Date : February 14, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19B13-PTH01-1-SCC
Customer identification : Laurel Leaf - Balkans - L1010591R
Type : Essential oil
Source : *Laurus nobilis*
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 : Benoit Roger, Ph. D.
Analysis date : February 13, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4658 ± 0.0003 (20 °C)

CONCLUSION

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

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
2-Methylbutyral	0.01	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	0.01	Furan
3-Methyl-1-penten-3-ol	0.01	0.01	Aliphatic alcohol
1-Methylpyrrole	0.02		Pyrrole
Ethyl isobutyrate	0.02	0.02	Aliphatic ester
Toluene	tr	0.15*	Simple phenolic
Hexanal	0.07	0.06	Aliphatic aldehyde
Isopropyl butyrate	0.01	0.01	Aliphatic ester
Ethyl 2-methylbutyrate	0.07	0.09*	Aliphatic ester
Ethyl isovalerate	0.03	0.03	Aliphatic ester
(3*Z*)-Hexenol	0.07	0.07	Aliphatic alcohol
Isopropyl 2-methylbutyrate	0.01	0.01	Aliphatic ester
2-Heptanol	0.03	0.02	Aliphatic alcohol
Isobutyl isobutyrate	0.03	5.48*	Aliphatic ester
Tricyclene	0.01	0.01	Monoterpene
α-Thujene	0.14	[0.15]*	Monoterpene
α-Pinene	6.30	6.23	Monoterpene
α-Fenchene	0.48*	[0.09]*	Monoterpene
Thujadiene isomer	[0.48]*	0.02	Monoterpene
Camphene	[0.48]*	0.41	Monoterpene
Thuja-2,4(10)-diene	tr	6.39*	Monoterpene
β-Pinene	12.07*	[5.48]*	Monoterpene
Sabinene	[12.07]*	[6.39]*	Monoterpene
Dehydro-1,8-cineole	0.08	0.08	Monoterpenic ether
Myrcene	0.52	0.50	Monoterpene
α-Phellandrene	0.12*	0.09	Monoterpene
Pseudolimonene	[0.12]*	0.03	Monoterpene
Isobutyl 2-methylbutyrate	0.07	0.06	Aliphatic ester
Δ3-Carene	0.04	0.03	Monoterpene
α-Terpinene	0.46	0.44	Monoterpene
para-Cymene	1.32	1.38	Monoterpene
Limonene	50.84*	2.81	Monoterpene
1,8-Cineole	[50.84]*	48.56	Monoterpenic ether
(*Z*)-β-Ocimene	0.12	0.10	Monoterpene
Unknown	0.01		Unknown
