Date : January 21, 2019

Certificate of Analysis – GC Profiling

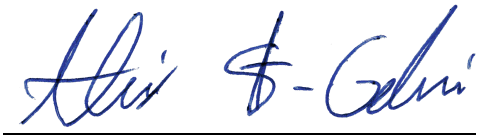
Sample identification

Internal code : 19A15-HBN02-1-CC
Customer identification : Hydacheim spicatum - lot 5978 - SKU 1120
Type : Essential oil
Source : *Hedychium spicatum*
Customer : Health & Beauty Natural Oils

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 : Benoit Roger, Ph. D.
Analysis date : January 17, 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: 1.5045 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. However, the oil has been mislabelled, and does not come from ginger lily. Its profile is rather characteristic of zedoary (Curcuma zedoaria), with the characteristic presence of curzerenone & analogs, germacrone, camphor and cineole.

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	tr	tr	Aliphatic aldehyde
2-Methylbutanol	tr	tr	Aliphatic alcohol
Toluene	tr	0.05*	Simple phenolic
Hexanal	tr	tr	Aliphatic aldehyde
2-Heptanone	0.02	0.03	Aliphatic ketone
2-Heptanol	0.04	0.04	Aliphatic alcohol
Tricyclene	0.19	0.18	Monoterpene
α-Thujene	0.05	[0.05]*	Monoterpene
α-Pinene	0.83	0.80	Monoterpene
Camphene	3.61*	3.47	Monoterpene
α-Fenchene	[3.61]*	0.01	Monoterpene
β-Pinene	1.32*	1.11	Monoterpene
Sabinene	[1.32]*	0.16	Monoterpene
6-Methyl-5-hepten-2-one	0.01	0.01	Aliphatic ketone
Myrcene	0.37	0.34	Monoterpene
α-Phellandrene	0.02	0.02	Monoterpene
2-Octanol	0.01	0.01	Aliphatic alcohol
Δ3-Carene	0.01	0.01	Monoterpene
α-Terpinene	0.02	0.02	Monoterpene
para-Cymene	0.12	0.11	Monoterpene
Limonene	8.34*	1.06	Monoterpene
β-Phellandrene	[8.34]*	7.12*	Monoterpene
1,8-Cineole	[8.34]*	[7.12]*	Monoterpenic ether
(*Z*)-β-Ocimene	0.01	0.01	Monoterpene
2-Heptyl acetate	0.01	tr	Aliphatic ester
(*E*)-β-Ocimene	0.01	0.01	Monoterpene
γ-Terpinene	0.03	0.03	Monoterpene
cis-Sabinene hydrate	0.02	0.02	Monoterpenic alcohol
Terpinolene	0.06*	0.05	Monoterpene
para-Cymenene	[0.06]*	0.01	Monoterpene
2-Nonanone	0.11	0.10	Aliphatic ketone
trans-Sabinene hydrate	0.02	0.02	Monoterpenic alcohol
Linalool	0.65	0.63	Monoterpenic alcohol
2-Nonanol	0.21	0.21	Aliphatic alcohol
β-Thujone	0.01	0.01	Monoterpenic ketone
cis-para-Menth-2-en-1-ol	0.01	0.02	Monoterpenic alcohol
trans-Pinocarveol	0.01	0.05	Monoterpenic alcohol
Camphor	8.93	8.91*	Monoterpenic ketone
Camphene hydrate	0.18	5.45*	Monoterpenic alcohol
Isoborneol	2.71	2.71	Monoterpenic alcohol
Borneol	0.86	1.28*	Monoterpenic alcohol
Terpinen-4-ol	0.26	0.26	Monoterpenic alcohol
para-Cymen-8-ol	0.01	0.04	Monoterpenic alcohol
α-Terpineol	0.36	[1.28]*	Monoterpenic alcohol
Myrtenol	0.05	0.02	Monoterpenic alcohol
trans-Isopiperitenol	0.01	0.46*	Monoterpenic alcohol
2-Decanol?	0.02	0.28*	Aliphatic alcohol

