

Date : 2024-07-19

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 24G05-PTH03

**Customer Identification** : Indian Sandalwood - Indonesia - SA2107R

**Type** : Essential Oil

**Source** : *Santalum album*

**Customer** : Plant Therapy

Checked and approved by:

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Alexis St-Gelais, Ph. D., Chimiste 2013-174

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## GAS CHROMATOGRAPHIC ANALYSIS

**Method :** PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

**✖ISO**

**Results :** See analysis summary (next page)

**Analyst :** Sylvain Mercier, M. Sc., Chimiste 2014-005

**Date :** 2024-07-17

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.5063 \pm 0.0003$  (20 °C)

**Method :** PC-MAT-016 - Measure of the refractive index of a liquid.

**Analyst :** Cindy Caron B. Sc.

**Date :** 2024-07-08

## 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
4-Methylacetophenone	0.02	Simple phenolic
Unknown	0.02	Terpene derivative
Teresantalic acid	0.05	Monoterpenic acid
Unknown	0.01	Terpenic aldehyde
Tricycloekasantalal	0.10	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.02	Terpenic aldehyde
Unknown	0.03	Unknown
Unknown	0.01	Unknown
7-epi-Sesquithujene	0.02	Sesquiterpene
γ-4-Dimethylbenzenebutyral	0.03	Simple phenolic
α-Cedrene	0.03	Sesquiterpene
cis-α-Bergamotene	0.01	Sesquiterpene
α-Santalene	0.80	Sesquiterpene
Unknown	0.01	Sesquiterpene
trans-α-Bergamotene	0.19	Sesquiterpene
Unknown	0.01	Sesquiterpene
epi-β-Santalene	0.91	Sesquiterpene
Geranylacetone	0.02	Monoterpenic ketone
β-Santalene	1.44	Sesquiterpene
Unknown	0.03	Unknown
10-epi-β-Acoradiene	0.01	Sesquiterpene
γ-Curcumene	0.11	Sesquiterpene
α-Curcumene	0.17	Sesquiterpene
Unknown	0.04	Sesquiterpene
Unknown	0.01	Sesquiterpene
Unknown	0.01	Sesquiterpene
Unknown	0.01	Sesquiterpene
α-Alaskene	0.02	Sesquiterpene
β-Bisabolene	0.08	Sesquiterpene
β-Curcumene	0.24	Sesquiterpene
Unknown	0.22	Oxygenated sesquiterpene
β-Sesquiphellandrene	0.05	Sesquiterpene
8,14-Cedranoxide	0.01	Sesquiterpenic ether
Unknown	0.22	Sesquiterpene
(E)-α-Bisabolene	0.06	Sesquiterpene
Unknown	0.13	Sesquiterpene
(E)-Nerolidol	0.06	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene

