Date : December 06, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19L05-PTH05-1-CC
Customer identification : Cinnamon Cassia ORGANIC - China - CX0104812R
Type : Essential oil
Source : *Cinnamomum cassia*
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : December 06, 2019

Checked and approved by :

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

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Physicochemical data

Physical aspect: Light yellow liquid
Refractive index: 1.6080 ± 0.0003 (20 °C)

ISO 3216:1997 - Oil of cassia

Compound	Min. %	Max. %	Observed %	Complies?
(Z)-Cinnamal	0	0.7	0.5	Yes
Benzeneacetaldehyde	0	0.7	ND	Yes
Styrene	0	0.15	0.12	Yes
(E)-Cinnamyl alcohol	0	1	0	Yes
(E)-Cinnamyl acetate	0	6	1	Yes
Phenylethyl alcohol	0	0.5	0.7	No
Salicylaldehyde	0.2	1.0	0.2	Yes
Acetophenone	0	0.1	0	Yes
Benzaldehyde	0.5	2.0	0.9	Yes
(E)-ortho-Methoxycinnamyl acetate	0	2	ND	Yes
(E)-ortho-Methoxycinnamal	3	15	7	Yes
Coumarin	1.5	4.0	0.6	No
Eugenol	0	0.5	0	Yes
(E)-Cinnamal	70	88	81	Yes
Refractive index	1.6000	1.6140	1.6080	Yes

Conclusion

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for cassia oil.

Analysis summary – Consolidated contents

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

Identification	%	Classe
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Hexanal	0.01	Aliphatic aldehyde
(2*E*)-Hexenal	0.01	Aliphatic aldehyde
Styrene	0.12	Simple phenolic
Tricyclene	tr	Monoterpene
α-Thujene	tr	Monoterpene
α-Pinene	0.12	Monoterpene
α-Fenchene	tr	Monoterpene
Camphene	0.08	Monoterpene
Benzaldehyde	0.93	Simple phenolic
Sabinene	tr	Monoterpene
β-Pinene	0.04	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Benzofuran	tr	Simple phenolic
Myrcene	tr	Monoterpene
α-Phellandrene	tr	Monoterpene
Octanal	tr	Aliphatic aldehyde
Δ3-Carene	tr	Monoterpene
para-Cymene	0.04	Monoterpene
Limonene	0.04	Monoterpene
β-Phellandrene	0.01*	Monoterpene
1,8-Cineole	[0.01]*	Monoterpenic ether
Salicylaldehyde	0.19	Simple phenolic
(*Z*)-β-Ocimene	tr	Monoterpene
(*E*)-β-Ocimene	tr	Monoterpene
γ-Terpinene	tr	Monoterpene
Acetophenone	0.03	Simple phenolic
cis-Linalool oxide (fur.)	tr	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
ortho-Guaiacol	0.01	Simple phenolic
Terpinolene	0.01	Monoterpene
Linalool	tr	Monoterpenic alcohol
Nonanal	0.01	Aliphatic aldehyde
Phenylethyl alcohol	0.71	Simple phenolic
ortho-Vinylanisole	0.06	Simple phenolic
2-Methylbenzofuran	0.02	Phenylpropanoid
Hydrocinnamal	0.65	Phenylpropanoid
Borneol	0.14	Monoterpenic alcohol
3-Methylbenzofuran?	0.03	Phenylpropanoid
Terpinen-4-ol	0.03	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.04	Monoterpenic alcohol
(*Z*)-Cinnamal	0.48	Phenylpropanoid
Hydrocinnamyl alcohol	0.19	Phenylpropanoid
ortho-Anisaldehyde	0.61	Simple phenolic
Phenylethyl acetate	0.05	Phenolic ester

