

Date : August 12, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20H10-PTH03

Customer identification : Sandalwood Australian - Australia - S2010685R

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 : Fanny Charlier, B. Sc., chimiste à l'entraînement

Analysis date : August 12, 2020

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: 1.5048 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 22769:2009 - OIL OF AUSTRALIAN SANDALWOOD

Compound	Min. %	Max. %	Observed %	Complies?
(Z)-Lanceol	1.0	10.0	3.2	Yes
(Z)-Nuciferol	2.0	15.0	8.0	Yes
(2E,6E)-Farnesol	2.5	15.0	15.0	Yes
(Z)- α -trans-Bergamotol	2.0	10.0	3.4	Yes
(Z)-epi- β -Santalol	0.5	3.5	1.3	Yes
(Z)- β -Santalol	5.0	20.0	5.1	Yes
epi- α -Bisabolol	2.0	12.5	5.8	Yes
(Z)- α -Santalol	15.0	25.0	15.1	Yes
Refractive index	1.5000	1.5170	1.5048	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
Unknown	0.01	Terpene derivative
Teresantalic acid	0.16	Monoterpenic acid
Unknown	0.02	Terpenic aldehyde
Tricycloekasantalal	0.03	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	0.01	Simple phenolic
α-Cedrene	0.07	Sesquiterpene
Sesquithujene	0.02	Sesquiterpene
β-Cedrene	0.02	Sesquiterpene
cis-α-Bergamotene	0.01	Sesquiterpene
α-Santalene	0.16	Sesquiterpene
trans-α-Bergamotene	0.06	Sesquiterpene
epi-β-Santalene	0.13	Sesquiterpene
Geranylacetone	0.02	Monoterpenic ketone
α-Acoradiene	0.03	Sesquiterpene
β-Santalene	0.20	Sesquiterpene
(E)-β-Farnesene	0.07	Sesquiterpene
β-Acoradiene	0.01	Sesquiterpene
10-epi-β-Acoradiene	0.04	Sesquiterpene
γ-Curcumene	0.12	Sesquiterpene
Unknown	0.11	Sesquiterpene
ar-Curcumene	0.20	Sesquiterpene
α-Selinene	0.03	Sesquiterpene
Unknown	0.03	Sesquiterpene
Unknown	0.09	Sesquiterpene
Unknown	0.05	Sesquiterpene
α-Alaskene	0.06	Sesquiterpene
β-Bisabolene	0.11	Sesquiterpene
β-Curcumene	0.31	Sesquiterpene
(3E,6E)-α-Farnesene	0.04	Sesquiterpene
β-Sesquiphellandrene	0.08	Sesquiterpene
8,14-Cedranoxide	0.04	Sesquiterpenic ether
(E)-α-Bisabolene	0.06	Sesquiterpene
(E)-Nerolidol	2.40	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
Dendrolasin	1.23	Sesquiterpenic ether
Helifolen-12-al A	0.01	Sesquiterpenic aldehyde
Guaiol	0.26	Sesquiterpenic alcohol
α-Cedrol	0.26	Sesquiterpenic alcohol
Helifolen-12-al B	0.09	Sesquiterpenic aldehyde
Unknown	0.12	Oxygenated sesquiterpene

