PLANT THERAPY
100% PURE ESSENTIAL OILS

GC/MS BATCH NUMBER: J40100

ESSENTIAL OIL: JACK PINE
BOTANICAL NAME: PINUS BANKSIANA
ORIGIN: CANDA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF JACK PINE OIL	%
α-PINENE	53.5
β-PINENE	9.8
Δ3-CARENE	6.4
BORNYL ACETATE	6.1
LIMONENE	5.3
MYRCENE	3.8
CAMPHENE	3.4
α-TERPINEOL	2.0
TERPINOLENE	1.1
β-PHELLANDRENE	1.0

Comments from Robert Tisserand: This Jack Pine is complex and fresh, green/woody. One of the minor constituents, cis-3-hexenol, smells very much like cut grass, and is quite unusual in essential oils.

Date : April 15, 2016

SAMPLE IDENTIFICATION

Internal code : 16C24-PTH15-1-DM
Customer identification : Jack Pine - Canada - J4010058R
Type : Essential oil
Source : *Pinus banksiana*
Customer : Plant Therapy

ANALYSIS

Method : PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).
Analyst : Sylvain Mercier, M. Sc., chimiste
Analysis date : 2016-04-09

Checked and approved by :

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.	
Toluene	1.16	743	0.06	54.37	965	0.97*	Simple phenolic
Hexanal	1.55	801	0.02	0.01	1020	1.25	Aliphatic aldehyde
cis-Hex-3-en-1-ol	2.30	862	0.04	0.02	1335	4.90	Aliphatic alcohol
Santene	2.41	872	0.10	0.09	909	0.74	Normonoterpene
Styrene	2.64	891	0.11	0.36	1193	2.96*	Phenylpropanoid
Tricyclene	3.00	915	0.87	0.85	933	0.84	Monoterpene
α-Thujene	3.09	921	0.07	[54.37]	965	0.97*	Monoterpene
α-Pinene	3.25	931	53.47	[54.37]	965	0.97*	Monoterpene
Camphene	3.47*	944	3.74	3.44	1009	1.16	Monoterpene
α-Fenchene	3.47*	944	[3.74]	0.11	1001	1.11	Monoterpene
Thuja-2,4(10)-diene	3.55	949	0.15	0.20	1062	1.59*	Monoterpene
Sabinene	3.87†	969	9.78	[0.20]	1062	1.59*	Monoterpene
β-Pinene	3.96†	974	[9.78]	9.77	1049	1.48	Monoterpene
Myrcene	4.23	991	3.84	3.80	1121	2.11	Monoterpene
Δ3-Carene	4.50*	1007	6.55	6.44	1099	1.88	Monoterpene
α-Phellandrene	4.50*	1007	[6.55]	0.10	1113	2.02	Monoterpene
α-Terpinene	4.66	1016	0.18	0.15	1127	2.17	Monoterpene
para-Cymene	4.84	1026	0.20	0.23	1214	3.20	Monoterpene
Limonene	4.90	1030	5.26	5.05	1146	2.41	Monoterpene
β-Phellandrene	4.92	1031	1.03	1.25	1151	2.46	Monoterpene
1,8-Cineole	4.97	1033	0.03	0.04	1158	2.55	Monoterp. ether
cis-β-Ocimene	5.07	1039	0.07	[0.36]	1193	2.96*	Monoterpene
γ-Terpinene	5.43	1059	0.22	[0.36]	1193	2.96*	Monoterpene
Isoterpinolene	5.74	1077	0.04	0.02	1224	3.35	Monoterpene
Terpinolene	5.90	1086	1.07	1.01	1229	3.41	Monoterpene
Fenchone	6.03	1093	0.06	0.06	1326	4.78	Monoterp. ketone
para-Cymenene	6.06	1095	0.20	0.16	1375	5.49	Monoterpene
α-Pinene oxide	6.10	1097	0.02	0.02	1311	4.55	Monoterp. ether
Linalool	6.31	1107	0.06	0.06	1506	7.81	Monoterp. alcohol
Nonanal	6.43	1111	0.01	0.01	1339	4.97	Aliphatic aldehyde
endo-Fenchol	6.67	1121	0.18	0.23	1525	8.27	Monoterp. alcohol
trans-Pinocarveol	7.12	1138	0.18	0.23	1576	9.84	Monoterp. alcohol
Camphor	7.30	1146	0.28	0.28	1430	6.35	Monoterp. ketone
Camphene hydrate	7.49	1153	0.04	0.05	1529	8.39	Monoterp. alcohol
Borneol	8.01	1174	0.81	1.06	1628	11.56	Monoterp. alcohol
Terpinen-4-ol	8.20	1181	0.31	0.41	1537	8.64	Monoterp. alcohol
Myrtenol	8.70	1201	0.06	0.09	1715	15.48	Monoterp. alcohol
α-Terpineol	8.79	1203	1.59	1.42	1634	11.83	Monoterp. alcohol
Verbenone	9.22	1214	0.02	0.04	1606	10.75	Monoterp. ketone
Thymol methyl ether	9.89	1229	0.06	0.07	1530	8.45	Monoterp. ether
Bornyl acetate	12.14	1282	6.05	6.09	1515	8.00	Monoterp. ester

