Date : March 13, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19C07-PTH05-1-SCC
Customer identification : Cinnamon Leaf - Sri Lanka - CB010389R
Type : Essential oil
Source : *Cinnamomum verum*
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 : Sylvain Mercier, M. Sc., Chimiste
Analysis date : March 11, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow viscous liquid
Refractive index: 1.5320 ± 0.0003 (20 °C)

ISO 3524:2004 - OIL OF CINNAMON LEAF, SRI LANKA TYPE

Compound	Min. %	Max. %	Observed %	Complies?
Benzyl benzoate	2.0	4.0	3.4	Yes
Eugenyl acetate	1.3	3.0	2.2	Yes
(E)-Cinnamyl acetate	1.1	1.8	1.5	Yes
Eugenol	70.0	83.0	75.3	Yes
(E)-Cinnamal	0.8	1.5	1.4	Yes
Refractive index	1.5270	1.5400	1.5320	Yes

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	tr	tr	Aliphatic aldehyde
Toluene	0.01	0.12*	Simple phenolic
Ethyl 2-methylbutyrate	tr	0.01*	Aliphatic ester
Styrene	0.02	0.08	Simple phenolic
Tricyclene	0.01	0.01	Monoterpene
α-Thujene	0.11	[0.12]*	Monoterpene
α-Pinene	0.88	0.86	Monoterpene
Camphene	0.30*	0.29	Monoterpene
α-Fenchene	[0.30]*	[0.01]*	Monoterpene
Benzaldehyde	0.18	0.69*	Simple phenolic
β-Pinene	0.29*	0.28	Monoterpene
Sabinene	[0.29]*	0.01	Monoterpene
Myrcene	0.11	0.11	Monoterpene
α-Phellandrene	0.97*	0.94	Monoterpene
Pseudolimonene	[0.97]*	0.01	Monoterpene
Δ3-Carene	0.07	0.07	Monoterpene
α-Terpinene	0.10	0.10	Monoterpene
ortho-Cymene	0.02	0.70*	Simple phenolic
para-Cymene	0.69	[0.70]*	Monoterpene
β-Phellandrene	0.75*	0.46*	Monoterpene
1,8-Cineole	[0.75]*	[0.46]*	Monoterpenic ether
Limonene	[0.75]*	0.28	Monoterpene
Benzyl alcohol	0.05	0.07*	Simple phenolic
(*Z*)-β-Ocimene	0.02	[0.08]*	Monoterpene
(*E*)-β-Ocimene	0.04	0.04	Monoterpene
γ-Terpinene	0.03	[0.08]*	Monoterpene
