

Date : May 06, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 22D29-PTH01


**Customer identification** : Organic Mastic - Corsica - PA8100R

**Type** : Essential oil

**Source** : *Pistacia lentiscus*

**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** : Alexis St-Gelais, Ph. D., Chimiste 2013-174

**Analysis date** : May 06, 2022

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:**  $1.4770 \pm 0.0003$  (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
1-Methylpyrrole	0.01	Pyrrole
Toluene	0.01	Simple phenolic
Hexanal	0.02	Aliphatic aldehyde
(2E)-Hexenal	0.19	Aliphatic aldehyde
(3Z)-Hexenol	0.07	Aliphatic alcohol
Hexanol	0.02	Aliphatic alcohol
Tricyclene	0.46	Monoterpene
$\alpha$ -Thujene	0.69	Monoterpene
$\alpha$ -Pinene	23.40	Monoterpene
Camphene	1.67	Monoterpene
$\alpha$ -Fenchene	0.02	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Geranic oxide	tr	Monoterpenic ether
$\beta$ -Pinene	4.09	Monoterpene
Sabinene	4.35	Monoterpene
Myrcene	11.80	Monoterpene
$\alpha$ -Phellandrene	6.29	Monoterpene
Pseudolimonene	0.05	Monoterpene
$\Delta^3$ -Carene	0.04	Monoterpene
(3Z)-Hexenyl acetate	0.09	Aliphatic ester
1,4-Cineole	1.97*	Monoterpenic ether
$\alpha$ -Terpinene	1.97*	Monoterpene
para-Cymene	2.18	Monoterpene
$\beta$ -Phellandrene	3.69	Monoterpene
Limonene	5.15	Monoterpene
(Z)- $\beta$ -Ocimene	0.10	Monoterpene
(E)- $\beta$ -Ocimene	0.34	Monoterpene
Isoamyl butyrate	0.27	Aliphatic ester
$\gamma$ -Terpinene	3.27	Monoterpene
2-Methylbutyl butyrate	0.09	Aliphatic ester
Unknown	0.01	Oxygenated monoterpene
Terpinolene	1.21	Monoterpene
para-Cymenene	0.05	Monoterpene
2-Nonanone	0.25	Aliphatic ketone
Linalool	0.05	Monoterpenic alcohol
2-Methylbutyl 2-methylbutyrate	0.07	Aliphatic ester
2-Nonanol	0.10	Aliphatic alcohol
Isoamyl isovalerate	0.13	Aliphatic ester
endo-Fenchol	0.04	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.13	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.03	Aliphatic alcohol
1-Terpineol	0.04	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.06	Monoterpenic alcohol
Camphene hydrate	0.03	Monoterpenic alcohol
Epoxyterpinolene	0.03	Monoterpenic ether

