

Date : December 04, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19K27-PTH02-1-CC

Customer identification : German Chamomile - Egypt - C8010391R

Type : Essential oil

Source : *Matricaria chamomilla*

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 : December 02, 2019

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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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.

PHYSICOCHEMICAL DATA

Physical aspect: Dark blue liquid

Refractive index: 1.5064 ± 0.0003 (20 °C)

ISO 19332:2008 - OIL OF BLUE CHAMOMILE - EGYPT

Compound	Min. %	Max. %	Observed %	Complies?
α-Bisabolol oxide A	35	50	41	Yes
Chamazulene	2	5	3	Yes
α-Bisabolol	1	10	1	Yes
Bisabolone oxide A	2.0	6.5	4.5	Yes
(E)-β-Farnesene	15	35	16	Yes
α-Bisabolol oxide B	2	8	5	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for blue chamomile oil from Egypt.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Classe
3-Buten-2-one	tr	Aliphatic ketone
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.03	Aliphatic aldehyde
Toluene	tr	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
Ethyl 2-methylbutyrate	0.18	Aliphatic ester
Ethyl isovalerate	0.02	Aliphatic ester
(3Z)-Hexenol	tr	Aliphatic alcohol
Nonene	tr	Alkene
Heptanal	0.01	Aliphatic aldehyde
Santolinatriene	0.01	Monoterpene
α -Thujene	0.01	Monoterpene
α -Pinene	0.02	Monoterpene
Unknown	0.01	Monoterpene
Camphene	0.02	Monoterpene
Propyl 2-methylbutyrate	0.08	Aliphatic ester
Benzaldehyde	0.01	Simple phenolic
β -Pinene	0.01	Monoterpene
Sabinene	0.03	Monoterpene
6-Methyl-5-hepten-2-one	0.06	Aliphatic ketone
2-Pentylfuran	0.05	Furan
Myrcene	0.02	Monoterpene
α -Phellandrene	0.01	Monoterpene
Octanal	0.08	Aliphatic aldehyde
Yomogi alcohol	0.04	Monoterpenic alcohol
α -Terpinene	0.01	Monoterpene
para-Cymene	0.11	Monoterpene
Limonene	0.05	Monoterpene
1,8-Cineole	0.03	Monoterpenic ether
(Z)- β -Ocimene	0.06	Monoterpene
(E)- β -Ocimene	0.33	Monoterpene
γ -Terpinene	0.14	Monoterpene
Artemisia ketone	0.39	Monoterpenic ketone
Octanol	0.02	Aliphatic alcohol
Artemisia alcohol	0.11	Monoterpenic alcohol
Terpinolene	0.01	Monoterpene
Linalool	0.02	Monoterpenic alcohol
Nonanal	0.10	Aliphatic aldehyde
Unknown	0.02	Oxygenated monoterpene
Camphor	0.01	Monoterpenic ketone
<i>trans</i> -Chrysanthemal	0.01	Monoterpenic aldehyde
Borneol	0.06	Monoterpenic alcohol
Artemisyl acetate	0.02	Monoterpenic ester
Nonanol	0.02	Aliphatic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
Creosol	0.03	Simple phenolic
α -Terpineol	0.04	Monoterpenic alcohol

