

Date : October 18, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19E28-PTH04-1-SCC

Customer identification : Copaiba Balsam Org - Brazil - CB710386R

Type : Essential oil

Source : *Copaifera officinalis*

Customer : Plant Therapy

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 : May 28, 2019

Checked and approved by :

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

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This report is an update of a version first issued on May 29, 2019, to correct a typographical mistake.

PHYSICOCHEMICAL DATA

Physical aspect: Orange liquid

Refractive index: 1.5060 ± 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
(2E,4E)-3,7-Dimethylocta-2,4-diene?	0.02	0.01	Monoterpene
(Z)- β -Ocimene	0.10	0.10	Monoterpene
(E)- β -Ocimene	0.01	0.01	Monoterpene
allo-Ocimene	0.02	0.02	Monoterpene
δ -Elemene isomer	0.02	0.02	Sesquiterpene
δ -Elemene	0.24	0.21	Sesquiterpene
α -Cubebene	0.56	0.56	Sesquiterpene
Cyclosativene I	0.02	0.01	Sesquiterpene
Cyclosativene II	0.02	0.02	Sesquiterpene
α -Ylangene	0.07	0.08	Sesquiterpene
α -Copaene	4.05	4.21	Sesquiterpene
<i>cis</i> - β -Elemene	0.03	0.12	Sesquiterpene
7-epi-Sesquithujene	0.05	0.07	Sesquiterpene
β -Cubebene	0.37	0.40	Sesquiterpene
β -Elemene	0.97	46.14*	Sesquiterpene
Cyperene	0.23	0.20	Sesquiterpene
α -Gurjunene	0.03	0.04	Sesquiterpene
Sesquithujene	0.07	0.08	Sesquiterpene
β -Caryophyllene	39.06*	[46.14]*	Sesquiterpene
β -Copaene	[39.06]*	0.02	Sesquiterpene
β -Ylangene	[39.06]*	0.07	Sesquiterpene
γ -Elemene	0.28	0.26	Sesquiterpene
<i>trans</i> - α -Bergamotene	3.94*	[46.14]*	Sesquiterpene
Aromadendrene	[3.94]*	0.16	Sesquiterpene
Sesquisabinene A	0.29	0.27	Sesquiterpene
α -Humulene	5.34	5.71*	Sesquiterpene
allo-Aromadendrene	0.40	0.44	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.28*	[5.71]*	Sesquiterpene
(E)- β -Farnesene	[0.28]*	0.22*	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.24*	0.05	Sesquiterpene
γ -Muurolole	[0.24]*	[0.22]*	Sesquiterpene
Germacrene D	6.84	5.92	Sesquiterpene
β -Selinene	1.54*	1.37	Sesquiterpene
α -Curcumene	[1.54]*	[0.30]*	Sesquiterpene
δ -Selinene	0.11	0.13	Sesquiterpene
α -Selinene	1.50*	1.00	Sesquiterpene
Viridiflorene	[1.50]*	1.65	Sesquiterpene
Bicyclogermacrene	[1.50]*	0.52	Sesquiterpene
epi-Cubebol	[1.50]*	0.06	Sesquiterpenic alcohol
Caparratriene	0.09	0.08	Sesquiterpene
α -Muurolole	0.45	0.38	Sesquiterpene
δ -Guaiene	0.22	[1.37]	Sesquiterpene
β -Bisabolene	1.95*	1.51	Sesquiterpene
γ -Cadinene	[1.95]*	[0.63]*	Sesquiterpene
Cubebol	[1.95]*	0.06	Sesquiterpenic alcohol
β -Curcumene	[1.95]*	0.07	Sesquiterpene
(3E,6E)- α -Farnesene	[1.95]*	0.07	Sesquiterpene

