

Date : September 24, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18117-PTH2-1-CC

Customer identification : Rosemary - Tunisia - R4010785R

Type : Essential oil

Source : *Rosmarinus officinalis* ct. 1,8-Cineole

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Lindsay Girard, B. Sc.

Analysis date : September 18, 2018

Checked and approved by :



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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.

This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4660 ± 0.0003 (20 °C)

ISO 1342:2001 - OIL OF ROSEMARY - MOROCCO & TUNISIA

Compound	Min. %	Max. %	Observed %	Complies?
Verbenone		0.4	0.1	Yes
Borneol	1	5	2	Yes
α-Terpineol	1.0	2.5	1.7	Yes
Bornyl acetate	0.1	1.6	1.1	Yes
Camphor	5	15	11	Yes
para-Cymene	0.5	2.5	2.0	Yes
1,8-Cineole	38	55	44	Yes
Limonene	1.5	4.0	3.7	Yes
Myrcene	1.0	2.0	1.3	Yes
β-Pinene	4	9	8	Yes
Camphene	2.5	6.0	2.7	Yes
α-Pinene	9	14	13	Yes
Refractive index	1.4640	1.4700	1.4660	Yes

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
(3Z)-Hexenol	tr	0.01	Aliphatic alcohol
Hashishene	0.01	12.74*	Monoterpene
Tricyclene	0.12	0.11	Monoterpene
α -Thujene	0.06	0.07	Monoterpene
α -Pinene	12.72	[12.74]*	Monoterpene
Camphene	2.71*	2.73	Monoterpene
α -Fenchene	[2.71]*	0.05	Monoterpene
Thuja-2,4(10)-diene	0.01	0.06*	Monoterpene
Sabinene	7.70*	[0.06]*	Monoterpene
β -Pinene	[7.70]*	7.72	Monoterpene
Octen-3-ol	0.01	0.03	Aliphatic alcohol
Octan-3-one	0.03	0.03	Aliphatic ketone
Myrcene	1.27	1.28	Monoterpene
α -Phellandrene	0.40*	0.35	Monoterpene
Pseudolimonene	[0.40]*	0.05	Monoterpene
Δ^3 -Carene	0.58	0.58	Monoterpene
α -Terpinene	0.22	0.23	Monoterpene
para-Cymene	49.85	2.04	Monoterpene
Limonene	[49.85]*	3.68	Monoterpene
1,8-Cineole	[49.85]*	44.04*	Monoterpenic ether
β -Phellandrene	[49.85]*	[44.04]*	Monoterpene
(Z)- β -Ocimene	0.03	0.04	Monoterpene
(E)- β -Ocimene	0.01	0.02	Monoterpene
γ -Terpinene	0.95	0.98	Monoterpene
cis-Sabinene hydrate	0.02	0.04	Monoterpenic alcohol
Isoterpinolene	0.01	0.01	Monoterpene
para-Cymenene	0.34*	0.02	Monoterpene
Terpinolene	[0.34]*	0.31	Monoterpene
trans-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Linalool	0.69	0.68	Monoterpenic alcohol
endo-Fenchol	0.03	0.03	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	0.02	Monoterpenic alcohol
Camphor	11.34	11.26*	Monoterpenic ketone
Camphene hydrate	0.04	4.13*	Monoterpenic alcohol
Isoborneol	0.05	0.09*	Monoterpenic alcohol
Pinocarvone	0.02	0.02	Monoterpenic ketone
Borneol	1.73	3.36*	Monoterpenic alcohol
δ -Terpineol	0.11	[0.09]*	Monoterpenic alcohol
Terpinen-4-ol	0.58	0.56	Monoterpenic alcohol
para-Cymen-8-ol	0.02	0.02	Monoterpenic alcohol
α -Terpineol	1.66	[3.36]*	Monoterpenic alcohol
Myrtenol	0.02	0.01	Monoterpenic alcohol
Verbenone	0.10	0.09	Monoterpenic ketone
Linalyl acetate	0.01	0.01	Monoterpenic ester
Bornyl acetate	1.15	1.15	Monoterpenic ester
α -Cubebene	0.01	0.01	Sesquiterpene
α -Ylangene	0.02*	0.01	Sesquiterpene
α -Copaene	[0.02]*	[11.26]*	Sesquiterpene

