



CERTIFICATE OF ANALYSIS

PRODUCT IDENTIFICATION		COMPANY IDENTIFICATION	
PRODUCT NAME:	Hemlock Spruce	COMPANY:	ZAYAT AROMA INC.
BOTANICAL NAME:	Tsuga canadensis	ADDRESS:	1339 SHEFFORD, BROMONT (QC) J2L 1C9, CANADA
SYNONYM(S):		TELEPHONE:	1.855.534.1671
		FAX:	1.855.553.6010
		WEB:	WWW.ZAYATAROMA.COM
		E-MAIL:	INFO@ZAYATAROMA.COM
INCI NAME:	Tsuga canadensis leaf oil		
CAS TSCA:	8008-10-4	HS CODE:	3301.29
CAS EINECS:	289-926-6	EINECS:	
FEMA:	N/A	COE:	N/A
COUNTRY OF ORIGIN:	Canada	FDA CODE:	N/A
PRODUCTION TYPE:	Certified Organic	Certified organic by Ecocert Canada	
PRODUCTION METHOD:	Steam distilled	 	
PART DISTILLED:	Needles & Twigs		
LOT NUMBER:	EAB878226CA93224E		
PRODUCTION DATE:	07/2024		
EXPIRATION DATE:	07/2029		

PROPERTIES	SPECIFICATIONS	RESULTS
APPEARANCE	<i>Colorless to pale yellow liquid</i>	<i>Complies</i>
ODOR	<i>Characteristic fresh balsamic sweet fruity odor</i>	<i>Complies</i>
SOLUBILITY	<i>Soluble in alcohol and oils. Insoluble in water.</i>	<i>Complies</i>
SPECIFIC GRAVITY:	<i>0.890 - 0.926 @ 20°C</i>	<i>0.917</i>
OPTICAL ROTATION:	<i>-25.0 - -15.0 @ 20°C</i>	<i>Ok</i>
REFRACTIVE INDEX:	<i>1.466 - 1.472 @ 20°C</i>	<i>Ok</i>
PEROXYDE VALUE:	<i><= 15 mEq O2/KG</i>	<i>Complies</i>

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Date : 2024-08-22

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24H08-ZAA01

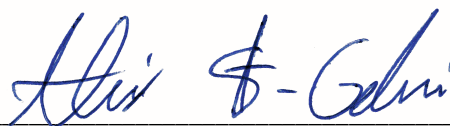
Customer Identification : Pruche Biologique Canada - EAB878226-11M - CA93224E

Type : Essential Oil

Source : *Tsuga canadensis*

Customer : ZAYAT AROMA

Checked and approved by:



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

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GAS CHROMATOGRAPHIC ANALYSIS

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

✖ISO

Results : See analysis summary (next page)

Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005

Date : 2024-08-13

PHYSICOCHEMICAL DATA

Refractive index : 1.4693 ± 0.0003 (20 °C)

Method : PC-MAT-016 - Measure of the refractive index of a liquid.

Analyst : Cindy Caron B. Sc.

Date : 2024-08-09

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
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Toluene	0.02	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
Octane	tr	Alkane
Furfural	tr	Furan
(3Z)-Hexenol	0.02	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Santene	0.37	Normonoterpene
Unknown	0.02	Normonoterpene
Bornylene	0.01	Monoterpene
Hashishene	tr	Monoterpene
Tricyclene	6.51	Monoterpene
α -Thujene	0.18	Monoterpene
α -Pinene	21.45	Monoterpene
α -Fenchene	0.05	Monoterpene
Camphene	15.63	Monoterpene
Thuja-2,4(10)-diene	0.07	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.04	Monoterpene
β -Pinene	2.15	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Dehydro-1,8-cineole	0.02	Monoterpenic ether
Myrcene	2.50	Monoterpene
α -Phellandrene	1.14	Monoterpene
Menthatriene isomer I	0.03	Monoterpene
Δ^3 -Carene	0.10	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
1,4-Cineole	0.02	Monoterpenic ether
α -Terpinene	0.32	Monoterpene
<i>para</i> -Cymene	0.55	Monoterpene
β -Phellandrene	[1.98]	Monoterpene
Limonene	3.66	Monoterpene
1,8-Cineole	[1.98]	Monoterpenic ether
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	tr	Monoterpene
γ -Terpinene	0.39	Monoterpene
Unknown	0.04	Oxygenated monoterpene
Fenchone	0.01	Monoterpenic ketone

