Date : August 22, 2019

Certificate of Analysis – GC Profiling

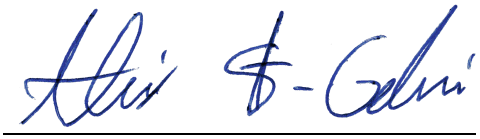
Sample identification

Internal code : 19H15-PTH08-1-SCC
Customer identification : Cinnamon Bark - Morocco - CCO10689R
Type : Essential oil
Source : *Cinnamomum verum*
Customer : Plant Therapy

Analysis

Method: PC-PA-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 : Sylvain Mercier, M. Sc., Chimiste
Analysis date : August 21, 2019

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow liquid
Refractive index: 1.5912 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

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Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Classe
Toluene	tr	Simple phenolic
Ethylbenzene	tr	Simple phenolic
Styrene	0.01	Simple phenolic
Hashishene	0.01	Monoterpene
α-Thujene	0.15	Monoterpene
α-Pinene	2.69	Monoterpene
Camphene	0.21	Monoterpene
α-Fenchene	0.02	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Benzaldehyde	0.25	Simple phenolic
β-Pinene	0.18	Monoterpene
Sabinene	0.07	Monoterpene
Myrcene	0.03	Monoterpene
α-Phellandrene	0.41	Monoterpene
Δ3-Carene	0.04	Monoterpene
α-Terpinene	0.25	Monoterpene
ortho-Cymene	0.01	Monoterpene
para-Cymene	0.67	Monoterpene
Limonene	0.89	Monoterpene
β-Phellandrene	1.36*	Monoterpene
1,8-Cineole	[1.36]*	Monoterpenic ether
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	tr	Monoterpene
γ-Terpinene	0.02	Monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.02	Monoterpene
trans-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Linalool	3.05	Monoterpenic alcohol
(3*E*)-2,7-Dimethyl-3,6-octadien-2-ol	0.02	Monoterpenic alcohol
Phenylethyl alcohol	0.01	Simple phenolic
Hydrocinnamal	0.08	Phenylpropanoid
Borneol	0.04	Monoterpenic alcohol
Terpinen-4-ol	0.11	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.13	Monoterpenic alcohol
(*Z*)-Cinnamal	0.35	Phenylpropanoid
Hydrocinnamyl alcohol	0.03	Phenylpropanoid
ortho-Anisaldehyde	0.01	Simple phenolic
Chavicol	0.02	Phenylpropanoid
(*E*)-Cinnamal	72.84	Phenylpropanoid
Safrole	0.05	Phenylpropanoid
α-Cubebene	0.04	Sesquiterpene
Eugenol	5.22	Phenylpropanoid
Hydrocinnamyl acetate	0.01	Phenylpropanoid ester
α-Copaene	1.57	Sesquiterpene
β-Cubebene	0.09	Sesquiterpene
β-Elemene	0.05	Sesquiterpene

α-Gurjunene	0.04	Sesquiterpene
β-Caryophyllene	1.83	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.01	Sesquiterpene
(*E*)-Cinnamic acid	0.10	Phenylpropanoid
(*E*)-Cinnamyl acetate	3.35	Phenylpropanoid ester
(*E*)-Isoeugenol	0.01	Phenylpropanoid
α-Humulene	0.31	Sesquiterpene
allo-Aromadendrene	0.07	Sesquiterpene
γ-Muurolene	0.08	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
Unknown	0.02	Sesquiterpene
ar-Curcumene	0.02	Sesquiterpene
Bicyclogermacrene	0.05	Sesquiterpene
Viridiflorene	0.02	Sesquiterpene
2,3-Epoxycinnamyl acetate I?	0.03	Phenylpropanoid ester
γ-Cadinene	0.03	Sesquiterpene
Cubebol	0.01	Sesquiterpenic alcohol
trans-Calamenene	0.05	Sesquiterpene
δ-Cadinene	0.35	Sesquiterpene
(*E*)-ortho-Methoxycinnamal	0.07	Phenylpropanoid
Eugenyl acetate	0.11	Phenylpropanoid ester
α-Calacorene	0.06	Sesquiterpene
Caryophyllenyl alcohol	0.02	Sesquiterpenic alcohol
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.11	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
Tetradecanal?	0.01	Aliphatic aldehyde
1,10-diepi-Cubenol	0.03	Sesquiterpenic alcohol
Caryophylladienol II	0.01	Sesquiterpenic alcohol
τ-Muurolol	0.02	Sesquiterpenic alcohol
α-Muurolol	0.01	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.02	Sesquiterpenic alcohol
Benzyl benzoate	0.08	Phenolic ester
Unknown	0.01	Unknown
Unknown	0.09	Unknown
Unknown	0.05	Unknown
Consolidated total	**98.23%**	

*: 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.

