Date : November 15, 2017

Certificate of Analysis

Sample identification

Internal code : 17K06-HBN1-1-CC
Customer identification : Myrrh Oil - 170009291
Type : Essential oil
Source : *Commiphora myrrha*
Customer : Health & Beauty Natural Oils

GC Profiling 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 : 2017-11-07

Total Fatty Acids Methyl Esters (FAMES)

Method: Simultaneous hydrolysis and methylation of oil sample using a mixture of heptane/methanol/ toluene/1,2-dimethoxypropane/sulfuric acid. Injection of the upper phase on GC-FID on a BPX-5 column for quantification using the method PC-HV-6, with identification of the methyl esters by GC-MS.
Analyst: Alexis St-Gelais, M. Sc., chimiste
Analysis date: 2017-11-08

Checked and approved by :

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

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IDENTIFIED COMPOUNDS – GC PROFILING

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
α-Pinene	3.42	927	0.05	0.08	946	1.14	Monoterpene
δ-Elemene	15.32	1321	0.88	0.97	1416	7.09	Sesquiterpene
α-Cubebene	15.97	1331	0.02	0.02	1407	6.86	Sesquiterpene
α-Copaene	17.70	1357	0.10	0.10	1430	7.41	Sesquiterpene
β-Bourbonene	18.12	1364	0.34	0.30	1451	7.91	Sesquiterpene
β-Elemene	19.00	1377	5.36	5.99	1523	9.87*	Sesquiterpene
β-Caryophyllene	20.61	1400	0.38	[5.99]	1523	9.87*	Sesquiterpene
β-Copaene	21.51	1411	0.08	0.11	1505	9.19	Sesquiterpene
γ-Elemene	21.91	1416	2.06	2.13	1567	11.50	Sesquiterpene
cis-Muurola-3,5-diene	22.58	1424	0.07	0.04	1560	11.23	Sesquiterpene
α-Humulene	23.41	1434	0.15	0.19	1581	11.99	Sesquiterpene
γ-Gurjunene	25.13	1454	0.13	0.16	1610	13.13	Sesquiterpene
γ-Muurolene	25.49	1458	0.09	0.12	1597	12.57	Sesquiterpene
Germacrene D	25.64	1460	0.65	0.52	1620	13.64	Sesquiterpene
β-Selinene	26.26	1468	0.53	0.62	1623	13.83	Sesquiterpene
α-Selinene	26.90	1475	0.49	0.70	1631	14.21	Sesquiterpene
Curzerene	27.92	1488	36.07	37.17	1776	22.69	Sesquiterp. ether
γ-Cadinene	28.78	1498	0.15	0.05	1666	16.07	Sesquiterpene
δ-Cadinene	29.41	1506	0.25	0.22	1673	16.44	Sesquiterpene
trans-γ-Bisabolene	30.46	1521	0.16	0.36	1680	16.74*	Sesquiterpene
Selina-3,7(11)-diene	30.75	1525	0.19	[0.36]	1680	16.74*	Sesquiterpene
Germacrene B	32.10	1544	2.37	2.42	1719	19.02	Sesquiterpene
α-Elemol	32.69	1553	0.19	27.72	1994	36.22*	Sesquiterp. alcohol
Spathulenol	34.01*	1571	0.40	0.07	2018	37.26	Sesquiterp. alcohol
(*E*)-Nerolidol	34.01*	1571	[0.40]	[27.72]	1994	36.22*	Sesquiterp. alcohol
cis-β-Elemenone?	35.46	1592	0.15				Sesquiterp. ketone
Curzerenone	35.79	1596	0.16				Sesquiterp. ketone
Furanoeudesma-1,3-diene	36.66	1616	19.12	[27.72]	1994	36.22*	Sesquiterp. ether
Lindestrene	36.95	1623	6.65	[27.72]	1994	36.22*	Sesquiterp. ether
τ-Muurolol	37.37	1634	0.18	0.16	2086	39.40	Sesquiterp. alcohol
Furanodiene	37.73	1643	0.21	[27.72]	1994	36.22*	Sesquiterp. ether
Isofuranogermacrene	37.95	1648	0.82	[27.72]	1994	36.22*	Sesquiterp. ether
α-Cadinol	38.09	1651	0.19	1.40	2126	40.62*	Sesquiterp. alcohol
Elemyl acetate	38.51	1662	0.73	0.76	1946	34.07	Sesquiterp. ester
Germacrone	39.10	1676	0.62	0.64	2076	39.08	Sesquiterp. ketone
Unidentified furanoeudesmane	39.27	1680	1.41	1.30	2049	38.26	Sesquiterp. ether
2-Methoxyfuranodiene	40.34	1709	1.28	[1.40]	2126	40.62*	Sesquiterp. ether
Myristic acid	42.84	1788	0.43	0.80	2623	51.45	Fatty acid
2-Acetoxyfuranodiene	45.57	1886	0.61	0.65	2441	47.88	Sesquiterp. ester
Methyl palmitate	46.63	1927	0.05	0.06	2173	41.83	Fatty acid ester

