PLANT THERAPY
100% PURE ESSENTIAL OILS

GC/MS BATCH NUMBER: CB1100

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

KEY CONSTITUENTS PRESENT IN THIS BATCH OF COPAIBA BALSAM ORGANIC OIL	%
β-CARYOPHYLLENE	28.2
GERMACRENE D	5.2
α-COPAENE	5.1
trans-α-BERGAMOTENE	4.8
α-HUMULENE	3.8
β-SELINENE	5.2
trans-γ-BISABOLENE	2.4
β-BISABOLENE	1.3

Comments from Robert Tisserand: Delightful lemony odor, characteristic of some copaiba oleoresins. The constituents are all in expected amounts.

Date : September 28, 2016

SAMPLE IDENTIFICATION

Internal code : 16I16-PTH8-1-DM
Customer identification : Organic Copaiba Balsam - CB710063R
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 : 2016-09-27

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Limonene	5.09	1027	tr	tr	1136	2.23	Monoterpene
cis-β-Ocimene	5.28	1037	0.12	0.09	1182	2.76	Monoterpene
trans-β-Ocimene	5.46	1047	0.01	tr	1198	2.95	Monoterpene
δ-Elemene	15.05	1319	0.11	0.26	1421	6.06*	Sesquiterpene
α-Cubebene	15.73	1330	0.69	0.47	1413	5.95	Sesquiterpene
α-Ylangene	16.94	1348	0.05	[0.26]	1421	6.06*	Sesquiterpene
α-Copaene	17.59	1358	5.10	4.33	1440	6.43	Sesquiterpene
Cyperene	18.41	1371	0.52	0.49	1480	7.17	Sesquiterpene
β-Elemene	18.67	1375	0.59	24.34	1539	8.47*	Sesquiterpene
β-Caryophyllene	20.86	1406	28.18	[24.34]	1539	8.47*	Sesquiterpene
γ-Elemene	21.69	1416	0.17	0.14	1582	9.77	Sesquiterpene
trans-α-Bergamotene	22.09	1421	4.76	3.90	1542	8.57	Sesquiterpene
cis-β-Farnesene	22.70	1428	0.38	3.40	1591	10.02*	Sesquiterpene
α-Humulene	23.28	1435	3.77	[3.40]	1591	10.02*	Sesquiterpene
allo-Aromadendrene	23.42	1437	0.44	0.39	1567	9.31	Sesquiterpene
trans-β-Farnesene	24.29	1447	0.21	1.27	1619	10.86*	Sesquiterpene
Germacrene D	25.55*	1462	7.07	5.18	1633	11.39*	Sesquiterpene
γ-Muurolene	25.55*	1462	[7.07]	[1.27]	1619	10.86*	Sesquiterpene
β-Selinene	26.02	1468	1.56	[5.18]	1633	11.39*	Sesquiterpene
Viridiflorene	26.13	1469	0.12	0.07	1600	10.31	Sesquiterpene
Bicyclogermacrene	26.61*	1474	1.37	0.80	1637	11.51	Sesquiterpene
α-Selinene	26.61*	1474	[1.37]	0.66	1641	11.73	Sesquiterpene
Valencene	27.29	1482	0.46	0.34	1651	12.16	Sesquiterpene
α-Muurolene	27.43	1484	0.19	0.13	1642	11.78	Sesquiterpene
γ-Cadinene	28.35	1496	0.83	1.26	1665	12.75*	Sesquiterpene
β-Bisabolene	28.60*	1499	1.46	[1.26]	1665	12.75*	Sesquiterpene
δ-Cadinene	28.60*	1499	[1.46]	0.51	1673	13.14	Sesquiterpene
trans-γ-Bisabolene	29.15	1506	2.40	1.92	1680	13.48	Sesquiterpene
trans-Cadina-1,4-diene	29.86	1516	0.30	0.36	1697	14.19	Sesquiterpene
β-Sesquiphellandrene	30.10	1519	0.20	0.17	1710	14.72	Sesquiterpene
α-Cadinene	30.43	1524	0.20				Sesquiterpene
trans-α-Bisabolene	30.92	1531	0.07	0.08	1705	14.56	Sesquiterpene
Germacrene B	31.51	1539	0.19	0.20	1725	15.43	Sesquiterpene
Maaliol	32.67	1555	0.07	0.05	1888	25.35	Sesquiterp. alcohol
Caryophyllenyl alcohol	33.37	1564	0.16				Sesquiterp. alcohol
Caryophyllene oxide	33.48	1566	0.06	0.06	1844	22.29	Sesquiterp. ether
Spathulenol	33.66	1568	0.03	0.02	2025	33.81	Sesquiterp. alcohol
Globulol	34.05	1573	0.06	0.04	1973	30.80	Sesquiterp. alcohol
Viridiflorol	34.56	1580	0.08	0.05	1981	31.33	Sesquiterp. alcohol
Junenol	35.72	1598	0.37	0.32	1925	27.83	Sesquiterp. alcohol
1,10-diepi-Cubenol	35.89	1602	0.09	0.13	1938	28.78	Sesquiterp. alcohol