(*E*)-β-Ocimene	0.17	0.16	Monoterpene
γ-Terpinene	1.37	1.36	Monoterpene
cis-Sabinene hydrate	0.02	0.05*	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	0.02	Monoterpenic alcohol
trans-Linalool oxide (fur.)	0.06*	[0.05]*	Monoterpenic alcohol
Terpinolene	[0.06]*	0.03	Monoterpene
2-Nonanone	0.04	0.04	Aliphatic ketone
trans-Sabinene hydrate	0.02	0.02	Monoterpenic alcohol
Linalool	6.09	6.10	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.01	0.01	Monoterpenic alcohol
trans-Pinocarveol	0.02	0.01	Monoterpenic alcohol
trans-para-Menth-2-en-1-ol	0.02	0.02*	Monoterpenic alcohol
Nerol oxide	0.01*	[0.05]*	Aliphatic ether

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Pinocarvone	[0.01]*	0.02	Monoterpenic ketone
(*E*)-2,6-Dimethyl-1,5,7-octatrien-3-ol	0.01	0.01	Monoterpenic alcohol
Borneol	0.02	1.48	Monoterpenic alcohol
δ-Terpineol	0.06	0.06	Monoterpenic alcohol
Terpinen-4-ol	1.42*	1.43*	Monoterpenic alcohol
Rosefuran oxide	[1.42]*	[1.43]*	Monoterpenic ether
Thuj-3-en-10-al	0.01	0.01	Monoterpenic aldehyde
para-Cymen-8-ol	0.01	0.01	Monoterpenic alcohol
Methyl salicylate	1.76*	0.03	Phenolic ester
α-Terpineol	[1.76]*	8.22*	Monoterpenic alcohol
Myrtenal	[1.76]*	0.02*	Monoterpenic aldehyde
Myrtenol	0.08*	0.07	Monoterpenic alcohol
cis-Piperitol	[0.08]*	0.01	Monoterpenic alcohol
Methylchavicol	0.20	0.19	Phenylpropanoid
trans-Piperitol	0.01	0.03*	Monoterpenic alcohol
trans-Carveol	0.01	0.02	Monoterpenic alcohol
1-para-Menthen-9-al	0.01	[0.02]*	Monoterpenic aldehyde
Nerol	0.30	0.29	Monoterpenic alcohol
Carvone	0.02*	0.02	Monoterpenic ketone
Neral	[0.02]*	0.01	Monoterpenic aldehyde
Geraniol	0.14*	0.04	Monoterpenic alcohol
Linalyl acetate	[0.14]*	0.11	Monoterpenic ester
4-Thujen-2α-yl acetate	0.02	0.02	Monoterpenic ester
Bornyl acetate	0.29	0.30	Monoterpenic ester
2-Undecanone	0.11	0.13*	Aliphatic ketone
Terpinen-4-yl acetate	0.02	[0.02]*	Monoterpenic ester
