Date : March 24, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21C23-PTH08
Customer identification : Cinnamon Cassia Organic - CX0105R
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 : Sylvain Mercier, M. Sc., Chimiste
Analysis date : March 24, 2021

Checked and approved by :

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

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Physicochemical data

Physical aspect: Light orange liquid
Refractive index: 1.6078 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3216:1997 - Oil of cassia

Compound	Min. %	Max. %	Observed %	Complies?
(E)-Cinnamal	70	88	77	Yes
Eugenol		0.5	0.1	Yes
Coumarin	1.5	4.0	2.3	Yes
(E)-ortho-Methoxycinnamal	3	15	7	Yes
(E)-ortho-Methoxycinnamyl acetate		2	0	Yes
Benzaldehyde	0.5	2.0	0.9	Yes
Acetophenone		0.1	0	Yes
Salicylaldehyde	0.2	1.0	0.3	Yes
Phenylethyl alcohol		0.5	0.5	Yes
(E)-Cinnamyl acetate		6	4	Yes
(E)-Cinnamyl alcohol		1	0	Yes
Styrene		0.15	0	Yes
Benzeneacetaldehyde		0.7	0	Yes
(Z)-Cinnamal		0.7	0.4	Yes
Refractive index	1.6000	1.6140	1.6078	Yes

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
Furfural	tr	Furan
(2*E*)-Hexenal	tr	Aliphatic aldehyde
α-Thujene	tr	Monoterpene
α-Pinene	0.04	Monoterpene
Camphene	0.03	Monoterpene
Benzaldehyde	0.89	Simple phenolic
β-Pinene	0.02	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Benzofuran	0.01	Simple phenolic
Myrcene	0.01	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Δ3-Carene	0.01	Monoterpene
para-Cymene	0.04	Monoterpene
Limonene	0.02	Monoterpene
1,8-Cineole	0.01	Monoterpenic ether
Benzyl alcohol	0.01	Simple phenolic
Salicylaldehyde	0.29	Simple phenolic
γ-Terpinene	tr	Monoterpene
Acetophenone	0.03	Simple phenolic
Octanol	tr	Aliphatic alcohol
ortho-Guaiacol	0.02	Simple phenolic
Terpinolene	0.01	Monoterpene
Linalool	0.01	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Phenylethyl alcohol	0.45	Simple phenolic
ortho-Vinylanisole	0.03	Simple phenolic
2-Methylbenzofuran	0.03	Phenylpropanoid
Hydrocinnamal	0.47	Phenylpropanoid
Borneol	0.09	Monoterpenic alcohol
3-Methylbenzofuran?	0.13	Phenylpropanoid
Terpinen-4-ol	0.02	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.03	Monoterpenic alcohol
Methyl salicylate	0.02	Phenolic ester
(*Z*)-Cinnamal	0.37	Phenylpropanoid
Hydrocinnamyl alcohol	0.12	Phenylpropanoid
ortho-Anisaldehyde	0.38	Simple phenolic
Phenylethyl acetate	0.08	Phenolic ester
(*E*)-Cinnamal	76.96	Phenylpropanoid
(*E*)-Cinnamyl alcohol	0.24	Phenylpropanoid
Eugenol	0.06	Phenylpropanoid
Cyclosativene I	0.04	Sesquiterpene
Cyclosativene II	0.01	Sesquiterpene
ortho-Methoxyhydrocinnamal?	0.15	Phenylpropanoid
α-Ylangene	0.02	Sesquiterpene

