

Date : April 27, 2023

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 23D20-PTH02

**Customer identification** : Frankincense Serrata - India - F40110R

**Type** : Essential oil

**Source** : *Boswellia serrata*

**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** : Amélie Simard, Analyste

**Analysis date** : April 24, 2023

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:**  $1.4582 \pm 0.0003$  (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
(E)-2-Methyl-1,3-pentadiene	tr	Alkene
Toluene	0.01	Simple phenolic
Unknown	tr	Unknown
Unknown	0.01	Monoterpene
Unknown	0.03	Unknown
Hashishene	0.11	Monoterpene
Tricyclene	0.01	Monoterpene
$\alpha$ -Thujene	68.26	Monoterpene
$\alpha$ -Pinene	9.88	Monoterpene
Unknown	0.35	Monoterpene
Camphene	0.10	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.03	Monoterpene
$\beta$ -Pinene	0.44	Monoterpene
Sabinene	4.91	Monoterpene
Pseudolimonene isomer	0.01	Monoterpene
Dehydro-1,8-cineole	0.01	Monoterpenic ether
Myrcene	0.94	Monoterpene
2-Carene	0.01	Monoterpene
$\alpha$ -Phellandrene	1.80	Monoterpene
$\Delta^3$ -Carene	2.34	Monoterpene
$\alpha$ -Terpinene	0.38	Monoterpene
meta-Cymene	0.06	Monoterpene
para-Cymene	1.29	Monoterpene
Unknown	0.15	Unknown
Limonene	1.33	Monoterpene
$\beta$ -Phellandrene	0.39	Monoterpene
Unknown	0.01	Unknown
(Z)- $\beta$ -Ocimene	0.35	Monoterpene
Unknown	0.06	Unknown
(E)- $\beta$ -Ocimene	0.17	Monoterpene
Unknown	0.03	Unknown
$\gamma$ -Terpinene	0.74	Monoterpene
cis-Sabinene hydrate	0.13	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Isoterpinolene	0.01	Monoterpene
Terpinolene	0.21	Monoterpene
para-Cymenene	0.01	Monoterpene
trans-Sabinene hydrate	0.10	Monoterpenic alcohol
Linalool	0.09	Monoterpenic alcohol
Unknown	0.05	Oxygenated monoterpene
$\beta$ -Thujone	0.14	Monoterpenic ketone
cis-para-Menth-2-en-1-ol	0.07	Monoterpenic alcohol
$\alpha$ -Campholenal	0.01	Monoterpenic aldehyde