δ-Terpinyl acetate	0.21	0.22	Monoterpenic ester
exo-2-Hydroxycineole acetate	0.02	0.03	Monoterpenic ester
α-Cubebene	7.92*	[0.05]*	Sesquiterpene
α-Terpinyl acetate	[7.92]*	[8.22]*	Monoterpenic ester
Eugenol	0.89	0.92	Phenylpropanoid
Neryl acetate	0.14	0.13	Monoterpenic ester
α-Ylangene	0.02	0.02	Sesquiterpene
α-Copaene	0.02	0.01	Sesquiterpene
β-Bourbonene	0.01	0.01	Sesquiterpene
Geranyl acetate	0.01	0.01	Monoterpenic ester
β-Cubebene	0.01	0.01	Sesquiterpene
β-Elemene	0.12	1.63*	Sesquiterpene
Methyleugenol	2.19	2.18	Phenylpropanoid
β-Caryophyllene	1.52	[1.63]*	Sesquiterpene
α-Guaiene	0.01	[1.63]*	Sesquiterpene
6,9-Guaiadiene	0.07	[0.13]*	Sesquiterpene
(*E*)-Cinnamyl acetate	0.04	0.06	Phenylpropanoid ester
α-Humulene	0.02	0.02*	Sesquiterpene
allo-Aromadendrene	0.02	0.02	Sesquiterpene
cis-Muurola-4(15),5-diene	0.01	[0.02]*	Sesquiterpene
Unknown	0.02		Unknown
Germacrene D	0.03	0.05	Sesquiterpene
β-Selinene	0.04	0.03	Sesquiterpene
α-Selinene	0.06*	0.01	Sesquiterpene
Bicyclogermacrene	[0.06]*	0.01	Sesquiterpene
Viridiflorene	[0.06]*	0.01	Sesquiterpene

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(3*Z*,6*E*)-α-Farnesene	0.14	0.02	Sesquiterpene
Germacrene A	[0.14]*	[0.03]*	Sesquiterpene
Methyl (*E*)-isoeugenol	[0.14]*	0.10	Phenylpropanoid
γ-Cadinene	0.05	0.04*	Sesquiterpene
δ-Cadinene	0.05	[0.04]*	Sesquiterpene
α-Calacorene	0.01	0.01	Sesquiterpene
(*E*)-α-Bisabolene	0.03	0.02	Sesquiterpene
Germacrene D-4-ol	0.01	0.01	Sesquiterpenic alcohol
Spathulenol	0.04	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.08	0.07	Sesquiterpenic ether
Viridiflorol	0.01	0.01	Sesquiterpenic alcohol
Ledol	0.01	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01*	0.01	Sesquiterpenic alcohol
τ-Muurolol	[0.01]*	0.01	Sesquiterpenic alcohol
β-Eudesmol	0.04	0.04	Sesquiterpenic alcohol
α-Eudesmol	0.03	0.02	Sesquiterpenic alcohol
Total identified	**99.13%**	**99.22%**	