P. mariana biomarker‡	12.71	1296	0.17	0.17	1573	9.74	Monoterp. ester
Myrtenyl acetate	14.20	1321	0.22	0.20	1614	10.97	Monoterp. ester
α-Terpinyl acetate	15.54	1344	0.12	0.11	1623	11.37	Monoterp. ester
β-Bourbonene	16.91	1366	0.06	0.15	1457	6.88	Sesquiterpene
Longifolene	18.32	1388	0.07	0.04	1479	7.30	Sesquiterpene
Germacrene D	23.88	1460	0.10	0.13	1618	11.12	Sesquiterpene
Bicyclogermacrene	24.78	1471	0.04	0.05	1638	12.02	Sesquiterpene
α-Muurolene	25.94	1485	0.08	0.04	1645	12.37	Sesquiterpene
γ-Cadinene	26.93	1497	0.18	0.18	1672	13.55	Sesquiterpene
δ-Cadinene	27.60	1505	0.46	0.46	1678	13.83	Sesquiterpene
τ-Cadinol	36.40	1635	0.02	0.03	2077	36.86	Sesquiterp. alcohol
τ-Muurolol	36.53	1638	0.03	0.03	2092	37.41	Sesquiterp. alcohol
α-Cadinol	36.99	1648	0.05	0.06	2130	38.70	Sesquiterp. alcohol
Total identified			**98.43%**	**99.24%**			

*: 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

‡ : Also characteristic of a number of other conifers, including *P. banksiana*

Note: no correction factor was applied

Other Data

Physical aspect : Clear liquid

Refractive index : 1.4685 ± 0.0003 (20 °C)