Carvone	0.04	0.63*	Monoterpenic ketone
(7*Z*)-Undecen-2-one	0.02		Aliphatic ketone
Isobornyl acetate	0.08*	0.06	Monoterpenic ester
Bornyl acetate	[0.08]*	0.03	Monoterpenic ester
2-Undecanone	0.06	0.06	Aliphatic ketone
2-Undecanol	0.04	0.05	Aliphatic alcohol
4-Vinylguaiacol	0.02	0.09	Simple phenolic
δ-Elemene isomer	0.02	0.02*	Sesquiterpene
δ-Elemene	0.48*	0.47	Sesquiterpene
Piperitenone	[0.48]*	0.02	Monoterpenic ketone
α-Cubebene	0.02	[0.02]*	Sesquiterpene
α-Copaene	0.03	[8.91]*	Sesquiterpene
1,5-diepi-β-Bourbonene	0.03	0.02	Sesquiterpene
cis-β-Elemene	0.13	0.12	Sesquiterpene
β-Elemene	[4.40]	[5.45]*	Sesquiterpene
Cyperene	4.40	0.07	Sesquiterpene
β-Caryophyllene	1.05	[5.45]*	Sesquiterpene
β-Copaene	0.03	0.03	Sesquiterpene
Unknown	0.05	0.08*	Sesquiterpene
γ-Elemene	0.28	[0.28]*	Sesquiterpene
α-Guaiene	0.01	[5.45]*	Sesquiterpene
6,9-Guaiadiene	0.12	0.13	Sesquiterpene
Unknown	0.23	0.20	Sesquiterpene
α-Humulene	0.76	0.77	Sesquiterpene
allo-Aromadendrene	0.03	0.07	Sesquiterpene
(*E*)-β-Farnesene	0.48	0.47	Sesquiterpene
γ-Muurolene	[0.24]	0.15	Sesquiterpene
Selina-4,11-diene	0.24	0.20	Sesquiterpene
Germacrene D	0.92	0.91	Sesquiterpene
β-Selinene	0.58	0.58	Sesquiterpene
δ-Selinene	0.05	[0.08]*	Sesquiterpene
Viridiflorene	0.05	[0.08]*	Sesquiterpene
α-Selinene	0.60	[0.63]*	Sesquiterpene
Curzerene	3.72	3.61	Sesquiterpenic ether
Germacrene A	0.13	[0.46]*	Sesquiterpene
γ-Cadinene	0.15*	[0.46]*	Sesquiterpene
Cubebol	[0.15]*	0.05	Sesquiterpenic alcohol
δ-Cadinene	0.33*	0.22	Sesquiterpene
Unknown	[0.33]*		Sesquiterpene
Selina-3,7(11)-diene	0.07	0.07	Sesquiterpene
α-Elemol	0.08	0.15	Sesquiterpenic alcohol
Germacrene B	1.14	1.08	Sesquiterpene
Caryophyllene oxide	0.32*	0.28	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.32]*	0.02	Sesquiterpenic ether
Unknown	0.27		Oxygenated sesquiterpene
Humulene epoxide I	0.43	0.14	Sesquiterpenic ether
Curzerenone	30.68*	[35.40]	Sesquiterpenic ketone
Humulene epoxide II	[30.68]*	0.16	Sesquiterpenic ether
β-Elemenone	[30.68]*	0.90	Sesquiterpenic ketone
Epicurzerenone	1.33	1.16	Sesquiterpenic ketone
Unknown	1.29*	0.69	Unknown
Unknown	[1.29]*		Unknown