(*E*)-Cinnamal	81.48	Phenylpropanoid
(*E*)-Cinnamyl alcohol	0.18	Phenylpropanoid
Eugenol	0.03	Phenylpropanoid
Cyclosativene I	0.02	Sesquiterpene
Cyclosativene II	0.01	Sesquiterpene
α-Ylangene	0.39	Sesquiterpene
α-Copaene	tr	Sesquiterpene
ortho-Methoxyhydrocinnamal?	0.36	Phenylpropanoid
β-Elemene	0.02	Sesquiterpene
cis-α-Bergamotene	0.01	Sesquiterpene
β-Caryophyllene	0.14	Sesquiterpene
Coumarin	0.64	Coumarin
trans-α-Bergamotene	0.05	Sesquiterpene
(*E*)-Cinnamyl acetate	0.65	Phenylpropanoid ester
(*E*)-Cinnamic acid	0.41	Phenylpropanoid
α-Humulene	0.15	Sesquiterpene
(*Z*)-ortho-Methoxycinnamal	0.07	Phenylpropanoid
allo-Aromadendrene	0.05	Sesquiterpene
γ-Muurolene	0.16	Sesquiterpene
α-Amorphene	0.03	Sesquiterpene
ar-Curcumene	0.10	Sesquiterpene
Viridiflorene	0.08	Sesquiterpene
α-Muurolene	0.08	Sesquiterpene
γ-Cadinene	0.20	Sesquiterpene
β-Bisabolene	0.01	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.05	Sesquiterpene
δ-Cadinene	0.15	Sesquiterpene
trans-Calamenene	0.03	Sesquiterpene
(*E*)-ortho-Methoxycinnamal	6.95	Phenylpropanoid
α-Calacorene	0.03	Sesquiterpene
(*E*)-α-Bisabolene	0.08	Sesquiterpene
(*E*)-Nerolidol	0.08	Sesquiterpenic alcohol
Spathulenol	0.12	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Humulene epoxide I	0.01	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
Tetradecanal?	0.04	Aliphatic aldehyde
1-epi-Cubenol	0.03	Sesquiterpenic alcohol
Caryophylladienol II	0.02	Sesquiterpenic alcohol
τ-Muurolol	0.03	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
α-Muurolol	0.04	Sesquiterpenic alcohol
β-Eudesmol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.03	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.05	Sesquiterpenic alcohol
α-Bisabolol	0.06	Sesquiterpenic alcohol
Benzyl benzoate	0.07	Phenolic ester
Phenylethyl benzoate	0.05	Phenolic ester
Benzyl salicylate	0.02	Phenolic ester
Dolabradiene	0.07	Diterpene
Manoyl oxide	0.01	Diterpenic ether

Kaurene?	0.01	Diterpene
Phenylethyl (*E*)-cinnamate	0.02	Phenylpropanoid ester
Consolidated total	**98.26%**	