Unknown	0.01	Unknown
allo-Ocimene	0.02	Monoterpene
<i>trans</i> -Pinocarveol	0.02	Monoterpenic alcohol
<i>trans</i> -Sabinol	0.06	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.04	Monoterpenic alcohol
para-Menth-3-en-8-ol	0.02	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Unknown	0.02	Oxygenated monoterpene
Borneol	0.03	Monoterpenic alcohol
$\alpha$ -Phellandren-8-ol	0.01	Monoterpenic alcohol
<i>cis</i> -Sabinol	0.07	Monoterpenic alcohol
Terpinen-4-ol	0.70	Monoterpenic alcohol
meta-Cymen-8-ol	0.02	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
$\alpha$ -Terpineol	0.05	Monoterpenic alcohol
Methylchavicol	1.18	Phenylpropanoid
<i>cis</i> - $\alpha$ -Phellandrene epoxide (iPr vs Me)	0.02	Monoterpenic ether
Verbenone	0.03	Monoterpenic ketone
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone
Piperitone	0.04	Monoterpenic ketone
<i>trans</i> -Sabinene hydrate acetate	0.01	Monoterpenic ester
Linalyl acetate	0.01	Monoterpenic ester
Unknown	0.03	Oxygenated monoterpene
Bornyl acetate	0.02	Monoterpenic ester
Thymol	0.01	Monoterpenic alcohol
Carvacrol	0.01	Monoterpenic alcohol
para-Menth-5-en-1,2-diol isomer III	0.01	Monoterpenic alcohol
$\alpha$ -Terpinyl acetate	0.04	Monoterpenic ester
$\alpha$ -Copaene	0.09	Sesquiterpene
