

Date : March 13, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19C04-PTH04-1-SCC

Customer identification : Organic Juniper Berry - Albania - J50102711R

Type : Essential oil

Source : *Juniperus communis*

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 : Benoit Roger, Ph. D.

Analysis date : March 12, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4740 ± 0.0003 (20 °C)

ISO 8897:2010 - OIL OF JUNIPER BERRY

Compound	Min. %	Max. %	Observed %	Complies?
δ-Cadinene	1.0	3.5	0.8	No
Germacrene D	1.0	5.0	4.5	Yes
α-Humulene	1.0	4.0	1.1	Yes
β-Caryophyllene	1.5	5.0	1.6	Yes
Bornyl acetate		0.6	0.2	Yes
Terpinen-4-ol	1.0	6.0	1.3	Yes
Limonene	2.0	8.0	4.2	Yes
Myrcene	3.0	22.0	16.5	Yes
β-Pinene	1.0	12.0	2.1	Yes
Sabinene	4.0	20.0	17.4	Yes
α-Pinene	25.0	45.0	33.7	Yes
Refractive index	1.4700	1.4830	1.4740	Yes

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Tricyclene	0.07	0.08	Monoterpene
α -Thujene	1.72	1.73	Monoterpene
α -Pinene	33.71	33.56	Monoterpene
Camphene	0.24*	0.21	Monoterpene
α -Fenchene	[0.24]*	0.03	Monoterpene
Thuja-2,4(10)-diene	0.01	17.38*	Monoterpene
meta-Cymene	0.06	16.42*	Monoterpene
β -Pinene	19.59*	2.06	Monoterpene
Sabinene	[19.59]*	[17.38]*	Monoterpene
Octen-3-ol	tr	0.50*	Aliphatic alcohol
6-Methyl-5-hepten-2-one	0.01		Aliphatic ketone
Myrcene	16.52	[16.42]*	Monoterpene
2-Carene	0.01	0.01	Monoterpene
Menthatriene isomer I	0.08*	tr	Monoterpene
α -Phellandrene	[0.08]*	0.06	Monoterpene
Δ^3 -Carene	0.13	0.12	Monoterpene
α -Terpinene	0.66*	0.67*	Monoterpene
1,4-Cineole	[0.66]*	[0.67]*	Monoterpenic ether
para-Cymene	0.27	0.26	Monoterpene
β -Phellandrene	4.71*	0.43*	Monoterpene
1,8-Cineole	[4.71]*	[0.43]*	Monoterpenic ether
Limonene	[4.71]*	4.22	Monoterpene
(Z)- β -Ocimene	0.01	1.16*	Monoterpene
(E)- β -Ocimene	0.02	0.02	Monoterpene
γ -Terpinene	1.17	[1.16]*	Monoterpene
cis-Sabinene hydrate	0.14	[0.50]*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	0.01	Monoterpenic alcohol
Terpinolene	1.25*	1.19	Monoterpene
para-Cymenene	[1.25]*	0.01	Monoterpene
6,7-Epoxymyrcene	0.01	0.02	Monoterpenic ether
trans-Sabinene hydrate	0.11	0.10	Monoterpenic alcohol
Linalool	0.07	0.11*	Monoterpenic alcohol
Nonanal	0.02	0.03	Aliphatic aldehyde
endo-Fenchol	0.01	0.05*	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.07	[0.11]*	Monoterpenic alcohol
α -Campholenal	0.02	0.01	Monoterpenic aldehyde
trans-Pinocarveol	0.03	0.03	Monoterpenic alcohol
cis-Verbenol	0.05	0.01	Monoterpenic alcohol
trans-Verbenol	0.04	0.06	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.01	1.12*	Monoterpenic alcohol
Citronellal	0.02	0.01	Monoterpenic aldehyde
Borneol	0.03	0.16*	Monoterpenic alcohol
α -Phellandren-8-ol	0.01	0.67*	Monoterpenic alcohol
Isopinocampone	0.02	0.06*	Monoterpenic ketone
Terpinen-4-ol	1.32	1.32	Monoterpenic alcohol
para-Cymen-8-ol	0.04	0.03	Monoterpenic alcohol
Myrtenal	0.13*	0.01	Monoterpenic aldehyde
α -Terpineol	[0.13]*	[0.16]*	Monoterpenic alcohol

