

Date : April 08, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 22D07-PTH08

**Customer identification** : Nutmeg - Indonesia - N40110R

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

**Analysis date** : April 08, 2022

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow liquid

**Refractive index:**  $1.4823 \pm 0.0003$  (20 °C; method PC-MAT-016)

*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	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Toluene	tr	Simple phenolic
Bornylene	0.01	Monoterpene
Hashishene	0.02	Monoterpene
$\alpha$ -Thujene	1.63	Monoterpene
$\alpha$ -Pinene	21.95	Monoterpene
Camphene	0.33	Monoterpene
$\alpha$ -Fenchene	0.07	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.03	Monoterpene
$\beta$ -Pinene	15.92	Monoterpene
Sabinene	17.25	Monoterpene
Myrcene	2.31	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
2-Carene	0.01	Monoterpene
$\alpha$ -Phellandrene	0.75	Monoterpene
Pseudolimonene	0.05	Monoterpene
$\Delta^3$ -Carene	1.01	Monoterpene
$\alpha$ -Terpinene	2.86	Monoterpene
para-Cymene	0.77	Monoterpene
Limonene	3.85	Monoterpene
1,8-Cineole	2.13	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.02	Monoterpene
(E)- $\beta$ -Ocimene	0.04	Monoterpene
$\gamma$ -Terpinene	4.26	Monoterpene
Unknown	0.01	Oxygenated monoterpene
cis-Sabinene hydrate	0.29	Monoterpenic alcohol
para-Cymenene	0.07	Monoterpene
Terpinolene	1.58	Monoterpene
trans-Sabinene hydrate	0.22	Monoterpenic alcohol
Unknown	0.06	Oxygenated monoterpene
Unknown	0.01	Oxygenated monoterpene
Linalool	0.26	Monoterpenic alcohol
Unknown	tr	Monoterpenic alcohol
para-Mentha-1,3,8-triene	0.01	Monoterpene
endo-Fenchol	0.03	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.14	Monoterpenic alcohol
trans-Pinocarveol	0.02	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.09	Monoterpenic alcohol
Epoxyterpinolene	0.03	Monoterpenic ether
Sabinaketone	0.01	Normonoterpenic ketone
Pinocarvone	0.01	Monoterpenic ketone
Borneol	0.04	Monoterpenic alcohol
$\delta$ -Terpineol	0.01	Monoterpenic alcohol

Terpinen-4-ol	4.31	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
para-Cymen-8-ol	0.03	Monoterpenic alcohol
$\alpha$ -Terpineol	0.77	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.03	Monoterpenic alcohol
Myrtenol	0.01	Monoterpenic alcohol
<i>trans</i> -Piperitol	0.05	Monoterpenic alcohol
endo-Fenchyl acetate	0.01	Monoterpenic ester
Citronellol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Unknown	0.11	Unknown
Geraniol	0.04	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Safrole	1.45	Phenylpropanoid
Cuminol	0.02	Monoterpenic alcohol
Terpinen-4-yl acetate	0.03	Monoterpenic ester
Unknown	0.04	Unknown
Thymol	0.01	Monoterpenic alcohol
Unknown	0.25	Simple phenolic
Unknown	0.01	Unknown
1,4-para-Menthadien-7-ol	0.01	Monoterpenic alcohol
$\alpha$ -Cubebene	0.05	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.12	Monoterpenic ester
Citronellyl acetate	0.05	Monoterpenic ester
Eugenol	0.40	Phenylpropanoid
Neryl acetate	0.03	Monoterpenic ester
$\alpha$ -Copaene	0.31	Sesquiterpene
Geranyl acetate	0.22	Monoterpenic ester
$\beta$ -Elemene	0.01	Sesquiterpene
Vanillin	0.01	Simple phenolic
Methyleugenol	0.30	Phenylpropanoid
$\beta$ -Caryophyllene	0.10	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.09	Sesquiterpene
$\alpha$ -Humulene	0.01	Sesquiterpene
( <i>E</i> )-Isoeugenol	0.70	Phenylpropanoid
<i>trans</i> -Cadina-1(6),4-diene	0.01	Sesquiterpene
$\gamma$ -Muurolene	0.03	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
<i>trans</i> -Muurola-4(15),5-diene	0.02	Sesquiterpene
Bicyclgermacrene	0.03	Sesquiterpene
Methyl ( <i>E</i> )-isoeugenol	0.06	Phenylpropanoid
$\gamma$ -Cadinene	0.02	Sesquiterpene
$\beta$ -Bisabolene	0.04	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.04	Sesquiterpene
Myristicin	9.52	Phenylpropanoid
<i>trans</i> -Cadina-1,4-diene	0.03	Sesquiterpene
Elemicin	0.31	Phenylpropanoid
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
Methoxyeugenol	0.45	Phenylpropanoid
( <i>E</i> )-Isoelemicin	0.01	Phenylpropanoid
Myristic acid	0.22	Aliphatic acid

