

**Date :** March 07, 2018

**CERTIFICATE OF ANALYSIS - GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 18B20-PLG28-1-CC

**Customer identification :** Copaiba

**Type :** Resin

**Source :** *Copaifera officinalis*

**Customer :** Plant Guru

*ANALYSIS*

**Method:** PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** March 01, 2018

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Light yellow viscous liquid

**Refractive index:**  $1.5045 \pm 0.0003$  (20 °C)

*CONCLUSION*

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Myrcene	tr	tr	Monoterpene
Limonene	0.01*	tr	Monoterpene
(2E,4E)-3,7-Dimethylocta-2,4-diene?	[0.01]*	0.01	Monoterpene
(Z)-β-Ocimene	0.09	0.10	Monoterpene
(E)-β-Ocimene	tr	0.01	Monoterpene
allo-Ocimene	0.01	0.02	Monoterpene
δ-Elemene isomer	0.01	0.02	Sesquiterpene
δ-Elemene	0.50	0.53	Sesquiterpene
α-Cubebene	0.50	0.53	Sesquiterpene
Cyclosativene I	0.02	0.01	Sesquiterpene
Cyclosativene II	0.01	0.02	Sesquiterpene
α-Ylangene	0.06	0.08	Sesquiterpene
α-Copaene	3.45	3.68	Sesquiterpene
cis-β-Elemene	0.03	0.13*	Sesquiterpene
7-epi-Sesquithujene?	0.37	0.42*	Sesquiterpene
β-Cubebene	1.04*	[0.42]*	Sesquiterpene
β-Elemene	[1.04]*	47.79*	Sesquiterpene
Cyperene	0.17	0.20	Sesquiterpene
α-Gurjunene	0.04	0.03	Sesquiterpene
β-Caryophyllene	40.79*	[47.79]*	Sesquiterpene
β-Ylangene	[40.79]*	0.07	Sesquiterpene
β-Copaene	[40.79]	[0.13]*	Sesquiterpene
γ-Elemene	0.32	0.34	Sesquiterpene
trans-α-Bergamotene	3.52*	[47.79]*	Sesquiterpene
Aromadendrene	[3.52]*	0.11	Sesquiterpene
β-Humulene	[3.52]*	0.07	Sesquiterpene
Sesquisabinene A	0.23	0.22	Sesquiterpene
α-Humulene	5.52	5.94*	Sesquiterpene
allo-Aromadendrene	0.34	0.32	Sesquiterpene
cis-Muurolo-4(15),5-diene	0.25*	[5.94]*	Sesquiterpene
(E)-β-Farnesene	[0.25]*	0.19	Sesquiterpene
trans-Cadina-1(6),4-diene	0.19	[5.94]*	Sesquiterpene
γ-Muurolole	1.57	1.74*	Sesquiterpene
Germacrene D	5.25	5.77*	Sesquiterpene
β-Selinene	0.81*	0.53	Sesquiterpene
ar-Curcumene	[0.81]*	0.15	Sesquiterpene
trans-Muurolo-4(15),5-diene	0.11*	[5.77]*	Sesquiterpene
γ-Amorphene	[0.11]*	0.03	Sesquiterpene
epi-Cubebol	0.98*	0.05	Sesquiterpenic alcohol
Viridiflorene	[0.98]*	[1.74]*	Sesquiterpene
α-Selinene	[0.98]*	0.45	Sesquiterpene
Bicyclogermacrene	[0.98]*	0.53	Sesquiterpene
Caparratriene	0.10	0.12	Sesquiterpene
α-Muurolole	0.45	0.42	Sesquiterpene
β-Bisabolene	2.24	1.80	Sesquiterpene
γ-Cadinene	[2.24]	0.65*	Sesquiterpene
β-Curcumene	0.22*	0.13	Sesquiterpene
(3E,6E)-α-Farnesene	[0.22]*	0.07	Sesquiterpene