*: 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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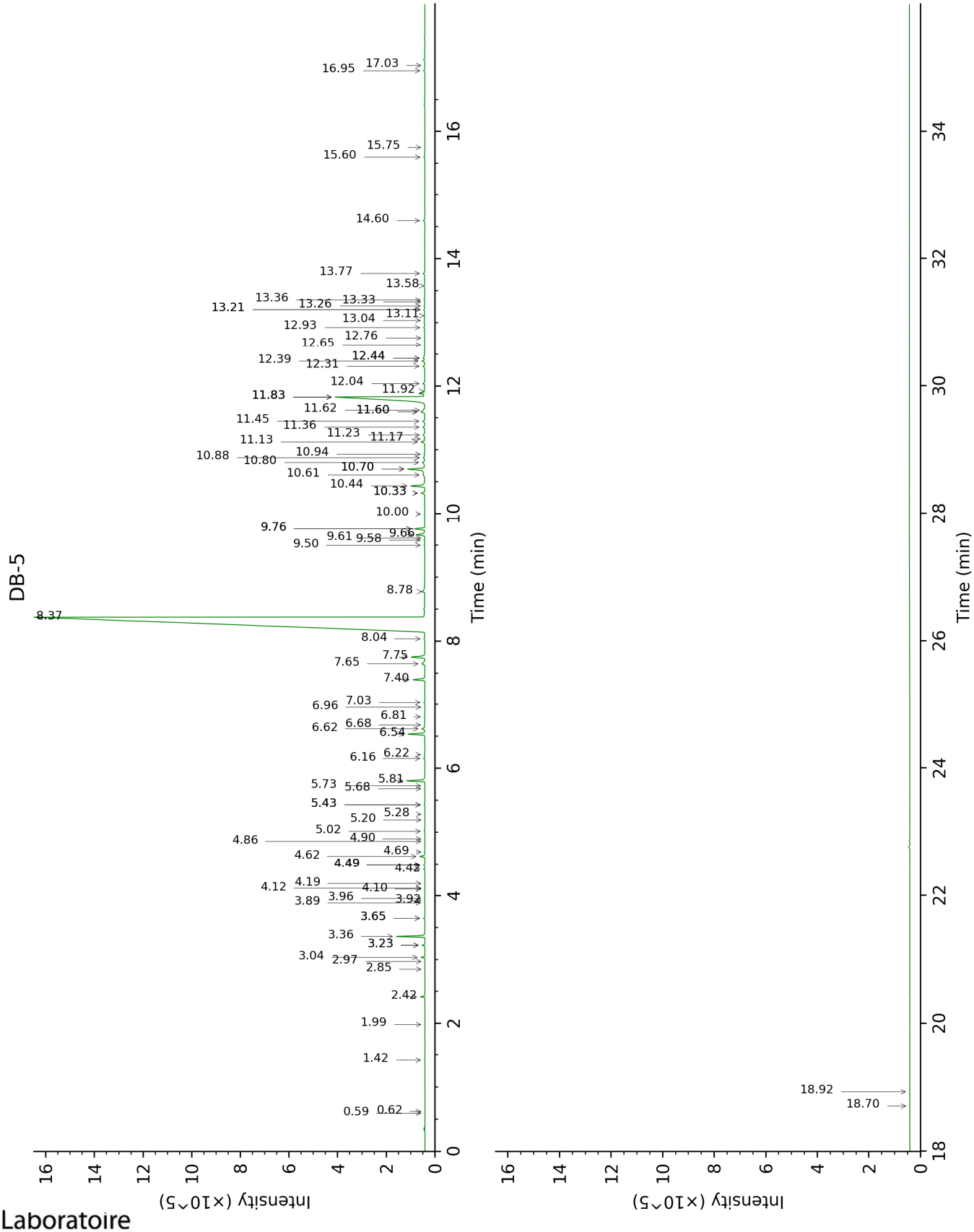
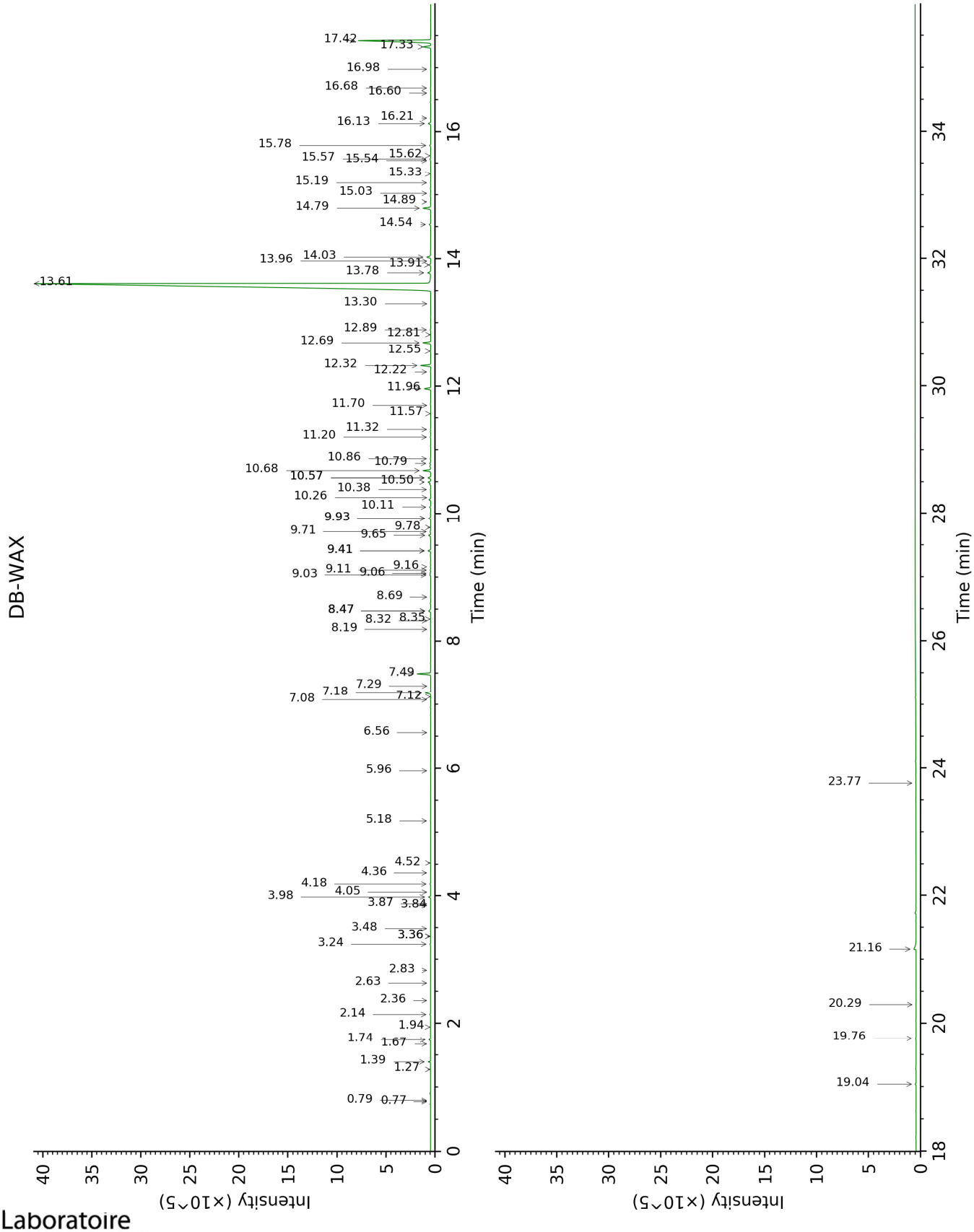

