

Date : January 24, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19A15-PTH06-1-CC

Customer identification : Pine - Austria - P7010683R

Type : Essential oil

Source : *Pinus sylvestris*

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 : January 18, 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: 1.4715 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Toluene	tr	0.01	Simple phenolic
Santene	0.05	0.05	Monoterpene
Tricyclene	0.09	0.09	Monoterpene
α -Thujene	0.02	0.03	Monoterpene
α -Pinene	41.15	41.07	Monoterpene
Camphene	1.10*	1.05	Monoterpene
α -Fenchene	[1.10]*	0.05	Monoterpene
Thuja-2,4(10)-diene	0.03	0.06*	Monoterpene
Unknown	tr		Monoterpene
β -Pinene	20.49*	20.34	Monoterpene
Sabinene	[20.49]*	[0.06]*	Monoterpene
Unknown	0.06	0.07*	Monoterpene
Myrcene	3.34	3.34	Monoterpene
2,7-Dimethyl-2,6-octadiene	0.05*	0.03	Monoterpene
3-para-Menthene?	[0.05]*	0.02	Monoterpene
<i>trans</i> -Carane?	0.03	[0.06]*	Monoterpene
Pseudolimonene	0.34*	0.16	Monoterpene
α -Phellandrene	[0.34]*	0.18	Monoterpene
Δ^3 -Carene	15.40	15.38	Monoterpene
α -Terpinene	1.49	1.48	Monoterpene
Carvomenthene	0.03*	[0.07]*	Aliphatic alcohol
ortho-Cymene	[0.03]*	1.46*	Simple phenolic
para-Cymene	1.47	[1.46]*	Monoterpene
Limonene	8.78*	7.68	Monoterpene
β -Phellandrene	[8.78]*	0.99*	Monoterpene
1,8-Cineole	[8.78]*	[0.99]*	Monoterpenic ether
(<i>Z</i>)- β -Ocimene	0.01	0.01	Monoterpene
(<i>E</i>)- β -Ocimene	0.02	0.02	Monoterpene
γ -Terpinene	0.06	0.06	Monoterpene
Unknown	0.01	0.01	Oxygenated monoterpene
Terpinolene	0.59*	0.58	Monoterpene
para-Cymenene	[0.59]*	0.01	Monoterpene
α -Pinene oxide	tr		Monoterpenic ether
Linalool	0.02	0.57*	Monoterpenic alcohol
endo-Fenchol	0.04	0.04*	Monoterpenic alcohol
<i>trans</i> -Pinocarveol	0.05	0.05	Monoterpenic alcohol
Camphor	0.01	0.01*	Monoterpenic ketone
<i>trans</i> -Verbenol	0.08	0.07	Monoterpenic alcohol
Camphene hydrate	0.01	1.68*	Monoterpenic alcohol
Pinocamphone	tr	[0.01]*	Monoterpenic ketone
Pinocarvone	0.01	0.01	Monoterpenic ketone
Borneol	0.07	0.49*	Monoterpenic alcohol
Isopinocamphone	0.01	0.01	Monoterpenic ketone
Terpinen-4-ol	0.04	0.04	Monoterpenic alcohol
para-Cymen-8-ol	0.02	0.03	Monoterpenic alcohol
α -Terpineol	0.41	[0.49]*	Monoterpenic alcohol
Myrtenal	0.03	0.02	Monoterpenic aldehyde
Myrtenol	0.01*	0.01	Monoterpenic alcohol

