Date : February 25, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19B22-PTH08-1-SCC
Customer identification : Cinnamon Cassia Organic - China - CX010388R
Type : Essential oil
Source : *Cinnamomum cassia*
Customer : Plant Therapy

Analysis

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Lindsay Girard, B. Sc.
Analysis date : February 25, 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: 1.6018 ± 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	0.19	No
(E)-Cinnamyl alcohol	0	1	0.4	Yes
(E)-Cinnamyl acetate	0	6	5	Yes
Phenylethyl alcohol	0	0.5	0.4	Yes
Salicylaldehyde	0.2	1.0	0.5	Yes
Acetophenone	0	0.1	0.1	Yes
Benzaldehyde	0.5	2.0	1.4	Yes
(E)-ortho-Methoxycinnamyl acetate	0	2	ND	Yes
(E)-ortho-Methoxycinnamal	3	15	1	No
Coumarin	1.5	4.0	1.4	No
Eugenol	0	0.5	0	Yes
(E)-Cinnamal	70	88	83	Yes
Refractive index	1.6000	1.6140	1.6018	Yes

Conclusion

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Acetic acid	tr		Aliphatic acid
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	tr	tr	Aliphatic aldehyde
2-Methylbutanol	tr	tr	Aliphatic alcohol
Hexanal	0.01	0.01	Aliphatic aldehyde
Furfural	0.02		Aliphatic alcohol
(3*Z*)-Hexenol	0.01	0.01*	Aliphatic alcohol
Styrene	0.19	0.19*	Simple phenolic
α-Pinene	0.08	0.07	Monoterpene
Camphene	0.04	0.04	Monoterpene
Benzaldehyde	1.36	1.65*	Simple phenolic
Sabinene	0.03*	0.01	Monoterpene
β-Pinene	[0.03]*	0.02	Monoterpene
6-Methyl-5-hepten-2-one	0.01	0.01	Aliphatic ketone
Benzofuran	0.02		Simple phenolic
Myrcene	tr		Monoterpene
Octanal	0.01	0.01	Aliphatic aldehyde
para-Cymene	0.01	0.01	Monoterpene
1,8-Cineole	0.05*	0.01*	Monoterpenic ether
β-Phellandrene	[0.05]*	[0.01]*	Monoterpene
Limonene	[0.05]*	0.04	Monoterpene
Salicylaldehyde	0.46	0.45	Simple phenolic
(*Z*)-β-Ocimene	0.02	[0.19]*	Monoterpene
(*E*)-β-Ocimene	0.01	0.01	Monoterpene
γ-Terpinene	0.01	[0.19]*	Monoterpene
Acetophenone	0.09	0.10	Simple phenolic
cis-Linalool oxide (fur.)	tr	tr	Monoterpenic alcohol
Octanol	0.01	0.01	Aliphatic alcohol
Terpinolene	0.01*		Monoterpene
ortho-Guaiacol	[0.01]*	0.01	Simple phenolic
Linalool	0.01*	0.01	Monoterpenic alcohol
Nonanal	[0.01]*	[0.01]*	Aliphatic aldehyde
Phenylethyl alcohol	0.38	0.39	Simple phenolic
ortho-Vinylanisole	0.07	0.06	Simple phenolic
2-Methylbenzofuran	tr	0.01	Phenylpropanoid
Hydrocinnamal	0.91	1.16*	Phenylpropanoid
Borneol	0.06	0.11*	Monoterpenic alcohol
3-Methylbenzofuran?	0.45	0.52*	Phenylpropanoid
Terpinen-4-ol	0.02	0.04	Monoterpenic alcohol
α-Terpineol	0.03	[0.11]*	Monoterpenic alcohol
Methyl salicylate	tr	[1.16]*	Phenolic ester
(*Z*)-Cinnamal	0.51	0.51	Phenylpropanoid
Hydrocinnamyl alcohol	0.10	0.14	Phenylpropanoid
ortho-Anisaldehyde	0.12	0.10	Simple phenolic
Phenylethyl acetate	0.13	0.17	Phenolic ester
(*E*)-Cinnamal	82.67	82.38*	Phenylpropanoid
(*E*)-Cinnamyl alcohol	0.37	0.39	Phenylpropanoid
Hydrocinnamic acid	0.01	0.05	Phenylpropanoid