Dendrolasin	0.02	Sesquiterpenic ether
Guaiol	0.04	Sesquiterpenic alcohol
Helifolen-12-al B	0.03	Sesquiterpenic aldehyde
Unknown	0.11	Oxygenated sesquiterpene
$\alpha$ -Acorenol	0.05	Sesquiterpenic alcohol
$\beta$ -Acorenol	0.16	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.05	Sesquiterpenic alcohol
Unknown	0.65	Oxygenated sesquiterpene
$\alpha$ -Bisabolol oxide B, epimer 1	0.06	Sesquiterpenic alcohol
$\alpha$ -Bisabolol oxide B, epimer 2	0.27	Sesquiterpenic alcohol
Unknown	0.37	Oxygenated sesquiterpene
Unknown	0.48	Oxygenated sesquiterpene
Unknown	0.25	Oxygenated sesquiterpene
$\beta$ -Bisabolol	0.85	Sesquiterpenic alcohol
epi-Cyclosantalal	0.41	Sesquiterpenic aldehyde
( <i>E</i> )- $\alpha$ -Santalal	2.19	Sesquiterpenic aldehyde
( <i>Z</i> )- $\alpha$ -Santalol	42.98	Sesquiterpenic alcohol
$\alpha$ -Bisabolol	0.12	Sesquiterpenic alcohol
( <i>Z</i> )- $\alpha$ - <i>trans</i> -Bergamotol	6.64	Sesquiterpenic alcohol
( <i>E</i> )- $\alpha$ -Santalol	0.44	Sesquiterpenic alcohol
Unknown	0.19	Oxygenated sesquiterpene
( <i>Z</i> )-epi- $\beta$ -Santalol	3.56	Sesquiterpenic alcohol
( <i>E</i> )- $\alpha$ - <i>trans</i> -Bergamotol	0.43	Sesquiterpenic alcohol
Unknown	0.33	Oxygenated sesquiterpene
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	0.54	Sesquiterpenic alcohol
( <i>Z</i> )- $\beta$ -Santalol	20.46	Sesquiterpenic alcohol
( <i>Z</i> )- $\gamma$ -Curcumen-12-ol	0.97	Sesquiterpenic alcohol
( <i>Z</i> )-Nuciferol	1.50	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesal	0.02	Sesquiterpenic aldehyde
( <i>E</i> )- $\beta$ -Santalol	1.73	Sesquiterpenic alcohol
Unknown	0.94	Oxygenated sesquiterpene
Unknown	0.31	Oxygenated sesquiterpene
Unknown	0.41	Oxygenated sesquiterpene
Santalol isomer II	0.08	Sesquiterpenic alcohol
Curcumen-12-ol analog	0.28	Sesquiterpenic alcohol
( <i>Z</i> )- $\beta$ -Curcumen-12-ol	1.49	Sesquiterpenic alcohol
( <i>Z</i> )-Lanceol	2.04	Sesquiterpenic alcohol
Unknown	0.12	Oxygenated sesquiterpene
( <i>Z</i> )- $\alpha$ -Santalyl acetate	0.05	Sesquiterpenic ester
Unknown	0.09	Unknown
Unknown	0.09	Oxygenated sesquiterpene
Bisabola-2,7( <i>Z</i> ),10( <i>Z</i> )-trien-13-ol?	0.23	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene

Unknown	0.03	Unknown
Unknown	0.02	Unknown
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.02	Unknown
<b>Consolidated total</b>	<b>97.63</b>	

