	0.42			
Unknown [m/z 121, 93 (96), 95 (96), 41 (65), 82 (63), 69 (62), 67 (59)... 222 (8)]	13.42	1660	0.38	14.09	2050	0.36
Unknown [m/z 67, 119 (70), 82 (42), 91 (37), 95 (36), 121 (34), 93 (32)...]	13.44*	1662	0.77	14.57	2097	0.56
Bulnesol	13.44*	1662	[0.77]	15.13	2153	0.24
epi-Cyclosantalal	13.53*	1669	0.95			
β-Bisabolol	13.53*	1669	[0.95]	14.62	2102	0.66
(E)-α-Santalal	13.60†	1675	43.58	14.49	2089	2.46
(Z)-α-Santalol	13.72†	1684	[43.58]	16.46	2290	41.52
(Z)-α-trans-Bergamotol	13.85	1696	6.15	16.53	2298	6.23
(E)-α-Santalol	13.88	1698	0.44	16.74	2320	0.38
Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.93	1702	0.28			
(Z)-epi-β-Santalol	13.97	1705	3.55	17.00	2348	3.19
(E)-α-trans-Bergamotol	14.03	1711	0.46	17.53*	2407	0.49

(Z)-β-Santalol	14.18*†	1724	22.96	17.17	2367	18.64
Unknown [m/z 119, 91 (31), 105 (29), 41 (25), 133 (23), 158 (21)...]	14.18*†	1724	[22.96]	16.63	2309	0.29
Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	14.18*†	1724	[22.96]	15.43	2183	0.12
(Z)-Nuciferol	14.24†	1728	[22.96]	17.97	2456	2.13
Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.37*	1740	2.68			
(E)-β-Santalol	14.37*	1740	[2.68]	17.53*	2407	[0.49]
(2E,6E)-Farnesal	14.37*	1740	[2.68]	15.61*	2201	[0.37]
(Z)-β-Curcumen-12-ol	14.57	1757	1.42	17.70	2426	0.97
(Z)-Lanceol	14.64	1764	2.24	17.75*	2432	2.11
(Z)-α-Santalyl acetate	14.79	1777	0.05			
Unknown [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	14.83	1780	0.20	17.75*	2432	[2.11]
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	14.95	1790	0.13			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]	15.44	1835	0.17			
(Z)-γ-Curcumen-12-ol				17.37	2389	0.24
Total identified		91.79%			84.68%	
Total reported		94.28%			86.44%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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