

Date : March 07, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18B21-CHS2-1-CC

Customer identification : Sandalwood - Australia - APISO-171105SD/SA

Type : Essential oil

Source : *Santalum album*

Customer : American College of Healthcare Sciences

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 : March 01, 2018

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: 1.5058 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Furfural	tr		Aliphatic alcohol
Santene	tr	tr	Monoterpene
Tricyclene	tr	tr	Monoterpene
Limonene	tr	tr	Monoterpene
4-Methylacetophenone	0.01	0.01	Simple phenolic
Unknown	0.01	0.01	Terpene derivative
Teresantalic acid	0.03	0.03	Monoterpenic acid
Unknown	tr		Terpenic aldehyde
Tricycloekasantalal	0.09*	0.04	Terpenic aldehyde
Unknown	[0.09]*		Unknown
Unknown	0.04		Unknown
7-epi-Sesquithujene	0.01	0.02	Sesquiterpene
γ -4-Dimethylbenzenebutyral	0.01		Simple phenolic
α -Cedrene	0.02	0.01	Sesquiterpene
α -Santalene	0.79	0.79	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.20	0.16	Sesquiterpene
epi- β -Santalene	0.87	0.85	Sesquiterpene
Geranylacetone	0.02		Monoterpenic ketone
β -Santalene	1.29	1.29	Sesquiterpene
Unknown	0.04*		Unknown
β -Acoradiene	[0.04]*	0.02	Sesquiterpene
10-epi- β -Acoradiene	tr	0.01	Sesquiterpene
γ -Curcumene	0.10	0.13	Sesquiterpene
α -Curcumene	0.23*	0.17*	Sesquiterpene
Unknown	[0.23]*		Sesquiterpene
Unknown	0.01	0.01	Sesquiterpene
α -Alaskene	0.02	0.01	Sesquiterpene
β -Bisabolene	0.09	0.10	Sesquiterpene
β -Curcumene	0.23	0.21	Sesquiterpene
β -Sesquiphellandrene	0.10	[0.17]*	Sesquiterpene
Unknown	0.14*		Sesquiterpene
8,14-Cedranoxide	[0.14]*	0.01	Sesquiterpenic ether
Unknown	0.04		Sesquiterpene
(<i>E</i>)-Nerolidol	0.07	0.07	Sesquiterpenic alcohol
Unknown	0.03	0.03	Oxygenated sesquiterpene
Dendrolasin	0.06	0.05	Sesquiterpenic ether
Unknown	0.09		Oxygenated sesquiterpene
β -Eudesmol	0.74*	0.15	Sesquiterpenic alcohol
10-epi- β -Acorenol?	[0.74]*		Sesquiterpenic alcohol
Unknown	[0.74]*		Oxygenated sesquiterpene
α -Bisabolol oxide B, epimer 2	0.39*	0.24	Sesquiterpenic alcohol
α -Bisabolol oxide B, epimer 1	[0.39]*	0.09	Sesquiterpenic alcohol
Unknown	0.23		Oxygenated sesquiterpene
Unknown	0.81	0.49	Oxygenated sesquiterpene
Bulnesol	0.12	0.13	Sesquiterpenic alcohol
β -Bisabolol	0.56	0.55	Sesquiterpenic alcohol
epi-Cyclosantalal	0.53		Sesquiterpenic aldehyde
(<i>E</i>)- α -Santalal	1.26	1.17	Sesquiterpenic aldehyde

(Z)- α -Santalol	46.39	46.35	Sesquiterpenic alcohol
(Z)- α - <i>trans</i> -Bergamotol	5.84	6.00	Sesquiterpenic alcohol
(E)- α -Santalol	0.48	0.39	Sesquiterpenic alcohol
Unknown	0.14		Oxygenated sesquiterpene
(Z)- <i>epi</i> - β -Santalol	4.20	3.91	Sesquiterpenic alcohol
(E)- α - <i>trans</i> -Bergamotol	0.33	0.24	Sesquiterpenic alcohol
(Z)- β -Santalol	20.57*	20.15	Sesquiterpenic alcohol
Unknown	[20.57]*	0.26	Oxygenated sesquiterpene
Unknown	[20.57]*	0.07	Oxygenated sesquiterpene
(Z)-Nuciferol	1.99*	0.89	Sesquiterpenic alcohol
Unknown	2.55*		Oxygenated sesquiterpene
(E)- β -Santalol	[2.55]*	1.64	Sesquiterpenic alcohol
(2E,6E)-Farnesal	[2.55]	0.34	Sesquiterpenic aldehyde
(Z)- β -Curcumen-12-ol	0.75	0.58	Sesquiterpenic alcohol
(Z)-Lanceol	2.85	2.86	Sesquiterpenic alcohol
Unknown	0.30		Oxygenated sesquiterpene
Unknown	0.10		Oxygenated sesquiterpene
(Z)- γ -Curcumen-12-ol		0.26	Sesquiterpenic alcohol
Total identified	93.97%	89.92%	