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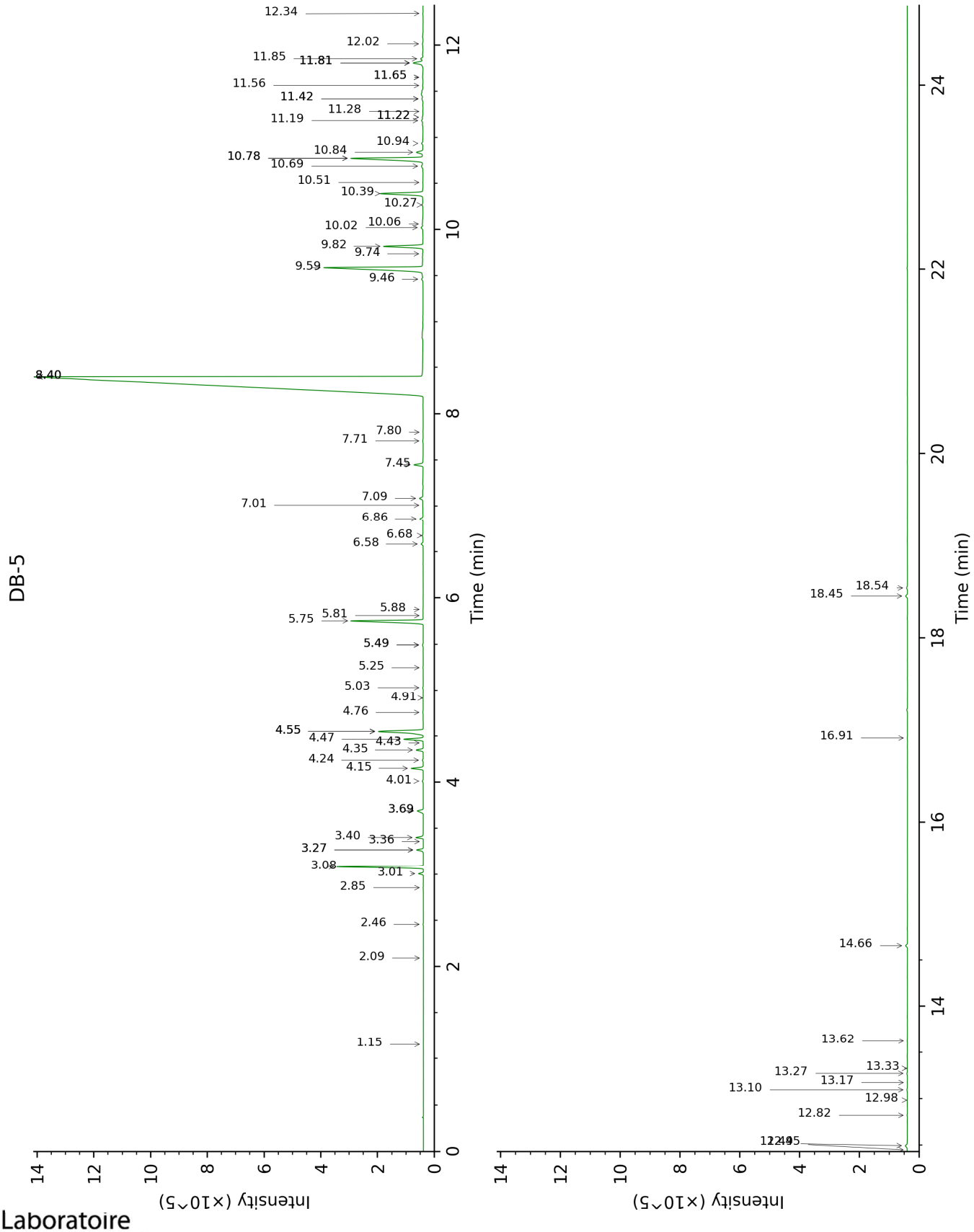
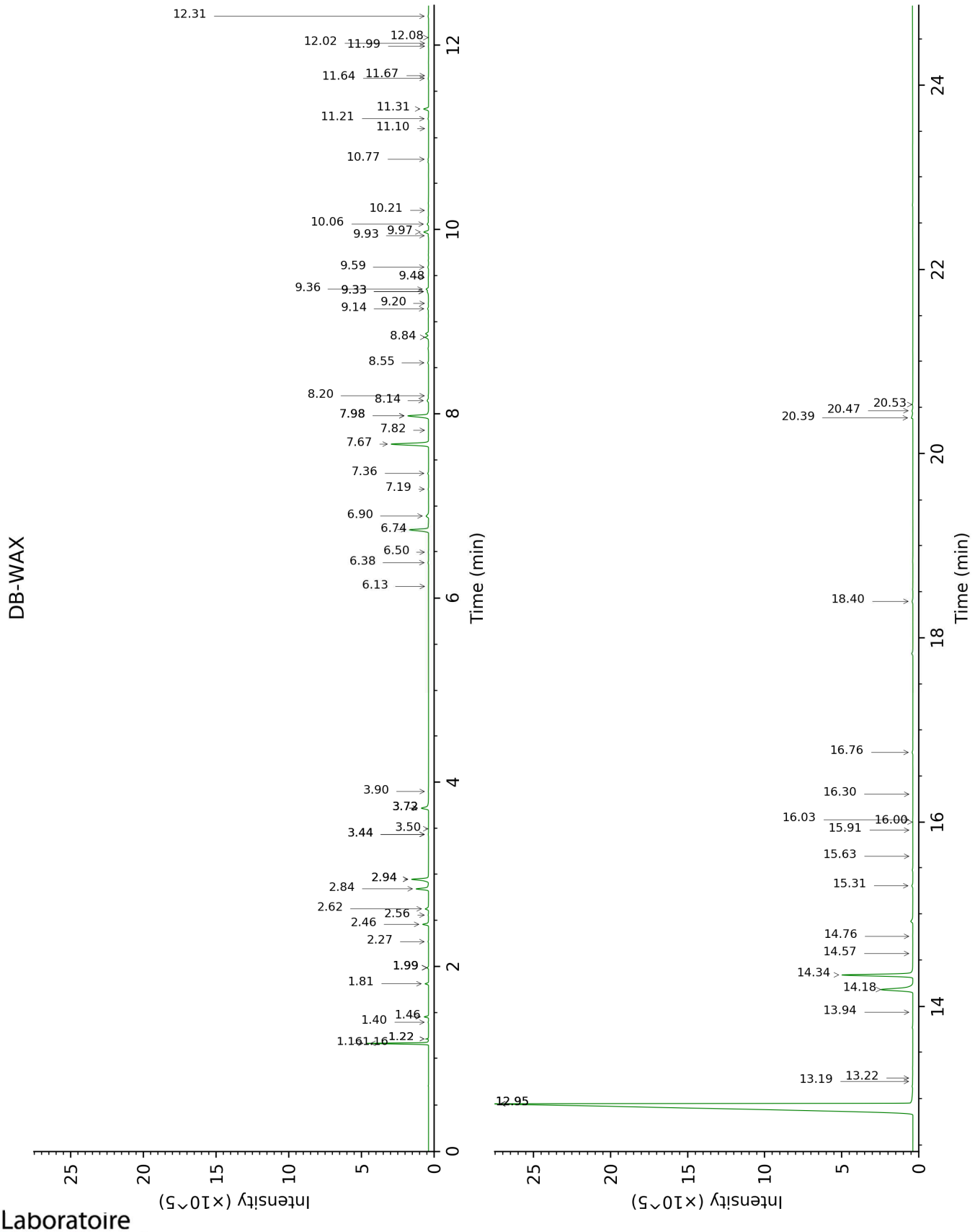