Safranal	0.03	Monoterpenic aldehyde
Decanal	0.02	Aliphatic aldehyde
Citronellol	0.03	Monoterpenic alcohol
Carvone	0.05	Monoterpenic ketone
(2E)-Hexenyl isovalerate	0.01	Aliphatic ester
Hexyl isovalerate	0.01	Aliphatic ester
Linalyl acetate	0.01	Monoterpenic ester
α -Ionene	0.01	Terpene derivative
4,8-Dimethylnona-3,8-dien-2-one	0.04	Terpenic ketone
(E)-4,8-Dimethylnona-3,8-dien-2-one	0.01	Terpenic ketone
Pelargonic acid	0.07	Aliphatic acid
Lavandulyl acetate	0.04	Monoterpenic ester
Tridecane	0.01	Alkane
(2E,4E)-Decadienal	0.01	Aliphatic aldehyde
Bicycloelemene	0.02	Sesquiterpene
7 β H-Silphiperfol-5-ene	0.01	Sesquiterpene
α -Longipinene	0.04	Sesquiterpene
Dehydro-ar-ionene	0.03	Miscellaneous
α -Copaene	0.05	Sesquiterpene
Modhephene	0.01	Sesquiterpene
cis- β -Elemene	0.02	Sesquiterpene
α -Isocomene	0.07	Sesquiterpene
Capric acid	1.03	Aliphatic acid
β -Elemene	0.07	Sesquiterpene
β -Isocomene	0.01	Sesquiterpene
β -Caryophyllene	0.10	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
Aromadendrene	0.08	Sesquiterpene
Striatene?	0.03	Sesquiterpene
α -Humulene	0.05	Sesquiterpene
allo-Aromadendrene	0.13	Sesquiterpene
(E)- β -Farnesene	15.63	Sesquiterpene
Dehydrosesquicineole	0.20	Sesquiterpenic ether
Germacrene D	1.23	Sesquiterpene
γ -Muurolene	0.05	Sesquiterpene
ar-Curcumene	0.07	Sesquiterpene
β -Selinene	0.15	Sesquiterpene
α -Selinene	0.05	Sesquiterpene
Bicyclogermacrene	0.66	Sesquiterpene
Viridiflorene	0.18	Sesquiterpene
α -Zingiberene	0.05	Sesquiterpene
α -Muurolene	0.09	Sesquiterpene
(3Z,6E)- α -Farnesene	0.10	Sesquiterpene
γ -Cadinene	0.15	Sesquiterpene
3,6-Dihydrochamazulene	0.61	Azulene
(3E,6E)- α -Farnesene	0.72	Sesquiterpene
Dihydrochamazulene isomer I	0.17	Azulene
δ -Cadinene	0.29	Sesquiterpene
(E)- α -Bisabolene	0.04	Sesquiterpene
Salviadienol?	0.03	Sesquiterpenic alcohol
Sesquirosefuran?	0.08	Sesquiterpenic ether
(E)-Nerolidol	0.22	Sesquiterpenic alcohol

Spathulenol	0.80	Sesquiterpenic alcohol
Dendrolasin	0.19	Sesquiterpenic ether
Unknown	tr	Oxygenated sesquiterpene
Caryophyllene oxide	0.07	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Globulol	0.09	Sesquiterpenic alcohol
Viridiflorol	0.10	Sesquiterpenic alcohol
5,6-Dihydrochamazulene	0.18	Azulene
(2,7Z)-Bisaboladien-4-ol	0.22	Sesquiterpenic alcohol
τ-Muurolool	0.06	Sesquiterpenic alcohol
τ-Cadinol	0.68	Sesquiterpenic alcohol
α-Bisabolol oxide B, epimer 1	5.07	Sesquiterpenic alcohol
α-Bisabolol oxide B, epimer 2	0.11	Sesquiterpenic alcohol
Ageratochromene	0.35	Chromane
β-Bisabolol	0.08	Sesquiterpenic alcohol
(E)-Bisabol-11-ol	0.02	Sesquiterpenic alcohol
Bisabolone oxide A	4.45	Sesquiterpenic ketone
α-Bisabolol	1.44	Sesquiterpenic alcohol
(2E,6Z)-Farnesol	0.08	Sesquiterpenic alcohol
Herniarin	0.11	Coumarin
Chamazulene	2.59	Azulene
α-Bisabolol oxide A	41.22	Sesquiterpenic alcohol
α-Costol?	0.23	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Phytone	0.31	Terpenic ketone
(Z)-Spiroether	5.29	Polyyne
(E)-Spiroether	0.64	Polyyne
(Z)-Tibetin spiroether	0.07	Polyyne
(E)-Tibetin spiroether	0.16	Polyyne
Palmitic acid	1.47	Aliphatic acid
Eicosane	0.03	Alkane
Heneicosane	0.03	Alkane
Phytol	0.15	Diterpenic alcohol
Linoleic acid	0.22	Aliphatic acid
Oleic acid	0.39	Aliphatic acid
cis-Vaccenic acid?	0.40	Aliphatic acid
(9Z)-18-Octadecenolide?	0.12	Aliphatic lactone
Docosane	0.03	Alkane
Tricosane	0.35	Alkane
Tetracosane	0.09	Alkane
Pentacosane	0.72	Alkane
Hexacosane	0.04	Alkane
Heptacosane	0.13	Alkane
Consolidated total	94.07%	