Myrtenol	0.06	0.06	Monoterpenic alcohol
Verbenone	0.03	0.45*	Monoterpenic ketone
<i>trans</i> -Carveol	0.02	0.01	Monoterpenic alcohol
Citronellol	0.05	0.06	Monoterpenic alcohol
Thymol methyl ether	0.05	0.05	Monoterpenic ether
Carvacrol methyl ether	0.01	0.08*	Monoterpenic ether
Piperitone	0.01	4.60*	Monoterpenic ketone
Geraniol	0.01	0.01	Monoterpenic alcohol
Methyl citronellate	0.04	0.04	Monoterpenic ester
Geranial	0.01	[0.67]*	Monoterpenic aldehyde
Bornyl acetate	0.18	0.20	Monoterpenic ester
2-Undecanone	0.01	[0.08]*	Aliphatic ketone
Thymol	0.03	0.04*	Monoterpenic alcohol
Myrtenyl acetate	0.03	[0.45]*	Monoterpenic ester
Terpinyl acetate analog	0.02	[0.45]*	Monoterpenic ester
α -Cubebene	0.44*	[0.50]*	Sesquiterpene
α -Terpinyl acetate	[0.44]*	0.11	Monoterpenic ester
α -Ylangene	0.02	0.02	Sesquiterpene
α -Copaene	0.18	0.18	Sesquiterpene
<i>cis</i> - β -Elemene	0.04	[0.05]*	Sesquiterpene
β -Cubebene	0.05	0.06	Sesquiterpene
β -Elemene	0.92	2.45*	Sesquiterpene
Sibirene	0.10*	0.07	Sesquiterpene
Longifolene	[0.10]*	0.06	Sesquiterpene
α -Gurjunene	0.02	[0.06]*	Sesquiterpene
β -Caryophyllene	1.57	[2.45]*	Sesquiterpene
β -Copaene	0.07*	[2.45]*	Sesquiterpene
<i>cis</i> -Thujopsene	[0.07]*	0.04	Sesquiterpene
γ -Elemene	0.26	0.26	Sesquiterpene
α -Himachalene	0.02	0.02	Sesquiterpene
α -Humulene	1.12	[1.12]*	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.42*	[0.45]*	Sesquiterpene
allo-Aromadendrene	[0.42]*	0.03	Sesquiterpene
β -Acoradiene	[0.42]*	0.07	Sesquiterpene
10- <i>epi</i> - β -Acoradiene	0.03*	[0.45]*	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	[0.03]*	[1.12]*	Sesquiterpene
Germacrene D	4.69*	[4.60]*	Sesquiterpene
γ -Muurolene	[4.69]*	0.19	Sesquiterpene
β -Selinene	0.18	0.21	Sesquiterpene
γ -Amorphene	0.06	[4.60]*	Sesquiterpene
α -Selinene	0.68*	0.19	Sesquiterpene
Bicyclogermacrene	[0.68]*	[0.67]*	Sesquiterpene
α -Muurolene	0.64	[0.67]*	Sesquiterpene
1,2-Dihydrocuparene	[0.64]*	0.14	Sesquiterpene
Germacrene A	[0.64]*	[0.74]*	Sesquiterpene
γ -Cadinene	0.33	0.74	Sesquiterpene
<i>trans</i> -Calamenene	0.74*	0.02	Sesquiterpene
δ -Cadinene	[0.74]*	0.78	Sesquiterpene
Selina-4(15),7(11)-diene	0.06	0.06	Sesquiterpene
α -Cadinene	0.06*	0.02	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	[0.06]*	[0.74]*	Sesquiterpene
Selina-3,7(11)-diene	0.04	0.03	Sesquiterpene

Germacrene B	2.46	2.50	Sesquiterpene
Caryophyllenyl alcohol	0.02	0.17*	Sesquiterpenic alcohol
Germacrene D-4-ol	0.22*	[0.17]*	Sesquiterpenic alcohol
Spathulenol	[0.22]*	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	0.03	Sesquiterpenic ether
Humulene epoxide II	0.02	0.02	Sesquiterpenic ether
10-epi-Cubenol	0.02	0.05	Sesquiterpenic alcohol
τ-Muurolol	0.08*	[0.04]*	Sesquiterpenic alcohol
τ-Cadinol	[0.08]*	0.06	Sesquiterpenic alcohol
α-Muurolol	0.03	0.01	Sesquiterpenic alcohol
α-Cadinol	0.07	0.19*	Sesquiterpenic alcohol
meta-Camphorene	0.12	[0.19]*	Diterpene
Trachylobane?	0.04	0.04	Diterpene
para-Camphorene	0.04	0.04	Diterpene
ar-Abietatriene	0.02	0.02	Diterpene
Total identified	98.86%	98.46%	

