

Date : May 04, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21D20-ORA09

Customer identification : Rosemary - Tunisia - 3 years - 012138A

Type : Essential oil

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

Customer : Organic Aromas Inc.

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 : April 30, 2021

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4671 ± 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-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
(3Z)-Hexenol	0.03	Aliphatic alcohol
Isovaleric acid	tr	Aliphatic acid
Hexanol	0.01	Aliphatic alcohol
Cyclohexanol	tr	Aliphatic alcohol
Bornylene	0.01	Monoterpene
Hashishene	0.02	Monoterpene
Tricyclene	0.14	Monoterpene
α -Thujene	0.29	Monoterpene
α -Pinene	11.58	Monoterpene
Camphene	4.11	Monoterpene
α -Fenchene	0.09	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
β -Pinene	5.55	Monoterpene
Sabinene	0.11	Monoterpene
Octen-3-ol	0.04	Aliphatic alcohol
Octan-3-one	0.13	Aliphatic ketone
Dehydro-1,8-cineole	0.07	Monoterpenic ether
Myrcene	1.14	Monoterpene
Octan-3-ol	tr	Aliphatic alcohol
α -Phellandrene	0.08	Monoterpene
Pseudolimonene	0.03	Monoterpene
Δ^3 -Carene	0.37	Monoterpene
α -Terpinene	0.20	Monoterpene
para-Cymene	1.72	Monoterpene
Limonene	2.39	Monoterpene
1,8-Cineole	45.31	Monoterpenic ether
(Z)- β -Ocimene	0.02	Monoterpene
(E)- β -Ocimene	0.05	Monoterpene
γ -Terpinene	0.33	Monoterpene
cis-Sabinene hydrate	0.07	Monoterpenic alcohol
para-Cymenene	0.04	Monoterpene
Terpinolene	0.25	Monoterpene
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.65	Monoterpenic alcohol
endo-Fenchol	0.06	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
Camphene hydrate	tr	Monoterpenic alcohol
Camphor	12.28	Monoterpenic ketone
Isoborneol	0.02	Monoterpenic alcohol
Pinocarvone	0.02	Monoterpenic ketone

Borneol	2.89	Monoterpenic alcohol
δ-Terpineol	0.35	Monoterpenic alcohol
Isopinocampone	tr	Monoterpenic ketone
Terpinen-4-ol	0.73	Monoterpenic alcohol
para-Cymen-8-ol	0.05	Monoterpenic alcohol
Myrtenal	0.04	Monoterpenic aldehyde
α-Terpineol	1.59	Monoterpenic alcohol
Myrtenol	0.03	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Carvone	0.01	Monoterpenic ketone
Piperitone	0.01	Monoterpenic ketone
<i>trans</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Bornyl acetate	1.01	Monoterpenic ester
α-Cubebene	0.05	Sesquiterpene
α-Ylangene	0.07	Sesquiterpene
α-Copaene	0.25	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
β-Caryophyllene	2.96	Sesquiterpene
β-Copaene	0.01	Sesquiterpene
Aromadendrene	0.06	Sesquiterpene
α-Humulene	0.30	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.01	Sesquiterpene
γ-Murolene	0.22	Sesquiterpene
α-Amorphene	0.02	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
α-Selinene	0.09	Sesquiterpene
α-Murolene	0.07	Sesquiterpene
β-Bisabolene	0.05	Sesquiterpene
γ-Cadinene	0.13	Sesquiterpene
δ-Cadinene	0.22	Sesquiterpene
<i>trans</i> -Calamenene	0.04	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	Sesquiterpene
α-Calacorene	0.02	Sesquiterpene
Caryophyllene oxide	0.19	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Humulene epoxide II	0.02	Sesquiterpenic ether
Caryophylladienol II	0.01	Sesquiterpenic alcohol
14-Hydroxy-(Z)-caryophyllene	0.02	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	0.01	Sesquiterpenic alcohol
Unknown	0.04	Unknown
meta-Camphorene	tr	Diterpene
Consolidated total	99.01%	

