

GC/MS BATCH NUMBER: CJ0103

ESSENTIAL OIL: COPAIBA BALSAM
BOTANICAL NAME: COPAIFERA OFFICINALIS
ORIGIN: EL SALVADOR

KEY CONSTITUENTS PRESENT IN THIS BATCH OF COPAIBA BALSAM OIL	%
β -CARYOPHYLLENE	29.4
COPAIBA DITERPENES	19.0
trans- α -BERGAMOTENE	6.0
α -HUMULENE	4.0
β -BISABOLENE	3.6
GERMACRENE D	3.4
α -COPAENE	2.8
trans- γ -BISABOLENE	1.6
GERMACRENE B	1.6
β -SELINENE	1.2
γ -MUUROLENE	1.2

Comments from Robert Tisserand: This is an oleoresin not a distilled oil. The oleoresin is more environmentally friendly to produce, and its diterpenic acids (not found in the distilled oil) lend it greater therapeutic properties.

Date : August 25, 2016

SAMPLE IDENTIFICATION

Internal code : 16H10-PTH10-1-DM

Customer identification : Copaiba Balsam - CJ010363R

Type : Essential oil

Source : *Copaifera officinalis*

Customer : Plant Therapy

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 : 2016-08-25

Checked and approved by :

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.	
<i>cis</i> - β -Ocimene	5.28	1037	0.08	0.06	1186	2.81	Monoterpene
δ -Elemene	15.07	1320	0.27	0.31	1418	6.01	Sesquiterpene
α -Cubebene	15.72	1330	0.39	0.33	1425	6.15	Sesquiterpene
Cycloisosativene	16.71	1345	0.09	0.05	1431	6.26	Sesquiterpene
α -Copaene	17.47	1356	2.82	2.46	1441	6.45	Sesquiterpene
β -Cubebene	18.40	1371	0.32	0.25	1483	7.24	Sesquiterpene
β -Elemene	18.68	1375	0.91	25.64	1538	8.44*	Sesquiterpene
Cyperene	18.95	1379	0.18	0.10	1490	7.36	Sesquiterpene
β -Caryophyllene	20.65	1403	29.43	[25.64]	1538	8.44*	Sesquiterpene
γ -Elemene	21.62	1415	0.29	0.24	1576	9.59	Sesquiterpene
<i>trans</i> - α -Bergamotene	22.01	1420	5.98	5.98	1542	8.56	Sesquiterpene
<i>cis</i> - β -Farnesene	22.66	1427	0.32	0.17	1586	9.87	Sesquiterpene
α -Humulene	23.19	1434	3.98	3.68	1592	10.06	Sesquiterpene
allo-Aromadendrene	23.35	1436	0.20	0.21	1571	9.44	Sesquiterpene
<i>trans</i> - β -Farnesene	24.25	1447	0.30	0.31	1626	11.09	Sesquiterpene
Germacrene D	25.37*	1460	4.86	3.35	1633	11.40*	Sesquiterpene
γ -Muuroleone	25.37*	1460	[4.86]	1.15	1622	10.96	Sesquiterpene
β -Selinene	25.93*	1467	1.32	[3.35]	1633	11.40*	Sesquiterpene
Viridiflorene	25.93*	1467	[1.32]	0.13	1605	10.45	Sesquiterpene
Bicyclogermacrene	26.52	1473	0.82	0.69	1637	11.51	Sesquiterpene
Valencene	27.27	1482	0.34	0.30	1654	12.32	Sesquiterpene
α -Muuroleone	27.41	1484	0.21	0.23	1650	12.13	Sesquiterpene
γ -Cadinene	28.33	1495	0.55	3.33	1669	12.97*	Sesquiterpene
β -Bisabolene	28.63*	1499	3.64	[3.33]	1669	12.97*	Sesquiterpene
δ -Cadinene	28.63*	1499	[3.64]	0.41	1678	13.35	Sesquiterpene
<i>trans</i> - γ -Bisabolene	29.05	1505	1.63	1.37	1684	13.59	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	29.87	1516	0.46	0.39	1702	14.44	Sesquiterpene
β -Sesquiphellandrene	30.09	1519	0.15	0.17	1689	13.82	Sesquiterpene
α -Cadinene	30.45	1524	0.13	0.31	1716	15.02*	Sesquiterpene
<i>trans</i> - α -Bisabolene	31.57	1539	0.37	[0.31]	1716	15.02*	Sesquiterpene
Germacrene B	31.72	1542	1.62	1.39	1732	15.75	Sesquiterpene
Maaliol	32.71	1555	0.05	0.04	1894	25.79	Sesquiterp. alcohol
Caryophyllenyl alcohol	33.43	1565	0.23				Sesquiterp. alcohol
Caryophyllene oxide	33.50*	1566	0.18	0.12	1855	23.08	Sesquiterp. ether
Spathulenol	33.50*	1566	[0.18]	0.09	2026	33.88	Sesquiterp. alcohol
Globulol	34.10	1574	0.04	0.04	1976	31.02	Sesquiterp. alcohol
Viridiflorol	34.61	1581	0.06	0.03	1989	31.77	Sesquiterp. alcohol
Junenol	35.74	1598	0.37	0.33	1931	28.29	Sesquiterp. alcohol
1,10-diepi-Cubenol	36.24	1611	0.02	0.04	1953	29.67	Sesquiterp. alcohol
1-epi-Cubenol	36.52	1617	0.06	0.03	1980	31.27	Sesquiterp. alcohol
Cubenol	37.02	1629	0.07	0.07	1962	30.23	Sesquiterp. alcohol

