

## GC/MS BATCH NUMBER: SA5100

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**ESSENTIAL OIL:** SPRUCE BLACK  
**BOTANICAL NAME:** PICEA MARIANA  
**ORIGIN:** CANADA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF SPRUCE BLACK OIL	%
BORNYL ACETATE	22.1
$\alpha$ -PINENE	18.2
CAMPHENE	14.1
$\Delta$ 3-CARENE	10.6
$\beta$ -PINENE	8.1
MYRCENE	3.2
LIMONENE	3.0
$\beta$ -PHELLANDRENE	2.1
SANTENE	1.8
TRICYCLENENE	1.4
BORNEOL	1.4
$\alpha$ -TERPINEOL	1.3

Comments from Robert Tisserand: Lively, fresh, green-pine odor quality. Constituents are in expected amounts.

**Date :** September 12, 2017

*SAMPLE IDENTIFICATION*

**Internal code :** 17I07-PTH3-1-DM

**Customer identification :** Black Spruce - Canada - SA510077R

**Type :** Essential oil

**Source :** *Picea mariana*

**Customer :** Plant Therapy

*ANALYSIS*

**Method :** PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Identifications double-checked by GC-MS

**Analyst :** Alexis St-Gelais, M. Sc., chimiste

**Analysis date :** 2017-09-06

Checked and approved by :

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

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Hexanal	1.72	806	0.03				Aliphatic aldehyde
<i>cis</i> -Hex-3-en-1-ol	2.50	865	0.06	0.04	1321	5.59	Aliphatic alcohol
Santene	2.62	874	1.79	1.70	884	0.97	Normonoterpene
Tricyclene	3.23	915	1.40	1.33	917	1.10	Monoterpene
$\alpha$ -Thujene	3.32	920	0.26	18.29	948	1.23*	Monoterpene
$\alpha$ -Pinene	3.46	929	18.16	[18.29]	948	1.23*	Monoterpene
Camphene	3.74*	945	14.16	14.11	994	1.53	Monoterpene
$\alpha$ -Fenchene	3.74*	945	[14.16]	0.11	985	1.45	Monoterpene
Thuja-2,4(10)-diene	3.80	949	0.03	0.48	1058	2.05*	Monoterpene
Sabinene	4.14	969	0.28	[0.48]	1058	2.05*	Monoterpene
$\beta$ -Pinene	4.22	974	8.11	7.73	1040	1.90	Monoterpene
Myrcene	4.49	990	3.23	3.55	1114	2.66*	Monoterpene
$\Delta$ 3-Carene	4.79*	1007	11.08	10.59	1093	2.40	Monoterpene
$\alpha$ -Phellandrene	4.79*	1007	[11.08]	0.28	1106	2.56	Monoterpene
<i>cis</i> -Hex-3-en-1-yl acetate	4.85	1010	0.04	0.04	1270	4.79	Aliphatic ester
$\alpha$ -Terpinene	4.95	1015	0.20	[3.55]	1114	2.66*	Monoterpene
Limonene	5.19*	1028	5.15	3.01	1140	3.00	Monoterpene
$\beta$ -Phellandrene	5.19*	1028	[5.15]	2.23	1145	3.06*	Monoterpene
1,8-Cineole	5.25	1031	0.52	[2.23]	1145	3.06*	Monoterp. ether
<i>cis</i> - $\beta$ -Ocimene	5.35	1037	0.01	0.24	1192	3.63*	Monoterpene
<i>trans</i> - $\beta$ -Ocimene	5.53	1047	0.01	0.41	1210	3.91	Monoterpene
$\gamma$ -Terpinene	5.72	1057	0.24	[0.24]	1192	3.63*	Monoterpene
<i>P. mariana</i> biomarker	6.03	1074	0.03	0.06	1450	8.09	Monoterp. alcohol
Isoterpinolene	6.12	1079	0.04	0.99	1226	4.14*	Monoterpene
Terpinolene	6.21	1084	0.96	[0.99]	1226	4.14*	Monoterpene
meta-Cymenene	6.24	1085	0.02	0.04	1360	6.21	Monoterpene
Fenchone	6.36	1092	0.05	0.07	1323	5.62	Monoterp. ketone
para-Cymenene	6.42	1095	0.15	0.16	1367	6.32	Monoterpene
$\gamma$ -Campholenal	6.47	1098	0.06				Monoterp. aldehyde
Linalool	6.71	1107	0.41	0.48	1496	9.23	Monoterp. alcohol
<i>trans</i> -Sabinene hydrate	6.79	1110	0.05	0.11	1490	9.06*	Monoterp. alcohol
endo-Fenchol	7.16	1123	0.10	0.86	1517	9.99*	Monoterp. alcohol
$\alpha$ -Campholenal	7.27	1127	0.18				Monoterp. aldehyde
<i>trans</i> -Pinocarveol	7.63	1140	0.19	0.38	1567	11.86*	Monoterp. alcohol
Camphor	7.79	1146	0.18	0.17	1422	7.42	Monoterp. ketone
<i>trans</i> -Verbenol	7.84	1148	0.05	0.09	1603	13.28	Monoterp. alcohol
Camphene hydrate	8.06	1156	0.57	[0.86]	1517	9.99*	Monoterp. alcohol
Isoborneol	8.34	1166	0.09	0.10	1594	12.87	Monoterp. alcohol
Borneol	8.68	1178	1.39	1.41	1615	13.95*	Monoterp. alcohol