Palmitic acid	0.05	Aliphatic acid
para-Camphorene	0.01	Diterpene
Stearic acid	0.05	Aliphatic acid
<b>Consolidated total</b>	<b>98.76%</b>	

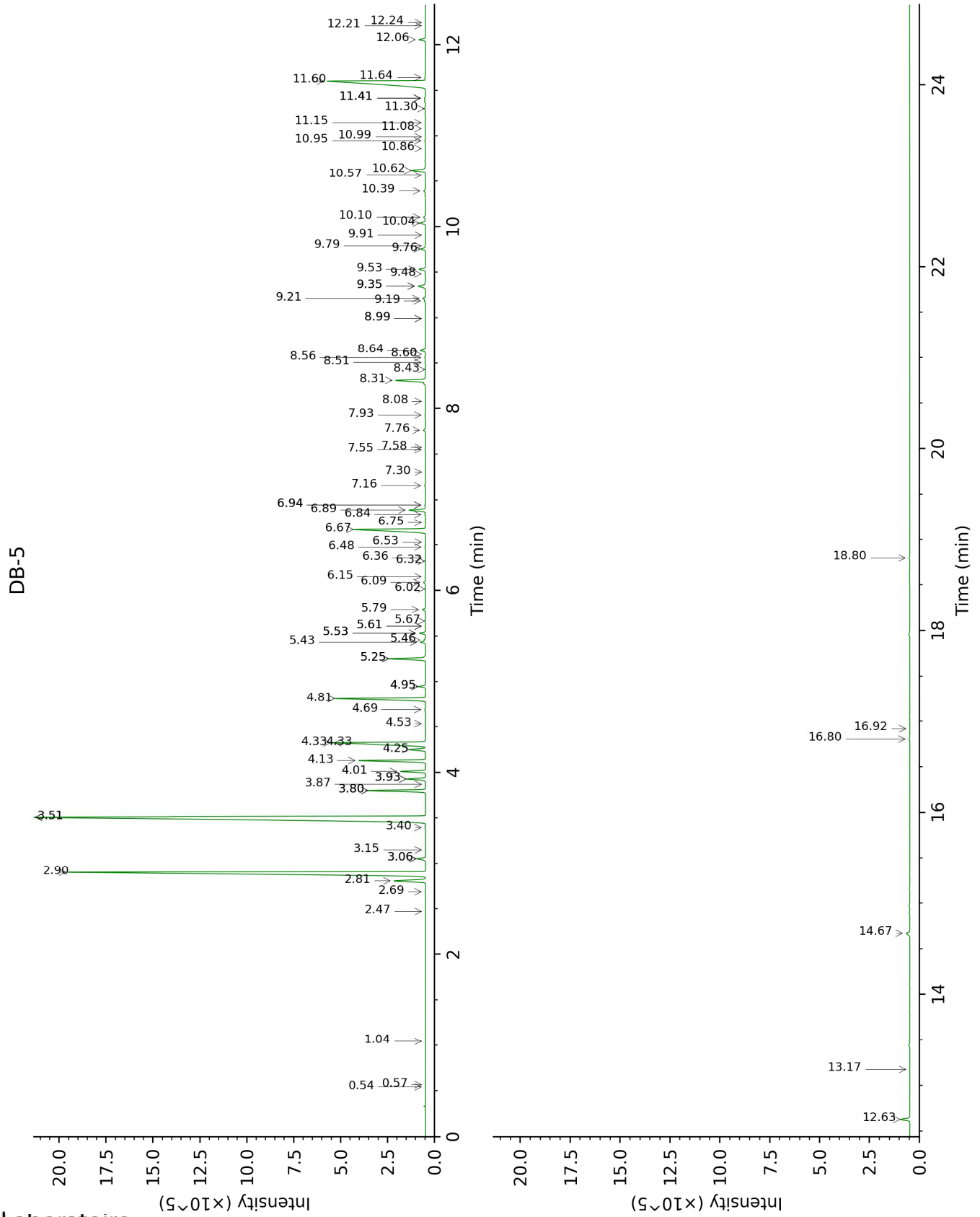
tr: The compound has been detected below 0.005% of total signal.