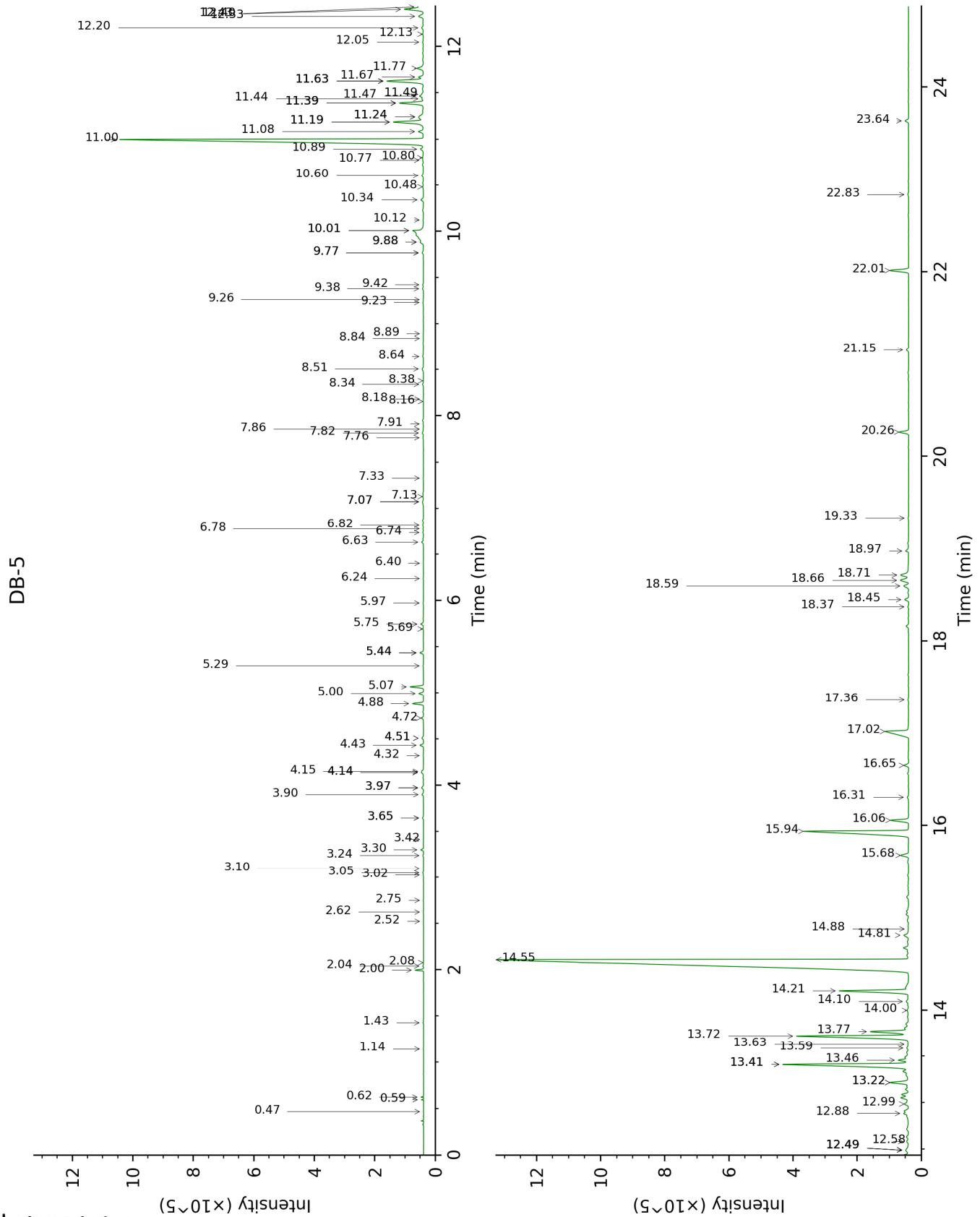
tr: The compound has been detected below 0.005% of total signal.

