

Date : May 21, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 20E13-PTH01

**Customer identification :** Juniper Berry - India - J2010899R

**Type :** Essential oil

**Source :** *Juniperus communis*

**Customer :** Plant Therapy

ANALYSIS

**Method:** PC-MAT-007 - 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.

**Analysis date :** May 19, 2020

Checked and approved by :

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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Faintly yellow liquid

**Refractive index:** 1.4764 ± 0.0003 (20 °C; method PC-MAT-016)

#### ISO 8897:2010 - OIL OF JUNIPER BERRY

Compound	Min. %	Max. %	Observed %	Complies?
δ-Cadinene	1.0	3.5	1.1	Yes
Germacrene D	1.0	5.0	1.5	Yes
α-Humulene	1.0	4.0	2.2	Yes
β-Caryophyllene	1.5	5.0	3.1	Yes
Bornyl acetate		0.6	0.2	Yes
Terpinen-4-ol	1.0	6.0	2.8	Yes
Limonene	2.0	8.0	6.6	Yes
Myrcene	3.0	22.0	9.8	Yes
β-Pinene	1.0	12.0	6.6	Yes
Sabinene	4.0	20.0	12.5	Yes
α-Pinene	25.0	45.0	39.9	Yes
<b>Refractive index</b>	1.4700	1.4830	1.4764	Yes

#### CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for oil of juniper berry.

## ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Tricyclene	0.11	Monoterpene
$\alpha$ -Thujene	0.35	Monoterpene
$\alpha$ -Pinene	39.94	Monoterpene
Camphene	0.22	Monoterpene
$\alpha$ -Fenchene	0.04	Monoterpene
Thuja-2,4(10)-diene	0.05	Monoterpene
meta-Cymene	0.01	Monoterpene
$\beta$ -Pinene	6.60	Monoterpene
Sabinene	12.52	Monoterpene
Octen-3-ol	0.01	Aliphatic alcohol
Myrcene	9.77	Monoterpene
$\alpha$ -Phellandrene	0.01	Monoterpene
Menthatriene isomer I	0.01	Monoterpene
$\Delta^3$ -Carene	0.19	Monoterpene
$\alpha$ -Terpinene	0.05	Monoterpene
ortho-Cymene	0.01	Monoterpene
para-Cymene	0.23	Monoterpene
Limonene	6.59	Monoterpene
1,8-Cineole	0.07	Monoterpenic ether
$\beta$ -Phellandrene	0.09	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.01	Monoterpene
$\gamma$ -Terpinene	1.16	Monoterpene
<i>cis</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Unknown	tr	Oxygenated monoterpene
meta-Cymenene	0.01	Monoterpene
para-Cymenene	0.01	Monoterpene
Terpinolene	1.22	Monoterpene
$\alpha$ -Pinene oxide	0.04	Monoterpenic ether
6,7-Epoxymyrcene	0.02	Monoterpenic ether
<i>trans</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
Linalool	0.06	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
endo-Fenchol	0.01	Monoterpenic alcohol
<i>cis</i> -para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
$\alpha$ -Campholenal	0.03	Monoterpenic aldehyde
<i>trans</i> -Pinocarveol	0.08	Monoterpenic alcohol
<i>cis</i> -Verbenol	0.02	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.12	Monoterpenic alcohol
Pinocarpone	0.01	Monoterpenic ketone
Borneol	0.04	Monoterpenic alcohol
$\alpha$ -Phellandren-8-ol	0.01	Monoterpenic alcohol
Isopinocampone	0.02	Monoterpenic ketone
Terpinen-4-ol	2.76	Monoterpenic alcohol
para-Cymen-8-ol	0.04	Monoterpenic alcohol
$\alpha$ -Terpineol	0.05	Monoterpenic alcohol