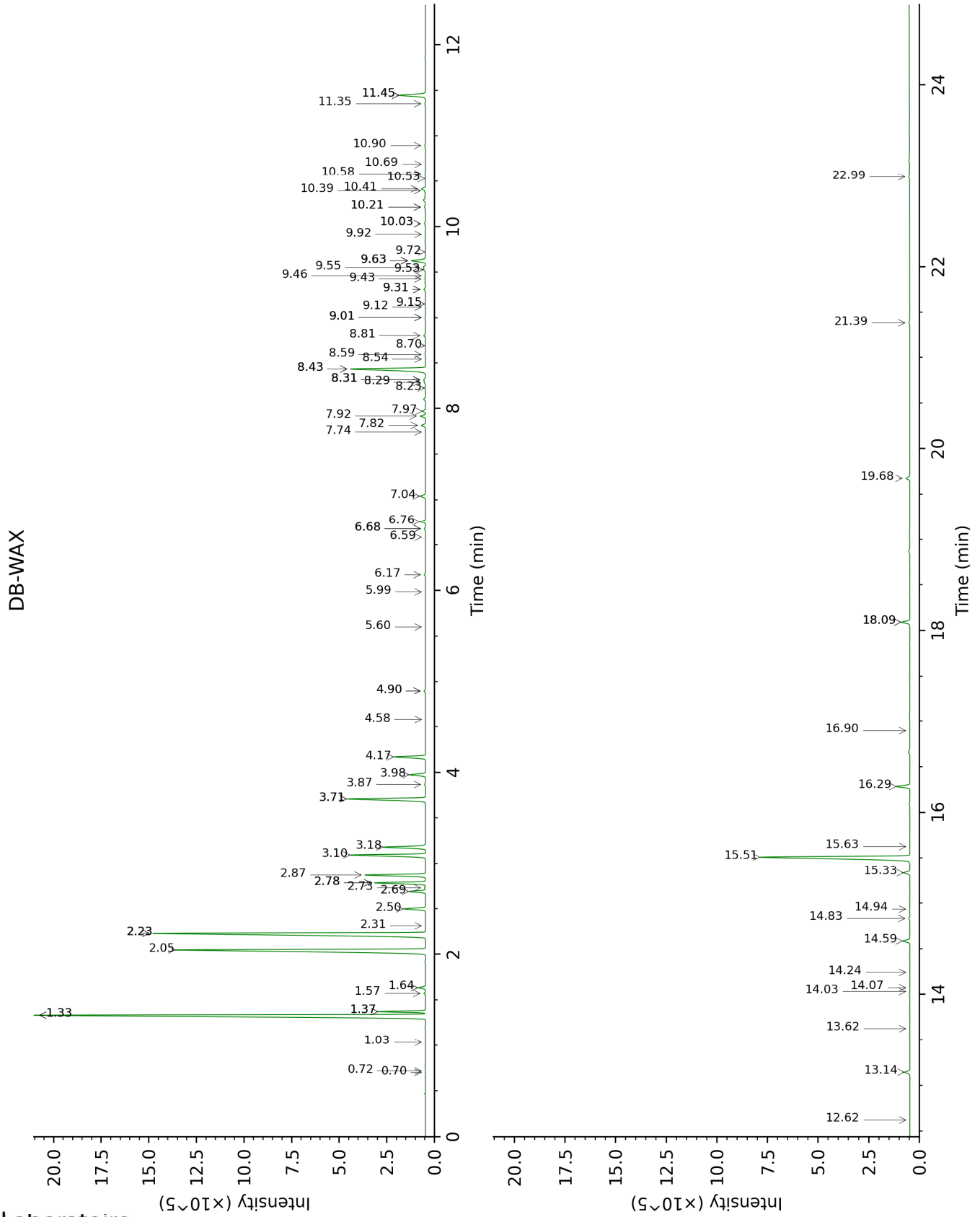
Note: no correction factor was applied

**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.

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







FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.54	642	tr	0.72	888	0.01
2-Methylbutyral	0.57	652	tr	0.70	882	tr
Toluene	1.04	758	tr	1.37*	1003	1.64
Bornylene	2.47	902	0.01	1.03	947	tr
Hashishene	2.69	917	0.02	1.33*	998	21.82
$\alpha$ -Thujene	2.81	925	1.63	1.37*	1003	[1.64]
$\alpha$ -Pinene	2.90	932	21.95	1.33*	998	[21.82]
Camphene	3.06*	942	0.41	1.64	1029	0.33
$\alpha$ -Fenchene	3.06*	942	[0.41]	1.57	1022	0.07
Thuja-2,4(10)-diene	3.15	948	0.01	2.23*	1088	17.26
3,7,7-Trimethylcyclohepta-1,3,5-triene	3.40	965	0.03	2.78*	1135	2.34
$\beta$ -Pinene	3.51*	973	33.31	2.05	1070	15.92
Sabinene	3.51*	973	[33.31]	2.23*	1088	[17.26]
Myrcene	3.80*	992	2.33	2.78*	1135	[2.34]
6-Methyl-5-hepten-2-one	3.80*	992	[2.33]	4.90*	1298	0.07
2-Carene	3.87	997	0.01	2.31	1097	0.01
$\alpha$ -Phellandrene	3.93*	1001	0.80	2.69	1127	0.75
Pseudolimonene	3.93*	1001	[0.80]	2.73	1131	0.05
$\Delta$ 3-Carene	4.01	1006	1.01	2.50	1112	1.01
$\alpha$ -Terpinene	4.13	1014	2.86	2.87	1142	2.87
para-Cymene	4.25	1022	0.77	3.98	1228	0.78
Limonene	4.33*	1026	5.98	3.10	1160	3.85
1,8-Cineole	4.33*	1026	[5.98]	3.18	1167	2.13
(Z)- $\beta$ -Ocimene	4.53	1039	0.02	3.71*	1209	4.27
(E)- $\beta$ -Ocimene	4.69	1049	0.04	3.87	1220	0.05
$\gamma$ -Terpinene	4.81	1057	4.26	3.71*	1209	[4.27]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	4.95*	1066	0.29	4.58	1274	0.01
cis-Sabinene hydrate	4.95*	1066	[0.29]	6.76	1429	0.29
para-Cymenene	5.25*	1085	1.64	6.17	1386	0.07
Terpinolene	5.25*	1085	[1.64]	4.17	1243	1.58
trans-Sabinene hydrate	5.44	1096	0.22	7.82	1507	0.22
Unknown [m/z 95, 152 (20), 67 (17), 96 (16), 41 (12)]	5.46	1098	0.06	4.90*	1298	[0.07]
Unknown [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.53*	1102	0.27	5.60	1345	0.01