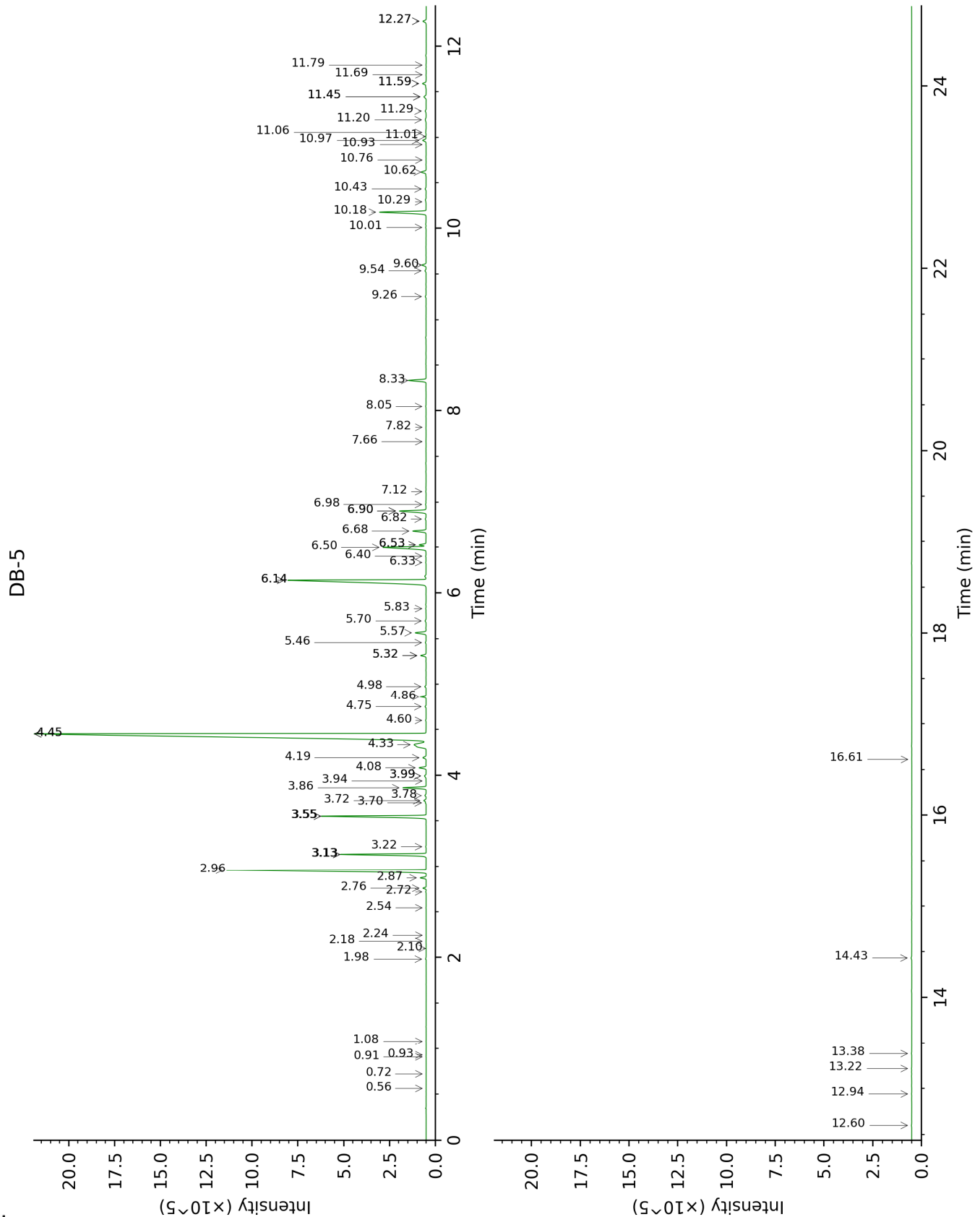
tr: The compound has been detected below 0.005% of total signal.