*: 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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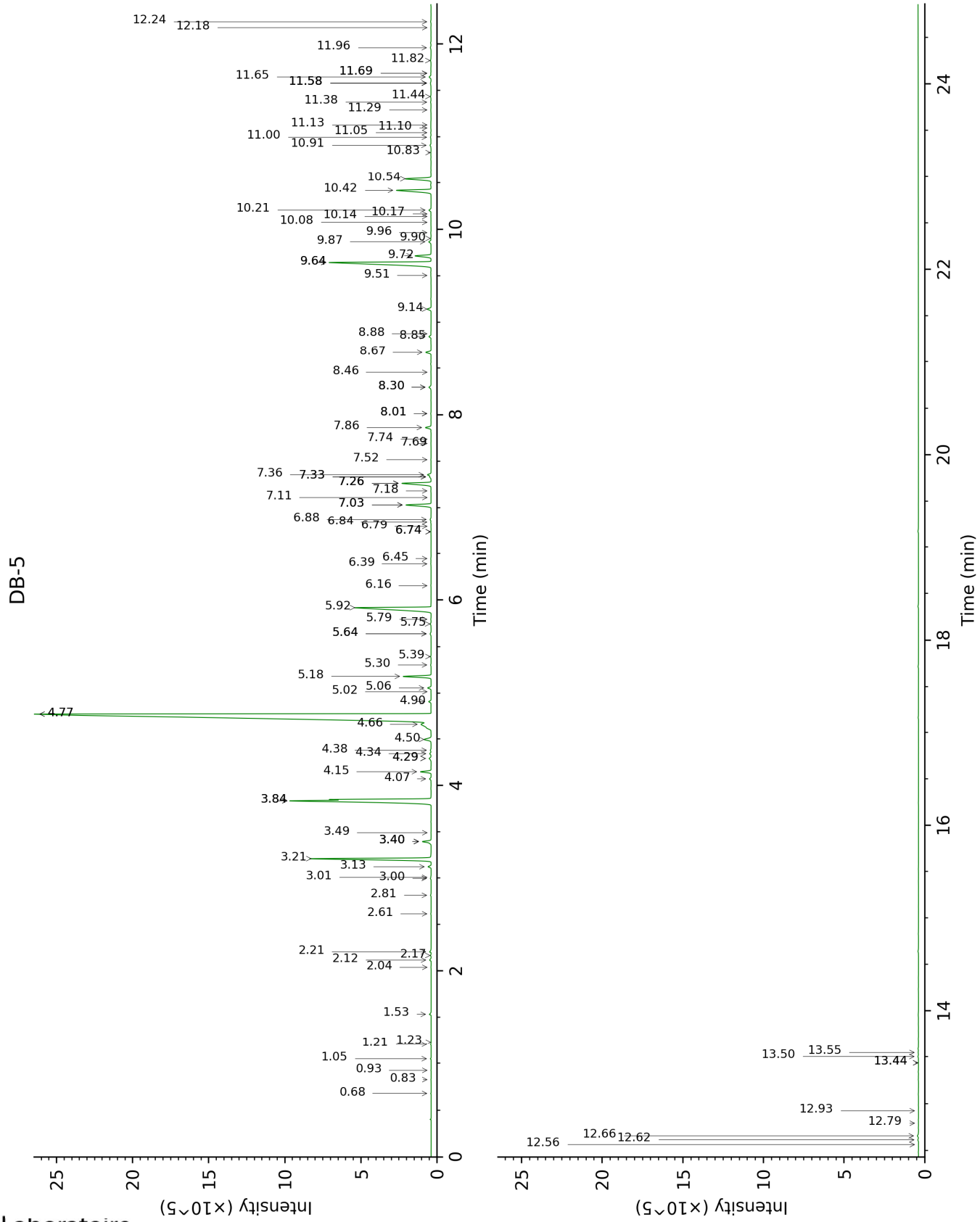
DB-5
Intensity (×10^5)
Time (min)
12.24
12.18
11.96
11.82
11.65
11.69
11.58
11.38
11.44
11.29
11.13
11.10
11.05
11.00
10.91
10.83
10.54
10.42
10.21
10.17
10.14
10.08
9.96
9.90
9.87
9.72
9.64
9.51
9.14
8.88
8.85
8.67
8.46
8.30
8.01
7.86
7.74
7.69
7.52
7.36
7.33
7.26
7.18
7.11
7.03
6.88
6.84
6.79
6.74
6.39
6.45
6.16
5.92
5.79
5.75
5.64
5.39
5.30
5.18
5.06
5.02
4.90
4.77
4.66
4.50
4.38
4.34
4.29
4.15
4.07
3.84
3.49
3.40
3.21
3.13
3.01
3.00
2.81
2.61
2.21
2.17
2.12
2.04
1.53
1.23
1.21
1.05
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0.83
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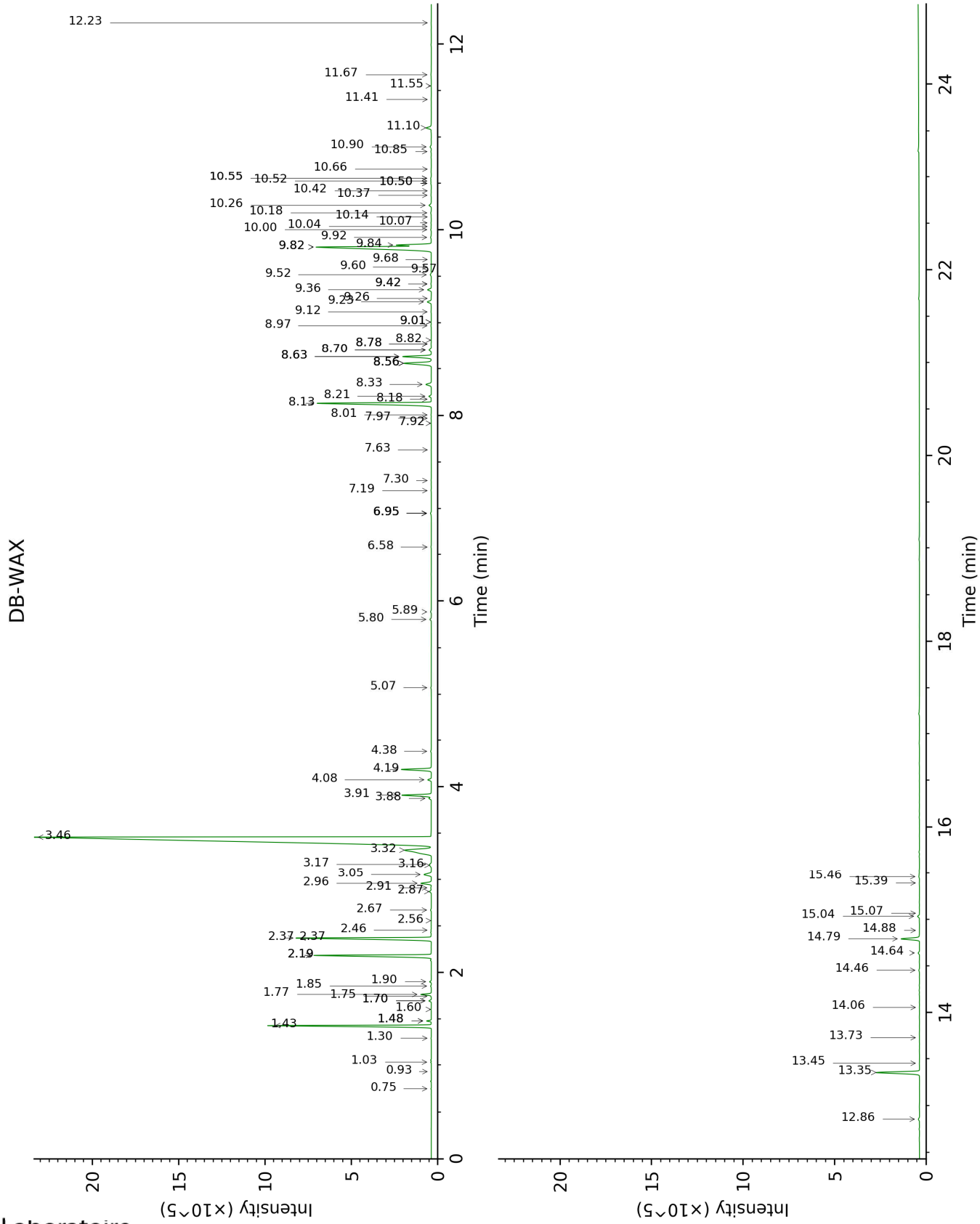
13.44
12.93
12.79
12.66
12.62
12.56


DB-WAX
Time (min)
Intensity (×10^5)
12.23
11.67
11.55
11.41
11.10
10.90
10.85
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10.55
10.52
10.50
10.42
10.37
10.26
10.18
10.14
10.07
10.00
10.04
9.92
9.82
9.84
9.68
9.60
9.57
9.52
9.42
9.36
9.26
9.23
9.12
9.01
8.97
8.82
8.78
8.70
8.63
8.56
8.33
8.21
8.18
8.13
8.01
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7.30
7.19
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6.58
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3.17
3.16
3.05
2.96
2.91
2.87
2.67
2.56
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2.37
2.37
2.19
1.90
1.85
1.77
1.75
1.70
1.60
1.48
1.43
1.30
1.03
0.93
0.75
15.46
15.39
15.04
15.07
14.88
14.79
14.64
14.46
14.06
13.73
13.45
13.35
12.86

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
2-Methylbutyral	0.68	649	0.01	0.75	882	0.01
2-Ethylfuran	0.83	692	tr	0.93	923	0.01
3-Methyl-1-penten-3-ol	0.93	715	0.01	2.56	1103	0.01
1-Methylpyrrole	1.05	731	0.02			
Ethyl isobutyrate	1.21	752	0.02	1.03	938	0.02
Toluene	1.23	756	tr	1.48*	1003	0.15