Myrtenol	0.05	Monoterpenic alcohol
Verbenone	0.04	Monoterpenic ketone
Decanal	0.01	Aliphatic aldehyde
<i>trans</i> -Carveol	0.04	Monoterpenic alcohol
<i>cis</i> -Carveol	0.01	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone
Carvacrol methyl ether	0.01	Monoterpenic ether
Piperitone	0.01	Monoterpenic ketone
Methyl citronellate	0.03	Monoterpenic ester
Bornyl acetate	0.19	Monoterpenic ester
2-Undecanone	0.01	Aliphatic ketone
Thymol	0.01	Monoterpenic alcohol
Carvacrol	0.01	Monoterpenic alcohol
Myrtenyl acetate	0.01	Monoterpenic ester
Terpinyl acetate analog	0.10	Monoterpenic ester
$\alpha$ -Cubebene	0.03	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.01	Monoterpenic ester
Citronellyl acetate	0.01	Monoterpenic ester
$\alpha$ -Copaene	0.05	Sesquiterpene
<i>cis</i> - $\beta$ -Elemene	0.01	Sesquiterpene
$\beta$ -Cubebene	0.03	Sesquiterpene
$\beta$ -Elemene	0.17	Sesquiterpene
$\alpha$ -Cedrene	0.23	Sesquiterpene
$\alpha$ -Gurjunene	0.01	Sesquiterpene
$\beta$ -Caryophyllene	3.10	Sesquiterpene
$\beta$ -Copaene	0.08	Sesquiterpene
<i>cis</i> -Thujopsene	0.01	Sesquiterpene
$\gamma$ -Elemene	0.14	Sesquiterpene
$\alpha$ -Himachalene	0.01	Sesquiterpene
$\alpha$ -Humulene	2.20	Sesquiterpene
allo-Aromadendrene	0.04	Sesquiterpene
$\beta$ -Acoradiene	0.04	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.08	Sesquiterpene
Germacrene D	1.47	Sesquiterpene
$\beta$ -Selinene	0.04	Sesquiterpene
ar-Curcumene	0.01	Sesquiterpene
epi-Cubebol	0.08	Sesquiterpenic alcohol
$\alpha$ -Selinene	0.11	Sesquiterpene
1,2-Dihydrocuparene	0.02	Sesquiterpene
$\alpha$ -Muurolene	0.10	Sesquiterpene
$\gamma$ -Cadinene	0.35	Sesquiterpene
Zonarene	0.03	Sesquiterpene
$\delta$ -Cadinene	1.12	Sesquiterpene
<i>trans</i> -Calamenene	0.04	Sesquiterpene
Selina-4(15),7(11)-diene	0.05	Sesquiterpene
Selina-3,7(11)-diene	0.04	Sesquiterpene
$\alpha$ -Elemol	0.24	Sesquiterpenic alcohol
Germacrene B	0.90	Sesquiterpene
Caryophyllenyl alcohol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.05	Sesquiterpenic ether

allo-Cedrol	0.12	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
$\alpha$ -Cedrol	1.56	Sesquiterpenic alcohol
Humulene epoxide II	0.04	Sesquiterpenic ether
10-epi-Cubenol	0.02	Sesquiterpenic alcohol
1,10-diepi-Cubenol	0.01	Sesquiterpenic alcohol
Unknown	0.14	Oxygenated sesquiterpene
$\tau$ -Muurolol	0.05	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.06	Sesquiterpenic alcohol
$\alpha$ -Muurolol	0.07	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.07	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Germacra-4(15),5,10(14)-trien-1 $\beta$ -ol?	0.03	Sesquiterpenic alcohol
Cedryl acetate	0.04	Sesquiterpenic ester
meta-Camphorene	0.22	Diterpene
para-Camphorene	0.09	Diterpene
18-Norabieta-8,11,13-triene?	0.13	Norditerpene
7,13-Abietadiene	0.56	Diterpene
<b>Consolidated total</b>	<b>97.39%</b>	