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

Note: no correction factor was applied

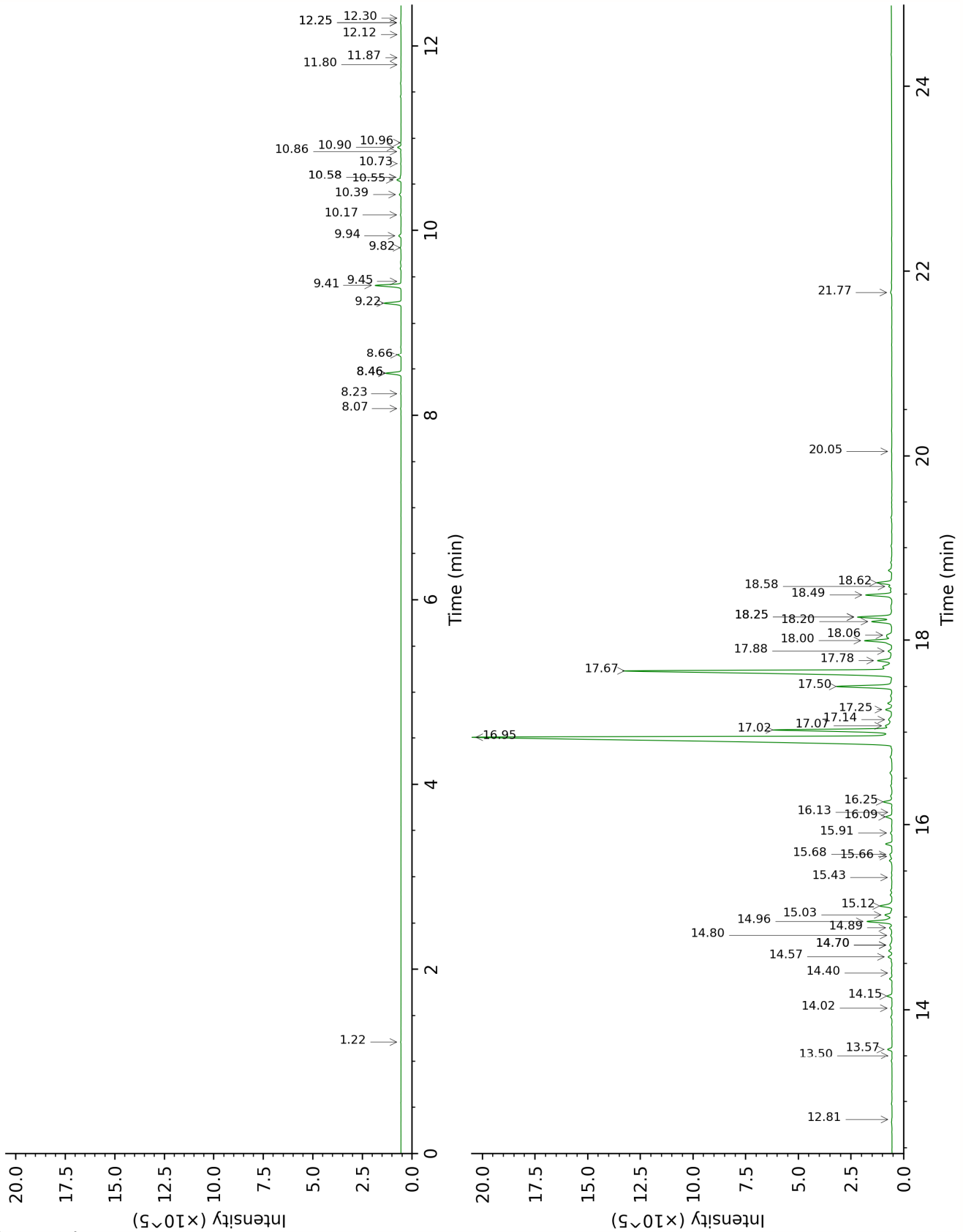
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

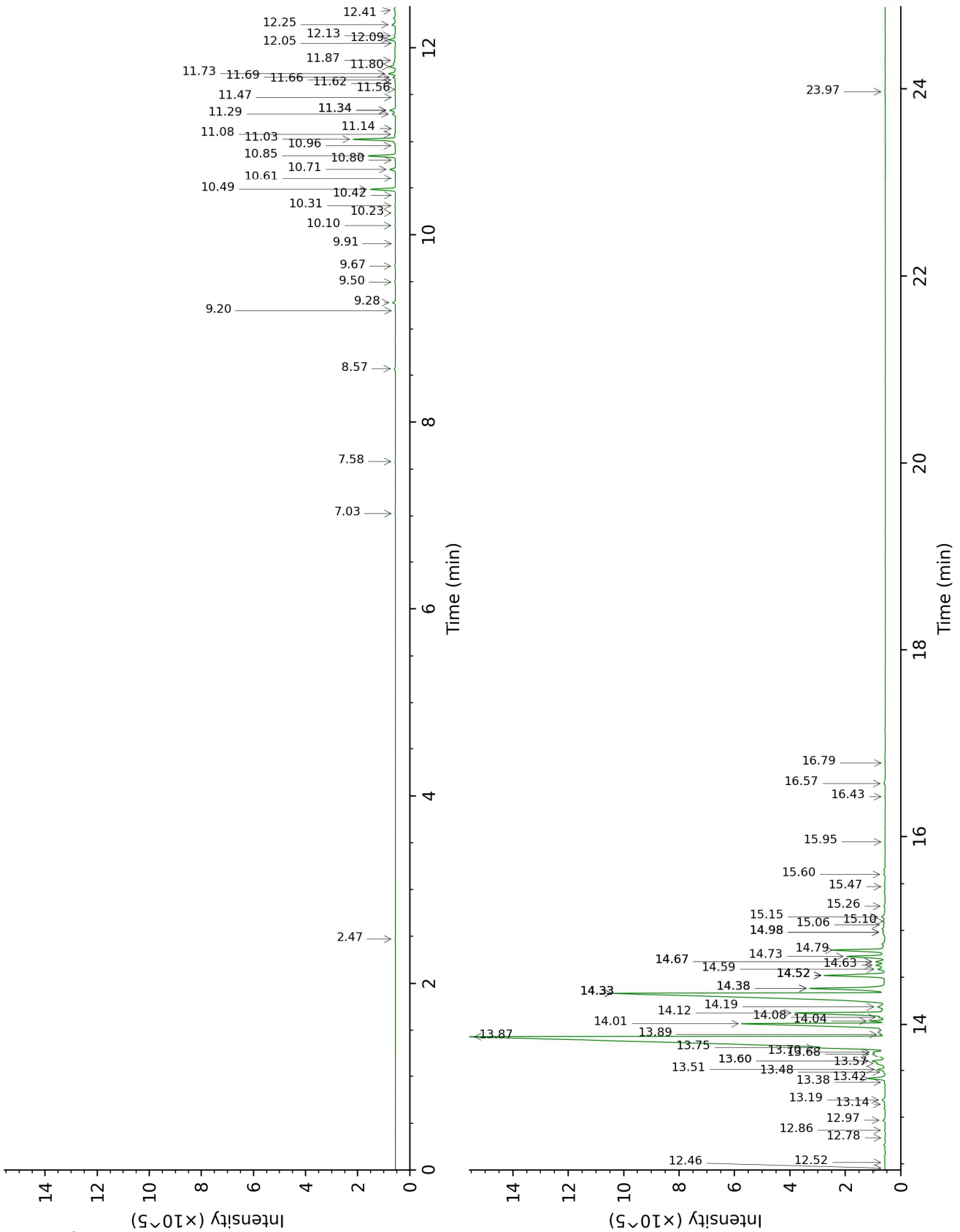
**Bracketed value ([xx]):** A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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