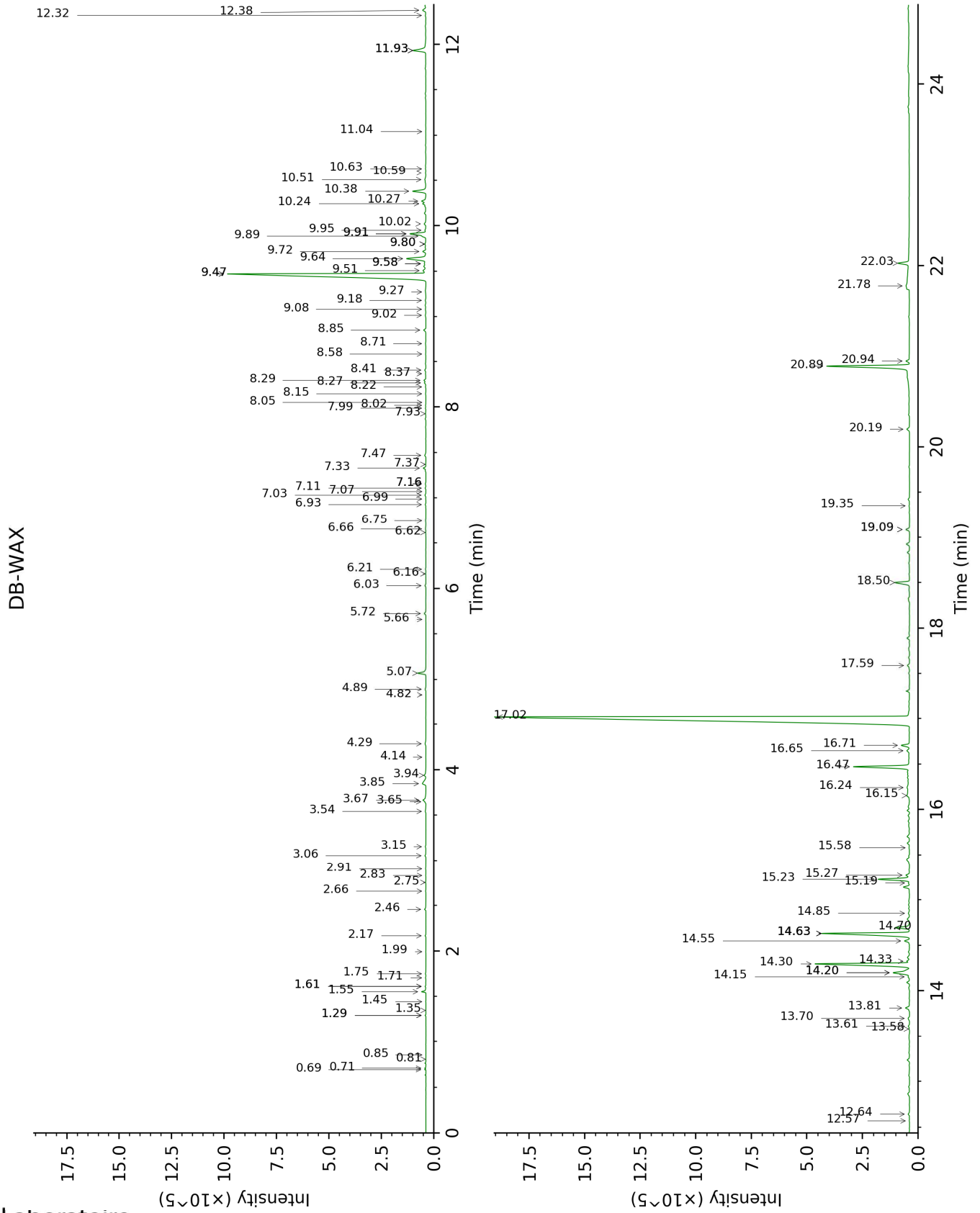
Note: no correction factor was applied

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.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
3-Buten-2-one	0.47	570	tr	0.81	912	tr
Isovaleral	0.60	641	0.02	0.71	885	0.02
2-Methylbutyral	0.62	652	0.03	0.69	880	0.02
Toluene	1.14	760	tr	1.29*	992	0.02
Hexanal	1.43	800	0.01	1.75	1042	0.02
Ethyl 2-methylbutyrate	2.00	849	0.18	1.55	1022	0.15
Ethyl isovalerate	2.04	852	0.02	1.71	1037	0.01
(3Z)-Hexenol	2.08	855	tr	5.66	1349	0.01
Nonene	2.52	892	tr	0.85	920	tr
Heptanal	2.62	900	0.01	2.91	1146	0.02
Santolinatriene	2.75	909	0.01	1.44	1012	tr
α -Thujene	3.02	927	0.01	1.35	1002	tr
α -Pinene	3.05	929	0.02	1.29*	992	[0.02]
Unknown [m/z 93, 91 (50), 92 (37), 79 (36), 77 (35), 121 (19)... 136 (t)]	3.10	932	0.01	1.61*	1028	0.03
Camphene	3.24	941	0.02	1.61*	1028	[0.03]
Propyl 2-methylbutyrate	3.30	946	0.08	2.46	1110	0.07
Benzaldehyde	3.42	953	0.01	7.16*	1459	0.03
β -Pinene	3.65*	968	0.04	1.99	1066	0.01