cis-Linalool oxide (fur.)	0.02	0.02	Monoterpenic alcohol
Isoterpinolene	0.01	0.01	Monoterpene
Terpinolene	0.12*	0.09	Monoterpene
trans-Linalool oxide (fur.)	[0.12]*	0.04*	Monoterpenic alcohol
para-Cymenene	[0.12]*	0.01	Monoterpene
Linalool	2.13	2.13	Monoterpenic alcohol
Phenylethyl alcohol	0.01	0.01	Simple phenolic
cis-para-Menth-2-en-1-ol	0.01	0.02	Monoterpenic alcohol
Camphor	0.02	[0.69]*	Monoterpenic ketone
Camphene hydrate	0.01	3.23*	Monoterpenic alcohol
Hydrocinnamal	0.07	0.06*	Phenylpropanoid
Borneol	0.09	0.35*	Monoterpenic alcohol
Benzyl acetate	0.03	0.04	Phenolic ester
Terpinen-4-ol	0.09	0.12	Monoterpenic alcohol
Cryptone	0.01	0.01	Normonoterpenic ketone
para-Cymen-8-ol	0.03	0.03	Monoterpenic alcohol
α-Terpineol	0.25	[0.35]*	Monoterpenic alcohol
α-Phellandrene epoxide	0.04	0.02	Monoterpenic ether
trans-Piperitol	0.01	0.01	Monoterpenic alcohol
(*Z*)-Cinnamal	0.01	[0.07]*	Phenylpropanoid
Hydrocinnamyl alcohol	0.09	0.10	Phenylpropanoid

ortho-Anisaldehyde	0.02	0.10*	Simple phenolic
Chavicol	1.46*	0.09*	Phenylpropanoid
(*E*)-Cinnamal	[1.46]*	1.41*	Phenylpropanoid
Safrole	0.82	0.83	Phenylpropanoid
(*E*)-Cinnamyl alcohol	0.14	0.12	Phenylpropanoid
α-Cubebene	0.02	[0.04]*	Sesquiterpene
Eugenol	75.42	75.30	Phenylpropanoid
ortho-Methoxyhydrocinnamal?	[75.42]	0.02	Phenylpropanoid
Hydrocinnamyl acetate	0.10	[0.10]*	Phenylpropanoid ester
α-Copaene	0.54	[0.69]*	Sesquiterpene
β-Cubebene	0.01	0.01	Sesquiterpene
β-Elemene	0.02	[3.23]*	Sesquiterpene
α-Gurjunene	0.05*	0.01	Sesquiterpene
Methyleugenol	[0.05]*	[1.41]*	Phenylpropanoid
β-Caryophyllene	3.23	[3.23]*	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.01	0.01	Sesquiterpene
(*E*)-Cinnamyl acetate	1.47	1.49	Phenylpropanoid ester
α-Humulene	0.59	0.55*	Sesquiterpene
