

**Date :** December 10, 2021

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 21K26-PTH01

**Customer identification :** Sandalwood Australian - Australia - S20109219R

**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 :** Seydou Ka, Ph. D.

**Analysis date :** December 07, 2021

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow viscous liquid

**Refractive index:**  $1.5062 \pm 0.0003$  (20 °C; method PC-MAT-016)

*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
Unknown	0.01	Terpene derivative
Teresantalic acid	0.09	Monoterpenic acid
Unknown	0.04	Terpenic aldehyde
Tricycloekasantalal	0.07	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.01	Terpenic aldehyde
$\gamma$ -4-Dimethylbenzenebutyral	0.04	Simple phenolic
$\alpha$ -Cedrene	0.10	Sesquiterpene
Sesquithujene	0.04	Sesquiterpene
$\beta$ -Cedrene	0.02	Sesquiterpene
<i>cis</i> - $\alpha$ -Bergamotene	0.26	Sesquiterpene
$\alpha$ -Santalene	0.01	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.10	Sesquiterpene
<i>epi</i> - $\beta$ -Santalene	0.18	Sesquiterpene
Geranylacetone	0.04	Monoterpenic ketone
$\beta$ -Santalene	0.30	Sesquiterpene
$\alpha$ -Acoradiene	0.10	Sesquiterpene
$\beta$ -Acoradiene	0.04	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.02	Sesquiterpene
10- <i>epi</i> - $\beta$ -Acoradiene	0.06	Sesquiterpene
Unknown	0.24	Sesquiterpene
$\gamma$ -Curcumene	0.16	Sesquiterpene
$\alpha$ -Curcumene	0.33	Sesquiterpene
$\beta$ -Selinene	0.02	Sesquiterpene
$\alpha$ -Selinene	0.04	Sesquiterpene
Unknown	0.05	Sesquiterpene
Unknown	0.14	Sesquiterpene
Unknown	0.08	Sesquiterpene
$\alpha$ -Alaskene	0.14	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.03	Sesquiterpene
$\beta$ -Curcumene	0.32	Sesquiterpene
$\beta$ -Bisabolene	0.12	Sesquiterpene
Sesquicineole	0.13	Sesquiterpenic ether
$\beta$ -Sesquiphellandrene	0.01	Sesquiterpene
8,14-Cedranoxide	0.03	Sesquiterpenic ether
( <i>E</i> )- $\alpha$ -Bisabolene	0.01	Sesquiterpene
( <i>E</i> )-Nerolidol	2.32	Sesquiterpenic alcohol
Unknown	0.11	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Dendrolasin	0.92	Sesquiterpenic ether
$\alpha$ -Cedrol	0.20	Sesquiterpenic alcohol
Guaiol	0.26	Sesquiterpenic alcohol
Helifolen-12-al A	0.01	Sesquiterpenic aldehyde
Helifolen-12-al B	0.09	Sesquiterpenic aldehyde
Unknown	0.11	Oxygenated sesquiterpene