Linalool	5.53*	1102	[0.27]	7.92	1515	0.26
Unknown [m/z 119, 109 (94), 43 (61), 95 (56), 91 (48), 77 (32),	5.61*	1107	0.02	8.32*†	1546	[0.18]

152 (32), 137 (31), 134 (24)]						
para-Mentha-1,3,8- triene	5.61*	1107	[0.02]	5.98	1373	0.01
endo-Fenchol	5.67	1111	0.03	8.23	1539	0.03
cis-para-Menth-2-en- 1-ol	5.79	1119	0.14	7.97	1519	0.15
trans-Pinocarveol	6.02	1133	0.02	9.01*	1600	0.03
trans-para-Menth-2- en-1-ol	6.09	1138	0.09	8.81	1584	0.09
Epoxyterpinolene	6.15	1142	0.03	6.59	1416	0.01
Sabinaketone	6.32	1153	0.01	8.54	1564	0.01
Pinocarvone	6.36	1155	0.01	7.74	1502	0.02
Borneol	6.48	1163	0.04	9.63*	1650	0.81
δ-Terpineol	6.53	1166	0.01	9.31*	1624	0.09
Terpinen-4-ol	6.67	1175	4.31	8.43*	1555	4.53
Cryptone	6.75	1180	0.01	9.01*	1600	[0.03]
para-Cymen-8-ol	6.84	1186	0.03	11.35	1795	0.04
α-Terpineol	6.89	1189	0.77	9.63*	1650	[0.81]
cis-Piperitol	6.94*	1193	0.05	9.43	1634	0.03
Myrtenol	6.94*	1193	[0.05]	10.69	1738	0.01
trans-Piperitol	7.16	1206	0.05	10.21*	1698	0.07
endo-Fenchyl acetate	7.30	1216	0.01	6.68*	1423	0.06
Citronellol	7.55	1233	0.02	10.58	1729	0.03
Unknown [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	7.58	1234	0.01			
Unknown [m/z 43, 109 (63), 71 (50), 81 (31), 55 (29), 85 (26)...]	7.76	1247	0.11	9.56†	1644	[0.23]
Geraniol	7.93	1258	0.04	11.45*	1803	1.51
trans-Ascaridole glycol	8.08	1268	0.01	14.03	2041	0.01
Safrole	8.31	1284	1.45	11.45*	1803	[1.51]
Cuminol	8.43	1291	0.02	14.07	2045	0.01
Terpinen-4-yl acetate	8.51	1297	0.03	8.59	1568	0.02
Unknown [m/z 81, 55 (82), 41 (58), 69 (51), 67 (49)...]	8.56	1300	0.04	10.90	1756	0.04
Thymol	8.60	1303	0.01	14.94	2130	0.01
Unknown [m/z 121, 178 (20), 77 (13), 122 (10)]	8.64	1306	0.25	8.43*	1555	[4.53]
Unknown [m/z 149, 178 (41), 121 (36), 91 (30), 55 (21)]	8.99*	1331	0.02	8.70	1576	0.01
1,4-para- Menthadien-7-ol	8.99*	1331	[0.02]	13.62	2002	0.01
α-Cubebene	9.19	1344	0.05	6.68*	1423	[0.06]