τ-Cadinol	0.22	0.91	Sesquiterpenic alcohol
β-Eudesmol	0.23*	0.22	Sesquiterpenic alcohol
Neointermedeol	[0.23]*	0.06	Sesquiterpenic alcohol
α-Cadinol	0.48	0.19	Sesquiterpenic alcohol
Unknown	0.22		Oxygenated sesquiterpene
Germacrone	7.76	35.40	Sesquiterpenic ketone
Unknown	0.02	0.32	Lignan
Unknown	0.28		Unknown
Curdione	1.05		Sesquiterpenic ketone
Unknown	0.21	0.31	Oxygenated sesquiterpene
Curcumenol	0.40	0.32	Sesquiterpenic alcohol
Neocurdione	0.29		Sesquiterpenic ketone
Furanodienone	1.09		Sesquiterpenic ketone
Unknown	0.64		Unknown
Isofuranodienone	0.51		Sesquiterpenic ketone
Curcumenone	0.44		Sesquiterpenic ketone
Zederone	0.62	0.69	Sesquiterpenic ketone
2-Nonadecanone	0.01		Aliphatic ketone
Coronarin *E*	0.03		Diterpene
Total identified	**92.89%**	**85.81%**	

*: 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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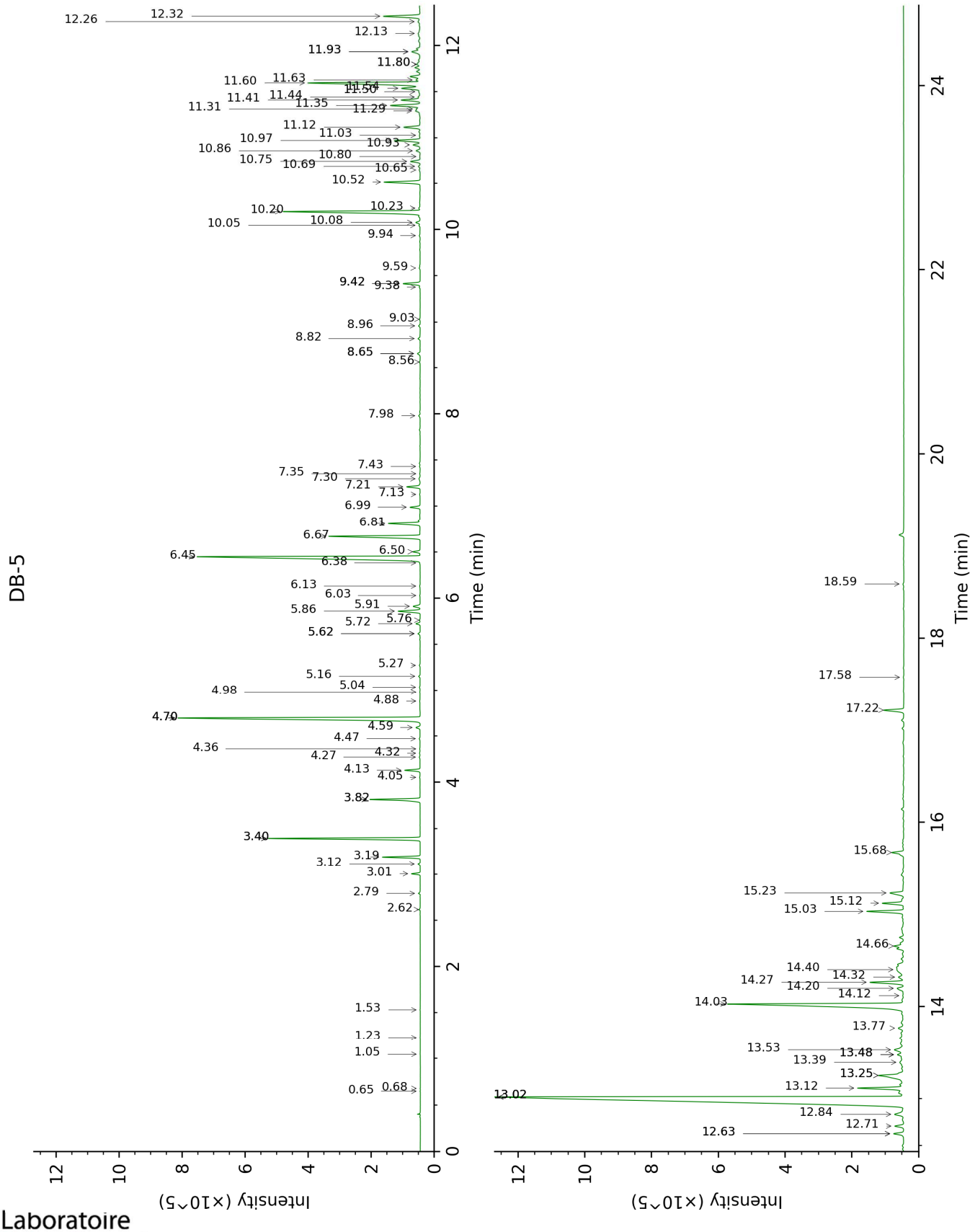
DB-5
Time (min)
Intensity (×10^5)
12.26
12.32
12.13
11.93
11.80
11.60
11.63
11.54
11.50
11.41
11.44
11.35
11.31
11.29
11.12
11.03
10.97
10.93
10.86
10.80
10.75
10.69
10.65
10.52
10.20
10.23
10.05
10.08
9.94
9.59
9.42
9.38
8.96
9.03
8.82
8.65
8.56
7.98
7.43
7.35
7.30
7.21
7.13
6.99
6.81
6.67
6.50
6.45
6.38
6.13
6.03
5.91
5.86
5.72
5.76
5.62
5.27
5.16
5.04
4.98
4.88
4.70
4.59
4.47
4.36
4.32
4.27
4.13
4.05
3.82
3.40
3.19
3.12
3.01
2.79
2.62
1.53
1.23
1.05
0.65
0.68
18.59
17.58
17.22
15.68
15.23
15.12
15.03
14.66
14.40
14.32
14.27
14.20
14.12
14.03
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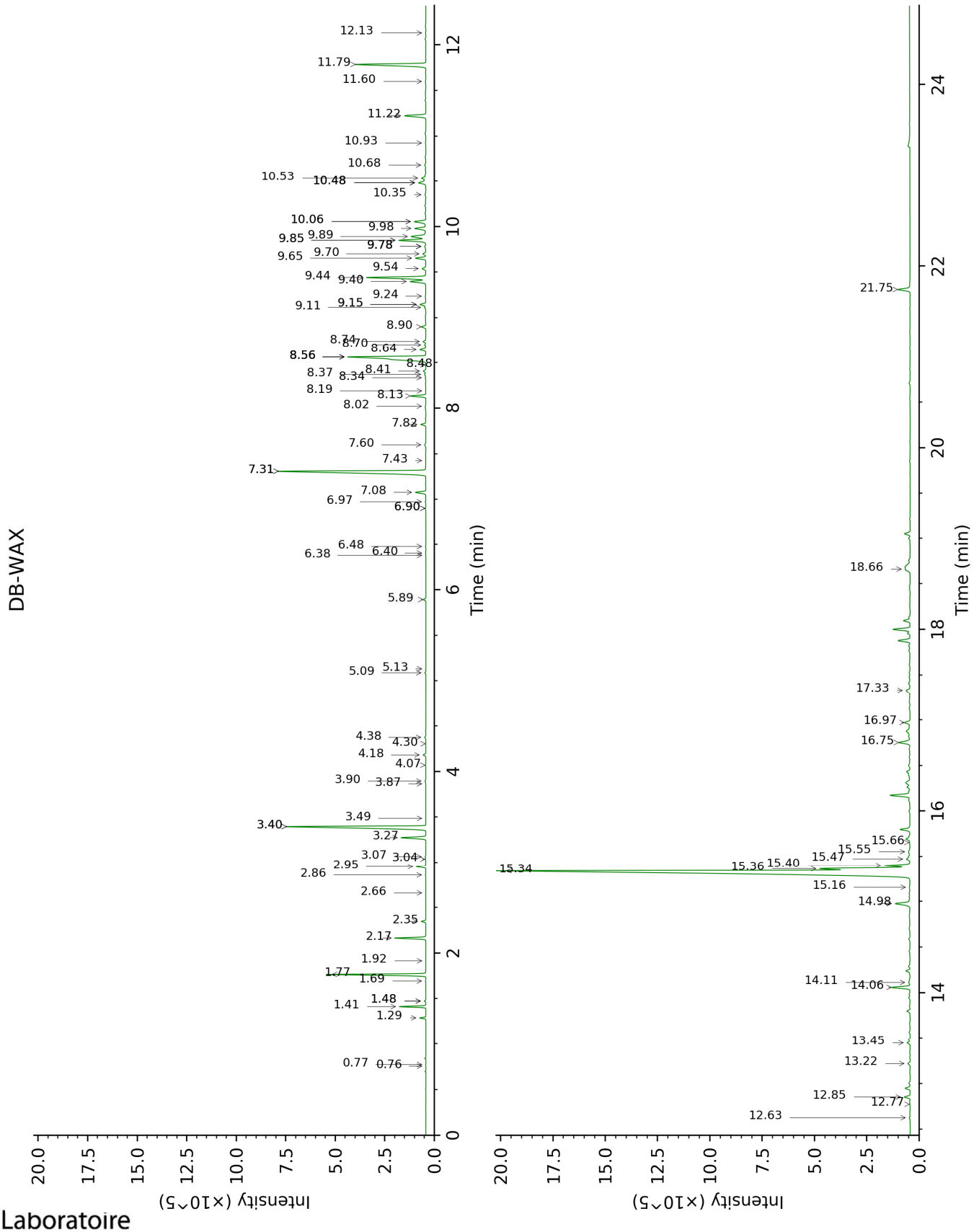
13.12
13.02
12.84
12.71
12.63