Cubebol	[0.22]*	0.05	Sesquiterpenic alcohol
$\delta$ -Cadinene	2.42*	2.21*	Sesquiterpene
<i>trans</i> -Calamenene	[2.42]*	0.07	Sesquiterpene
Zonarene	[2.42]*	[2.21]*	Sesquiterpene
$\beta$ -Sesquiphellandrene	[2.42]*	0.14	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.22	0.23	Sesquiterpene
$\alpha$ -Cadinene	0.17	0.16	Sesquiterpene
( <i>E</i> )- $\gamma$ -Bisabolene	0.06	[0.65]*	Sesquiterpene
$\alpha$ -Calacorene	0.09	0.09	Sesquiterpene
( <i>E</i> )- $\alpha$ -Bisabolene	0.23	0.20	Sesquiterpene
Germacrene B	1.63	1.75	Sesquiterpene
Maaliol	0.05	0.06	Sesquiterpenic alcohol
$\beta$ -Calacorene	0.06	0.07	Sesquiterpene
Caryophyllenyl alcohol	0.29	0.67*	Sesquiterpenic alcohol
Spathulenol	0.05	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.20	0.19	Sesquiterpenic ether
Globulol	0.07	0.06	Sesquiterpenic alcohol
Viridiflorol	0.07	0.07	Sesquiterpenic alcohol
Ledol	0.11	0.08	Sesquiterpenic alcohol
Junenol	0.53	[0.67]*	Sesquiterpenic alcohol
Rosifoliol	0.03	0.03	Sesquiterpenic alcohol
1- <i>epi</i> -Cubenol	0.10	0.09	Sesquiterpenic alcohol
Unknown	0.06	0.11	Oxygenated sesquiterpene
Caryophylladienol II	0.02	0.18*	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.51*	0.15	Sesquiterpenic alcohol
$\tau$ -Muurolol	[0.51]*	0.32	Sesquiterpenic alcohol
$\alpha$ -Muurolol	0.38	0.35	Sesquiterpenic alcohol
Unknown	0.07	0.08	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.48	0.64	Sesquiterpenic alcohol
Selin-11-en-4 $\alpha$ -ol	[0.48]	0.26	Sesquiterpenic alcohol
Cadalene	0.13*	0.06	Sesquiterpene
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	[0.13]*	0.04	Sesquiterpenic alcohol
$\alpha$ -Bisabolol	0.02	0.03	Sesquiterpenic alcohol
Juniper camphor	0.16	0.20	Sesquiterpenic alcohol
Methyl ( <i>E,E</i> )-farnesate?	0.01		Sesquiterpenic ester
Unknown	0.05	0.03	Oxygenated diterpene
Unknown	0.08	0.12	Diterpene
Unknown	0.12	0.09	Oxygenated diterpene
Palmitic acid	0.31		Aliphatic acid
Unknown	0.20	[0.18]*	Oxygenated diterpene
<i>cis</i> -3,14-Clerodadien-13-ol	0.08	0.08	Diterpenic alcohol
Manool	0.15	0.17	Diterpenic alcohol
Kolavelool	0.40	0.43	Diterpenic alcohol
Linoleic acid	0.32	0.60	Aliphatic acid
Oleic acid	0.25	0.38	Aliphatic acid
3 $\alpha$ -Hydroxymanool	0.47		Diterpenic alcohol
Copalol	0.59		Diterpenic alcohol
Kolavenol	0.53		Diterpenic alcohol
Methyl copalate?	0.05		Diterpenic ester
Copaifera diterpenic acid I	5.14	4.70	Diterpenic acid
Copaifera diterpenic acid II	1.25		Diterpenic acid
Kolavenyl acetate?	0.20		Diterpenic ester

Methyl hardwickiiate?	0.06		Diterpenic ester
Copaifera diterpenic acid III	0.22		Diterpenic acid
Copaifera diterpenic acid IV	2.46		Diterpenic acid
Copaifera diterpenic acid V	0.74		Diterpenic acid
Copaifera diterpenic acid VI	2.19		Diterpenic acid
Copaifera diterpenic acid VII	0.77		Diterpenic acid
Copaifera diterpenic acid VIII	0.35		Diterpenic acid
<b>Total identified</b>	<b>93.83%</b>	<b>88.12%</b>	

