

Date : July 09, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20G08-PTH18


**Customer identification** : Copaiba Balsam - Brazil - CJ0107911R

**Type** : Resin

**Source** : *Copaifera officinalis*

**Customer** : Plant Therapy

ANALYSIS

**Method**: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst** : Fanny Charlier, B. Sc., chimiste à l'entraînement

**Analysis date** : July 09, 2020

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow liquid

**Refractive index:**  $1.5065 \pm 0.0003$  (20 °C; method PC-MAT-016)

*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
Myrcene	tr	Monoterpene
(2E,4E)-3,7-Dimethylocta-2,4-diene?	0.01	Monoterpene
(Z)- $\beta$ -Ocimene	0.11	Monoterpene
(E)- $\beta$ -Ocimene	0.01	Monoterpene
allo-Ocimene	0.01	Monoterpene
$\delta$ -Elemene	0.35	Sesquiterpene
$\alpha$ -Cubebene	0.51	Sesquiterpene
Cyclosativene I	0.03	Sesquiterpene
Cyclosativene II	0.02	Sesquiterpene
$\alpha$ -Ylangene	0.08	Sesquiterpene
$\alpha$ -Copaene	3.94	Sesquiterpene
<i>cis</i> - $\beta$ -Elemene	0.05	Sesquiterpene
7-epi-Sesquithujene?	0.01	Sesquiterpene
$\beta$ -Cubebene	0.43	Sesquiterpene
$\beta$ -Elemene	1.47	Sesquiterpene
Cyperene	0.22	Sesquiterpene
$\alpha$ -Cedrene	0.07	Sesquiterpene
$\beta$ -Caryophyllene	39.31	Sesquiterpene
$\beta$ -Ylangene	0.13	Sesquiterpene
$\beta$ -Copaene	0.29	Sesquiterpene
$\gamma$ -Elemene	0.52	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	4.04	Sesquiterpene
$\beta$ -Humulene	0.07	Sesquiterpene
Aromadendrene	0.17	Sesquiterpene
Sesquisabinene A	0.29	Sesquiterpene
$\alpha$ -Humulene	5.39	Sesquiterpene
allo-Aromadendrene	0.38	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.10	Sesquiterpene
(E)- $\beta$ -Farnesene	0.24	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.32	Sesquiterpene
Germacrene D	8.09	Sesquiterpene
$\gamma$ -Muurolole	0.40	Sesquiterpene
$\beta$ -Selinene	1.67	Sesquiterpene
Bicyclogermacrene	0.51	Sesquiterpene
epi-Cubebol	0.06	Sesquiterpenic alcohol
$\alpha$ -Selinene	1.13	Sesquiterpene
Caparratriene	0.07	Sesquiterpene
$\alpha$ -Muurolole	0.62	Sesquiterpene
$\delta$ -Guaiene	0.26	Sesquiterpene
$\beta$ -Bisabolene	2.21	Sesquiterpene
$\gamma$ -Cadinene	0.92	Sesquiterpene
Cubebol	0.08	Sesquiterpenic alcohol
(3E,6E)- $\alpha$ -Farnesene	0.27	Sesquiterpene
<i>trans</i> -Calamenene	0.12	Sesquiterpene
$\delta$ -Cadinene	2.43	Sesquiterpene