Rosifoliol	0.20	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
α -Acorenol	0.17	Sesquiterpenic alcohol
γ -Eudesmol	0.16	Sesquiterpenic alcohol
10-epi- β -Acorenol?	0.16	Sesquiterpenic alcohol
β -Eudesmol	0.20	Sesquiterpenic alcohol
Unknown	0.35	Oxygenated sesquiterpene
α -Bisabolol oxide B, epimer 1	0.11	Sesquiterpenic alcohol
α -Bisabolol oxide B, epimer 2	0.46	Sesquiterpenic alcohol
β -Bisabolol	0.34	Sesquiterpenic alcohol
Bulnesol	1.51	Sesquiterpenic alcohol
epi-Cyclosantalal	3.26	Sesquiterpenic aldehyde
(<i>E</i>)- α -Santalal	2.40	Sesquiterpenic aldehyde
Cedr-8-en-13-ol	0.40	Sesquiterpenic alcohol
(<i>Z</i>)- α -Santalol	15.11	Sesquiterpenic alcohol
epi- α -Bisabolol	5.77	Sesquiterpenic alcohol
α -Bisabolol	0.08	Sesquiterpenic alcohol
(<i>Z</i>)- α - <i>trans</i> -Bergamotol	3.45	Sesquiterpenic alcohol
(<i>E</i>)- α -Santalol	0.22	Sesquiterpenic alcohol
Unknown	0.54	Oxygenated sesquiterpene
Unknown	0.22	Oxygenated sesquiterpene
(<i>Z</i>)-epi- β -Santalol	1.26	Sesquiterpenic alcohol
(<i>E</i>)- α - <i>trans</i> -Bergamotol	0.88	Sesquiterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
(<i>Z</i>)- β -Santalol	5.08	Sesquiterpenic alcohol
Unknown	0.09	Oxygenated sesquiterpene
(2 <i>E</i> ,6 <i>E</i>)-Farnesol	14.97	Sesquiterpenic alcohol
(<i>Z</i>)-Nuciferol	7.97	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i>)-Farnesal	0.17	Sesquiterpenic aldehyde
(<i>E</i>)- β -Santalol	0.01	Sesquiterpenic alcohol
Unknown	2.04	Oxygenated sesquiterpene
Curcumen-12-ol analog	0.29	Sesquiterpenic alcohol
(<i>Z</i>)- β -Curcumen-12-ol	7.03	Sesquiterpenic alcohol
(<i>Z</i>)-Lanceol	3.16	Sesquiterpenic alcohol
12-Hydroxy-(<i>Z</i>)-sesquicineole	0.12	Sesquiterpenic alcohol
Unknown	0.99	Oxygenated sesquiterpene
Unknown	0.72	Oxygenated sesquiterpene
Unknown	0.44	Oxygenated sesquiterpene
Bisabola-2,7(<i>Z</i>),10(<i>Z</i>)-trien-13-ol?	0.81	Oxygenated sesquiterpene
Unknown	0.40	Oxygenated sesquiterpene
Unknown	0.15	Oxygenated sesquiterpene
Unknown	0.13	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
(2 <i>E</i> ,6 <i>E</i>)-Farnesyl acetate	0.13	Sesquiterpenic ester
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
(<i>E</i>)-Nuciferol?	0.11	Sesquiterpenic alcohol
Consolidated total	89.26%	