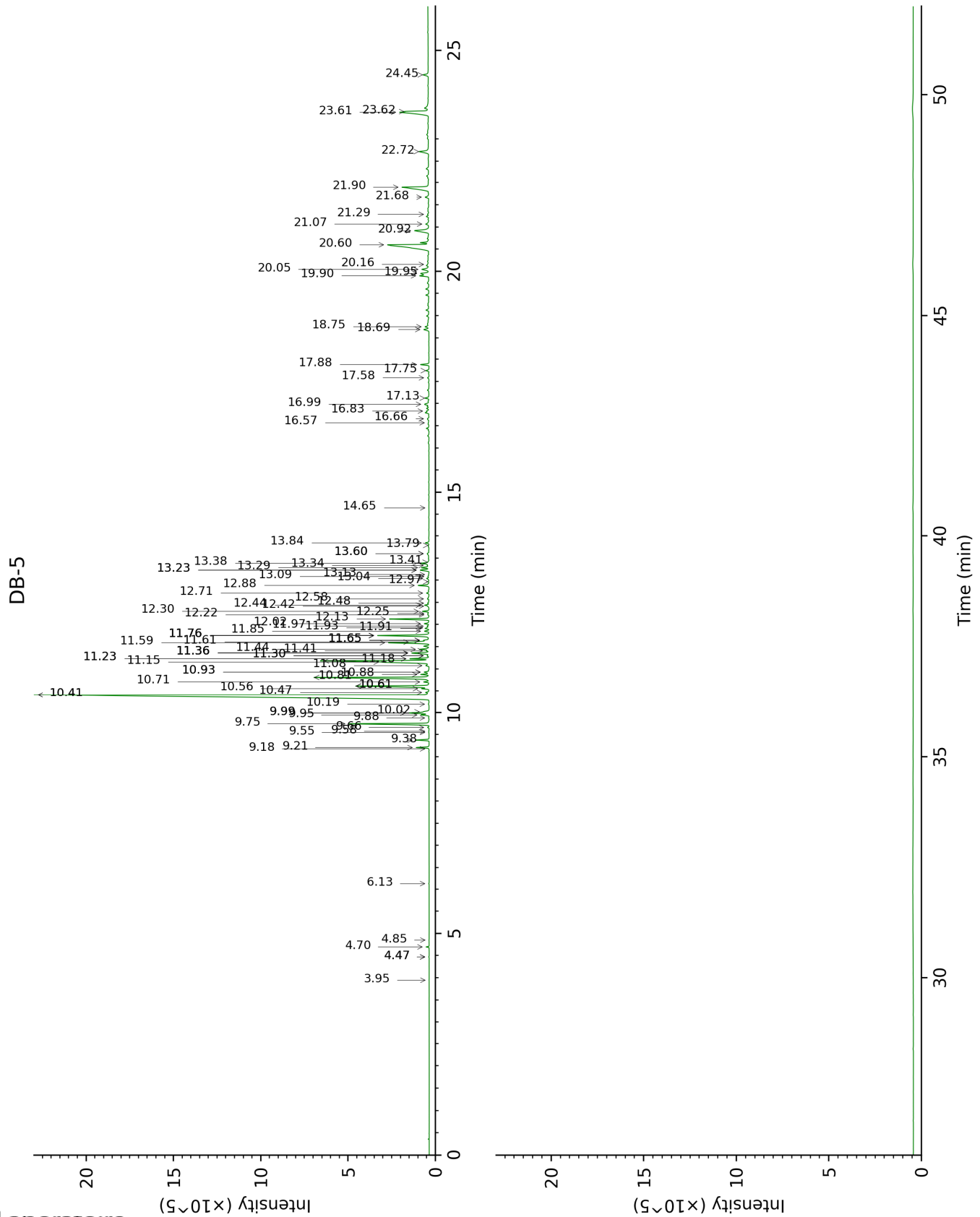
\*: Two or more compounds are coeluting on this column