Unknown	0.05	Oxygenated monoterpene
Isoborneol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Borneol	0.03	Monoterpenic alcohol
Terpinen-4-ol	3.85	Monoterpenic alcohol
Cryptone	0.05	Normonoterpenic ketone
para-Cymen-8-ol	0.05	Monoterpenic alcohol
$\alpha$ -Terpineol	0.56	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.04	Monoterpenic alcohol
<i>cis</i> - $\alpha$ -Phellandrene epoxide (iPr vs Me)	0.13	Monoterpenic ether
Verbenone	0.01	Monoterpenic ketone
<i>trans</i> -Piperitol	0.03	Monoterpenic alcohol
Unknown	0.03	Unknown
Citronellol	0.06	Monoterpenic alcohol
Unknown	0.13	Unknown
Isoamyl hexanoate	0.16	Aliphatic ester
Geraniol	0.07	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.04	Monoterpenic alcohol
Vitispirane?	0.01	Terpenic ether
Bornyl acetate	0.35	Monoterpenic ester
<i>cis</i> -Ascaridole glycol	0.04	Monoterpenic alcohol
2-Undecanone	0.28	Aliphatic ketone
Unknown	0.15	Unknown
Unknown	0.02	Unknown
2-Undecanol	0.03	Aliphatic alcohol
Unknown	0.04	Monoterpenic alcohol
$\delta$ -Elemene	0.07	Sesquiterpene
$\alpha$ -Cubebene	0.02	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.09	Monoterpenic ester
Unknown	0.04	Unknown
$\alpha$ -Copaene	0.27	Sesquiterpene
$\beta$ -Bourbonene	0.03	Sesquiterpene
<i>cis</i> - $\beta$ -Elemene	0.04	Sesquiterpene
$\beta$ -Cubebene	0.15	Sesquiterpene
$\beta$ -Elemene	0.35	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
$\beta$ -Caryophyllene	2.75	Sesquiterpene
$\beta$ -Copaene	0.05	Sesquiterpene
Aromadendrene	0.04	Sesquiterpene
Isoamyl benzoate	0.10	Phenolic ester
Phenylethyl butyrate	0.02	Phenolic ester
Unknown	0.08	Sesquiterpene
$\alpha$ -Humulene	0.68	Sesquiterpene
allo-Aromadendrene	0.27	Sesquiterpene
( <i>E</i> )- $\beta$ -Farnesene	0.09	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.25	Sesquiterpene
$\gamma$ -Muurolene	0.58	Sesquiterpene
Germacrene D	3.66	Sesquiterpene
$\beta$ -Selinene	0.07	Sesquiterpene
$\gamma$ -Amorphene	0.08	Sesquiterpene
Viridiflorene	0.06	Sesquiterpene

α-Selinene	0.17	Sesquiterpene
α-Muurolene	0.64	Sesquiterpene
δ-Amorphene	0.17	Sesquiterpene
β-Bisabolene	0.19	Sesquiterpene
γ-Cadinene	0.32	Sesquiterpene
δ-Cadinene	2.09	Sesquiterpene
<i>trans</i> -Calamenene	0.18	Sesquiterpene
Zonarene	0.23	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.15	Sesquiterpene
( <i>E</i> )-γ-Bisabolene	0.04	Sesquiterpene
α-Cadinene	0.09	Sesquiterpene
α-Calacorene	0.02	Sesquiterpene
Isocaryophyllene epoxide B	0.06	Sesquiterpenic ether
α-Elemol	0.06	Sesquiterpenic alcohol
Germacrene B	0.14	Sesquiterpene
Elemicin	0.02	Phenylpropanoid
Caryophyllenyl alcohol	0.02	Sesquiterpenic alcohol
(3 <i>Z</i> )-Hexenyl benzoate	0.03	Phenolic ester
Spathulenol	0.10	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.05	Sesquiterpenic ether
Caryophyllene oxide	0.16	Sesquiterpenic ether
Viridiflorol	0.04	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene
Eudesm-5-en-11-ol	0.05	Sesquiterpenic alcohol
Junenol	0.16	Sesquiterpenic alcohol
1- <i>epi</i> -Cubenol	0.28	Sesquiterpenic alcohol
Cubenol	0.33	Sesquiterpenic alcohol
τ-Muurolol	0.48	Sesquiterpenic alcohol
τ-Cadinol	0.41	Sesquiterpenic alcohol
α-Muurolol	0.30	Sesquiterpenic alcohol
Unknown	0.16	Sesquiterpenic alcohol
α-Cadinol	0.81	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
α-Bisabolol	0.10	Sesquiterpenic alcohol
Benzyl benzoate	0.04	Phenolic ester
Benzyl salicylate	0.02	Phenolic ester
meta-Camphorene	0.12	Diterpene
para-Camphorene	0.05	Diterpene
<b>Consolidated total</b>	<b>97.00%</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.