Rosifoliol	0.23	Sesquiterpenic alcohol
$\alpha$ -Acorenol	0.20	Sesquiterpenic alcohol
$\beta$ -Acorenol	0.15	Sesquiterpenic alcohol
10-epi- $\beta$ -Acorenol?	0.10	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.15	Sesquiterpenic alcohol
Unknown	0.43	Oxygenated sesquiterpene
$\alpha$ -Bisabolol oxide B, epimer 2	0.77*	Sesquiterpenic alcohol
$\alpha$ -Bisabolol oxide B, epimer 1	0.77*	Sesquiterpenic alcohol
Unknown	0.60	Oxygenated sesquiterpene
Bulnesol	0.30	Sesquiterpenic alcohol
epi- $\beta$ -Bisabolol	1.48	Sesquiterpenic alcohol
$\beta$ -Bisabolol	0.80	Sesquiterpenic alcohol
epi-Cyclosantalal	2.10	Sesquiterpenic aldehyde
Cedr-8-en-13-ol	0.05	Sesquiterpenic alcohol
(Z)- $\alpha$ -Santalol	15.79	Sesquiterpenic alcohol
(E)- $\alpha$ -Santalol	0.81	Sesquiterpenic aldehyde
$\alpha$ -Bisabolol	0.06	Sesquiterpenic alcohol
epi- $\alpha$ -Bisabolol	6.40	Sesquiterpenic alcohol
(Z)- $\alpha$ -trans-Bergamotol	3.22	Sesquiterpenic alcohol
(E)- $\alpha$ -Santalol	0.40	Sesquiterpenic alcohol
Unknown	0.36	Oxygenated sesquiterpene
Lanceoloxide	0.21	Sesquiterpenic ether
(Z)-epi- $\beta$ -Santalol	1.33	Sesquiterpenic alcohol
(E)- $\alpha$ -trans-Bergamotol	1.14	Sesquiterpenic alcohol
(Z)- $\beta$ -Santalol	5.54	Sesquiterpenic alcohol
Unknown	0.07	Oxygenated sesquiterpene
(Z)-Nuciferol	10.83	Sesquiterpenic alcohol
(Z)- $\gamma$ -Curcumen-12-ol	5.57	Sesquiterpenic alcohol
(2E,6E)-Farnesol	13.07	Sesquiterpenic alcohol
(E)- $\beta$ -Santalol	1.33	Sesquiterpenic alcohol
Unknown	0.83	Oxygenated sesquiterpene
(2E,6E)-Farnesal	0.20	Sesquiterpenic aldehyde
Unknown	2.11	Oxygenated sesquiterpene
Curcumen-12-ol analog	0.19	Sesquiterpenic alcohol
Unknown	0.88	Oxygenated sesquiterpene
(Z)- $\beta$ -Curcumen-12-ol	5.75	Sesquiterpenic alcohol
(Z)-Lanceol	3.01	Sesquiterpenic alcohol
12-Hydroxy-(Z)-sesquicineole	1.06*	Sesquiterpenic alcohol
Unknown	1.06*	Oxygenated sesquiterpene
Unknown	0.65	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Bisabola-2,7(Z),10(Z)-trien-13-ol?	0.73	Oxygenated sesquiterpene
Unknown	0.43	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.16	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
(2E,6E)-Farnesyl acetate	0.13	Sesquiterpenic ester
Unknown	0.24	Oxygenated sesquiterpene
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.09	Oxygenated sesquiterpene

