Date : May 26, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20E25-PTH08
Customer identification : Eucalyptus Globulus Organic - Portugal - E3011382R
Type : Essential oil
Source : *Eucalyptus globulus*
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 : Sylvain Mercier, M. Sc., Chimiste
Analysis date : May 26, 2020

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

Physicochemical data

Physical aspect: Faintly yellow liquid
Refractive index: 1.4648 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 770:2002 - Crude oil of Eucalyptus globulus

Compound	Min. %	Max. %	Observed %	Complies?
Globulol	0.5	1.5	0.5	Yes
Aromadendrene	0.5	10.0	4.9	Yes
trans-Pinocarveol	1	6	2	Yes
para-Cymene	1.0	2.0	1.5	Yes
1,8-Cineole	60		62	Yes
Limonene	1	8	3	Yes
α-Phellandrene	0.1	1.0	0.4	Yes
α-Pinene	10	22	14	Yes
Refractive index	1.4570	1.4750	1.4648	Yes

Conclusion

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for crude Eucalyptus globulus oil.

Analysis summary – Consolidated contents

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

Identification	%	Class
Isobutyral	tr	Aliphatic aldehyde
Isobutanol	tr	Aliphatic alcohol
Isovaleral	0.37	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.04	Aliphatic alcohol
Toluene	0.01	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
Isovaleric acid	0.03	Aliphatic acid
Hexanol	0.02	Aliphatic alcohol
Isoamyl acetate	0.01	Aliphatic ester
2-Methylbutyl acetate	tr	Aliphatic ester
Hashishene	0.05	Monoterpene
Tricyclene	tr	Monoterpene
α-Thujene	0.01	Monoterpene
α-Pinene	13.59	Monoterpene
Camphene	0.12	Monoterpene
α-Fenchene	0.05	Monoterpene
Thuja-2,4(10)-diene	0.06	Monoterpene
β-Pinene	0.32	Monoterpene
Sabinene	tr	Monoterpene
trans-meta-Mentha-2,8-diene	0.02	Monoterpene
2-Pentylfuran	0.03	Furan
Myrcene	0.14	Monoterpene
Pseudolimonene	tr	Monoterpene
α-Phellandrene	0.40	Monoterpene
cis-Dehydroxylinalool oxide	0.02	Monoterpenic ether
α-Terpinene	0.09	Monoterpene
para-Cymene	1.45	Monoterpene
Limonene	3.31	Monoterpene
1,8-Cineole	62.00	Monoterpenic ether
(*Z*)-β-Ocimene	0.02	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.27	Monoterpene
Unknown	0.12	Oxygenated monoterpene
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Terpinolene	0.15	Monoterpene
trans-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
para-Cymenene	0.18	Monoterpene
α-Pinene oxide	0.01	Monoterpenic ether
Linalool	0.04	Monoterpenic alcohol
Unknown	0.02	Unknown
Isoamyl isovalerate	0.08	Aliphatic ester
endo-Fenchol	0.12	Monoterpenic alcohol
α-Campholenal	0.05	Monoterpenic aldehyde
Nopinone	0.01	Normonoterpenic ketone