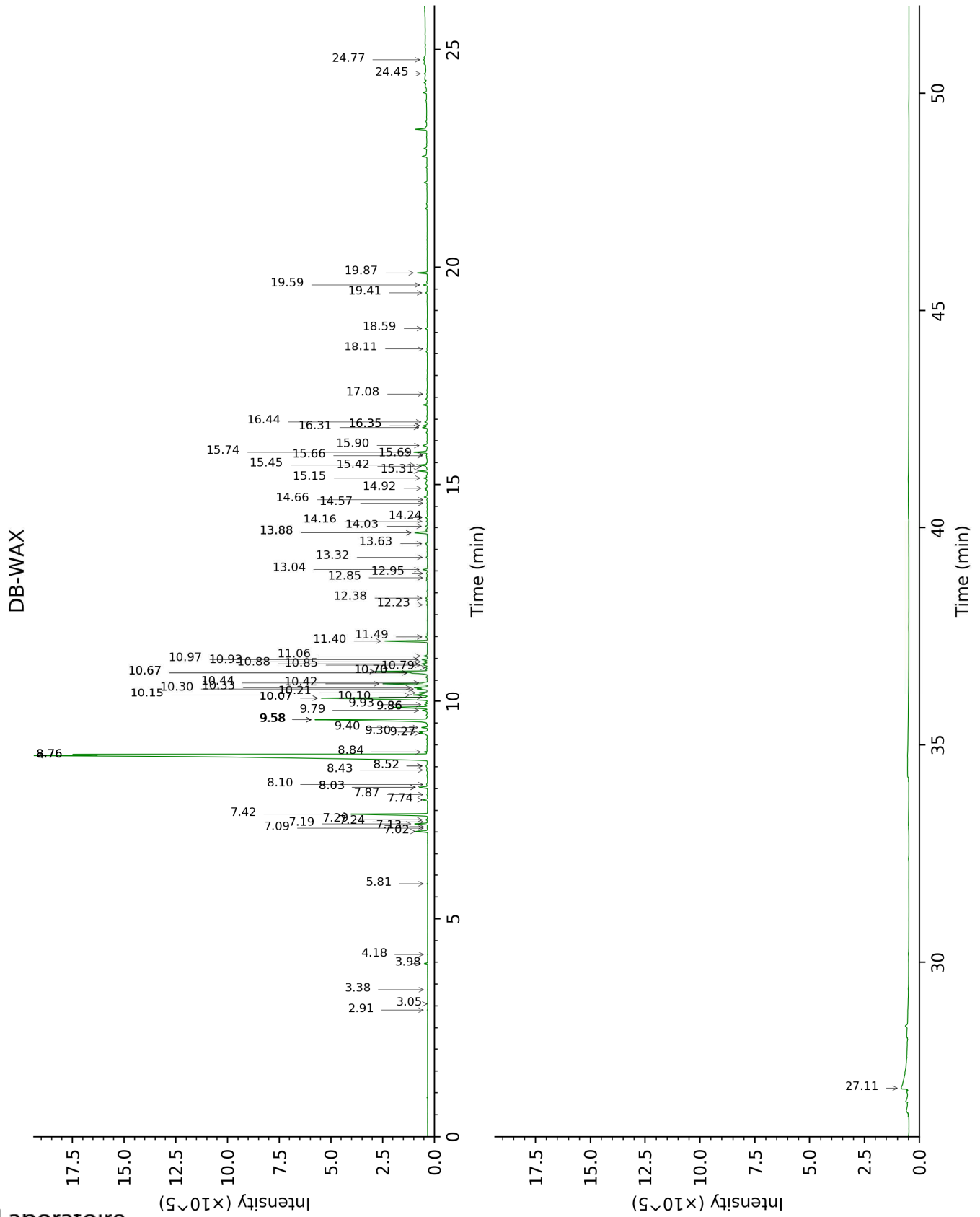
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Myrcene	3.95	987	tr	3.05	1134	tr
Limonene	4.47*	1021	0.01	3.38	1159	tr
(2E,4E)-3,7-Dimethylocta-2,4-diene?	4.47*	1021	[0.01]	2.91	1124	0.01
(Z)- $\beta$ -Ocimene	4.70	1035	0.09	3.98	1204	0.10
(E)- $\beta$ -Ocimene	4.85	1045	tr	4.18	1219	0.01
allo-Ocimene	6.13	1125	0.01	5.81	1334	0.02
$\delta$ -Elemene isomer	9.18	1327	0.01	7.10	1427	0.02
$\delta$ -Elemene	9.21	1329	0.50	7.19	1434	0.53
$\alpha$ -Cubebene	9.38	1341	0.50	7.02	1421	0.53
Cyclosativene I	9.55	1353	0.02	7.13	1429	0.01
Cyclosativene II	9.58	1355	0.01	7.24	1438	0.02
$\alpha$ -Ylangene	9.66	1361	0.06	7.29	1441	0.08
$\alpha$ -Copaene	9.75	1367	3.45	7.42	1450	3.68
<i>cis</i> - $\beta$ -Elemene	9.88	1376	0.03	8.52*	1534	0.13
7-epi-Sesquithujene?	9.95	1381	0.37	8.03*	1496	0.42
$\beta$ -Cubebene	9.99*	1384	1.04	8.03*	1496	[0.42]
$\beta$ -Elemene	9.99*	1384	[1.04]	8.76*†	1552	47.79
Cyperene	10.02	1386	0.17	7.74	1474	0.20
$\alpha$ -Gurjunene	10.19	1398	0.04	7.86	1484	0.03
$\beta$ -Caryophyllene	10.41*†	1414	40.79	8.76*†	1552	[47.79]
$\beta$ -Ylangene	10.41*†	1414	[40.79]	8.43	1526	0.07
$\beta$ -Copaene	10.47†	1419	[40.79]	8.52*	1534	[0.13]
$\gamma$ -Elemene	10.56	1425	0.32	9.30	1594	0.34
<i>trans</i> - $\alpha$ -Bergamotene	10.61*	1429	3.52	8.76*†	1552	[47.79]
Aromadendrene	10.61*	1429	[3.52]	8.84	1558	0.11
$\beta$ -Humulene	10.61*	1429	[3.52]	8.10	1501	0.07
Sesquisabinene A	10.71	1436	0.23	9.40	1602	0.22
$\alpha$ -Humulene	10.81	1444	5.52	9.58*	1616	5.94
allo-Aromadendrene	10.88	1449	0.34	9.27	1591	0.32
<i>cis</i> -Muurolo-4(15),5-diene	10.93*	1453	0.25	9.58*	1616	[5.94]
(E)- $\beta$ -Farnesene	10.93*	1453	[0.25]	9.79	1633	0.19
<i>trans</i> -Cadina-1(6),4-diene	11.08	1464	0.19	9.58*	1616	[5.94]
$\gamma$ -Muurolole	11.16	1470	1.57	9.86*	1639	1.74
Germacrene D	11.18	1472	5.25	10.08*	1656	5.77
$\beta$ -Selinene	11.23*	1475	0.81	10.15	1662	0.53
ar-Curcumene	11.23*	1475	[0.81]	10.93	1726	0.15
<i>trans</i> -Muurolo-4(15),5-diene	11.30*	1480	0.11	10.08*	1656	[5.77]
$\gamma$ -Amorphene	11.30*	1480	[0.11]	10.10	1658	0.03
epi-Cubebol	11.36*	1485	0.98	12.23	1838	0.05
Viridiflorene	11.36*	1485	[0.98]	9.86*	1639	[1.74]