Eugenol	0.03	0.03	Phenylpropanoid
α-Ylangene	0.08	0.03	Sesquiterpene
α-Copaene	0.29*	[1.65]*	Sesquiterpene
ortho-Methoxyhydrocinnamal?	[0.29]*	0.34*	Phenylpropanoid
β-Elemene	0.01	0.01	Sesquiterpene
β-Caryophyllene	0.18	0.23*	Sesquiterpene
cis-α-Bergamotene	0.01	0.02	Sesquiterpene
Coumarin	1.40	1.41	Coumarin
trans-α-Bergamotene	0.13	[0.23]*	Sesquiterpene
(*E*)-Cinnamyl acetate	5.32*	5.39	Phenylpropanoid ester
(*E*)-Cinnamic acid	[5.32]*	0.15	Phenylpropanoid
(*Z*)-ortho-Methoxycinnamal	0.08		Phenylpropanoid
allo-Aromadendrene	0.05	0.08	Sesquiterpene
γ-Muurolene	0.10	0.12*	Sesquiterpene
ar-Curcumene	0.06	0.08	Sesquiterpene
Viridiflorene	0.06	[0.12]*	Sesquiterpene
α-Muurolene	0.06	[0.52]*	Sesquiterpene
β-Bisabolene	0.13	0.13	Sesquiterpene
γ-Cadinene	0.01	[1.16]*	Sesquiterpene
δ-Cadinene	0.13	[1.16]	Sesquiterpene
(*E*)-ortho-Methoxycinnamal	0.85	0.85	Phenylpropanoid
α-Calacorene	0.02	0.03	Sesquiterpene
(*E*)-Nerolidol	0.30	[0.34]*	Sesquiterpenic alcohol
Spathulenol	0.07	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.06	0.05	Sesquiterpenic ether
Humulene epoxide II	0.01	[82.38]*	Sesquiterpenic ether
Tetradecanal	0.04	0.04	Aliphatic aldehyde
1-epi-Cubenol	0.02	0.02	Sesquiterpenic alcohol
Caryophylladienol II	0.02	0.03	Sesquiterpenic alcohol
τ-Muurolol	0.03*	0.02	Sesquiterpenic alcohol
τ-Cadinol	[0.03]*	0.02	Sesquiterpenic alcohol
α-Muurolol	0.01	0.03	Sesquiterpenic alcohol
α-Cadinol	0.02	0.02	Sesquiterpenic alcohol
Mustakone	0.04*	0.03	Sesquiterpenic ketone
Cadalene	[0.04]*	0.02	Sesquiterpene
α-Bisabolol	0.03	0.02	Sesquiterpenic alcohol
Benzyl benzoate	0.04	0.04	Phenolic ester
Phenylethyl benzoate	0.01	0.01	Phenolic ester
Benzyl salicylate	0.01	tr	Phenolic ester
Dolabradiene	0.11	0.04	Diterpene
Manoyl oxide	tr	0.01	Diterpenic ether
Kaurene?	0.02		Diterpene
Phenylethyl (*E*)-cinnamate	0.03	0.03	Phenylpropanoid ester
Total identified	**98.19%**	**98.08%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