allo-Aromadendrene	0.02	0.02	Sesquiterpene
γ-Gurjunene	0.01	0.01	Sesquiterpene
trans-Cadina-1(6),4-diene	0.02	[0.55]*	Sesquiterpene
γ-Muurolene	0.04	0.03	Sesquiterpene
Germacrene D	0.02	0.10	Sesquiterpene
Unknown	0.04	0.07	Sesquiterpene
Bicyclogermacrene	0.15*	0.11*	Sesquiterpene
Viridiflorene	[0.15]*	[0.35]*	Sesquiterpene
α-Muurolene	0.03	[0.11]*	Sesquiterpene
2,3-Epoxycinnamyl acetate I?	0.02	[0.09]*	Phenylpropanoid ester
γ-Cadinene	0.07*	[0.06]*	Sesquiterpene
Cubebol	[0.07]*	0.04	Sesquiterpenic alcohol
trans-Calamenene	0.18*	0.01	Sesquiterpene
δ-Cadinene	[0.18]*	0.16	Sesquiterpene
Eugenyl acetate	2.15	2.16	Phenylpropanoid ester
trans-Cadina-1,4-diene	0.01	0.02	Sesquiterpene
(*E*)-ortho-Methoxycinnamal	0.03	0.01	Phenylpropanoid
α-Calacorene	0.01	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.02	0.01	Sesquiterpenic ether
Caryophyllenyl alcohol	0.01	0.01	Sesquiterpenic alcohol
Spathulenol	0.06	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.42*	0.43	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.42]*	0.02	Sesquiterpenic ether
Humulene epoxide II	0.09	0.08*	Sesquiterpenic ether
1,10-diepi-Cubenol	0.03	[0.08]*	Sesquiterpenic alcohol
Caryophylladienol I	0.02	0.04*	Sesquiterpenic alcohol
Caryophylladienol II	0.03	[0.04]*	Sesquiterpenic alcohol
τ-Muurolol	0.04	0.03	Sesquiterpenic alcohol
α-Muurolol	0.01	0.01	Sesquiterpenic alcohol
Unknown	0.05	0.02	Sesquiterpenic alcohol
α-Cadinol	0.03	0.03	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.04	0.03	Sesquiterpenic alcohol
(*E*)-Coniferyl alcohol	0.04	0.03	Phenylpropanoid
Benzyl benzoate	3.42	3.50	Phenolic ester

Phenylethyl benzoate	0.03	0.03	Phenolic ester
Unknown	0.05		Unknown
Unknown	0.01	0.01	Unknown
Unknown	0.01		Unknown