1,5-diepi- $\beta$ -Bourbonene	0.03	Sesquiterpene
$\beta$ -Bourbonene	0.33	Sesquiterpene
$\beta$ -Elemene	0.02	Sesquiterpene
$\beta$ -Longipinene	0.04	Sesquiterpene
Sibirene	0.01	Sesquiterpene
Methyleugenol	0.07	Phenylpropanoid
$\beta$ -Ylangene	0.02	Sesquiterpene
$\beta$ -Caryophyllene	0.06	Sesquiterpene
$\beta$ -Copaene	0.04	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.03	Sesquiterpene
Isogermacrene D	0.03	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.01	Sesquiterpene
$\gamma$ -Muurolole	0.04	Sesquiterpene
Germacrene D	0.21	Sesquiterpene
Unknown	0.06	Sesquiterpene
Bicyclogermacrene	0.03	Sesquiterpene
$\alpha$ -Muurolole	0.02	Sesquiterpene
$\gamma$ -Cadinene	0.07	Sesquiterpene
$\delta$ -Cadinene	0.10	Sesquiterpene
$\alpha$ -Elemol	0.01	Sesquiterpenic alcohol
Elemicin	0.02	Phenylpropanoid
Guaiol	0.01	Sesquiterpenic alcohol

4,10-diepi-Guaiol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.03	Unknown
$\alpha$ -Phellandrene dimer II	0.02	Diterpene
(3E)-Cembrene A	0.03	Diterpene
Verticilla-4(20),7,11-triene	0.01	Diterpene
Cembrenol	0.02	Diterpenic alcohol
Serratol	0.07	Diterpenic alcohol
<b>Consolidated total</b>	<b>99.15%</b>	

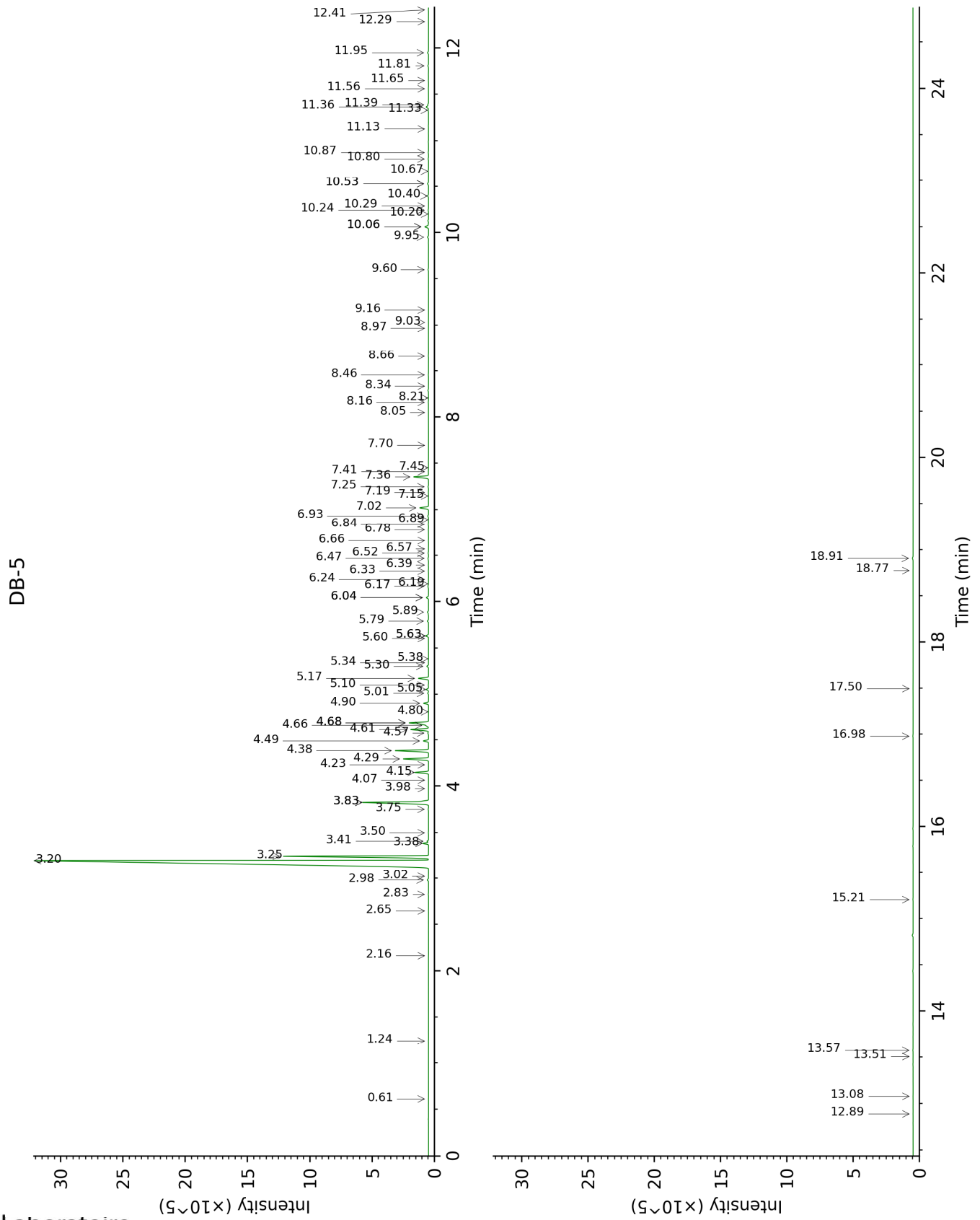
tr: The compound has been detected below 0.005% of total signal.