DB-5
Time (min)
Intensity (×10^5)
16.95
17.03
15.60
15.75
14.60
13.77
13.58
13.21
13.36
13.26
13.33
12.93
13.04
13.11
12.65
12.76
12.39
12.31
12.44
12.04
11.92
11.83
11.62
11.60
11.45
11.36
11.23
11.17
11.13
10.88
10.80
10.94
10.61
10.70
10.44
10.33
10.00
9.76
9.61
9.58
9.66
9.50
8.78
8.37
8.04
7.65
7.75
7.40
6.96
7.03
6.81
6.62
6.68
6.54
6.16
6.22
5.73
5.68
5.81
5.43
5.20
5.28
5.02
4.86
4.90
4.62
4.69
4.49
4.42
4.12
4.19
4.10
3.89
3.96
3.92
3.65
3.36
3.23
3.04
2.97
2.85
2.42
1.99
1.42
0.59
0.62
18.92
18.70


DB-WAX
Intensity (×10^5)
Time (min)
17.42
17.33
16.98
16.68
16.60
16.13
16.21
15.78
15.57
15.54
15.62
15.33
15.19
15.03
14.89
14.79
14.54
13.96
14.03
13.91
13.78
13.61
13.30
12.89
12.81
12.69
12.55
12.32
12.22
11.96
11.70
11.57
11.32
11.20
10.86
10.79
10.68
10.57
10.50
10.38
10.26
10.11
9.93
9.78
9.71
9.65
9.41
9.16
9.11
9.06
9.03
8.69
8.47
8.35
8.32
8.19
7.49
7.29
7.18
7.12
7.08
6.56
5.96
5.18
4.52
4.36
4.18
4.05
3.98
3.87
3.84
3.48
3.36
3.24
2.83
2.63
2.36
2.14
1.94
1.74
1.67
1.39
1.27
0.79
0.77
23.77
21.16
20.29
19.76
19.04