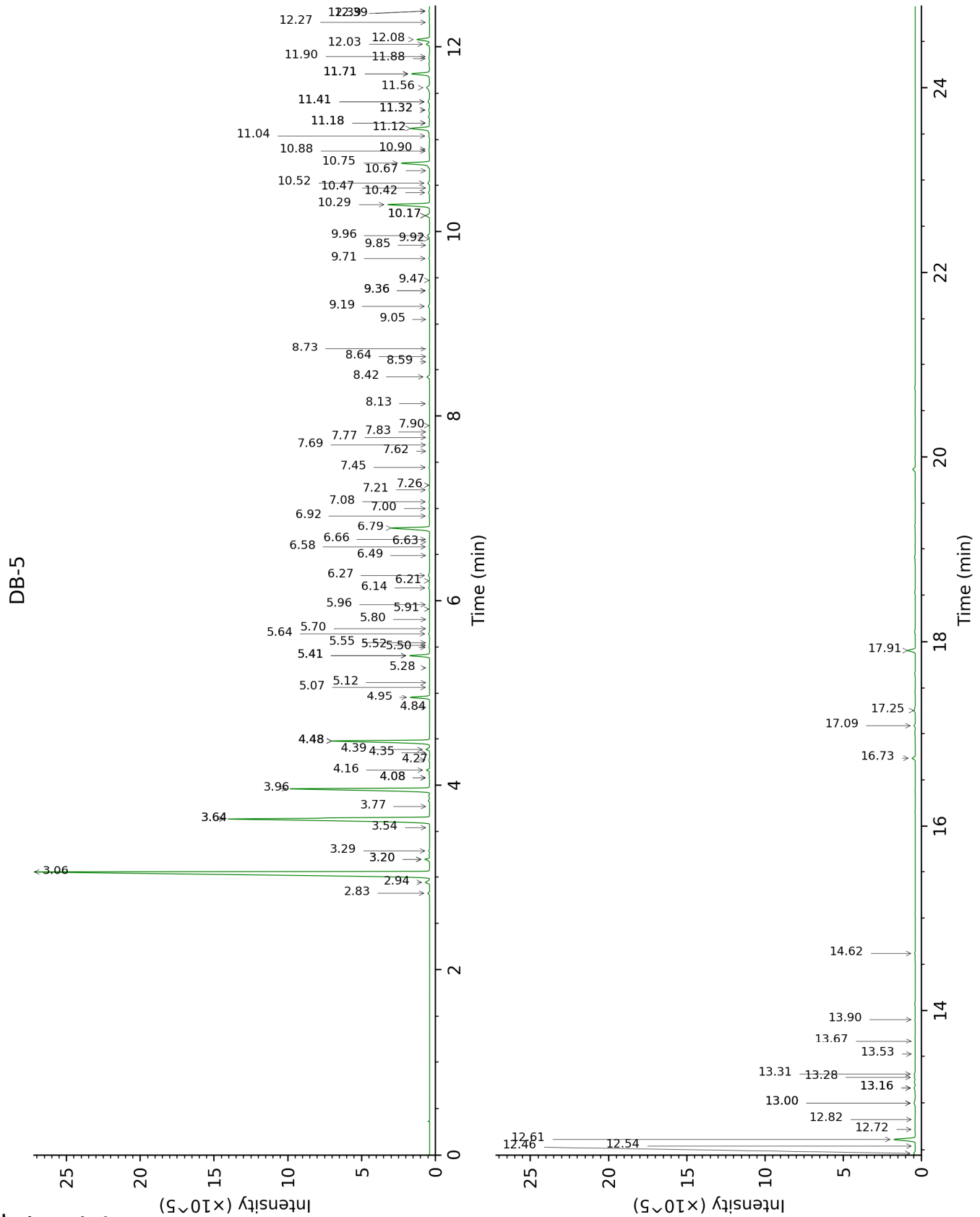
tr: The compound has been detected below 0.005% of total signal.