δ-Cadinene	2.53*	2.22	Sesquiterpene
<i>trans</i> -Calamenene	[2.53]*	0.02	Sesquiterpene
Zonarene	[2.53]*	[0.63]*	Sesquiterpene
β-Sesquiphellandrene	[2.53]*	[0.30]*	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.22*	0.15	Sesquiterpene
(<i>E</i>)-γ-Bisabolene	[0.22]*	0.63	Sesquiterpene
α-Cadinene	0.15	0.16*	Sesquiterpene
α-Calacorene	0.12*	0.14	Sesquiterpene
Selina-3,7(11)-diene	[0.12]*	0.30	Sesquiterpene
(<i>E</i>)-α-Bisabolene	0.21*	[0.16]*	Sesquiterpene
Isocaryophyllene epoxide B	[0.21]*	0.08	Sesquiterpenic ether
Germacrene B	1.07	1.12	Sesquiterpene
Maaliol	0.15	0.13	Sesquiterpenic alcohol
β-Calacorene	0.36*	0.02	Sesquiterpene
Caryophyllenyl alcohol	[0.36]*	0.65*	Sesquiterpenic alcohol
Spathulenol	0.15*	0.03	Sesquiterpenic alcohol
Germacrene D-4-ol	[0.15]*	0.10	Sesquiterpenic alcohol
Caryophyllene oxide	0.23*	0.12	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.23]*	0.04	Sesquiterpenic ether
10-epi-Junenol	[0.23]*	0.01	Sesquiterpenic alcohol
Globulol	[0.23]*	0.06	Sesquiterpenic alcohol
Ledol	0.19	0.11	Sesquiterpenic alcohol
Unknown	0.61*	0.09	Oxygenated sesquiterpene
Junenol	[0.61]*	[0.65]*	Sesquiterpenic alcohol
Rosifoliol	0.04	0.04	Sesquiterpenic alcohol
1-epi-Cubenol	0.12	0.12	Sesquiterpenic alcohol
Caryophylladienol II	0.07	0.30*	Sesquiterpenic alcohol
Isospathulenol	0.03	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.56*	0.29	Sesquiterpenic alcohol
τ-Muurolol	[0.56]*	0.30	Sesquiterpenic alcohol
α-Muurolol	0.35*	0.32	Sesquiterpenic alcohol
Unknown	[0.35]*	0.05	Oxygenated sesquiterpene
Unknown	0.15*	0.07	Sesquiterpenic alcohol
Selin-11-en-4α-ol	[0.15]*	0.10	Sesquiterpenic alcohol
α-Cadinol	0.44	0.42	Sesquiterpenic alcohol
<i>cis</i> -Calamenen-10-ol	0.02	0.20	Sesquiterpenic alcohol
<i>trans</i> -Calamenen-10-ol	0.03	0.25*	Sesquiterpenic alcohol
(3 <i>Z</i>)-Caryophylla-3,8(13)-dien-5β-ol	0.16*	[0.25]*	Sesquiterpenic alcohol
Cadalene	[0.16]*	0.16	Sesquiterpene
Germacra-4(15),5,10(14)-trien-1α-ol	0.03	[0.30]*	Sesquiterpenic alcohol
α-Bisabolol	0.03	0.03	Sesquiterpenic alcohol
Juniper camphor	0.17	[0.30]*	Sesquiterpenic alcohol
Aromadendrane-4,10-diol	0.01	[0.25]*	Sesquiterpenic alcohol
Methyl (<i>E,E</i>)-farnesate?	0.07		Sesquiterpenic ester
Unknown	0.02	0.05	Oxygenated diterpene
Unknown	0.05	[0.30]*	Diterpene
Unknown	0.02	0.02	Oxygenated diterpene
Unknown	0.02	0.01	Oxygenated diterpene
Palmitic acid	0.30	0.20	Aliphatic acid
Unknown	0.14	[0.30]*	Oxygenated diterpene
<i>cis</i> -3,14-Clerodadien-13-ol	0.22	0.29	Diterpenic alcohol
Manool	0.29	0.20	Diterpenic alcohol