*: Two or more compounds are coeluting on this column

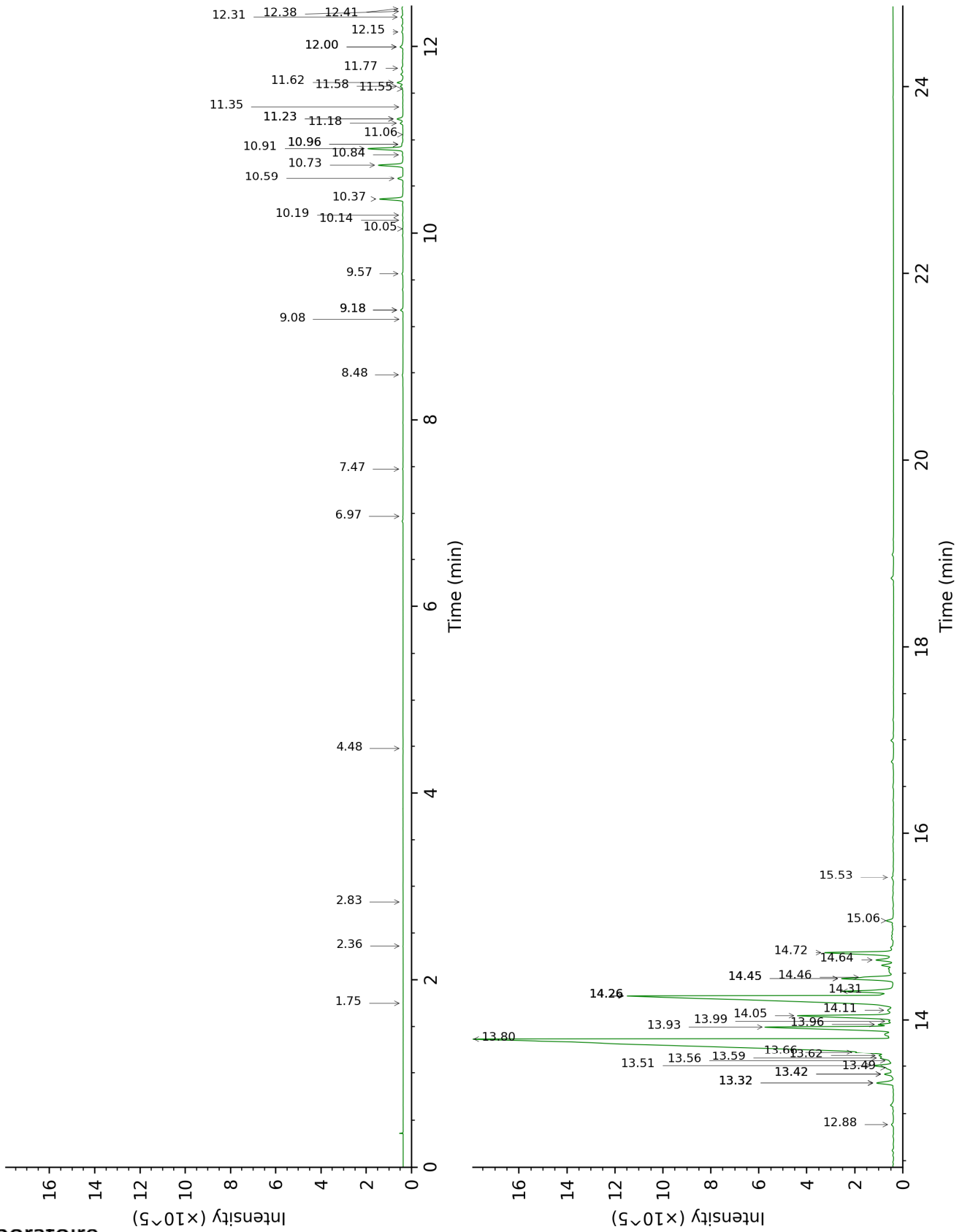
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