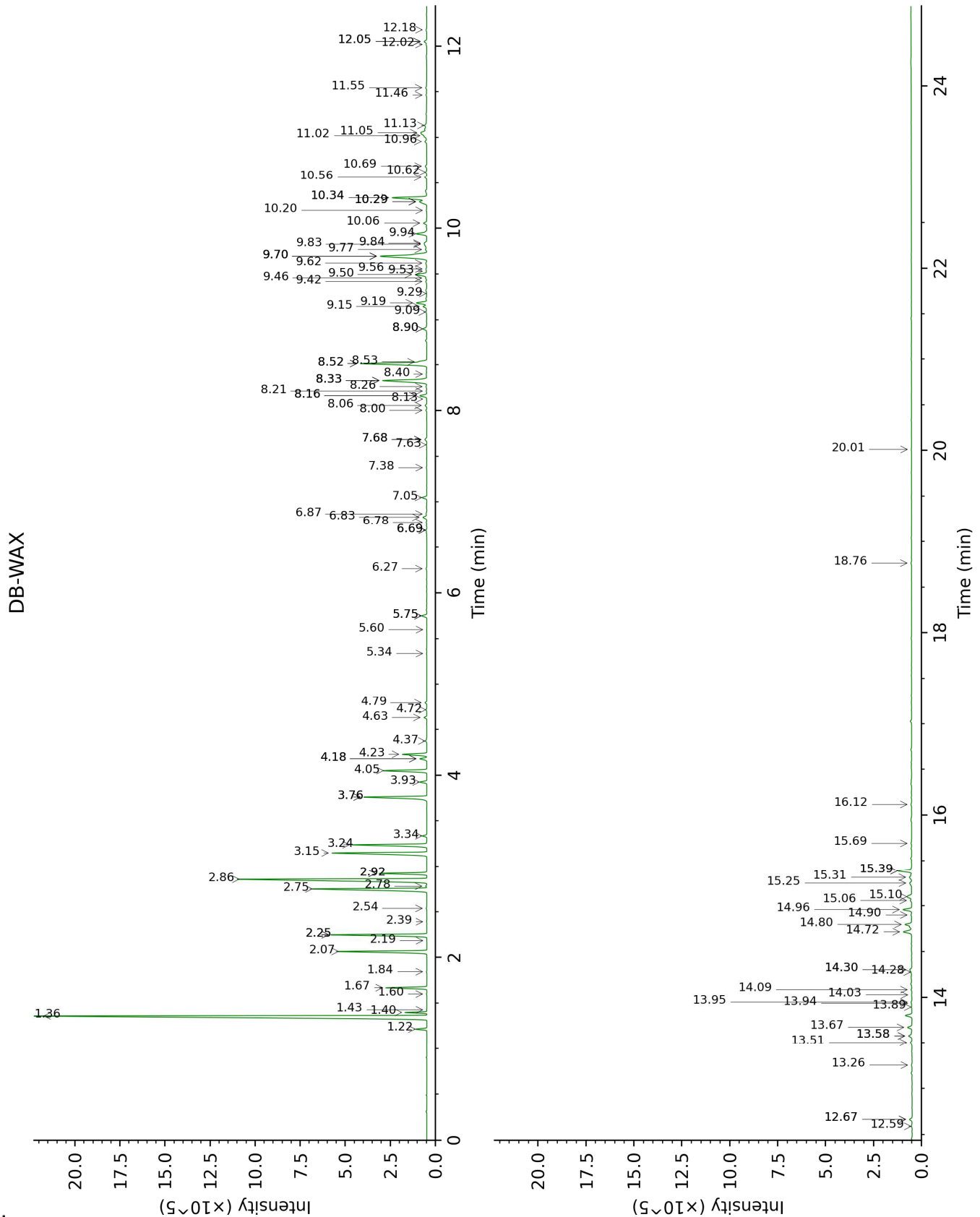
Note: no correction factor was applied

**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.

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	%
1-Methylpyrrole	1.08	733	0.01	2.39	1099	0.01
Toluene	1.27	759	0.01	1.43	1003	0.01
Hexanal	1.57	799	0.02	1.84	1045	0.02
(2E)-Hexenal	2.15	847	0.19	3.34	1174	0.19
(3Z)-Hexenol	2.24	854	0.07	5.75*	1351	0.29
Hexanol	2.44	871	0.02	5.34	1322	0.02
Tricyclene	3.07	918	0.46	1.22	972	0.44
$\alpha$ -Thujene	3.19	926	0.69	1.40	1000	0.67
$\alpha$ -Pinene	3.29	932	23.40	1.36	996	22.78
Camphene	3.46*	943	1.73	1.67	1027	1.67
$\alpha$ -Fenchene	3.46*	943	[1.73]	1.60	1020	0.02
Thuja-2,4(10)-diene	3.55	949	0.01	2.25*	1085	4.36
Geranic oxide	3.88*†	971	8.65	2.18	1079	tr
$\beta$ -Pinene	3.88*†	971	[8.65]	2.07	1067	4.09
Sabinene	3.88*†	971	[8.65]	2.25*	1085	[4.36]
Myrcene	4.23	994	11.80	2.86	1136	11.51
$\alpha$ -Phellandrene	4.36*	1003	6.52	2.75	1128	6.29
Pseudolimonene	4.36*	1003	[6.52]	2.78	1130	0.05
$\Delta^3$ -Carene	4.44	1007	0.04	2.54	1111	0.03