Unknown	0.11	Oxygenated sesquiterpene
<b>Consolidated total</b>	<b>97.76%</b>	

\*: 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

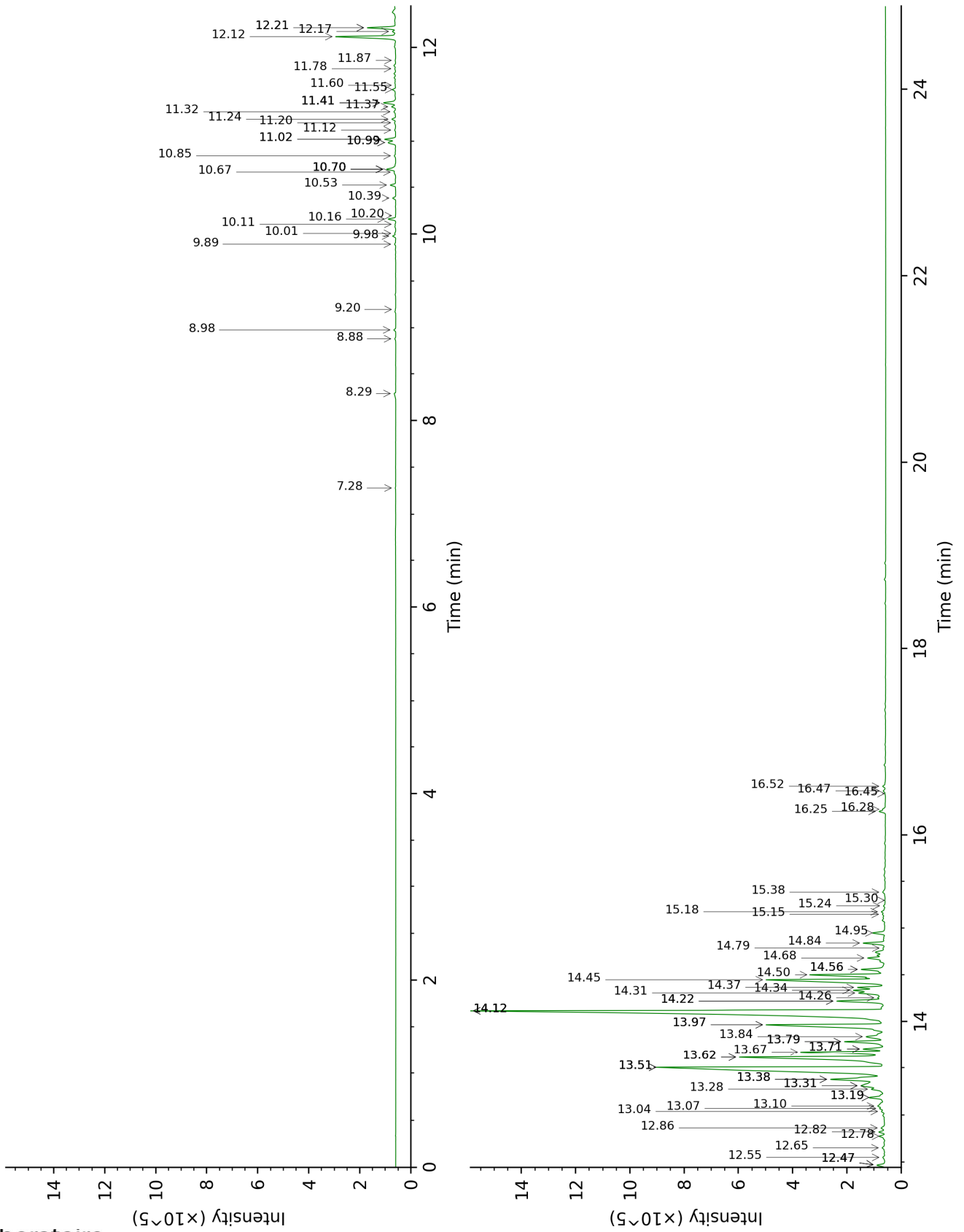
Note: no correction factor was applied

**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.

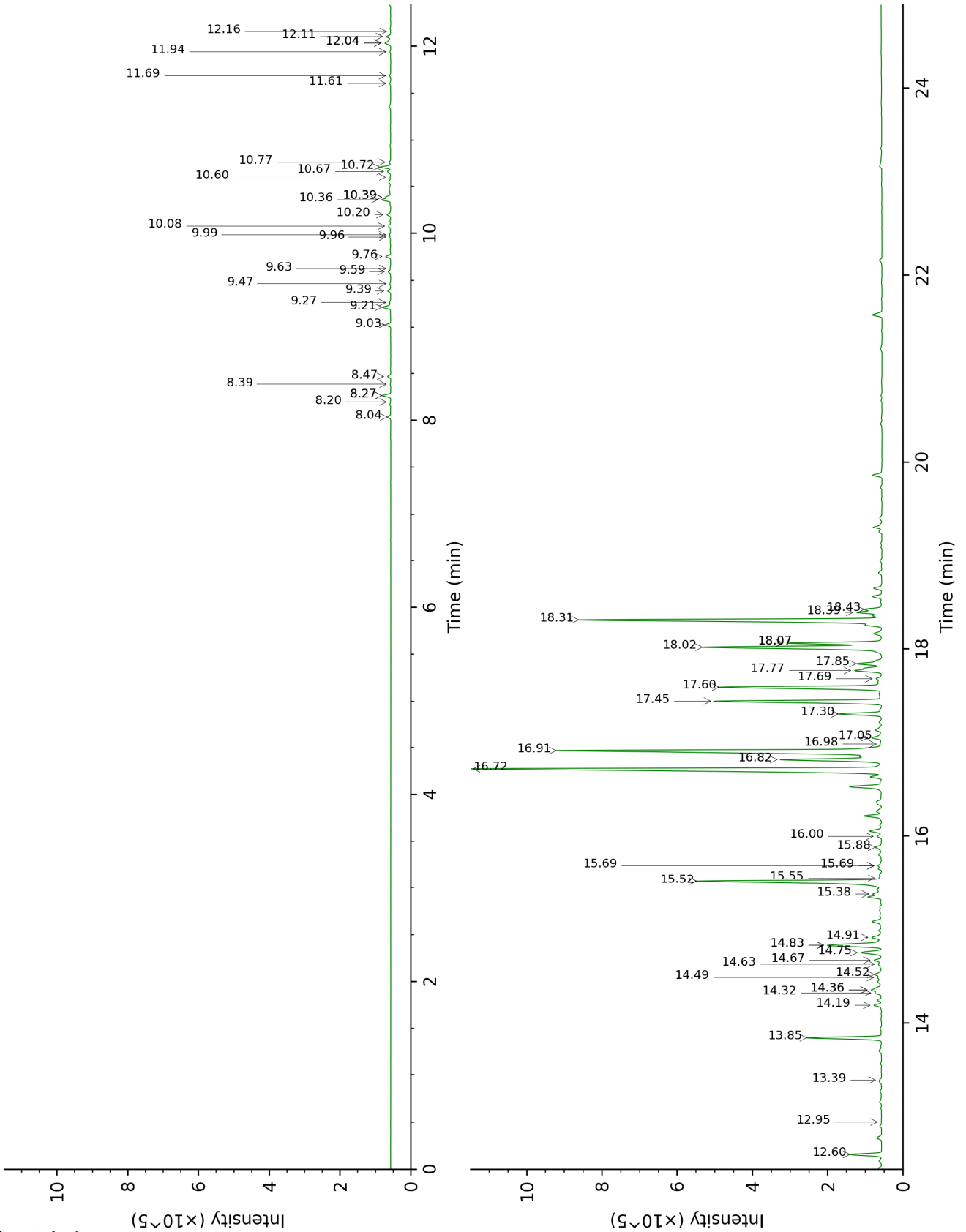
**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

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	%
Unknown [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	7.28	1215	0.01	9.26	1604	0.04
Teresantalic acid	8.29	1283	0.09	15.69*	2181	0.16
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	8.88	1323	0.04			
Tricycloekasantalal	8.98	1330	0.07	10.39*	1695	0.15
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	9.20	1346	0.01	10.39*	1695	[0.15]
γ-4-Dimethylbenzenebutyral	9.89	1395	0.04			
α-Cedrene	9.98	1401	0.10	8.04	1509	0.11
Sesquithujene	10.01	1403	0.04	8.20	1521	0.01
β-Cedrene	10.11	1410	0.02	8.39	1536	0.02
cis-α-Bergamotene	10.16	1415	0.26	8.27*	1527	0.28
α-Santalene	10.20	1417	0.01	8.27*	1527	[0.28]
trans-α-Bergamotene	10.39	1431	0.10	8.47	1542	0.10
epi-β-Santalene	10.53	1442	0.18	9.03	1585	0.16