Terpinen-4-ol	8.84	1184	0.49	0.59	1525	10.28*	Monoterp. alcohol
Myrtenal	9.28	1199	0.05	[0.59]	1525	10.28*	Monoterp. aldehyde
Cryptone	9.36	1201	0.05	[0.38]	1567	11.86*	Monoterp. ketone
para-Cymen-8-ol	9.44	1203	0.08	0.10	1777	23.65	Monoterp. alcohol
$\alpha$ -Terpineol	9.53	1205	1.31	1.62	1619	14.16*	Monoterp. alcohol
Verbenone	9.91*	1213	0.33	0.19	1609	13.60*	Monoterp. ketone
endo-Fenchyl acetate	9.91*	1213	[0.33]	0.27	1402	6.96	Monoterp. ester
Citronellol	10.64	1229	0.06	0.04	1712	19.26	Monoterp. alcohol
Thymol methyl ether	10.94	1236	0.09	0.09	1534	10.64	Monoterp. ether
cis-Verbenyl acetate	12.77	1276	0.14				Monoterp. ester
Bornyl acetate	13.14	1284	22.06	23.39	1508	9.69	Monoterp. ester
Isobornyl acetate	13.17	1285	0.41	[0.86]	1517	9.99*	Monoterp. ester
trans-Pinocarvyl acetate	13.59	1294	0.13	0.20	1548	11.15	Monoterp. ester
<i>P. mariana</i> biomarker	13.65	1295	0.10	0.25	1584	12.49*	Monoterp. ester
$\alpha$ -Cubebene	15.97	1331	0.05	0.16	1412	7.21	Sesquiterpene
exo-2-Hydroxycineole acetate	16.10	1333	0.03				Monoterp. alcohol
$\alpha$ -Terpinyl acetate	16.71	1342	0.08	[1.41]	1615	13.95*	Monoterp. ester
Citronellyl acetate	17.28	1351	0.10	[0.19]	1609	13.60*	Monoterp. ester
$\alpha$ -Copaene	17.72	1357	0.03	0.02	1436	7.76	Sesquiterpene
$\beta$ -Elemene	18.95	1376	0.08	[0.59]	1525	10.28*	Sesquiterpene
Geranyl acetate	19.40	1383	0.21	0.24	1690	17.91*	Monoterp. ester
Longifolene	19.69	1387	0.17	[0.11]	1490	9.06*	Sesquiterpene
$\beta$ -Caryophyllene	20.62	1400	0.29	[0.86]	1517	9.99*	Sesquiterpene
$\alpha$ -Humulene	23.43	1434	0.07	[0.25]	1584	12.49*	Sesquiterpene
trans-Cadina-1(6),4-diene	25.10	1454	0.05	[0.25]	1584	12.49*	Sesquiterpene
$\gamma$ -Muuroolene	25.50	1459	0.10	[0.19]	1609	13.60*	Sesquiterpene
Germacrene D	25.64	1460	0.14	[1.62]	1619	14.16*	Sesquiterpene
trans-Muurolo-4(14),5-diene	26.26	1468	0.04	0.05	1630	14.72	Sesquiterpene
$\beta$ -Selinene	26.44	1470	0.04	[1.62]	1619	14.16*	Sesquiterpene
$\alpha$ -Muuroolene	27.69	1485	0.26	0.34	1642	15.37	Sesquiterpene
$\gamma$ -Cadinene	28.74	1497	0.32	0.36	1666	16.65	Sesquiterpene
$\delta$ -Cadinene	29.41	1507	0.97	1.04	1673	17.00	Sesquiterpene
trans-Calamenene	29.77	1512	0.07	0.04	1731	20.51	Sesquiterpene
trans-Cadina-1,4-diene	30.54	1522	0.02	[0.24]	1690	17.91*	Sesquiterpene
$\alpha$ -Cadinene	30.88	1527	0.09	0.07	1702	18.57	Sesquiterpene
trans- $\alpha$ -Bisabolene	31.90	1542	0.22	0.38	1705	18.76	Sesquiterpene
1,10-diepi-Cubenol	36.68	1617	0.02	0.05	1950	34.87	Sesquiterp. alcohol
$\tau$ -Cadinol	37.57	1639	0.11	0.12	2066	39.25	Sesquiterp. alcohol
$\tau$ -Muurolol	37.69	1641	0.10	0.11	2080	39.71	Sesquiterp. alcohol
$\alpha$ -Muurolol	37.80	1644	0.03	0.02	2101	40.38	Sesquiterp. alcohol
$\alpha$ -Cadinol	38.13	1652	0.20	0.22	2140	41.42	Sesquiterp. alcohol
Oplopanone	41.09	1733	0.04	0.04	2344	46.23	Sesquiterp. alcohol