(3Z)-Hexenyl acetate	4.46	1009	0.09	4.79	1283	0.09
1,4-Cineole	4.55*	1014	1.97	2.92*	1141	1.91
$\alpha$ -Terpinene	4.55*	1014	[1.97]	2.92*	1141	[1.91]
para-Cymene	4.66	1022	2.18	4.05	1228	2.12
$\beta$ -Phellandrene	4.75*	1027	9.06	3.24	1166	3.69
Limonene	4.75*	1027	[9.06]	3.15	1159	5.15
(Z)- $\beta$ -Ocimene	4.95	1040	0.10	3.76*	1207	3.37
(E)- $\beta$ -Ocimene	5.10	1050	0.34	3.93	1219	0.33
Isoamyl butyrate	5.24*	1058	3.64	4.18*	1238	0.36
$\gamma$ -Terpinene	5.24*	1058	[3.64]	3.76*	1207	[3.37]
2-Methylbutyl butyrate	5.28	1061	0.09	4.18*	1238	[0.36]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.40	1068	0.01	4.72	1277	0.05
Terpinolene	5.69*	1086	1.27	4.23	1241	1.21
para-Cymenene	5.69*	1086	[1.27]	6.27	1388	0.05
2-Nonanone	5.79	1092	0.25	5.75*	1351	[0.29]
Linalool	5.91†	1100	0.22	8.00	1517	0.05
2-Methylbutyl 2-methylbutyrate	5.95*†	1103	[0.22]	4.37	1252	0.07
2-Nonanol	5.95*†	1103	[0.22]	7.68*	1493	0.13
Isoamyl isovalerate	6.03	1108	0.13	4.63	1271	0.14
endo-Fenchol	6.07	1111	0.04	8.26	1537	0.06