γ -Campholenal	0.11	Aliphatic alcohol
<i>para</i> -Cymenene	0.12	Monoterpene
Terpinolene	0.72	Monoterpene
α -Thujone	0.01	Monoterpenic ketone
Linalool	0.07	Monoterpenic alcohol
endo-Fenchol	0.05	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	0.01	Monoterpenic alcohol
α -Campholenal	0.04	Monoterpenic aldehyde
<i>trans</i> -Pinocarveol	0.08	Monoterpenic alcohol
Camphor	0.32	Monoterpenic ketone
Camphene hydrate	0.08	Monoterpenic alcohol
<i>meta</i> -Mentha-4,6-dien-8-ol	0.04	Monoterpenic alcohol
Pinocamphone	0.01	Monoterpenic ketone
Isoborneol	0.04	Monoterpenic alcohol
Pinocarvone	0.03	Monoterpenic ketone
Borneol	0.79	Monoterpenic alcohol
Isopinocamphone	0.03	Monoterpenic ketone
α -Phellandren-8-ol	0.06	Monoterpenic alcohol
Terpinen-4-ol	0.51	Monoterpenic alcohol
Cryptone	0.04	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.02	Monoterpenic alcohol
Myrtenal	0.08	Monoterpenic aldehyde
α -Terpineol	0.68	Monoterpenic alcohol
Methyl salicylate	0.03	Phenolic ester
Myrtenol	0.06	Monoterpenic alcohol
Verbenone	0.08	Monoterpenic ketone
Thymol methyl ether	0.02	Monoterpenic ether
Citronellol	0.05	Monoterpenic alcohol
Carvone	0.02	Monoterpenic ketone
Carvotanacetone	0.01	Monoterpenic ketone
Piperitone	1.94	Monoterpenic ketone
Unknown	0.13	Unknown
Isobornyl acetate	30.24	Monoterpenic ester
Unknown	0.21	Monoterpenic ester
<i>trans</i> -Pinocarvyl acetate	0.08	Monoterpenic ester
Thymol	0.05	Monoterpenic alcohol
Myrtenyl acetate	0.12	Monoterpenic ester
Pin-2-en-8-yl acetate	0.99	Monoterpenic ester
Terpinyl acetate analog	0.04	Monoterpenic ester
α -Cubebene	0.02	Sesquiterpene
Citronellyl acetate	0.05	Monoterpenic ester
Unknown	0.03	Oxygenated monoterpene
α -Ylangene	0.02	Sesquiterpene
α -Copaene	0.04	Sesquiterpene
<i>trans</i> -Myrtanyl acetate	0.04	Monoterpenic ester

β-Bourbonene	0.03	Sesquiterpene
Geranyl acetate	0.06	Monoterpenic ester
β-Elemene	0.02	Sesquiterpene
Longifolene	0.01	Sesquiterpene
β-Caryophyllene	1.10	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.02	Sesquiterpene
α-Humulene	1.38	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.03	Sesquiterpene
γ-Murolene	0.14	Sesquiterpene
Germacrene D	0.05	Sesquiterpene
β-Selinene	0.07	Sesquiterpene
α-Selinene	0.08	Sesquiterpene
α-Murolene	0.07	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)-α-Farnesene	0.02	Sesquiterpene
γ-Cadinene	0.14	Sesquiterpene
(<i>Z</i>)-γ-Bisabolene	0.02	Sesquiterpene
δ-Cadinene	0.31	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.02	Sesquiterpene
α-Cadinene	0.01	Sesquiterpene
α-Calacorene	0.01	Sesquiterpene
(<i>E</i>)-α-Bisabolene	tr	Sesquiterpene
(<i>E</i>)-Nerolidol	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Salvial-4(14)-en-1-one	0.01	Aliphatic alcohol
Humulene epoxide I	0.01	Sesquiterpenic ether
Humulene epoxide II	0.02	Sesquiterpenic ether
1,10-diepi-Cubenol	0.01	Sesquiterpenic alcohol
1-epi-Cubenol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
τ-Murolol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Aliphatic ester
Eudesma-4(15),7-dien-1β-ol	0.01	Sesquiterpenic alcohol
Cembrene?	0.01	Diterpene
Unknown	0.01	Diterpene
Manool	0.07	Diterpenic alcohol
7,13-Abietadiene	tr	Diterpene
Consolidated total	99.49	

