

Date : January 20, 2017

SAMPLE IDENTIFICATION

Internal code : 17A03-TOB29-1-DM

Customer identification : Silver Fir - 06-2100-BP

Type : Essential Oil

Source : *Abies alba*

Customer : TruIQ Global, LLC

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 : Sylvain Mercier, M. Sc., chimiste

Analysis date : 2017-01-13

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Toluene	1.28	762	tr				Simple phenolic
Cyclofenchene	2.54	873	0.07	0.08	842	0.83	Monoterpene
Santene	2.57	875	1.44	1.56	889	1.03	Normonoterpene
Bornylene?	2.88	899	0.25	0.12	884	1.01	Monoterpene
Tricyclene	3.17	917	3.01	3.03	922	1.17	Monoterpene
α -Thujene	3.25	922	0.04	33.76	958	1.33*	Monoterpene
α -Pinene	3.41	932	33.23	[33.76]	958	1.33*	Monoterpene
β -Fenchene	3.48	936	0.26	0.38	972	1.43	Monoterpene
Camphene	3.68*	948	12.98	12.19	997	1.63	Monoterpene
α -Fenchene	3.68*	948	[12.98]	0.93	985	1.54	Monoterpene
Thuja-2,4(10)-diene	3.74	952	0.03	0.12	1068	2.16*	Monoterpene
Sabinene	4.08	974	0.02	[0.12]	1068	2.16*	Monoterpene
β -Pinene	4.18	980	18.36	18.61	1051	2.03	Monoterpene
Myrcene	4.42	995	0.27	0.25	1117	2.75	Monoterpene
α -Phellandrene	4.69*	1008	0.29	0.12	1110	2.67	Monoterpene
Δ 3-Carene	4.69*	1008	[0.29]	0.16	1096	2.48	Monoterpene
Carvomenthene	4.97	1023	0.07	0.07	1087	2.35	Monoterpene
Limonene	5.16*	1033	20.23	19.37	1147	3.17	Monoterpene
para-Cymene	5.16*	1033	[20.23]	0.44	1211	4.04	Monoterpene
β -Phellandrene	5.16*	1033	0.17	0.55	1151	3.21*	Monoterpene
1,8-Cineole	5.19	1034	0.21	[0.55]	1151	3.21*	Monoterp. ether
<i>cis</i> - β -Ocimene	5.29	1039	0.01	0.01	1189	3.71	Monoterpene
<i>trans</i> - β -Ocimene	5.47	1049	0.02	0.02	1203	3.93	Monoterpene
γ -Terpinene	5.66	1058	0.03	0.04	1191	3.75	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	5.95	1074	0.01	tr	1388	6.85	Monoterp. alcohol
Terpinolene	6.13	1083	0.27	0.25	1225	4.26	Monoterpene
para-Cymenene	6.36	1095	0.01	0.01	1369	6.52	Monoterpene
α -Pinene oxide	6.45	1099	0.03	0.03	1302	5.44	Monoterp. ether
Linalool	6.68	1107	0.06	0.11	1498	9.67	Monoterp. alcohol
<i>cis</i> -Verbenol?	6.83	1113	0.02	0.02	1507	10.01	Monoterp. alcohol
<i>trans</i> -para-Mentha-2,8-dien-1-ol	7.19	1126	0.02	0.02	1559	12.00	Monoterp. alcohol
<i>cis</i> -Limonene oxide	7.26	1129	0.01	0.01	1375	6.61	Monoterp. ether
<i>trans</i> -Pinocarveol	7.59*	1141	0.06	0.04	1573	12.54	Monoterp. alcohol
<i>cis</i> -para-Mentha-2,8-dien-1-ol	7.59*	1141	[0.06]	0.03	1600	13.76	Monoterp. alcohol
Epoxyterpinolene	7.67	1144	0.01				Monoterp. ether
<i>trans</i> -Verbenol	7.80	1149	0.04	0.05	1602	13.89*	Monoterp. alcohol
Pinocarvone	8.12	1161	0.02	0.02	1479	9.07	Monoterp. ketone
Borneol	8.62	1179	0.02	0.02	1619	14.78	Monoterp. alcohol
para-Cymen-8-ol	9.22	1199	0.03	0.02	1770	23.99	Monoterp. alcohol

α -Terpineol	9.42*	1204	0.11	0.05	1623	15.00	Monoterp. alcohol
Myrtenal	9.42*	1204	[0.11]	0.08	1530	10.88	Monoterp. aldehyde
Myrtenol	9.53	1206	0.02	0.03	1708	19.77	Monoterp. alcohol
Verbenone	9.75	1211	0.02	[0.05]	1602	13.89*	Monoterp. ketone
<i>trans</i> -Carveol	10.49	1227	0.03	0.03	1756	23.05	Monoterp. alcohol
Carvone	11.27	1245	0.05	0.03	1630	15.33	Monoterp. ketone
Linalyl acetate	11.70	1255	0.01	1.30	1504	9.90*	Monoterp. ester
Bornyl acetate	12.76	1278	1.34	[1.30]	1504	9.90*	Monoterp. ester
Limonene hydroperoxide I	14.77	1314	0.04				Monoterp. peroxide
<i>trans</i> -Sabinyl acetate	15.02	1318	0.04				Monoterp. ester
Limonene hydroperoxide II	15.72	1329	0.03				Monoterp. peroxide
α -Copaene	17.41	1355	0.03	0.03	1425	7.75	Sesquiterpene
Longifolene	19.36	1384	0.23	0.17	1486	9.24	Sesquiterpene
Isocaryophyllene	19.71	1389	0.03	[1.30]	1504	9.90*	Sesquiterpene
β -Caryophyllene	20.41	1399	5.25	4.89	1516	10.37*	Sesquiterpene
β -Copaene	21.02	1406	0.04	[4.89]	1516	10.37*	Sesquiterpene
α -Humulene	23.09	1431	0.11	0.10	1578	12.72	Sesquiterpene
δ -Cadinene	29.00	1503	0.08	0.09	1668	17.38	Sesquiterpene
<i>trans</i> -Calamenene	29.41	1508	0.04	0.05	1727	21.09	Sesquiterpene
Caryophyllene oxide analog?	31.43	1536	0.06				Sesquiterp. ether
Caryophyllene oxide	33.60*	1566	0.47	0.35	1844	29.33	Sesquiterp. ether
Caryophyllenyl alcohol	33.60*	1566	[0.47]				Sesquiterp. alcohol
Humulene epoxide I	34.01	1572	0.02				Sesquiterp. ether
Humulene epoxide II	35.31	1590	0.02				Sesquiterp. ether
Total identified			99.67%	99.64%			

*: 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 : 1.4715 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent were detected using this method. Please note that literature indicate the presence of chemotypes and/or variation in *Abies alba*, and we cannot as such assess the species identity with certitude. However, our best hypothesis is that this oil was produced from fir wood, provided the relatively high pinene and caryophyllene contents¹.

REFERENCES

- (1) Gazmend, Z.; Tsitsimpikou, C.; Petrakis, P. V.; Naxakis, G.; Habili, D.; Vassilios, R. Foliar and Cortex Oleoresin Variability of Silver Fir (*Abies Alba* Mill.) in Albania. *Zeitschrift für Naturforsch. C* **2001**, 56 (7–8), 531–539.



