Date : November 17, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20K10-PTH04
Customer identification : Cinnamon Cassia Organic - India - CX0106207R
Type : Essential oil
Source : *Cinnamomum cassia*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc., chimiste à l'entraînement
Analysis date : November 12, 2020

Checked and approved by :

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

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Physicochemical data

Physical aspect: Yellow liquid
Refractive index: 1.6089 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3216:1997 - Oil of cassia

Compound	Min. %	Max. %	Observed %	Complies?
(Z)-Cinnamal	0	0.7	0.5	Yes
Benzeneacetaldehyde	0	0.7	0	Yes
Styrene	0	0.15	0.14	Yes
(E)-Cinnamyl alcohol	0	1	0	Yes
(E)-Cinnamyl acetate	0	6	3	Yes
Phenylethyl alcohol	0	0.5	0.5	Yes
Salicylaldehyde	0.2	1.0	0.2	Yes
Acetophenone	0	0.1	0	Yes
Benzaldehyde	0.5	2.0	0.7	Yes
(E)-ortho-Methoxycinnamyl acetate	0	2	0	Yes
(E)-ortho-Methoxycinnamal	3	15	9	Yes
Coumarin	1.5	4.0	1.7	Yes
Eugenol	0	0.5	0	Yes
(E)-Cinnamal	70	88	77	Yes
Refractive index	1.6000	1.6140	1.6089	Yes

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	%	Class
Ethanol	0.02	Aliphatic alcohol
Hexanal	0.01	Aliphatic aldehyde
Styrene	0.14	Simple phenolic
α-Pinene	0.06	Monoterpene
Camphene	0.05	Monoterpene
Benzaldehyde	0.73	Simple phenolic
β-Pinene	0.03	Monoterpene
Sabinene	0.01	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	0.01	Monoterpene
α-Phellandrene	0.01	Monoterpene
Octanal	tr	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
para-Cymene	0.05	Monoterpene
Limonene	0.03	Monoterpene
1,8-Cineole	0.01	Monoterpenic ether
β-Phellandrene	tr	Monoterpene
Salicylaldehyde	0.22	Simple phenolic
(*E*)-β-Ocimene	tr	Monoterpene
γ-Terpinene	0.01	Monoterpene
Acetophenone	0.03	Simple phenolic
ortho-Guaiacol	0.03	Simple phenolic
Linalool	0.01	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Phenylethyl alcohol	0.54	Simple phenolic
ortho-Vinylanisole	0.04	Simple phenolic
2-Methylbenzofuran	0.02	Phenylpropanoid
Hydrocinnamal	0.52	Phenylpropanoid
Borneol	0.11	Monoterpenic alcohol
3-Methylbenzofuran?	0.03	Phenylpropanoid
Terpinen-4-ol	0.05	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.04	Monoterpenic alcohol
Methyl salicylate	0.01	Phenolic ester
(*Z*)-Cinnamal	0.45	Phenylpropanoid
Hydrocinnamyl alcohol	0.14	Phenylpropanoid
ortho-Anisaldehyde	0.50	Simple phenolic
Phenylethyl acetate	0.03	Phenolic ester
(*E*)-Cinnamal	77.37	Phenylpropanoid
(*E*)-Cinnamyl alcohol	0.13	Phenylpropanoid
Eugenol	0.04	Phenylpropanoid
Cyclosativene I	0.04	Sesquiterpene
Cyclosativene II	0.01	Sesquiterpene
ortho-Methoxyhydrocinnamal?	0.25	Phenylpropanoid
α-Ylangene	0.02	Sesquiterpene