DB-WAX
Time (min)
Intensity (×10^5)
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11.79
11.60
11.22
10.93
10.68
10.53
10.48
10.35
10.06
9.98
9.89
9.85
9.78
9.70
9.65
9.54
9.44
9.40
9.24
9.15
9.11
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8.70
8.64
8.56
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8.41
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8.19
8.13
8.02
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7.60
7.43
7.31
7.08
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6.90
6.48
6.40
6.38
5.89
5.13
5.09
4.38
4.30
4.18
4.07
3.90
3.87
3.49
3.40
3.27
3.07
3.04
2.95
2.86
2.66
2.35
2.17
1.92
1.77
1.69
1.48
1.41
1.29
0.77
0.76
21.75
18.66
17.33
16.97
16.75
15.66
15.55
15.47
15.40
15.36
15.34
15.16
14.98
14.11
14.06
13.45
13.22
12.85
12.77
12.63

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.65	640	tr	0.77	888	tr
2-Methylbutyral	0.68	649	tr	0.76	883	tr
2-Methylbutanol	1.05	731	tr	3.49	1177	tr
Toluene	1.23	756	tr	1.48*	1003	0.05
Hexanal	1.53	796	tr	1.92	1044	tr
2-Heptanone	2.62	888	0.02	3.07	1144	0.03
2-Heptanol	2.79	903	0.04	5.09	1302	0.04
Tricyclene	3.01	917	0.19	1.29	975	0.18
α-Thujene	3.12	924	0.05	1.48*	1003	[0.05]
α-Pinene	3.19	929	0.83	1.41	994	0.80
Camphene	3.40*	942	3.61	1.77	1030	3.47
α-Fenchene	3.40*	942	[3.61]	1.69	1023	0.01
β-Pinene	3.82*	970	1.32	2.17	1068	1.11
Sabinene	3.82*	970	[1.32]	2.35	1085	0.16
6-Methyl-5-hepten-2-one	4.06	986	0.01	5.13	1305	0.01
Myrcene	4.13	991	0.37	2.95	1135	0.34
α-Phellandrene	4.27	1000	0.02	2.86	1128	0.02
2-Octanol	4.32	1003	0.01	6.48	1392	0.01
Δ3-Carene	4.36	1006	0.01	2.66	1112	0.01
α-Terpinene	4.47	1013	0.02	3.04	1142	0.02
para-Cymene	4.59	1021	0.12	4.18	1231	0.11
Limonene	4.70*	1027	8.34	3.28	1160	1.06
β-Phellandrene	4.70*	1027	[8.34]	3.40*	1170	7.12
1,8-Cineole	4.70*	1027	[8.34]	3.40*	1170	[7.12]
(*Z*)-β-Ocimene	4.88	1039	0.01	3.86	1207	0.01
2-Heptyl acetate	4.98	1045	0.01	4.30	1241	tr
(*E*)-β-Ocimene	5.04	1048	0.01	4.07	1223	0.01
γ-Terpinene	5.16	1056	0.03	3.90	1210	0.03
cis-Sabinene hydrate	5.27	1063	0.02	6.97	1429	0.02
Terpinolene	5.62*	1085	0.06	4.38	1246	0.05
para-Cymenene	5.62*	1085	[0.06]	6.38	1385	0.01
2-Nonanone	5.72	1092	0.11	5.89	1350	0.10
trans-Sabinene hydrate	5.76	1094	0.02	8.02	1508	0.02
Linalool	5.86	1100	0.65	8.14	1517	0.63
2-Nonanol	5.91	1104	0.21	7.82	1493	0.21
β-Thujone	6.03	1111	0.01	6.40	1387	0.01
cis-para-Menth-2-en-1-ol	6.13	1118	0.01	8.19	1521	0.02
trans-Pinocarveol	6.38	1134	0.01	9.24	1603	0.05
Camphor	6.45	1138	8.93	7.31*	1454	8.91
Camphene hydrate	6.50	1142	0.18	8.56*	1550	5.45
Isoborneol	6.67	1153	2.71	9.44	1620	2.71
Borneol	6.81	1162	0.86	9.85*	1653	1.28
Terpinen-4-ol	6.99	1174	0.26	8.64	1557	0.26