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

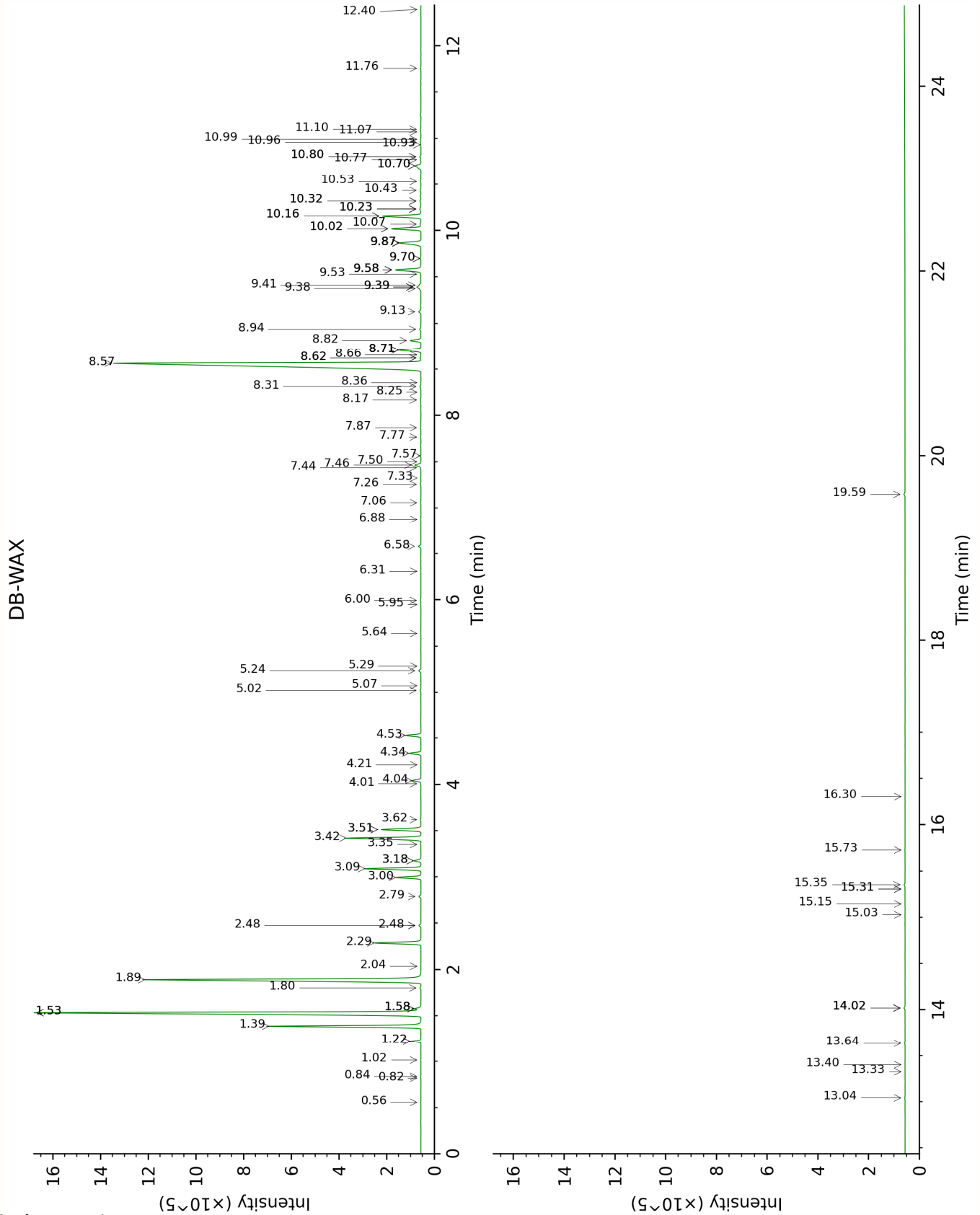
Note: no correction