trans-Pinocarveol	1.85	Monoterpenic alcohol
Nerol oxide	0.04	Aliphatic ether
Pinocarvone	0.50	Monoterpenic ketone
Pinocamphone	0.05	Monoterpenic ketone
Borneol	0.13	Monoterpenic alcohol
δ-Terpineol	0.10	Monoterpenic alcohol
Isopinocamphone	0.10	Monoterpenic ketone
Terpinen-4-ol	0.22	Monoterpenic alcohol
Cryptone	0.02	Normonoterpenic ketone
para-Cymen-8-ol	0.04	Monoterpenic alcohol
trans-Isocarveol	0.28	Monoterpenic alcohol
α-Terpineol	1.12	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.13	Monoterpenic alcohol
cis-α-Phellandrene epoxide (IPP vs Me)	0.04	Monoterpenic ether
Unknown	0.02	Oxygenated monoterpene
trans-Carveol	0.06	Monoterpenic alcohol
cis-Isocarveol	0.19	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
trans-α-Phellandrene epoxide (IPP vs Me)	0.04	Monoterpenic ether
Myrtenyl formate?	0.03	Monoterpenic ester
Carvone	0.05	Monoterpenic ketone
Carvotanacetone	0.03	Monoterpenic ketone
Unknown	0.02	Unknown
Geraniol	0.01	Monoterpenic alcohol
Vitispirane?	0.01	Terpenic ether
Bornyl acetate	0.01	Monoterpenic ester
trans-Pinocarvyl acetate	0.04	Monoterpenic ester
δ-Terpinyl acetate	0.03	Monoterpenic ester
exo-2-Hydroxycineole acetate	0.04	Monoterpenic ester
α-Terpinyl acetate	0.83	Monoterpenic ester
Isoledene	0.09	Sesquiterpene
α-Copaene	0.05	Sesquiterpene
7-Cubebene	0.03	Sesquiterpene
Geranyl acetate	0.03	Monoterpenic ester
Unknown	0.04	Sesquiterpene
α-Gurjunene	0.26	Sesquiterpene
Unknown	0.08	Sesquiterpene
β-Caryophyllene	0.09	Sesquiterpene
γ-Maaliene	0.12	Sesquiterpene
β-Gurjunene	0.26	Sesquiterpene
α-Maaliene	0.04	Sesquiterpene
Aromadendrene	4.88	Sesquiterpene
Selina-5,11-diene	0.15	Sesquiterpene
α-Humulene	0.06	Sesquiterpene
allo-Aromadendrene	1.08	Sesquiterpene
Valerena-4,7(11)-diene	0.02	Sesquiterpene
γ-Gurjunene	0.07	Sesquiterpene
Unknown	0.04	Sesquiterpene
γ-Muurolene	0.04	Sesquiterpene
β-Selinene	0.11	Sesquiterpene
allo-Aromadendr-9-ene	0.10	Sesquiterpene

Viridiflorene	0.49	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
γ-Cadinene	0.06	Sesquiterpene
Unknown	0.05	Sesquiterpene
δ-Cadinene	0.05	Sesquiterpene
Epiglobulol	0.19	Sesquiterpenic alcohol
Palustrol	0.03	Sesquiterpenic alcohol
Maaliol	0.03	Sesquiterpenic alcohol
Spathulenol	0.03	Sesquiterpenic alcohol
Globulol	0.52	Sesquiterpenic alcohol
Viridiflorol	0.08	Sesquiterpenic alcohol
Cubeban-11-ol	0.04	Sesquiterpenic alcohol
Ledol	0.06	Sesquiterpenic alcohol
Rosifoliol	0.06	Sesquiterpenic alcohol
γ-Eudesmol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.04	Sesquiterpenic alcohol
Unknown	0.02	Sesquiterpenic alcohol
Consolidated total	**98.83%**	

tr: The compound has been detected below 0.005% of total signal.