1-epi-Cubenol	36.38	1614	0.10	0.11	1955	29.77	Sesquiterp. alcohol
Cubenol	36.77	1623	0.04	0.05	1945	29.17	Sesquiterp. alcohol
τ-Cadinol	37.30	1636	0.11	0.11	2073	36.00	Sesquiterp. alcohol
τ-Muurolol	37.45	1640	0.27	0.23	2090	36.58	Sesquiterp. alcohol
α-Muurolol	37.58	1643	0.31	0.27	2107	37.13	Sesquiterp. alcohol
Selin-11-en-4-α-ol	37.70	1646	0.12	0.09	2137	38.13	Sesquiterp. alcohol
α-Cadinol	37.90	1651	0.45	0.30	2130	37.92*	Sesquiterp. alcohol
α-Bisabolol	39.34*	1685	0.12	[0.30]	2130	37.92*	Sesquiterp. alcohol
Manool	49.18	2038	0.24	0.21	2566	47.75	Diterp. alcohol
3-α-Hydroxy-manool?	54.71	2290	0.63				Diterp. alcohol
Copaifera biomarker	56.34	2372	6.75	6.56	3533	62.79	Diterp. acid?
Copaifera biomarker	56.77	2393	0.21	0.14	3555	63.09	Diterp. acid?
Methyl hardwickiate?	58.64	2490	0.16				Diterp. Ester
Copaifera biomarker	59.35	2529	5.70				Diterp. acid?
Copaifera biomarker	61.19	2630	0.71				Diterp. acid?
Copaifera biomarker	63.09	2737	6.24	6.55	3990	68.62	Diterp. acid?
Copaifera biomarker	64.08	2794	2.62				Diterp. acid?
Total identified			**87.22%**	**66.05%**			

*: 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 liquid
Refractive index : 1.5045 ± 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.

