

Date : April 06, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 21C19-PTH14


**Customer identification** : Nutmeg - Indonesia - N40109208R

**Type** : Essential oil

**Source** : *Myristica fragrans*

**Customer** : Plant Therapy

ANALYSIS

**Method**: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst** : Seydou Ka, M. Sc.

**Analysis date** : March 29, 2021

Checked and approved by :

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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Faintly yellow liquid

**Refractive index:** 1.4818 ± 0.0003 (20 °C; method PC-MAT-016)

#### ISO 3215:1999 - OIL OF NUTMEG, INDONESIAN TYPE

Compound	Min. %	Max. %	Observed %	Complies?
α-Pinene	15	28	22	Yes
β-Pinene	13	18	15	Yes
Sabinene	14	29	21	Yes
Δ <sup>3</sup> -Carene	0.5	2.0	0.8	Yes
Limonene	2.0	7.0	3.8	Yes
γ-Terpinene	2.0	6.0	4.2	Yes
Terpinen-4-ol	2.0	6.0	4.5	Yes
Safrole	1.0	2.5	1.3	Yes
Myristicin	5.0	12.0	8.4	Yes
<b>Refractive index</b>	1.4750	1.4850	1.4818	Yes

#### 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
Tricyclene	0.02	Monoterpene
$\alpha$ -Thujene	1.78	Monoterpene
$\alpha$ -Pinene	21.59	Monoterpene
Camphene	0.33	Monoterpene
$\alpha$ -Fenchene	0.07	Monoterpene
meta-Cymene	0.03	Monoterpene
Sabinene	21.15	Monoterpene
$\beta$ -Pinene	15.27	Monoterpene
Myrcene	2.41	Monoterpene
$\alpha$ -Phellandrene	0.71	Monoterpene
Pseudolimonene	0.02	Monoterpene
$\Delta^3$ -Carene	0.77	Monoterpene
$\alpha$ -Terpinene	2.84	Monoterpene
para-Cymene	0.81	Monoterpene
1,8-Cineole	2.20*	Monoterpenic ether
$\beta$ -Phellandrene	[2.20]*	Monoterpene
Limonene	3.83	Monoterpene
(Z)- $\beta$ -Ocimene	0.02	Monoterpene
(E)- $\beta$ -Ocimene	0.04	Monoterpene
$\gamma$ -Terpinene	4.24	Monoterpene
cis-Sabinene hydrate	0.26	Monoterpenic alcohol
Terpinolene	1.45	Monoterpene
para-Cymenene	0.06	Monoterpene
trans-Sabinene hydrate	0.18	Monoterpenic alcohol
Unknown	0.06	Oxygenated monoterpene
Linalool	0.17	Monoterpenic alcohol
endo-Fenchol	0.03	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.15	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	tr	Aliphatic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.10	Monoterpenic alcohol
Epoxyterpinolene?	0.01	Monoterpenic ether
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	4.51	Monoterpenic alcohol
para-Cymen-8-ol	0.04	Monoterpenic alcohol
$\alpha$ -Terpineol	0.65	Monoterpenic alcohol
cis-Piperitol	0.06	Monoterpenic alcohol
trans-Piperitol	0.06	Monoterpenic alcohol
Citronellol	0.01	Monoterpenic alcohol
Geraniol	0.02	Monoterpenic alcohol
trans-Ascaridole glycol	0.01	Monoterpenic alcohol
Bornyl acetate	0.11	Monoterpenic ester
Safrole	1.30	Phenylpropanoid
Terpinen-4-yl acetate	0.03	Monoterpenic ester
Unknown	0.27	Simple phenolic

$\alpha$ -Cubebene	0.04	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.15	Monoterpenic ester
Eugenol	0.31	Phenylpropanoid
Citronellyl acetate	0.10	Monoterpenic ester
$\alpha$ -Copaene	0.28	Sesquiterpene
Geranyl acetate	0.18	Monoterpenic ester
Vanillin	0.02	Simple phenolic
Unknown	0.01	Terpene derivative
Methyleugenol	0.31	Phenylpropanoid
$\beta$ -Caryophyllene	0.08	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.09	Sesquiterpene
( <i>E</i> )-Isoeugenol	0.51	Phenylpropanoid
( <i>E</i> )- $\beta$ -Farnesene	0.03	Sesquiterpene
Germacrene D	0.04	Sesquiterpene
Bicyclogermacrene	0.02	Sesquiterpene
Methyl ( <i>E</i> )-isoeugenol	0.06	Phenylpropanoid
$\alpha$ -Murolene	0.02	Sesquiterpene
$\beta$ -Bisabolene	0.08	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.06	Sesquiterpene
Myristicin	8.45	Phenylpropanoid
$\delta$ -Cadinene	0.12	Sesquiterpene
Elemicin	0.32	Phenylpropanoid
Methoxyeugenol	0.23	Phenylpropanoid
Myristic acid	0.17	Aliphatic acid
Palmitic acid	0.04	Aliphatic acid
Stearic acid	0.03	Aliphatic acid
<b>Consolidated total</b>	<b>99.47%</b>	