Hexanal	1.53	796	0.07	1.90	1042	0.06
Isopropyl butyrate	2.04	840	0.01	1.60	1014	0.01
Ethyl 2-methylbutyrate	2.12	847	0.07	1.70*	1022	0.09
Ethyl isovalerate	2.17	851	0.03	1.86	1037	0.03
(3*Z*)-Hexenol	2.21	854	0.07	5.80	1339	0.07
Isopropyl 2-methylbutyrate	2.61	887	0.01	1.75	1027	0.01
2-Heptanol	2.81	903	0.03	5.07	1300	0.02
Isobutyl isobutyrate	3.00	915	0.03	2.18*	1068	5.48
Tricyclene	3.01	916	0.01	1.30	976	0.01
α-Thujene	3.13	924	0.14	1.48*	1003	[0.15]
α-Pinene	3.22	929	6.30	1.43	995	6.23
α-Fenchene	3.40*	941	0.48	1.70*	1022	[0.09]
Thujadiene isomer	3.40*	941	[0.48]	2.46	1094	0.02
Camphene	3.40*	941	[0.48]	1.77	1029	0.41
Thuja-2,4(10)-diene	3.49	947	tr	2.37*	1086	6.39
β-Pinene	3.84*†	970	12.07	2.18*	1068	[5.48]
Sabinene	3.84*†	970	[12.07]	2.37*	1086	[6.39]
Dehydro-1,8-cineole	4.07	985	0.08	3.17	1151	0.08
Myrcene	4.15	990	0.52	2.96	1134	0.50
α-Phellandrene	4.29*	1000	0.12	2.87	1127	0.09
Pseudolimonene	4.29*	1000	[0.12]	2.91	1130	0.03
Isobutyl 2-methylbutyrate	4.34	1003	0.07	3.16	1150	0.06
Δ3-Carene	4.38	1005	0.04	2.67	1112	0.03
α-Terpinene	4.50	1012	0.46	3.05	1142	0.44
para-Cymene	4.66	1022	1.32	4.19	1231	1.38
Limonene	4.77*	1029	50.84	3.32	1163	2.81
1,8-Cineole	4.77*	1029	[50.84]	3.46	1174	48.56
(*Z*)-β-Ocimene	4.90	1038	0.12	3.88	1208	0.10
Unknown [m/z 109, 43 (57), 91 (28), 67 (25), 93 (24), 95 (22), 77 (21), 137 (21), 41 (17), 79 (14)...]	5.02	1045	0.01			
(*E*)-β-Ocimene	5.06	1047	0.17	4.08	1223	0.16

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γ-Terpinene	5.18	1055	1.37	3.91	1210	1.36
cis-Sabinene hydrate	5.30	1063	0.02	6.95*	1424	0.05
cis-Linalool oxide (fur.)	5.39	1068	0.02	6.58	1396	0.02
trans-Linalool oxide (fur.)	5.64*	1084	0.06	6.95*	1424	[0.05]
Terpinolene	5.64*	1084	[0.06]	4.38	1246	0.03
2-Nonanone	5.74	1090	0.04	5.89	1344	0.04
trans-Sabinene hydrate	5.80	1094	0.02	8.01	1504	0.02
Linalool	5.92	1101	6.09	8.13	1514	6.10
