Date : May 26, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20E11-PTH04
Customer identification : Nutmeg - Indonesia - N40106911R
Type : Essential oil
Source : *Myristica fragrans*
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc.
Analysis date : May 12, 2020

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Fainty yellow liquid
Refractive index: 1.4835 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3215:1999 - OIL OF NUTMEG, INDONESIAN TYPE

Compound	Min. %	Max. %	Observed %	Complies?
Myristicin	5.0	12.0	10.3	Yes
Safrole	1.0	2.5	1.8	Yes
Terpinen-4-ol	2.0	6.0	4.7	Yes
γ-Terpinene	2.0	6.0	4.1	Yes
Limonene	2.0	7.0	3.7	Yes
Δ3-Carene	0.5	2.0	1.0	Yes
Sabinene	14	29	19	Yes
β-Pinene	13	18	15	Yes
α-Pinene	15	28	20	Yes
Refractive index	1.4750	1.4850	1.4835	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for nutmeg oil, Indonesian type.

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
α-Thujene	1.67	Monoterpene
α-Pinene	20.08	Monoterpene
Camphene	0.29	Monoterpene
α-Fenchene	0.05	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
Sabinene	19.23	Monoterpene
β-Pinene	14.81	Monoterpene
Myrcene	2.24	Monoterpene
Pseudolimonene	0.05	Monoterpene
α-Phellandrene	0.74	Monoterpene
Δ3-Carene	0.99	Monoterpene
α-Terpinene	2.81	Monoterpene
ortho-Cymene	0.01	Monoterpene
para-Cymene	0.80	Monoterpene
Limonene	3.72	Monoterpene
1,8-Cineole	1.94	Monoterpenic ether
β-Phellandrene	0.14	Monoterpene
(*Z*)-β-Ocimene	0.02	Monoterpene
(*E*)-β-Ocimene	0.03	Monoterpene
γ-Terpinene	4.10	Monoterpene
cis-Sabinene hydrate	0.41	Monoterpenic alcohol
Terpinolene	1.61	Monoterpene
para-Cymenene	0.06	Monoterpene
trans-Sabinene hydrate	0.35	Monoterpenic alcohol
Unknown	0.06	Oxygenated monoterpene
Linalool	0.16	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.16	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.01	Aliphatic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.11	Monoterpenic alcohol
Epoxyterpinolene	0.03	Monoterpenic ether
Borneol	0.03	Monoterpenic alcohol
δ-Terpineol	0.01	Monoterpenic alcohol
Terpinen-4-ol	4.67	Monoterpenic alcohol
para-Cymen-8-ol	0.04	Monoterpenic alcohol
α-Terpineol	0.74	Monoterpenic alcohol
cis-Piperitol	0.07	Monoterpenic alcohol
trans-Piperitol	0.06	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol
Linalyl acetate	0.04	Monoterpenic ester
trans-Ascaridole glycol	0.02	Monoterpenic alcohol
Bornyl acetate	0.03	Monoterpenic ester
Safrole	1.79	Phenylpropanoid

Isobornyl acetate	0.05	Monoterpenic ester
Terpinen-4-yl acetate	0.04	Monoterpenic ester
Thymol	0.05	Monoterpenic alcohol
Unknown	0.23	Simple phenolic
Carvacrol	0.02	Monoterpenic alcohol
Unknown	0.02	Unknown
α-Terpinyl acetate	0.18	Monoterpenic ester
Citronellyl acetate	0.02	Monoterpenic ester
Eugenol	0.42	Phenylpropanoid
Neryl acetate	0.02	Monoterpenic ester
α-Copaene	0.28	Sesquiterpene
Geranyl acetate	0.21	Monoterpenic ester
β-Cubebene	0.02	Sesquiterpene
Vanillin	0.02	Simple phenolic
Methyleugenol	0.33	Phenylpropanoid
(*Z*)-Isoeugenol	0.01	Phenylpropanoid
β-Caryophyllene	0.04	Sesquiterpene
trans-α-Bergamotene	0.08	Sesquiterpene
(*E*)-Isoeugenol	0.84	Phenylpropanoid
(*E*)-β-Farnesene	0.03	Sesquiterpene
trans-Cadina-1(6),4-diene	0.01	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	0.04	Sesquiterpene
Bicyclogermacrene	0.03	Sesquiterpene
(*Z*)-α-Bisabolene	0.07	Sesquiterpene
β-Bisabolene	0.05	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.05	Sesquiterpene
trans-Calamenene	0.01	Sesquiterpene
Myristicin	10.28	Phenylpropanoid
trans-Cadina-1,4-diene	0.04	Sesquiterpene
Elemicin	0.32	Phenylpropanoid
Caryophyllene oxide	0.01	Sesquiterpenic ether
Methoxyeugenol	0.50	Phenylpropanoid
Myristic acid	0.15	Aliphatic acid
Palmitic acid	0.06	Aliphatic acid
Consolidated total	**98.78%**	