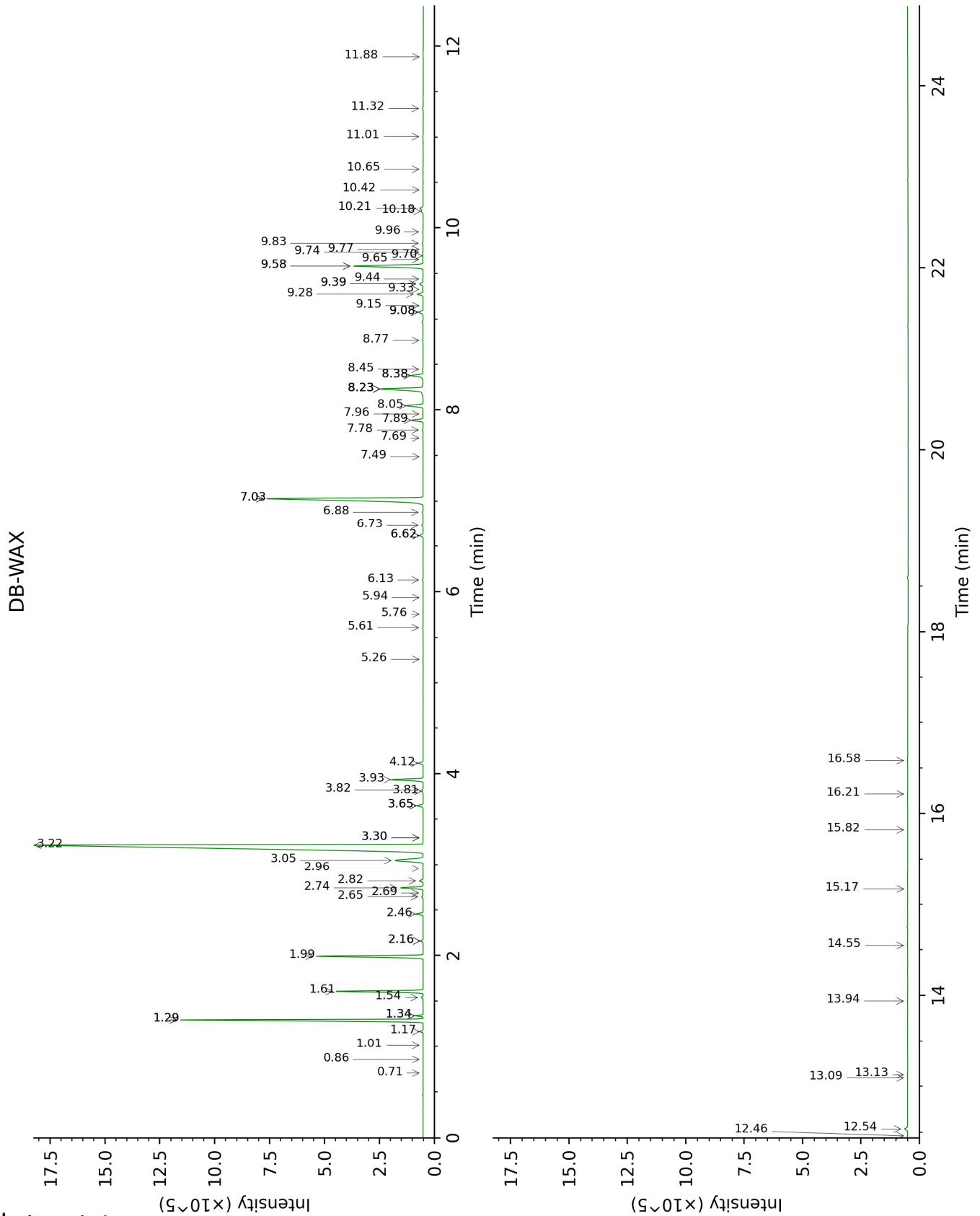
Note: no correction factor was applied

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	0.56	639	tr	0.71	887	tr
2-Ethylfuran	0.72	702	tr	0.86	919	tr
Isoamyl alcohol	0.91	732	tr	3.30*	1178	0.01
2-Methylbutanol	0.93	735	tr	3.30*	1178	[0.01]
Toluene	1.08	758	tr	1.34*	1001	0.30
(3Z)-Hexenol	1.98	856	0.03	5.61	1347	0.04
Isovaleric acid	2.10	867	tr	9.33	1631	0.03
Hexanol	2.18	873	0.01	5.26	1322	0.01
Cyclohexanol	2.24	879	tr	5.76	1358	tr
Bornylene	2.54	905	0.01	1.01	946	0.01
Hashishene	2.72	917	0.02	1.30*	994	11.61
Tricyclene	2.76	920	0.14	1.17	972	0.14
α-Thujene	2.87	927	0.29	1.34*	1001	[0.30]
α-Pinene	2.96	933	11.58	1.30*	994	[11.61]
Camphene	3.13*	945	4.20	1.61	1028	4.11
α-Fenchene	3.13*	945	[4.20]	1.54	1021	0.09
Thuja-2,4(10)-diene	3.22	951	0.02	2.16*	1084	0.13
β-Pinene	3.55*	973	5.67	1.99	1067	5.55
Sabinene	3.55*	973	[5.67]	2.16*	1084	[0.13]
Octen-3-ol	3.70	983	0.04	6.62*	1421	0.21
Octan-3-one	3.72	985	0.13	3.82	1219	0.06
Dehydro-1,8-cineole	3.78	988	0.07	2.96	1151	0.01
Myrcene	3.86	994	1.14	2.74	1134	1.14
Octan-3-ol	3.94	999	tr	5.94	1371	tr
α-Phellandrene	3.99*	1003	0.11	2.65	1126	0.08
Pseudolimonene	3.99*	1003	[0.11]	2.69	1129	0.03
Δ3-Carene	4.08	1009	0.37	2.46	1111	0.36
α-Terpinene	4.19	1016	0.20	2.82	1140	0.19
para-Cymene	4.33	1025	1.72	3.93	1227	1.71
Limonene	4.45*	1032	47.68	3.05	1158	2.39
1,8-Cineole	4.45*	1032	[47.68]	3.22	1172	45.31
(Z)-β-Ocimene	4.60	1042	0.02	3.65*	1206	0.35
(E)-β-Ocimene	4.75	1051	0.05	3.81	1218	0.05
γ-Terpinene	4.86	1058	0.33	3.65*	1206	[0.35]
cis-Sabinene hydrate	4.98	1065	0.07	6.73	1430	0.08
para-Cymenene	5.32*	1087	0.29	6.13	1385	0.04
Terpinolene	5.32*	1087	[0.29]	4.12	1240	0.25
trans-Sabinene hydrate	5.46	1096	0.04	7.78	1508	0.05
Linalool	5.56	1103	0.65	7.89	1517	0.65
endo-Fenchol	5.70	1111	0.06	8.23*	1544	3.03
cis-para-Menth-2-en-1-ol	5.83	1120	0.02	7.96	1522	0.02
Camphene hydrate	6.14*	1140	12.37	8.23*	1544	[3.03]