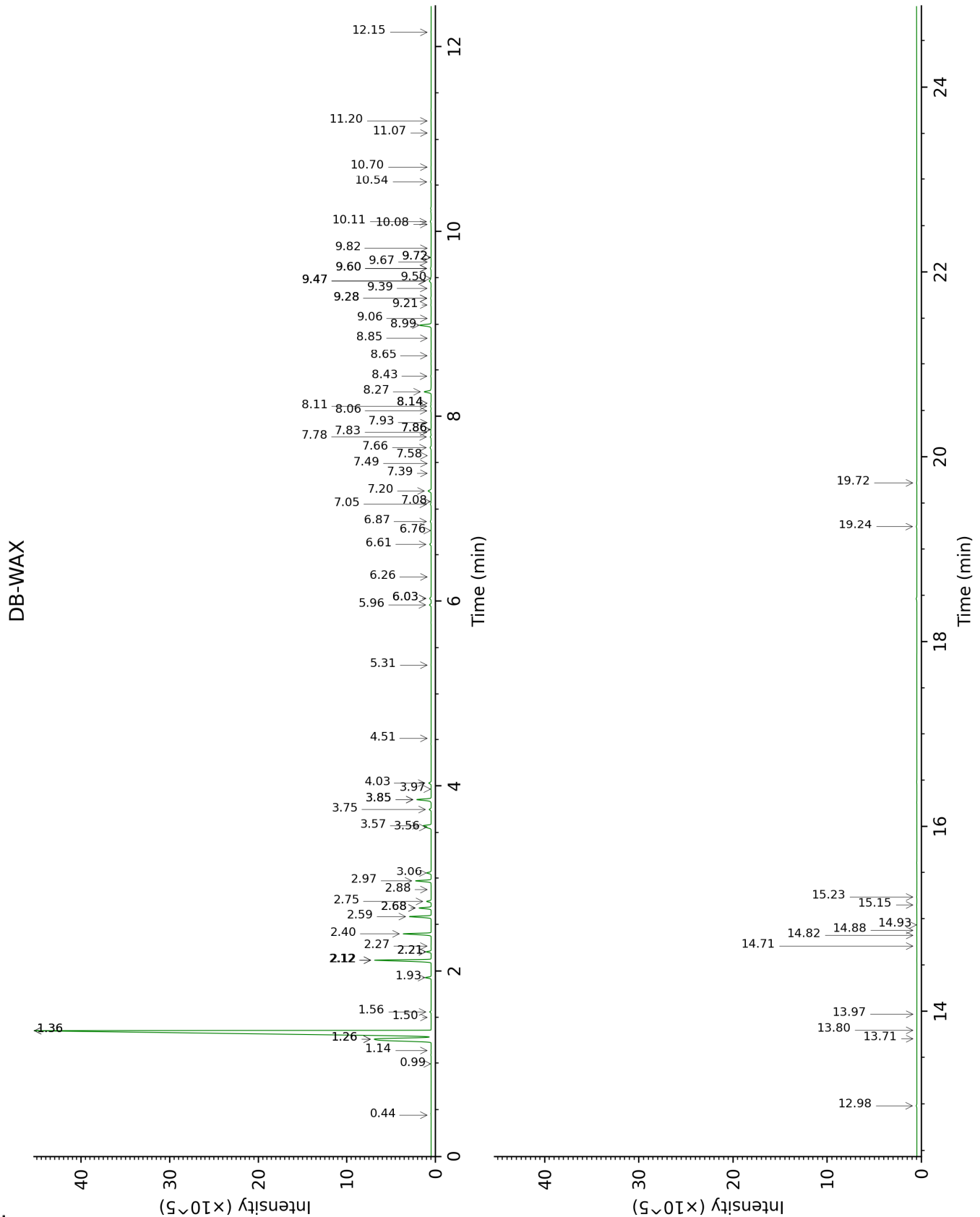
Note: no correction factor was applied

**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	%
(E)-2-Methyl-1,3-pentadiene	0.61	629	tr	0.44	764	tr
Toluene	1.24	759	0.01	1.36*	1004	68.69
Unknown [m/z 109, 43 (28), 124 (28), 41 (14), 55 (11), 79 (9), 81 (8)...]	2.16	852	tr	1.50	1019	tr
Unknown [m/z 93, 91 (75), 121 (61), 77 (58), 79 (38), 92 (26), 43 (24), 41 (23), 105 (22), 107 (19), 136 (16)]	2.65	892	0.01	0.99	945	0.01
Unknown [m/z 93, 91 (72), 121 (58), 77 (49), 79 (41), 43 (22), 105 (20), 107 (20), 41 (18), 136 (17), 92 (17)]	2.82	906	0.03			
Hashishene	2.98	916	0.11	1.26*	993	9.99
Tricyclene	3.02	919	0.01	1.14	970	0.01
$\alpha$ -Thujene	3.20	930	68.26	1.36*	1004	[68.69]
$\alpha$ -Pinene	3.24	934	9.88	1.26*	993	[9.99]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.38†	943	0.45	2.21*	1092	0.36
Camphene	3.41†	944	[0.45]	1.56	1025	0.10
Thuja-2,4(10)-diene	3.50	950	0.02	2.12*	1083	4.94
3,7,7-Trimethylcyclohepta-1,3,5-triene	3.75	967	0.03	2.68*	1132	0.97
$\beta$ -Pinene	3.83*	972	5.35	1.93	1063	0.44
Sabinene	3.83*	972	[5.35]	2.12*	1083	[4.94]
Pseudolimonene isomer	3.98	981	0.01	2.27	1099	0.02
Dehydro-1,8-cineole	4.07	987	0.01	2.88	1149	0.01
Myrcene	4.15	993	0.94	2.68*	1132	[0.97]
2-Carene	4.23	998	0.01	2.21*	1092	[0.36]
$\alpha$ -Phellandrene	4.30	1002	1.80	2.59	1125	1.81
$\Delta$ 3-Carene	4.38	1008	2.34	2.40	1110	2.34
$\alpha$ -Terpinene	4.49	1015	0.38	2.75	1138	0.37
meta-Cymene	4.57	1020	0.06	3.86*	1227	1.35
para-Cymene	4.61	1022	1.29	3.86*	1227	[1.35]
Unknown [m/z 109, 43 (58), 95 (26)... 137 (15)...]	4.66	1025	0.15	5.96	1378	0.16
Limonene	4.68*	1027	1.71	2.97	1156	1.33
$\beta$ -Phellandrene	4.68*	1027	[1.71]	3.06	1163	0.39
Unknown [m/z 67, 93 (70), 82 (70), 121 (42),	4.80	1034	0.01			