factor was applied

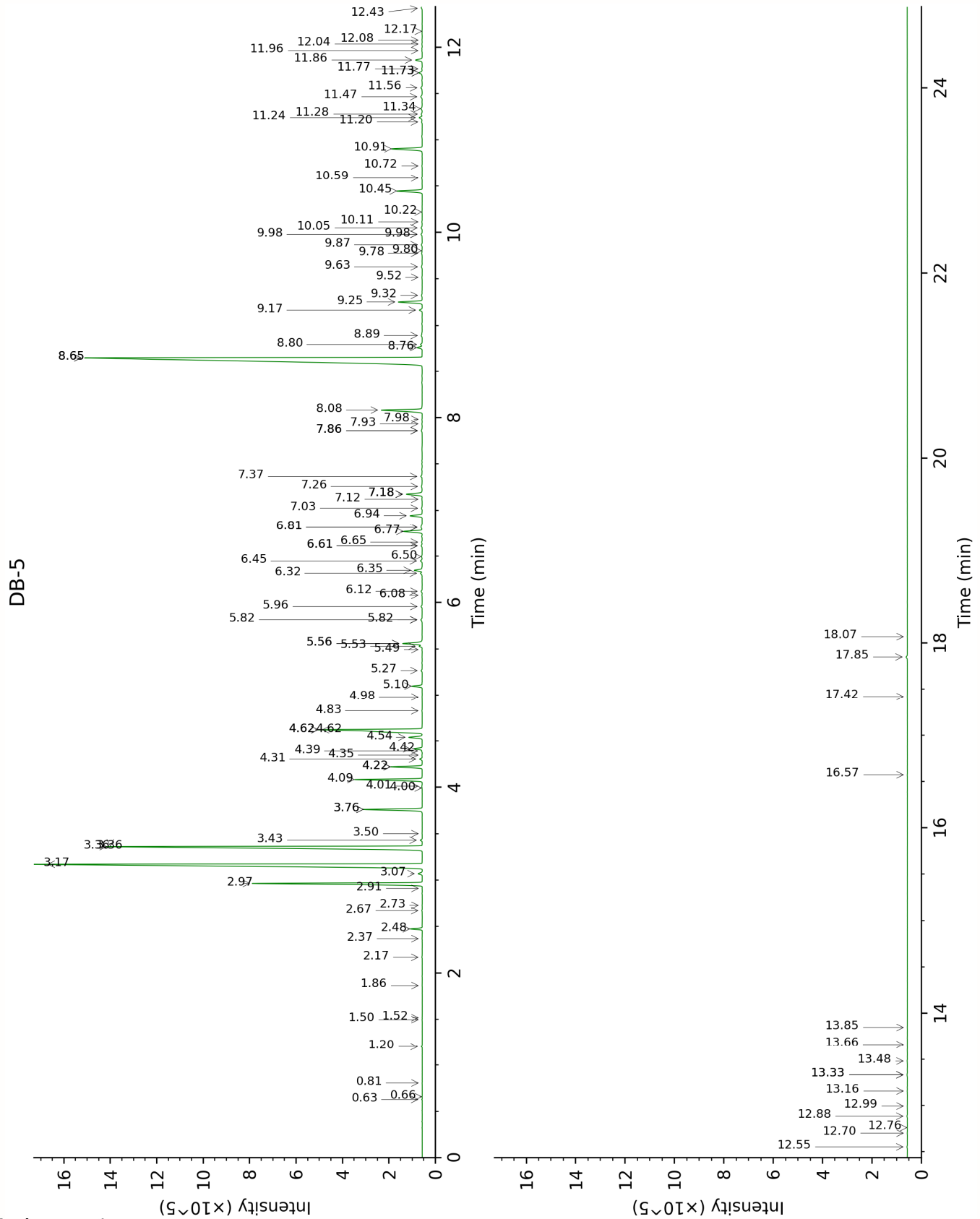
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