Unknown	0.02		Unknown
Unknown	0.04		Lignan
Unknown	0.03		Lignan
Total identified	**98.65%**	**98.36%**	

*: 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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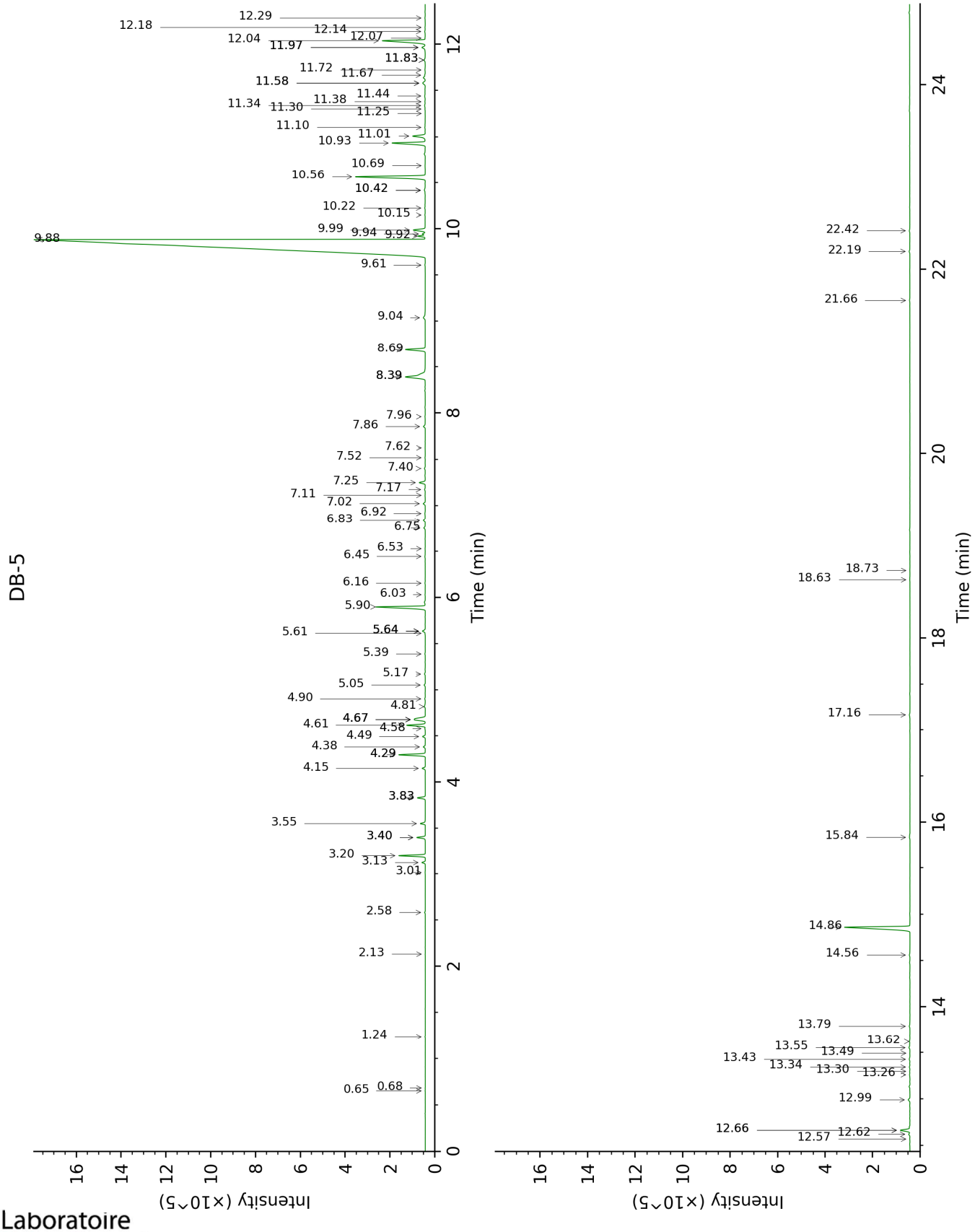
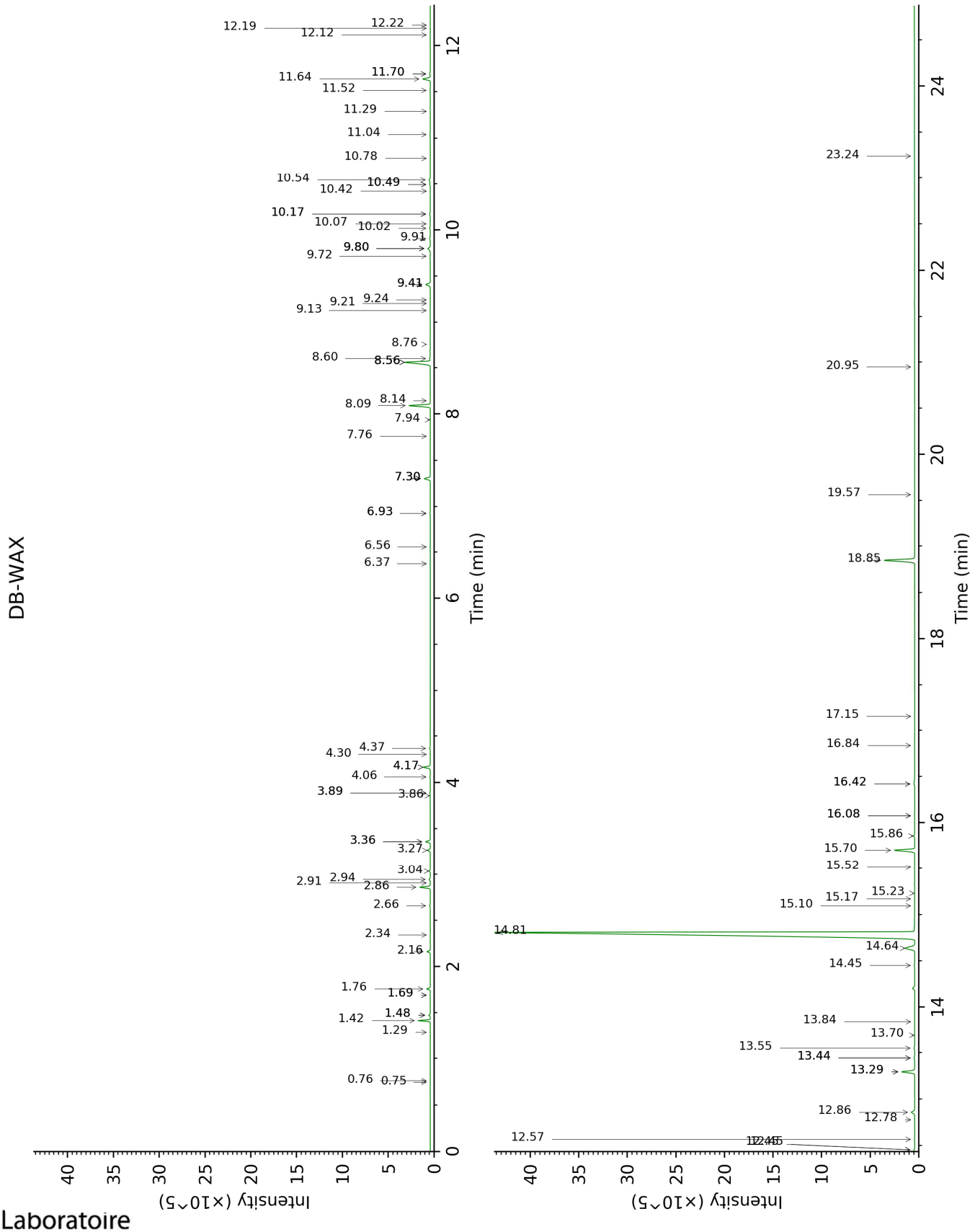

DB-5
Time (min)
Intensity (×10^5)
12.29
12.18
12.14
12.04
12.07
11.97
11.83
11.72
11.67
11.58
11.44
11.34
11.38
11.30
11.25
11.10
11.01
10.93
10.69
10.56
10.42
10.22
10.15
9.99
9.94
9.92
9.88
9.61
9.04
8.69
8.39
7.96
7.86
7.62
7.52
7.40
7.25
7.17
7.11
7.02
6.92
6.83
6.75
6.53
6.45
6.16
6.03
5.90
5.64
5.61
5.39
5.17
5.05
4.90
4.81
4.67
4.61
4.58
4.49
4.38
4.29
4.15
3.83
3.55
3.40
3.20
3.13
3.01
2.58
2.13
1.24
0.68
0.65
22.42
22.19
21.66
18.73
18.63
17.16
15.84
14.86
14.56
13.79
13.62
13.55
13.49
13.43
13.34
13.30
13.26
12.99
12.66
12.62
12.57


DB-WAX
12.19
12.22
12.12
11.64
11.70
11.52
11.29
11.04
10.78
10.54
10.49
10.42
10.17
10.07
10.02
9.91
9.80
9.72
9.41
9.21
9.24
9.13
8.76
8.60
8.56
8.09
8.14
7.94
7.76
7.30
6.93
6.56
6.37
4.30
4.37
4.17
4.06
3.89
3.86
3.36
3.27
3.04
2.91
2.94
2.86
2.66
2.34
2.16
1.76
1.69
1.42
1.48
1.29
0.76
0.75
Time (min)
Intensity (×10^5)
23.24
20.95
19.57
18.85
17.15
16.84
16.42
16.08
15.86
15.70
15.52
15.23
15.17
15.10
14.81
14.64
14.45
13.84
13.70
13.55
13.44
13.29
12.86
12.78
12.57
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.65	640	tr	0.76	885	tr
2-Methylbutyral	0.68	650	tr	0.75	880	tr
Toluene	1.24	756	0.01	1.48*	1002	0.12
Ethyl 2-methylbutyrate	2.13	848	tr	1.69*	1022	0.01
Styrene	2.58	884	0.02	3.86†	1206	0.08
Tricyclene	3.01	916	0.01	1.29	975	0.01
α-Thujene	3.13	924	0.11	1.48*	1002	[0.12]
α-Pinene	3.20	929	0.88	1.42	993	0.86
Camphene	3.40*	941	0.30	1.76	1028	0.29