para-Cymen-8-ol	7.13	1183	0.01	11.60	1801	0.04
α-Terpineol	7.21	1188	0.36	9.85*	1653	[1.28]
Myrtenol	7.30	1194	0.05	10.92	1743	0.02
trans-Isopiperitenol	7.35	1197	0.01	10.48*	1705	0.46
2-Decanol?	7.43	1202	0.02	9.15*	1596	0.28
Carvone	7.98	1240	0.04	10.06*	1670	0.63
(7*Z*)-Undecen-2-one	8.56	1279	0.02			
Isobornyl acetate	8.65*	1286	0.08	8.37	1535	0.06
Bornyl acetate	8.65*	1286	[0.08]	8.34	1533	0.03
2-Undecanone	8.82	1297	0.06	8.70	1561	0.06
2-Undecanol	8.96	1307	0.04	10.35	1694	0.05
4-Vinylguaiacol	9.03	1308	0.02	15.16	2133	0.09
δ-Elemene isomer	9.38	1333	0.02	6.90*	1424	0.02
δ-Elemene	9.42*	1336	0.48	7.08	1437	0.47
Piperitenone	9.42*	1336	[0.48]	12.13	1848	0.02
α-Cubebene	9.59	1348	0.02	6.90*	1424	[0.02]
α-Copaene	9.94	1372	0.03	7.31*	1454	[8.91]
1,5-diepi-β-Bourbonene	10.05	1380	0.03	7.43	1463	0.02
cis-β-Elemene	10.08	1383	0.13	8.41	1538	0.12
β-Elemene	10.20†	1391	[4.40]	8.56*	1550	[5.45]
Cyperene	10.23†	1394	4.40	7.60	1476	0.07
β-Caryophyllene	10.52	1414	1.05	8.56*	1550	[5.45]
β-Copaene	10.65	1424	0.03	8.48	1544	0.03
Unknown [m/z 93, 91 (52), 119 (37), 105 (31), 77 (29), 41 (27), 134 (26)... 204? (2)]	10.69	1427	0.05	9.78*	1648	0.08
γ-Elemene	10.75	1431	0.28	9.15*	1596	[0.28]
α-Guaiene	10.80	1435	0.01	8.56*	1550	[5.45]
6,9-Guaiadiene	10.86	1440	0.12	8.74	1564	0.13
Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.93	1445	0.23	8.90	1577	0.20
α-Humulene	10.97	1448	0.76	9.40	1616	0.77
allo-Aromadendrene	11.03	1452	0.03	9.11	1593	0.07
(*E*)-β-Farnesene	11.12	1459	0.48	9.66	1637	0.47
γ-Muurolene	11.29†	1472	[0.24]	9.70	1641	0.15
Selina-4,11-diene	11.31†	1474	0.24	9.54	1628	0.20
Germacrene D	11.35	1477	0.92	9.89	1657	0.91
β-Selinene	11.41	1481	0.58	9.98	1664	0.58
δ-Selinene	11.44	1484	0.05	9.78*	1648	[0.08]
Viridiflorene	11.50	1488	0.05	9.78*	1648	[0.08]
α-Selinene	11.54	1491	0.60	10.06*	1670	[0.63]
Curzerene	11.60	1495	3.72	11.79	1817	3.61