<i>cis</i> -para-Menth-2-en-1-ol	6.19	1118	0.13	8.06	1521	0.10
4-Hydroxy-4-methylcyclohex-2-enone	6.33	1128	0.03	14.03	2033	0.03
1-Terpineol	6.42	1133	0.04	8.21	1533	0.04
<i>trans</i> -para-Menth-2-en-1-ol	6.47	1137	0.06	8.90*	1587	0.27
Camphene hydrate	6.55	1142	0.03	8.40	1548	0.03
Epoxyterpinolene	6.58	1143	0.03	6.69*	1419	0.05
Unknown [m/z 109, 41 (49), 124 (41), 43 (31), 95 (28), 84 (22)... 152 (7)]	6.61	1146	0.05	6.78	1425	0.04
Isoborneol	6.70	1152	0.02	9.29	1618	0.02
Unknown [m/z 95, 81 (36), 93 (34), 53 (29), 136 (29)...]	6.75	1155	0.01	5.60	1340	0.01
Borneol	6.86	1162	0.03	9.70*	1650	4.09
Terpinen-4-ol	7.07	1176	3.85	8.52*	1557	3.90
Cryptone	7.14	1180	0.05	9.09	1601	0.07
para-Cymen-8-ol	7.18	1183	0.05	11.46	1798	0.04
$\alpha$ -Terpineol	7.27	1188	0.56	9.70*	1650	[4.09]
<i>cis</i> -Piperitol	7.34	1193	0.04	9.46	1631	0.06
<i>cis</i> - $\alpha$ -Phellandrene epoxide (iPr vs Me)	7.42	1198	0.13	10.96	1755	0.11
Verbenone	7.47	1201	0.01	9.53	1637	0.02
<i>trans</i> -Piperitol	7.54	1206	0.03	10.29*	1699	0.59
Unknown [m/z 43, 97 (72), 41 (44), 71 (27), 55 (26), 82 (25)...]	7.72	1218	0.03			
Citronellol	7.96	1235	0.06	10.62	1727	0.06
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	8.19	1251	0.13	11.02	1761	0.16
Isoamyl hexanoate	8.26	1255	0.16	6.83	1430	0.25
Geraniol	8.30	1258	0.07	11.55	1806	0.06
<i>trans</i> -Ascaridole glycol	8.42	1267	0.04	14.08	2038	0.04
Vitispirane?	8.49	1271	0.01	7.63	1488	0.03
Bornyl acetate	8.72	1287	0.35	8.16*	1530	0.40
<i>cis</i> -Ascaridole glycol	8.77	1290	0.04	14.72	2099	0.58
2-Undecanone	8.89*	1298	0.42	8.53	1558	0.28

Unknown [m/z 95, 110 (95), 67 (31), 43 (29), 122 (18), 41 (14)...]	8.89*	1298	[0.42]			
Unknown [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...]	9.00	1306	0.02			
2-Undecanol	9.02	1307	0.03	10.20	1691	0.03
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.18	1314	0.04	14.90	2118	0.04
δ-Elemene	9.42	1331	0.07	6.87	1432	0.05
α-Cubebene	9.65*	1347	0.07	6.69*	1419	[0.05]
α-Terpinyl acetate	9.65*	1347	[0.07]	9.62	1644	0.09
Unknown [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...]	9.76	1355	0.04	13.90	2020	0.03
α-Copaene	10.01	1373	0.27	7.05	1446	0.26
β-Bourbonene	10.12	1381	0.03	7.38	1470	0.03
cis-β-Elemene	10.15	1382	0.04	8.16*	1530	[0.40]
β-Cubebene	10.21	1387	0.15	7.68*	1493	[0.13]
β-Elemene	10.25	1390	0.35	8.33*	1542	2.97
Isocaryophyllene	10.39	1400	0.01	8.13	1527	0.02
Methyleugenol	10.42	1402	0.02	13.26	1960	0.04
β-Caryophyllene	10.59	1414	2.75	8.33*	1542	[2.97]
β-Copaene	10.72	1424	0.05	8.33*	1542	[2.97]
Aromadendrene	10.83*	1432	0.18	8.52*	1557	[3.90]
Isoamyl benzoate	10.83*	1432	[0.18]	12.05*	1850	0.16
Phenylethyl butyrate	10.89	1437	0.02	12.67*	1905	0.17
Unknown [m/z 161, 120 (82), 105 (61), 91 (39), 119 (36), 81 (32), 93 (32), 79 (25), 41 (22) ...204 (14)]	11.01	1446	0.08			
α-Humulene	11.04	1448	0.68	9.19	1609	0.63
allo- Aromadendrene	11.14	1455	0.27	8.90*	1587	[0.27]
(E)-β-Farnesene	11.18	1458	0.09	9.42	1628	0.07
trans-Cadina- 1(6),4-diene	11.34	1470	0.25	9.15	1606	0.22
γ-Murolene	11.39	1474	0.58	9.50	1634	0.72
Germacrene D	11.43	1477	3.66	9.70*	1650	[4.09]
β-Selinene	11.45	1478	0.07	9.77	1656	0.09
γ-Amorphene	11.48	1481	0.08			
Viridiflorene	11.55†	1486	0.48	9.56	1639	0.06
α-Selinene	11.62†	1491	[0.48]	9.83†	1661	0.34