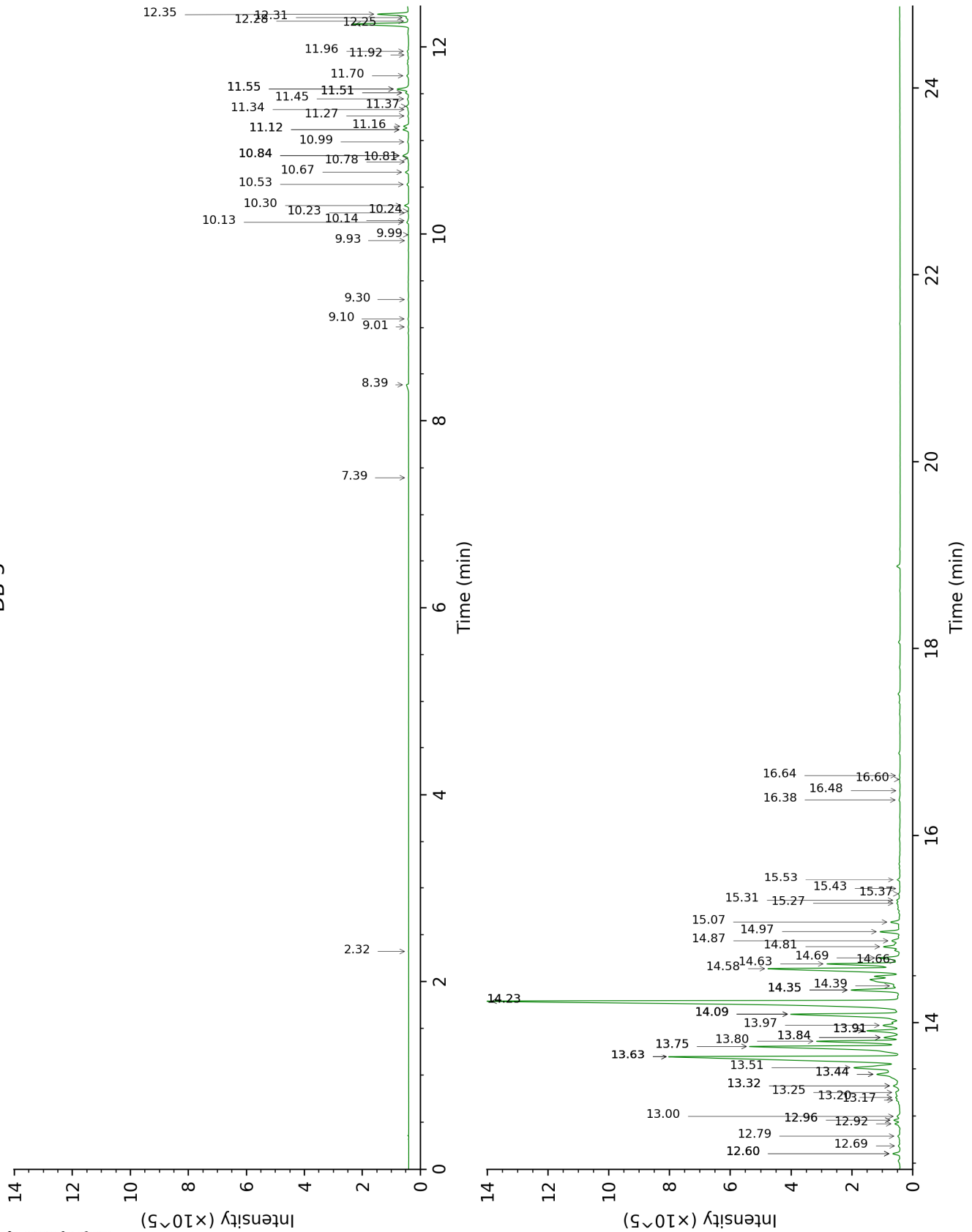
Note: no correction factor was applied

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.

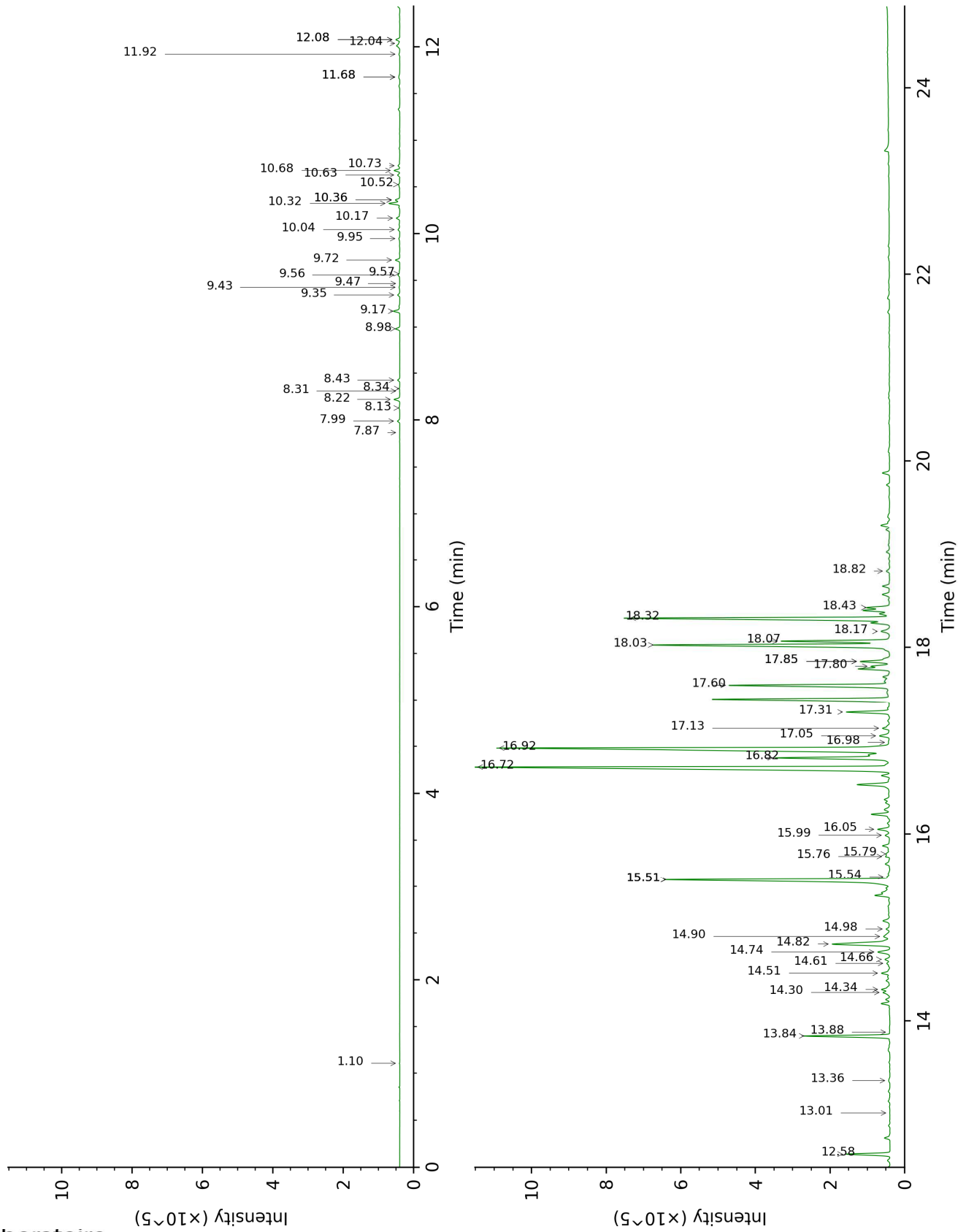
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