DB-5
12.34
12.02
11.85
11.81
11.65
11.56
11.42
11.28
11.22
11.19
10.94
10.84
10.78
10.69
10.51
10.39
10.27
10.02
10.06
9.82
9.74
9.59
9.46
8.40
7.80
7.71
7.45
7.09
7.01
6.86
6.68
6.58
5.88
5.81
5.75
5.49
5.25
5.03
4.91
4.76
4.55
4.47
4.43
4.35
4.24
4.15
4.01
3.69
3.40
3.36
3.27
3.08
3.01
2.85
2.46
2.09
1.15
Time (min)
Intensity (×10^5)
18.54
18.45
16.91
14.66
13.62
13.33
13.27
13.17
13.10
12.98
12.82
Time (min)
Intensity (×10^5)


DB-WAX
Time (min)
Intensity (×10^5)
12.31
12.08
12.02
11.99
11.64
11.67
11.31
11.21
11.10
10.77
10.21
10.06
9.93
9.97
9.59
9.48
9.36
9.33
9.20
9.14
8.84
8.55
8.20
8.14
7.98
7.82
7.67
7.36
7.19
6.90
6.74
6.50
6.38
6.13
3.90
3.72
3.50
3.44
2.94
2.84
2.62
2.56
2.46
2.27
1.99
1.81
1.46
1.40
1.22
1.16
1.16
20.53
20.47
20.39
18.40
16.76
16.30
16.03
16.00
15.91
15.63
15.31
14.76
14.57
14.34
14.18
13.94
13.22
13.19
12.95

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.15	761	tr	1.22*	1001	0.15
Ethylbenzene	2.09	856	tr	1.99*	1083	0.08
Styrene	2.46	886	0.01	3.50	1211	0.02
Hashishene	2.85	915	0.01	1.16*	992	2.66
α-Thujene	3.01	925	0.15	1.22*	1001	[0.15]
α-Pinene	3.08	930	2.69	1.16*	992	[2.66]
Camphene	3.27*	942	0.23	1.46	1028	0.21
α-Fenchene	3.27*	942	[0.23]	1.40	1022	0.02
Thuja-2,4(10)-diene	3.36	948	0.01	1.99*	1083	[0.08]
Benzaldehyde	3.40	951	0.25	6.90	1459	0.26
β-Pinene	3.69*	970	0.26	1.82	1065	0.18
Sabinene	3.69*	970	[0.26]	1.99*	1083	[0.08]
Myrcene	4.01	992	0.03	2.56	1134	0.04
α-Phellandrene	4.15	1001	0.41	2.46	1126	0.39
Δ3-Carene	4.24	1006	0.04	2.27	1111	0.03
α-Terpinene	4.35	1013	0.25	2.62	1140	0.24
ortho-Cymene	4.43	1018	0.01	3.72*	1228	0.67
para-Cymene	4.47	1020	0.67	3.72*	1228	[0.67]
Limonene	4.55*	1026	2.26	2.84	1157	0.89
β-Phellandrene	4.55*	1026	[2.26]	2.94*	1166	1.34
1,8-Cineole	4.55*	1026	[2.26]	2.94*	1166	[1.34]
(*Z*)-β-Ocimene	4.76	1039	0.01	3.44*	1206	0.03
(*E*)-β-Ocimene	4.91	1049	tr	3.72*	1228	[0.67]
γ-Terpinene	5.03	1056	0.02	3.44*	1206	[0.03]
cis-Linalool oxide (fur.)	5.25	1070	0.01	6.13	1401	0.01
Terpinolene	5.49*	1085	0.03	3.90	1241	0.02
trans-Linalool oxide (fur.)	5.49*	1085	[0.03]	6.50	1429	0.02
Linalool	5.75	1102	3.05	7.67	1518	3.09
(3*E*)-2,7-Dimethyl-3,6-octadien-2-ol	5.81	1105	0.02	7.82	1530	0.01
Phenylethyl alcohol	5.88	1110	0.01	11.67	1852	0.01
Hydrocinnamal	6.58	1156	0.08	10.06	1711	0.11
Borneol	6.68	1161	0.04	9.33*†	1651	0.32
Terpinen-4-ol	6.86	1174	0.11	8.14	1556	0.13
para-Cymen-8-ol	7.01	1183	0.01	11.10	1800	0.01
α-Terpineol	7.09	1188	0.13	9.36†	1653	[0.32]
(*Z*)-Cinnamal	7.45	1212	0.35	11.31	1819	0.36
Hydrocinnamyl alcohol	7.71	1230	0.03	13.19	1990	0.02
ortho-Anisaldehyde	7.80	1236	0.01	12.02	1883	0.01
Chavicol	8.40*	1278	73.79	16.03	2274	0.02
(*E*)-Cinnamal	8.40*	1278	[73.79]	12.95*	1968	72.88
Safrole	8.40*	1278	[73.79]	11.21	1810	0.05

