

Date : May 31, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19E22-PTH03-1-SCC

Customer identification : Balsam Fir - Canada - BN0104912R

Type : Essential oil

Source : *Abies balsamea* ct. Eastern / Low thymol

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 : May 30, 2019

Checked and approved by :

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

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This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4730 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
2-Ethylfuran	tr	tr	Furan
Toluene	0.01	0.01	Simple phenolic
Hexanal	tr	0.01	Aliphatic aldehyde
Octane	tr	0.01	Alkane
(3Z)-Hexenol	0.04	0.06	Aliphatic alcohol
Hexanol	0.01	0.03	Aliphatic alcohol
Santene	0.89	0.89*	Monoterpene
Unknown	0.01	0.09*	Normonoterpene
Bornylene	0.01	[0.89]*	Monoterpene
Tricyclene	0.45	0.46	Monoterpene
α -Thujene	0.08	[0.09]*	Monoterpene
α -Pinene	16.53	16.33	Monoterpene
α -Fenchene	5.92*	0.64	Monoterpene
Camphene	[5.92]*	5.24	Monoterpene
Thuja-2,4(10)-diene	0.02	0.09*	Monoterpene
meta-Cymene	0.04	1.61*	Monoterpene
β -Pinene	29.25*	28.91	Monoterpene
Sabinene	[29.25]*	[0.09]*	Monoterpene
Unknown	0.03		Monoterpene
Myrcene	1.60	[1.61]*	Monoterpene
2-Carene	0.07	0.05	Monoterpene
Pseudolimonene	0.19*	0.07	Monoterpene
α -Phellandrene	[0.19]*	0.11	Monoterpene
Δ^3 -Carene	16.43	16.33	Monoterpene
α -Terpinene	0.24	0.22	Monoterpene
Carvomenthene	0.04*	0.01	Aliphatic alcohol
Hexyl acetate	[0.04]*	0.03*	Aliphatic ester
para-Cymene	0.25	0.25	Monoterpene
Limonene	12.75*	7.61	Monoterpene
β -Phellandrene	[12.75]*	5.19*	Monoterpene
1,8-Cineole	[12.75]*	[5.19]*	Monoterpenic ether
(E)- β -Ocimene	0.01	0.01	Monoterpene
γ -Terpinene	0.17	0.18	Monoterpene
meta-Cymenene	0.07*	0.01	Monoterpene
Fenchone	[0.07]*	0.08	Aliphatic alcohol
Isoterpinolene	[0.07]*	[0.03]*	Monoterpene
Terpinolene	1.08*	0.99	Monoterpene
γ -Campholenal	[1.08]*	0.03	Aliphatic alcohol
para-Cymenene	[1.08]*	0.05	Monoterpene
Unknown	0.06*		Unknown
Linalool	[0.06]*	0.06	Monoterpenic alcohol
α -Thujone	[0.06]*	0.01	Monoterpenic ketone
endo-Fenchol	0.05	0.06	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.01	0.03	Monoterpenic alcohol
α -Campholenal	0.01	0.01	Monoterpenic aldehyde
trans-Pinocarveol	0.08	0.07	Monoterpenic alcohol
Camphor	0.26	0.26	Monoterpenic ketone
Camphene hydrate	0.08*	0.06*	Monoterpenic alcohol