α-Copaene	0.26	Sesquiterpene
β-Elemene	0.02	Sesquiterpene
β-Caryophyllene	0.09	Sesquiterpene
Coumarin	2.25	Coumarin
trans-α-Bergamotene	0.04	Sesquiterpene
(*E*)-Cinnamyl acetate	4.39	Phenylpropanoid ester
(*E*)-Cinnamic acid	0.54	Phenylpropanoid
α-Humulene	0.03	Sesquiterpene
(*Z*)-ortho-Methoxycinnamal	0.06	Phenylpropanoid
allo-Aromadendrene	0.02	Sesquiterpene
γ-Muurolene	0.10	Sesquiterpene
α-Amorphene	0.02	Sesquiterpene
ar-Curcumene	0.08	Sesquiterpene
Viridiflorene	0.03	Sesquiterpene
α-Selinene	0.01	Sesquiterpene
α-Muurolene	0.06	Sesquiterpene
(3-Phenyloxiran-2-yl)methyl acetate	0.03	Aliphatic alcohol
β-Bisabolene	0.11	Sesquiterpene
γ-Cadinene	0.08	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
(*E*)-ortho-Methoxycinnamal	6.97	Phenylpropanoid
(*E*)-γ-Bisabolene	0.09	Sesquiterpene
α-Calacorene	0.02	Sesquiterpene
(*E*)-α-Bisabolene	0.03	Sesquiterpene
(*E*)-Nerolidol	0.16	Sesquiterpenic alcohol
Spathulenol	0.12	Sesquiterpenic alcohol
Caryophyllene oxide	0.09	Sesquiterpenic ether
Humulene epoxide I	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	0.03	Sesquiterpenic alcohol
τ-Muurolol	0.03	Sesquiterpenic alcohol
τ-Cadinol	0.04	Sesquiterpenic alcohol
β-Eudesmol	0.02	Sesquiterpenic alcohol
α-Eudesmol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.03	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.01	Sesquiterpenic alcohol
Cadalene	0.01	Sesquiterpene
Mustakone	0.02	Sesquiterpenic ketone
(*E*)-ortho-Methoxycinnamyl acetate	0.16	Phenylpropanoid ester
cis-14-nor-Muurol-5-en-4-one?	0.01	Norsesquiterpenic ketone
α-Bisabolol	0.04	Sesquiterpenic alcohol
Benzyl benzoate	0.05	Phenolic ester
Phenylethyl benzoate	0.03	Phenolic ester
Benzyl salicylate	0.01	Phenolic ester
Biformene?	0.04	Diterpene
Sandaracopimaradiene?	0.04	Diterpene
Dolabradiene	0.07	Diterpene
Manoyl oxide	tr	Diterpenic ether
Kaurene?	0.06	Diterpene
Phenylethyl (*E*)-cinnamate	0.05	Phenylpropanoid ester