α-Selinene	11.36*	1485	[0.98]	10.21	1667	0.45
Bicyclogermacrene	11.36*	1485	[0.98]	10.33	1677	0.53
Caparratriene	11.41	1489	0.10	9.93	1644	0.12
α-Muurolene	11.44	1491	0.45	10.30	1674	0.42
β-Bisabolene	11.59†	1502	2.24	10.42	1684	1.80
γ-Cadinene	11.61†	1503	[2.24]	10.67*	1705	0.65
β-Curcumene	11.65*	1506	0.22	10.44	1685	0.13
(3E,6E)-α-Farnesene	11.65*	1506	[0.22]	10.79	1715	0.07
Cubebol	11.65*	1506	[0.22]	12.85	1893	0.05
δ-Cadinene	11.76*	1515	2.42	10.70*	1707	2.21
trans-Calamenene	11.76*	1515	[2.42]	11.50	1774	0.07
Zonarene	11.76*	1515	[2.42]	10.70*	1707	[2.21]
β-Sesquiphellandrene	11.76*	1515	[2.42]	10.85	1720	0.14
trans-Cadina-1,4-diene	11.85	1523	0.22	10.88	1722	0.23
α-Cadinene	11.92	1527	0.17	11.06	1737	0.16
(E)-γ-Bisabolene	11.93	1529	0.06	10.67*	1705	[0.65]
α-Calacorene	11.97	1532	0.09	12.38	1852	0.09
(E)-α-Bisabolene	12.02	1536	0.23	10.98	1730	0.20
Germacrene B	12.13	1544	1.63	11.40	1766	1.75
Maaliol	12.22	1552	0.05	13.32	1936	0.06
β-Calacorene	12.25	1554	0.06	12.95	1902	0.07
Caryophyllenyl alcohol	12.30	1558	0.29	13.88*	1987	0.67
Spathulenol	12.42	1567	0.05	14.66	2062	0.03
Caryophyllene oxide	12.44	1568	0.20	13.04	1910	0.19
Globulol	12.48	1572	0.07	14.16	2014	0.06
Viridiflorol	12.58	1580	0.07	14.24	2022	0.07
Ledol	12.71	1590	0.11	13.63	1964	0.08
Junenol	12.88	1604	0.53	13.88*	1987	[0.67]
Rosifoliol	12.97	1610	0.03	14.58	2054	0.03
1-epi-Cubenol	13.04	1616	0.10	14.03	2002	0.09
Unknown [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	13.09	1620	0.06	14.92	2087	0.11
Caryophylladienol II	13.13	1624	0.02	16.35*	2231	0.18
τ-Cadinol	13.23*	1632	0.51	15.15	2110	0.15
τ-Muurolol	13.23*	1632	[0.51]	15.31	2126	0.32
α-Muurolol	13.28	1636	0.38	15.45	2140	0.35
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.34	1641	0.07	15.42	2136	0.08
α-Cadinol	13.38†	1644	0.48	15.74	2169	0.64
Selin-11-en-4α-ol	13.41†	1647	[0.48]	15.90	2184	0.26
Cadalene	13.60*	1662	0.13	15.66	2161	0.06
(3Z)-Caryophylla-	13.60*	1662	[0.13]	17.08	2307	0.04