α-Copaene	0.31	Sesquiterpene
β-Elemene	tr	Sesquiterpene
β-Caryophyllene	0.10	Sesquiterpene
cis-α-Bergamotene	0.03	Sesquiterpene
Coumarin	1.71	Coumarin
trans-α-Bergamotene	0.08	Sesquiterpene
(*E*)-Cinnamyl acetate	3.03	Phenylpropanoid ester
(*E*)-Cinnamic acid	0.20	Phenylpropanoid
(*Z*)-ortho-Methoxycinnamal	0.10	Phenylpropanoid
allo-Aromadendrene	0.08	Sesquiterpene
(*E*)-β-Farnesene	0.04	Sesquiterpene
γ-Muurolene	0.12	Sesquiterpene
α-Amorphene	0.02	Sesquiterpene
ar-Curcumene	0.08	Sesquiterpene
Viridiflorene	0.05	Sesquiterpene
α-Muurolene	0.07	Sesquiterpene
(3-Phenyloxiran-2-yl)methyl acetate	0.01	Aliphatic alcohol
β-Bisabolene	0.09	Sesquiterpene
γ-Cadinene	0.05	Sesquiterpene
trans-Calamenene	0.03	Sesquiterpene
δ-Cadinene	0.11	Sesquiterpene
(*E*)-ortho-Methoxycinnamal	9.04	Phenylpropanoid
α-Calacorene	0.04	Sesquiterpene
(*E*)-α-Bisabolene	0.05	Sesquiterpene
(*E*)-Nerolidol	0.01	Sesquiterpenic alcohol
Spathulenol	0.10	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
Tetradecanal	0.03	Aliphatic aldehyde
1-epi-Cubenol	0.03	Sesquiterpenic alcohol
Caryophylladienol II	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.06	Sesquiterpenic alcohol
τ-Muurolol	0.03	Sesquiterpenic alcohol
β-Eudesmol	0.02	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene
α-Cadinol	0.03	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.06	Sesquiterpenic alcohol
cis-14-nor-Muurol-5-en-4-one?	0.02	Norsesquiterpenic ketone
Cadalene	0.02	Sesquiterpene
α-Bisabolol	0.07	Sesquiterpenic alcohol
Benzyl benzoate	0.05	Phenolic ester
Phenylethyl benzoate	0.03	Phenolic ester
Unknown	0.03	Unknown
Benzyl salicylate	0.01	Phenolic ester
Dolabradiene	0.04	Diterpene
Manoyl oxide	tr	Diterpenic ether
Kaurene?	0.01	Diterpene
Phenylethyl (*E*)-cinnamate	0.02	Phenylpropanoid ester
Consolidated total	**98.05%**	