DB-WAX



DB-5





FULL ANALYSIS DATA

Santene	Column DB-WAX			Column DB-5		
	1.22	948.0	0.01	2.47	883.4	0.01
4-Methylacetophenone	10.73	1707.6	0.02	7.03	1180.9	0.02
Unknown SASP II [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	9.45	1604.8	0.01	7.58	1216.9	0.02
Teresantalic acid	15.91	2182.2	0.09	8.57	1283.2	0.05
Unknown SASP III [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]				9.20	1326.1	0.01
Tricycloekasantalal (1S,5S,6R)-2,6-	10.58*	1695.0	[0.09]	9.28	1332.2	0.10
Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	10.58*	1695.0	[0.09]	9.50	1347.6	0.02
Unknown SAAL II [m/z 93, 160 (81), 91 (58), 94 (53), 134 (53)...]				9.67	1359.6	0.03
Unknown UNKN XXX [m/z 123, 95 (46), 124 (35), 94 (27), 69 (27), 81 (24)...]				9.91	1376.4	0.01
7-epi-Sesquithujene	8.08	1499.1	0.02	10.10	1390.0	0.02
γ-4-Dimethylbenzenebutyral				10.23	1399.4	0.03
α-Cedrene	8.24	1511.3	0.02	10.31	1404.9	0.03
cis-α-Bergamotene	8.46*	1528.3	[0.82]	10.42	1413.2	0.01
α-Santalene	8.46*	1528.3	[0.82]	10.49	1417.9	0.80
Unknown UNKN XXXI [m/z 68, 67 (79), 134 (57), 93 (48), 119 (44), 79 (43)...202 (1)]				10.61	1426.8	0.01
trans-α-Bergamotene	8.66	1543.5	0.17	10.70	1434.2	0.19
Unknown SASP IV [m/z 93, 91 (80), 79 (68), 123 (68), 121 (56)... 204 (3)]				10.80	1441.6	0.01
epi-β-Santalene	9.22	1586.4	0.91	10.85	1445.0	0.91
Geranylacetone	11.87	1804.1	0.01	10.96	1453.0	0.02
β-Santalene	9.41	1601.4	1.43	11.03	1458.2	1.44
Unknown SAAL III [m/z 135, 119 (34), 107 (25), 91 (20), 93 (19)...]				11.08	1462.1	0.03
10-epi-β-Acoradiene	9.82	1633.8	0.04	11.14	1466.7	0.01
γ-Curcumene	9.94	1644.1	0.13	11.30	1478.2	0.11
α-Curcumene	10.90	1722.3	0.17	11.34*	1481.2	[0.21]
Unknown SASP V [m/z 119, 91 (24), 105 (16), 121 (16),				11.34*	1481.2	[0.21]