β-Sesquiphellandrene	0.32	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.06	Sesquiterpene
( <i>E</i> )-γ-Bisabolene	0.07	Sesquiterpene
α-Cadinene	0.17	Sesquiterpene
α-Calacorene	0.09	Sesquiterpene
Selina-3,7(11)-diene	0.09	Sesquiterpene
( <i>E</i> )-α-Bisabolene	0.23	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Germacrene B	2.81	Sesquiterpene
Maaliol	0.10	Sesquiterpenic alcohol
β-Calacorene	0.16	Sesquiterpene
Caryophyllenyl alcohol	0.11	Sesquiterpenic alcohol
Spathulenol	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.09	Sesquiterpenic ether
Caryophyllene oxide isomer	0.05	Sesquiterpenic ether
10-epi-Junenol	0.01	Sesquiterpenic alcohol
Globulol	0.08	Sesquiterpenic alcohol
Viridiflorol	0.08	Sesquiterpenic alcohol
Ledol	0.15	Sesquiterpenic alcohol
Humulene epoxide I	0.03	Sesquiterpenic ether
Junenol	0.46	Sesquiterpenic alcohol
Unknown	0.08	Oxygenated sesquiterpene
Rosifoliol	0.03	Sesquiterpenic alcohol
1-epi-Cubenol	0.15	Sesquiterpenic alcohol
Caryophylladienol II	0.04	Sesquiterpenic alcohol
τ-Cadinol	0.21	Sesquiterpenic alcohol
τ-Muurolol	0.36	Sesquiterpenic alcohol
α-Muurolol	0.37	Sesquiterpenic alcohol
Unknown	0.17	Sesquiterpenic alcohol
α-Cadinol	0.48	Sesquiterpenic alcohol
Selin-11-en-4α-ol	0.02	Sesquiterpenic alcohol
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5β-ol	0.02	Sesquiterpenic alcohol
Cadalene	0.04	Sesquiterpene
Germacra-4(15),5,10(14)-trien-1α-ol	0.03	Sesquiterpenic alcohol
α-Bisabolol	0.02	Sesquiterpenic alcohol
Juniper camphor	0.22	Sesquiterpenic alcohol
Aromadendrane-4,10-diol	0.01	Sesquiterpenic alcohol
Methyl ( <i>E,E</i> )-farnesate?	0.01	Sesquiterpenic ester
Unknown	0.01	Oxygenated diterpene
Unknown	0.05	Diterpene
Unknown	0.01	Oxygenated diterpene
Unknown	0.04	Oxygenated diterpene
Palmitic acid	0.09	Aliphatic acid
Unknown	0.01	Oxygenated diterpene
<i>cis</i> -3,14-Clerodadien-13-ol	0.03	Diterpenic alcohol
Manool	0.20	Diterpenic alcohol
Kolavelool	0.11	Diterpenic alcohol
Linoleic acid	0.02	Aliphatic acid
Oleic acid	0.02	Aliphatic acid
3α-Hydroxymanool	0.01	Diterpenic alcohol
Copalol	0.54	Diterpenic alcohol
Kolavenol	0.30	Diterpenic alcohol

Methyl copalate?	0.16	Diterpenic ester
Copaifera diterpenic acid I	4.02	Diterpenic acid
Methyl kolavenate	0.20	Diterpenic ester
Copaifera diterpenic acid II	0.42	Diterpenic acid
Kolavenyl acetate?	0.07	Diterpenic ester
Methyl hardwickiiate?	0.13	Diterpenic ester
Copaifera diterpenic acid III	0.19	Diterpenic acid
Copaifera diterpenic acid IV	1.79	Diterpenic acid
Copaifera diterpenic acid V	0.47	Diterpenic acid
Copaifera diterpenic acid VI	1.67	Diterpenic acid
Copaifera diterpenic acid VII	0.20	Diterpenic acid
Copaifera diterpenic acid VIII	0.74	Diterpenic acid
<b>Consolidated total</b>	<b>96.43%</b>	