3,8(13)-dien-5 $\beta$ -ol						
$\alpha$ -Bisabolol	13.79	1678	0.02	15.69	2163	0.03
Juniper camphor	13.84	1682	0.16	16.31	2227	0.20
Methyl ( <i>E,E</i> )-farnesate?	14.65	1751	0.01			
Unknown [m/z 43, 95 (66), 81 (63), 137 (61), 41 (53), 107 (47)... 262 (6)...]	16.57	1924	0.05	18.12	2420	0.03
Unknown [m/z 95, 105 (79), 107 (75), 189 (68), 41 (64), 81 (61)... 257 (12), 272 (2)]	16.66	1932	0.08	16.44	2240	0.12
Unknown [m/z 43, 95 (98), 107 (84), 93 (55), 121 (53)... 262 (7)...]	16.83	1949	0.12	18.59	2473	0.09
Palmitic acid	16.99	1963	0.31			
Unknown [m/z 95, 107 (27), 81 (19), 191 (17), 55 (16)... 275 (1)...]	17.13	1977	0.20	16.35*	2231	[0.18]
<i>cis</i> -3,14-Clerodadien-13-ol	17.58	2021	0.08	19.41	2568	0.08
Manool	17.75	2037	0.15	19.60	2589	0.17
Kolavelool	17.88	2050	0.40	19.87	2622	0.43
Linoleic acid	18.69	2132	0.32	24.77	3266	0.60
Oleic acid	18.75	2138	0.25	24.45	3220	0.38
3 $\alpha$ -Hydroxymanool	19.90	2259	0.47			
Copalol	19.96	2265	0.59			
Kolavenol	20.05	2274	0.53			
Methyl copalate?	20.16	2286	0.05			
Copaifera diterpenic acid I	20.60	2335	5.14	27.11	3594	4.70
Copaifera diterpenic acid II	20.92	2371	1.25			
Kolavenyl acetate?	21.07	2388	0.20			
Methyl hardwickiate?	21.29	2412	0.06			
Copaifera diterpenic acid III	21.68	2458	0.22			
Copaifera diterpenic acid IV	21.90	2484	2.46			
Copaifera diterpenic acid V	22.72	2582	0.74			
Copaifera diterpenic acid VI	23.61	2691	2.19			
Copaifera diterpenic acid VII	23.62	2693	0.77			
Copaifera diterpenic acid VIII	24.45	2800	0.35			

<b>Total identified</b>	<b>93.83%</b>	<b>88.12%</b>
<b>Total reported</b>	<b>94.40%</b>	<b>88.56%</b>

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

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