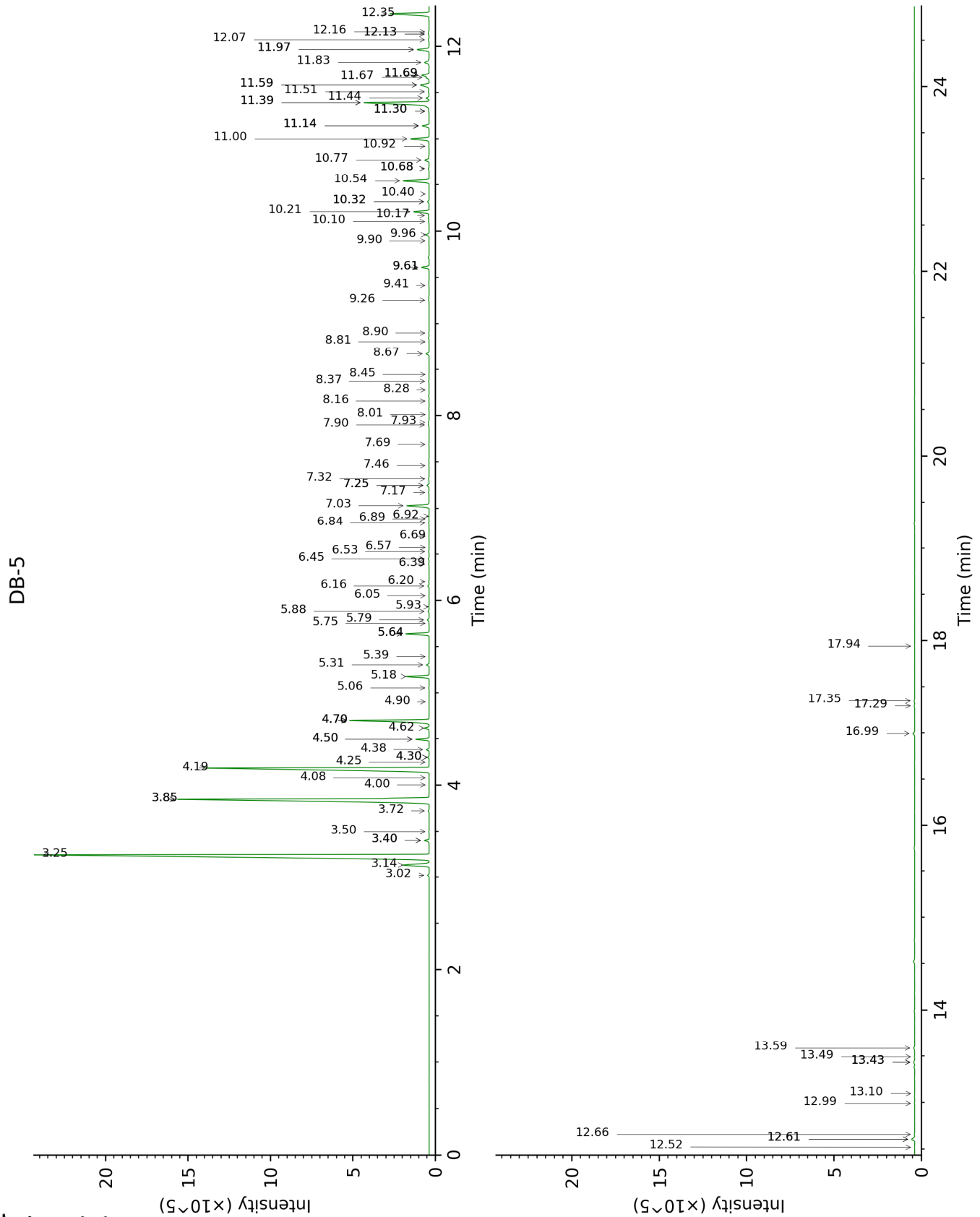
*: Two or more compounds are coeluting on this column