Conclusion

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

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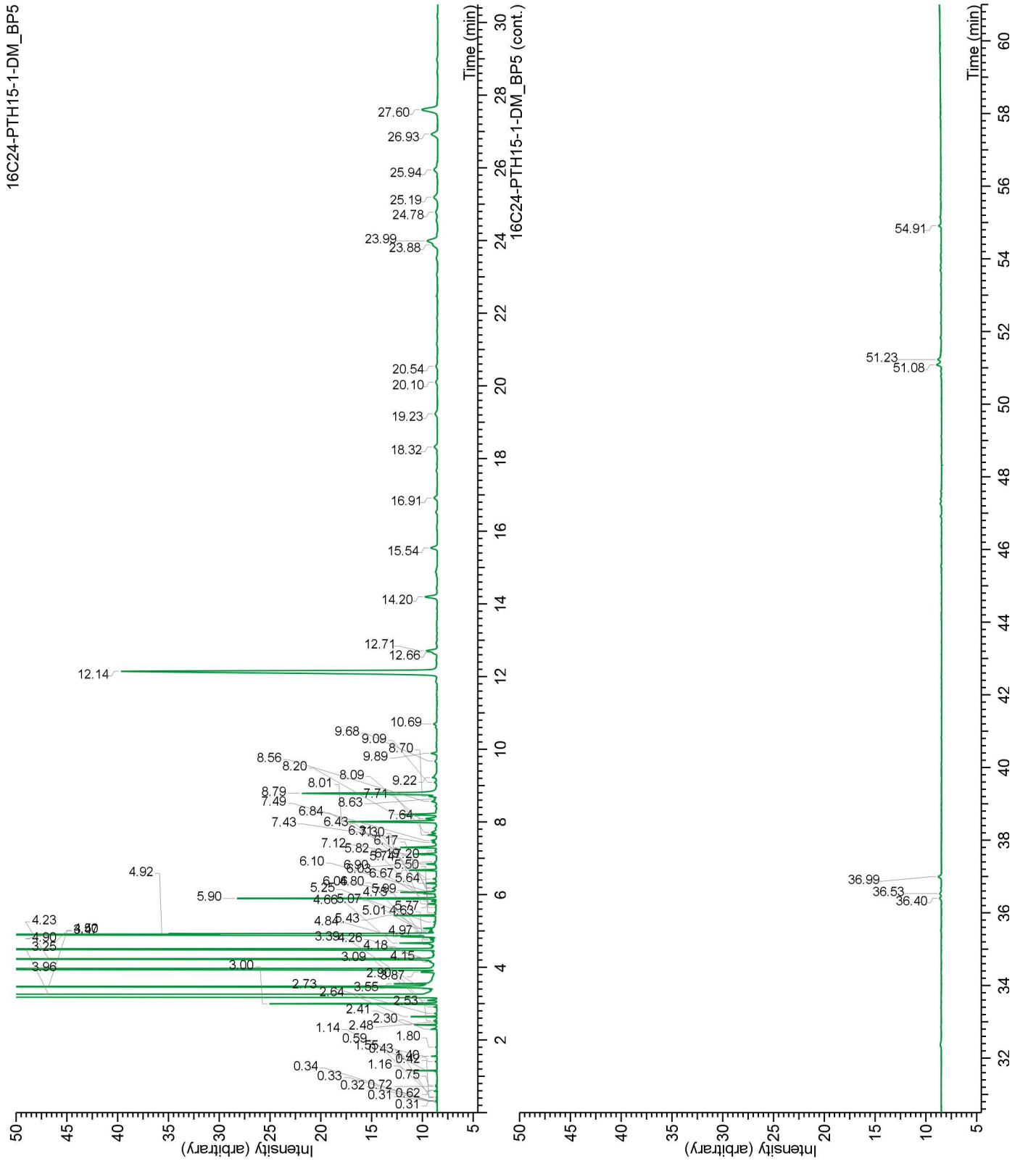