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Palmitic acid	48.18	1989	0.41	0.74	2842	55.35	Fatty acid
Total identified			**84.18%**	**86.57%**			

*: 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

Total Fatty Acids Methyl Esters (FAMES)

Methyl Esters	**R.T.**	**%**	**Types**
Myristic acid	8.36	0.27	Saturated
Palmitic acid	10.77	2.17	Saturated
Margaric acid	11.95	0.05	Saturated
Linoleic acid	12.71	10.43	Unsaturated
Oleic acid	12.78	6.88	Unsaturated
Ricinenic acid? (9,11-Octadecadienoic acid isomer)	12.81	4.14	Unsaturated
cis-Vaccenic acid	12.84	0.82	Unsaturated
Stearic acid	13.09	2.88	Saturated
Octadecadienoic acid isomer	13.33	3.38	Unsaturated
Octadecadienoic acid isomer II	13.60	2.56	Unsaturated
Ricinoleic acid	14.98	66.42	Unsaturated
Total identified		**70.01%**	Saturated: 5.37% Unsaturated : 94.63%

Other Data

Physical aspect : Light yellow viscous liquid
Refractive index : 1.5008 ± 0.0003 (20 °C)

Conclusion

Standard GC profiling of the sample did not reveal any oddity in the chemical profile, which is in line with expectations for *C. myrrha*. However, the total peak area detected was below that observed in average for such samples, accounting for only 61%. This suggested dilution with a foreign matrix. An attempt to determine more precisely the non-volatile portion was prevented by the fact that myrrh produces a sticky resin upon drying at 100 °C, loosing very little mass even for pure samples. Still, the area ratio allows to estimate that the sample contains about 40% of diluent.

A solubility test using 94% ethanol did not produce any turbidity using between 1 and 10 parts of ethanol pert part of essential oil, suggesting that no mineral oil was present.

To check for the presence of vegetable oil, the sample was treated in a similar fashion as a pure vegetable would have been for total fatty acids methyl esters profiling. Essential oils are typically poor in fatty acids. In this case, several fatty acids were detected, including the quite specific ricinoleic acid, indicative of addition of castor oil. Still, pure castor oil would be expected to contain over 80% of ricinoleic acid[1–4], suggesting that other vegetable oils might have been used.

REFERENCES

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(2) Canoira, L.; Garcia Galean, J.; Alcantara, R.; Lapuerta, M.; Garcia-Contreras, R. Fatty Acid Methyl Esters (FAMEs) from Castor Oil: Production Process Assessment and Synergistic Effects in Its Properties. *Reneweable Energy* **2010**, *35*, 208–217.