Kolavelool	0.05	0.05	Diterpenic alcohol
Linoleic acid	0.05		Aliphatic acid
Oleic acid	0.04		Aliphatic acid
Stearic acid	0.48	0.29	Aliphatic acid
3 α -Hydroxymanool	0.54		Diterpenic alcohol
Copalol	0.35		Diterpenic alcohol
Kolavenol	0.15		Diterpenic alcohol
Methyl copalate?	0.26		Diterpenic ester
Copaifera diterpenic acid I	3.85	2.94	Diterpenic acid
Methyl kolavenate	1.60		Diterpenic ester
Copaifera diterpenic acid II	0.30	3.05	Diterpenic acid
Kolavenyl acetate?	0.10		Diterpenic ester
Methyl hardwickiiate?	0.15		Diterpenic ester
Copaifera diterpenic acid III	0.19		Diterpenic acid
Copaifera diterpenic acid IV	1.60	1.03	Diterpenic acid
Copaifera diterpenic acid V	0.44		Diterpenic acid
Copaifera diterpenic acid VI	1.77		Diterpenic acid
Copaifera diterpenic acid VII	0.19		Diterpenic acid
Copaifera diterpenic acid VIII	0.74		Diterpenic acid
Humulene epoxide I		1.48	Sesquiterpenic ether
Viridiflorol		0.07	Sesquiterpenic alcohol
Total identified	91.32%	90.57%	

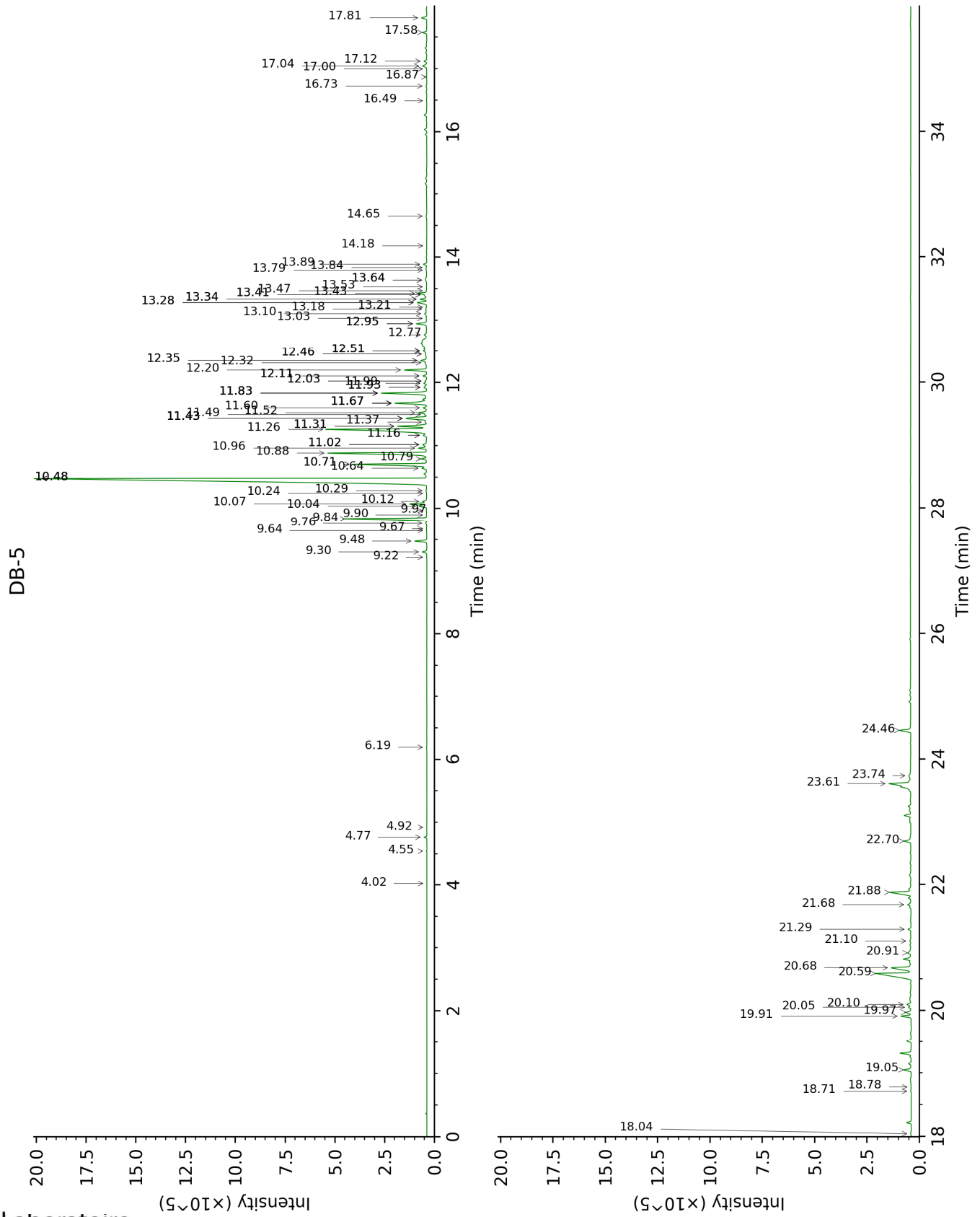
*: Two or more compounds are coeluting on this column