Methylchavicol	[0.01]*	0.23*	Phenylpropanoid
Verbenone	0.01	0.03	Monoterpenic ketone
<i>trans</i> -Carveol	0.01	0.02	Monoterpenic alcohol
Thymol methyl ether	0.01	[1.68]*	Monoterpenic ether
Bornyl acetate	1.10*	1.16	Monoterpenic ester
Isobornyl acetate	[1.10]*	0.01	Monoterpenic ester
α -Longipinene	0.05	0.08*	Sesquiterpene
α -Cubebene	0.04	[0.08]*	Sesquiterpene
Longicyclene	0.02	0.01	Sesquiterpene
α -Ylangene	0.01	tr	Sesquiterpene
α -Copaene	0.08	0.08	Sesquiterpene
Geranyl acetate	0.02	0.01	Monoterpenic ester
Longifolene	0.55	[0.57]*	Sesquiterpene
Methyleugenol	0.01	tr	Phenylpropanoid
β -Caryophyllene	1.64	[1.68]*	Sesquiterpene
β -Copaene	0.01	[0.04]*	Sesquiterpene
α -Humulene	0.22	[0.23]*	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.01	[0.23]*	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.03	0.03	Sesquiterpene
Germacrene D	0.02	0.01*	Sesquiterpene
<i>trans</i> -Muurolo-4(15),5-diene	tr	[0.01]*	Sesquiterpene
α -Selinene	0.01	0.01	Sesquiterpene