τ-Cadinol	37.35	1637	0.09	0.06	2078	36.14	Sesquiterp. alcohol
τ-Muurolol	37.48	1641	0.19	0.20	2099	36.84	Sesquiterp. alcohol
α-Muurolol	37.61	1644	0.28	0.22	2114	37.37	Sesquiterp. alcohol
Selin-11-en-4-α-ol	37.75	1647	0.13	0.15	2130	37.94	Sesquiterp. alcohol
α-Cadinol	37.93	1651	0.53	0.28	2137	38.15	Sesquiterp. alcohol
α-Bisabolol	39.39	1686	0.17	0.16	2143	38.37	Sesquiterp. alcohol
Manool	49.22	2040	0.27	0.26	2576	47.94	Sesquiterp. alcohol
Unknown (m/z = 95, 189 (97), 105 (87), 107 (84), 91 (70), 93 (68), 120 (65)... 257 (22), 272 (4))	49.51	2053	0.23				Diterpene
3-α-Hydroxy-manool?	54.74	2292	0.54				Diterp. alcohol
<i>C. officinalis</i> diterpene	56.13	2361	3.74	3.90	3540	62.90	Diterp. acid
Methyl copalate?	56.21	2365	0.22				Diterp. ester
<i>C. officinalis</i> diterpene	56.90	2400	0.49	0.18	3559	63.16	Diterp. acid
Methyl hardwickiate?	58.60	2487	2.06				Diterp. ester
<i>C. officinalis</i> diterpene	59.18	2519	2.94	3.45	3945	68.06	Diterp. acid
<i>C. officinalis</i> diterpene	61.20	2630	1.16				Diterp. acid
<i>C. officinalis</i> diterpene	62.94	2728	6.48				Diterp. acid
<i>C. officinalis</i> diterpene	63.62	2767	1.63				Diterp. acid
Total identified			67.22%	55.13%			

*: Two or more compounds are coeluting on this column

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

Note: no correction factor was applied

OTHER DATA

Physical aspect : Light yellow brown

Refractive index : 1.5050 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent were detected using this method. The sesquiterpenic fraction of the oil corresponds to literature for *Copaifera* sp. The several important unknowns reported are likely acidic constituents, judging by their peak shapes and respective retention indexes on both columns. Furthermore, they appear in the diterpenes region. This leads us to believe that they are poorly volatile diterpenic acids which are harder to detect by MS. Several diterpenic acids, such as copalic acid and hardwickic acid (methyl esters of which are detected here in small amounts) have been reported as important constituents of *Copaifera* sp. resins.