α-Terpinyl acetate	9.21	1346	0.12	9.53†	1642	0.23
Citronellyl acetate	9.35*	1356	0.44	9.31*	1624	[0.09]
Eugenol	9.35*	1356	[0.44]	14.59	2095	0.40
Neryl acetate	9.48	1365	0.03	10.03*	1683	0.07
α-Copaene	9.53	1369	0.31	7.04	1450	0.30
Geranyl acetate	9.76	1384	0.22	10.42	1715	0.22
β-Elemene	9.79	1387	0.01	8.29†	1544	0.18
Vanillin	9.91	1395	0.01	18.09*	2471	0.47
Methyleugenol	10.04	1404	0.30	13.14	1957	0.28
β-Caryophyllene	10.10	1409	0.10	8.32*†	1546	[0.18]
<i>trans</i> -α-Bergamotene	10.39	1431	0.09	8.32*†	1546	[0.18]
α-Humulene	10.57	1444	0.01	9.15	1611	0.02
( <i>E</i> )-Isoeugenol	10.62	1448	0.70	16.29	2271	0.71
<i>trans</i> -Cadina-1(6),4-diene	10.86	1466	0.01	9.12	1609	0.01
γ-Murolene	10.95	1472	0.03	9.46	1637	0.03
Germacrene D	10.99	1475	0.01	9.63*	1650	[0.81]
<i>trans</i> -Muurolo-4(15),5-diene	11.08	1482	0.02	9.72	1658	0.02
Bicyclgermacrene	11.15	1487	0.03	9.92	1674	0.03
Methyl ( <i>E</i> )-isoeugenol	11.30	1498	0.06	14.83	2120	0.05
γ-Cadinene	11.42*	1507	0.06	10.21*	1698	[0.07]
β-Bisabolene	11.42*	1507	[0.06]	10.03*	1683	[0.07]
(3 <i>E</i> ,6 <i>E</i> )-α-Farnesene	11.42*	1507	[0.06]	10.40	1713	0.04
Myristicin	11.60	1522	9.52	15.51	2189	9.44
<i>trans</i> -Cadina-1,4-diene	11.64	1525	0.03	10.53	1724	0.02
Elemicin	12.06	1557	0.31	15.33	2171	0.33
Spathulenol	12.21	1569	0.01	14.24	2062	0.01
Caryophyllene oxide	12.24	1572	0.01	12.62	1908	0.01
Methoxyeugenol	12.63	1602	0.45	18.09*	2471	[0.47]
( <i>E</i> )-Isoelemicin	13.17	1647	0.01	16.90	2336	0.01
Myristic acid	14.67	1774	0.22	19.68	2659	0.21
Palmitic acid	16.80	1969	0.05	21.39	2877	0.05
para-Camphorene	16.92	1980	0.01	15.63	2201	0.01
Stearic acid	18.80	2168	0.05	22.99	3096	0.05
<b>Total identified</b>		<b>98.38%</b>			<b>98.44%</b>	
<b>Total reported</b>		<b>98.85%</b>			<b>98.51%</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