

GC/MS BATCH NUMBER: CJ0102

ESSENTIAL OIL: COPAIBA BALSAM
BOTANICAL NAME: *COPAIFERA OFFICINALIS*
ORIGIN: BRAZIL

KEY CONSTITUENTS PRESENT IN THIS BATCH OF OIL	%
COPAIBA DITERPENES	25.9
β -CARYOPHYLLENE	23.7
trans- α -BERGAMOTENE	5.4
α -HUMULENE	3.6
β -BISABOLENE	3.2
GERMACRENE D	3.0
α -COPAENE	2.5
GERMACRENE B	1.6
δ -CADINENE	1.5

Comments from Robert Tisserand: Because this is an oleoresin, gc/ms analysis does not show as 90-100% total. After beta-caryophyllene, the major constituents include diterpenic acids such as kaurenoic acid and hydroxycopalic acid, which are therapeutically active, but show on the analysis simply as "copaiba diterpene". The reasons for using the oleoresin in aromatherapy are that it does less damage to the trees than distilling the essential oil, and that it contains more therapeutic compounds - these diterpenic acids - than the distilled oil.

Date : February 12, 2016

SAMPLE IDENTIFICATION

Internal code : 16B01-PTH5-1-LC

Customer identification : Copaiba Balsam - Brazil - CJ0102S1R

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 : Alexis St-Gelais, M. Sc., chimiste

Analysis date : 2016-02-11

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.	
Limonene	4.48	1027	tr	tr	1145	2.42	Monoterpene
<i>cis</i> - β -Ocimene	4.69	1039	0.06	0.06	1194	2.99	Monoterpene
<i>trans</i> - β -Ocimene	4.86	1048	tr	tr	1208	3.18	Monoterpene
δ -Elemene	12.92	1318	0.24	0.24	1418	6.27	Sesquiterpene
α -Cubebene	13.48	1327	0.33	0.28	1409	6.10	Sesquiterpene
Cycloisosativene	14.29	1342	0.07	0.04	1417	6.24	Sesquiterpene
α -Copaene	14.98	1354	2.47	2.18	1433	6.56	Sesquiterpene
β -Cubebene	15.81	1368	0.27	0.25	1479	7.41	Sesquiterpene
Cyperene	16.11*	1373	1.00	0.03	1486	7.55	Sesquiterpene
β -Elemene	16.11*	1373	[1.00]	4.68	1534	8.77*	Sesquiterpene
β -Caryophyllene	17.83*	1401	26.39	23.66	1531	8.68	Sesquiterpene
<i>cis</i> - α -Bergamotene	17.83*	1401	[26.39]	0.01	1516	8.23	Sesquiterpene
γ -Elemene	18.78	1414	0.19	0.24	1573	9.92	Sesquiterpene
<i>trans</i> - α -Bergamotene	19.06	1418	5.43	[4.68]	1534	8.77*	Sesquiterpene
<i>cis</i> - β -Farnesene	19.66	1425	0.31	0.22	1583	10.25	Sesquiterpene
α -Humulene	20.10	1431	3.55	3.20	1589	10.43	Sesquiterpene
allo-Aromadendrene	20.23	1433	0.21	0.17	1564	9.65	Sesquiterpene
<i>trans</i> - β -Farnesene	21.19	1445	0.25	0.25	1621	11.59	Sesquiterpene
Germacrene D	22.14*	1458	4.09	2.95	1626	11.79	Sesquiterpene
γ -Muurolene	22.14*	1458	[4.09]	1.13	1615	11.32*	Sesquiterpene
Viridiflorene	22.65*	1464	1.14	[1.13]	1615	11.32*	Sesquiterpene
β -Selinene	22.65*	1464	[1.14]	0.48	1629	11.94	Sesquiterpene
Bicyclogermacrene	23.18*	1471	0.71	0.42	1635	12.20	Sesquiterpene
α -Selinene	23.18*	1471	[0.71]	0.03	1633	12.12	Sesquiterpene
α -Muurolene	23.95	1481	0.34	0.22	1643	12.59	Sesquiterpene
γ -Cadinene	24.90	1494	0.42	0.26	1665	13.56	Sesquiterpene
β -Bisabolene	25.22	1497	3.24	2.67	1663	13.46	Sesquiterpene
δ -Cadinene	25.60	1501	1.46	1.08	1678	14.13	Sesquiterpene
<i>trans</i> -Calamenene	25.95	1506	0.05	0.03	1736	17.12	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	26.39	1511	0.44	0.29	1697	14.97	Sesquiterpene
β -Sesquiphellandrene	26.63*	1514	0.12	0.05	1700	15.11	Sesquiterpene
<i>trans</i> - γ -Bisabolene	26.63*	1514	[0.12]	0.05	1682	14.28	Sesquiterpene
Germacrene B	28.01	1530	1.63	1.17	1724	16.41	Sesquiterpene
Maaliol	29.37	1547	0.09	0.04	1894	27.41	Sesquiterp. alcohol
Caryophyllene oxide	30.22*	1557	0.34	0.10	1850	24.32	Sesquiterp. ether
Caryophyllenyl alcohol	30.22*	1557	[0.34]				Sesquiterp. alcohol
Spathulenol	30.76	1563	0.02	0.02	2021	35.17	Sesquiterp. alcohol
Globulol	31.17	1568	0.02	0.02	1976	32.61	Sesquiterp. alcohol
Viridiflorol	31.89	1577	0.04	0.03	1985	33.17	Sesquiterp. alcohol
Junenol	33.28	1593	0.26	0.24	1931	29.81	Sesquiterp. alcohol
τ -Cadinol	35.45	1637	0.05	0.06	2074	37.04	Sesquiterp. alcohol

τ-Muurolol	35.56	1640	0.16	0.16	2093	37.75	Sesquiterp. alcohol
α-Muurolol	35.71	1643	0.29	0.20	2108	38.28	Sesquiterp. alcohol
Selin-11-en-4-α-ol	36.01	1649	0.11	0.10	2142	39.27*	Sesquiterp. alcohol
α-Cadinol	36.11	1651	0.40	0.22	2134	39.04	Sesquiterp. alcohol
α-Bisabolol	37.66	1684	0.16	[0.10]	2142	39.27*	Sesquiterp. alcohol
Manool	47.89	2032	0.24	0.25	2556	48.57	Diterp. alcohol
Unknown (m/z = 95, 189 (97), 105 (87), 107 (84), 91 (70), 93 (68), 120 (65)... 257 (22), 272 (4))	48.18	2045	0.24				Oxygenated diterp.
3-α-Hydroxy-manool?	53.68	2293	0.89				Diterp. alcohol
Methyl copalate?	55.05*	2361	6.82				Diterp. ester
Copaiba diterpene	55.05*	2361	[6.82]	7.38	3496	63.89	Diterp. acid?
Copaiba diterpene	55.68	2393	1.33	1.31	3571	64.96	Diterp. acid?
Methyl hardwickiate?	57.46	2484	4.21				Diterp. ester
Copaiba diterpene	58.11	2519	5.49	6.50	3941	69.91	Diterp. acid?
Copaiba diterpene	60.06	2625	1.38				Diterp. acid?
Copaiba diterpene	61.83	2723	8.67	8.06	4058	73.10	Diterp. acid?
Copaiba diterpene	62.50	2762	2.20	1.50	4121	82.86	Diterp. acid?
Total identified			68.75%	47.78%			

*: 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 : Yellow liquid

Refractive index : 1.5055 ± 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 officinalis*. 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 officinalis* resins.