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.60	641	tr	0.79	894	tr
2-Methylbutyral	0.62	652	tr	0.77	887	tr
Hexanal	1.42	801	0.01	1.94	1047	0.01
(2*E*)-Hexenal	1.98	850	0.01	3.48	1176	0.01
Styrene	2.42	886	0.12	3.98	1213	0.13
Tricyclene	2.85	918	tr	1.28	973	tr
α-Thujene	2.97	926	tr			
α-Pinene	3.04	930	0.12	1.39	993	0.12
α-Fenchene	3.23*	942	0.09	1.67	1021	tr
Camphene	3.23*	942	[0.09]	1.74	1028	0.08
Benzaldehyde	3.36	951	0.93	7.49	1466	0.96
Sabinene	3.65*	970	0.05	2.36	1088	tr
β-Pinene	3.65*	970	[0.05]	2.14	1067	0.04
6-Methyl-5-hepten-2-one	3.89	986	0.01	5.18	1298	0.02
Benzofuran	3.92	988	tr			
Myrcene	3.96	991	tr			
α-Phellandrene	4.10	1000	tr	2.83	1126	tr
Octanal	4.12	1001	tr	4.52	1251	tr
Δ3-Carene	4.19	1006	tr	2.63	1110	tr
para-Cymene	4.42	1020	0.04	4.18	1227	0.04
Limonene	4.49*	1025	0.06	3.24	1157	0.04
β-Phellandrene	4.49*	1025	[0.06]	3.36*	1167	0.01
1,8-Cineole	4.49*	1025	[0.06]	3.36*	1167	[0.01]
Salicylaldehyde	4.62	1033	0.19	9.41*	1614	0.21
(*Z*)-β-Ocimene	4.69	1038	tr	3.84	1203	tr
(*E*)-β-Ocimene	4.86	1048	tr	4.05	1218	tr
γ-Terpinene	4.90	1050	tr	3.87	1205	tr
Acetophenone	5.02	1058	0.03	9.06	1585	0.05
cis-Linalool oxide (fur.)	5.20	1069	tr	6.56	1397	tr
Octanol	5.28	1075	0.01	8.32	1528	tr
ortho-Guaiacol	5.43*	1084	0.04	11.57	1792	0.01
Terpinolene	5.43*	1084	[0.04]	4.36	1240	0.01
Linalool	5.68	1100	tr	8.19	1518	0.01
Nonanal	5.73	1103	0.01	5.96	1354	0.01
Phenylethyl alcohol	5.81	1108	0.71	12.32	1858	0.74
ortho-Vinylanisole	6.16	1131	0.06	9.03	1583	0.06
2-Methylbenzofuran	6.22	1135	0.02	9.11	1589	0.04
Hydrocinnamal	6.54	1156	0.65	10.68	1716	0.59
Borneol	6.62	1161	0.14	9.93*	1655	0.17
3-Methylbenzofuran?	6.68	1165	0.03	10.38	1692	0.03
Terpinen-4-ol	6.81	1174	0.03	8.69	1557	0.01
para-Cymen-8-ol	6.96	1183	0.01	11.70	1803	tr
α-Terpineol	7.03	1188	0.04	9.93*	1655	[0.17]
(*Z*)-Cinnamal	7.40	1213	0.48	11.96	1826	0.51
Hydrocinnamyl alcohol	7.65	1230	0.19	13.78	1991	0.32
ortho-Anisaldehyde	7.75	1237	0.61	12.69	1890	0.62
Phenylethyl acetate	8.04	1257	0.05	11.20	1760	0.05