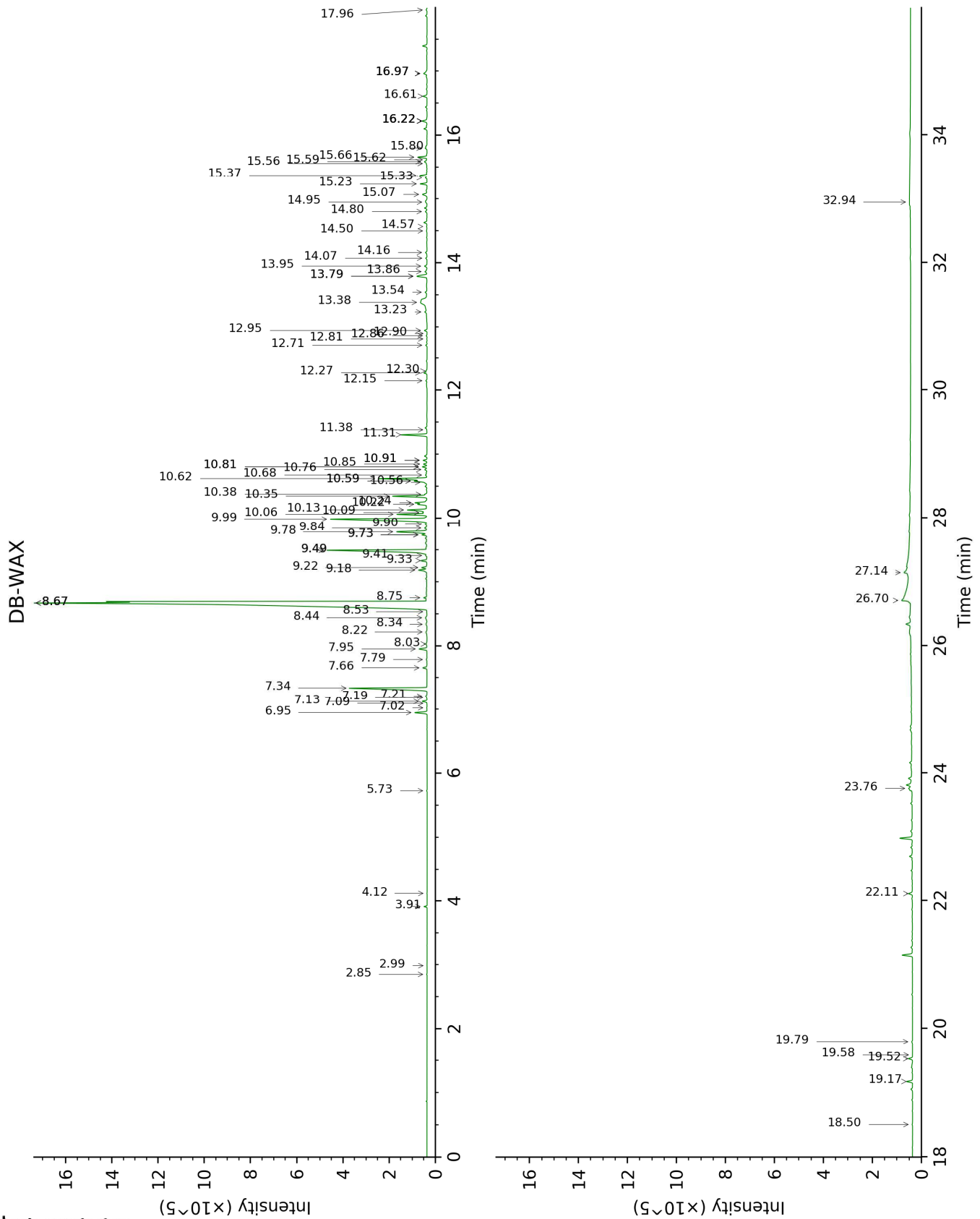
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	4.02	992	tr	2.99	1135	tr
(2E,4E)-3,7-Dimethylocta-2,4-diene?	4.55	1025	0.02	2.85	1124	0.01
(Z)- β -Ocimene	4.77	1039	0.10	3.91	1206	0.10
(E)- β -Ocimene	4.92	1049	0.01	4.12	1221	0.01
allo-Ocimene	6.19	1130	0.02	5.73	1333	0.02
δ -Elemene isomer	9.22	1330	0.02	7.02	1427	0.02
δ -Elemene	9.30	1336	0.24	7.13	1435	0.21
α -Cubebene	9.48	1348	0.56	6.95	1422	0.56
Cyclosativene I	9.64	1360	0.02	7.10	1433	0.01
Cyclosativene II	9.67	1363	0.02	7.19	1440	0.02
α -Ylangene	9.76	1369	0.07	7.21	1441	0.08
α -Copaene	9.84	1374	4.05	7.34	1451	4.21
<i>cis</i> - β -Elemene	9.90	1378	0.03	8.44	1534	0.12
7-epi-Sesquithujene	9.97	1383	0.05	8.03	1502	0.07
β -Cubebene	10.04	1388	0.37	7.95	1496	0.40
β -Elemene	10.08	1391	0.97	8.67*	1552	46.14
Cyperene	10.12	1394	0.23	7.66	1474	0.20
α -Gurjunene	10.24	1403	0.03	7.79	1484	0.04
Sesquithujene	10.29	1406	0.07	8.22	1517	0.08
β -Caryophyllene	10.48*	1420	39.06	8.67*	1552	[46.14]
β -Copaene	10.48*	1420	[39.06]	8.53	1542	0.02