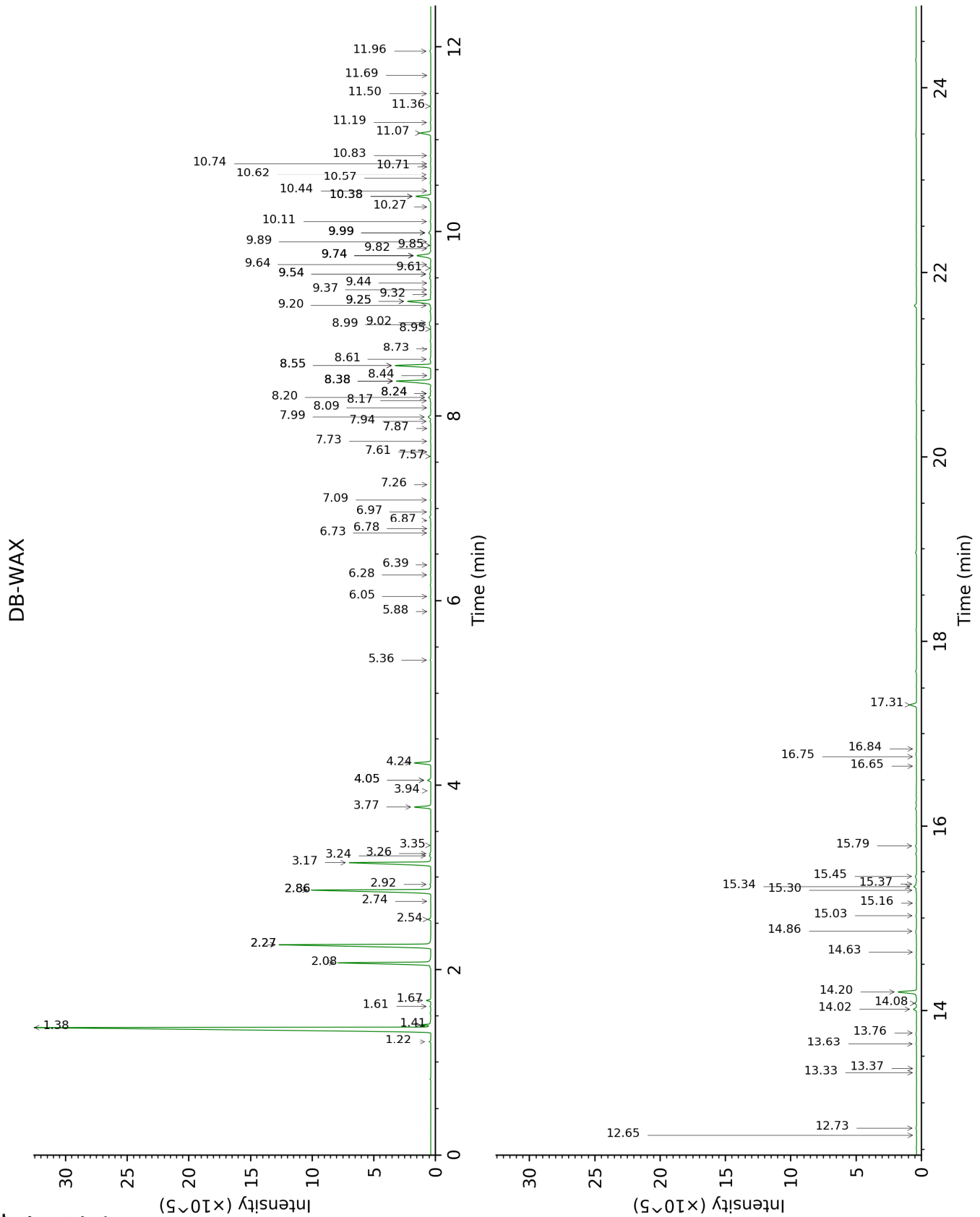
Note: no correction factor was applied

**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	%
Tricyclene	2.83	918	0.11	1.22	970	0.10
$\alpha$ -Thujene	2.94	926	0.35	1.41†	999	[40.37]
$\alpha$ -Pinene	3.06	933	39.94	1.38†	996	40.37
Camphene	3.20*	942	0.29	1.67	1025	0.22
$\alpha$ -Fenchene	3.20*	942	[0.29]	1.61	1018	0.04
Thuja-2,4(10)-diene	3.29	948	0.05	2.27*	1084	12.69
meta-Cymene	3.54	965	0.01	2.86*	1133	9.82
$\beta$ -Pinene	3.64*	971	19.12	2.08	1065	6.60
Sabinene	3.64*	971	[19.12]	2.27*	1084	[12.69]
Octen-3-ol	3.77	980	0.01	6.78	1420	0.02
Myrcene	3.96	993	9.77	2.86*	1133	[9.82]
$\alpha$ -Phellandrene	4.08*	1001	0.03	2.74	1124	0.01
Menthatriene isomer I	4.08*	1001	[0.03]	3.35	1172	0.01
$\Delta$ 3-Carene	4.16	1006	0.19	2.54	1108	0.18
$\alpha$ -Terpinene	4.27	1013	0.05	2.92	1138	0.05
ortho-Cymene	4.35	1018	0.01	4.05*	1225	0.23
para-Cymene	4.39	1020	0.23	4.05*	1225	[0.23]
Limonene	4.48*	1026	6.71	3.16	1157	6.59
1,8-Cineole	4.48*	1026	[6.71]	3.26	1165	0.07
$\beta$ -Phellandrene	4.48*	1026	[6.71]	3.24	1163	0.09
(E)- $\beta$ -Ocimene	4.84	1048	0.01	3.94	1216	0.01
$\gamma$ -Terpinene	4.95	1056	1.16	3.77	1204	1.18
cis-Sabinene hydrate	5.06	1063	0.02	6.87	1427	0.02
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.12	1066	tr			
meta-Cymenene	5.28	1076	0.01	6.28	1383	0.03
para-Cymenene	5.41*	1084	1.23	6.39	1391	0.01
Terpinolene	5.41*	1084	[1.23]	4.24	1238	1.22
$\alpha$ -Pinene oxide	5.50	1090	0.04	5.36	1317	0.04
6,7-Epoxymyrcene	5.52	1092	0.02	6.05	1366	0.02
trans-Sabinene hydrate	5.55	1093	0.01	7.94	1507	0.07
Linalool	5.64	1099	0.06	8.09	1518	0.06
Nonanal	5.70	1103	0.01	5.88	1354	0.01
endo-Fenchol	5.80	1109	0.01	8.44	1545	0.01
cis-para-Menth-2-en-1-ol	5.91	1117	0.02	8.17	1524	0.05
$\alpha$ -Campholenal	5.96	1120	0.03	6.97	1434	0.03
trans-Pinocarveol	6.14	1131	0.08	9.25*†	1608	[2.12]
cis-Verbenol	6.22	1136	0.02	9.32	1614	0.02
trans-Verbenol	6.27	1140	0.12	9.54*†	1632	0.24