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

DB-5



DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Santene	2.32	881	0.01	1.10	943	0.01
Unknown [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	7.40	1218	0.01	9.34	1610	0.07
Teresantalic acid	8.39	1282	0.16	15.79†	2186	[0.25]
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	9.01	1324	0.02			
Tricycloekasantalal	9.10	1330	0.03	10.36*	1692	0.14
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	9.30	1345	0.02	10.36*	1692	[0.14]
7-epi-Sesquithujene	9.93	1389	0.01	7.87	1496	0.01
γ-4-Dimethylbenzenebutyral	9.99	1394	0.01			
α-Cedrene	10.13	1403	0.07	7.99	1506	0.08
Sesquithujene	10.14	1404	0.02	8.13	1517	0.02
β-Cedrene	10.23	1411	0.02	8.34	1532	0.01
cis-α-Bergamotene	10.24	1412	0.01	8.31	1530	0.01
α-Santalene	10.30	1416	0.16	8.22	1524	0.17
trans-α-Bergamotene	10.53	1433	0.06	8.43	1539	0.06
epi-β-Santalene	10.67	1443	0.13	8.98	1582	0.12
Geranylacetone	10.78	1452	0.02	11.68*	1803	0.07
α-Acoradiene	10.81	1454	0.03	9.43	1617	0.03
β-Santalene	10.84*	1456	0.30	9.17	1597	0.20
(E)-β-Farnesene	10.84*	1456	[0.30]	9.56	1628	0.07
β-Acoradiene	10.84*	1456	[0.30]	9.47	1620	0.01
10-epi-β-Acoradiene	10.99	1467	0.04	9.57	1629	0.03
γ-Curcumene	11.12*	1477	0.23	9.72	1640	0.12
Unknown [m/z 119, 91 (24), 105 (16), 121 (16), 93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]	11.12*	1477	[0.23]			
ar-Curcumene	11.16	1480	0.20	10.68	1719	0.17
α-Selinene	11.27	1488	0.03	9.95	1659	0.05
Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.34	1493	0.03	12.08*	1838	0.12
Unknown [m/z 119, 93 (52), 105 (38), 91 (33), 41 (31), 79 (25)... 204 (2)]	11.37	1496	0.09	12.08*	1838	[0.12]
Unknown [m/z 119, 91 (14), 120 (10), 117 (9)... 200? (2)]	11.45	1502	0.05	11.92	1824	0.04
α-Alaskene	11.51*†	1506	0.62	10.04	1666	0.06
β-Bisabolene	11.51*†	1506	[0.62]	10.17	1676	0.11
β-Curcumene	11.55*†	1510	[0.62]	10.32	1689	0.31
(3E,6E)-α-Farnesene	11.55*†	1510	[0.62]	10.52	1706	0.04
β-Sesquiphellandrene	11.70	1521	0.08	10.63	1715	0.07

