

Date : December 21, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22L15-PTH01

Customer identification : Pine Scots - Austria - P70110R

Type : Essential oil

Source : *Pinus sylvestris*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Amélie Simard, Analyste

Analysis date : December 19, 2022

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4712 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Toluene	tr	Simple phenolic
Santene	0.09	Normonoterpene
Tricyclene	0.13	Monoterpene
α -Thujene	0.05	Monoterpene
α -Pinene	53.28	Monoterpene
Camphene	1.21	Monoterpene
α -Fenchene	0.03	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Unknown	0.04	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.02	Monoterpene
β -Pinene	10.91	Monoterpene
Sabinene	0.04	Monoterpene
Unknown	0.15	Monoterpene
Myrcene	4.59	Monoterpene
2,7-Dimethyl-2,6-octadiene	0.06	Monoterpene
3-para-Menthene?	0.01	Monoterpene
α -Phellandrene	0.09	Monoterpene
Pseudolimonene	0.31	Monoterpene
Δ^3 -Carene	11.41	Monoterpene
1,4-Cineole	0.05	Monoterpenic ether
α -Terpinene	0.18	Monoterpene
Carvomenthene	0.03	Aliphatic alcohol
para-Cymene	0.74	Monoterpene
Limonene	7.99	Monoterpene
β -Phellandrene	0.66	Monoterpene
1,8-Cineole	0.07	Monoterpenic ether
ortho-Cymene	0.01	Monoterpene
(Z)- β -Ocimene	0.02	Monoterpene
(E)- β -Ocimene	0.03	Monoterpene
γ -Terpinene	0.16	Monoterpene
Terpinolene isomer	0.01	Monoterpene
Fenchone	0.01	Monoterpenic ketone
Terpinolene	0.62	Monoterpene
para-Cymenene	0.02	Monoterpene
α -Pinene oxide	0.02	Monoterpenic ether
Verbenol analog?	0.01	Monoterpenic alcohol
endo-Fenchol	0.06	Monoterpenic alcohol
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
α -Campholenal	0.01	Monoterpenic aldehyde
Nopinone	0.01	Normonoterpenic ketone
<i>cis</i> -para-Mentha-2,8-dien-1-ol	0.03	Monoterpenic alcohol
<i>trans</i> -Pinocarveol	0.03	Monoterpenic alcohol
Camphor	0.02	Monoterpenic ketone
<i>trans</i> -Verbenol	0.05	Monoterpenic alcohol

Camphene hydrate	0.02	Monoterpenic alcohol
Isoborneol	0.02	Monoterpenic alcohol
Pinocarvone	0.02	Monoterpenic ketone
Borneol	0.10	Monoterpenic alcohol
Isopinocampone	0.03	Monoterpenic ketone
Terpinen-4-ol	0.04	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
para-Cymen-8-ol	0.04	Monoterpenic alcohol
Myrtenal	0.02	Monoterpenic aldehyde
α -Terpineol	0.35	Monoterpenic alcohol
Myrtenol	0.03	Monoterpenic alcohol
Methylchavicol	0.03	Phenylpropanoid
Verbenone	0.02	Monoterpenic ketone
endo-Fenchyl acetate	0.02	Monoterpenic ester
trans-Carveol	0.02	Monoterpenic alcohol
cis-Carveol	0.01	Monoterpenic alcohol
Thymol methyl ether analog I (isothymol methyl ether?)	0.02	Monoterpenic ether
Piperitone	0.02	Monoterpenic ketone
Bornyl acetate	0.82	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Carvacrol	0.01	Monoterpenic alcohol
α -Longipinene	0.08	Sesquiterpene
α -Terpinyl acetate	0.01	Monoterpenic ester
α -Cubebene	0.01	Sesquiterpene
Longicyclene	0.03	Sesquiterpene
α -Ylangene	0.02	Sesquiterpene
α -Copaene	0.12	Sesquiterpene
β -Bourbonene	0.01	Sesquiterpene
β -Elemene	0.01	Sesquiterpene
β -Longipinene	0.01	Sesquiterpene
Longifolene	0.73	Sesquiterpene
β -Caryophyllene	2.10	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
Cadina-3,5-diene?	0.02	Sesquiterpene
α -Humulene	0.20	Sesquiterpene
cis-Muurolo-4(15),5-diene	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.04	Sesquiterpene
γ -Muurolole	0.03	Sesquiterpene
Germacrene D	0.02	Sesquiterpene
β -Selinene	0.01	Sesquiterpene
trans-Muurolo-4(15),5-diene	0.02	Sesquiterpene
β -Himachalene	0.01	Sesquiterpene
α -Muurolole	0.04	Sesquiterpene
(Z)- α -Bisabolene	0.02	Sesquiterpene
γ -Cadinene	0.02	Sesquiterpene
trans-Calamenene	0.03	Sesquiterpene
δ -Cadinene	0.13	Sesquiterpene
trans-Cadina-1,4-diene	0.03	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Caryophyllene oxide	0.09	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether

Longiborneol	0.02	Sesquiterpenic alcohol
Guaiol	0.03	Sesquiterpenic alcohol
Humulene epoxide II	0.02	Sesquiterpenic ether
1-epi-Cubenol	0.01	Sesquiterpenic alcohol
Bulnesol	0.04	Sesquiterpenic alcohol
Sandaracopimaradiene?	0.01	Diterpene
Unknown	0.01	Oxygenated diterpene
para-Camphorene	0.01	Diterpene
Unknown	0.02	Unknown
Consolidated total	99.02%	

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

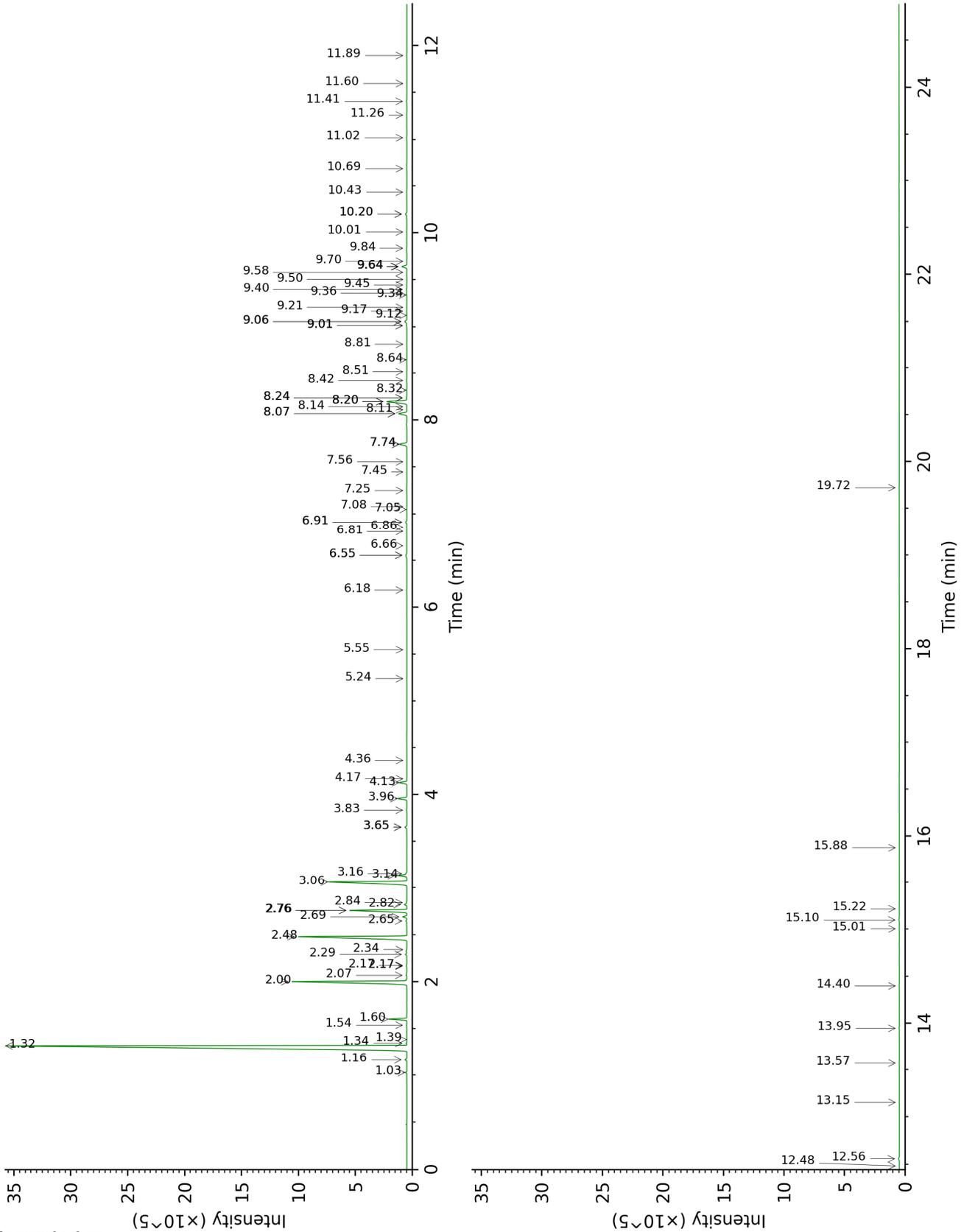
Note: no correction factor was applied

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.

