Date : May 31, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22E24-PTH01
Customer identification : Rosemary ORGANIC - Tunisia - R50112211R
Type : Essential oil
Source : *Rosmarinus officinalis* ct. 1,8-Cineole
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Pamela Lavoie, M.Sc., Chimiste
Analysis date : May 30, 2022

Checked and approved by :

Alexis St-Gelais, Ph. D., 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

Méthode certifiée ISO 17025:2017 Certified method

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

PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4657 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

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

Analysis summary – Consolidated contents

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

Identification	%	Class
Isovaleral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Toluene	tr	Simple phenolic
(2*E*)-Hexenal	tr	Aliphatic aldehyde
(3*Z*)-Hexenol	0.02	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
Bornylene	0.01	Monoterpene
Hashishene	0.02	Monoterpene
Tricyclene	0.15	Monoterpene
α-Thujene	0.28	Monoterpene
α-Pinene	11.84	Monoterpene
Camphene	4.28	Monoterpene
α-Fenchene	0.08	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
β-Pinene	6.73	Monoterpene
Sabinene	0.08	Monoterpene
Octen-3-ol	0.17	Aliphatic alcohol
Octan-3-one	0.06	Aliphatic ketone
Dehydro-1,8-cineole	0.01	Monoterpenic ether
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	1.52	Monoterpene
Pseudolimonene	0.04	Monoterpene
α-Phellandrene	0.17	Monoterpene
Δ3-Carene	0.18	Monoterpene
α-Terpinene	0.49	Monoterpene
para-Cymene	1.32	Monoterpene
1,8-Cineole	49.30	Monoterpenic ether
Limonene	2.42	Monoterpene
(*Z*)-β-Ocimene	0.06	Monoterpene
(*E*)-β-Ocimene	0.06	Monoterpene
γ-Terpinene	0.86	Monoterpene
cis-Sabinene hydrate	0.07	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Fenchone	0.01	Monoterpenic ketone
Terpinolene	0.38	Monoterpene
para-Cymenene	0.03	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.83	Monoterpenic alcohol
Unknown	0.02	Unknown
endo-Fenchol	0.05	Monoterpenic alcohol
trans-Pinene hydrate	0.02	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
α-Campholenal	0.02	Monoterpenic aldehyde
cis-Limonene oxide	0.01	Monoterpenic ether

trans-Pinocarveol	0.03	Monoterpenic alcohol
Camphor	9.18	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.01	Monoterpenic alcohol
Camphene hydrate	0.03	Monoterpenic alcohol
Isopulegol	0.03	Monoterpenic alcohol
Isoborneol	0.02	Monoterpenic alcohol
Pinocamphone	0.01	Monoterpenic ketone
Pinocarvone	0.02	Monoterpenic ketone
Borneol	1.76	Monoterpenic alcohol
δ-Terpineol	0.31	Monoterpenic alcohol
Isopinocamphone	0.02	Monoterpenic ketone
Terpinen-4-ol	0.65	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	1.37	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.02	Monoterpenic alcohol
Verbenone	0.01	Monoterpenic ketone
Bornyl formate	0.01	Monoterpenic ester
Citronellol	0.01	Monoterpenic alcohol
Piperitone	0.01	Monoterpenic ketone
Geraniol	0.01	Monoterpenic alcohol
trans-Ascaridole glycol	0.02	Monoterpenic alcohol
Geranial	0.01	Monoterpenic aldehyde
Bornyl acetate	0.40	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Thymol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.02	Monoterpenic alcohol
α-Cubebene	0.03	Sesquiterpene
Eugenol	0.02	Phenylpropanoid
α-Ylangene	0.06	Sesquiterpene
α-Copaene	0.18	Sesquiterpene
α-Gurjunene	0.01	Sesquiterpene
Methyleugenol	0.03	Phenylpropanoid
β-Caryophyllene	2.56	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
β-Gurjunene	0.03	Sesquiterpene
Aromadendrene	0.04	Sesquiterpene
α-Humulene	0.27	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
(*E*)-β-Farnesene	0.02	Sesquiterpene
γ-Muurolene	0.12*	Sesquiterpene
α-Amorphene	0.12*	Sesquiterpene
β-Selinene	0.01	Sesquiterpene
α-Selinene	0.05	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
β-Bisabolene	0.04	Sesquiterpene
γ-Cadinene	0.06	Sesquiterpene
trans-Calamenene	0.02	Sesquiterpene
δ-Cadinene	0.15	Sesquiterpene
trans-Cadina-1,4-diene	0.02	Sesquiterpene
α-Cadinene	0.01	Sesquiterpene

