

# Analysis Sandalwood, Royal Hawaiian Essential Oil

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Date : June 14, 2017

#### SAMPLE IDENTIFICATION

Internal code : 17F08-FSE3-1-DM

Customer Identification : Sandalwood, Royal Hawaiian - Lot #HA-1132016

Type : Essential oil

Source : Santalum paniculatum

Customer : Flowers Shining Everywhere Inc.



#### ANALYSIS



Method : PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Analyst : Sylvain Mercier, M. Sc., chimiste

Analysis date : 2017-06-13

Checked and approved by :



*Alexis St-Gelais*

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



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# IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Santene	2.62	876	0.28	0.26	881	0.84	Normonoterpene
Tricyclene	3.22	917	0.01	0.01	912	0.95	Monoterpene
Teresantallic acid	13.70	1300	0.38	0.45	2128	39.78	Monoterp. acid
Tricycloekasantalal	15.85	1333	0.15				Terpenic aldehyde
$\alpha$ -Cedrene	20.11	1398	0.11	0.07	1481	8.19	Sesquiterpene
$\alpha$ -Funebrene	20.39	1401	0.02	0.02	1511	8.90	Sesquiterpene
$\alpha$ -Santalene	20.87	1407	0.71	0.70	1502	8.69	Sesquiterpene
trans- $\alpha$ -Bergamotene	22.15	1423	0.13	0.10	1521	9.13	Sesquiterpene
(Z)-epi- $\beta$ -Santalene	23.08	1434	0.60	0.52	1556	10.36	Sesquiterpene
(Z)- $\beta$ -Santalene	24.10	1446	0.93	0.96	1571	10.88	Sesquiterpene
$\gamma$ -Curcumene	25.89	1468	0.17	0.14	1616	12.54	Sesquiterpene
$\alpha$ -Curcumene	26.40	1474	0.17	0.20	1687	16.01	Sesquiterpene
$\alpha$ -Selinene	26.71	1477	0.11	0.07	1635	13.34	Sesquiterpene
$\beta$ -Bisabolene	28.70	1502	0.29	0.25	1652	14.21	Sesquiterpene
$\beta$ -Curcumene	28.84	1504	0.32	0.24	1662	14.75	Sesquiterpene
(E)-Nerolidol	33.67	1571	0.13	0.21	1988	34.65	Sesquiterp. alcohol
Dendrolasin	33.77	1572	0.10	0.14	1853	26.30	Sesquiterp. ether
$\alpha$ -Acorenol	36.31	1613	0.21	0.15	2020	36.10	Sesquiterp. alcohol
$\beta$ -Acorenol	36.64	1621	0.11	0.11	2042	37.03	Sesquiterp. alcohol
Unknown (m/z = 91, 179 (62), 79 (58), 105 (58), 93 (58), 67 (57), 161 (57)... 188 (42), 216 (6))	37.42	1640	0.53				Oxygenated sesquiterp.
$\alpha$ -Bisabolol oxide B	37.59	1645	0.47	0.47	2034	36.75	Sesquiterp. alcohol
Unknown (m/z = 95, 121 (84), 161 (77), 43 (63), 79 (61), 91 (61), 105 (54), 93 (54), 204 (47)... 220 (8))	37.64	1646	0.25				Oxygenated sesquiterp.
(E)- $\alpha$ -Santalol?	38.18	1659	0.94				Sesquiterp. aldehyde
Santalal analog?	38.28	1661	0.65				Sesquiterp. aldehyde
Cedr-8-en-13-ol	38.70	1672	4.02	3.56	2258	43.19	Sesquiterp. alcohol
(Z)- $\alpha$ -Santalol	39.11	1682	28.23	28.94	2249	42.96	Sesquiterp. alcohol
(Z)- $\alpha$ -trans-Bergamotol	39.54*	1692	3.98	0.95	2277	43.62	Sesquiterp. alcohol
(E)- $\alpha$ -Santalol	39.54*	1692	[3.98]	2.48	2306	44.27	Sesquiterp. alcohol
(Z)-epi- $\beta$ -Santalol	39.99	1704	2.78	11.55	2325	44.69*	Sesquiterp. alcohol
(Z)- $\beta$ -Santalol	40.55	1722	10.93	[11.55]	2325	44.69*	Sesquiterp. alcohol
(Z)-Nuciferol	40.79	1730	4.89	8.65	2419	46.71	Sesquiterp. alcohol
(Z)- $\gamma$ -Curcumen-12-ol	40.94	1734	6.52	3.76	2342	45.06	Sesquiterp. alcohol
(E)- $\beta$ -Santalol	41.29	1745	1.73				Sesquiterp. alcohol
(Z)- $\beta$ -Curcumen-12-ol	41.86	1763	4.78	5.00	2389	46.09	Sesquiterp. alcohol
(Z)-Lanceol	42.13	1772	7.64	7.27	2397	46.26	Sesquiterp. alcohol

(E)-Lanceol?	42.97	1798	0.48	0.45	2432	47.00	Sesquiterp. alcohol
<b>Total Identified</b>	<b>82.97%</b>			<b>77.68%</b>			

[-]: Two or more compounds are coeluting on this column

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

Note: no correction factor was applied

#### OTHER DATA

**Physical aspect** : Light yellow liquid

**Refractive Index** : 1.5065 - 1.0003 (20°C)

#### CONCLUSION

No adulterant, contaminant or diluent were detected using this method. The concentrations of santalols reported in literature are however slightly higher for *S. paniculatum*, with (Z)- $\alpha$ -santalol reported minimally at 34%<sup>1</sup>. This oil however is not widely described in literature, and the values observed here could still be within natural variation.

#### REFERENCES

- (1) Braun, N. A.; Sim, S.; Kohlenberg, B.; Lawrence, B. M. Hawaiian Sandalwood: Oil Composition of *Santalum Paniculatum* and Comparison with Other Sandal Species. *Nat. Prod. Commun.* **2014**, 9 (9), 1365–1368.