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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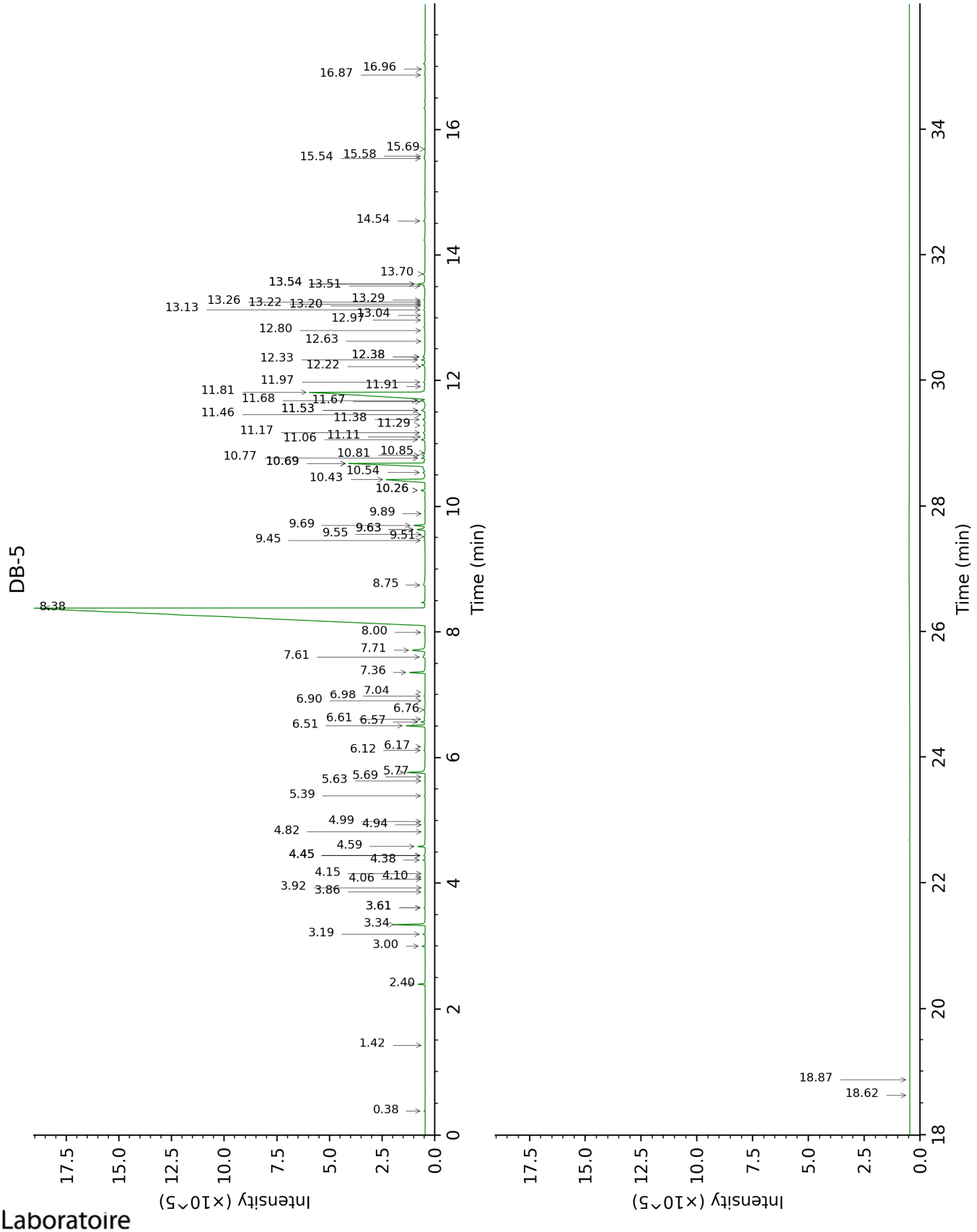
DB-5
Time (min)
Intensity (×10^5)
16.87
16.96
15.54
15.58
15.69
14.54
13.70
13.54
13.51
13.13
13.26
13.22
13.20
13.29
13.04
12.97
12.80
12.63
12.33
12.38
12.22
11.97
11.91
11.81
11.68
11.67
11.46
11.53
11.38
11.29
11.17
11.06
11.11
10.77
10.69
10.81
10.85
10.43
10.54
10.26
9.89
9.69
9.55
9.63
9.51
9.45
8.75
8.38
8.00
7.61
7.71
7.36
6.90
6.98
7.04
6.76
6.51
6.61
6.57
6.12
6.17
5.63
5.69
5.77
5.39
4.99
4.94
4.82
4.59
4.45
4.38
4.15
4.06
4.10
3.92
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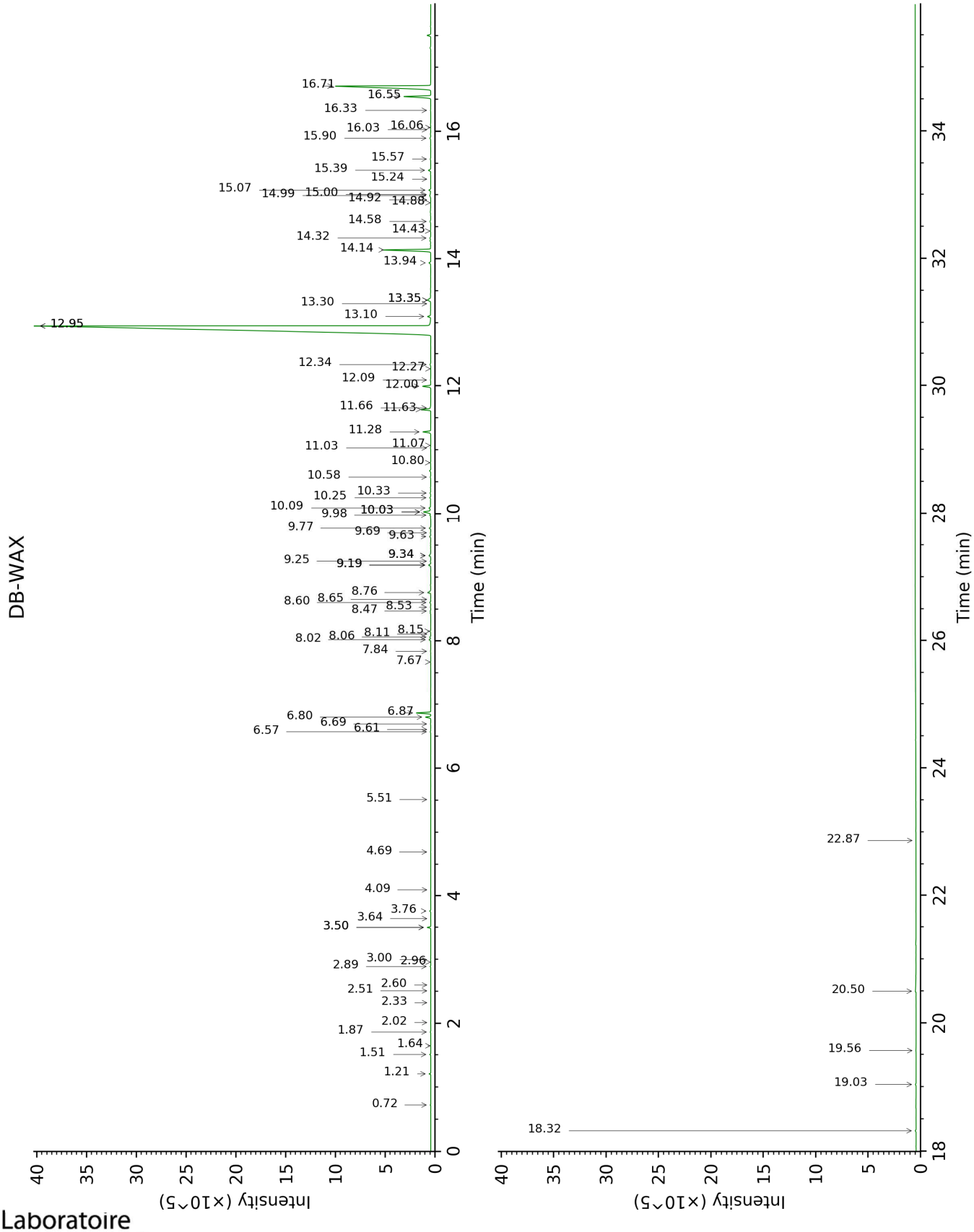
3.19
3.00
2.40
1.42
0.38
18.87
18.62