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

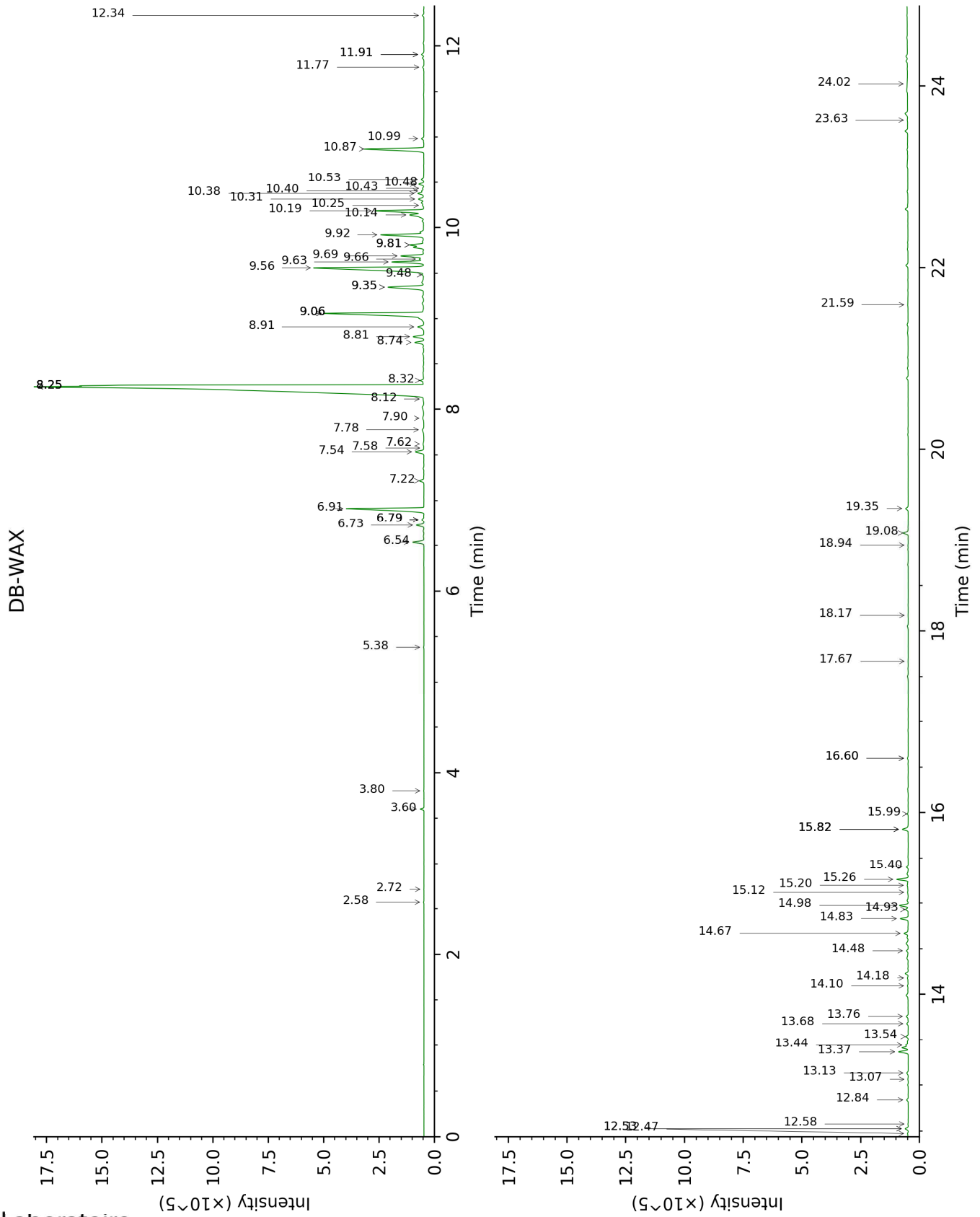
Note: no correction factor was applied

**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.

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







FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Myrcene	3.91	992	tr	2.72	1134	0.01
(2E,4E)-3,7-Dimethylocta-2,4-diene?	4.43	1025	0.01	2.58	1122	0.02
(Z)-β-Ocimene	4.65	1039	0.11	3.60	1205	0.14
(E)-β-Ocimene	4.81	1049	0.01	3.80	1220	0.02
allo-Ocimene	6.07	1129	0.01	5.38	1330	0.02
δ-Elemene	9.17	1334	0.35	6.73	1429	0.37
α-Cubebene	9.34	1346	0.51	6.54	1415	0.58
Cyclosativene I	9.51	1358	0.03	6.79*	1433	0.11
Cyclosativene II	9.54	1360	0.02	6.79*	1433	[0.11]
α-Ylangene	9.62	1366	0.08	6.79*	1433	[0.11]
α-Copaene	9.70	1371	3.94	6.91	1443	4.50
cis-β-Elemene	9.83*	1381	0.06	8.12	1534	0.05
7-epi-Sesquithujene?	9.83*	1381	[0.06]	7.58	1492	0.01
β-Cubebene	9.90	1386	0.43	7.54	1489	0.52
β-Elemene	9.94	1388	1.47	8.25*	1544	51.11
Cyperene	9.98	1391	0.22	7.22	1465	0.23
α-Cedrene	10.15	1403	0.07	7.78	1508	0.16
β-Caryophyllene	10.34*	1417	39.45	8.25*	1544	[51.11]
β-Ylangene	10.34*	1417	[39.45]	7.90	1517	0.13
β-Copaene	10.41	1423	0.29	8.25*	1544	[51.11]
γ-Elemene	10.51	1430	0.52	8.81	1588	0.57
trans-α-Bergamotene	10.57*	1434	4.28	8.25*	1544	[51.11]
β-Humulene	10.57*	1434	[4.28]	7.62	1496	0.07
Aromadendrene	10.57*	1434	[4.28]	8.32	1550	0.17
Sesquisabinene A	10.65	1441	0.29	8.91	1596	0.37
α-Humulene	10.74	1448	5.39	9.06*	1608	6.35
allo-Aromadendrene	10.82	1453	0.38	8.74	1583	0.47
cis-Muurolo-4(15),5-diene	10.86	1456	0.10	9.06*	1608	[6.35]
(E)-β-Farnesene	10.89	1458	0.24	9.35*	1631	2.23
trans-Cadina-1(6),4-diene	11.03	1469	0.32	9.06*	1608	[6.35]
Germacrene D	11.12*	1476	8.49	9.56	1648	8.09
γ-Muurolole	11.12*	1476	[8.49]	9.35*	1631	[2.23]
β-Selinene	11.17	1480	1.67	9.63	1654	1.44
Bicyclogermacrene	11.30*	1489	1.70	9.81*†	1669	1.12
epi-Cubebol	11.30*	1489	[1.70]	11.77	1835	0.06
α-Selinene	11.30*	1489	[1.70]	9.69	1659	1.13
Caparratriene	11.39*	1496	0.70	9.48	1642	0.07
α-Muurolole	11.39*	1496	[0.70]	9.81*†	1669	[1.12]
δ-Guaiene	11.46	1501	0.26	9.66	1656	0.18