β -Himachalene	0.01	[0.49]*	Sesquiterpene
α -Muurolole	0.03	0.03	Sesquiterpene
γ -Cadinene	0.01	0.03	Sesquiterpene
<i>trans</i> -Calamenene	0.14*	0.02	Sesquiterpene
δ -Cadinene	[0.14]*	0.11*	Sesquiterpene
Zonarene	[0.14]*	[0.11]*	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	0.01	Sesquiterpene
Caryophyllene oxide	0.14*	0.13	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.14]*	0.03	Sesquiterpenic ether
Longiborneol	0.01	0.01	Sesquiterpenic alcohol
Humulene epoxide II	0.01	0.02	Sesquiterpenic ether
1- <i>epi</i> -Cubenol	0.01	0.01	Sesquiterpenic alcohol
τ -Cadinol	0.01		Sesquiterpenic alcohol
β -Eudesmol	0.01	0.02*	Sesquiterpenic alcohol
meta-Camphorene	0.02	[0.02]*	Diterpene
para-Camphorene	0.01	tr	Diterpene
Unknown	0.01		Unknown
Hexanal		0.01	Aliphatic aldehyde
α -Campholenal		0.01	Monoterpenic aldehyde
Nopinone		0.01	Normonoterpenic ketone
Total identified	99.60%	99.40%	

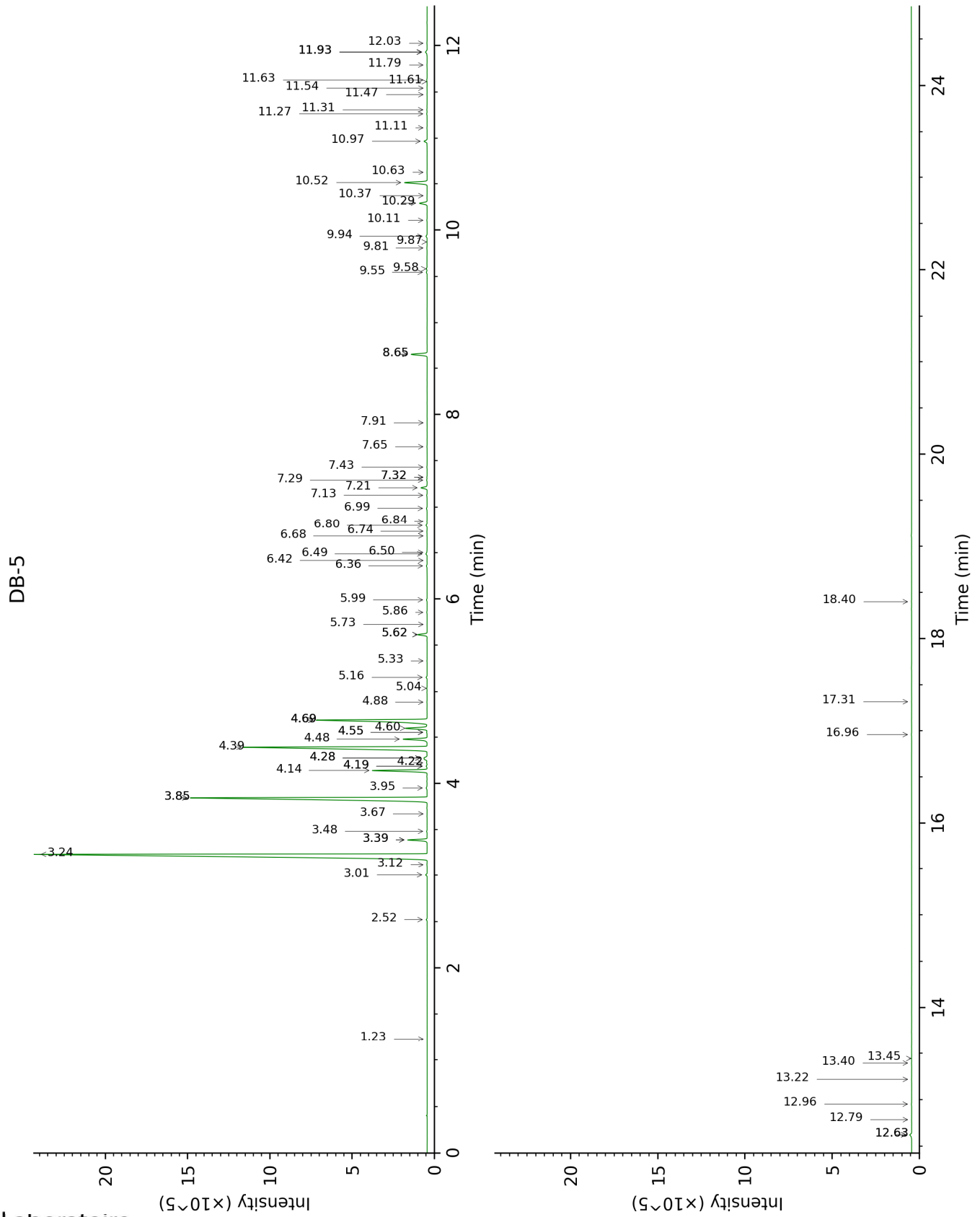
*: Two or more compounds are coeluting on this column