Sabinene	3.65*	968	[0.04]	2.17	1083	0.03
6-Methyl-5-hepten-2-one	3.90	985	0.06	4.89	1301	0.05
2-Pentylfuran	3.97*	990	0.08	3.54	1198	0.05
Myrcene	3.97*	990	[0.08]	2.76	1134	0.02
α -Phellandrene	4.14*	1001	0.08	2.66	1126	0.01
Octanal	4.14*	1001	[0.08]	4.29	1255	0.08
Yomogi alcohol	4.15	1002	0.04	6.03	1376	0.05
α -Terpinene	4.32	1013	0.01	2.83	1140	0.01
para-Cymene	4.43	1020	0.11	3.94	1228	0.11
Limonene	4.51*	1025	0.06	3.06	1158	0.05
1,8-Cineole	4.51*	1025	[0.06]	3.16	1166	0.03
(Z)- β -Ocimene	4.72	1038	0.06	3.65†	1206	0.23
(E)- β -Ocimene	4.88	1048	0.33	3.85	1221	0.33
γ -Terpinene	5.00	1056	0.14	3.67†	1207	[0.23]
Artemisia ketone	5.07	1060	0.39	5.07	1315	0.41
Octanol	5.30	1075	0.02	8.02	1524	0.02
Artemisia alcohol	5.44*	1084	0.12	7.33	1472	0.11
Terpinolene	5.44*	1084	[0.12]	4.14	1243	0.01
Linalool	5.69	1100	0.02	7.93	1517	0.03
Nonanal	5.75	1104	0.10	5.72	1354	0.09
Unknown [m/z 43, 81 (62), 59 (60), 85 (49), 82 (38)... 154 (2)]	5.97	1119	0.02			
Camphor	6.24	1136	0.01	6.99	1446	0.01