8,14-Cedranoxide	11.92	1538	0.04	11.68*	1803	[0.07]
(E)- α -Bisabolene	11.96	1541	0.06	10.73	1723	0.06
(E)-Nerolidol	12.25	1564	2.40	13.84	1997	2.31
Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.28	1566	0.03	12.04	1834	0.02
Unknown [m/z 43, 125 (91), 107 (39), 41 (24), 67 (24), 93 (21)... 220 (4)]	12.32	1570	0.09			
Dendrolasin	12.35	1572	1.23	12.58	1882	1.17
Helifolen-12-al A	12.60*	1592	0.32	13.01	1921	0.01
Guaiol	12.60*	1592	[0.32]	14.30	2041	0.26
α -Cedrol	12.60*	1592	[0.32]	14.34	2044	0.26
Helifolen-12-al B	12.69	1599	0.09	13.36	1952	0.06
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]	12.79	1607	0.12			
Rosifoliol	12.92	1618	0.20	14.51	2060	0.27
Unknown [m/z 41, 91 (78), 67 (76), 119 (70), 55 (61)... 220 (7)]	12.96*	1621	0.25	13.88	2000	0.01
α -Acorenol	12.96*	1621	[0.25]	14.66	2074	0.17
γ -Eudesmol	13.00	1624	0.16	14.98	2106	0.14
10-epi- β -Acorenol?	13.17	1638	0.16			
β -Eudesmol	13.20	1641	0.20	15.51*	2158	7.49
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.25	1645	0.35			
α -Bisabolol oxide B, epimer 1	13.32*	1651	0.50	14.61	2070	0.11
α -Bisabolol oxide B, epimer 2	13.32*	1651	[0.50]	14.74	2082	0.46
β -Bisabolol	13.44*	1661	1.86	14.90	2098	0.34
Bulnesol	13.44*	1661	[1.86]	15.51*	2158	[7.49]
epi-Cyclosantalal	13.51	1667	3.26			
(E)- α -Santalal	13.63*	1676	15.65	14.82	2090	2.40
Cedr-8-en-13-ol	13.63*	1676	[15.65]	17.05	2316	0.40
(Z)- α -Santalol	13.63*	1676	[15.65]	16.72	2281	15.11
epi- α -Bisabolol	13.75*	1686	8.44	15.51*	2158	[7.49]
α -Bisabolol	13.75*	1686	[8.44]	15.54	2161	0.08
(Z)- α -trans-Bergamotol	13.80	1690	3.45	16.82	2292	4.05
(E)- α -Santalol	13.84*	1694	0.76	17.13	2325	0.22
Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.84*	1694	[0.76]			
Unknown [m/z 43, 125 (55), 93 (46), 107 (45), 67 (34), 41 (32)... 220 (2)]	13.92*	1700	1.48			
(Z)-epi- β -Santalol	13.92*	1700	[1.48]	17.31	2343	1.26
(E)- α -trans-Bergamotol	13.97	1705	0.88	17.85*	2402	0.89
Unknown [m/z 119, 91 (31), 105 (29), 41 (25), 133 (23),	14.09*	1715	5.78	16.98	2309	0.06

158 (21)...						
(Z)- β -Santalol	14.09*	1715	[5.78]	17.60	2374	5.08
Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...	14.09*	1715	[5.78]	15.76†	2183	0.25
(2E,6E)-Farnesol	14.23*	1727	26.17	16.92	2302	14.97
(Z)-Nuciferol	14.23*	1727	[26.17]	18.32	2453	7.97
(2E,6E)-Farnesal	14.35*	1737	2.22	15.99	2206	0.17
(E)- β -Santalol	14.35*	1737	[2.22]	17.85*	2402	[0.89]
Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.35*	1737	[2.22]			
Curcumen-12-ol analog	14.39	1741	0.29	17.80	2397	0.51
(Z)- β -Curcumen-12-ol	14.58	1757	7.03	18.03	2422	7.77
(Z)-Lanceol	14.63	1761	3.16	18.07	2426	2.85
12-Hydroxy-(Z)-sesquicineole	14.66	1764	0.12			
Unknown [m/z 93, 107 (80), 43 (74), 91 (55), 41 (49), 79 (48), 119 (48)... 236 (3)]	14.69	1767	0.99			
Unknown [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	14.81	1777	0.72	18.17	2438	0.35
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	14.87	1783	0.44			
Bisabola-2,7(Z),10(Z)-trien-13-ol?	14.97	1791	0.81	18.43	2466	0.68
Unknown [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	15.07	1800	0.40			
Unknown [m/z 119, 145 (62), 105 (52), 91 (52), 121 (38)...	15.27	1818	0.15			
Unknown [m/z 43, 81 (61), 41 (49), 93 (47), 119 (39), 141 (35)...	15.31	1821	0.13			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...	15.37	1827	0.06			
Unknown [m/z 141, 43 (87), 123 (55), 81 (37)... 236 (t)]	15.43	1832	0.01			
(2E,6E)-Farnesyl acetate	15.53	1841	0.13	16.05	2213	0.43
Unknown [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	16.38	1919	0.07			
Unknown [m/z 93, 109 (98), 43 (97), 68 (83), 95 (74), 110 (72), 81 (71)...220 (8)]	16.48	1929	0.02			
Unknown [m/z 43, 107 (24), 93 (23), 125 (23), 95 (23), 119 (23)...220 (1)]	16.60	1940	0.03			

Unknown [m/z 43, 107 (23), 119 (23), 93 (22), 125 (22), 132 (22)...220 (1)] (E)-Nuciferol?	16.64	1944	0.04		
				18.82	2510 0.11
Total identified		89.32%			80.15%
Total reported		93.17%			80.94%

*: 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