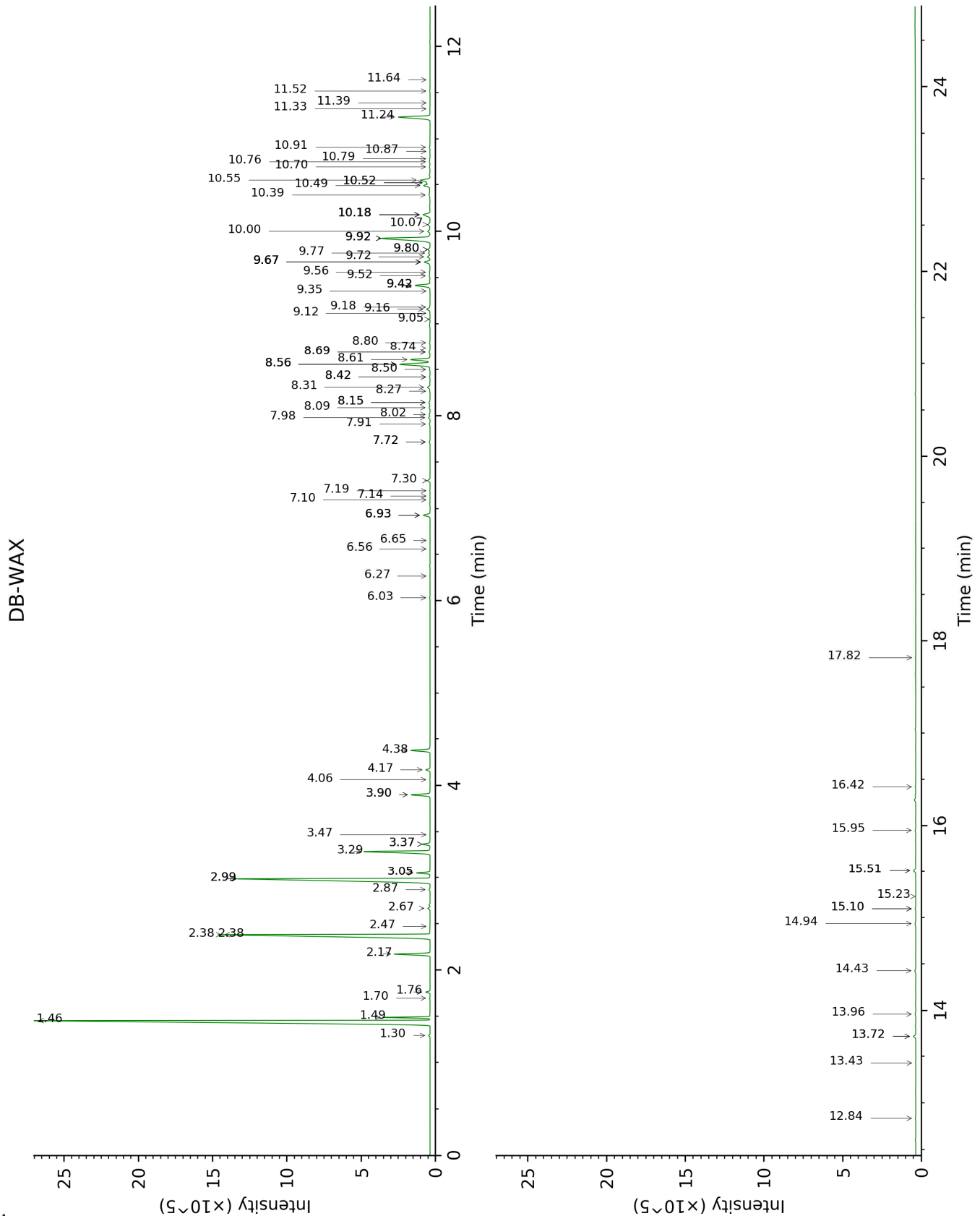
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Tricyclene	3.02	917	0.07	1.30	976	0.08
α-Thujene	3.14	924	1.72	1.49	1004	1.73
α-Pinene	3.25	932	33.71	1.46	999	33.56
Camphene	3.40*	942	0.24	1.76	1029	0.21
α-Fenchene	3.40*	942	[0.24]	1.70	1023	0.03
Thuja-2,4(10)-diene	3.50	948	0.01	2.38*	1087	17.38
meta-Cymene	3.72	962	0.06	2.99*	1136	16.42
β-Pinene	3.85*	971	19.59	2.17	1067	2.06
Sabinene	3.85*	971	[19.59]	2.38*	1087	[17.38]
Octen-3-ol	4.00	981	tr	6.93*	1422	0.50
6-Methyl-5-hepten-2-one	4.08	986	0.01			
Myrcene	4.19	993	16.52	2.99*	1136	[16.42]
2-Carene	4.25	997	0.01	2.47	1096	0.01
Menthatriene isomer I	4.30*	1000	0.08	3.47	1175	tr
α-Phellandrene	4.30*	1000	[0.08]	2.87	1127	0.06
Δ ³ -Carene	4.38	1006	0.13	2.67	1112	0.12
α-Terpinene	4.50*	1012	0.66	3.05*	1142	0.67
1,4-Cineole	4.50*	1012	[0.66]	3.05*	1142	[0.67]
para-Cymene	4.62	1020	0.27	4.17	1230	0.26
β-Phellandrene	4.70*	1025	4.71	3.37*	1167	0.43
1,8-Cineole	4.70*	1025	[4.71]	3.37*	1167	[0.43]
Limonene	4.70*	1025	[4.71]	3.29	1160	4.22
(Z)-β-Ocimene	4.90	1038	0.01	3.90*	1209	1.16
(E)-β-Ocimene	5.06	1047	0.02	4.06	1222	0.02
γ-Terpinene	5.18	1055	1.17	3.90*	1209	[1.16]
cis-Sabinene hydrate	5.31	1063	0.14	6.93*	1422	[0.50]
cis-Linalool oxide (fur.)	5.39	1068	0.01	6.65	1401	0.01
Terpinolene	5.64*	1084	1.25	4.38	1246	1.19
para-Cymenene	5.64*	1084	[1.25]	6.56	1394	0.01
6,7-Epoxymyrcene	5.75	1091	0.01	6.27	1372	0.02
trans-Sabinene hydrate	5.79	1093	0.11	7.98	1502	0.10
Linalool	5.88	1099	0.07	8.15*†	1515	0.11
Nonanal	5.93	1102	0.02	6.03	1355	0.03
endo-Fenchol	6.05	1110	0.01	8.42*	1537	0.05
cis-para-Menth-2-en-1-ol	6.16	1116	0.07	8.15*†	1515	[0.11]
α-Campholenal	6.20	1120	0.02	7.14	1438	0.01
trans-Pinocarveol	6.39	1132	0.03	9.18	1597	0.03
cis-Verbenol	6.45	1135	0.05	9.35	1611	0.01
trans-Verbenol	6.53	1140	0.04	9.56	1628	0.06
meta-Mentha-4,6-dien-8-ol	6.57	1143	0.01	9.42*	1616	1.12