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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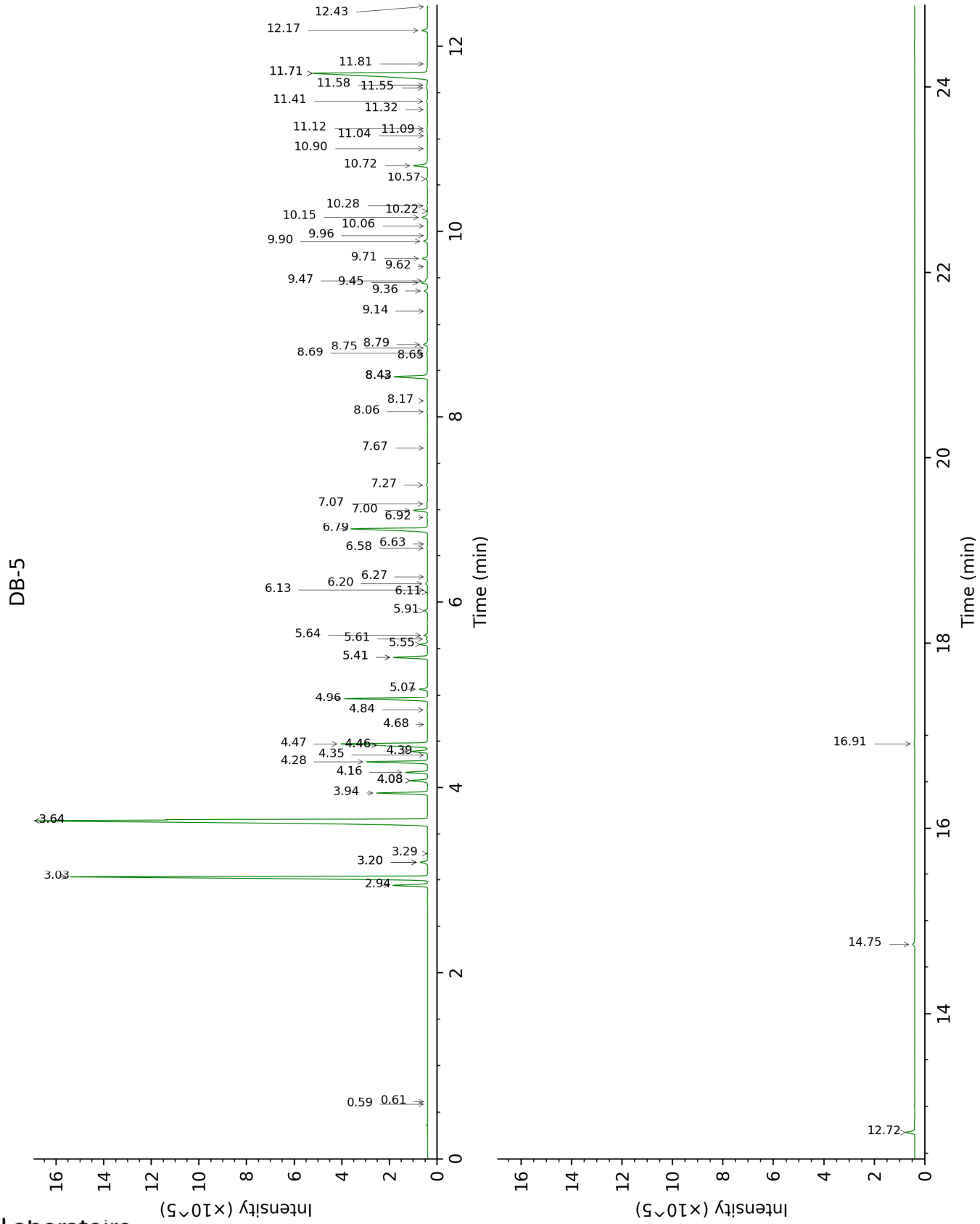
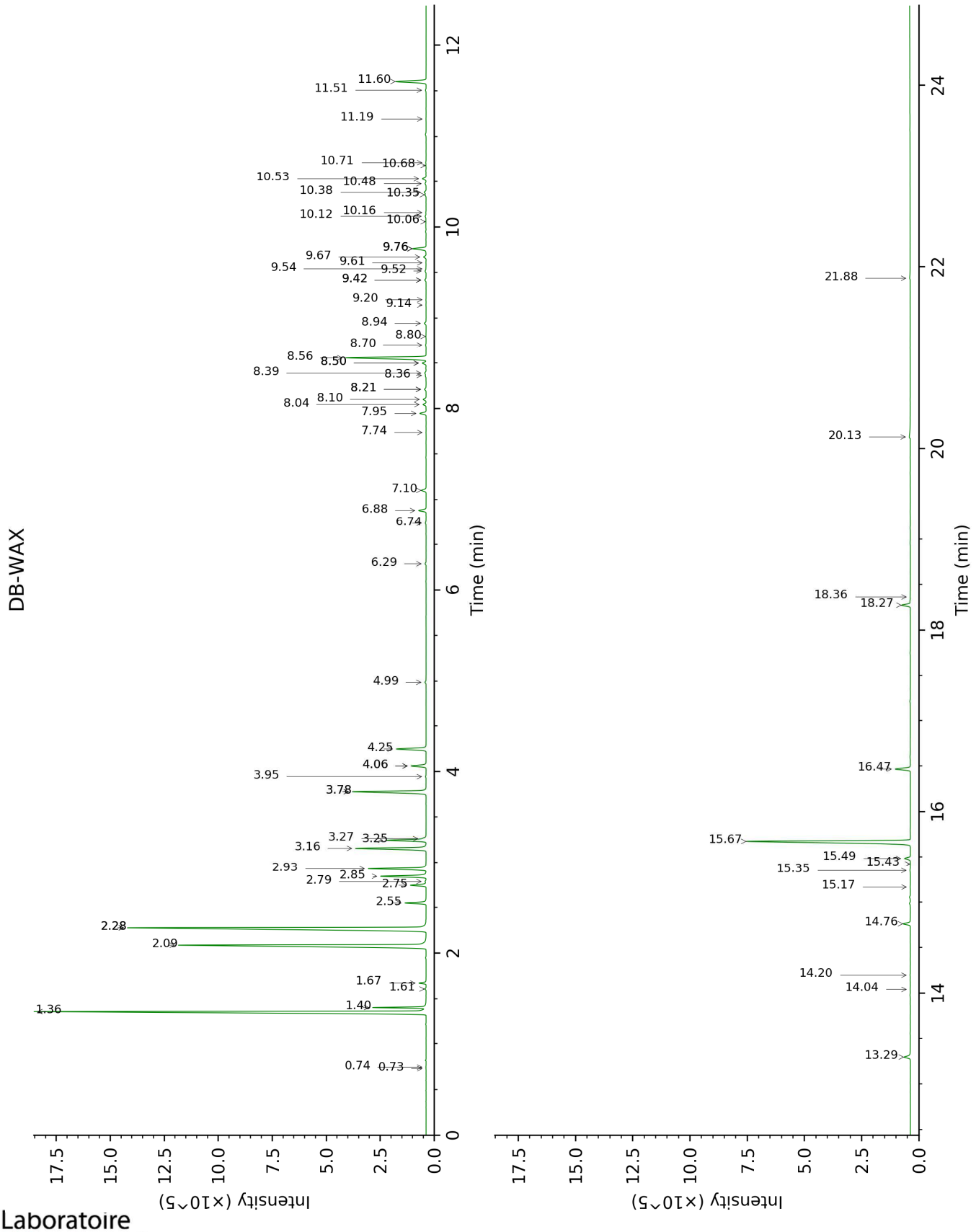