93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]						
Unknown SASP VI [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	12.30	1841.5	0.01	11.47	1491.4	0.01
Unknown SASP VII [m/z 119, 93 (52), 105 (38), 91 (33), 41 (31), 79 (25)... 204 (2)]	12.25*	1837.3	[0.04]	11.56	1497.7	0.01
Unknown CULO XII [m/z 119, 91 (14), 120 (10), 117 (9)... 200? (2)]	12.12	1825.9	0.01	11.62	1502.4	0.01
$\alpha$ -Alaskene	10.17	1662.0	0.03	11.66	1505.3	0.02
$\beta$ -Bisabolene	10.39	1679.5	0.10	11.69	1507.6	0.08
$\beta$ -Curcumene	10.55	1692.2	0.22	11.73	1510.6	0.24
Unknown CULO LIV [m/z 121, 93 (56), 91 (12), 94 (11), 122 (10)...220]	13.57	1956.1	0.23	11.80	1516.5	0.22
$\beta$ -Sesquiphellandrene	10.86	1718.5	0.03	11.87	1521.7	0.05
8,14-Cedranoxide	11.80	1797.4	0.01	12.05	1536.1	0.01
Unknown SAAL VIII [m/z 121, 93 (91), 79 (57), 91 (25), 43 (23), 77 (18)...202 (8)]	14.15	2009.9	0.26	12.09	1539.2	0.22
(E)- $\alpha$ -Bisabolene	10.96	1726.5	0.02	12.13	1542.4	0.06
Unknown SAAL IX [m/z 121, 93 (79), 79 (51), 91 (21), 77 (16), 43 (15)...202 (5)]				12.25	1551.7	0.13
(E)-Nerolidol	14.02	1997.3	0.06	12.41	1564.3	0.06
Unknown SASP VIII [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.25*	1837.3	[0.04]	12.46	1568.1	0.02
Dendrolasin	12.81	1886.0	0.02	12.52	1572.9	0.02
Guaiol	14.40	2033.7	0.04	12.78	1593.6	0.04
Helifolen-12-al B	13.50	1949.7	0.01	12.86	1599.8	0.03
Unknown SASP X [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]				12.97	1608.6	0.11
$\alpha$ -Acorenol	14.70*	2062.5	[0.22]	13.14	1622.6	0.05
$\beta$ -Acorenol	15.12	2103.8	0.81	13.19	1626.5	0.16
$\beta$ -Eudesmol	15.66	2156.9	0.05	13.38	1642.0	0.05
Unknown SASP XI [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]				13.42	1645.5	0.65