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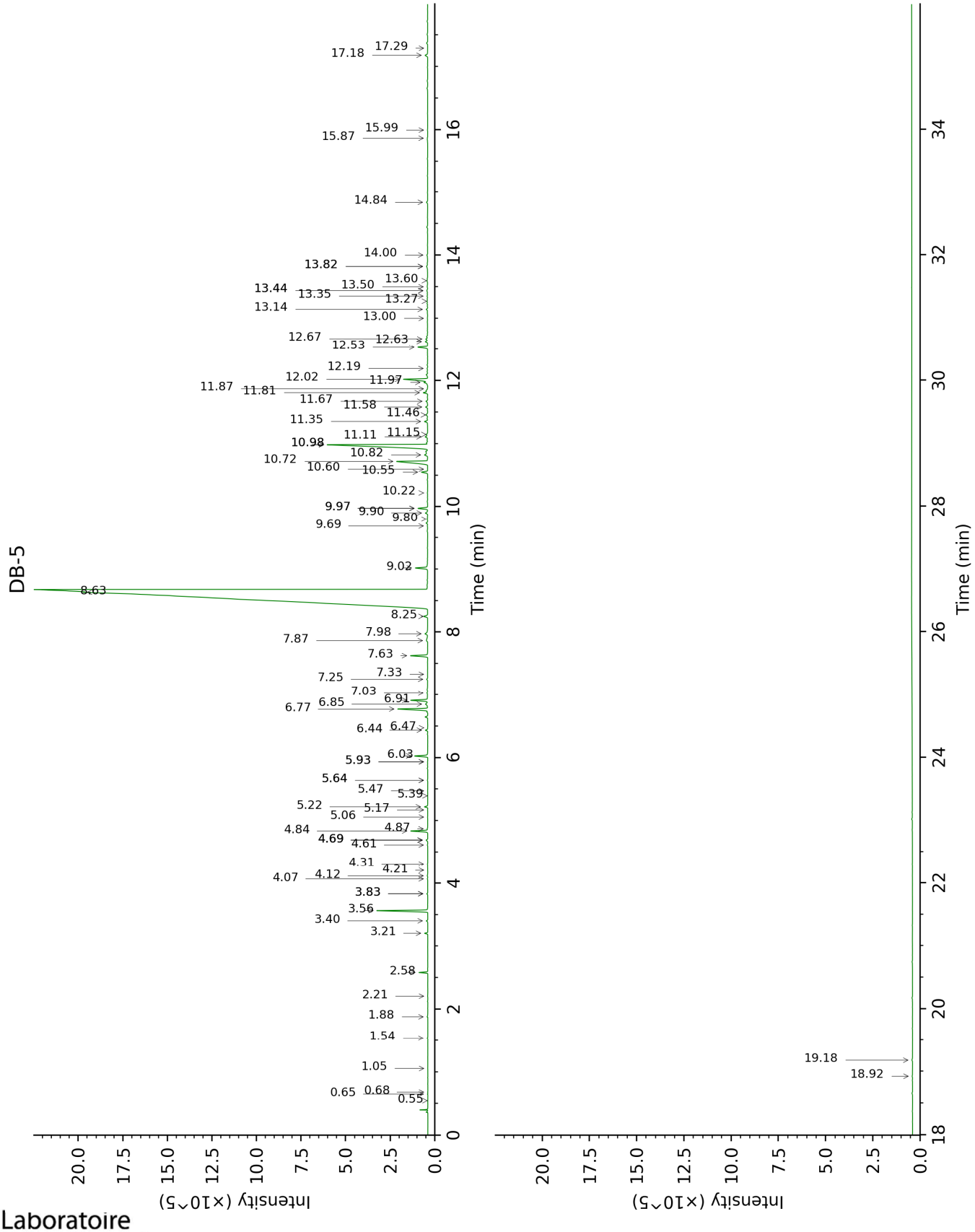
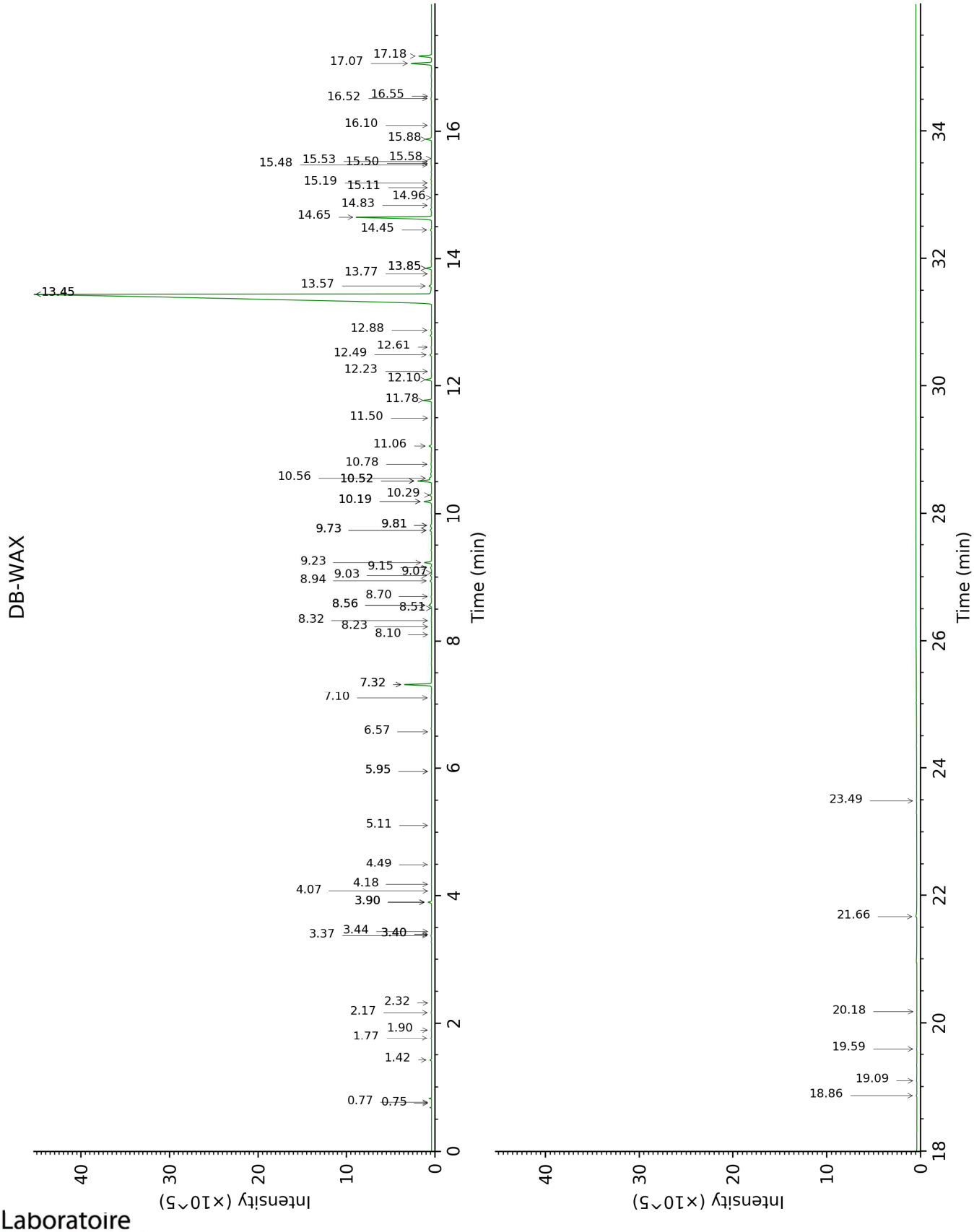