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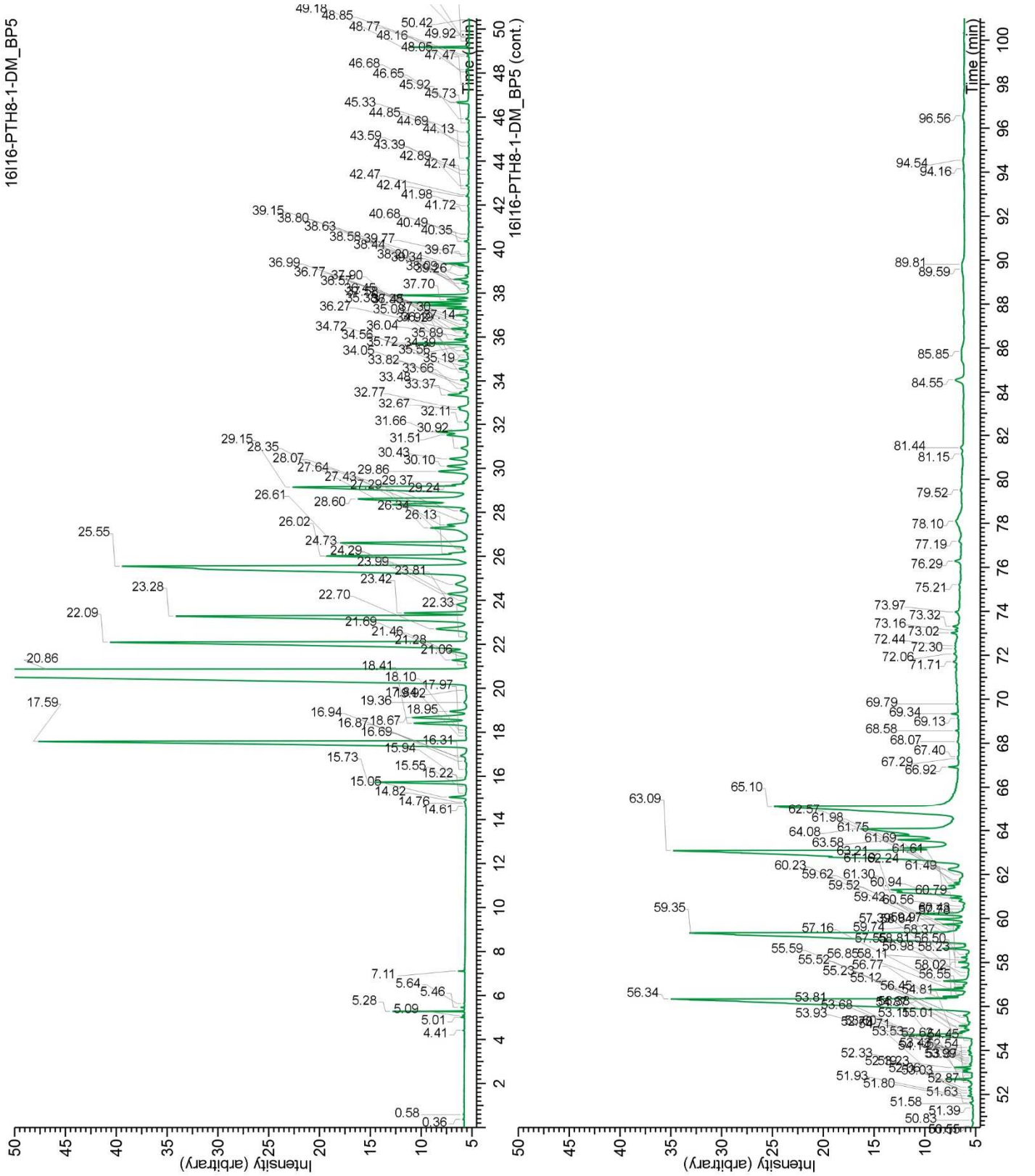
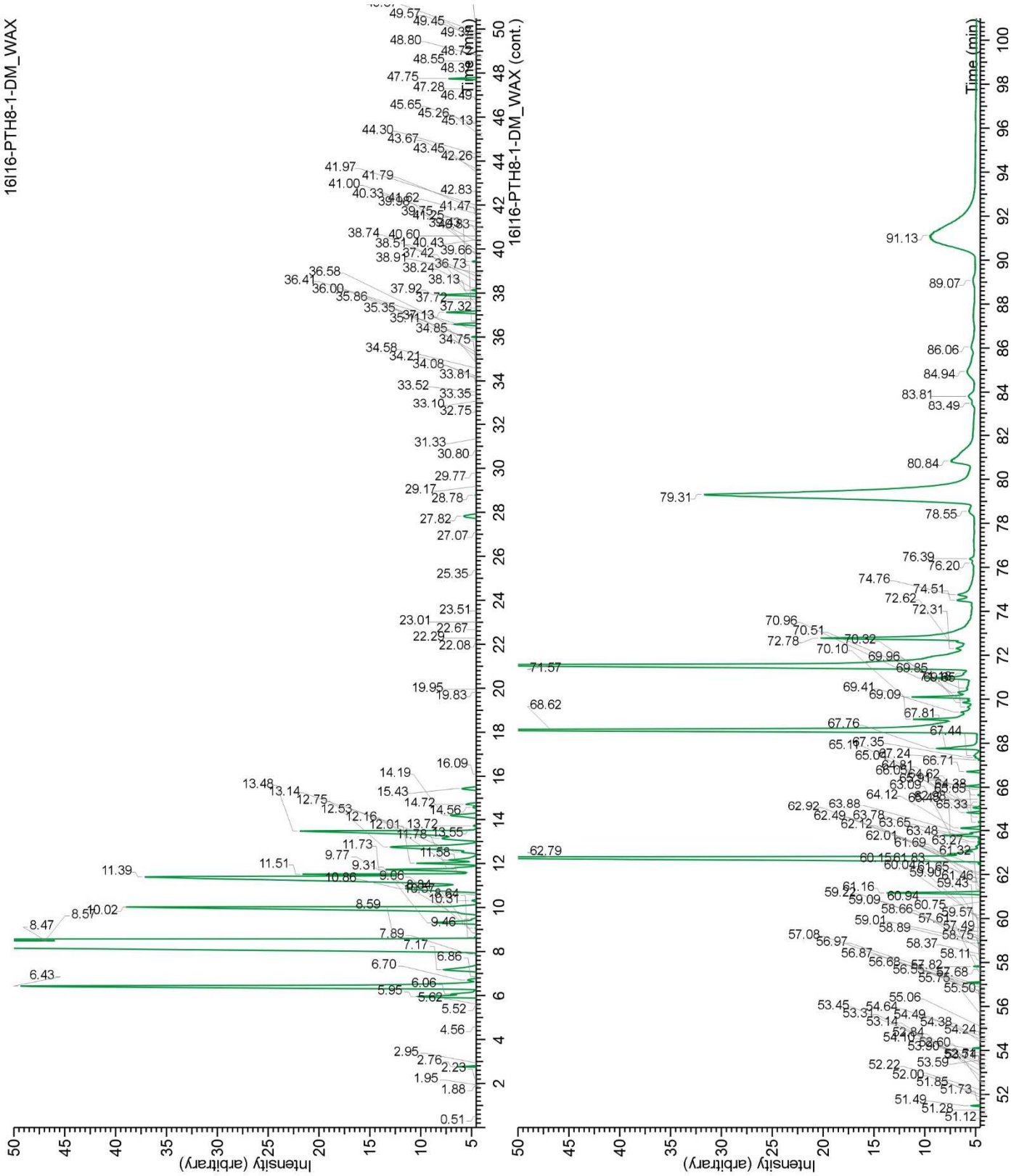

16I16-PTH8-1-DM_BP5
16I16-PTH8-1-DM_BP5 (cont.)
Time (min)
Intensity (arbitrary)


16I16-PTH8-1-DM_WAX
16I16-PTH8-1-DM_WAX (cont.)
Time (min)
Intensity (arbitrary)