Manool	49.40	2041	0.04	0.04	2541	50.26	Diterp. alcohol
<i>cis</i> -Abienol	51.63	2139	0.05				Diterp. alcohol
<b>Total identified</b>			<b>98.6%</b>	<b>99.1%</b>			

\*: Two or more compounds are coeluting on this column

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

Note: no correction factor was applied

#### OTHER DATA

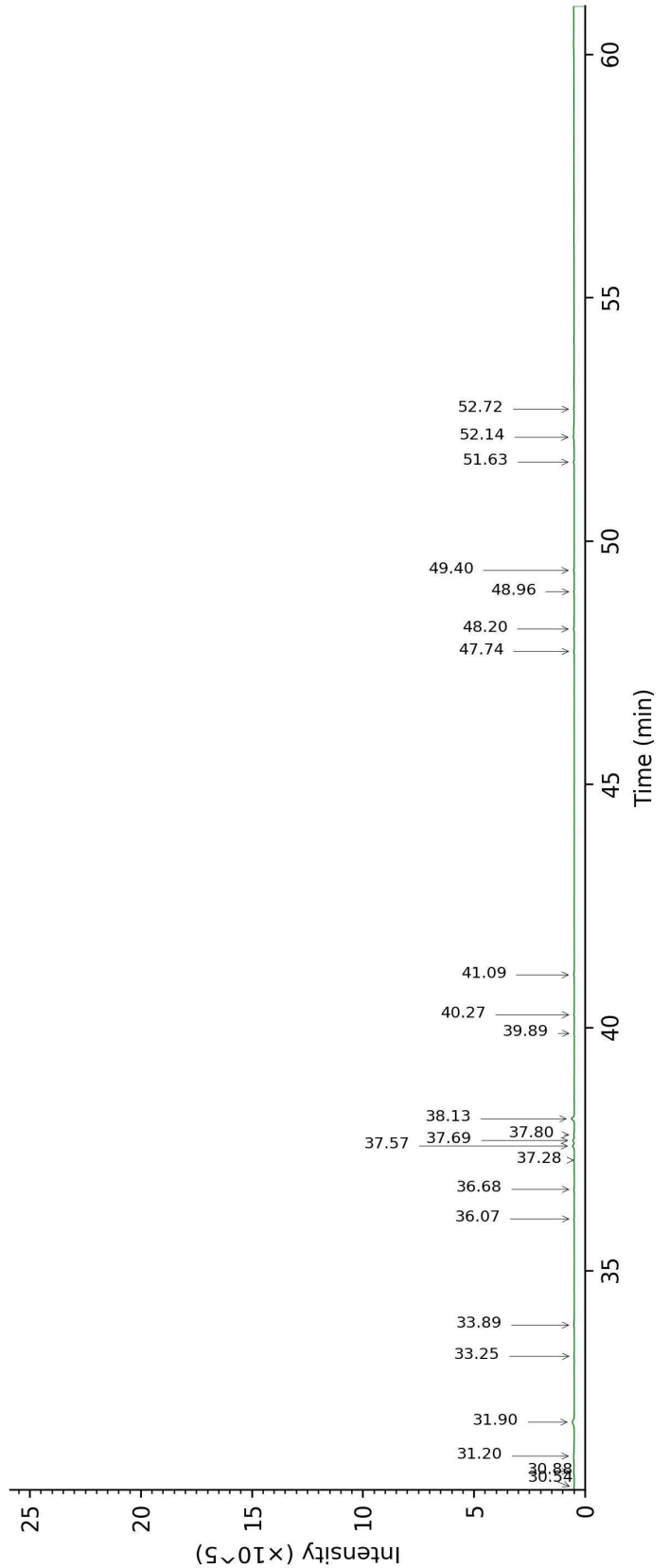
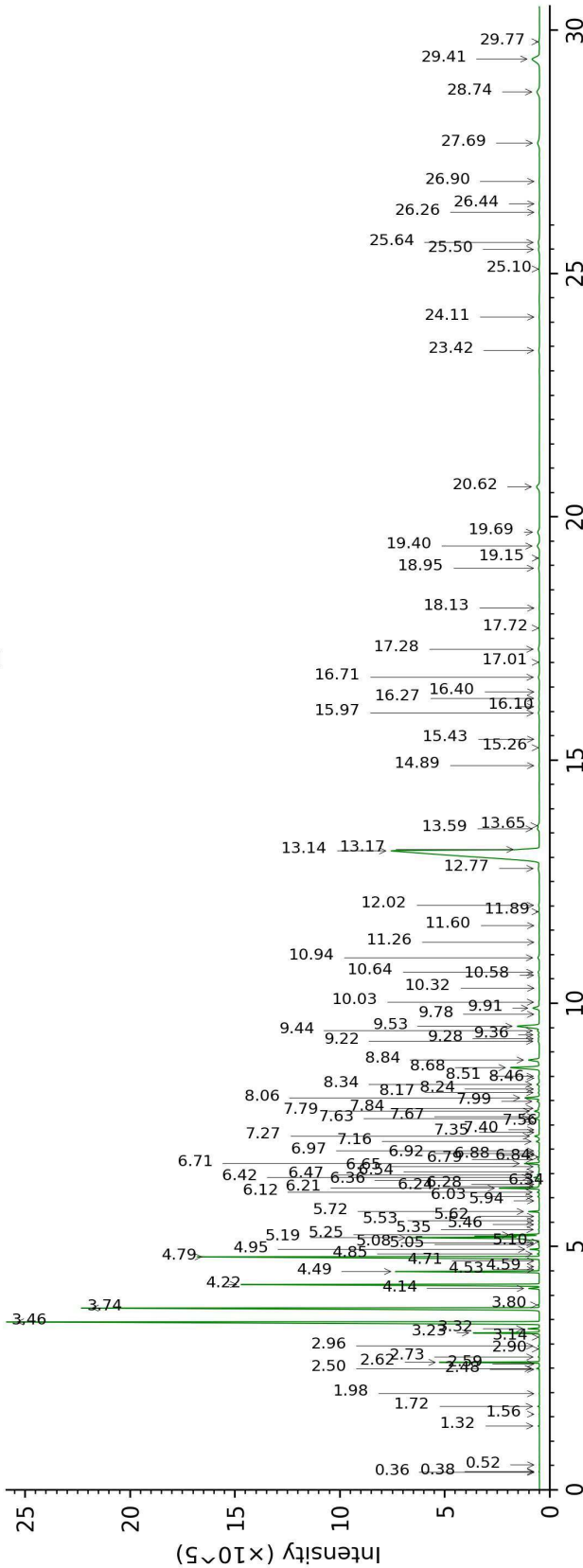
**Physical aspect :** Clear liquid

**Refractive index :** 1.4705 ± 0.0003 (20 °C)

#### CONCLUSION

No adulterant, contaminant or diluent were detected using this method.

17107-PTH3-1-DM\_BP5



17107-PTH3-1-DM\_WAX