Geranylacetone	10.67†	1453	0.51	11.69	1805	0.04
β-Santalene	10.70*†	1455	[0.51]	9.22	1600	0.30
α-Acoradiene	10.70*†	1455	[0.51]	9.39	1614	0.10
β-Acoradiene	10.70*†	1455	[0.51]	9.47	1620	0.04
(E)-β-Farnesene	10.70*†	1455	[0.51]	9.63	1633	0.02
10-epi-β-Acoradiene	10.85	1466	0.06	9.59	1631	0.09
Unknown [m/z 119, 91 (24), 105 (16), 121 (16), 93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]	10.99*†	1476	0.76			
γ-Curcumene	10.99*†	1476	[0.76]	9.76	1644	0.16
ar-Curcumene	11.02*†	1479	[0.76]	10.72	1722	0.33
β-Selinene	11.02*†	1479	[0.76]	9.96	1660	0.02
α-Selinene	11.12	1486	0.04	9.99	1662	0.05
Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.20	1492	0.05	12.10	1842	0.14
Unknown [m/z 119, 93 (52), 105 (38), 91 (33), 41 (31), 79 (25)... 204 (2)]	11.24	1495	0.14	12.04*	1836	0.28
Unknown [m/z 119, 91 (14), 120 (10), 117 (9)... 200? (2)]	11.32	1501	0.08	11.94	1828	0.03
α-Alaskene	11.37	1505	0.14	10.08	1670	0.09
(3E,6E)-α-Farnesene	11.41*	1508	0.49	10.60	1713	0.03
β-Curcumene	11.41*	1508	[0.49]	10.36	1692	0.32
β-Bisabolene	11.41*	1508	[0.49]	10.20	1680	0.12
Sesquicineole	11.55	1519	0.13	10.39*	1695	[0.15]
β-Sesquiphellandrene	11.60	1523	0.01	10.67	1718	0.12