Consolidated total	**97.72%**	

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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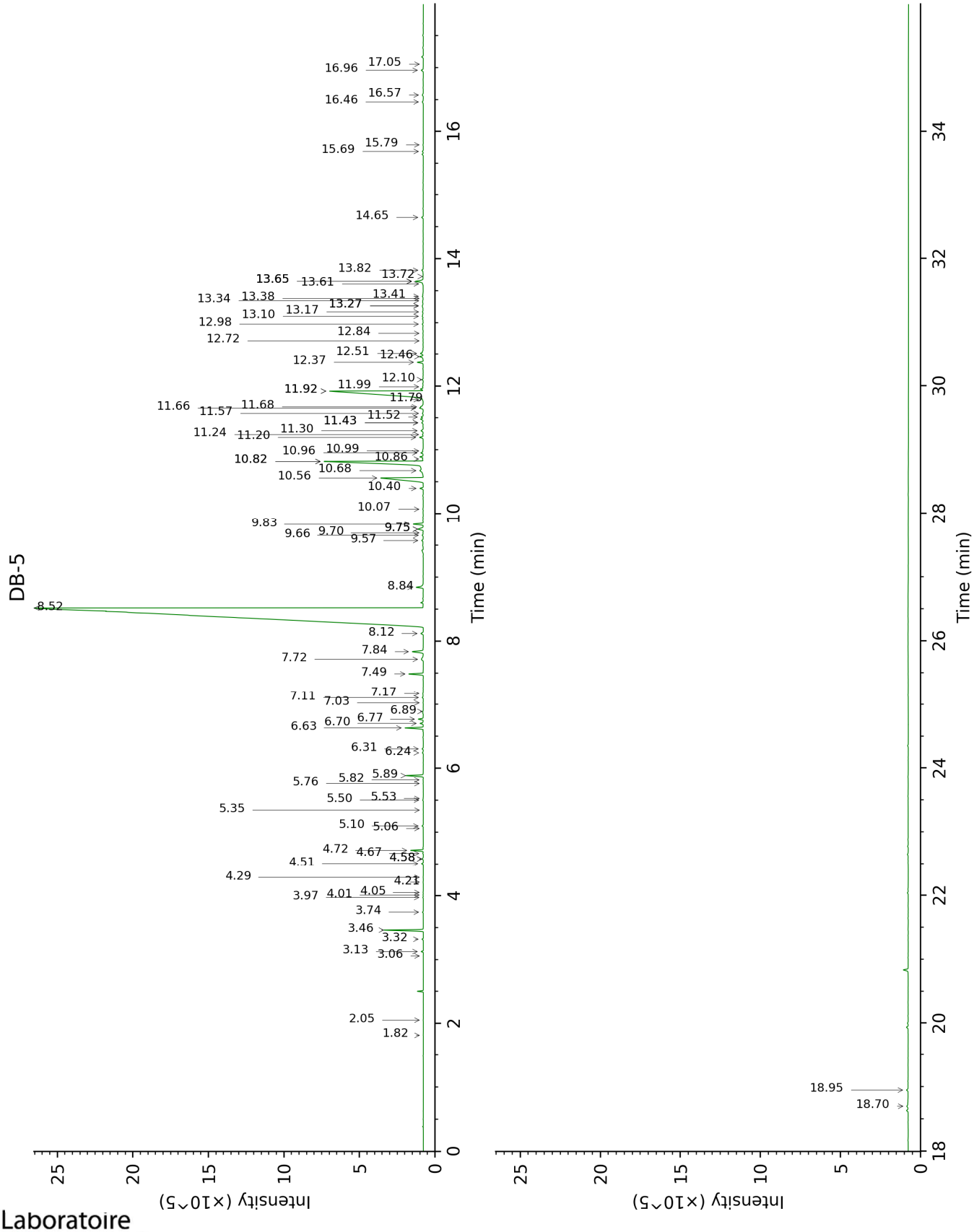
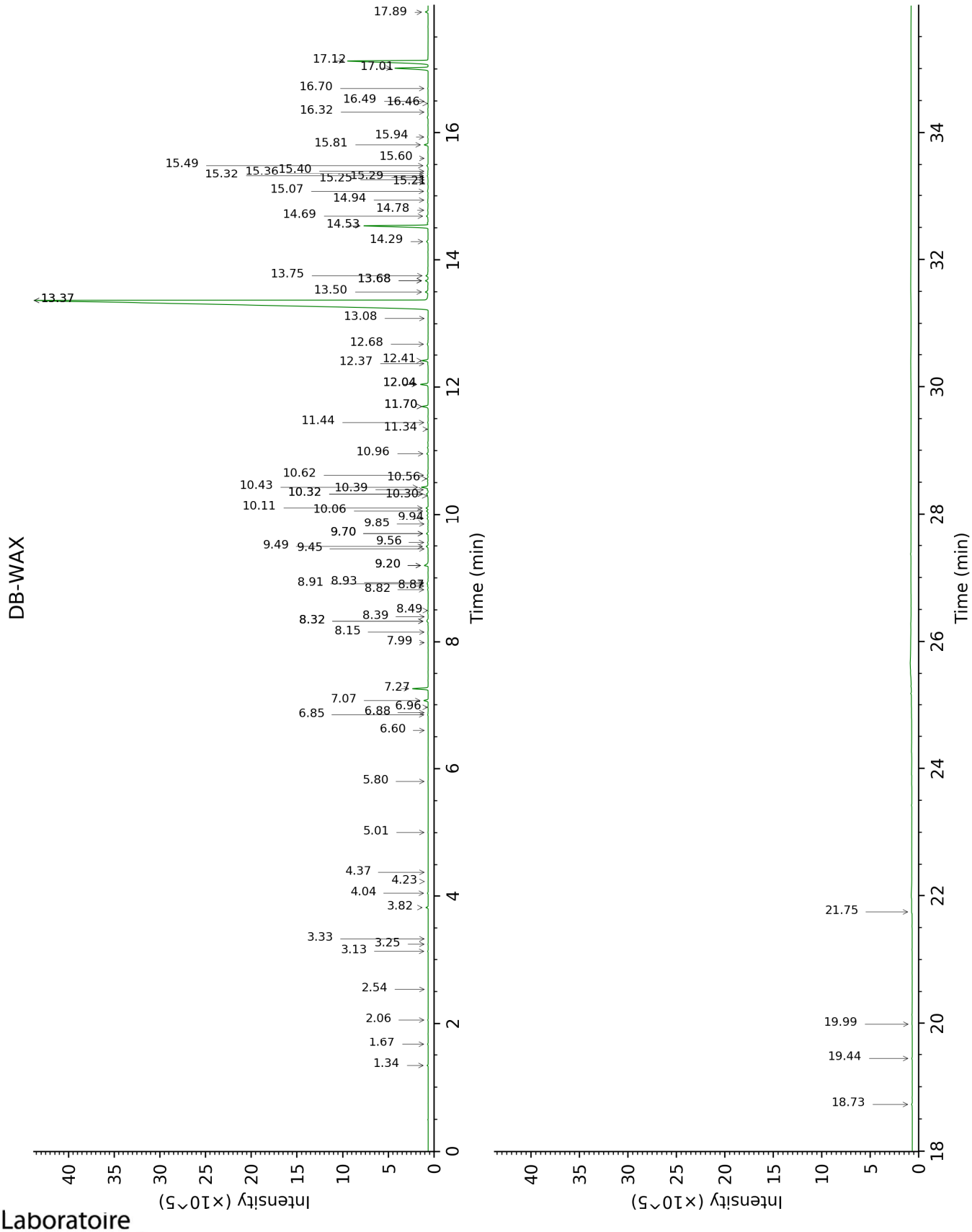