α-Calacorene	0.01	Sesquiterpene
Caryophyllene oxide	0.08	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
Caryophylladienol II	0.01	Sesquiterpenic alcohol
14-Hydroxy-(*Z*)-caryophyllene	0.01	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	tr	Sesquiterpenic alcohol
Consolidated total	**99.66%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

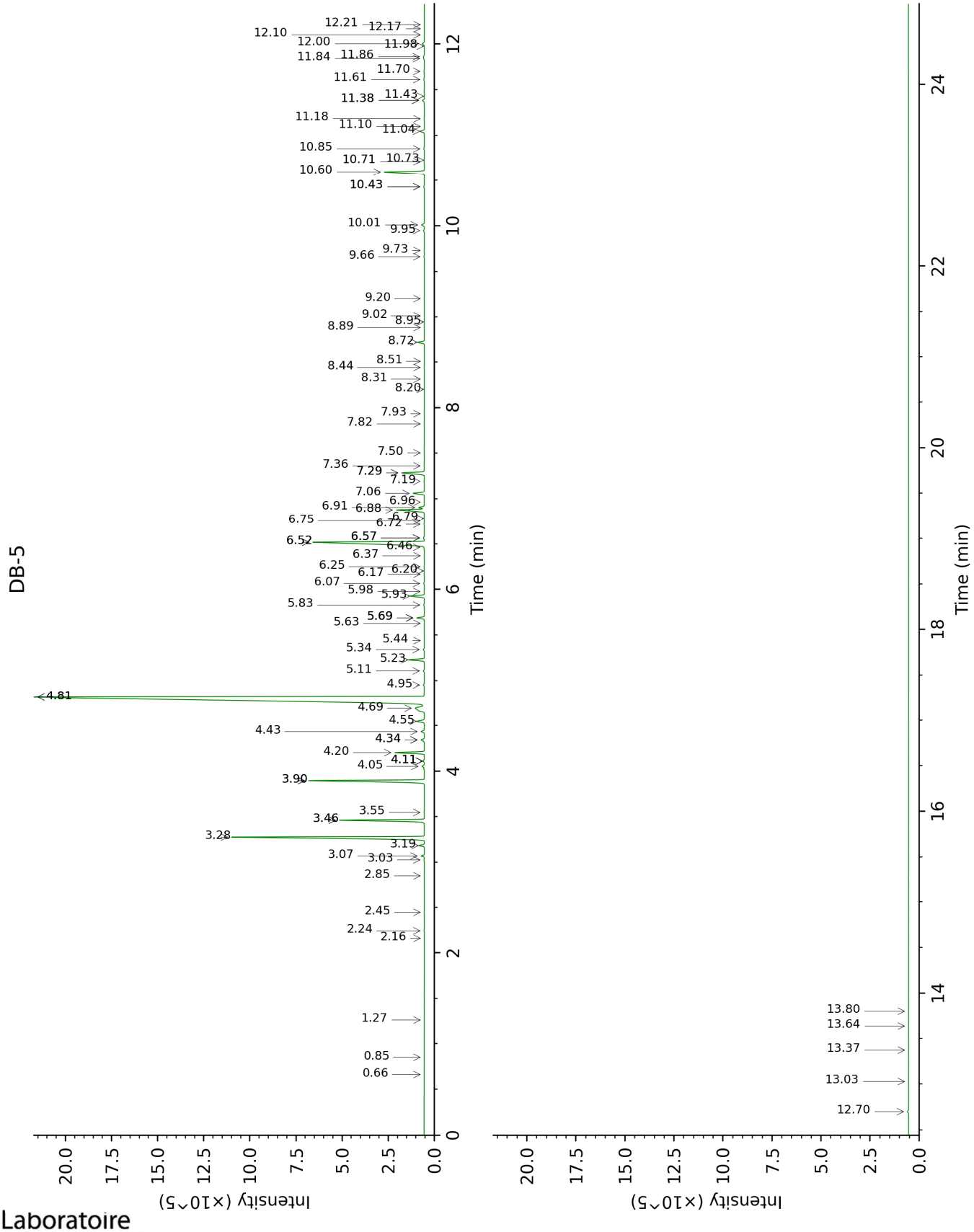
Note: no correction factor was applied

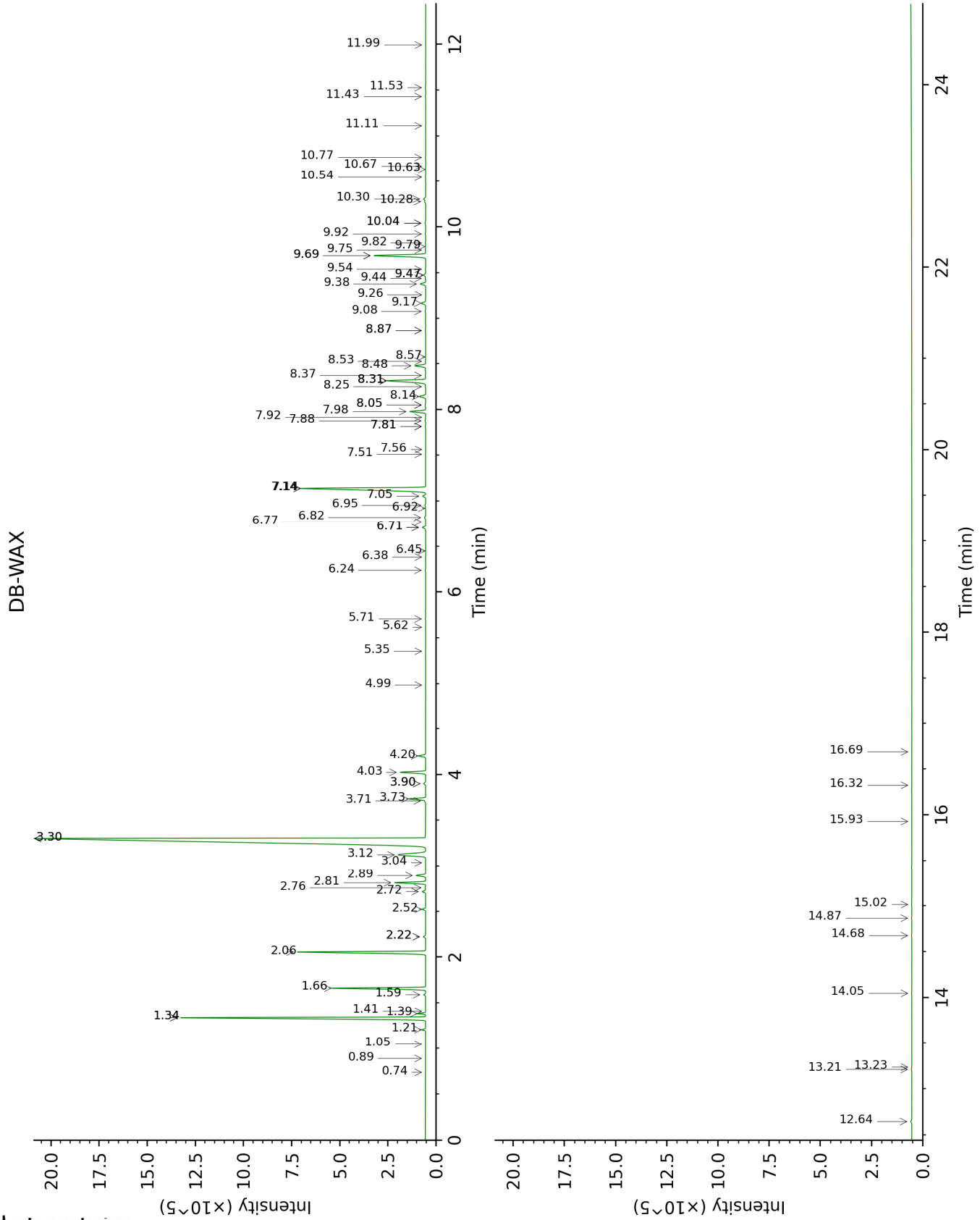
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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)
12.10
12.21
12.17
12.00
11.98
11.84
11.86
11.70
11.61
11.38
11.43
11.18
11.10
11.04
10.85
10.71
10.73
10.60
10.43
10.01
9.95
9.66
9.73
9.20
9.02
8.89
8.95
8.72
8.44
8.51
8.31
8.20
7.93
7.82
7.50
7.36
7.29
7.19
7.06
6.96
6.91
6.88
6.79
6.75
6.72
6.52
6.57
6.46
6.37
6.25
6.17
6.20
6.07
5.98
5.93
5.83
5.63
5.69
5.44
5.34
5.23
5.11
4.95
4.81
4.69
4.55
4.43
4.34
4.20
4.11
4.05
3.90
3.55
3.46
3.28
3.19
3.07
3.03
2.85
2.45
2.24
2.16
1.27
0.85
0.66
13.80
13.64
13.37
13.03
12.70