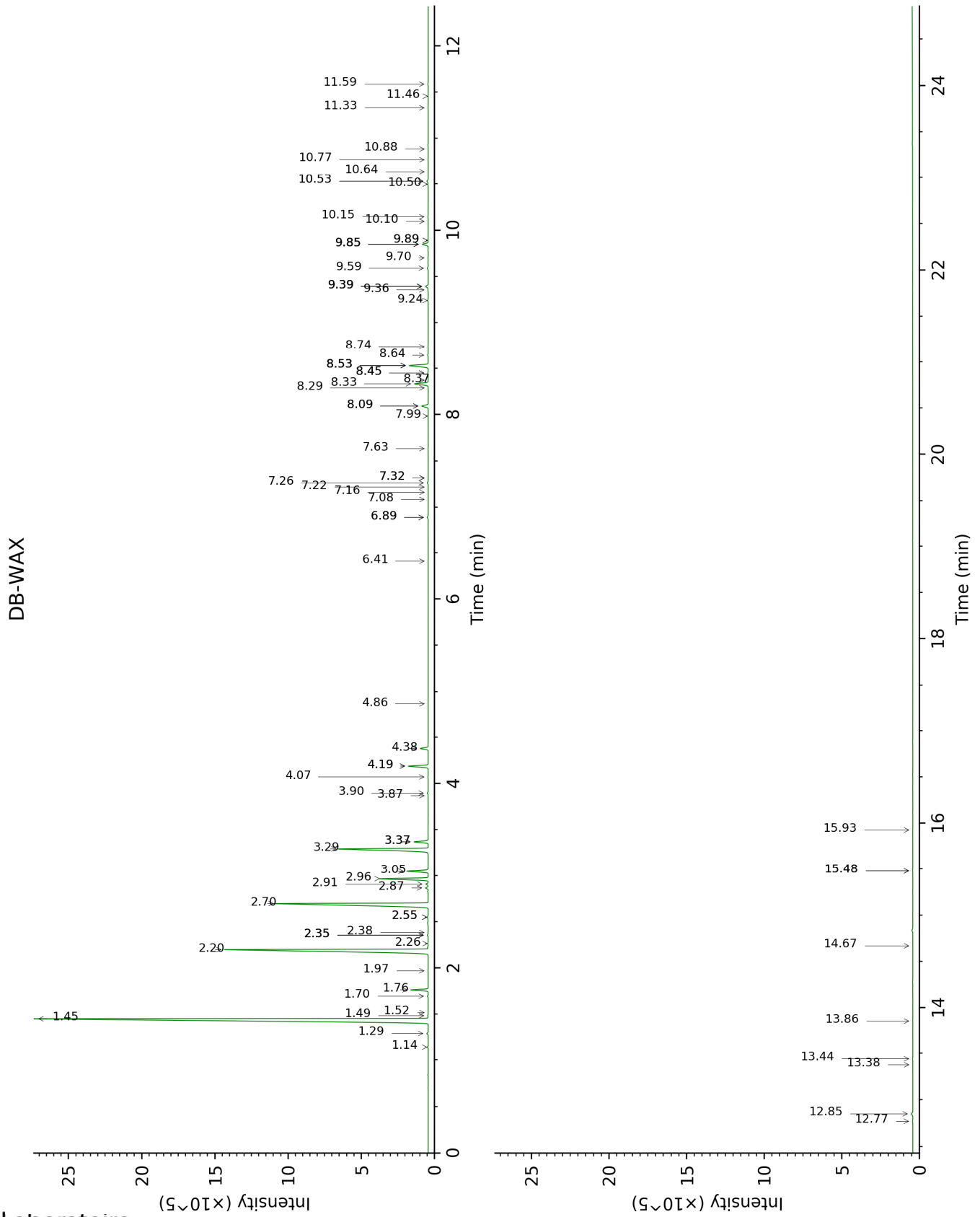
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Toluene	1.23	756	tr	1.52	1007	0.01
Santene	2.52	881	0.05	1.14	953	0.05
Tricyclene	3.01	917	0.09	1.29	976	0.09
α -Thujene	3.12	925	0.02	1.48	1004	0.03
α -Pinene	3.24	932	41.15	1.45	999	41.07
Camphene	3.39*	942	1.10	1.76	1030	1.05
α -Fenchene	3.39*	942	[1.10]	1.70	1023	0.05
Thuja-2,4(10)-diene	3.48	948	0.03	2.36*	1086	0.06
Unknown [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]	3.67	961	tr			
β -Pinene	3.85*	972	20.49	2.20	1071	20.34
Sabinene	3.85*	972	[20.49]	2.36*	1086	[0.06]
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.95	979	0.06	2.55*	1104	0.07
Myrcene	4.14	992	3.34	2.96	1136	3.34
2,7-Dimethyl-2,6-octadiene	4.19*	995	0.05	2.26	1077	0.03
3-para-Menthene?	4.19*	995	[0.05]	2.38	1088	0.02
<i>trans</i> -Carane?	4.22	997	0.03	2.36*	1086	[0.06]
Pseudolimonene	4.28*	1000	0.34	2.91	1131	0.16
α -Phellandrene	4.28*	1000	[0.34]	2.86	1128	0.18
Δ^3 -Carene	4.39	1008	15.40	2.70	1115	15.38
α -Terpinene	4.48	1014	1.49	3.05	1142	1.48
Carvomenthene	4.55*	1018	0.03	2.55*	1104	[0.07]
ortho-Cymene	4.55*	1018	[0.03]	4.19*	1232	1.46
para-Cymene	4.60	1021	1.47	4.19*	1232	[1.46]
Limonene	4.69*	1026	8.78	3.29	1162	7.68
β -Phellandrene	4.69*	1026	[8.78]	3.37*	1168	0.99
1,8-Cineole	4.69*	1026	[8.78]	3.37*	1168	[0.99]
(Z)- β -Ocimene	4.88	1039	0.01	3.87	1208	0.01
(E)- β -Ocimene	5.04	1048	0.02	4.07	1223	0.02
γ -Terpinene	5.16	1056	0.06	3.90	1210	0.06
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.33	1067	0.01	4.86	1284	0.01
Terpinolene	5.62*	1085	0.59	4.38	1246	0.58
para-Cymenene	5.62*	1085	[0.59]	6.41	1387	0.01
α -Pinene oxide	5.73	1092	tr			
Linalool	5.86	1100	0.02	8.09*	1514	0.57
endo-Fenchol	5.99	1109	0.04	8.45*	1542	0.04