DB-5
Time (min)
Intensity (×10^5)
8.63
17.29
17.18
15.99
15.87
14.84
14.00
13.82
13.60
13.50
13.44
13.35
13.27
13.14
13.00
12.67
12.63
12.53
12.19
12.02
11.97
11.87
11.81
11.67
11.58
11.46
11.35
11.15
11.11
10.98
10.82
10.72
10.60
10.55
10.22
9.97
9.90
9.80
9.69
9.02
8.25
7.98
7.87
7.63
7.33
7.25
7.03
6.91
6.85
6.77
6.47
6.44
6.03
5.93
5.64
5.47
5.39
5.22
5.17
5.06
4.87
4.84
4.69
4.61
4.31
4.21
4.12
4.07
3.83
3.56
3.40
3.21
2.58
2.21
1.88
1.54
1.05
0.68
0.65
0.55
19.18
18.92


DB-WAX
Intensity (×10^5)
Time (min)
17.18
17.07
16.55
16.52
16.10
15.88
15.58
15.53
15.50
15.48
15.19
15.11
14.96
14.83
14.65
14.45
13.85
13.77
13.57
13.45
12.88
12.61
12.49
12.23
12.10
11.78
11.50
11.06
10.78
10.56
10.52
10.29
10.19
9.81
9.73
9.23
9.15
9.07
9.03
8.94
8.70
8.56
8.51
8.32
8.23
8.10
7.32
7.10
6.57
5.95
5.11
4.49
4.18
4.07
3.90
3.44
3.40
3.37
2.32
2.17
1.90
1.77
1.42
0.77
0.75
23.49
21.66
20.18
19.59
19.09
18.86

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetic acid	0.55	606	tr			
Isovaleral	0.65	640	tr	0.76	886	tr
2-Methylbutyral	0.68	649	tr	0.75	881	tr
2-Methylbutanol	1.05	732	tr	3.44	1172	tr
Hexanal	1.54	796	0.01	1.90	1041	0.01
Furfural	1.88	828	0.02			
(3*Z*)-Hexenol	2.21	854	0.01	5.95*	1349	0.01
Styrene	2.58	884	0.19	3.90*	1209	0.19
α-Pinene	3.20	929	0.08	1.42	994	0.07
Camphene	3.40	942	0.04	1.77	1029	0.04
Benzaldehyde	3.56	952	1.36	7.32*	1452	1.65
Sabinene	3.83*	970	0.03	2.32	1081	0.01
β-Pinene	3.83*	970	[0.03]	2.17	1067	0.02
6-Methyl-5-hepten-2-one	4.07	985	0.01	5.11	1303	0.01
Benzofuran	4.12	988	0.02			
Myrcene	4.21	994	tr			
Octanal	4.31	1001	0.01	4.49	1255	0.01
para-Cymene	4.61	1020	0.01	4.18	1230	0.01
1,8-Cineole	4.69*	1025	0.05	3.40*	1169	0.01
β-Phellandrene	4.69*	1025	[0.05]	3.40*	1169	[0.01]
Limonene	4.69*	1025	[0.05]	3.37	1167	0.04
Salicylaldehyde	4.84	1034	0.46	9.23	1601	0.45
(*Z*)-β-Ocimene	4.87	1036	0.02	3.90*	1209	[0.19]
(*E*)-β-Ocimene	5.06	1048	0.01	4.07	1222	0.01
γ-Terpinene	5.17	1055	0.01	3.90*	1209	[0.19]
Acetophenone	5.22	1058	0.09	8.94	1578	0.10
cis-Linalool oxide (fur.)	5.40	1068	tr	6.57	1395	tr
Octanol	5.47	1073	0.01	8.23	1522	0.01
Terpinolene	5.64*	1084	0.01			
ortho-Guaiacol	5.64*	1084	[0.01]	11.50	1791	0.01
Linalool	5.93*	1102	0.01	8.10	1512	0.01
Nonanal	5.93*	1102	[0.01]	5.95*	1349	[0.01]
Phenylethyl alcohol	6.03	1108	0.38	12.10	1845	0.39
ortho-Vinylanisole	6.44	1134	0.07	9.03	1585	0.06
2-Methylbenzofuran	6.47	1137	tr	9.07	1588	0.01
Hydrocinnamal	6.77	1156	0.91	10.52*†	1707	1.16
Borneol	6.85	1161	0.06	9.81*	1648	0.11
3-Methylbenzofuran?	6.91	1165	0.45	10.19*	1680	0.52
Terpinen-4-ol	7.03	1172	0.02	8.70	1559	0.04
α-Terpineol	7.25	1187	0.03	9.81*	1648	[0.11]
Methyl salicylate	7.33	1192	tr	10.52*†	1707	[1.16]
(*Z*)-Cinnamal	7.63	1212	0.51	11.78	1816	0.51
Hydrocinnamyl alcohol	7.87	1228	0.10	13.57	1980	0.14
ortho-Anisaldehyde	7.98	1235	0.12	12.49	1879	0.10
Phenylethyl acetate	8.25	1254	0.13	11.06	1754	0.17
(*E*)-Cinnamal	8.63	1280	82.67	13.45*	1968	82.38
(*E*)-Cinnamyl alcohol	9.02	1302	0.37	15.88	2206	0.39