α-Muurolene	11.70	1497	0.64	9.94	1670	0.68
δ-Amorphene	11.73	1499	0.17	9.84†	1662	[0.34]
β-Bisabolene	11.85†	1508	0.51	10.06	1680	0.19
γ-Cadinene	11.86†	1509	[0.51]	10.29*	1699	[0.59]
δ-Cadinene	12.01*	1521	2.35	10.34*	1703	2.14
<i>trans</i> -Calamenene	12.01*	1521	[2.35]	11.13	1770	0.18
Zonarene	12.01*	1521	[2.35]	10.29*	1699	[0.59]
<i>trans</i> -Cadina-1,4-diene	12.10	1528	0.15	10.56	1722	0.11
( <i>E</i> )-γ-Bisabolene	12.12	1530	0.04	10.34*	1703	[2.14]
α-Cadinene	12.17	1534	0.09	10.69	1732	0.09
α-Calacorene	12.21	1536	0.02	12.02	1848	0.03
Isocaryophyllene epoxide B	12.28	1542	0.06	12.05*	1850	[0.16]
α-Elemol	12.31	1545	0.06	13.95	2025	0.05
Germacrene B	12.38	1550	0.14	11.05	1764	0.63
Elemicin	12.44	1555	0.02	15.39*	2167	0.83
Caryophyllenyl alcohol	12.55	1563	0.02	13.58*†	1990	0.26
(3 <i>Z</i> )-Hexenyl benzoate	12.58	1566	0.03	14.28	2057	0.04
Spathulenol	12.63	1570	0.10	14.30*	2059	0.16
Caryophyllene oxide isomer	12.68	1574	0.05	12.59	1898	0.06
Caryophyllene oxide	12.69	1575	0.16	12.67*	1905	[0.17]
Viridiflorol	12.77	1581	0.04	13.94	2024	0.02
Unknown [m/z 161, 119 (78), 105 (75), 120 (72), 43 (64)... 218 (4)]	12.81	1584	0.02	12.18	1862	0.05
Eudesm-5-en-11-ol	13.02	1600	0.05	14.30*	2059	[0.16]
Junenol	13.13	1609	0.16	13.50	1983	0.09
1-epi-Cubenol	13.28	1622	0.28	13.67	1999	0.27
Cubenol	13.40	1632	0.33	13.58*†	1990	[0.26]
τ-Muurolol	13.45†	1636	0.99	14.96	2124	0.48
τ-Cadinol	13.46†	1636	[0.99]	14.80	2107	0.41
α-Muurolol	13.51	1641	0.30	15.10†	2138	[0.43]
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.57	1646	0.16	15.06†	2134	0.43
α-Cadinol	13.60	1649	0.81	15.39*	2167	[0.83]
Unknown [m/z 123, 95 (31), 81 (29), 105 (27)... 222 (5)]	13.81	1665	0.04	16.12	2242	0.05
α-Bisabolol	13.98	1680	0.10	15.32	2159	0.17

Benzyl benzoate	14.84	1753	0.04	18.76	2533	0.04
Benzyl salicylate	16.00	1856	0.02	20.01	2681	0.02
meta-Camphorene	17.02	1951	0.12	15.25	2153	0.16
para-Camphorene	17.37	1984	0.05	15.69	2197	0.04
<b>Total identified</b>		<b>97.34%</b>			<b>95.40%</b>	
<b>Total reported</b>		<b>97.98%</b>			<b>96.25%</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