<i>trans</i> -para-Menth-2-en-1-ol	[0.08]*	0.01	Monoterpenic alcohol
meta-Mentha-4,6-dien-8-ol	0.03	0.02*	Monoterpenic alcohol
Isoborneol	0.25	0.24	Monoterpenic alcohol
Pinocamphone	0.01	0.01	Monoterpenic ketone
Pinocarvone	0.03	0.04	Monoterpenic ketone
Borneol	0.86	1.56*	Monoterpenic alcohol
Isopinocamphone	0.03	0.02	Monoterpenic ketone
Terpinen-4-ol	0.17	0.14	Monoterpenic alcohol
meta-Cymen-8-ol	0.05	0.04	Monoterpenic alcohol
Cryptone	0.04	0.04	Normonoterpenic ketone
para-Cymen-8-ol	0.01	0.01	Monoterpenic alcohol
α -Terpineol	0.66	[1.56]*	Monoterpenic alcohol
Myrtenal	0.05	0.04	Monoterpenic aldehyde
Myrtenol	0.06	0.06	Monoterpenic alcohol
Methylchavicol	0.02	[0.02]*	Phenylpropanoid
Verbenone	0.07	0.05*	Monoterpenic ketone
endo-Fenchyl acetate	0.01*	0.05	Monoterpenic ester
<i>trans</i> -Carveol	[0.01]*	0.01	Monoterpenic alcohol
Citronellol	0.09*	0.05*	Monoterpenic alcohol
Thymol methyl ether	[0.09]*	0.22*	Monoterpenic ether
Piperitone	0.08	0.10*	Monoterpenic ketone
Phellandral	0.01	0.03*	Monoterpenic aldehyde
Bornyl acetate	8.59*	8.68	Monoterpenic ester
Isobornyl acetate	[8.59]*	0.20	Monoterpenic ester
2-Undecanone	0.04	0.01	Aliphatic ketone
Thymol	0.01	0.02	Monoterpenic alcohol
Isohexyl isocaproate	0.01	0.02	Aliphatic ester
Citronellyl acetate	0.02	0.02	Monoterpenic ester
α -Copaene	0.01	0.01	Sesquiterpene
Geranyl acetate	0.02	0.03	Monoterpenic ester
β -Longipinene	0.01	0.01	Sesquiterpene
Longifolene	0.13	0.19	Sesquiterpene
Methyleugenol	0.01	0.01	Phenylpropanoid
β -Caryophyllene	0.23	[0.22]*	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.03	[0.06]*	Sesquiterpene
α -Humulene	0.09	0.10	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.03	0.03	Sesquiterpene
γ -Muurolene	0.01	[0.05]*	Sesquiterpene
Germacrene D	0.01	[1.56]*	Sesquiterpene
β -Selinene	0.03	[0.10]*	Sesquiterpene
α -Selinene	0.02	[0.03]*	Sesquiterpene
β -Himachalene	0.03	0.05	Sesquiterpene
α -Muurolene	0.01	0.02	Sesquiterpene
γ -Cadinene	0.29*	0.01	Sesquiterpene
β -Bisabolene	[0.29]*	0.31	Sesquiterpene
δ -Cadinene	0.03	0.03	Sesquiterpene
α -Calacorene	0.01	0.02	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.04	[0.05]*	Sesquiterpene
(<i>E</i>)-Nerolidol	0.01	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	0.01	Sesquiterpenic ether
Humulene epoxide II	0.01	0.01	Sesquiterpenic ether
Total identified	98.99%	98.68%	

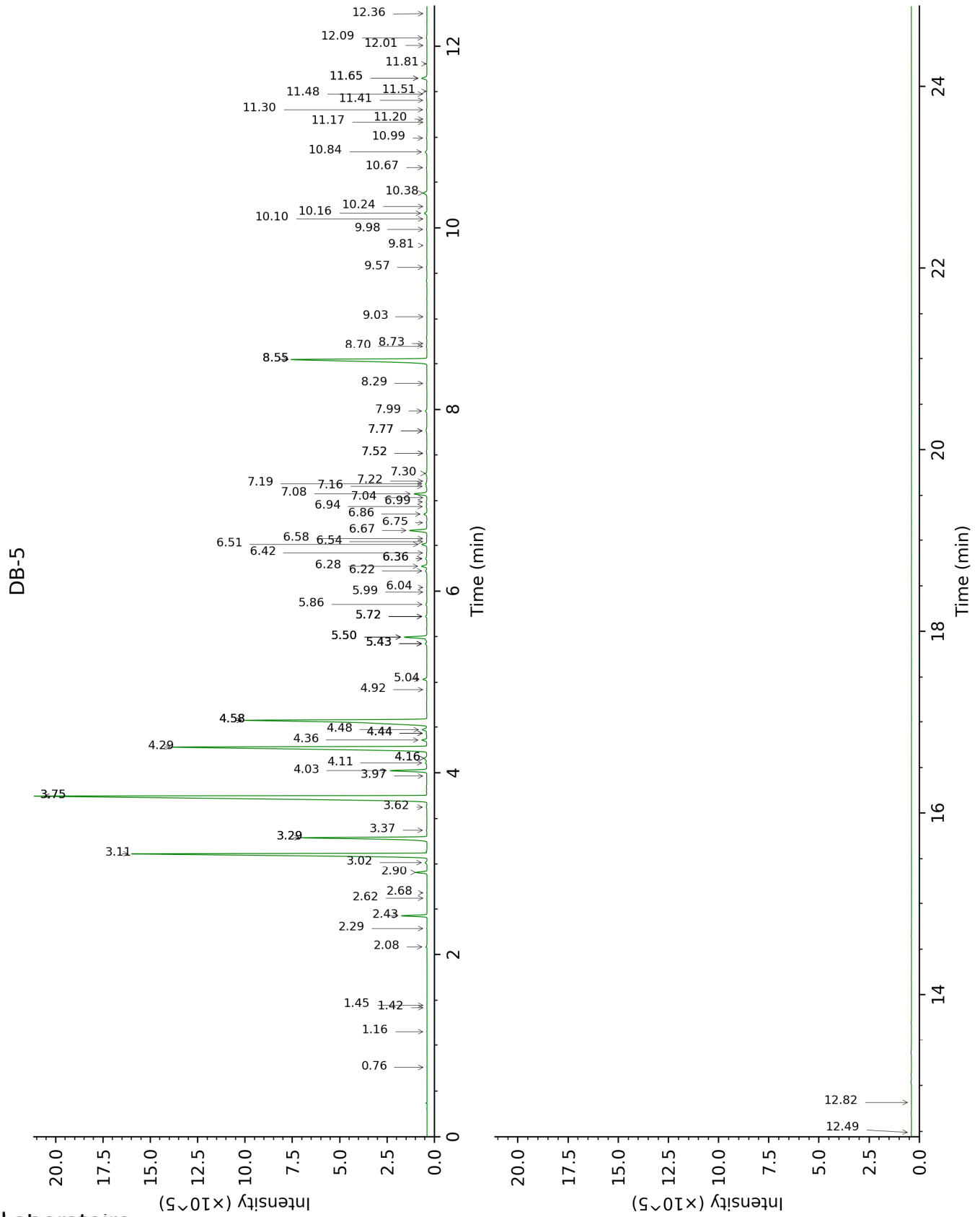
*: Two or more compounds are coeluting on this column