107 (39), 91 (33), 79 (28)...						
(Z)- $\beta$ -Ocimene	4.90	1040	0.35	3.56	1204	0.36
Unknown [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...	5.01	1047	0.06	7.05	1459	0.07
(E)- $\beta$ -Ocimene	5.05	1050	0.17	3.75	1219	0.17
Unknown [m/z 109, 45 (67), 41 (40), 67 (39), 81 (33), 79 (27), 95 (24), 91 (23), 82 (21), 55 (21), 93 (20)...	5.10	1053	0.03			
$\gamma$ -Terpinene	5.17	1057	0.74	3.57	1206	0.72
<i>cis</i> -Sabinene hydrate	5.30	1065	0.13	6.61	1426	0.13
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.34	1068	0.01	4.52	1278	0.01
<i>cis</i> -Linalool oxide (fur.)	5.38	1070	0.01	6.26	1400	0.01
Isoterpinolene	5.60	1084	0.01	3.97	1236	0.01
Terpinolene	5.63*	1086	0.23	4.03	1241	0.21
<i>para</i> -Cymenene	5.63*	1086	[0.23]	6.03*	1383	0.15
<i>trans</i> -Sabinene hydrate	5.79	1096	0.10	7.66	1505	0.12
Linalool	5.89	1102	0.09	7.78	1514	0.09
Unknown [m/z 109, 81 (54), 91 (32), 79 (22)...	6.04*	1112	0.18			
$\beta$ -Thujone	6.04*	1112	[0.18]	6.03*	1383	[0.15]
<i>cis</i> - <i>para</i> -Menth-2-en-1-ol	6.17	1120	0.07	7.83	1518	0.06
$\alpha$ -Campholenal	6.19	1121	0.01	6.76	1437	0.01
Unknown [m/z 111, 43 (22), 55 (14), 41 (12), 110 (11)...	6.24	1124	0.01			
allo-Ocimene	6.33	1130	0.02	5.31	1330	0.02
<i>trans</i> -Pinocarveol	6.40	1134	0.02	8.85	1598	0.02
<i>trans</i> -Sabinol	6.47	1139	0.06	9.50	1650	0.04
<i>trans</i> -Verbenol	6.52	1142	0.04	9.21	1627	0.04
<i>para</i> -Menth-3-en-8-ol	6.57	1145	0.02	8.43	1565	0.04
Unknown [m/z 109, 81 (39), 41 (38), 95 (24)... 152 (1)]	6.66	1151	0.02			
Unknown [m/z 109, 43 (75), 137 (46), 67 (31), 93 (25)... 152 (4)]	6.78	1159	0.02			
Borneol	6.84	1162	0.03	9.47*	1648	0.26