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DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.24	759	tr	1.38	1002	tr
Santene	2.55	883	0.09	1.03	946	0.08
Tricyclene	3.03	919	0.13	1.16	970	0.13
α -Thujene	3.15	926	0.05	1.34	998	0.04
α -Pinene	3.27	934	53.28	1.32	995	53.51
Camphene	3.42*	944	1.24	1.60	1025	1.21
α -Fenchene	3.42*	944	[1.24]	1.54	1018	0.03
Thuja-2,4(10)-diene	3.45	946	0.02	2.17*	1084	0.03
Benzaldehyde	3.58	954	0.01	7.08	1455	0.01
Unknown [m/z 121, 93 (86), 79 (71), 67 (62), 55 (49)... 136 (24)]	3.67	960	0.04			
3,7,7-Trimethylcyclohepta-1,3,5-triene	3.77	967	0.02	2.76*	1134	4.62
β -Pinene	3.86*	973	10.90	2.00	1066	10.91
Sabinene	3.86*	973	[10.90]	2.17	1084	0.04
Unknown [m/z 93, 79 (73), 67 (49), 95 (42), 91 (41), 121 (38)...]	3.98	981	0.15	2.29	1096	0.11
Myrcene	4.18	993	4.59	2.76*	1134	[4.62]
2,7-Dimethyl-2,6-octadiene	4.22*	996	0.10	2.07	1073	0.06
3-para-Menthene?	4.22*	996	[0.10]	2.17*	1084	[0.03]
α -Phellandrene	4.30*	1001	0.42	2.65	1125	0.09
Pseudolimonene	4.30*	1001	[0.42]	2.69	1128	0.31
Δ^3 -Carene	4.42	1009	11.41	2.48	1111	11.45
1,4-Cineole	4.48	1013	0.05	2.84	1140	0.04
α -Terpinene	4.51	1015	0.18	2.82	1139	0.17
Carvomenthene	4.58	1019	0.03	2.34	1100	0.02
para-Cymene	4.63	1022	0.74	3.96	1228	0.74
Limonene	4.72*	1028	8.70	3.06	1158	7.99
β -Phellandrene	4.72*	1028	[8.70]	3.14	1164	0.66
1,8-Cineole	4.72*	1028	[8.70]	3.16	1166	0.07
ortho-Cymene	4.84	1035	0.01	4.36	1259	tr
(Z)- β -Ocimene	4.92	1040	0.02	3.65*	1206	0.17
(E)- β -Ocimene	5.07	1050	0.03	3.83	1219	0.03
γ -Terpinene	5.19	1057	0.16	3.65*	1206	[0.17]
Terpinolene isomer	5.59*	1082	0.02	4.17	1244	0.01
Fenchone	5.59*	1082	[0.02]	5.55	1343	0.01
Terpinolene	5.65*	1086	0.64	4.13	1241	0.62
para-Cymenene	5.65*	1086	[0.64]	6.18	1389	0.02
α -Pinene oxide	5.75	1092	0.02	5.24	1320	0.01
Verbenol analog?	6.01	1108	0.01	8.11	1533	0.01
endo-Fenchol	6.06	1112	0.06	8.20*	1540	2.11
trans-para-Mentha-2,8-dien-1-ol	6.17	1119	0.02	8.82	1588	0.01
α -Campholenal	6.21	1121	0.01	6.86	1439	0.03