<i>trans</i> -Pinocarveol	6.36	1133	0.05	9.24	1604	0.05
Camphor	6.42	1136	0.01	7.32*	1455	0.01
<i>trans</i> -Verbenol	6.49	1141	0.08	9.59	1632	0.07
Camphene hydrate	6.50	1142	0.01	8.53*	1548	1.68
Pinocamphone	6.68	1154	tr	7.32*	1455	[0.01]
Pinocarvone	6.74	1157	0.01	7.98	1505	0.01
Borneol	6.80	1161	0.07	9.85*	1653	0.49
Isopinocamphone	6.84	1164	0.01	7.63	1479	0.01
Terpinen-4-ol	6.99	1173	0.04	8.64	1557	0.04
para-Cymen-8-ol	7.13	1182	0.02	11.59	1799	0.03
α -Terpineol	7.21	1188	0.41	9.85*	1653	[0.49]
Myrtenal	7.29	1193	0.03	8.74	1564	0.02
Myrtenol	7.32*	1195	0.01	10.88	1740	0.01
Methylchavicol	7.32*	1195	[0.01]	9.39*	1616	0.23
Verbenone	7.43	1202	0.01	9.70	1641	0.03
<i>trans</i> -Carveol	7.65	1217	0.01	11.46	1788	0.02
Thymol methyl ether	7.91	1235	0.01	8.53*	1548	[1.68]
Bornyl acetate	8.65*	1286	1.10	8.33	1532	1.16
Isobornyl acetate	8.65*	1286	[1.10]	8.37	1536	0.01
α -Longipinene	9.55	1345	0.05	6.89*	1423	0.08
α -Cubebene	9.58	1347	0.04	6.89*	1423	[0.08]
Longicyclene	9.81	1363	0.02	7.22	1448	0.01
α -Ylangene	9.87	1368	0.01	7.16	1443	tr
α -Copaene	9.94	1372	0.08	7.26	1451	0.08
Geranyl acetate	10.11	1385	0.02	10.64	1719	0.01
Longifolene	10.29	1398	0.55	8.09*	1514	[0.57]
Methyleugenol	10.37	1404	0.01	13.38	1962	tr
β -Caryophyllene	10.52	1414	1.64	8.53*	1548	[1.68]
β -Copaene	10.63	1423	0.01	8.45*	1542	[0.04]
α -Humulene	10.97	1448	0.22	9.39*	1616	[0.23]
<i>cis</i> -Muuro-la-4(15),5-diene	11.11	1459	0.01	9.39*	1616	[0.23]
<i>trans</i> -Cadina-1(6),4-diene	11.26	1470	0.03	9.36	1613	0.03
Germacrene D	11.31	1474	0.02	9.89*	1657	0.01
<i>trans</i> -Muuro-la-4(15),5-diene	11.47	1486	tr	9.89*	1657	[0.01]
α -Selinene	11.54	1491	0.01	10.10	1673	0.01
β -Himachalene	11.61	1496	0.01	9.85*	1653	[0.49]
α -Muuro-lene	11.63	1498	0.03	10.15	1678	0.03
γ -Cadinene	11.79	1510	0.01	10.50	1706	0.03
<i>trans</i> -Calamenene	11.93*	1521	0.14	11.33	1778	0.02
δ -Cadinene	11.93*	1521	[0.14]	10.53*	1709	0.11
Zonarene	11.93*	1521	[0.14]	10.53*	1709	[0.11]
<i>trans</i> -Cadina-1,4-diene	12.03	1528	0.01	10.77	1730	0.01
Caryophyllene oxide	12.63*	1576	0.14	12.85	1913	0.13
Caryophyllene	12.63*	1576	[0.14]	12.77	1905	0.03

oxide isomer						
Longiborneol	12.79	1588	0.01	14.67	2085	0.01
Humulene epoxide II	12.96	1602	0.01	13.44	1968	0.02
1-epi-Cubenol	13.22	1623	0.01	13.86	2006	0.01
τ -Cadinol	13.40	1638	0.01			
β -Eudesmol	13.44	1642	0.01	15.48*	2166	0.02
meta-Camphorene	16.96	1953	0.02	15.48*	2166	[0.02]
para-Camphorene	17.31	1987	0.01	15.93	2211	tr
Unknown [m/z 191, 81 (47), 95 (41), 69 (39), 109 (32), 93 (32)...]	18.40	2094	0.01			
Hexanal				1.97	1049	0.01
α -Campholenal				7.08	1438	0.01
Nopinone				8.29	1529	0.01
Total identified		99.60%			99.40%	
Total reported		99.69%			99.41%	

*: 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