Isovaleral	Column DB-WAX			Column DB-5		
	0.84	885.4	0.01	0.63	640.8	0.01
2-Methylbutyral	0.82	878.9	tr	0.66	651.1	tr
2-Ethylfuran	1.02	917.7	0.01	0.81	702.4	tr
Toluene	1.58*	1000.4	[0.28]	1.20	758.9	0.02
Hexanal	2.04	1043.9	0.01	1.50	800.1	tr
Octane	0.56	784.2	tr	1.52	803.0	tr
Furfural	6.88	1409.1	0.01	1.86	832.0	tr
(3Z)-Hexenol	6.00	1345.8	0.03	2.17	857.2	0.02
Hexanol	5.64	1320.4	0.02	2.37	873.9	0.01
Santene	1.22*	949.3	[0.38]	2.48	882.6	0.37
Unknown ABBA I [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	1.58*	1000.4	[0.28]	2.67	898.9	0.02
Bornylene	1.22*	949.3	[0.38]	2.73	903.6	0.01
Hashishene	1.54*	996.2	[21.35]	2.91	915.6	tr
Tricyclene	1.39	974.6	6.51	2.97	919.2	6.51
α -Thujene	1.58*	1000.4	[0.28]	3.07	926.1	0.18
α -Pinene	1.54*	996.2	[21.35]	3.17	932.8	21.45
α -Fenchene	1.80	1021.6	0.05	3.36*	945.4	[15.70]
Camphene	1.89	1030.2	15.63	3.36*	945.4	[15.70]
Thuja-2,4(10)- diene	2.48*	1085.9	[0.10]	3.43	949.9	0.07
Benzaldehyde	7.56	1459.8	0.01	3.50	954.5	0.01
Sabinene	2.48*	1085.9	[0.10]	3.76*	971.8	[2.19]
β -Pinene	2.29	1068.0	2.15	3.76*	971.8	[2.19]
6-Methyl-5- hepten-2-one	5.28	1295.3	tr	4.00	987.1	0.01
Dehydro-1,8- cineole	3.35	1154.5	0.02	4.02	988.4	0.02
Myrcene	3.09	1134.6	2.51	4.09	993.0	2.50
α -Phellandrene	3.00	1127.3	1.14	4.22*	1002.1	[1.16]
Menthatriene isomer I	3.62	1174.9	0.03	4.22*	1002.1	[1.16]
Δ 3-Carene	2.79	1111.6	0.10	4.31	1007.4	0.10
(3Z)-Hexenyl acetate	5.07	1280.1	tr	4.35	1010.0	0.01
1,4-Cineole	3.18*	1141.0	[0.34]	4.40	1012.9	0.02
α -Terpinene	3.18*	1141.0	[0.34]	4.42	1014.4	0.32
<i>para</i> -Cymene	4.34	1227.4	0.55	4.54	1022.1	0.55
β -Phellandrene	3.51*	1166.8	[1.98]	4.62*	1027.1	[5.63]
Limonene	3.42	1159.7	3.66	4.62*	1027.1	[5.63]
1,8-Cineole	3.51*	1166.8	[1.98]	4.62*	1027.1	[5.63]