β-Bisabolene	11.54*	1507	2.39	9.92	1678	2.21
γ-Cadinene	11.54*	1507	[2.39]	10.14	1696	0.92

Cubebol	11.54*	1507	[2.39]	12.34	1885	0.08
(3E,6E)- $\alpha$ -Farnesene	11.60	1512	0.27	10.32	1710	0.30
<i>trans</i> -Calamenene	11.70*	1520	2.65	10.99	1767	0.12
$\delta$ -Cadinene	11.70*	1520	[2.65]	10.19	1700	2.43
$\beta$ -Sesquiphellandrene	11.70*	1520	[2.65]	10.38	1716	0.32
<i>trans</i> -Cadina-1,4-diene	11.79*	1527	0.29	10.43	1720	0.06
(E)- $\gamma$ -Bisabolene	11.79*	1527	[0.29]	10.25	1704	0.07
$\alpha$ -Cadinene	11.85	1532	0.17	10.53	1729	0.13
$\alpha$ -Calacorene	11.88*	1534	0.18	11.91*	1848	0.12
Selina-3,7(11)-diene	11.88*	1534	[0.18]	10.40	1718	0.09
(E)- $\alpha$ -Bisabolene	11.97*	1541	0.25	10.48	1724	0.23
Isocaryophyllene epoxide B	11.97*	1541	[0.25]	11.91*	1848	[0.12]
Germacrene B	12.07	1549	2.81	10.87	1758	3.22
Maaliol	12.18	1557	0.10	12.84	1932	0.08
$\beta$ -Calacorene	12.22*	1560	0.27	12.53*	1903	0.14
Caryophyllenyl alcohol	12.22*	1560	[0.27]	13.44	1987	0.11
Spathulenol	12.32	1569	0.05	14.18	2058	0.04
Caryophyllene oxide	12.37*	1572	0.15	12.53*	1903	[0.14]
Caryophyllene oxide isomer	12.37*	1572	[0.15]	12.48	1898	0.05
10-epi-Junenol	12.37*	1572	[0.15]	12.58	1908	0.01
Globulol	12.40	1575	0.08	13.68	2010	0.06
Viridiflorol	12.50	1583	0.08	13.76	2018	0.08
Ledol	12.63	1593	0.15	13.14	1959	0.08
Humulene epoxide I	12.70	1598	0.03	13.07	1952	0.02
Junenol	12.81*	1607	0.60	13.37	1980	0.46
Unknown [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	12.81*	1607	[0.60]	14.48	2086	0.08
Rosifoliol	12.89	1614	0.03	14.10	2050	0.04
1-epi-Cubenol	12.97	1620	0.15	13.54	1996	0.11
Caryophylladienol II	13.04	1627	0.04	15.82*	2221	0.30
$\tau$ -Cadinol	13.15*	1635	0.58	14.67	2105	0.21
$\tau$ -Muurolol	13.15*	1635	[0.58]	14.83	2121	0.36
$\alpha$ -Muurolol	13.20	1640	0.37	14.98	2136	0.39
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.26	1645	0.17	14.93	2131	0.12
$\alpha$ -Cadinol	13.29	1647	0.48	15.26	2164	0.51
Selin-11-en-4 $\alpha$ -ol	13.34	1651	0.02	15.40	2178	0.10
(3Z)-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	13.50*†	1665	0.14	16.60*	2302	0.04