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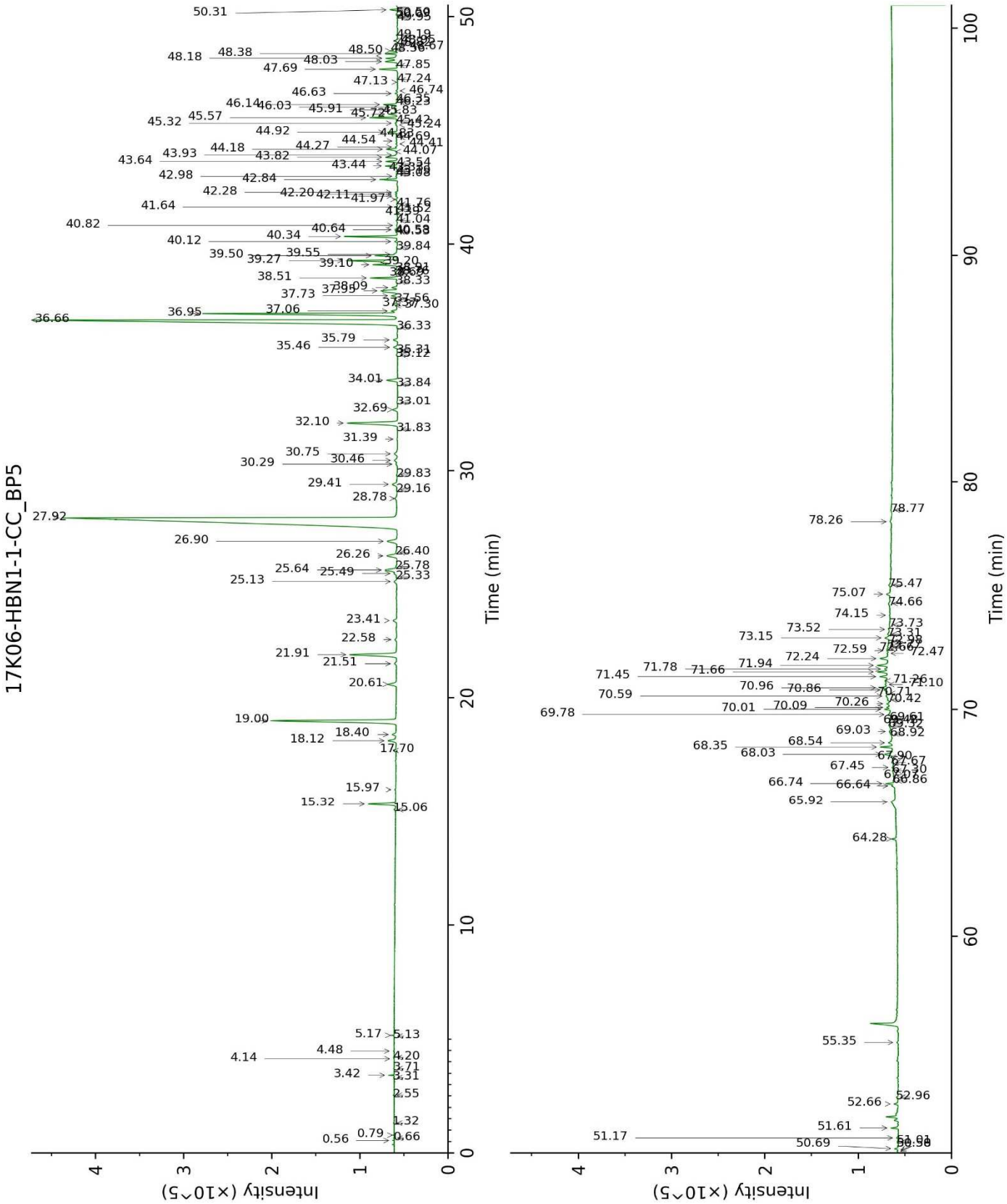
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46.14
46.03
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