DB-5
Time (min)
Intensity (×10^5)
16.96
17.05
16.46
16.57
15.69
15.79
14.65
13.82
13.72
13.65
13.61
13.34
13.38
13.41
13.27
12.98
13.10
13.17
12.72
12.84
12.37
12.51
12.46
11.92
11.99
12.10
11.79
11.66
11.57
11.68
11.52
11.24
11.20
11.43
11.30
10.82
10.96
10.99
10.86
10.56
10.68
10.40
10.07
9.83
9.66
9.70
9.75
9.57
8.84
8.52
8.12
7.72
7.84
7.49
7.11
7.03
7.17
6.89
6.63
6.70
6.77
6.31
6.24
5.76
5.82
5.89
5.50
5.53
5.35
5.10
5.06
4.72
4.67
4.58
4.51
4.29
4.21
3.97
4.01
4.05
3.74
3.46
3.32
3.13
3.06
2.05
1.82
18.95
18.70


DB-WAX
Intensity (×10^5)
Time (min)
17.89
17.12
17.01
16.70
16.49
16.46
16.32
15.94
15.81
15.60
15.49
15.32
15.36
15.40
15.25
15.29
15.21
15.07
14.94
14.78
14.69
14.53
14.29
13.75
13.68
13.50
13.37
13.08
12.68
12.37
12.41
12.04
11.70
11.44
11.34
10.96
10.62
10.56
10.43
10.32
10.39
10.30
10.11
10.06
9.85
9.94
9.70
9.56
9.49
9.45
9.20
8.91
8.93
8.82
8.87
8.32
8.39
8.49
8.15
7.99
7.27
7.07
6.96
6.85
6.88
6.60
5.80
5.01
4.37
4.23
4.04
3.82
3.33
3.25
3.13
2.54
2.06
1.67
1.34
21.75
19.99
19.44
18.73