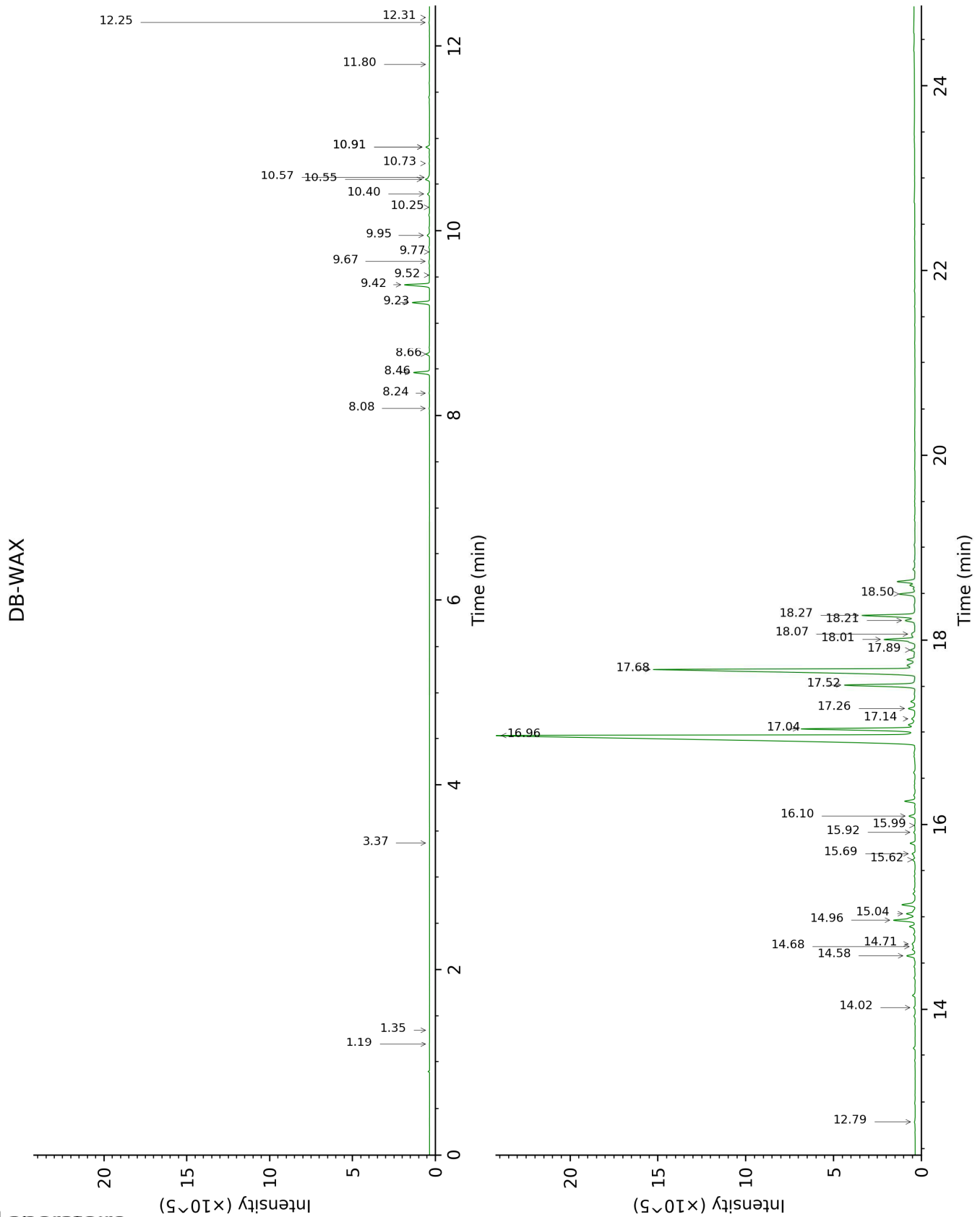
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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DB-5