(Z)- β -Ocimene	4.01	1203.9	0.02	4.83	1040.0	0.01
(E)- β -Ocimene	4.21	1218.5	0.01	4.98	1049.5	tr
γ -Terpinene	4.04	1206.5	0.41	5.10	1057.0	0.39
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.02	1276.5	0.05	5.27	1067.5	0.04
Fenchone	5.95	1342.7	0.01	5.49	1081.7	0.01
γ -Campholenal	5.24	1291.7	0.11	5.53	1084.0	0.11
<i>para</i> -Cymenene	6.58	1387.5	0.12	5.56*	1085.8	[0.85]
Terpinolene	4.53	1241.2	0.72	5.56*	1085.8	[0.85]
α -Thujone	6.31	1368.3	0.01	5.82*	1101.7	[0.07]
Linalool	8.31	1515.9	0.07	5.82*	1101.7	[0.07]
endo-Fenchol	8.62*	1539.7	[0.05]	5.96	1110.8	0.05
<i>cis-para</i> -Menth-2- en-1-ol	8.36	1519.1	0.01	6.08	1118.5	0.01
α -Campholenal	7.26	1437.1	0.05	6.12	1121.3	0.04
<i>trans</i> -Pinocarveol	9.41*†	1600.9	[0.06]	6.32	1133.7	0.08
Camphor	7.46	1452.5	0.33	6.35	1135.8	0.32
Camphene hydrate	8.71*	1546.5	[1.18]	6.45	1142.2	0.08
<i>meta</i> -Mentha-4,6- dien-8-ol	9.58*	1614.2	[1.45]	6.50	1145.2	0.04
Pinocamphone	7.50	1455.1	0.01	6.61*	1152.6	[0.05]
Isoborneol	9.58*	1614.2	[1.45]	6.61*	1152.6	[0.05]
Pinocarvone	8.17	1504.8	0.03	6.65	1155.1	0.03
Borneol	10.02*	1649.8	[1.47]	6.77	1162.5	0.79
Isopinocamphone	7.87	1482.2	0.03	6.81*	1165.4	[0.10]
α -Phellandren-8- ol	10.43	1682.9	0.06	6.81*	1165.4	[0.10]
Terpinen-4-ol	8.82	1554.7	0.52	6.94	1173.7	0.51
Cryptone	9.39*†	1599.3	[0.23]	7.02	1178.8	0.04
<i>para</i> -Cymen-8-ol	11.76	1794.4	0.03	7.12	1185.0	0.02
Myrtenal	8.94	1564.0	0.08	7.18*	1188.5	[0.76]
α -Terpineol	10.02*	1649.8	[1.47]	7.18*	1188.5	[0.76]
Methyl salicylate	10.77	1710.9	0.03	7.18*	1188.5	[0.76]
Myrtenol	11.10	1738.7	0.04	7.26	1193.8	0.06
Verbenone	9.87*	1637.5	[1.34]	7.37	1200.7	0.08
Thymol methyl ether	8.66	1542.5	0.02	7.86*	1233.5	[0.05]
Citronellol	10.96	1726.8	0.05	7.86*	1233.5	[0.05]
Carvone	10.23*	1666.8	[0.08]	7.94	1238.5	0.02
Carvotanacetone	9.70*	1624.0	[0.05]	7.98	1241.7	0.01
Piperitone	10.16*	1660.7	[2.04]	8.08	1248.4	1.94

Unknown PIMA 13 [m/z 119, 43 (87), 91 (78), 92 (70), 134 (50)...]	9.13	1578.6	0.13	8.65*	1286.0	[30.45]
Isobornyl acetate	8.57	1535.4	30.24	8.65*	1286.0	[30.45]
Unknown PIMA 6 [m/z 107, 43 (76), 150 (42), 91 (28), 108 (23)]	9.39*†	1599.3	[0.23]	8.76	1293.9	0.21
<i>trans</i> -Pinocarvyl acetate	9.38	1598.0	0.06	8.80	1296.1	0.08
Thymol	15.35	2127.5	0.05	8.89	1302.5	0.05
Myrtenyl acetate	9.87*	1637.5	[1.34]	9.17	1321.7	0.12
Pin-2-en-8-yl acetate	9.87*	1637.5	[1.34]	9.25	1327.9	0.99
Terpinyl acetate analog	9.87*	1637.5	[1.34]	9.32	1332.9	0.04
α -Cubebene	7.06	1422.5	0.02	9.52	1346.5	0.02
Citronellyl acetate	9.70*	1624.0	[0.05]	9.63	1354.4	0.05
Unknown PIMA 8 [m/z 93, 121 (68), 43 (67), 67 (44), 136 (36), 107 (34)... 180 (4)]	10.32*	1673.7	[0.07]	9.78	1364.7	0.03
α -Ylangene	7.32	1442.2	0.02	9.80	1366.6	0.02
α -Copaene	7.44	1450.4	0.03	9.87	1371.1	0.04
<i>trans</i> -Myrtanyl acetate	10.53	1690.7	0.04	9.98*	1379.0	[0.06]
β -Bourbonene	7.77	1474.8	0.03	9.98*	1379.0	[0.06]
Geranyl acetate	10.80*	1713.7	[0.07]	10.05	1383.9	0.06
β -Elemene	8.71*	1546.5	[1.18]	10.11	1388.4	0.02
Longifolene	8.25	1511.2	0.01	10.22	1395.8	0.01
β -Caryophyllene	8.71*	1546.5	[1.18]	10.44	1412.3	1.10
β -Copaene	8.62*	1539.7	[0.05]	10.59	1422.9	0.02
<i>trans</i> - α - Bergamotene	8.71*	1546.5	[1.18]	10.72	1432.8	0.02
α -Humulene	9.58*	1614.2	[1.45]	10.91	1446.6	1.38
<i>trans</i> -Cadina- 1(6),4-diene	9.53	1610.4	0.02	11.20	1468.0	0.03
γ -Murolene	9.87*	1637.5	[1.34]	11.24	1471.5	0.14
Germacrene D	10.07	1653.7	0.06	11.28	1474.4	0.05
β -Selinene	10.16*	1660.7	[2.04]	11.34	1478.7	0.07
α -Selinene	10.23*	1666.8	[0.08]	11.47	1488.2	0.08
α -Murolene	10.32*	1673.7	[0.07]	11.56	1495.4	0.07
(3E,6E)- α -	10.80*	1713.7	[0.07]	11.73*	1507.7	[0.16]