(*E*)-Cinnamal	8.37	1280	81.48	13.61	1975	80.80
(*E*)-Cinnamyl alcohol	8.78	1308	0.18	16.13	2222	0.21
Eugenol	9.58	1360	0.03	14.89	2097	0.04
Cyclosativene I	9.50	1362	0.02	7.08	1435	0.02
Cyclosativene II	9.61	1362	0.01	7.12	1439	tr
α-Ylangene	9.66	1366	0.39	7.18	1443	0.40
α-Copaene	9.76*	1372	0.41	7.30	1451	tr
ortho-Methoxyhydrocinnamal?	9.76*	1372	[0.41]	14.03	2014	0.36
β-Elemene	10.00	1390	0.02	8.47*	1540	0.21
cis-α-Bergamotene	10.33*	1413	0.15	8.35	1530	0.01
β-Caryophyllene	10.33*	1413	[0.15]	8.47*	1540	[0.21]
Coumarin	10.44	1421	0.64	17.33	2348	0.64
trans-α-Bergamotene	10.61†	1434	1.03	8.47*	1540	[0.21]
(*E*)-Cinnamyl acetate	10.70*†	1441	[1.03]	14.79	2087	0.65
(*E*)-Cinnamic acid	10.70*†	1441	[1.03]	21.16	2795	0.41
α-Humulene	10.80	1449	0.15	9.41*	1614	[0.21]
(*Z*)-ortho-Methoxycinnamal	10.88	1454	0.07	15.78	2186	0.10
allo-Aromadendrene	10.94	1458	0.05	9.16	1593	0.04
γ-Muurolene	11.13	1472	0.16	9.66	1633	0.17
α-Amorphene	11.17	1476	0.03	9.78	1643	0.01
ar-Curcumene	11.23	1480	0.10	10.79	1726	0.08
Viridiflorene	11.36	1490	0.08	9.71	1638	0.07
α-Muurolene	11.45	1496	0.08	10.11	1669	0.09
γ-Cadinene	11.60*	1507	0.21	10.50	1701	0.20
β-Bisabolene	11.60*	1507	[0.21]	10.26	1681	0.01
(3*E*,6*E*)-α-Farnesene	11.62	1510	0.05	10.57*	1707	0.21
δ-Cadinene	11.83*	1526	7.24	10.57*	1707	[0.21]
trans-Calamenene	11.83*	1526	[7.24]	11.32	1771	0.03
(*E*)-ortho-Methoxycinnamal	11.83*	1526	[7.24]	17.42	2358	6.95
α-Calacorene	11.92	1533	0.03	12.22	1849	0.03
(*E*)-α-Bisabolene	12.04	1542	0.08	10.86	1732	0.03
(*E*)-Nerolidol	12.31	1564	0.08	13.91	2002	0.11
Spathulenol	12.39	1570	0.12	14.54	2063	0.12
Caryophyllene oxide	12.44*	1574	0.07	12.89	1908	0.06
Caryophyllene oxide isomer	12.44*	1574	[0.07]	12.81	1902	0.01
Humulene epoxide I	12.65	1590	0.01	13.30	1946	0.01
Humulene epoxide II	12.76	1599	0.01			
Tetradecanal?	12.92	1612	0.04	12.55	1878	0.04
1-epi-Cubenol	13.04	1621	0.03	13.96	2008	0.03
Caryophylladienol II	13.11	1628	0.02	16.21	2230	0.03
τ-Muurolol	13.21*	1635	0.06	15.19	2127	0.03
τ-Cadinol	13.21*	1635	[0.06]	15.02	2110	0.02
α-Muurolol	13.26	1640	0.04	15.33	2141	0.02
β-Eudesmol	13.33	1645	0.01	15.54	2162	0.01
α-Cadinol	13.36	1648	0.03	15.62	2170	0.04
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.58	1666	0.05	16.98	2310	0.03
α-Bisabolol	13.77	1682	0.06	15.57	2165	0.08

Benzyl benzoate	14.60	1753	0.07	19.04	2540	0.07
Phenylethyl benzoate	15.60	1842	0.05	19.76	2624	0.05
Benzyl salicylate	15.75	1856	0.02	20.29	2687	0.02
Dolabradiene	16.95	1968	0.07	16.60	2271	0.04
Manoyl oxide	17.03	1976	0.01	16.68	2279	0.03
Kaurene?	18.70	2142	0.01			
Phenylethyl (*E*)-cinnamate	18.92	2166	0.02	23.77	3141	0.02
Total identified		**98.38%**			**97.58%**	
Total reported		**98.38%**			**97.58%**	

*: 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