\*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered [xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

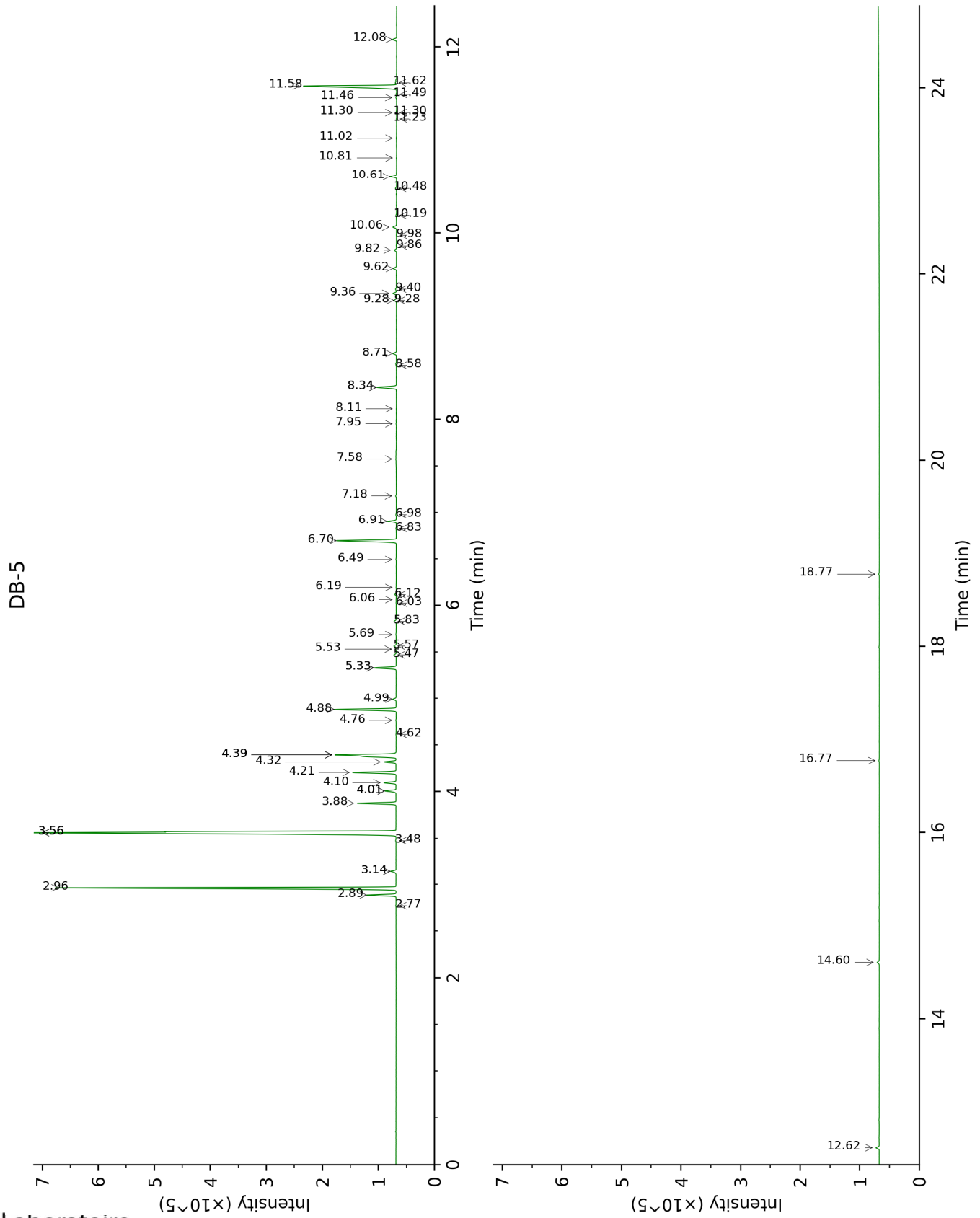
tr: The compound has been detected below 0.005% of total signal.