α -Gurjunene	0.01	0.01	Sesquiterpene
Methyleugenol	0.01	0.01	Phenylpropanoid
β -Caryophyllene	4.14	[4.13]*	Sesquiterpene
β -Copaene	0.03	[4.13]*	Sesquiterpene
α -Humulene	0.50	0.52	Sesquiterpene
allo-Aromadendrene	0.01	0.01	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.01	0.01	Sesquiterpene
γ -Muurolene	0.03*	0.03	Sesquiterpene
α -Amorphene	[0.03]*	0.01	Sesquiterpene
α -Muurolene	0.03	0.02	Sesquiterpene
β -Bisabolene	0.02	0.02	Sesquiterpene
γ -Cadinene	0.02	0.01	Sesquiterpene
δ -Cadinene	0.06	0.04	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	0.02	Sesquiterpene
Caryophyllene oxide isomer	0.03*	0.03*	Sesquiterpenic ether
Caryophyllene oxide	[0.03]*	[0.03]*	Sesquiterpenic ether
meta-Camphorene	0.01	0.02	Diterpene
Total identified	99.58%	99.46%	

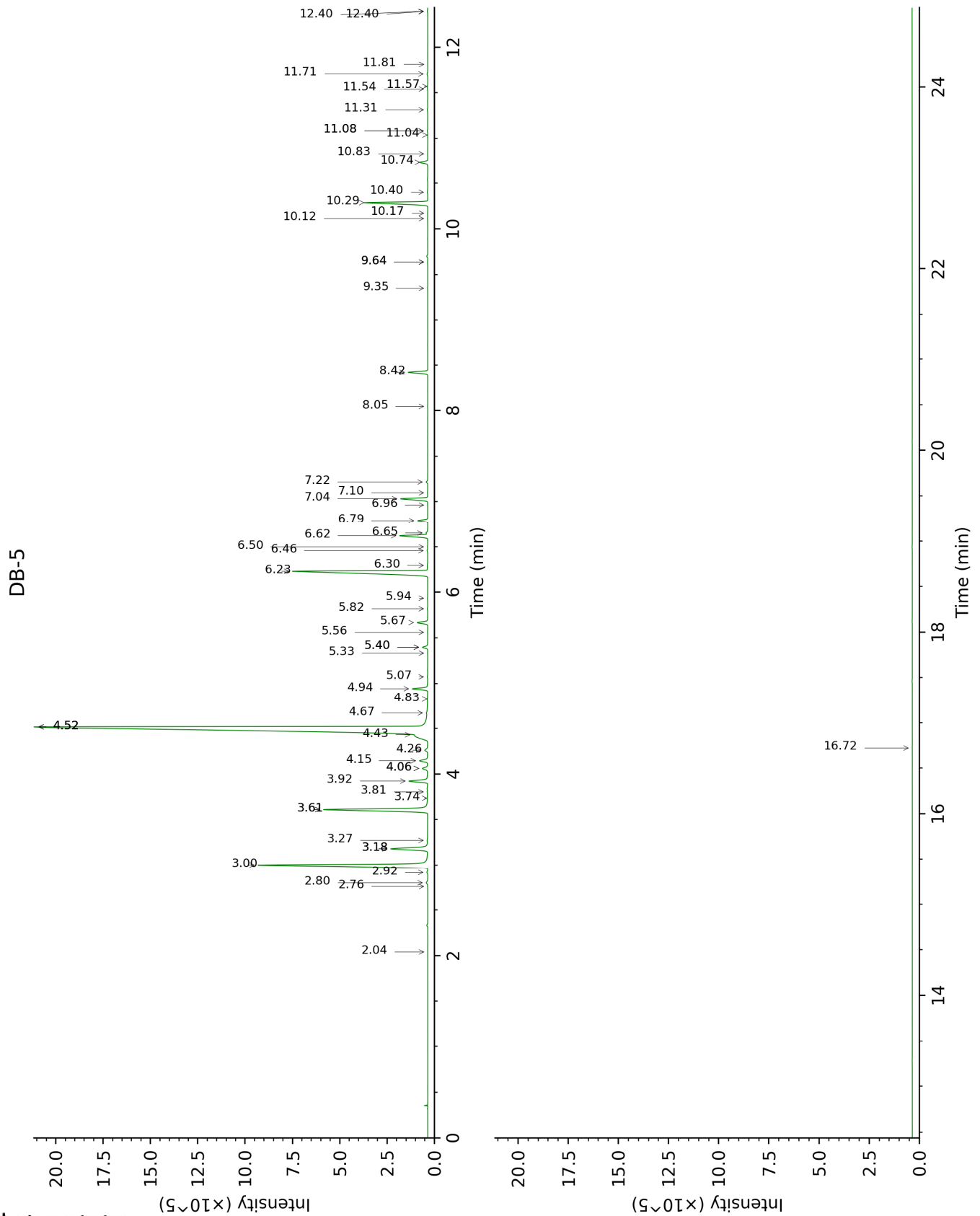
*: Two or more compounds are coeluting on this column