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Furfural	1.82	826	tr	6.60	1411	tr
(2*E*)-Hexenal	2.05	846	tr	3.33	1172	tr
α-Thujene	3.06	924	tr			
α-Pinene	3.13	929	0.04	1.34	990	0.04
Camphene	3.32	942	0.03	1.67	1025	0.03
Benzaldehyde	3.46	952	0.89	7.27	1461	0.90
β-Pinene	3.74	970	0.02	2.06	1065	0.02
6-Methyl-5-hepten-2-one	3.97	986	0.01	5.01	1294	0.01
Benzofuran	4.01	988	0.01			
Myrcene	4.05	991	0.01			
Octanal	4.21	1002	0.01	4.37	1250	tr
Δ3-Carene	4.29	1007	0.01	2.54	1110	tr
para-Cymene	4.51	1021	0.04	4.04	1226	0.04
Limonene	4.58*	1025	0.03	3.13	1157	0.02
1,8-Cineole	4.58*	1025	[0.03]	3.24	1166	0.01
Benzyl alcohol	4.67	1031	0.01	11.70*	1820	0.38
Salicylaldehyde	4.72	1034	0.29	9.20*	1610	0.31
γ-Terpinene	5.06	1056	tr	3.82	1210	0.11
Acetophenone	5.10	1058	0.03	8.87	1585	0.03
Octanol	5.35	1074	tr	8.15	1528	0.01
ortho-Guaiacol	5.50	1084	0.02	11.34	1789	0.01
Terpinolene	5.53	1085	0.01	4.23	1240	tr
Linalool	5.76	1100	0.01	7.99	1516	0.01
Nonanal	5.82	1104	0.01	5.80	1352	0.01
Phenylethyl alcohol	5.89	1108	0.45	12.04*	1851	0.48
ortho-Vinylanisole	6.24	1131	0.03	8.82	1580	0.03
2-Methylbenzofuran	6.31	1135	0.03	8.93	1589	0.03
Hydrocinnamal	6.63	1156	0.47	10.43	1712	0.46
Borneol	6.70	1161	0.09	9.70*	1651	0.10
3-Methylbenzofuran?	6.77	1165	0.13	10.11	1685	0.13
Terpinen-4-ol	6.89	1173	0.02	8.49	1555	0.01
para-Cymen-8-ol	7.03	1182	0.01	11.44	1798	0.03
α-Terpineol	7.11	1187	0.03	9.70*	1651	[0.10]
Methyl salicylate	7.17	1192	0.02	10.39	1709	0.05
(*Z*)-Cinnamal	7.49	1212	0.37	11.70*	1820	[0.38]
Hydrocinnamyl alcohol	7.72	1228	0.12	13.50	1984	0.21
ortho-Anisaldehyde	7.84	1236	0.38	12.41	1884	0.36
Phenylethyl acetate	8.12	1255	0.08	10.96	1756	0.08
(*E*)-Cinnamal	8.52	1282	76.96	13.37*	1971	77.58
(*E*)-Cinnamyl alcohol	8.84	1302	0.24	15.81	2210	0.24
Eugenol	9.57	1353	0.06	14.68	2097	0.12
Cyclosativene I	9.66	1359	0.04	6.85	1429	0.03
Cyclosativene II	9.70	1362	0.01	6.88	1432	0.01
ortho-Methoxyhydrocinnamal?	9.75*	1366	0.20	13.75	2008	0.15
α-Ylangene	9.75*	1366	[0.20]	6.96	1438	0.02
α-Copaene	9.83	1372	0.26	7.07	1446	0.26