β -Ylangene	10.48*	1420	[39.06]	8.34	1526	0.07
γ -Elemene	10.64	1433	0.28	9.22	1595	0.26
<i>trans</i> - α -Bergamotene	10.70*	1437	3.94	8.67*	1552	[46.14]
Aromadendrene	10.70*	1437	[3.94]	8.75	1558	0.16
Sesquisabinene A	10.79	1444	0.29	9.33	1604	0.27
α -Humulene	10.88	1451	5.34	9.49*	1617	5.71
allo-Aromadendrene	10.96	1456	0.40	9.18	1592	0.44
<i>cis</i> -Muurolo-4(15),5-diene	11.02*	1461	0.28	9.49*	1617	[5.71]
(E)- β -Farnesene	11.02*	1461	[0.28]	9.74*	1636	0.22
<i>trans</i> -Cadina-1(6),4-diene	11.16*	1472	0.24	9.41	1610	0.05
γ -Muurolole	11.16*	1472	[0.24]	9.74*	1636	[0.22]
Germacrene D	11.26	1479	6.84	9.99	1657	5.92
β -Selinene	11.31*	1482	1.54	10.06†	1663	1.37
ar-Curcumene	11.31*	1482	[1.54]	10.81*†	1724	[0.30]
δ -Selinene	11.37	1487	0.11	9.84	1645	0.13
α -Selinene	11.43*	1492	1.50	10.13	1668	1.00
Viridiflorene	11.43*	1492	[1.50]	9.78	1640	1.65
Bicyclogermacrene	11.43*	1492	[1.50]	10.24	1678	0.52
epi-Cubebol	11.43*	1492	[1.50]	12.15	1840	0.06
Caparratriene	11.50	1496	0.09	9.90	1650	0.08