cis-para-Menth-2-en-1-ol	6.16	1116	0.01	8.18	1518	0.01
trans-Pinocarveol	6.39	1132	0.02	9.26	1604	0.01
trans-para-Menth-2-en-1-ol	6.45	1135	0.02	9.01*	1583	0.02
Nerol oxide	6.74*	1154	0.01	6.95*	1424	[0.05]
Pinocarvone	6.74*	1154	[0.01]	7.97	1501	0.02
(*E*)-2,6-Dimethyl-1,5,7-octatrien-3-ol	6.79	1157	0.01	10.42	1699	0.01
Borneol	6.84	1160	0.02	9.84	1651	1.48
δ-Terpineol	6.88	1163	0.06	9.52	1624	0.06
Terpinen-4-ol	7.03*	1173	1.42	8.63*	1554	1.43
Rosefuran oxide	7.03*	1173	[1.42]	8.63*	1554	[1.43]
Thuj-3-en-10-al	7.11	1178	0.01	8.82	1568	0.01
para-Cymen-8-ol	7.18	1182	0.01	11.55	1796	0.01
Methyl salicylate	7.26*	1188	1.76	10.52	1708	0.03
α-Terpineol	7.26*	1188	[1.76]	9.82*	1649	8.22
Myrtenal	7.26*	1188	[1.76]	8.78*	1565	0.02
Myrtenol	7.33*	1192	0.08	10.90	1740	0.07
cis-Piperitol	7.33*	1192	[0.08]	9.60	1631	0.01
Methylchavicol	7.36	1194	0.20	9.36	1611	0.19
trans-Piperitol	7.52	1204	0.01	10.50*	1705	0.03
trans-Carveol	7.69	1216	0.01	11.41	1783	0.02
1-para-Menthen-9-al	7.74	1219	0.01	9.01*	1583	[0.02]
Nerol	7.86	1227	0.30	11.10	1757	0.29
Carvone	8.01*	1238	0.02	10.08	1670	0.02
Neral	8.01*	1238	[0.02]	9.57	1628	0.01
Geraniol	8.30*	1257	0.14	11.67	1806	0.04
Linalyl acetate	8.30*	1257	[0.14]	8.21	1520	0.11
4-Thujen-2α-yl acetate	8.46	1268	0.02	8.97	1580	0.02
Bornyl acetate	8.67	1282	0.29	8.33	1530	0.30
2-Undecanone	8.85	1294	0.11	8.70*	1559	0.13
Terpinen-4-yl acetate	8.88	1296	0.02	8.78*	1565	[0.02]
δ-Terpinyl acetate	9.14	1311	0.21	9.23	1600	0.22
exo-2-Hydroxycineole acetate	9.50	1336	0.02	10.18	1679	0.03

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α-Cubebene	9.64*	1346	7.92	6.95*	1424	[0.05]
α-Terpinyl acetate	9.64*	1346	[7.92]	9.82*	1649	[8.22]
Eugenol	9.72	1351	0.89	14.79	2097	0.92
Neryl acetate	9.87	1362	0.14	10.26	1686	0.13
α-Ylangene	9.90	1364	0.02	7.19	1442	0.02
α-Copaene	9.96	1369	0.02	7.30	1450	0.01
β-Bourbonene	10.08	1377	0.01	7.63	1476	0.01