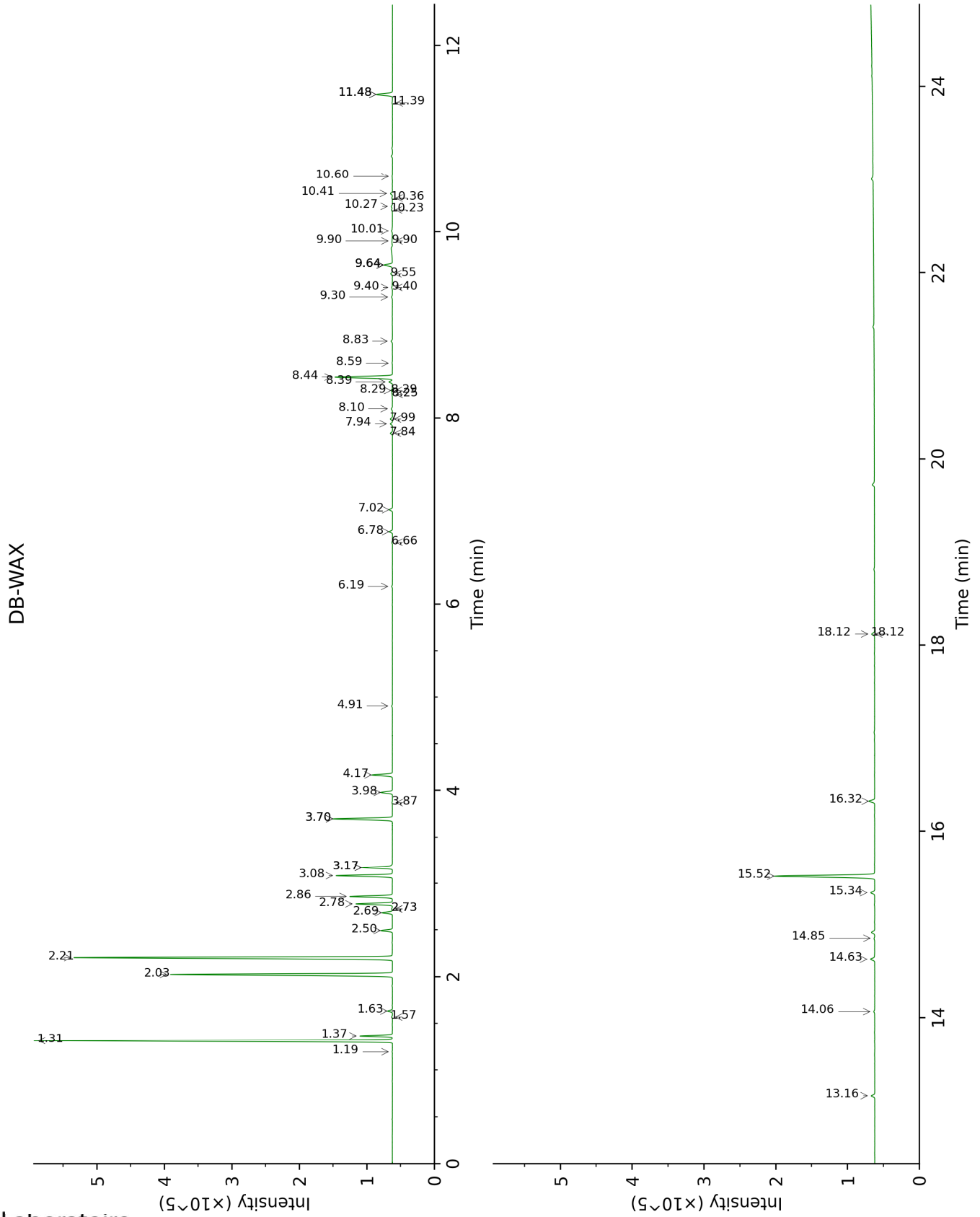
Note: no correction factor was applied

**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.

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Tricyclene	2.77	919	0.02	1.19	973	0.02
$\alpha$ -Thujene	2.89	927	1.78	1.37	1002	1.79
$\alpha$ -Pinene	2.96	932	21.59	1.31	993	21.50
Camphene	3.14*	944	0.39	1.63	1028	0.33
$\alpha$ -Fenchene	3.14*	944	[0.39]	1.57	1022	0.07
meta-Cymene	3.48	967	0.03	2.73*	1130	0.06
Sabinene	3.56*†	972	36.51	2.21	1086	21.15
$\beta$ -Pinene	3.56*†	972	[36.51]	2.03	1068	15.27
Myrcene	3.88	994	2.41	2.78	1134	2.38
$\alpha$ -Phellandrene	4.01*	1002	0.75	2.69	1127	0.71
Pseudolimonene	4.01*	1002	[0.75]	2.73*	1130	[0.06]
$\Delta^3$ -Carene	4.10	1008	0.77	2.50	1112	0.79
$\alpha$ -Terpinene	4.21	1015	2.84	2.86	1141	2.83
para-Cymene	4.32	1022	0.81	3.98	1227	0.81
1,8-Cineole	4.40*	1027	6.03	3.17*	1165	2.17
$\beta$ -Phellandrene	4.40*	1027	[6.03]	3.17*	1165	[2.17]
Limonene	4.40*	1027	[6.03]	3.08	1158	3.83
(Z)- $\beta$ -Ocimene	4.62	1041	0.02	3.70*	1206	4.18
(E)- $\beta$ -Ocimene	4.76	1050	0.04	3.87	1219	0.03
$\gamma$ -Terpinene	4.88	1058	4.24	3.70*	1206	[4.18]
cis-Sabinene hydrate	4.99	1065	0.26	6.78	1430	0.22
Terpinolene	5.33*	1087	1.55	4.17	1240	1.45
para-Cymenene	5.33*	1087	[1.55]	6.19	1387	0.06
trans-Sabinene hydrate	5.47	1095	0.18	7.84	1510	0.17
Unknown [m/z 95, 152 (20), 67 (17), 96 (16), 41 (12)]	5.53	1099	0.06	4.90	1294	0.05
Linalool	5.57	1101	0.17	7.94	1518	0.17
endo-Fenchol	5.69	1109	0.03	8.25	1542	0.04
cis-para-Menth-2-en-1-ol	5.83	1118	0.15	7.99	1522	0.17
4-Hydroxy-4-methylcyclohex-2-enone	6.03	1131	tr			
trans-Pinocarveol	6.06	1133	0.01			
trans-para-Menth-2-en-1-ol	6.12	1137	0.10	8.83	1588	0.11
Epoxyterpinolene?	6.19	1142	0.01			
Borneol	6.49	1161	0.02	9.64*	1654	0.72
Terpinen-4-ol	6.70	1174	4.51	8.44	1557	4.50
para-Cymen-8-ol	6.83	1182	0.04	11.39	1800	0.02
$\alpha$ -Terpineol	6.91	1188	0.65	9.64*	1654	[0.72]
cis-Piperitol	6.98	1192	0.06	9.40*	1634	0.07
trans-Piperitol	7.18	1205	0.06	10.23	1702	0.09