DB-WAX
Time (min)
Intensity (×10^5)
11.99
11.53
11.43
11.11
10.77
10.67
10.63
10.54
10.30
10.28
10.04
9.92
9.82
9.79
9.75
9.69
9.54
9.47
9.44
9.38
9.26
9.17
9.08
8.87
8.57
8.53
8.48
8.37
8.31
8.25
8.14
8.05
7.98
7.92
7.88
7.81
7.56
7.51
7.14
7.05
6.95
6.92
6.82
6.77
6.71
6.45
6.38
6.24
5.71
5.62
5.35
4.99
4.20
4.03
3.90
3.73
3.71
3.30
3.12
3.04
2.89
2.81
2.76
2.72
2.52
2.22
2.06
1.66
1.59
1.41
1.39
1.34
1.21
1.05
0.89
0.74
16.69
16.32
15.93
15.02
14.87
14.68
14.05
13.23
13.21
12.64

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.66	643	tr	0.74	885	tr
2-Ethylfuran	0.85	702	tr	0.89	916	0.01
Toluene	1.27	758	tr	1.41	1001	tr
(2*E*)-Hexenal	2.16	848	tr	3.30*	1171	49.30
(3*Z*)-Hexenol	2.24	854	0.02	5.71	1348	0.03
Hexanol	2.45	871	0.01	5.35	1323	0.01
Bornylene	2.85	903	0.01	1.05	943	0.01
Hashishene	3.03	915	0.02	1.34*	992	11.87
Tricyclene	3.07	918	0.15	1.21	970	0.15
α-Thujene	3.19	925	0.28	1.38	998	0.29
α-Pinene	3.28	931	11.84	1.34*	992	[11.87]
Camphene	3.46*	944	4.37	1.66	1026	4.28
α-Fenchene	3.46*	944	[4.37]	1.59	1019	0.08
Thuja-2,4(10)-diene	3.55	949	0.02	2.22*	1082	0.11
β-Pinene	3.90*	972	6.81	2.06	1066	6.73
Sabinene	3.90*	972	[6.81]	2.22*	1082	[0.11]
Octen-3-ol	4.05	982	0.17	6.71*	1420	0.20
Octan-3-one	4.11*	986	0.09	3.90*	1217	0.11
Dehydro-1,8-cineole	4.11*	986	[0.09]	3.04	1150	0.01
6-Methyl-5-hepten-2-one	4.11*	986	[0.09]	4.98	1297	0.01
Myrcene	4.20	992	1.52	2.81	1132	1.52
Pseudolimonene	4.34*	1002	0.21	2.76	1128	0.04
α-Phellandrene	4.34*	1002	[0.21]	2.72	1125	0.17
Δ3-Carene	4.44	1007	0.18	2.52	1110	0.18
α-Terpinene	4.55	1014	0.49	2.89	1139	0.49
para-Cymene	4.69	1023	1.32	4.02	1226	1.30
1,8-Cineole	4.81*	1031	51.73	3.30*	1171	[49.30]
Limonene	4.81*	1031	[51.73]	3.12	1157	2.42
(*Z*)-β-Ocimene	4.95	1040	0.06	3.71†	1204	0.89
(*E*)-β-Ocimene	5.11	1050	0.06	3.90*	1217	[0.11]
γ-Terpinene	5.23	1057	0.86	3.74†	1205	[0.89]
cis-Sabinene hydrate	5.34	1064	0.07	6.82	1429	0.06
cis-Linalool oxide (fur.)	5.44	1071	0.01	6.45	1401	0.01
Fenchone	5.63	1082	0.01	5.62	1341	0.01
Terpinolene	5.69*	1086	0.41	4.20	1240	0.38
para-Cymenene	5.69*	1086	[0.41]	6.24	1386	0.03
trans-Linalool oxide (fur.)	5.69*	1086	[0.41]	6.77	1425	0.01
trans-Sabinene hydrate	5.83	1095	0.04	7.88	1507	0.05
Linalool	5.93	1102	0.83	7.98	1515	0.84
Unknown [m/z 139, 95 (95), 109	5.98	1105	0.02			