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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.38	507	0.02	0.72	908	0.02
Hexanal	1.42	801	0.01	1.64	1043	0.01
Styrene	2.40	886	0.14	3.50*	1208	0.17
α-Pinene	3.00	930	0.06	1.21	994	0.06
Camphene	3.19	943	0.05	1.51	1029	0.05
Benzaldehyde	3.34	953	0.73	6.87	1455	0.76
β-Pinene	3.61*	971	0.03	1.87	1067	0.03
Sabinene	3.61*	971	[0.03]	2.02	1082	0.01
6-Methyl-5-hepten-2-one	3.86	988	0.01	4.69	1300	0.01
Myrcene	3.92	992	0.01	2.60	1135	tr
α-Phellandrene	4.06	1001	0.01	2.51	1127	0.01
Octanal	4.10	1004	tr	4.09	1253	tr
Δ3-Carene	4.15	1007	0.01	2.33	1112	0.01
para-Cymene	4.38	1021	0.05	3.76	1228	0.05
Limonene	4.45*	1026	0.04	2.89	1158	0.03
1,8-Cineole	4.45*	1026	[0.04]	3.00	1167	0.01
β-Phellandrene	4.45*	1026	[0.04]	2.96	1164	tr
Salicylaldehyde	4.59	1035	0.22	8.76	1601	0.21
(*E*)-β-Ocimene	4.82	1050	tr	3.64	1219	0.01
γ-Terpinene	4.94	1057	0.01	3.50*	1208	[0.17]
Acetophenone	4.99	1060	0.03	8.53	1583	0.02
ortho-Guaiacol	5.39	1086	0.03	11.03	1791	0.02
Linalool	5.63	1101	0.01	7.67	1516	0.02
Nonanal	5.69	1105	0.01	5.51	1356	0.01
Phenylethyl alcohol	5.77	1110	0.54	11.63	1845	0.56
ortho-Vinylanisole	6.12	1132	0.04	8.47	1578	0.04
2-Methylbenzofuran	6.17	1136	0.02	8.60	1589	0.06
Hydrocinnamal	6.51	1158	0.52	10.03*	1705	0.57
Borneol	6.57	1162	0.11	9.34*	1648	0.13
3-Methylbenzofuran?	6.61	1164	0.03	9.69	1678	0.03
Terpinen-4-ol	6.76	1174	0.05	8.16	1554	0.05
para-Cymen-8-ol	6.90	1183	0.01	11.07	1795	0.01
α-Terpineol	6.98	1188	0.04	9.34*	1648	[0.13]
Methyl salicylate	7.04	1193	0.01	10.09	1710	0.14
(*Z*)-Cinnamal	7.36	1214	0.45	11.28	1813	0.47
Hydrocinnamyl alcohol	7.61	1230	0.14	13.10	1980	0.23
ortho-Anisaldehyde	7.71	1238	0.50	12.00	1878	0.50
Phenylethyl acetate	8.00	1257	0.03	10.58	1752	0.04
(*E*)-Cinnamal	8.38	1283	77.37	12.95*	1966	76.74
(*E*)-Cinnamyl alcohol	8.75	1305	0.13	15.39	2209	0.15
Eugenol	9.45	1355	0.04	14.32	2100	0.07
Cyclosativene I	9.51	1359	0.04	6.57	1433	0.03
Cyclosativene II	9.55	1362	0.01	6.61	1436	0.01
ortho-Methoxyhydrocinnamal?	9.63*	1367	0.28	13.35*	2004	0.35
α-Ylangene	9.63*	1367	[0.28]	6.69	1442	0.02
α-Copaene	9.69	1372	0.31	6.80	1450	0.30