α-Cubebene	9.46	1347	0.04	6.38	1420	0.04
Eugenol	9.59	1356	5.22	14.34	2102	5.47
Hydrocinnamyl acetate	9.74	1366	0.01	11.99	1880	0.01
α-Copaene	9.82	1372	1.57	6.74	1448	1.55
β-Cubebene	10.02	1386	0.09	7.36	1494	0.07
β-Elemene	10.06	1389	0.05	7.98*	1543	1.76
α-Gurjunene	10.27	1404	0.04	7.19	1481	0.03
β-Caryophyllene	10.39	1413	1.83	7.98*	1543	[1.76]
Caryophylla-4(12),8(13)-diene	10.51	1422	0.01	8.20	1560	0.03
(*E*)-Cinnamic acid	10.69	1436	0.10	20.47	2785	0.09
(*E*)-Cinnamyl acetate	10.78*	1442	3.47	14.18	2087	3.35
(*E*)-Isoeugenol	10.78*	1442	[3.47]	16.00	2272	0.01
α-Humulene	10.84	1447	0.31	8.84	1610	0.27
allo-Aromadendrene	10.94	1454	0.07	8.55	1588	0.06
γ-Muurolene	11.19	1473	0.08	9.14	1636	0.07
Germacrene D	11.22*	1475	0.05	9.33*†	1651	[0.32]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.22*	1475	[0.05]	9.48	1663	0.02
ar-Curcumene	11.28	1480	0.02	10.21	1724	0.04
Bicyclogermacrene	11.42*	1490	0.08	9.59	1673	0.05
Viridiflorene	11.42*	1490	[0.08]	9.20	1640	0.02
2,3-Epoxycinnamyl acetate I?	11.56	1501	0.03	15.92	2263	0.02
γ-Cadinene	11.65*	1508	0.06	9.93	1700	0.03
Cubebol	11.65*	1508	[0.06]	12.08	1888	0.01
trans-Calamenene	11.81*	1520	0.50	10.77	1772	0.05
δ-Cadinene	11.81*	1520	[0.50]	9.98	1704	0.35
(*E*)-ortho-Methoxycinnamal	11.81*	1520	[0.50]	16.76	2352	0.07
Eugenyl acetate	11.85	1524	0.11	15.31	2199	0.10
α-Calacorene	12.02	1536	0.06	11.64	1849	0.04
Caryophyllenyl alcohol	12.34	1562	0.02	13.22	1994	0.02
Spathulenol	12.45	1570	0.01	13.94	2063	0.01
Caryophyllene oxide	12.50	1574	0.11	12.32	1909	0.07
Humulene epoxide II	12.82	1600	0.01	12.95*	1968	[72.88]
Tetradecanal?	12.98	1613	0.01			
1,10-diepi-Cubenol	13.10	1622	0.03	12.95*	1968	[72.88]
Caryophylladienol II	13.17	1628	0.01	15.63	2233	0.01
τ-Muurolol	13.27	1637	0.02	14.57	2125	0.01
α-Muurolol	13.33	1641	0.01	14.76	2144	0.01
(3*Z*)-Caryophylla-	13.62	1666	0.02	16.30	2304	0.01

3,8(13)-dien-5β-ol						
Benzyl benzoate	14.66	1754	0.08	18.40	2536	0.08
Unknown [m/z 93, 92 (57), 136 (34), 91 (23), 77 (13), 134 (11)...]	16.91	1958	0.01			
Unknown [m/z 69, 91 (57), 41 (49), 181 (32), 169 (25), 167 (22)...]	18.45	2110	0.09	20.39	2776	0.16
Unknown [m/z 69, 91 (56), 41 (49), 169 (34), 239 (28), 93 (23)...]	18.54	2119	0.05	20.53	2793	0.05
Total identified		**99.13%**			**98.12%**	
Total reported		**99.27%**			**98.34%**	

*: 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