8,14-Cedranoxide	11.78	1537	0.03	11.61	1798	0.04
(E)- $\alpha$ -Bisabolene	11.86	1544	0.01	10.77	1727	0.06
(E)-Nerolidol	12.12	1564	2.32	13.85	2001	2.19
Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.17	1568	0.11	12.04*	1836	[0.28]
Unknown [m/z 43, 125 (91), 107 (39), 41 (24), 67 (24), 93 (21)... 220 (4)]	12.21*	1571	0.96	12.16	1847	0.01
Dendrolasin	12.21*	1571	[0.96]	12.60	1886	0.92
$\alpha$ -Cedrol	12.47*	1591	0.29	14.32	2047	0.20
Guaiol	12.47*	1591	[0.29]	14.19	2034	0.26
Helifolen-12-al A	12.47*	1591	[0.29]	12.95	1918	0.01
Helifolen-12-al B	12.55	1598	0.09	13.39	1958	0.04
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]	12.65	1606	0.11			
Rosifoliol	12.78	1616	0.23	14.36*	2050	0.52
$\alpha$ -Acorenol	12.82	1620	0.20	14.52†	2066	[0.85]
$\beta$ -Acorenol	12.86	1624	0.15	14.92	2104	0.44
10-epi- $\beta$ -Acorenol?	13.04	1638	0.10			
$\beta$ -Eudesmol	13.07	1641	0.15	15.52*	2164	6.55
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.10	1643	0.43			
$\alpha$ -Bisabolol oxide B, epimer 2	13.19*	1650	0.77	14.63†	2076	[0.85]
$\alpha$ -Bisabolol oxide B, epimer 1	13.19*	1650	[0.77]	14.49†	2062	0.85
Unknown [m/z 121, 93 (96), 95 (96), 41 (65), 82 (63), 69 (62), 67 (59)... 222 (8)]	13.28	1658	0.60	14.36*	2050	[0.52]
Bulnesol	13.31*	1661	1.79	15.38	2150	0.30
epi- $\beta$ -Bisabolol	13.31*	1661	[1.79]	14.83*	2096	2.28
$\beta$ -Bisabolol	13.38*	1666	2.90	14.83*	2096	[2.28]
epi-Cyclosantalal	13.38*	1666	[2.90]	14.67†	2080	[0.85]
Cedr-8-en-13-ol	13.51*	1677	16.59	16.98	2317	0.05
(Z)- $\alpha$ -Santalol	13.51*	1677	[16.59]	16.72	2288	15.79
(E)- $\alpha$ -Santalol	13.51*	1677	[16.59]	14.75	2088	0.81
$\alpha$ -Bisabolol	13.62*	1686	7.68	15.55	2168	0.06
epi- $\alpha$ -Bisabolol	13.62*	1686	[7.68]	15.52*	2164	[6.55]
(Z)- $\alpha$ -trans-Bergamotol	13.67	1691	3.22	16.82	2299	3.32
(E)- $\alpha$ -Santalol	13.71*	1694	0.75	17.05	2324	0.40
Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.71*	1694	[0.75]			
Lanceoloxide	13.79*	1700	1.54			
(Z)-epi- $\beta$ -Santalol	13.79*	1700	[1.54]	17.30	2351	1.33
(E)- $\alpha$ -trans-Bergamotol	13.84	1705	1.14	17.85	2411	0.98
(Z)- $\beta$ -Santalol	13.97*	1716	6.09	17.45	2367	5.54

Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	13.97*	1716	[6.09]	15.69*	2181	[0.16]
(Z)-Nuciferol	14.12*	1729	27.65	18.31	2463	10.83
(Z)- $\gamma$ -Curcumen-12-ol	14.12*	1729	[27.65]	17.60	2383	5.57
(2E,6E)-Farnesol	14.12*	1729	[27.65]	16.91	2309	13.07
(E)- $\beta$ -Santalol	14.22*	1738	1.97	17.77	2403	1.33
Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.22*	1738	[1.97]	18.39	2472	0.83
(2E,6E)-Farnesal	14.26	1741	0.20	15.88	2201	0.26
Unknown [m/z 119, 93 (73), 110 (64), 111 (62), 95 (50), 81 (45), 109 943), 105 (43)... 220 (17), 238 (20)]	14.31†	1745	2.30			
Curcumen-12-ol analog	14.34†	1748	[2.30]	17.69	2393	0.19
Unknown [m/z 119, 93 (70), 111 (61), 110 (60), 109 (45), 95 (43)... 220 (17), 238 (16)]	14.37	1750	0.88			
(Z)- $\beta$ -Curcumen-12-ol	14.45	1757	5.75	18.02†	2431	9.41
(Z)-Lanceol	14.50†	1762	4.07	18.07*†	2436	[9.41]
12-Hydroxy-(Z)-sesquicineole	14.56*†	1767	[4.07]			
Unknown [m/z 93, 107 (80), 43 (74), 91 (55), 41 (49), 79 (48), 119 (48)... 236 (3)]	14.56*†	1767	[4.07]			
Unknown [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	14.68	1778	0.65	18.07*†	2436	[9.41]
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	14.79	1787	0.04			
Bisabola-2,7(Z),10(Z)-trien-13-ol?	14.84	1792	0.73	18.42	2476	0.53
Unknown [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	14.95	1801	0.43			
Unknown [m/z 119, 145 (62), 105 (52), 91 (52), 121 (38)...]	15.15	1819	0.09			
Unknown [m/z 43, 81 (61), 41 (49), 93 (47), 119 (39), 141 (35)...]	15.18	1821	0.16			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]	15.24	1827	0.06			
Unknown [m/z 141, 43 (87), 123 (55), 81 (37)... 236 (t)]	15.30	1832	0.01			
(2E,6E)-Farnesyl acetate	15.38	1840	0.13	16.00	2213	0.15
Unknown [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	16.26	1921	0.24			

Unknown [m/z 93, 109 (98), 43 (97), 68 (83), 95 (74), 110 (72), 81 (71)...220 (8)]	16.28	1923	0.07	
Unknown [m/z 43, 107 (24), 93 (23), 125 (23), 95 (23), 119 (23)...220 (1)]	16.44	1939	0.02	
Unknown [m/z 43, 107 (23), 119 (23), 93 (22), 125 (22), 132 (22)...220 (1)]	16.47	1942	0.09	
Unknown [m/z 93, 94 (86), 91 (48), 121 (42), 79 (42), 107 (37)...218 (2)]	16.52	1946	0.11	
<b>Total identified</b>		<b>90.53%</b>		<b>87.41%</b>
<b>Total reported</b>		<b>97.25%</b>		<b>88.45%</b>

\*: 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