Citronellal	6.69	1151	0.02	7.10	1435	0.01
Borneol	6.84	1160	0.03	9.80*	1648	0.16
α -Phellandren-8-ol	6.89	1163	0.01	10.18*	1679	0.67
Isopinocampone	6.92	1165	0.02	7.72*	1482	0.06
Terpinen-4-ol	7.03	1172	1.32	8.61	1552	1.32
para-Cymen-8-ol	7.17	1182	0.04	11.52	1793	0.03
Myrtenal	7.25*	1187	0.13	8.74	1562	0.01
α -Terpineol	7.25*	1187	[0.13]	9.80*	1648	[0.16]
Myrtenol	7.32	1191	0.06	10.91	1741	0.06
Verbenone	7.46	1200	0.03	9.67*	1637	0.45
<i>trans</i> -Carveol	7.69	1216	0.02	11.39	1782	0.01
Citronellol	7.90	1230	0.05	10.76	1728	0.06
Thymol methyl ether	7.93	1232	0.05	8.50	1543	0.05
Carvacrol methyl ether	8.01	1238	0.01	8.69*	1558	0.08
Piperitone	8.16	1248	0.01	9.92*	1658	4.60
Geraniol	8.28	1256	0.01	11.64	1804	0.01
Methyl citronellate	8.37	1262	0.04	8.27	1525	0.04
Geranial	8.45	1267	0.01	10.18*	1679	[0.67]
Bornyl acetate	8.67	1282	0.18	8.31	1528	0.20
2-Undecanone	8.81	1291	0.01	8.69*	1558	[0.08]
Thymol	8.90	1298	0.03	15.10*	2127	0.04
Myrtenyl acetate	9.26	1319	0.03	9.67*	1637	[0.45]
Terpinyl acetate analog	9.41	1330	0.02	9.67*	1637	[0.45]
α -Cubebene	9.61*	1344	0.44	6.93*	1422	[0.50]
α -Terpinyl acetate	9.61*	1344	[0.44]	9.76	1645	0.11
α -Ylangene	9.90	1364	0.02	7.19	1442	0.02
α -Copaene	9.96	1369	0.18	7.30	1451	0.18
<i>cis</i> - β -Elemene	10.10	1379	0.04	8.42*	1537	[0.05]
β -Cubebene	10.17	1383	0.05	7.91	1497	0.06
β -Elemene	10.21	1386	0.92	8.56*	1548	2.45
Sibirene	10.32*	1394	0.10	8.02	1505	0.07
Longifolene	10.32*	1394	[0.10]	8.09	1511	0.06
α -Gurjunene	10.40	1400	0.02	7.72*	1482	[0.06]
β -Caryophyllene	10.54	1410	1.57	8.56*	1548	[2.45]
β -Copaene	10.68*	1420	0.07	8.56*	1548	[2.45]
<i>cis</i> -Thujopsene	10.68*	1420	[0.07]	8.80	1566	0.04
γ -Elemene	10.77	1427	0.26	9.16	1595	0.26
α -Himachalene	10.92	1438	0.02	9.05	1586	0.02
α -Humulene	11.00	1444	1.12	9.42*	1616	[1.12]
(<i>E</i>)- β -Farnesene	11.14*	1455	0.42	9.67*	1637	[0.45]
allo-Aromadendrene	11.14*	1455	[0.42]	9.12	1592	0.03
β -Acoradiene	11.14*	1455	[0.42]	9.52	1625	0.07
10-epi- β -Acoradiene	11.30*	1466	0.03	9.67*	1637	[0.45]
<i>trans</i> -Cadina-1(6),4-diene	11.30*	1466	[0.03]	9.42*	1616	[1.12]
Germacrene D	11.39*	1473	4.69	9.92*	1658	[4.60]
γ -Murololene	11.39*	1473	[4.69]	9.72	1641	0.19