Hydrocinnamic acid	9.68	1349	0.01	19.09	2555	0.05
Eugenol	9.80	1357	0.03	14.83	2101	0.03
α-Ylangene	9.90	1364	0.08	7.10	1435	0.03
α-Copaene	9.98*	1370	0.29	7.32*	1452	[1.65]
ortho-Methoxyhydrocinnamal?	9.98*	1370	[0.29]	13.85*	2006	0.34
β-Elemene	10.22	1387	0.01	8.51	1544	0.01
β-Caryophyllene	10.55	1411	0.18	8.56*	1548	0.23
cis-α-Bergamotene	10.60	1414	0.01	8.32	1529	0.02
Coumarin	10.72	1423	1.40	17.07	2330	1.41
trans-α-Bergamotene	10.82	1431	0.13	8.56*	1548	[0.23]
(*E*)-Cinnamyl acetate	10.98*	1443	5.32	14.65	2083	5.39
(*E*)-Cinnamic acid	10.98*	1443	[5.32]	21.66	2865	0.15
(*Z*)-ortho-Methoxycinnamal	11.11	1452	0.08			
allo-Aromadendrene	11.15	1455	0.05	9.15	1594	0.08
γ-Muurolene	11.35	1470	0.10	9.73*	1642	0.12
ar-Curcumene	11.46	1478	0.06	10.78	1729	0.08
Viridiflorene	11.58	1487	0.06	9.73*	1642	[0.12]
α-Muurolene	11.67	1494	0.06	10.19*	1680	[0.52]
β-Bisabolene	11.81	1504	0.13	10.30	1688	0.13
γ-Cadinene	11.87	1509	0.01	10.52*†	1707	[1.16]
δ-Cadinene	11.97	1517	0.13	10.56†	1710	[1.16]
(*E*)-ortho-Methoxycinnamal	12.02	1521	0.85	17.18	2342	0.85
α-Calacorene	12.19	1535	0.02	12.23	1856	0.03
(*E*)-Nerolidol	12.53	1561	0.30	13.85*	2006	[0.34]
Spathulenol	12.63	1569	0.07	14.45	2064	0.07
Caryophyllene oxide	12.67	1572	0.06	12.88	1915	0.05
Humulene epoxide II	13.00	1598	0.01	13.45*	1968	[82.38]
Tetradecanal	13.14	1609	0.04	12.61	1890	0.04
1-epi-Cubenol	13.27	1620	0.02	13.76	1997	0.02
Caryophylladienol II	13.35	1627	0.02	16.10	2228	0.03
τ-Muurolol	13.44*	1634	0.03	15.11	2128	0.02
τ-Cadinol	13.44*	1634	[0.03]	14.96	2113	0.02
α-Muurolol	13.50	1639	0.01	15.19	2136	0.03
α-Cadinol	13.60	1647	0.02	15.58	2175	0.02
Mustakone	13.82*	1666	0.04	15.53	2171	0.03
Cadalene	13.82*	1666	[0.04]	15.50	2168	0.02
α-Bisabolol	14.00	1680	0.03	15.48	2165	0.02
Benzyl benzoate	14.84	1752	0.04	18.86	2528	0.04
Phenylethyl benzoate	15.87	1843	0.01	19.59	2612	0.01
Benzyl salicylate	16.00	1854	0.01	20.18	2682	tr
Dolabradiene	17.18	1965	0.11	16.52	2272	0.04
Manoyl oxide	17.29	1975	tr	16.55	2276	0.01
Kaurene?	18.92	2137	0.02			
Phenylethyl (*E*)-cinnamate	19.18	2164	0.03	23.49	3104	0.03
Total identified		**98.19%**			**98.08%**	
Total reported		**98.19%**			**98.08%**	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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

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