α-Phellandren-8-ol	6.89	1166	0.01	9.82	1677	0.01
cis-Sabinol	6.93	1168	0.07	10.54	1737	0.06
Terpinen-4-ol	7.02	1174	0.70	8.27	1552	0.74
meta-Cymen-8-ol	7.15	1182	0.02	11.20	1794	0.01
para-Cymen-8-ol	7.19	1185	0.02			
α-Terpineol	7.25	1189	0.05	9.47*	1648	[0.26]
Methylchavicol	7.36	1195	1.18	8.99	1609	1.20
cis-α-Phellandrene epoxide (iPr vs Me)	7.41	1199	0.02	10.70	1751	0.02
Verbenone	7.45	1202	0.03	9.28*	1633	0.05
trans-Carveol	7.70	1218	0.02	11.07	1782	0.01
Carvone	8.05	1241	0.01	9.67	1665	0.01
Piperitone	8.16	1249	0.04	9.60*	1659	0.08
trans-Sabinene hydrate acetate	8.21	1252	0.01	7.39	1484	0.01
Linalyl acetate	8.34	1260	0.01	7.86*	1520	0.03
Unknown [m/z 109, 41 (22), 81 (14), 43 (11)... 152 (4)]	8.46	1268	0.03			
Bornyl acetate	8.66	1282	0.02	7.93	1526	0.02
Thymol	8.97	1302	0.01	14.82	2132	0.02
Carvacrol	9.03	1307	0.01			
para-Menth-5-en-1,2-diol isomer III	9.16	1316	0.01	14.88	2137	0.01
α-Terpinyl acetate	9.60	1347	0.04	9.39	1641	0.03
α-Copaene	9.95	1372	0.09	6.87	1445	0.09
1,5-diepi-β-Bourbonene	10.06*	1380	0.34	7.08	1461	0.03
β-Bourbonene	10.06*	1380	[0.34]	7.20	1470	0.33
β-Elemene	10.20	1389	0.02	8.14*	1542	0.03
β-Longipinene	10.24	1392	0.04	7.49	1492	0.01
Sibirene	10.29	1395	0.01	7.58	1498	0.01
Methyleugenol	10.40	1403	0.07	12.98	1954	0.07
β-Ylangene	10.53*	1413	0.09	7.86*	1520	[0.03]
β-Caryophyllene	10.53*	1413	[0.09]	8.11	1540	0.06
β-Copaene	10.67	1423	0.04	8.06	1536	0.05
trans-α-Bergamotene	10.80	1433	0.03	8.14*	1542	[0.03]
Isogermacrene D	10.87	1438	0.03	8.65	1582	0.02
cis-Muurolo-4(15),5-diene	11.13	1457	0.01	9.06	1615	0.01
γ-Muurolole	11.33	1472	0.04	9.28*	1633	[0.05]
Germacrene D	11.36	1475	0.21	9.47*	1648	[0.26]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.39	1477	0.06	9.60*	1659	[0.08]
Bicyclogermacrene	11.56	1490	0.03	9.72*	1669	0.04
α-Muurolole	11.65	1496	0.02	9.72*	1669	[0.04]
γ-Cadinene	11.81	1508	0.07	10.08	1698	0.03
δ-Cadinene	11.95	1519	0.10	10.11	1700	0.09
α-Elemol	12.28	1546	0.01	13.71	2023	0.01

Elemicin	12.42	1556	0.02	15.15	2165	0.02
Guaiol	12.89	1593	0.01	13.80	2031	0.01
4,10-diepi-Guaiol	13.08	1608	0.02	13.97	2048	0.01
Unknown [m/z 204, 161 (97), 59 (87), 189 (78), 105 (45)...]	13.50	1643	0.01	14.93	2143	0.01
Unknown [m/z 214, 161 (86), 173 (82), 172 (79), 199 (75), 189 (75), 204 (70)...]	13.57	1648	0.03	14.70	2120	0.02
$\alpha$ -Phellandrene dimer II	15.20	1787	0.02	12.16	1878	0.02
(3E)-Cembrene A	16.98	1949	0.03	15.23	2173	0.02
Verticilla-4(20),7,11-triene	17.50	1999	0.01			
Cembrenol	18.77	2126	0.02	19.72	2671	0.03
Serratol	18.90	2139	0.07	19.24	2614	0.06
<b>Total identified</b>		<b>98.20%</b>			<b>98.93%</b>	
<b>Total reported</b>		<b>99.13%</b>			<b>99.21%</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