α-Bisabolol oxide B, epimer 1	14.70*	2062.5	[0.22]	13.48	1651.0	0.06
α-Bisabolol oxide B, epimer 2	14.80	2072.6	0.09	13.51	1653.3	0.27
Unknown SAAL IV [m/z 93, 121 (97), 91 (30), 92 (27), 79 (26), 94 (21), 105 (19), 122 (18)... 222 (9)]	16.09	2200.3	0.36	13.58	1658.6	0.37
Unknown CILI II [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	16.25	2217.0	0.48	13.60*	1660.8	[0.54]
Unknown SAAL V [m/z 121, 93 (96), 95 (96), 41 (65), 82 (63), 69 (62), 67 (59)... 222 (8)]	14.57	2050.4	0.25	13.60*	1660.8	[0.54]
β-Bisabolol	15.03	2094.1	0.55	13.68	1667.5	0.85
epi-Cyclosantalal	14.89	2080.5	0.17	13.70	1669.3	0.41
(E)-α-Santalal	14.96	2087.1	1.61	13.75	1673.3	2.19
(Z)-α-Santalol	16.95	2289.6	43.59	13.87	1682.9	42.98
α-Bisabolol	15.68	2159.2	0.13	13.89	1684.9	0.12
(Z)-α-trans-Bergamotol	17.02	2298.2	6.83	14.01	1694.4	6.64
(E)-α-Santalol	17.24	2321.9	0.40	14.04	1696.7	0.44
Unknown SASP XII [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]				14.08	1700.0	0.19
(Z)-epi-β-Santalol	17.50	2349.6	3.32	14.12	1703.8	3.56
(E)-α-trans-Bergamotol	18.06	2410.2	0.33	14.19	1709.5	0.43
Unknown ZIOF XXXIX [m/z 119, 91 (31), 105 (29), 41 (25), 133 (23), 158 (21)...]	17.14	2310.1	0.33	14.33*	1722.0	[21.20]
(2E,6E)-Farnesol	17.07	2302.9	0.54	14.33*	1722.0	[21.20]
(Z)-β-Santalol	17.67	2367.7	20.46	14.33*	1722.0	[21.20]
(Z)-γ-Curcumen-12-ol	17.78	2379.7	0.97	14.38*	1726.6	[3.26]
(Z)-Nuciferol	18.49	2458.9	1.50	14.38*	1726.6	[3.26]
(2E,6E)-Farnesal	16.13	2205.2	0.02	14.52*	1738.6	[2.43]
(E)-β-Santalol	18.00	2403.7	1.73	14.52*	1738.6	[2.43]
Unknown SAAL X [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	18.62	2473.7	0.94	14.52*	1738.6	[2.43]
Unknown SAAL XIX [m/z 93, 110 (80), 119 (74), 107 (74), 79 (64)... 236 (9)]				14.59	1744.3	0.31
Unknown SAAL XI [m/z 93, 121 (57), 91 (46), 138 (39), 119 (38), 109 (37)...]				14.63	1748.1	0.41

Santalol isomer II				14.67*	1751.3	[0.37]
Curcumen-12-ol analog	17.88	2391.0	0.28	14.67*	1751.3	[0.37]
(Z)-β-Curcumen-12-ol	18.20	2426.7	1.23	14.73	1756.2	1.49
(Z)-Lanceol	18.25*	2432.2	[1.99]	14.79	1762.0	2.04
Unknown SASP XVI [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	18.25*	2432.2	[1.99]	14.98*	1778.5	[0.18]
(Z)-α-Santalyl acetate	15.43	2134.4	0.05	14.98*	1778.5	[0.18]
Unknown EUCA V [m/z 159, 43 (40), 202 (21), 91 (19), 79 (18), 131 (17)...]				15.06	1785.4	0.09
Unknown SASP XVII [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]				15.10	1788.7	0.09
Bisabola-2,7(Z),10(Z)-trien-13-ol?	18.58	2469.2	0.17	15.15	1792.6	0.23
Unknown SASP XIX [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	20.05	2640.9	0.03	15.26	1802.6	0.08
Unknown SASP XX [m/z 119, 145 (62), 105 (52), 91 (52), 121 (38)...]				15.47	1821.5	0.03
Unknown SASP XXII [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]				15.60	1833.4	0.08
Unknown UNKN CLXII [m/z 93, 91 (51), 121 (45), 94 (39), 79 (36), 107 (34)...]				15.95	1864.9	0.03
Unknown SAAU IV [m/z 43, 94 (97), 109 (86), 67 (47), 95 (44), 122 (42)...]				16.43	1909.0	0.02
Unknown SAAU III [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	21.77	2856.2	0.13	16.57	1922.3	0.07
Unknown SAAU VI [m/z 43, 107 (24), 93 (23), 125 (23), 95 (23), 119 (23)...220 (1)]				16.79	1943.1	0.01
Unknown MISC LXV [m/z 93, 121 (96), 94 (81), 91 (46), 203 (41), 122 (40)...]				23.97	2738.9	0.02
Total reported		94.60%			97.85%	

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is taken into account in the consolidated 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