Geranyl acetate	10.14	1381	0.01	10.66	1719	0.01
β-Cubebene	10.17	1383	0.01	7.92	1497	0.01
β-Elemene	10.21	1386	0.12	8.56*	1548	1.63
Methyleugenol	10.42	1401	2.19	13.35	1959	2.18
β-Caryophyllene	10.54	1410	1.52	8.56*	1548	[1.63]
α-Guaiene	10.83	1432	0.01	8.56*	1548	[1.63]
6,9-Guaiadiene	10.91	1438	0.07	8.70*	1559	[0.13]
(*E*)-Cinnamyl acetate	11.00	1444	0.04	14.64	2082	0.06
α-Humulene	11.05	1448	0.02	9.42*	1616	0.02
allo-Aromadendrene	11.10	1451	0.02	9.12	1592	0.02
cis-Muurola-4(15),5-diene	11.13	1454	0.01	9.42*	1616	[0.02]
Unknown [m/z 43, 67 (61), 79 (57), 81 (44), 54 (44)...]	11.29	1466	0.02			
Germacrene D	11.38	1472	0.03	9.92	1658	0.05
β-Selinene	11.44	1476	0.04	10.00	1664	0.03
α-Selinene	11.58*	1487	0.06	10.04	1667	0.01
Bicyclogermacrene	11.58*	1487	[0.06]	10.14	1676	0.01
Viridiflorene	11.58*	1487	[0.06]	9.68	1638	0.01
(3*Z*,6*E*)-α-Farnesene	11.65†	1492	0.14	10.37	1695	0.02
Germacrene A	11.69*†	1495	[0.14]	10.50*	1705	[0.03]
Methyl (*E*)-isoeugenol	11.69*†	1495	[0.14]	15.04	2121	0.10
γ-Cadinene	11.82	1506	0.05	10.55*	1710	0.04
δ-Cadinene	11.96	1516	0.05	10.55*	1710	[0.04]
α-Calacorene	12.18	1533	0.01	12.23	1856	0.01
(*E*)-α-Bisabolene	12.24	1538	0.03	10.85	1735	0.02
Germacrene D-4-ol	12.56	1564	0.01	13.73	1994	0.01
Spathulenol	12.62	1568	0.04	14.46	2064	0.04
Caryophyllene oxide	12.66	1571	0.08	12.86	1913	0.07
Viridiflorol	12.79	1582	0.01	14.06	2026	0.01
Ledol	12.92	1592	0.01	13.45	1968	0.01
τ-Cadinol	13.44*	1634	0.01	14.88	2106	0.01
τ-Muurolol	13.44*	1634	[0.01]	15.07	2124	0.01
β-Eudesmol	13.50	1639	0.04	15.46	2164	0.04
α-Eudesmol	13.55	1643	0.03	15.39	2157	0.02
Total identified		**99.13%**			**99.22%**	
Total reported		**99.16%**			**99.22%**	

*: Two or more compounds are coeluting on this column

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[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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