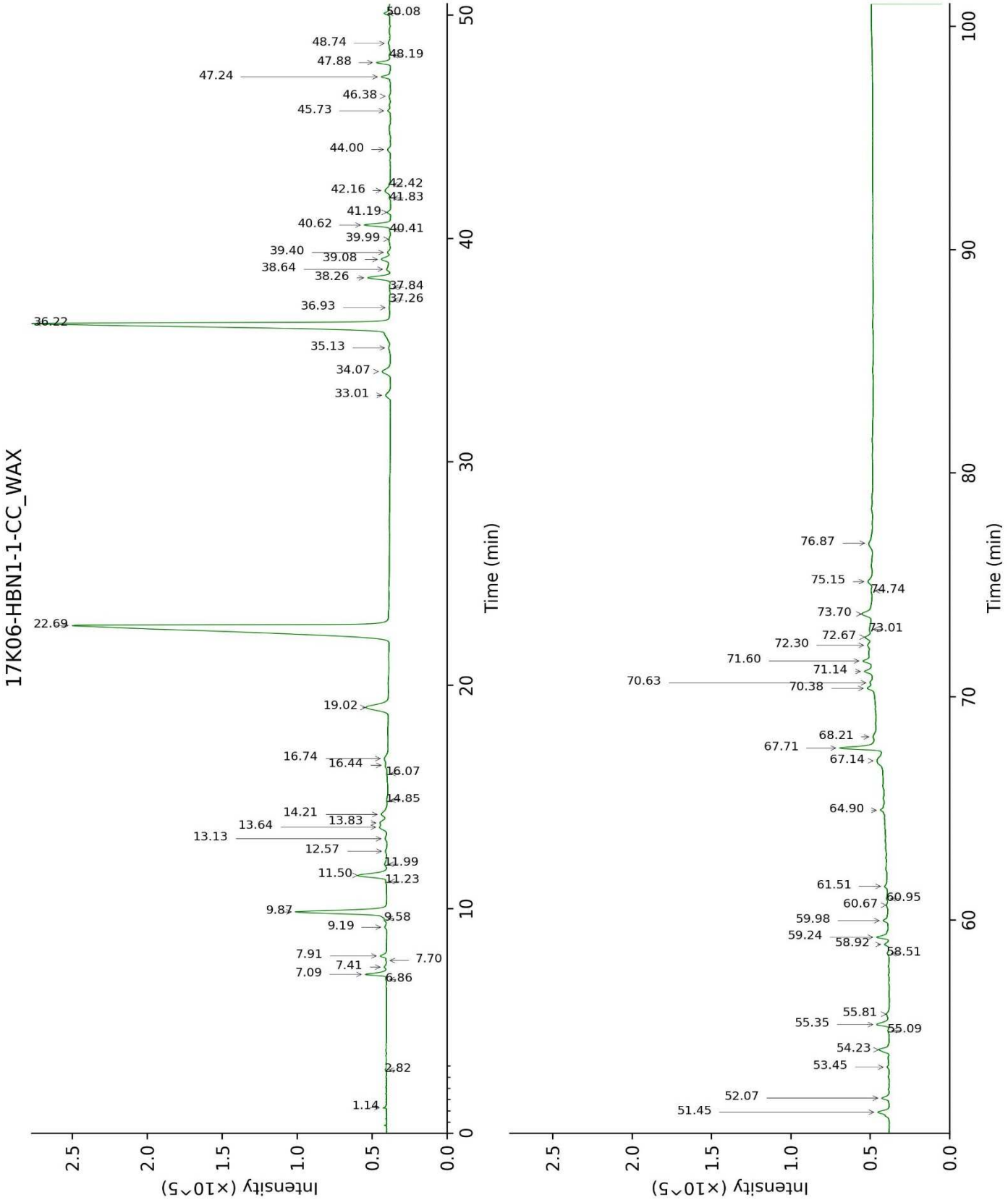
17K06-HBN1-1-CC_WAX
Time (min)
Intensity (×10^5)
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44.00
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