(64), 121 (40), 41 (23), 136 (22)...]						
endo-Fenchol	6.07	1110	0.05	8.31*	1541	2.61
trans-Pinene hydrate	6.17	1117	0.02	7.81*	1502	0.03
cis-para-Menth-2-en-1-ol	6.20	1119	0.02	8.05*	1521	0.06
α-Campholenal	6.25	1122	0.02	6.92	1436	0.02
cis-Limonene oxide	6.37	1130	0.01	6.38	1396	0.01
trans-Pinocarveol	6.46	1136	0.03	9.08	1600	0.04
Camphor	6.52*	1140	9.21	7.14*	1452	9.19
trans-para-Menth-2-en-1-ol	6.52*	1140	[9.21]	8.87*	1584	0.02
Camphene hydrate	6.56*	1143	0.07	8.37	1546	0.03
Isopulegol	6.56*	1143	[0.07]	8.05*	1521	[0.06]
Isoborneol	6.72	1152	0.02	9.26	1615	0.01
Pinocamphone	6.76	1155	0.01	7.14*	1452	[9.19]
Pinocarvone	6.78	1157	0.02	7.81*	1502	[0.03]
Borneol	6.88	1163	1.76	9.69*	1650	3.13
δ-Terpineol	6.91	1165	0.31	9.38	1625	0.31
Isopinocamphone	6.96	1169	0.02	7.51	1480	0.02
Terpinen-4-ol	7.06	1175	0.65	8.48	1554	0.63
para-Cymen-8-ol	7.19	1184	0.03	11.43	1795	0.02
α-Terpineol	7.29*	1190	1.39	9.69*	1650	[3.13]
Myrtenal	7.29*	1190	[1.39]	8.57	1561	0.01
Myrtenol	7.36	1194	0.02	10.76	1739	0.02
Verbenone	7.50	1204	0.01	9.54	1638	0.02
Bornyl formate	7.82	1225	0.01	7.92	1510	0.02
Citronellol	7.94	1233	0.01	10.64	1728	0.03
Piperitone	8.20	1251	0.01	9.78	1658	0.03
Geraniol	8.31	1259	0.01	11.53	1804	0.04
trans-Ascaridole glycol	8.44	1268	0.02	14.05	2034	0.02
Geranial	8.51	1272	0.01	10.04*	1678	0.05
Bornyl acetate	8.72	1287	0.40	8.14	1528	0.40
Unknown [m/z 43, 93 (66), 91 (44), 41 (38), 69 (35)... 152? (1)]	8.89	1298	0.01			
Thymol	8.95	1302	0.01	15.02	2129	0.02
Unknown [m/z 69, 41 (79), 91 (56), 92 (54), 79 (50), 77 (35)...]	9.02	1307	0.01			
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.20	1316	0.02	14.87	2114	0.02
α-Cubebene	9.66	1348	0.03	6.71*	1420	[0.20]
Eugenol	9.73	1353	0.02	14.68	2095	0.03

α-Ylangene	9.95	1368	0.06	6.95	1438	0.05
α-Copaene	10.01	1373	0.18	7.05	1446	0.17
α-Gurjunene	10.43*	1402	0.04	7.56	1484	0.01
Methyleugenol	10.43*	1402	[0.04]	13.21	1956	0.03
β-Caryophyllene	10.60	1415	2.56	8.31*	1541	[2.61]
β-Copaene	10.71	1423	0.02	8.31*	1541	[2.61]
β-Gurjunene	10.73	1425	0.03	8.25	1536	0.03
Aromadendrene	10.85	1434	0.04	8.53	1558	0.02
α-Humulene	11.04	1448	0.27	9.17	1608	0.27
allo-Aromadendrene	11.10	1452	0.01	8.87*	1584	[0.02]
(*E*)-β-Farnesene	11.18	1458	0.02	9.44†	1630	0.16
γ-Muurolene	11.38*	1473	0.12	9.47*†	1632	[0.16]
α-Amorphene	11.38*	1473	[0.12]	9.47*†	1632	[0.16]
β-Selinene	11.43	1477	0.01	9.75	1655	0.02
α-Selinene	11.61	1490	0.05	9.82	1661	0.02
α-Muurolene	11.70	1497	0.03	9.92	1669	0.04
β-Bisabolene	11.84†	1508	0.11	10.04*	1678	[0.05]
γ-Cadinene	11.86†	1510	[0.11]	10.28†	1698	0.21
trans-Calamenene	11.98	1519	0.02	11.11	1768	0.01
δ-Cadinene	12.00	1520	0.15	10.30†	1700	[0.21]
trans-Cadina-1,4-diene	12.10	1528	0.02	10.54	1720	0.02
α-Cadinene	12.17	1534	0.01	10.67	1731	0.02
α-Calacorene	12.21	1537	0.01	11.99	1845	0.01
Caryophyllene oxide	12.70	1575	0.08	12.64	1903	0.07
Humulene epoxide II	13.03	1601	0.01	13.24	1958	0.01
Caryophylladienol II	13.37	1629	0.01	15.93	2222	0.01
14-Hydroxy-(*Z*)-caryophyllene	13.64	1652	0.01	16.32	2263	0.01
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.80	1665	tr	16.69	2302	0.01
Total identified		**99.69%**			**99.59%**	
Total reported		**99.75%**			**99.61%**	

*: 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