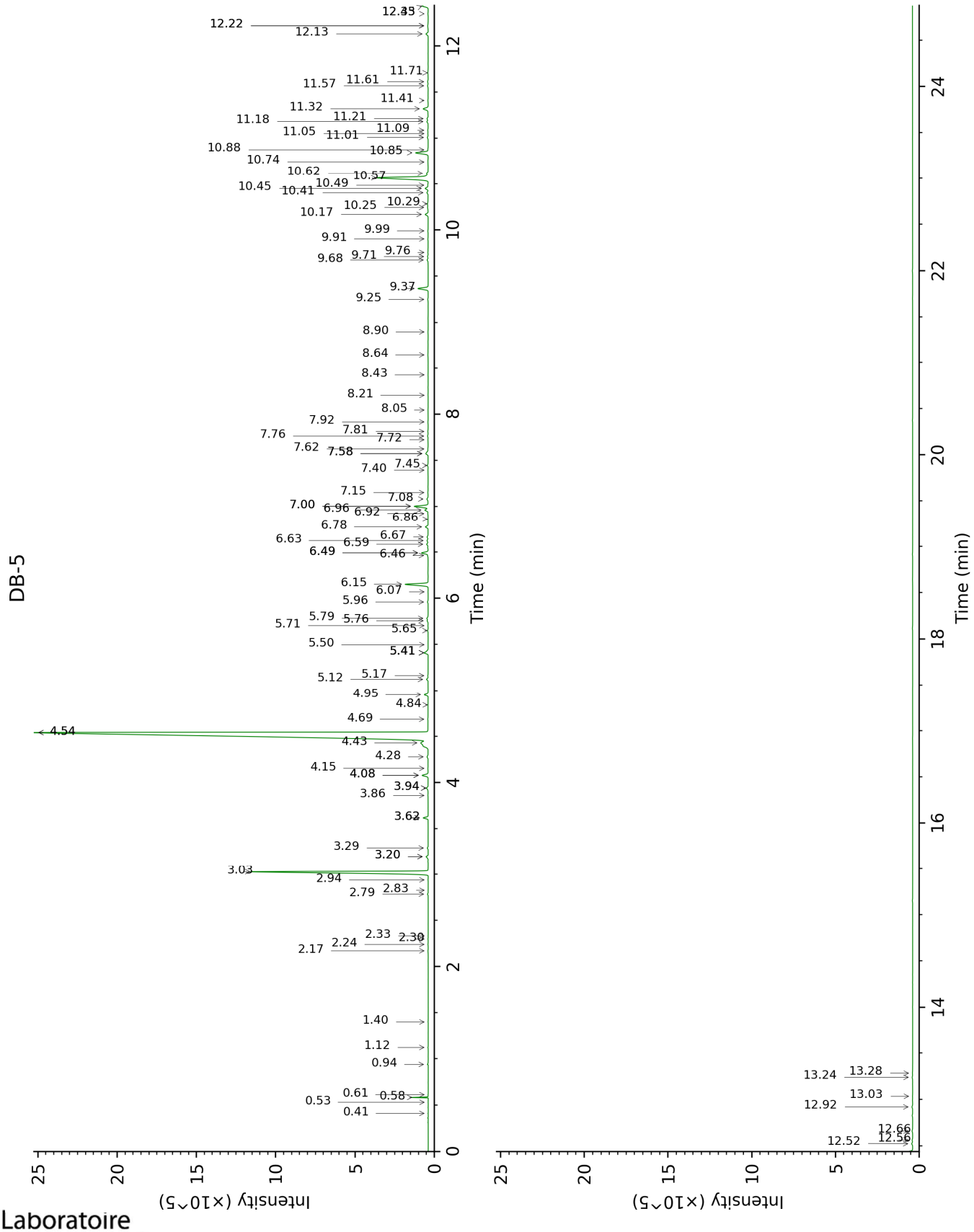
Note: no correction factor was applied

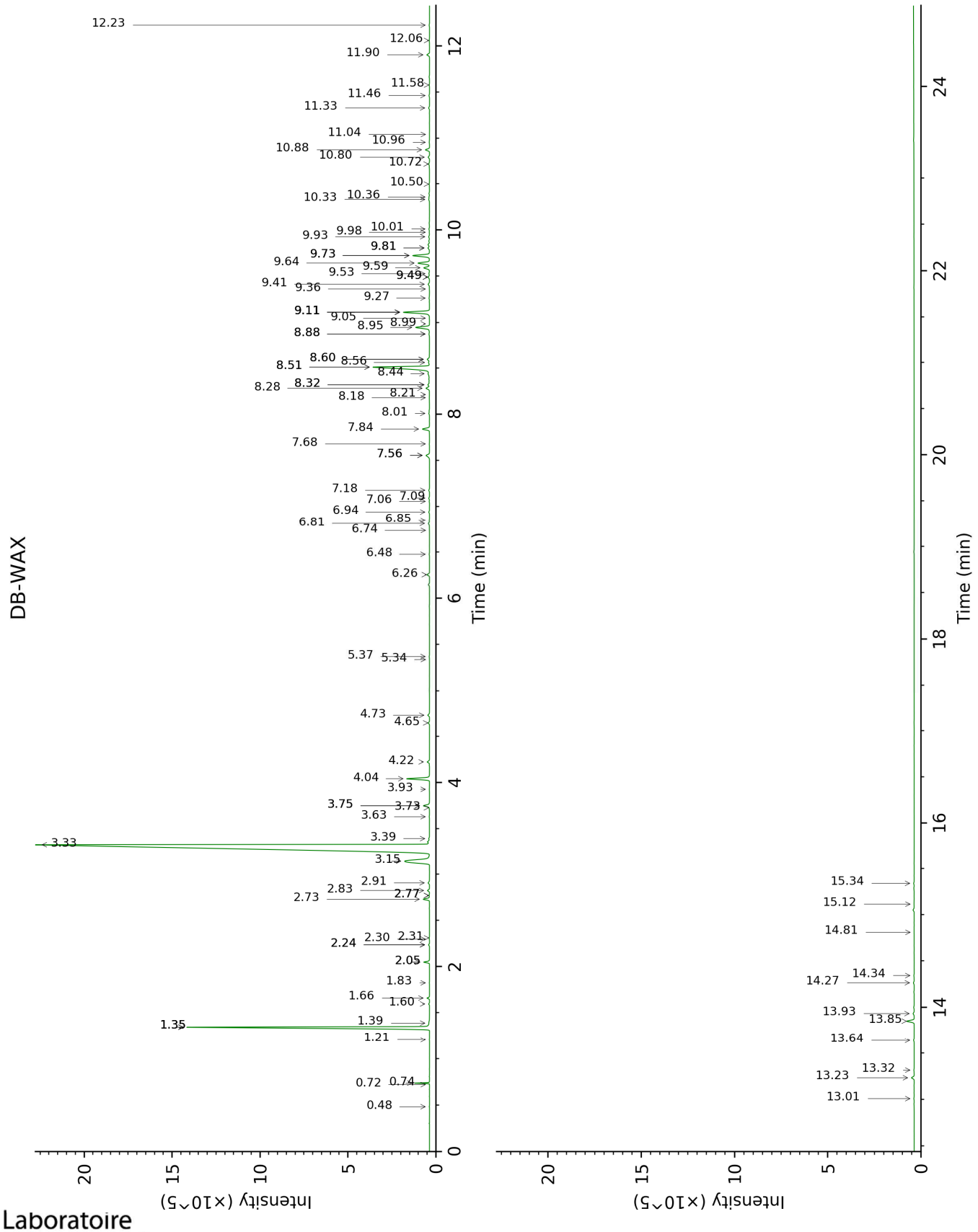
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