Nopinone	6.32	1128	0.01	8.07*	1530	0.80
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.40†	1133	0.07	9.34	1630	0.03
<i>trans</i> -Pinocarveol	6.42†	1134	[0.07]	9.01*	1604	0.04
Camphor	6.45	1136	0.02	7.05	1453	0.01
<i>trans</i> -Verbenol	6.55*	1143	0.07	9.40	1635	0.05
Camphene hydrate	6.55*	1143	[0.07]	8.32	1550	0.02
Isoborneol	6.72	1153	0.02	9.21	1620	0.02
Pinocarvone	6.75	1156	0.02	7.74*	1505	0.74
Borneol	6.87	1163	0.10	9.64*	1655	0.49
Isopinocampone	6.91	1166	0.03	7.45	1482	0.01
Terpinen-4-ol	7.04	1174	0.04	8.42	1558	0.04
Cryptone	7.12	1179	0.01	9.01*	1604	[0.04]
para-Cymen-8-ol	7.22	1185	0.04	11.41	1803	0.04
Myrtenal	7.28*	1189	0.41	8.51	1565	0.02
α-Terpineol	7.28*	1189	[0.41]	9.64*	1655	[0.49]
Myrtenol	7.37*	1195	0.07	10.69	1742	0.03
Methylchavicol	7.37*	1195	[0.07]	9.17	1616	0.03
Verbenone	7.50	1203	0.02	9.45	1639	0.02
endo-Fenchyl acetate	7.70	1216	0.02	6.66	1424	0.01
<i>trans</i> -Carveol	7.73	1218	0.02	11.26	1790	0.02
<i>cis</i> -Carveol	7.91	1230	0.01	11.60	1820	0.01
Thymol methyl ether analog I (isothymol methyl ether?)	7.97	1234	0.02	8.24*	1543	0.05
Piperitone	8.19	1248	0.02	9.70	1659	0.02
Bornyl acetate	8.69	1282	0.82	8.07*	1530	[0.80]
Unknown [m/z 43, 93 (66), 91 (44), 41 (38), 69 (35)... 152? (1)]	8.93	1298	0.01			
Carvacrol	9.04	1306	0.01	15.22	2158	0.01
α-Longipinene	9.59	1344	0.08	6.55*	1416	0.09
α-Terpinyl acetate	9.63*	1347	0.08	9.50	1644	0.01
α-Cubebene	9.63*	1347	[0.08]	6.55*	1416	[0.09]
Longicyclene	9.85	1362	0.03	6.91*	1443	0.12
α-Ylangene	9.92	1367	0.02	6.81	1435	0.02
α-Copaene	9.98	1371	0.12	6.91*	1443	[0.12]
β-Bourbonene	10.08	1379	0.01	7.25	1468	0.01
β-Elemene	10.22	1389	0.01	8.24*	1543	[0.05]
β-Longipinene	10.27	1392	0.01	7.56	1490	0.01
Longifolene	10.34	1397	0.73	7.74*	1505	[0.74]
β-Caryophyllene	10.56	1413	2.10	8.20*	1540	[2.11]
β-Copaene	10.68	1422	0.02	8.14	1536	0.02
Cadina-3,5-diene?	10.98	1444	0.02	8.64	1574	0.01
α-Humulene	11.02	1446	0.20	9.06*	1607	0.24
<i>cis</i> -Muurolo-4(15),5-diene	11.15	1457	0.02	9.12	1613	0.02
<i>trans</i> -Cadina-1(6),4-diene	11.31	1468	0.04	9.06*	1607	[0.24]
γ-Muurolole	11.35	1472	0.03	9.36	1632	0.03
Germacrene D	11.39	1474	0.02	9.58	1650	0.01
β-Selinene	11.46	1479	0.01	9.64*	1655	[0.49]

<i>trans</i> -Muurola-4(15),5-diene	11.53	1484	0.02	9.64*	1655	[0.49]
β-Himachalene	11.65	1494	0.01	9.64*	1655	[0.49]
α-Muurolene	11.68	1496	0.04	9.84	1670	0.03
(Z)-α-Bisabolene	11.75	1501	0.02	10.01	1684	0.03
γ-Cadinene	11.84	1508	0.02	10.20*	1700	0.15
<i>trans</i> -Calamenene	11.98*	1519	0.20	11.02	1770	0.03
δ-Cadinene	11.98*	1519	[0.20]	10.20*	1700	[0.15]
<i>trans</i> -Cadina-1,4-diene	12.08	1527	0.03	10.43	1720	0.03
Isocaryophyllene epoxide B	12.30	1544	0.02	11.90	1846	0.02
Caryophyllene oxide	12.67*	1573	0.10	12.56	1905	0.09
Caryophyllene oxide isomer	12.67*	1573	[0.10]	12.48	1898	0.01
Longiborneol	12.85	1587	0.02	14.40	2077	0.01
Guaiol	12.92	1593	0.03	13.95	2034	0.03
Humulene epoxide II	13.01	1599	0.02	13.15	1960	0.02
1-epi-Cubenol	13.27	1621	0.01	13.57	1998	0.01
Bulnesol	13.76	1661	0.04	15.10	2146	0.05
Sandaracopimaradiene?	16.79	1928	0.01	15.01	2137	0.01
Unknown [m/z 105, 91 (100), 81 (89), 79 (86), 109 (86), 257 (83)... 275 (12)...]	17.29	1975	0.01	15.88	2225	0.01
para-Camphorene	17.36	1982	0.01			
Unknown [m/z 191, 81 (47), 95 (41), 69 (39), 109 (32), 93 (32)...]	18.47	2091	0.02	19.72	2651	0.02
Total identified		98.95%			98.85%	
Total reported		99.18%			98.99%	

*: 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