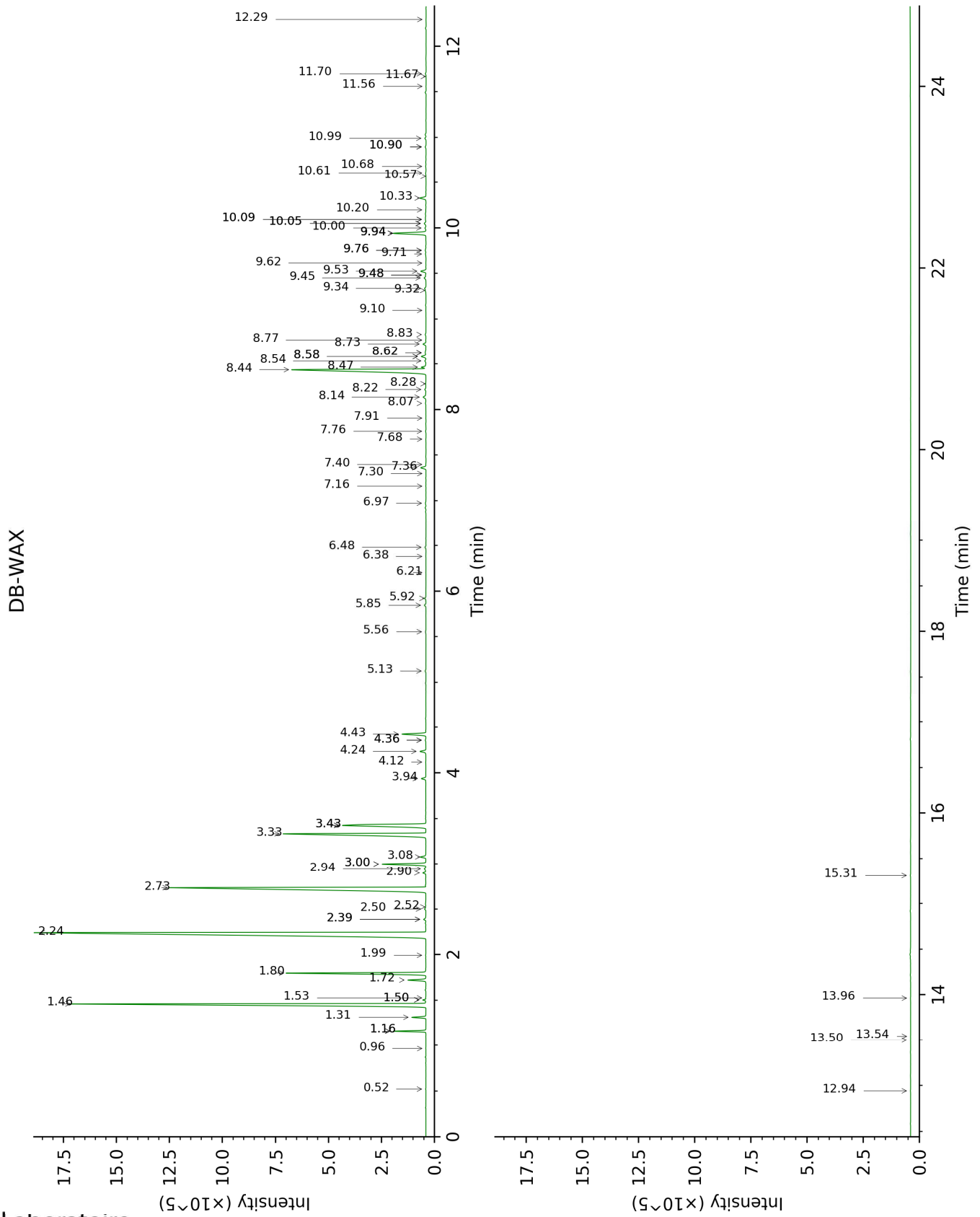
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
2-Ethylfuran	0.76	700	tr	0.96	920	tr
Toluene	1.16	760	0.01	1.53	1003	0.01
Hexanal	1.42	796	tr	1.99	1048	0.01
Octane	1.44	800	tr	0.52	787	0.01
(3Z)-Hexenol	2.08	855	0.04	5.92	1347	0.06
Hexanol	2.29	871	0.01	5.56	1321	0.03
Santene	2.43	883	0.89	1.16*	950	0.89
Unknown [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	2.62	898	0.01	1.50*	1001	0.09
Bornylene	2.68	903	0.01	1.16*	950	[0.89]
Tricyclene	2.90	918	0.45	1.31	974	0.46
α -Thujene	3.02	926	0.08	1.50*	1001	[0.09]
α -Pinene	3.11	932	16.53	1.46	997	16.33
α -Fenchene	3.29*	944	5.92	1.72	1022	0.64
Camphene	3.29*	944	[5.92]	1.80	1030	5.24
Thuja-2,4(10)- diene	3.37	949	0.02	2.39*	1086	0.09
meta-Cymene	3.62	966	0.04	3.00*	1136	1.61
β -Pinene	3.75*	974	29.25	2.24	1072	28.91
Sabinene	3.75*	974	[29.25]	2.39*	1086	[0.09]
Unknown [m/z 91, 119 (65), 109 (51), 134 (47)]	3.97	988	0.03			
Myrcene	4.03	992	1.60	3.00*	1136	[1.61]
2-Carene	4.11	998	0.07	2.50	1097	0.05
Pseudolimonene	4.16*	1001	0.19	2.94	1132	0.07
α -Phellandrene	4.16*	1001	[0.19]	2.90	1128	0.11
Δ^3 -Carene	4.28	1009	16.43	2.74	1116	16.33
α -Terpinene	4.36	1014	0.24	3.08	1142	0.22
Carvomenthene	4.44*	1018	0.04	2.52	1099	0.01
Hexyl acetate	4.44*	1018	[0.04]	4.36*	1239	0.03
para-Cymene	4.48	1021	0.25	4.24	1230	0.25
Limonene	4.58*	1027	12.75	3.33	1162	7.61
β -Phellandrene	4.58*	1027	[12.75]	3.43*	1169	5.19
1,8-Cineole	4.58*	1027	[12.75]	3.43*	1169	[5.19]
(E)- β -Ocimene	4.92	1049	0.01	4.12	1221	0.01
γ -Terpinene	5.04	1056	0.17	3.94	1208	0.18
meta-Cymenene	5.43*	1081	0.07	6.38	1380	0.01
Fenchone	5.43*	1081	[0.07]	5.85	1342	0.08
Isoterpinolene	5.43*	1081	[0.07]	4.36*	1239	[0.03]
Terpinolene	5.50*	1085	1.08	4.43	1244	0.99
γ -Campholenal	5.50*	1085	[1.08]	5.13	1295	0.03
para-Cymenene	5.50*	1085	[1.08]	6.48	1388	0.05
Unknown [m/z 79, 94 (87), 77 (25), 91 (21), 93	5.72*	1100	0.06			