β-Elemene	10.07	1389	0.02	8.39	1547	tr
β-Caryophyllene	10.40	1412	0.09	8.32*	1542	0.13
Coumarin	10.56	1425	2.25	17.01	2336	2.28
trans-α-Bergamotene	10.68†	1433	5.19	8.32*	1542	[0.13]
(*E*)-Cinnamyl acetate	10.82*†	1444	[5.19]	14.53	2082	4.39
(*E*)-Cinnamic acid	10.82*†	1444	[5.19]	21.75	2889	0.54
α-Humulene	10.86	1447	0.03	9.20*	1610	[0.31]
(*Z*)-ortho-Methoxycinnamal	10.96	1454	0.06	15.49	2177	0.09
allo-Aromadendrene	10.99	1456	0.02	8.91	1587	0.07
γ-Muurolene	11.20	1472	0.10	9.49	1635	0.12
α-Amorphene	11.24	1476	0.02	9.45	1632	0.01
ar-Curcumene	11.30	1480	0.08	10.56	1723	0.08
Viridiflorene	11.43*	1489	0.05	9.56	1640	0.03
α-Selinene	11.43*	1489	[0.05]	9.84	1663	0.01
α-Muurolene	11.52	1496	0.06	9.94	1671	0.07
(3-Phenyloxiran-2-yl)methyl acetate	11.57	1500	0.03	16.46	2277	0.02
β-Bisabolene	11.66	1507	0.11	10.06	1681	0.10
γ-Cadinene	11.68	1508	0.08	10.30	1700	0.05
δ-Cadinene	11.79	1517	0.02	10.32*	1703	0.11
(*E*)-ortho-Methoxycinnamal	11.92*	1528	7.07	17.12	2348	6.97
(*E*)-γ-Bisabolene	11.92*	1528	[7.07]	10.32*	1703	[0.11]
α-Calacorene	11.99	1533	0.02	12.04*	1851	[0.48]
(*E*)-α-Bisabolene	12.10	1542	0.03	10.62	1728	0.05
(*E*)-Nerolidol	12.37	1563	0.16	13.68*	2000	0.18
Spathulenol	12.46	1570	0.12	14.29	2059	0.10
Caryophyllene oxide	12.51	1574	0.09	12.68	1908	0.07
Humulene epoxide I	12.72	1590	0.01	13.08	1945	0.01
Humulene epoxide II	12.84	1600	0.01	13.37*	1971	[77.58]
Tetradecanal	12.98	1612	0.03	12.37	1880	0.02
1-epi-Cubenol	13.10	1622	0.03	13.68*	2000	[0.18]
Caryophylladienol II	13.17	1627	0.03	15.94	2223	0.03
τ-Muurolol	13.26*	1635	0.06	14.94	2122	0.03
τ-Cadinol	13.26*	1635	[0.06]	14.78	2107	0.04
β-Eudesmol	13.34	1642	0.02	15.29	2158	0.02
α-Eudesmol	13.38	1645	0.01	15.25	2154	0.01
α-Cadinol	13.41	1648	0.03	15.36	2165	0.03
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.61	1664	0.01	16.70	2302	0.02
Cadalene	13.65*	1667	0.30	15.21	2150	0.01
Mustakone	13.65*	1667	[0.30]	15.40	2168	0.02
(*E*)-ortho-Methoxycinnamyl acetate	13.65*	1667	[0.30]	17.89	2432	0.16
cis-14-nor-Muurol-5-en-4-one?	13.72	1673	0.01	15.60	2188	0.01
α-Bisabolol	13.82	1681	0.04	15.32	2160	0.05
Benzyl benzoate	14.65	1752	0.05	18.73	2525	0.05
Phenylethyl benzoate	15.69	1845	0.03	19.44	2608	0.03
Benzyl salicylate	15.79	1855	0.01	19.99	2672	0.03

Biformene?	16.46	1917	0.04			
Sandaracopimaradiene?	16.57	1927	0.04	15.07	2136	0.05
Dolabradiene	16.96	1964	0.07	16.32	2263	0.02
Manoyl oxide	17.05	1973	tr	16.49	2280	0.01
Kaurene?	18.70	2137	0.06			
Phenylethyl (*E*)-cinnamate	18.95	2164	0.05			
Total identified		**98.10%**			**98.42%**	
Total reported		**98.10%**			**98.42%**	

*: 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