DB-5
Time (min)
Intensity (×10^5)
12.43
12.17
11.81
11.71
11.58
11.55
11.41
11.32
11.12
11.04
11.09
10.90
10.72
10.57
10.28
10.22
10.15
10.06
9.90
9.96
9.71
9.62
9.47
9.45
9.36
9.14
8.69
8.75
8.79
8.65
8.43
8.17
8.06
7.67
7.27
7.07
7.00
6.92
6.79
6.58
6.63
6.27
6.20
6.13
6.11
5.91
5.64
5.61
5.55
5.41
5.07
4.96
4.84
4.68
4.47
4.46
4.39
4.35
4.28
4.16
4.08
3.94
3.64
3.29
3.20
3.03
2.94
0.59
0.61
16.91
14.75
12.72


DB-WAX
Time (min)
Intensity (×10^5)
11.60
11.51
11.19
10.71
10.68
10.53
10.48
10.38
10.35
10.12
10.16
10.06
9.76
9.67
9.61
9.54
9.52
9.42
9.20
9.14
8.94
8.80
8.70
8.56
8.50
8.39
8.36
8.21
8.10
8.04
7.95
7.74
7.10
6.88
6.74
6.29
4.99
4.25
4.06
3.95
3.78
3.27
3.25
3.16
2.93
2.85
2.79
2.75
2.55
2.28
2.09
1.67
1.61
1.40
1.36
0.74
0.73
21.88
20.13
18.36
18.27
16.47
15.67
15.49
15.43
15.35
15.17
14.76
14.20
14.04
13.29

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.59	640	tr	0.74	886	0.01
2-Methylbutyral	0.61	651	tr	0.73	880	tr
α-Thujene	2.94	926	1.67	1.40	998	1.80
α-Pinene	3.03	932	20.08	1.36	993	19.85
Camphene	3.20*	942	0.35	1.67	1025	0.29
α-Fenchene	3.20*	942	[0.35]	1.61	1019	0.05
Thuja-2,4(10)-diene	3.29	948	tr	2.28*	1085	19.24
Sabinene	3.64*	972	34.23	2.28*	1085	[19.24]
β-Pinene	3.64*	972	[34.23]	2.09	1066	14.81
Myrcene	3.94	992	2.24	2.85	1132	2.25
Pseudolimonene	4.08*	1000	0.80	2.79	1127	0.05
α-Phellandrene	4.08*	1000	[0.80]	2.75	1124	0.74
Δ3-Carene	4.16	1006	0.99	2.55	1109	0.99
α-Terpinene	4.28	1013	2.81	2.93	1138	2.81
ortho-Cymene	4.35	1018	0.01	4.06*	1225	0.81
para-Cymene	4.39	1020	0.80	4.06*	1225	[0.81]
Limonene	4.46*†	1024	5.81	3.16	1156	3.72
1,8-Cineole	4.46*†	1024	[5.81]	3.25	1163	1.94
β-Phellandrene	4.47†	1025	[5.81]	3.26	1165	0.14
(*Z*)-β-Ocimene	4.68	1038	0.02	3.78*	1205	4.12
(*E*)-β-Ocimene	4.84	1048	0.03	3.95	1217	0.03
γ-Terpinene	4.96	1056	4.10	3.78*	1205	[4.12]
cis-Sabinene hydrate	5.07	1063	0.41	6.88	1427	0.42
Terpinolene	5.41*	1084	1.66	4.25	1239	1.61
para-Cymenene	5.41*	1084	[1.66]	6.29	1384	0.06
trans-Sabinene hydrate	5.55	1093	0.35	7.95	1507	0.35
Unknown [m/z 95, 152 (20), 67 (17), 96 (16), 41 (12)]	5.60	1097	0.06	4.99	1293	0.08
Linalool	5.64	1100	0.16	8.04	1514	0.17
cis-para-Menth-2-en-1-ol	5.91	1117	0.16	8.10	1519	0.17
4-Hydroxy-4-methylcyclohex-2-enone	6.11	1129	0.01	14.04	2026	0.02
trans-Pinocarveol	6.13	1131	0.01	9.14	1600	0.01
trans-para-Menth-2-en-1-ol	6.20	1135	0.11	8.94	1584	0.11
Epoxyterpinolene	6.27	1140	0.03	6.74	1416	0.05
Borneol	6.58	1160	0.03	9.76*	1650	0.81
δ-Terpineol	6.63	1163	0.01	9.42*	1622	0.08
Terpinen-4-ol	6.79	1174	4.67	8.56	1554	4.67
para-Cymen-8-ol	6.92	1182	0.04	11.51	1796	0.04
α-Terpineol	7.00	1187	0.74	9.76*	1650	[0.81]
cis-Piperitol	7.06	1192	0.07	9.52	1630	0.06