α-Muurolene	11.52	1498	0.45	10.22	1676	0.38
δ-Guaiene	11.60	1504	0.22	10.09†	1665	[1.37]
β-Bisabolene	11.67*	1510	1.95	10.35	1686	1.51
γ-Cadinene	11.67*	1510	[1.95]	10.58*†	1706	[0.63]
Cubebol	11.67*	1510	[1.95]	12.71	1890	0.06
β-Curcumene	11.67*	1510	[1.95]	10.38	1688	0.07
(3E,6E)-α-Farnesene	11.67*	1510	[1.95]	10.68	1713	0.07
δ-Cadinene	11.83*	1523	2.53	10.62	1709	2.22
trans-Calamenene	11.83*	1523	[2.53]	11.38	1773	0.02
Zonarene	11.83*	1523	[2.53]	10.58*†	1706	[0.63]
β-Sesquiphellandrene	11.83*	1523	[2.53]	10.81*†	1724	[0.30]
trans-Cadina-1,4-diene	11.93*	1530	0.22	10.85	1728	0.15
(E)-γ-Bisabolene	11.93*	1530	[0.22]	10.56†	1704	0.63
α-Cadinene	11.99	1535	0.15	10.91*	1733	0.16
α-Calacorene	12.02*	1538	0.12	12.27	1851	0.14
Selina-3,7(11)-diene	12.02*	1538	[0.12]	10.76†	1721	0.30
(E)-α-Bisabolene	12.11*	1544	0.21	10.91*	1733	[0.16]
Isocaryophyllene epoxide B	12.11*	1544	[0.21]	12.30	1853	0.08
Germacrene B	12.20	1552	1.07	11.31	1767	1.12
Maaliol	12.32	1561	0.15	13.23	1938	0.13
β-Calacorene	12.35*	1563	0.36	12.81	1899	0.02
Caryophyllenyl alcohol	12.35*	1563	[0.36]	13.79*	1989	0.65
Spathulenol	12.46*	1572	0.15	14.57	2063	0.03
Germacrene D-4-ol	12.46*	1572	[0.15]	13.86	1996	0.10
Caryophyllene oxide	12.50*	1576	0.23	12.94	1911	0.12
Caryophyllene oxide isomer	12.50*	1576	[0.23]	12.86	1903	0.04
10-epi-Junenol	12.50*	1576	[0.23]	12.90	1906	0.01
Globulol	12.50*	1576	[0.23]	14.07	2016	0.06
Ledol	12.77	1596	0.19	13.54	1966	0.11
Unknown [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	12.94*	1610	0.61	14.80	2085	0.09
Junenol	12.94*	1610	[0.61]	13.79*	1989	[0.65]
Rosifoliol	13.03	1617	0.04	14.50	2056	0.04
1-epi-Cubebol	13.10	1624	0.12	13.95	2004	0.12
Caryophylladienol II	13.18	1630	0.07	16.22*	2229	0.30
Isospathulenol	13.21	1632	0.03	15.62	2167	0.02
τ-Cadinol	13.28*	1638	0.56	15.07	2112	0.29
τ-Muurolol	13.28*	1638	[0.56]	15.23	2128	0.30
α-Muurolol	13.34*	1643	0.35	15.37	2142	0.32
Unknown [m/z 121, 95 (50), 59 (46), 93 (41), 81 (36), 67 (36)... 206 (18), 220? (1)]	13.34*	1643	[0.35]	14.95	2100	0.05

Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.41*	1648	0.15	15.33	2138	0.07
Selin-11-en-4 α -ol	13.41*	1648	[0.15]	15.80	2185	0.10
α -Cadinol	13.43	1650	0.44	15.66	2171	0.42
<i>cis</i> -Calamene-10-ol	13.47	1654	0.02	16.61	2269	0.20
<i>trans</i> -Calamene-10-ol	13.53	1659	0.03	16.97*	2306	0.25
(3 <i>Z</i>)-Caryophylla-3,8(13)-dien-5 β -ol	13.64*†	1668	0.16	16.97*	2306	[0.25]
Cadalene	13.64*†	1668	[0.16]	15.59	2164	0.16
Germacre-4(15),5,10(14)-trien-1 α -ol	13.80	1681	0.03	16.22*	2229	[0.30]
α -Bisabolol	13.84	1684	0.03	15.56	2161	0.03
Juniper camphor	13.89	1688	0.17	16.22*	2229	[0.30]
Aromadendrane-4,10-diol	14.18	1713	0.01	16.97*	2306	[0.25]
Methyl (<i>E,E</i>)-farnesate?	14.65	1754	0.07			
Unknown [m/z 43, 95 (66), 81 (63), 137 (61), 41 (53), 107 (47)... 262 (6)...]	16.49	1919	0.02	17.96	2414	0.05
Unknown [m/z 95, 105 (79), 107 (75), 189 (68), 41 (64), 81 (61)... 257 (12), 272 (2)]	16.73	1941	0.05	16.22*	2229	[0.30]
Unknown [m/z 43, 95 (98), 107 (84), 93 (55), 121 (53)... 262 (7)...]	16.87	1955	0.02	18.50	2474	0.02
Unknown [m/z 95, 107 (61), 191 (46), 121 (45)...]	17.00	1967	0.02	19.58	2598	0.01
Palmitic acid	17.04	1972	0.30	22.11	2910	0.20
Unknown [m/z 95, 107 (27), 81 (19), 191 (17), 55 (16)... 275 (1)...]	17.12	1979	0.14	16.22*	2229	[0.30]
<i>cis</i> -3,14-Clerodadien-13-ol	17.58	2023	0.22	19.17	2550	0.29
Manool	17.81	2046	0.29	19.52	2591	0.20
Kolavelool	18.04	2069	0.05	19.79	2623	0.05
Linoleic acid	18.71	2137	0.05			
Oleic acid	18.78	2144	0.04			
Stearic acid	19.05	2172	0.48	23.76	3131	0.29

3 α -Hydroxymanool	19.91	2263	0.54			
Copalol	19.97	2269	0.35			
Kolavenol	20.05	2278	0.15			
Methyl copalate?	20.10	2283	0.26			
Copaifera diterpenic acid I	20.59	2336	3.85	26.70	3550	2.94
Methyl kolavenate	20.68	2346	1.60			
Copaifera diterpenic acid II	20.92	2373	0.30	27.14	3603	3.05
Kolavenyl acetate?	21.10	2394	0.10			
Methyl hardwickiiate?	21.29	2415	0.15			
Copaifera diterpenic acid III	21.68	2460	0.19			
Copaifera diterpenic acid IV	21.88	2483	1.60	32.94	3976	1.03
Copaifera diterpenic acid V	22.70	2581	0.44			
Copaifera diterpenic acid VI	23.61	2694	1.77			
Copaifera diterpenic acid VII	23.74	2709	0.19			
Copaifera diterpenic acid VIII	24.46	2802	0.74			
Humulene epoxide I				13.38	1951	1.48
Viridiflorol				14.16	2024	0.07
Total identified		91.32%			90.57%	
Total reported		91.57%			90.87%	

*: 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