Germacrene A	11.63	1497	0.13	10.48*	1705	[0.46]
γ-Cadinene	11.80*	1510	0.15	10.48*	1705	[0.46]
Cubebol	11.80*	1510	[0.15]	12.63	1892	0.05
δ-Cadinene	11.93*	1521	0.33	10.53	1709	0.22
Unknown [m/z 161, 81 (93), 105 (66), 93 (60), 119 (60), 204 (54)...]	11.93*	1521	[0.33]			
Selina-3,7(11)-diene	12.13	1537	0.07	10.68	1722	0.07
α-Elemol	12.26	1547	0.08	14.11	2031	0.15
Germacrene B	12.32	1551	1.14	11.22	1768	1.08
Caryophyllene oxide	12.63*	1576	0.32	12.85	1913	0.28
Caryophyllene oxide isomer	12.63*	1576	[0.32]	12.77	1905	0.02
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.71	1582	0.27			
Humulene epoxide I	12.84	1592	0.43	13.22	1947	0.14
Curzerenone	13.02*	1607	30.68	15.34†	2152	[35.40]
Humulene epoxide II	13.02*	1607	[30.68]	13.44	1968	0.16
β-Elemenone	13.02*	1607	[30.68]	14.06	2026	0.90
Epicurzerenone	13.12	1615	1.33	15.40	2158	1.16
Unknown [m/z 105, 121 (67), 191 (59), 93 (40), 91 (38), 67 (36)...]	13.25*	1626	1.29	16.75	2297	0.69
Unknown [m/z 121, 107 (45), 41 (42), 93 (41), 122 (37), 55 (36)...]	13.25*	1626	[1.29]			
τ-Cadinol	13.39	1638	0.22	14.98	2115	0.91
β-Eudesmol	13.48*	1645	0.23	15.47	2165	0.22
Neointermedeol	13.48*	1645	[0.23]	15.66	2183	0.06
α-Cadinol	13.53	1649	0.48	15.55	2173	0.19
Unknown [m/z 205, 93 (93), 43 (58), 79 (510, 91 (48), 119 (45)... 220 (3)]	13.77	1669	0.22			
Germacrone	14.03	1690	7.76	15.36†	2154	35.40
Unknown [m/z 133, 93 (97), 131 (85), 145 (83), 107 (69)...220]	14.12	1698	0.02	16.97	2321	0.32
Unknown [m/z	14.20	1704	0.28			

215; 91 (44), 43 (42), 93 (39), 133 (38), 145 (37), 41 (35)...]						
Curdione	14.26	1710	1.05			
Unknown [m/z 43, 71 (88), 93 (86), 41 (74), 55 (73), 81 (71), 95 (59), 91 (53), 67 (52)... 220 (13)... 236? (t)]	14.32	1715	0.21	17.33	2360	0.31
Curcumenol	14.40	1722	0.40	18.66	2508	0.32
Neocurdione	14.66	1744	0.29			
Furanodienone	15.03	1777	1.09			
Unknown [m/z 232, 135 (84), 147 (77), 162 (73), 91 (60), 108 (53)...]	15.12	1784	0.64			
Isofuranodienone	15.23	1794	0.51			
Curcumenone	15.68	1834	0.44			
Zederone	17.22	1977	0.62	21.74	2883	0.69
2-Nonadecanone	17.58	2012	0.01			
Coronarin *E*	18.59	2112	0.03			
Total identified		**92.89%**			**85.81%**	
Total reported		**94.80%**			**87.32%**	

*: 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