trans-Piperitol	7.27	1205	0.06	10.35	1698	0.06
Citronellol	7.67	1232	0.03	10.71	1728	0.02
Linalyl acetate	8.06	1259	0.04	8.21*	1527	0.10
trans-Ascaridole glycol	8.17	1268	0.02	14.20	2041	0.02
Bornyl acetate	8.43*	1286	1.86	8.21*	1527	[0.10]
Safrole	8.43*	1286	[1.86]	11.60	1804	1.79
Isobornyl acetate	8.43*	1286	[1.86]	8.36	1539	0.05
Terpinen-4-yl acetate	8.65	1301	0.04	8.70	1565	0.03
Thymol	8.68	1303	0.05	15.17	2135	0.01
Unknown [m/z 121, 178 (20), 77 (13), 122 (10)]	8.79	1305	0.23	8.50*	1550	0.23
Carvacrol	8.75	1308	0.02	15.42	2161	0.01
Unknown [m/z 149, 178 (41), 121 (36), 91 (30), 55 (21)]	9.14	1330	0.02	8.80	1573	0.01
α-Terpinyl acetate	9.36	1346	0.18	9.67	1642	0.14
Citronellyl acetate	9.45†	1352	0.44	9.42*	1622	[0.08]
Eugenol	9.47†	1353	[0.44]	14.76	2095	0.42
Neryl acetate	9.62	1364	0.02	10.16	1682	0.02
α-Copaene	9.71	1370	0.28	7.10	1444	0.29
Geranyl acetate	9.90	1384	0.21	10.53	1713	0.22
β-Cubebene	9.96	1388	0.02	7.74	1491	0.01
Vanillin	10.06	1395	0.02	18.36	2473	0.03
Methyleugenol	10.15	1402	0.33	13.29	1956	0.43
(*Z*)-Isoeugenol	10.22	1406	0.01	15.35	2153	0.03
β-Caryophyllene	10.28	1411	0.04	8.50*	1550	[0.23]
trans-α-Bergamotene	10.57	1432	0.08	8.39	1541	0.09
(*E*)-Isoeugenol	10.72	1443	0.84	16.47	2268	0.86
(*E*)-β-Farnesene	10.90	1457	0.03	9.54	1632	0.02
trans-Cadina-1(6),4-diene	11.04	1468	0.01	9.20	1605	0.01
γ-Muurolene	11.09	1471	0.02	9.61	1637	0.01
Germacrene D	11.12	1473	0.04	9.76*	1650	[0.81]
Bicyclogermacrene	11.32	1488	0.03	10.06	1674	0.02
(*Z*)-α-Bisabolene	11.41	1495	0.07	10.38	1700	0.12
β-Bisabolene	11.55	1506	0.05	10.12	1679	0.06
(3*E*,6*E*)-α-Farnesene	11.58	1508	0.05	10.48	1708	0.07
trans-Calamenene	11.71*	1518	10.38	11.19	1769	0.01
Myristicin	11.71*	1518	[10.38]	15.67	2186	10.28
trans-Cadina-1,4-diene	11.81	1526	0.04	10.68	1726	0.01
Elemicin	12.17	1554	0.32	15.49	2167	0.34
Caryophyllene oxide	12.43	1575	0.01			
Methoxyeugenol	12.72	1598	0.50	18.27	2463	0.51
Myristic acid	14.75	1768	0.15	20.13	2678	0.19

Palmitic acid	16.91	1966	0.06	21.88	2897	0.08
Total identified		**98.76%**			**98.90%**	
Total reported		**99.07%**			**99.00%**	

*: 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

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