Citronellol	7.58	1232	0.01	10.60	1732	0.04
Geraniol	7.95	1257	0.02	11.48*	1808	1.32



<i>trans</i> -Ascaridole glycol	8.11	1268	0.01	14.06	2047	0.06
Bornyl acetate	8.34*	1283	1.50	8.10	1530	0.11
Safrole	8.34*	1283	[1.50]	11.48*	1808	[1.32]
Terpinen-4-yl acetate	8.58	1299	0.03	8.59	1569	0.04
Unknown [m/z 121, 178 (20), 77 (13), 122 (10)]	8.71	1308	0.27	8.39	1553	0.28
α-Cubebene	9.28*	1348	0.21	6.66	1422	0.04
α-Terpinyl acetate	9.28*	1348	[0.21]	9.55	1646	0.15
Eugenol	9.36	1354	0.31	14.63	2101	0.37
Citronellyl acetate	9.40	1357	0.10	9.30	1626	0.08
α-Copaene	9.62	1373	0.28	7.02	1448	0.24
Geranyl acetate	9.82	1387	0.18	10.41	1717	0.15
Vanillin	9.86	1390	0.02	18.12*	2471	0.24
Unknown [m/z 120, 91 (34), 105 (27), 43 (27), 77 (20), 93 (17)... 178 (t)]	9.98	1398	0.01			
Methyleugenol	10.06	1404	0.31	13.16	1961	0.26
β-Caryophyllene	10.19	1413	0.08	8.30*	1546	0.11
<i>trans</i> -α-Bergamotene	10.48	1435	0.09	8.30*	1546	[0.11]
( <i>E</i> )-Isoeugenol	10.61	1445	0.51	16.32	2274	0.48
( <i>E</i> )-β-Farnesene	10.81	1460	0.03	9.40*	1634	[0.07]
Germacrene D	11.02	1476	0.04	9.64*	1654	[0.72]
Bicyclogermacrene	11.23	1491	0.02	9.90*	1675	0.05
Methyl ( <i>E</i> )-isoeugenol	11.30*	1496	0.08	14.85	2124	0.06
α-Murolene	11.30*	1496	[0.08]	9.90*	1675	[0.05]
β-Bisabolene	11.46	1508	0.08	10.01	1683	0.09
(3 <i>E</i> ,6 <i>E</i> )-α-Farnesene	11.49	1511	0.06	10.36	1713	0.05
Myristicin	11.58	1518	8.45	15.52	2190	8.17
δ-Cadinene	11.62	1521	0.12	10.27	1705	0.11
Elemicin	12.08	1557	0.32	15.34	2173	0.34
Methoxyeugenol	12.62	1600	0.23	18.12*	2471	[0.24]
Myristic acid	14.60	1767	0.17			
Palmitic acid	16.77	1965	0.04			
Stearic acid	18.77	2166	0.03			
<b>Total identified</b>		<b>99.38%</b>			<b>98.26%</b>	
<b>Total reported</b>		<b>99.73%</b>			<b>98.58%</b>	

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

[xx]: Duplicate percentage due to coelutions, not 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.

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index