(16), 95 (12), 138 (8)]						
Linalool	5.72*	1100	[0.06]	8.22	1517	0.06
α-Thujone	5.72*	1100	[0.06]	6.21	1368	0.01
endo-Fenchol	5.86	1108	0.05	8.54	1542	0.06
cis-para-Menth-2-en-1-ol	5.99	1117	0.01	8.28	1522	0.03
α-Campholenal	6.04	1120	0.01	7.16	1438	0.01
trans-Pinocarveol	6.22	1132	0.08	9.34	1604	0.07
Camphor	6.28	1135	0.26	7.36	1453	0.26
Camphene hydrate	6.36*	1141	0.08	8.62*	1548	0.06
trans-para-Menth-2-en-1-ol	6.36*	1141	[0.08]	9.10	1585	0.01
meta-Mentha-4,6-dien-8-ol	6.42	1145	0.03	9.48*	1616	0.02
Isoborneol	6.52	1151	0.25	9.53	1619	0.24
Pinocamphone	6.54	1153	0.01	7.40	1455	0.01
Pinocarvone	6.58	1155	0.03	8.07	1506	0.04
Borneol	6.67	1161	0.86	9.94*	1653	1.56
Isopinocamphone	6.75	1166	0.03	7.76	1482	0.02
Terpinen-4-ol	6.86	1173	0.17	8.73	1556	0.14
meta-Cymen-8-ol	6.94	1178	0.05	11.70	1800	0.04
Cryptone	6.99	1182	0.04	9.32	1602	0.04
para-Cymen-8-ol	7.04	1185	0.01	11.67	1798	0.01
α-Terpineol	7.08	1188	0.66	9.94*	1653	[1.56]
Myrtenal	7.16	1193	0.05	8.83	1565	0.04
Myrtenol	7.19	1195	0.06	10.99	1740	0.06
Methylchavicol	7.22	1197	0.02	9.48*	1616	[0.02]
Verbenone	7.30	1202	0.07	9.76*	1638	0.05
endo-Fenchyl acetate	7.52*	1217	0.01	6.97	1424	0.05
trans-Carveol	7.52*	1217	[0.01]	11.56	1788	0.01
Citronellol	7.77*	1234	0.09	10.90*	1732	0.05
Thymol methyl ether	7.77*	1234	[0.09]	8.58*	1545	0.22
Piperitone	7.98	1249	0.08	10.05*	1662	0.10
Phellandral	8.29	1270	0.01	10.09*	1665	0.03
Bornyl acetate	8.55*	1288	8.59	8.44	1534	8.68
Isobornyl acetate	8.55*	1288	[8.59]	8.47	1536	0.20
2-Undecanone	8.70	1298	0.04	8.77	1560	0.01
Thymol	8.73	1301	0.01	15.31	2136	0.02
Isohexyl isocaproate	9.03	1317	0.01	7.68	1476	0.02
Citronellyl acetate	9.57	1355	0.02	9.62	1627	0.02
α-Copaene	9.81	1372	0.01	7.30	1448	0.01
Geranyl acetate	9.98	1385	0.02	10.68	1714	0.03
β-Longipinene	10.10	1393	0.01	7.91	1493	0.01
Longifolene	10.16	1397	0.13	8.14	1511	0.19
Methyleugenol	10.24	1402	0.01	13.50	1962	0.01
β-Caryophyllene	10.38	1413	0.23	8.58*	1545	[0.22]
trans-α-	10.67	1435	0.03	8.62*	1548	[0.06]