α-Fenchene	3.40*	941	[0.30]	1.69*	1022	[0.01]
Benzaldehyde	3.55	951	0.18	7.30*	1450	0.69
β-Pinene	3.83*	969	0.29	2.16	1066	0.28
Sabinene	3.83*	969	[0.29]	2.34	1083	0.01
Myrcene	4.15	990	0.11	2.94	1133	0.11
α-Phellandrene	4.29*	1000	0.97	2.86	1127	0.94
Pseudolimonene	4.29*	1000	[0.97]	2.91	1130	0.01
Δ3-Carene	4.38	1005	0.07	2.66	1111	0.07
α-Terpinene	4.49	1012	0.10	3.04	1140	0.10
ortho-Cymene	4.58	1018	0.02	4.16*	1230	0.70
para-Cymene	4.61	1020	0.69	4.16*	1230	[0.70]
β-Phellandrene	4.67*	1024	0.75	3.36*	1166	0.46
1,8-Cineole	4.67*	1024	[0.75]	3.36*	1166	[0.46]
Limonene	4.67*	1024	[0.75]	3.27	1159	0.28
Benzyl alcohol	4.81	1032	0.05	11.70*	1808	0.07
(*Z*)-β-Ocimene	4.90	1038	0.02	3.89*†	1208	[0.08]
(*E*)-β-Ocimene	5.06	1047	0.04	4.06	1222	0.04
γ-Terpinene	5.17	1055	0.03	3.89*†	1208	[0.08]
cis-Linalool oxide (fur.)	5.39	1068	0.02	6.56	1394	0.02
Isoterpinolene	5.61	1082	0.01	4.30	1240	0.01
Terpinolene	5.64*	1084	0.12	4.37	1245	0.09
trans-Linalool oxide (fur.)	5.64*	1084	[0.12]	6.93*	1422	0.04
para-Cymenene	5.64*	1084	[0.12]	6.37	1380	0.01
Linalool	5.90	1100	2.13	8.09	1511	2.13
Phenylethyl alcohol	6.03	1108	0.01	12.12	1846	0.01
cis-para-Menth-2-en-1-ol	6.16	1116	0.01	8.14	1515	0.02
Camphor	6.44	1135	0.02	7.30*	1450	[0.69]
Camphene hydrate	6.53	1140	0.01	8.56*	1548	3.23
Hydrocinnamal	6.75	1155	0.07	10.49*	1705	0.06
Borneol	6.84	1160	0.09	9.80*	1648	0.35
Benzyl acetate	6.92	1165	0.03	10.07	1670	0.04
Terpinen-4-ol	7.02	1172	0.09	8.60	1551	0.12
Cryptone	7.11	1178	0.01	9.20	1599	0.01
para-Cymen-8-ol	7.18	1182	0.03	11.52	1793	0.03
α-Terpineol	7.25	1187	0.25	9.80*	1648	[0.35]
α-Phellandrene epoxide	7.40	1196	0.04	11.04	1752	0.02
trans-Piperitol	7.52	1204	0.01	10.42	1699	0.01
(*Z*)-Cinnamal	7.62	1211	0.01	11.70*	1808	[0.07]