This page was intentionally left blank. The following pages present the complete data of the analysis.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Time (min)
Intensity (×10^5)
12.35
12.22
12.13
11.71
11.61
11.57
11.41
11.32
11.21
11.18
11.09
11.05
11.01
10.88
10.85
10.74
10.62
10.57
10.49
10.45
10.41
10.29
10.25
10.17
9.99
9.91
9.76
9.71
9.68
9.37
9.25
8.90
8.64
8.43
8.21
8.05
7.92
7.81
7.76
7.72
7.62
7.58
7.45
7.40
7.15
7.08
7.00
6.96
6.92
6.86
6.78
6.67
6.63
6.59
6.49
6.46
6.15
6.07
5.96
5.79
5.76
5.71
5.65
5.50
5.41
5.17
5.12
4.95
4.84
4.69
4.54
4.43
4.28
4.15
4.08
3.94
3.86
3.62
3.29
3.20
3.03
2.94
2.83
2.79
2.33
2.30
2.24
2.17
1.40
1.12
0.94
0.61
0.58
0.53
0.41
13.28
13.24
13.03
12.92
12.66
12.56
12.52


DB-WAX
Time (min)
Intensity (×10^5)
12.23
12.06
11.90
11.58
11.46
11.33
11.04
10.96
10.88
10.80
10.72
10.50
10.33
10.36
9.93
9.98
10.01
9.81
9.73
9.64
9.59
9.53
9.49
9.41
9.36
9.27
9.11
9.05
8.95
8.99
8.88
8.60
8.56
8.51
8.44
8.32
8.28
8.18
8.21
8.01
7.84
7.68
7.56
7.18
7.06
7.09
6.94
6.85
6.81
6.74
6.48
6.26
5.37
5.34
4.73
4.65
4.22
4.04
3.93
3.75
3.73
3.63
3.39
3.33
3.15
2.91
2.83
2.73
2.77
2.30
2.31
2.24
2.05
1.83
1.66
1.60
1.39
1.35
1.21
0.72
0.74
0.48
15.34
15.12
14.81
14.34
14.27
13.93
13.85
13.64
13.32
13.23
13.01