β-Selinene	11.44	1477	0.18	10.00	1664	0.21
γ-Amorphene	11.51	1482	0.06	9.92*	1658	[4.60]
α-Selinene	11.58*	1488	0.68	10.07	1670	0.19
Bicyclogermacrene	11.58*	1488	[0.68]	10.18*	1679	[0.67]
α-Muurolene	11.67†	1494	0.64	10.18*	1679	[0.67]
1,2-Dihydrocuparene	11.69*†	1495	[0.64]	10.39	1696	0.14
Germacrene A	11.69*†	1495	[0.64]	10.52*†	1708	[0.74]
γ-Cadinene	11.83	1506	0.33	10.49†	1705	0.74
<i>trans</i> -Calamenene	11.97*	1517	0.74	11.33	1777	0.02
δ-Cadinene	11.97*	1517	[0.74]	10.55	1710	0.78
Selina-4(15),7(11)-diene	12.07	1525	0.06	10.70	1723	0.06
α-Cadinene	12.13*	1530	0.06	10.87	1737	0.02
(<i>E</i>)-γ-Bisabolene	12.13*	1530	[0.06]	10.52*†	1708	[0.74]
Selina-3,7(11)-diene	12.16	1532	0.04	10.79	1730	0.03
Germacrene B	12.35	1547	2.46	11.24	1769	2.50
Caryophyllenyl alcohol	12.52	1560	0.02	13.72*	1993	0.17
Germacrene D-4-ol	12.61*	1567	0.22	13.72*	1993	[0.17]
Spathulenol	12.61*	1567	[0.22]	14.43	2062	0.07
Caryophyllene oxide	12.66	1571	0.03	12.84	1911	0.03
Humulene epoxide II	12.99	1597	0.02	13.43	1966	0.02
10-epi-Cubenol	13.10	1606	0.02	13.96	2016	0.05
τ-Muurolol	13.43*	1633	0.08	15.10*	2127	[0.04]
τ-Cadinol	13.43*	1633	[0.08]	14.94	2111	0.06
α-Muurolol	13.49	1638	0.03	15.23	2140	0.01
α-Cadinol	13.58	1646	0.07	15.51*	2168	0.19
meta-Camphorene	16.99	1947	0.12	15.51*	2168	[0.19]
Trachylobane?	17.29	1975	0.04	16.42	2262	0.04
para-Camphorene	17.35	1980	0.04	15.95	2213	0.04
ar-Abietatriene	17.94	2039	0.02	17.82	2412	0.02
Total identified		98.86%			98.46%	
Total reported		98.86%			98.46%	

*: 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