Hydrocinnamyl alcohol	7.86	1227	0.09	13.55	1977	0.10

ortho-Anisaldehyde	7.96	1234	0.02	12.45*	1876	0.10
Chavicol	8.39*	1263	1.46	16.42*	2262	0.09
(*E*)-Cinnamal	8.39*	1263	[1.46]	13.29*	1954	1.41
Safrole	8.69	1283	0.82	11.64	1804	0.83
(*E*)-Cinnamyl alcohol	9.04	1304	0.14	15.86	2203	0.12
α-Cubebene	9.61	1344	0.02	6.93*	1422	[0.04]
Eugenol	9.88†	1363	75.42	14.81	2098	75.30
ortho-Methoxyhydrocinnamal?	9.92†	1366	[75.42]	13.84	2005	0.02
Hydrocinnamyl acetate	9.94	1367	0.10	12.45*	1876	[0.10]
α-Copaene	9.99	1370	0.54	7.30*	1450	[0.69]
β-Cubebene	10.15	1382	0.01	7.94	1499	0.01
β-Elemene	10.22	1387	0.02	8.56*	1548	[3.23]
α-Gurjunene	10.42*	1401	0.05	7.76	1485	0.01
Methyleugenol	10.42*	1401	[0.05]	13.29*	1954	[1.41]
β-Caryophyllene	10.56	1412	3.23	8.56*	1548	[3.23]
Caryophylla-4(12),8(13)-diene	10.69	1421	0.01	8.76	1564	0.01
(*E*)-Cinnamyl acetate	10.93	1439	1.47	14.64	2082	1.49
α-Humulene	11.01	1445	0.59	9.41*	1616	0.55
allo-Aromadendrene	11.10	1452	0.02	9.13	1593	0.02
γ-Gurjunene	11.25	1463	0.01	9.24	1602	0.01
trans-Cadina-1(6),4-diene	11.30	1466	0.02	9.41*	1616	[0.55]
γ-Muurolene	11.34	1469	0.04	9.72	1641	0.03
Germacrene D	11.38	1472	0.02	9.91	1656	0.10
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.44	1477	0.04	10.02	1666	0.07
Bicyclogermacrene	11.58*	1487	0.15	10.17*	1678	0.11
Viridiflorene	11.58*	1487	[0.15]	9.80*	1648	[0.35]
α-Muurolene	11.67	1494	0.03	10.17*	1678	[0.11]
2,3-Epoxycinnamyl acetate I?	11.72	1498	0.02	16.42*	2262	[0.09]
γ-Cadinene	11.83*	1506	0.07	10.49*	1705	[0.06]
Cubebol	11.83*	1506	[0.07]	12.57	1887	0.04
trans-Calamenene	11.97*	1517	0.18	11.29	1773	0.01
δ-Cadinene	11.97*	1517	[0.18]	10.54	1709	0.16
Eugenyl acetate	12.04	1523	2.15	15.70	2188	2.16