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.41	530	tr	0.48	784	0.01
Isobutanol	0.53	617	tr	2.05*	1066	0.32
Isovaleral	0.58	639	0.37	0.74	888	0.37
2-Methylbutyral	0.61	651	0.01	0.72	882	tr
Isoamyl alcohol	0.94	737	0.04	3.39	1180	0.05
Toluene	1.12	762	0.01	1.35*†	995	13.54
Hexanal	1.40	802	0.01	1.83	1044	0.01
Isovaleric acid	2.17	867	0.03	9.53†	1637	[0.16]
Hexanol	2.24	873	0.02	5.37	1321	0.02
Isoamyl acetate	2.30	878	0.01	2.31	1093	0.02
2-Methylbutyl acetate	2.33	881	tr	2.30	1091	0.01
Hashishene	2.79	915	0.05	1.35*†	995	[13.54]
Tricyclene	2.83	918	tr	1.21	972	0.01
α-Thujene	2.94	925	0.01	1.39†	1001	[13.54]
α-Pinene	3.03	931	13.59	1.35*†	995	[13.54]
Camphene	3.20*	942	0.17	1.66	1028	0.12
α-Fenchene	3.20*	942	[0.17]	1.60	1022	0.05
Thuja-2,4(10)-diene	3.29	948	0.06	2.24*	1085	0.06
β-Pinene	3.62*	970	0.34	2.05*	1066	[0.32]
Sabinene	3.62*	970	[0.34]	2.24*	1085	[0.06]
trans-meta-Mentha-2,8-diene	3.86	986	0.02	2.77*	1130	0.03
2-Pentylfuran	3.94*	991	0.16	3.63	1198	0.03
Myrcene	3.94*	991	[0.16]	2.82	1134	0.14
Pseudolimonene	4.08*	1000	0.48	2.77*	1130	[0.03]
α-Phellandrene	4.08*	1000	[0.48]	2.73	1127	0.40
cis-Dehydroxylinalool oxide	4.15	1005	0.02	3.73	1206	0.02
α-Terpinene	4.28	1013	0.09	2.91	1141	0.11
para-Cymene	4.43	1023	1.45	4.04	1229	1.45
Limonene	4.54*	1030	65.41	3.15	1160	3.31
1,8-Cineole	4.54*	1030	[65.41]	3.33	1174	62.00
(*Z*)-β-Ocimene	4.69	1039	0.02	3.75*	1207	0.43
(*E*)-β-Ocimene	4.84	1048	0.01	3.93	1220	0.01
γ-Terpinene	4.95	1056	0.27	3.75*	1207	[0.43]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.12	1066	0.12	4.73	1280	0.12
cis-Linalool oxide (fur.)	5.16	1069	0.03	6.48	1402	0.03
Terpinolene	5.41*	1085	0.39	4.22	1242	0.15
trans-Linalool oxide (fur.)	5.41*	1085	[0.39]	6.85	1430	0.02

para-Cymenene	5.41*	1085	[0.39]	6.26	1386	0.18
α-Pinene oxide	5.50	1090	0.01	5.34	1319	tr
Linalool	5.65	1100	0.04	8.01	1517	0.05
Unknown [m/z 43, 59 (37), 79 (33), 91 (32), 119 (31)...]	5.71	1103	0.02	8.99	1593	0.01
Isoamyl isovalerate	5.76	1107	0.08	4.65	1274	0.08
endo-Fenchol	5.78	1108	0.12	8.32*†	1541	0.15
α-Campholenal	5.96	1120	0.05	6.94	1436	0.05
Nopinone	6.07	1127	0.01	8.18	1530	0.02
trans-Pinocarveol	6.15	1132	1.85	9.11*	1603	1.92
Nerol oxide	6.46	1152	0.04	6.74	1421	0.01
Pinocarvone	6.49*	1154	0.53	7.84	1504	0.50
Pinocamphone	6.49*	1154	[0.53]	7.18	1454	0.05
Borneol	6.59	1160	0.13	9.73*	1653	1.25
δ-Terpineol	6.63	1163	0.10	9.42	1628	0.11
Isopinocamphone	6.67	1166	0.10	7.56*	1482	0.33
Terpinen-4-ol	6.78	1173	0.22	8.51*	1556	5.06
Cryptone	6.86	1178	0.02	9.11*	1603	[1.92]
para-Cymen-8-ol	6.92	1182	0.04	11.46	1799	0.04
trans-Isocarveol	6.96	1185	0.28	10.88	1749	0.28
α-Terpineol	7.00*	1188	1.13	9.73*	1653	[1.25]
Myrtenal	7.00*	1188	[1.13]	8.60*†	1562	0.18
Myrtenol	7.08	1193	0.13	10.80	1742	0.09
cis-α-Phellandrene epoxide (IPP vs Me)	7.15	1198	0.04	10.96	1756	0.02
Unknown [m/z 107, 79 (99), 91 (57), 94 (54), 135 (44), 150 (44)]	7.40	1214	0.02			
trans-Carveol	7.45	1217	0.06	11.33	1787	0.06
cis-Isocarveol	7.58*	1226	0.27	11.90	1838	0.19
Unknown [m/z 43, 135 (82), 91 (68), 107 (58), 79 (55), 150 (49)]	7.58*	1226	[0.27]	9.81*	1660	0.13
trans-α-Phellandrene epoxide (IPP vs Me)	7.62	1230	0.04	12.06	1852	0.03
Myrtenyl formate?	7.72	1236	0.03	8.88*	1584	0.05
Carvone	7.76	1239	0.05	9.93	1670	0.07
Carvotanacetone	7.81	1243	0.03	9.36	1623	0.01
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	7.92	1250	0.02	11.04	1763	0.01
Geraniol	8.05	1259	0.01	11.58	1809	0.03
Vitispirane?	8.21	1270	0.01	7.68	1492	0.02