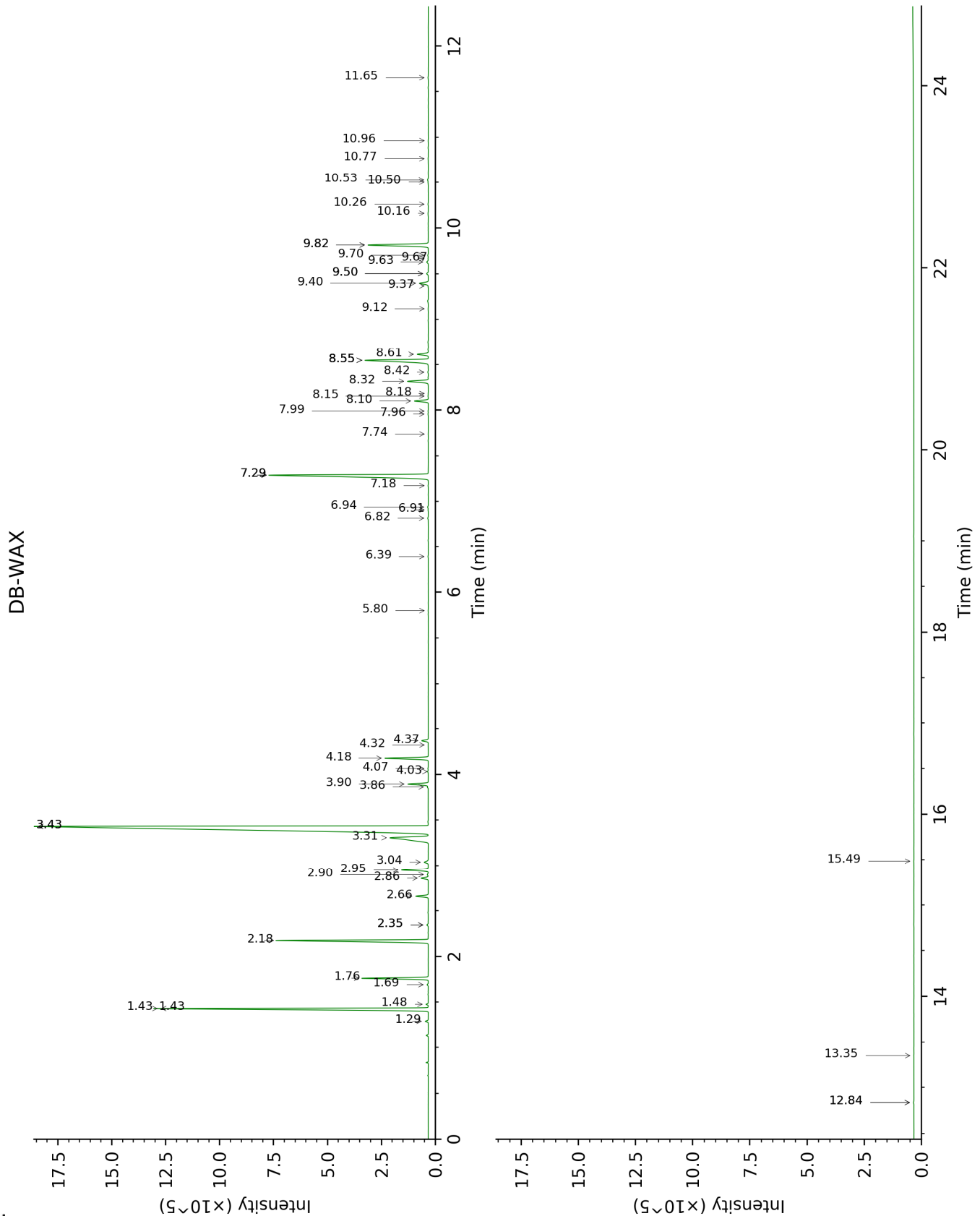
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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	%
(3Z)-Hexenol	2.04	855	tr	5.80	1346	0.01
Hashishene	2.76	913	0.01	1.43*	998	12.74
Tricyclene	2.80	916	0.12	1.29	976	0.11
α -Thujene	2.92	924	0.06	1.48	1002	0.07
α -Pinene	3.00	929	12.72	1.43*	998	[12.74]
Camphene	3.18*	941	2.71	1.76	1031	2.73
α -Fenchene	3.18*	941	[2.71]	1.69	1024	0.05
Thuja-2,4(10)-diene	3.27	948	0.01	2.35*	1088	0.06
Sabinene	3.61*	970	7.70	2.35*	1088	[0.06]
β -Pinene	3.61*	970	[7.70]	2.18	1072	7.72
Octen-3-ol	3.74	979	0.01	6.82	1419	0.03
Octan-3-one	3.81	983	0.03	4.03	1220	0.03
Myrcene	3.92	991	1.27	2.95	1139	1.28
α -Phellandrene	4.06*	1001	0.40	2.86	1132	0.35
Pseudolimonene	4.06*	1001	[0.40]	2.90	1134	0.05
Δ^3 -Carene	4.15	1006	0.58	2.66	1116	0.58
α -Terpinene	4.26	1013	0.22	3.04	1145	0.23
para-Cymene	4.43†	1024	49.85	4.18	1230	2.04
Limonene	4.52*†	1029	[49.85]	3.31	1166	3.68
1,8-Cineole	4.52*†	1029	[49.85]	3.43*	1175	44.04
β -Phellandrene	4.52*†	1029	[49.85]	3.43*	1175	[44.04]
(Z)- β -Ocimene	4.67	1039	0.03	3.86	1208	0.04
(E)- β -Ocimene	4.82	1049	0.01	4.07	1222	0.02
γ -Terpinene	4.94	1056	0.95	3.90	1210	0.98
cis-Sabinene hydrate	5.07	1064	0.02	6.94	1428	0.04
Isoterpinolene	5.33	1081	0.01	4.32	1240	0.01
para-Cymenene	5.40*	1085	0.34	6.39	1388	0.02
Terpinolene	5.40*	1085	[0.34]	4.37	1244	0.31
trans-Sabinene hydrate	5.56	1095	0.01	7.99	1506	0.01
Linalool	5.67	1102	0.69	8.10	1514	0.68
endo-Fenchol	5.82	1112	0.03	8.42	1539	0.03
cis-para-Menth-2-en-1-ol	5.94	1119	0.02	8.16	1519	0.02
Camphor	6.23	1138	11.34	7.29*	1454	11.26
Camphene hydrate	6.30	1142	0.04	8.55*	1549	4.13
Isoborneol	6.46	1153	0.05	9.50*	1624	0.09
Pinocarvone	6.50	1155	0.02	7.96	1503	0.02
Borneol	6.62	1163	1.73	9.82*	1649	3.36
δ -Terpineol	6.65	1165	0.11	9.50*	1624	[0.09]
Terpinen-4-ol	6.79	1174	0.58	8.61	1554	0.56
para-Cymen-8-ol	6.96	1185	0.02	11.65	1803	0.02
α -Terpineol	7.04	1190	1.66	9.82*	1649	[3.36]
Myrtenol	7.10	1194	0.02	10.96	1744	0.01
Verbenone	7.22	1201	0.10	9.63	1634	0.09