trans-Cadina-1,4-diene	12.07	1525	0.01	10.78	1730	0.02
(*E*)-ortho-Methoxycinnamal	12.14	1530	0.03	17.15	2339	0.01
α-Calacorene	12.18	1534	0.01	12.19	1853	0.01
Isocaryophyllene epoxide B	12.28	1542	0.02	12.22	1856	0.01
Caryophyllenyl alcohol	12.57	1564	0.01	13.70	1991	0.01
Spathulenol	12.62	1568	0.06	14.45	2064	0.05
Caryophyllene oxide	12.66*	1572	0.42	12.86	1913	0.43
Caryophyllene oxide isomer	12.66*	1572	[0.42]	12.78	1906	0.02
Humulene epoxide II	12.99	1597	0.09	13.44*	1967	0.08
1,10-diepi-Cubenol	13.26	1619	0.03	13.44*	1967	[0.08]

Caryophylladienol I	13.30	1622	0.02	16.08*	2226	0.04
Caryophylladienol II	13.34	1626	0.03	16.08*	2226	[0.04]
τ-Muurolol	13.43	1633	0.04	15.10	2127	0.03
α-Muurolol	13.49	1638	0.01	15.23	2140	0.01
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.55	1643	0.05	15.17	2134	0.02
α-Cadinol	13.62	1649	0.03	15.52	2169	0.03
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.79	1663	0.04	16.84	2305	0.03
(*E*)-Coniferyl alcohol	14.56	1728	0.04	23.24	3071	0.03
Benzyl benzoate	14.86	1754	3.42	18.85	2527	3.50
Phenylethyl benzoate	15.84	1840	0.03	19.57	2610	0.03
Unknown [m/z 93, 92 (57), 136 (34), 91 (23), 77 (13), 134 (11)...]	17.16	1963	0.05			
Unknown [m/z 69, 91 (57), 41 (49), 181 (32), 169 (25), 167 (22)...]	18.63	2107	0.01	20.95	2776	0.01
Unknown [m/z 69, 91 (56), 41 (49), 169 (34), 239 (28), 93 (23)...]	18.73	2117	0.01			
Unknown [m/z 151, 93 (44), 153 (29), 92 (21), 179 (18)... 314? (10)]	21.66	2436	0.02			
Unknown [m/z 326, 148 (67), 147 (41), 117 (30), 91 (22)...]	22.19	2497	0.04			
Unknown [m/z 326, 150 (54), 161 (42), 202 (41), 201 (28)]	22.42	2524	0.03			
Total identified		**98.65%**			**98.36%**	
Total reported		**98.90%**			**98.46%**	

*: 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