Farnesene						
γ-Cadinene	10.70*	1705.4	[0.45]	11.73*	1507.7	[0.16]
(Z)-γ-Bisabolene	10.23*	1666.8	[0.08]	11.77	1511.1	0.02
δ-Cadinene	10.70*	1705.4	[0.45]	11.86	1518.5	0.31
<i>trans</i> -Cadina-1,4-diene	10.93	1724.6	0.02	11.96	1526.5	0.02
α-Cadinene	11.07	1736.4	0.02	12.04	1532.0	0.01
α-Calacorene	12.40	1850.5	0.01	12.08	1535.3	0.01
(E)-α-Bisabolene	10.99	1729.6	0.02	12.17	1542.8	tr
(E)-Nerolidol	14.02*	1998.5	[0.06]	12.43	1562.6	0.05
Caryophyllene oxide	13.04	1908.2	0.02	12.55	1572.6	0.02
Salvia-4(14)-en-1-one	13.33	1934.2	0.01	12.70	1584.2	0.01
Humulene epoxide I	13.40	1941.2	0.01	12.76	1588.9	0.01
Humulene epoxide II	13.64	1962.7	0.02	12.88	1598.5	0.02
1,10-diepi-Cubenol	14.02*	1998.5	[0.06]	12.99	1607.4	0.01
1-epi-Cubenol	14.02*	1998.5	[0.06]	13.16	1620.8	0.01
τ-Cadinol	15.15	2106.9	0.01	13.33*	1635.2	[0.02]
τ-Murolol	15.31*	2122.9	[0.01]	13.33*	1635.2	[0.02]
α-Cadinol	15.73	2164.8	0.02	13.48	1647.5	0.02
Unknown HULU VII [m/z 79, 43 (80), 91 (63), 67 (54), 93 (42), 41 (41)...]	15.03	2095.2	0.01	13.66	1662.5	0.01
Eudesma-4(15),7-dien-1β-ol	16.30	2223.6	0.01	13.85	1677.9	0.01
Cembrene?	15.31*	2122.9	[0.01]	16.57	1918.6	0.01
Unknown PIGL III [m/z 159, 241 (87), 69 (60), 185 (34), 81 (31), 256 (26)...]				17.42	1998.9	0.01
Manool	19.58	2584.0	0.06	17.85	2041.5	0.07
7,13-Abietadiene				18.07	2063.2	tr
Total reported		99.27%			99.53%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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.

Essential Oil, *Tsuga canadensis*
Internal code: 24H08-ZAA01

Pruche Biologique Canada - EAB878226-11M - CA93224E

Report prepared for:
ZAYAT AROMA

Note: no correction factor was applied
R.T.: Retention time (minutes)
R.I.: Retention index