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Furfural	1.75	826	tr			
Santene	2.36	877	tr	1.19	950	tr
Tricyclene	2.83	913	tr	1.35	975	tr
Limonene	4.48	1021	tr	3.37	1159	tr
4-Methylacetophenone	6.97	1179	0.01	10.73	1710	0.01
Unknown [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	7.48	1212	0.01	9.52	1612	0.01
Teresantalic acid	8.48	1279	0.03	15.99	2194	0.03
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	9.08	1320	tr			
Tricycloekasantalal	9.18*	1327	0.09	10.58	1697	0.04
Unknown [m/z 112, 97 (31), 43 (29), 109 (22), 67 (16)...]	9.18*	1327	[0.09]			
Unknown [m/z 93, 160 (81), 91 (58), 94 (53), 134 (53)...]	9.57	1354	0.04			
7-epi-Sesquithujene	10.05	1388	0.01	8.08	1500	0.02
γ-4-Dimethylbenzenebutyral	10.14	1394	0.01			
α-Cedrene	10.19	1398	0.02	8.24	1512	0.01
α-Santalene	10.36	1411	0.79	8.46	1529	0.79
trans-α-Bergamotene	10.58	1427	0.20	8.66	1544	0.16
epi-β-Santalene	10.73	1438	0.87	9.23	1588	0.85
Geranylacetone	10.84	1446	0.02			
β-Santalene	10.91	1452	1.29	9.42	1603	1.29
Unknown [m/z 135, 119 (34), 107 (25), 91 (20), 93 (19)...]	10.96*	1455	0.04			
β-Acoradiene	10.96*	1455	[0.04]	9.67	1624	0.02
10-epi-β-Acoradiene	11.06	1462	tr	9.77	1632	0.01
γ-Curcumene	11.18	1472	0.10	9.95	1646	0.13
ar-Curcumene	11.23*	1475	0.23	10.91*	1725	0.17
Unknown [m/z 119, 91 (24), 105 (16), 121 (16), 93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]	11.23*	1475	[0.23]			
Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.35	1484	0.01	12.31	1845	0.01
α-Alaskene	11.55	1499	0.02	10.25	1670	0.01
β-Bisabolene	11.58	1501	0.09	10.40	1682	0.10
β-Curcumene	11.62	1504	0.23	10.55	1695	0.21
β-Sesquiphellandrene	11.77	1516	0.10	10.91*	1725	[0.17]
Unknown [m/z 121, 93	12.00*	1534	0.14			

(91), 79 (57), 91 (25), 43 (23), 77 (18)...202 (8)]						
8,14-Cedranoxide	12.00*	1534	[0.14]	11.80	1800	0.01
Unknown [m/z 121, 93 (79), 79 (51), 91 (21), 77 (16), 43 (15)...202 (5)]	12.16	1546	0.04			
(E)-Nerolidol	12.31	1559	0.07	14.02	2001	0.07
Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.38	1564	0.03	12.25	1840	0.03
Dendrolasin	12.41	1566	0.06	12.79	1887	0.05
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]	12.88	1604	0.09			
β-Eudesmol	13.32*	1640	0.74	15.69	2163	0.15
10-epi-β-Acorenol?	13.32*	1640	[0.74]			
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.32*	1640	[0.74]			
α-Bisabolol oxide B, epimer 2	13.42*	1648	0.39	14.71	2067	0.24
α-Bisabolol oxide B, epimer 1	13.42*	1648	[0.39]	14.68	2064	0.09
Unknown [m/z 93, 121 (97), 91 (30), 92 (27), 79 (26), 94 (21), 105 (19), 122 (18)... 222 (9)]	13.49	1653	0.23			
Unknown [m/z 121, 93 (96), 95 (96), 41 (65), 82 (63), 69 (62), 67 (59)... 222 (8)]	13.51	1655	0.81	14.58	2054	0.49
Bulnesol	13.56	1659	0.12	15.62	2157	0.13
β-Bisabolol	13.59	1662	0.56	15.04	2098	0.55
epi-Cyclosantalal	13.62	1664	0.53			
(E)-α-Santalal	13.66	1667	1.26	14.96	2091	1.17
(Z)-α-Santalol	13.80	1679	46.39	16.96	2295	46.35
(Z)-α-trans-Bergamotol	13.93	1689	5.84	17.04	2303	6.00
(E)-α-Santalol	13.96	1692	0.48	17.26	2326	0.39
Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.99	1694	0.14			
(Z)-epi-β-Santalol	14.05	1699	4.20	17.52	2354	3.91
(E)-α-trans-Bergamotol	14.11	1704	0.33	18.07	2414	0.24
(Z)-β-Santalol	14.26*	1717	20.57	17.68	2372	20.15
Unknown [m/z 119, 91 (31), 105 (29), 41 (25), 133 (23), 158 (21)...]	14.26*	1717	[20.57]	17.14	2314	0.26
Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	14.26*	1717	[20.57]	15.92	2186	0.07

(Z)-Nuciferol	14.31*	1722	1.99	18.50	2463	0.89
Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.44*†	1734	2.55			
(E)-β-Santalol	14.44*†	1734	[2.55]	18.01	2408	1.64
(2E,6E)-Farnesal	14.46†	1735	[2.55]	16.10	2205	0.34
(Z)-β-Curcumen-12-ol	14.64	1751	0.75	18.21	2431	0.58
(Z)-Lanceol	14.72	1757	2.85	18.27	2437	2.86
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	15.06	1787	0.30			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]	15.53	1828	0.10			
(Z)-γ-Curcumen-12-ol				17.89	2395	0.26
Total identified		93.97%			89.92%	
Total reported		95.78%			90.78%	

*: 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