Bornyl acetate	8.43	1285	0.01	8.21	1533	0.01
trans-Pinocarvyl acetate	8.64	1300	0.04	9.05	1598	0.01
δ-Terpinyl acetate	8.90	1314	0.03	9.11*	1603	[1.92]
exo-2-Hydroxycineole acetate	9.25	1338	0.04	10.01	1676	0.05
α-Terpinyl acetate	9.37	1347	0.83	9.64	1646	0.86
Isoledene	9.68	1369	0.09	6.81	1427	0.10
α-Copaene	9.71	1371	0.05	7.09	1448	0.05
7-Cubebene	9.76	1374	0.03	7.06	1445	0.02
Geranyl acetate	9.91	1385	0.03	10.50	1716	0.03
Unknown [m/z 93, 122 (98), 161 (98), 107 (86), 95 (46), 105 (72)... 204 (34)]	9.99	1391	0.04			
α-Gurjunene	10.17	1403	0.26	7.56*	1482	[0.33]
Unknown [m/z 119, 107 (86), 105 (85), 93 (78), 189 (66), 81 (65), 121 (64)... 204 (23)]	10.25	1409	0.08			
β-Caryophyllene	10.28	1412	0.09	8.32*†	1541	[0.15]
γ-Maaliene	10.41	1421	0.12	8.44	1550	0.16
β-Gurjunene	10.45	1424	0.26	8.28	1538	0.28
α-Maaliene	10.49	1427	0.04	8.56	1560	0.07
Aromadendrene	10.57	1433	4.88	8.51*	1556	[5.06]
Selina-5,11-diene	10.62	1437	0.15	8.60*†	1562	[0.18]
α-Humulene	10.74	1446	0.06	9.26	1615	0.04
allo-Aromadendrene	10.84	1454	1.08	8.95	1590	1.07
Valerena-4,7(11)-diene	10.88	1456	0.02	8.88*	1584	[0.05]
γ-Gurjunene	11.01	1466	0.07	9.11*	1603	[1.92]
Unknown [m/z 189, 145 (96), 105 (87), 131 (87), 133 (73), 160 (70)... 204 (44)]	11.05	1469	0.04			
γ-Muurolene	11.09	1472	0.04	9.49*†	1634	0.16
β-Selinene	11.18	1479	0.11	9.81*	1660	[0.13]
allo-Aromadendr-9-ene	11.21	1481	0.10	9.49*†	1634	[0.16]
Viridiflorene	11.32	1489	0.49	9.59	1642	0.44
α-Muurolene	11.41	1496	0.03	9.98	1673	0.02
γ-Cadinene	11.57	1508	0.06	10.33	1702	0.07
Unknown [m/z 159, 145 (91), 131 (67), 105 (46), 202 (43)]	11.61	1511	0.05	10.72	1736	0.06
δ-Cadinene	11.71	1519	0.05	10.36	1705	0.04

Epiglobulol	12.13	1552	0.19	13.23	1958	0.19
Palustrol	12.22*	1559	0.07	12.23	1866	0.03
Maaliol	12.22*	1559	[0.07]	13.01	1937	0.03
Spathulenol	12.35	1569	0.03	14.34	2063	0.03
Globulol	12.43	1576	0.52	13.85	2016	0.51
Viridiflorol	12.52	1583	0.08	13.93	2024	0.08
Cubeban-11-ol	12.56	1586	0.04	13.64	1995	0.05
Ledol	12.66	1594	0.06	13.32	1966	0.03
Rosifoliol	12.92	1614	0.06	14.27	2056	0.06
γ-Eudesmol	13.03	1624	0.02	14.81	2109	0.01
β-Eudesmol	13.24	1641	0.04	15.34	2162	0.04
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.28	1644	0.02	15.12	2139	0.03
Total identified		**98.70%**			**98.22%**	
Total reported		**99.11%**			**98.45%**	

*: 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