Bergamotene						
α -Humulene	10.84	1448	0.09	9.45	1613	0.10
(<i>E</i>)- β -Farnesene	10.99	1459	0.03	9.72	1635	0.03
γ -Muurolene	11.17	1472	0.01	9.76*	1638	[0.05]
Germacrene D	11.20	1474	0.01	9.94*	1653	[1.56]
β -Selinene	11.30	1482	0.03	10.05*	1662	[0.10]
α -Selinene	11.41	1490	0.02	10.09*	1665	[0.03]
β -Himachalene	11.48	1495	0.03	10.00	1658	0.05
α -Muurolene	11.51	1497	0.01	10.20	1674	0.02
γ -Cadinene	11.65*	1508	0.29	10.57	1704	0.01
β -Bisabolene	11.65*	1508	[0.29]	10.33	1684	0.31
δ -Cadinene	11.81	1521	0.03	10.61	1708	0.03
α -Calacorene	12.01	1536	0.01	12.30	1853	0.02
(<i>E</i>)- α -Bisabolene	12.09	1543	0.04	10.90*	1732	[0.05]
(<i>E</i>)-Nerolidol	12.36	1564	0.01	13.96	2005	0.01
Caryophyllene oxide	12.49	1574	0.02	12.94	1911	0.01
Humulene epoxide II	12.82	1600	0.01	13.54	1966	0.01
Total identified		98.99%			98.68%	
Total reported		99.03%			98.68%	

*: 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
R.T.: Retention time (minutes)
R.I.: Retention index