β-Elemene	9.89	1386	tr	8.11	1550	tr
β-Caryophyllene	10.26*	1412	0.11	8.02	1544	0.10
cis-α-Bergamotene	10.26*	1412	[0.11]	7.84	1529	0.03
Coumarin	10.43	1425	1.71	16.55	2334	1.73
trans-α-Bergamotene	10.54	1434	0.08	8.06	1547	0.06
(*E*)-Cinnamyl acetate	10.69*	1444	3.12	14.14	2082	3.03
(*E*)-Cinnamic acid	10.69*	1444	[3.12]	20.50	2808	0.20
(*Z*)-ortho-Methoxycinnamal	10.77	1451	0.10	15.07	2176	0.12
allo-Aromadendrene	10.82	1454	0.08	8.65	1593	0.01
(*E*)-β-Farnesene	10.85	1457	0.04	9.19*	1636	0.13
γ-Muurolene	11.06	1472	0.12	9.19*	1636	[0.13]
α-Amorphene	11.11	1476	0.02	9.25	1641	0.03
ar-Curcumene	11.17	1481	0.08	10.25	1724	0.07
Viridiflorene	11.29	1489	0.05	9.19*	1636	[0.13]
α-Muurolene	11.38	1496	0.07	9.64	1673	0.07
(3-Phenyloxiran-2-yl)methyl acetate	11.46	1502	0.01	16.03	2277	0.01
β-Bisabolene	11.53*	1507	0.14	9.77	1684	0.09
γ-Cadinene	11.53*	1507	[0.14]	9.98	1701	0.05
trans-Calamenene	11.67	1518	0.03	10.80	1771	0.02
δ-Cadinene	11.68	1520	0.11	10.03*	1705	[0.57]
(*E*)-ortho-Methoxycinnamal	11.81	1530	9.04	16.71	2352	8.98
α-Calacorene	11.91	1537	0.04	11.66	1847	0.03
(*E*)-α-Bisabolene	11.97	1543	0.05	10.33	1731	0.05
(*E*)-Nerolidol	12.22	1562	0.01	13.30	1999	0.01
Spathulenol	12.33	1571	0.10	13.94	2062	0.12
Caryophyllene oxide	12.38*	1574	0.07	12.34	1908	0.06
Caryophyllene oxide isomer	12.38*	1574	[0.07]	12.27	1902	0.01
Humulene epoxide II	12.64	1595	0.01	12.95*	1966	[76.74]
Tetradecanal	12.80	1608	0.03	12.09	1886	0.04
1-epi-Cubenol	12.97	1622	0.03	13.35*	2004	[0.35]
Caryophylladienol II	13.04	1628	0.02	15.57	2228	0.04
τ-Cadinol	13.13	1636	0.06	14.43	2111	0.04
τ-Muurolol	13.20	1641	0.03	14.58	2126	0.07
β-Eudesmol	13.22	1643	0.02	14.92	2161	0.01
Unknown [m/z 43, 81 (79), 93 (77), 91 (70), 161 (68), 107 (67), 95 (65)...]	13.26	1646	0.02			
α-Cadinol	13.29	1648	0.03	15.00	2169	0.03
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.51	1667	0.06	16.33	2310	0.02
cis-14-nor-Muurol-5-en-4-one?	13.54*	1669	0.23	15.24	2194	0.02
Cadalene	13.54*	1669	[0.23]	14.88	2156	0.02
α-Bisabolol	13.70	1683	0.07	14.99	2168	0.08
Benzyl benzoate	14.54	1755	0.05	18.32	2536	0.05
Phenylethyl benzoate	15.54	1844	0.03	19.03	2622	0.04

Unknown [m/z 69, 43 (73), 41 (41), 81 (39), 58 (38), 93 (30), 68 (26)...]	15.58	1847	0.03			
Benzyl salicylate	15.69	1857	0.01	19.56	2688	0.02
Dolabradiene	16.87	1967	0.04	15.90	2263	0.06
Manoyl oxide	16.96	1976	tr	16.06	2281	tr
Kaurene?	18.62	2142	0.01			
Phenylethyl (*E*)-cinnamate	18.87	2167	0.02	22.87	3133	tr
Total identified		**98.07%**			**97.59%**	
Total reported		**98.12%**			**97.59%**	

*: 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