Camphor	6.14*	1140	[12.37]	7.03*	1452	12.53
Isoborneol	6.33	1152	0.02	9.15	1616	0.01
Pinocarvone	6.40	1156	0.02	7.69	1502	0.02
Borneol	6.50	1163	2.89	9.58*	1652	4.52
δ-Terpineol	6.53*	1164	0.35	9.28	1627	0.35
Isopinocampone	6.53*	1164	[0.35]	7.49	1486	tr
Terpinen-4-ol	6.68	1174	0.73	8.38*	1555	0.78
para-Cymen-8-ol	6.82	1183	0.05	11.32	1798	0.05
Myrtenal	6.90*	1189	1.63	8.45	1561	0.04
α-Terpineol	6.90*	1189	[1.63]	9.58*	1652	[4.52]
Myrtenol	6.98	1193	0.03	10.65	1741	0.03
Verbenone	7.12	1202	0.01	9.44	1640	0.04
Carvone	7.66	1239	0.01	9.76	1667	0.01
Piperitone	7.82	1250	0.01	9.70	1661	0.04
<i>trans</i> -Ascaridole glycol	8.05	1265	0.02	13.94	2038	0.02
Bornyl acetate	8.33	1284	1.01	8.05	1529	1.02
α-Cubebene	9.26	1348	0.05	6.62*	1421	[0.21]
α-Ylangene	9.54	1368	0.07	6.88	1441	0.07
α-Copaene	9.60	1373	0.25	7.03*	1452	[12.53]
Methyleugenol	10.01	1402	0.02	13.13	1962	0.02
β-Caryophyllene	10.18	1414	2.96	8.23*	1544	[3.03]
β-Copaene	10.29	1422	0.01	8.23*	1544	[3.03]
Aromadendrene	10.43	1433	0.06	8.38*	1555	[0.78]
α-Humulene	10.62	1447	0.30	9.08*	1610	0.32
allo-Aromadendrene	10.76	1457	0.01	8.77	1586	0.04
<i>trans</i> -Cadina-1(6),4-diene	10.92	1470	0.01	9.08*	1610	[0.32]
γ-Murolene	10.97	1473	0.22	9.39*	1636	0.24
α-Amorphene	11.01	1476	0.02	9.39*	1636	[0.24]
β-Selinene	11.06	1480	0.03	9.66	1658	0.04
α-Selinene	11.20	1490	0.09	9.74	1664	0.04
α-Murolene	11.29	1497	0.07	9.83	1672	0.06
β-Bisabolene	11.45*	1509	0.18	9.96	1682	0.05
γ-Cadinene	11.45*	1509	[0.18]	10.18	1701	0.13
δ-Cadinene	11.59*	1520	0.24	10.21	1703	0.22
<i>trans</i> -Calamenene	11.59*	1520	[0.24]	11.01	1771	0.04
<i>trans</i> -Cadina-1,4-diene	11.69	1528	0.01	10.42	1721	0.01
α-Calacorene	11.79	1536	0.02	11.88	1848	0.03
Caryophyllene oxide	12.27*	1574	0.22	12.54	1906	0.19
Caryophyllene oxide isomer	12.27*	1574	[0.22]	12.46	1900	0.01
Humulene epoxide II	12.60	1600	0.02	13.09	1958	0.02
Caryophylladienol II	12.94	1628	0.01	15.82	2227	0.01
14-Hydroxy-(Z)-caryophyllene	13.22	1651	0.02	16.22	2268	0.02

(3Z)-Caryophylla-3,8(13)-dien-5β-ol	13.38	1664	0.01	16.58	2306	0.02
Unknown [m/z 43, 93 (89), 91 (54), 79 (52), 121 (51)....]	14.43	1754	0.04	14.55	2098	0.02
meta-Camphorene	16.61	1952	tr	15.17	2160	tr
Total identified	99.04%			99.12%		
Total reported	99.08%			99.14%		

*: Two or more compounds are coeluting on this column

[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

R.T.: Retention time (minutes)

R.I.: Retention index