Linalyl acetate	8.05	1257	0.01	8.18	1521	0.01
Bornyl acetate	8.42	1282	1.15	8.32	1531	1.15
α -Cubebene	9.35	1346	0.01	6.91	1426	0.01
α -Ylangene	9.64*	1367	0.02	7.18	1445	0.01
α -Copaene	9.64*	1367	[0.02]	7.29*	1454	[11.26]
α -Gurjunene	10.12	1400	0.01	7.74	1487	0.01
Methyleugenol	10.17	1405	0.01	13.35	1955	0.01
β -Caryophyllene	10.29	1413	4.14	8.55*	1549	[4.13]
β -Copaene	10.40	1422	0.03	8.55*	1549	[4.13]
α -Humulene	10.74	1447	0.50	9.40	1615	0.52
allo-Aromadendrene	10.83	1454	0.01	9.12	1593	0.01
<i>trans</i> -Cadina-1(6),4-diene	11.04	1469	0.01	9.37	1613	0.01
γ -Muuroleone	11.08*	1472	0.03	9.70	1640	0.03
α -Amorphene	11.08*	1472	[0.03]	9.67	1637	0.01
α -Muuroleone	11.32	1490	0.03	10.16	1677	0.02
β -Bisabolene	11.54	1507	0.02	10.26	1685	0.02
γ -Cadinene	11.57	1509	0.02	10.50	1705	0.01
δ -Cadinene	11.71	1520	0.06	10.53	1707	0.04
<i>trans</i> -Cadina-1,4-diene	11.81	1528	0.01	10.77	1728	0.02
Caryophyllene oxide isomer	12.40*	1574	0.03	12.84*	1908	0.03
Caryophyllene oxide	12.40*	1574	[0.03]	12.84*	1908	[0.03]
meta-Camphorene	16.72	1950	0.01	15.49	2162	0.02
Total identified		99.58%			99.46%	
Total reported		99.58%			99.46%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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