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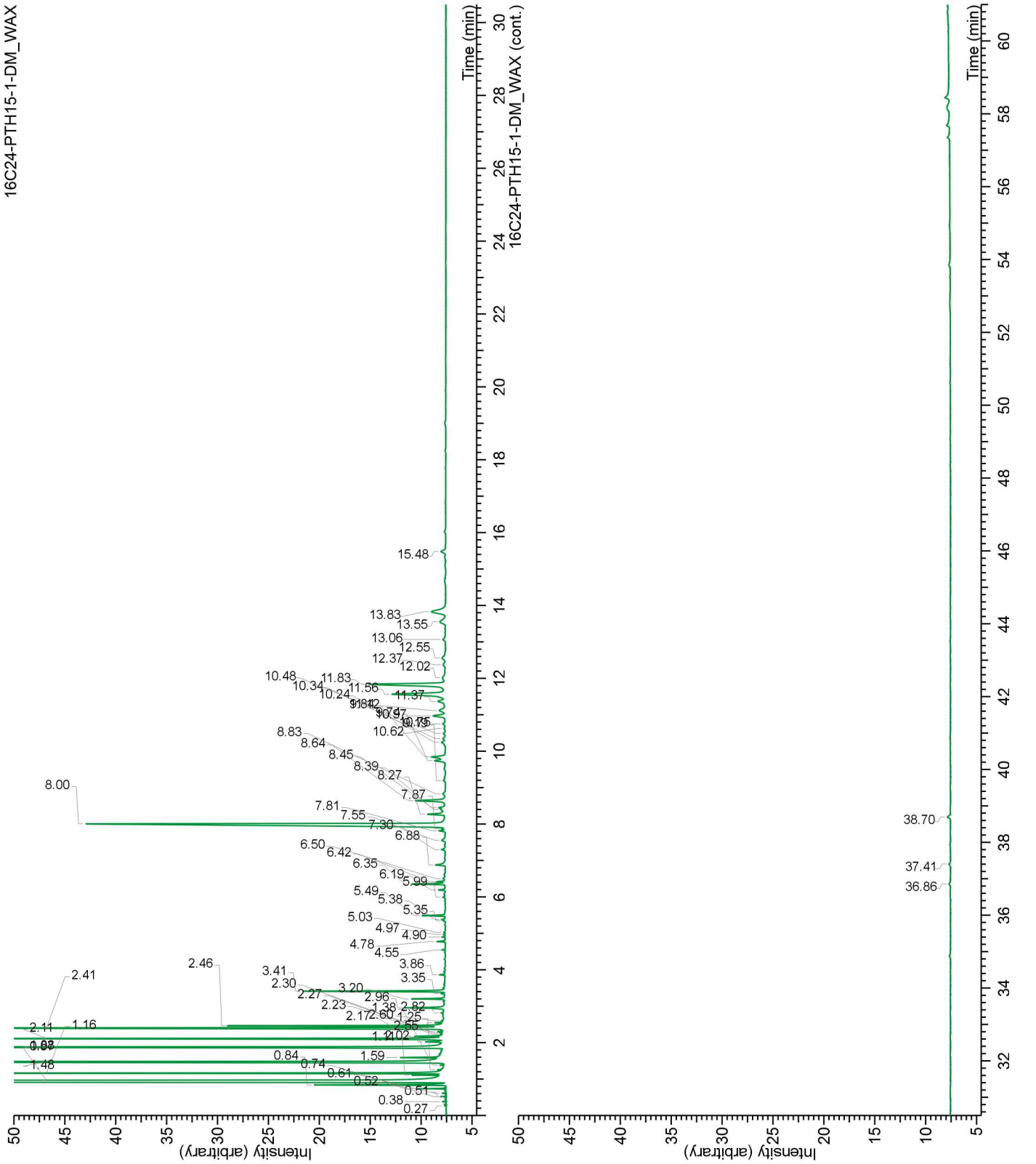
16C24-PTH15-1-DM_WAX
Time (min)
Intensity (arbitrary)
16C24-PTH15-1-DM_WAX (cont.)
15.48
13.83
13.55
13.06
12.55
12.37
12.02
10.48
11.83
10.34
11.56
10.24
11.37
10.62
8.83
8.64
8.45
8.39
8.27
7.87
8.00
7.81
7.55
7.30
6.88
6.50
6.42
6.35
6.19
5.99
5.49
5.38
5.35
5.03
4.97
4.90
4.78
4.55
3.86
3.35
2.46
3.41
2.41
2.30
2.27
3.20
2.96
2.23
1.38
2.82
2.17
2.60
1.25
2.11
1.16
1.59
0.84
0.74
0.61
0.52
0.51
0.38
0.27
38.70
37.41
36.86