Pinocarvone	6.49	1154	0.01	7.87	1501	0.01
Borneol	6.58	1160	0.04	9.82	1654	0.03
$\alpha$ -Phellandren-8-ol	6.63	1164	0.01	10.11	1678	0.05
Isopinocampone	6.66	1166	0.02	7.61	1482	0.01
Terpinen-4-ol	6.78	1174	2.76	8.55*	1553	2.79
para-Cymen-8-ol	6.92	1182	0.04	11.50	1794	0.04
$\alpha$ -Terpineol	7.00	1188	0.05	9.74*	1648	1.50
Myrtenol	7.08	1193	0.05	10.83	1738	0.03
Verbenone	7.20	1201	0.04	9.64	1640	0.04
Decanal	7.26	1204	0.01	7.26	1455	0.01
<i>trans</i> -Carveol	7.45	1217	0.04	11.36	1783	0.03
<i>cis</i> -Carveol	7.62	1230	0.01	11.69	1812	0.02
Citronellol	7.69	1234	0.02	10.74	1730	0.04
Carvone	7.77	1240	0.01	9.99*	1668	0.22
Carvacrol methyl ether	7.83	1244	0.01	8.55*	1553	[2.79]
Piperitone	7.90	1249	0.01	9.85	1657	0.02
Methyl citronellate	8.14	1265	0.03	8.24*	1530	0.05
Bornyl acetate	8.42	1285	0.19	8.20	1527	0.19
2-Undecanone	8.59	1296	0.01	8.61	1559	0.09
Thymol	8.64	1300	0.01	15.16	2135	0.03
Carvacrol	8.73	1306	0.01	15.37	2155	0.05
Myrtenyl acetate	9.05	1324	0.01	9.61	1637	0.02
Terpinyl acetate analog	9.19	1334	0.10	9.54*†	1632	[0.24]
$\alpha$ -Cubebene	9.36*	1346	0.03	6.73	1416	0.03
$\alpha$ -Terpinyl acetate	9.36*	1346	[0.03]	9.74*	1648	[1.50]
Citronellyl acetate	9.47	1354	0.01	9.44	1624	0.02
$\alpha$ -Copaene	9.71	1370	0.05	7.10	1443	0.04
<i>cis</i> - $\beta$ -Elemene	9.85	1380	0.01	8.24*	1530	[0.05]
$\beta$ -Cubebene	9.92	1385	0.03	7.73	1490	0.03
$\beta$ -Elemene	9.96	1388	0.17	8.38*	1540	3.15
$\alpha$ -Cedrene	10.17*	1403	0.31	7.99	1510	0.23
$\alpha$ -Gurjunene	10.17*	1403	[0.31]	7.57	1478	0.01
$\beta$ -Caryophyllene	10.29	1412	3.10	8.38*	1540	[3.15]
$\beta$ -Copaene	10.42	1421	0.08	8.38*	1540	[3.15]
<i>cis</i> -Thujopsene	10.47	1425	0.01	8.73	1567	0.01
$\gamma$ -Elemene	10.52	1429	0.14	9.00	1588	0.12
$\alpha$ -Himachalene	10.67	1440	0.01	8.95	1584	0.04
$\alpha$ -Humulene	10.75	1446	2.20	9.25*†	1608	[2.12]
allo-Aromadendrene	10.88	1455	0.04	9.02	1590	0.11
$\beta$ -Acoradiene	10.90	1457	0.04	9.37	1618	0.03
<i>trans</i> -Cadina-1(6),4-diene	11.04	1468	0.08	9.20†	1605	2.12
Germacrene D	11.12	1474	1.47	9.74*	1648	[1.50]
$\beta$ -Selinene	11.18*	1478	0.05	9.89	1660	0.04
ar-Curcumene	11.18*	1478	[0.05]	10.71	1728	0.01
epi-Cubebol	11.32*†	1488	0.19	11.96	1835	0.08
$\alpha$ -Selinene	11.32*†	1488	[0.19]	9.99*	1668	[0.22]