Cadalene	13.50*†	1665	[0.14]	15.12	2150	0.04
Germacre-4(15),5,10(14)-trien-1 $\alpha$ -ol	13.68	1679	0.03	15.82*	2221	[0.30]
$\alpha$ -Bisabolol	13.71	1682	0.02	15.20	2158	0.08
Juniper camphor	13.75	1685	0.22	15.82*	2221	[0.30]
Aromadendrane-4,10-diol	14.05	1710	0.01	16.60*	2302	[0.04]
Methyl ( <i>E,E</i> )-farnesate?	14.53	1752	0.01			
Unknown [m/z 43, 95 (66), 81 (63), 137 (61), 41 (53), 107 (47)... 262 (6)...]	16.38	1918	0.01	17.67	2418	0.01
Unknown [m/z 95, 105 (79), 107 (75), 189 (68), 41 (64), 81 (61)... 257 (12), 272 (2)]	16.58	1937	0.05	15.99	2238	0.03
Unknown [m/z 43, 95 (98), 107 (84), 93 (55), 121 (53)... 262 (7)...]	16.72	1951	0.01	18.17	2473	0.01
Unknown [m/z 95, 107 (61), 191 (46), 121 (45)...]	16.86	1964	0.04			
Palmitic acid	16.92	1969	0.09	21.59	2884	0.03
Unknown [m/z 95, 107 (27), 81 (19), 191 (17), 55 (16)... 275 (1)...]	16.98	1976	0.01			
<i>cis</i> -3,14-Clerodadien-13-ol	17.50	2026	0.03	18.94	2561	0.02
Manool	17.66	2041	0.20	19.08	2577	0.24
Kolavelool	17.79	2055	0.11	19.35	2609	0.13
Linoleic acid	18.57	2133	0.02	24.02	3210	0.03
Oleic acid	18.63	2139	0.02	23.63	3155	0.02
3 $\alpha$ -Hydroxymanool	19.76	2258	0.01			
Copalol	19.82	2264	0.54			
Kolavenol	19.90	2274	0.30			
Methyl copalate?	20.14	2299	0.16			
Copaifera diterpenic acid I	20.44	2333	4.02			
Methyl kolavenate	20.49	2339	0.20			
Copaifera diterpenic acid II	20.75	2368	0.42			
Kolavenyl acetate?	20.92	2387	0.07			
Methyl hardwickiate?	21.14	2411	0.13			
Copaifera diterpenic acid III	21.52	2456	0.19			
Copaifera	21.72	2479	1.79			

diterpenic acid IV Copaifera	22.55	2577	0.47	
diterpenic acid V Copaifera	23.46	2690	1.67	
diterpenic acid VI Copaifera	23.59	2706	0.20	
diterpenic acid VII Copaifera	24.30	2798	0.74	
diterpenic acid VIII Copaifera				
<b>Total identified</b>		<b>95.42%</b>		<b>94.37%</b>
<b>Total reported</b>		<b>95.71%</b>		<b>94.63%</b>

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

[xx]: Duplicate percentage due to coelutions, not 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