1,2-Dihydrocuparene	11.41*	1495	0.17	10.27	1691	0.02
$\alpha$ -Muurolene	11.41*	1495	[0.17]	9.99*	1668	[0.22]
$\gamma$ -Cadinene	11.56	1507	0.35	10.38*†	1700	1.47
Zonarene	11.71*	1518	1.34	10.44	1705	0.03
$\delta$ -Cadinene	11.71*	1518	[1.34]	10.38*†	1700	[1.47]
<i>trans</i> -Calamenene	11.71*	1518	[1.34]	11.18	1768	0.04
Selina-4(15),7(11)-diene	11.88	1531	0.05	10.58	1717	0.03
Selina-3,7(11)-diene	11.90	1533	0.04	10.62	1720	0.03
$\alpha$ -Elemol	12.03	1544	0.24	14.02	2023	0.23
Germacrene B	12.08	1548	0.90	11.07	1758	0.90
Caryophyllenyl alcohol	12.27	1562	0.03	13.64	1987	0.04
Caryophyllene oxide isomer	12.39*	1572	0.05	12.66	1897	0.01
Caryophyllene oxide	12.39*	1572	[0.05]	12.73	1904	0.05
allo-Cedrol	12.46	1577	0.12	14.08	2030	0.10
Unknown [m/z 159, 83 (88), 55 (53), 93 (50), 121 (48)... 220 (9)]	12.54	1584	0.01			
$\alpha$ -Cedrol	12.61	1589	1.56	14.20	2041	1.51
Humulene epoxide II	12.72	1598	0.04	13.33	1958	0.02
10- <i>epi</i> -Cubenol	12.82	1606	0.02	13.76	1999	0.03
1,10- <i>diepi</i> -Cubenol	13.00*	1620	0.15	13.37	1963	0.01
Unknown [m/z 119, 121 (64), 105 (57), 93 (55), 161 (52)... 218 (25)]	13.00*	1620	[0.15]			
$\tau$ -Muurolol	13.16*	1634	0.10	15.03	2121	0.05
$\tau$ -Cadinol	13.16*	1634	[0.10]	14.86	2105	0.06
$\alpha$ -Muurolol	13.28	1643	0.07	15.30	2148	0.05
$\alpha$ -Cadinol	13.31	1646	0.07	15.45	2164	0.12
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	13.53	1664	0.01	16.84	2306	0.01
Unknown [m/z 109, 91 (67), 79 (57), 81 (49), 107 (48)... 220 (7)]	13.67	1676	0.01	16.75	2297	0.02
Germacre-4(15),5,10(14)-trien-1 $\beta$ -ol?	13.90	1695	0.03	16.65	2286	0.02
Cedryl acetate	14.62	1757	0.04	14.63	2082	0.03
meta-Camphorene	16.74	1949	0.22	15.34	2152	0.24
para-	17.09	1983	0.09	15.79	2197	0.09

Camphorene						
18-Norabieta-8,11,13-triene?	17.25	1998	0.13			
7,13-Abietadiene	17.90	2064	0.56	17.31	2357	0.57
<b>Total identified</b>		<b>97.63%</b>			<b>97.19%</b>	
<b>Total reported</b>		<b>97.66%</b>			<b>97.20%</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