<i>trans</i> -Chrysanthemal	6.40	1147	0.01	7.07	1452	0.01
Borneol	6.63	1162	0.06	9.58*	1648	0.10
Artemisyl acetate	6.74	1169	0.02	6.21	1389	0.03
Nonanol	6.78	1172	0.02	9.27	1623	0.01
Terpinen-4-ol	6.82	1175	0.03	8.37	1551	0.02
Creosol	7.07*	1192	0.06	12.32	1884	0.03
α -Terpineol	7.07*	1192	[0.06]	9.58*	1648	[0.10]
Safranal	7.13	1196	0.03	8.71	1578	0.03
Decanal	7.33	1209	0.02	7.16*	1459	[0.03]
Citronellol	7.76	1236	0.03	10.58	1732	0.02
Carvone	7.82	1239	0.05	9.80*†	1666	0.10
(2 <i>E</i>)-Hexenyl isovalerate	7.86	1242	0.01	7.11	1455	0.03
Hexyl isovalerate	7.91	1246	0.01	6.62	1418	0.01
Linalyl acetate	8.16	1262	0.01	8.05	1526	0.01
α -Ionene	8.18	1263	0.01	6.75	1428	0.02
4,8-Dimethylnona-3,8-dien-2-one	8.34	1274	0.04	9.08	1607	0.04
(<i>E</i>)-4,8-Dimethylnona-3,8-dien-2-one	8.38	1276	0.01	9.02	1602	0.04
Pelargonic acid	8.51	1285	0.07	15.27	2167	0.17
Lavandulyl acetate	8.64	1294	0.04	8.58	1568	0.02
Tridecane	8.84	1307	0.01	4.82	1296	0.01
(2 <i>E</i> ,4 <i>E</i>)-Decadienal	8.90	1311	0.01	11.04	1771	0.01
Bicycloelemene	9.23	1335	0.02	6.93	1442	0.03
7 β H-Silphiperfol-5-ene	9.26	1337	0.01	6.16	1385	0.01
α -Longipinene	9.38	1345	0.04	6.66	1421	0.02
Dehydro-ar-ionene	9.42	1348	0.03			
α -Copaene	9.77*	1372	0.05	7.03	1450	0.05
Modhephene	9.77*	1372	[0.05]	7.37	1475	0.01
<i>cis</i> - β -Elemene	9.88*†	1380	1.35	8.15	1534	0.02
α -Isocomene	9.88*†	1380	[1.35]	7.47	1482	0.07
Capric acid	10.01*†	1389	[1.35]	16.15†	2258	1.11
β -Elemene	10.01*†	1389	[1.35]	8.27	1543	0.07
β -Isocomene	10.12	1397	0.01	7.99	1522	0.02
β -Caryophyllene	10.34	1413	0.10	8.29	1545	0.09
β -Copaene	10.48	1423	0.03	8.22	1540	0.02
Aromadendrene	10.60	1432	0.08	8.41	1554	0.06
Striatene?	10.77	1445	0.03			
α -Humulene	10.80	1447	0.05	9.18	1615	0.03
allo-Aromadendrene	10.89	1454	0.13	8.85	1590	0.11
(<i>E</i>)- β -Farnesene	11.00	1462	15.63	9.47*	1639	16.13
Dehydrosesquicineole	11.08	1468	0.20	9.89	1673	0.10
Germacrene D	11.19*	1476	1.28	9.64	1653	1.23
γ -Murolene	11.19*	1476	[1.28]	9.47*	1639	[16.13]
ar-Curcumene	11.24*	1480	0.24	10.51	1725	0.07
β -Selinene	11.24*	1480	[0.24]	9.72	1659	0.15
α -Selinene	11.39*	1491	0.90	9.80*†	1666	[0.10]
Bicyclogermacrene	11.39*	1491	[0.90]	9.91*	1675	0.88
Viridiflorene	11.39*	1491	[0.90]	9.51	1642	0.18
α -Zingiberene	11.44	1494	0.05	9.95	1679	0.05

α-Muurolene	11.47†	1496	0.19	9.91*	1675	[0.88]
(3Z,6E)-α-Farnesene	11.49†	1498	[0.19]	10.02	1684	0.10
γ-Cadinene	11.63*	1509	1.60	10.24	1702	0.15
3,6-Dihydrochamazulene	11.63*	1509	[1.60]	11.93*	1849	0.85
(3E,6E)-α-Farnesene	11.63*	1509	[1.60]	10.38	1714	0.72
Dihydrochamazulene isomer I	11.67	1512	0.17	11.93*	1849	[0.85]
δ-Cadinene	11.77	1520	0.29	10.27	1705	0.23
(E)-α-Bisabolene	12.05	1542	0.04	10.63	1736	0.02
Salviadienol?	12.13	1548	0.03	14.16	2056	0.06
Sesquirosefuran?	12.20	1554	0.08	11.93*	1849	[0.85]
(E)-Nerolidol	12.33	1563	0.22	13.61	2004	0.06
Spathulenol	12.40	1570	0.80	14.20*	2060	1.13
Dendrolasin	12.43†	1572	0.36	12.38	1889	0.19
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.49*†	1576	[0.36]			
Caryophyllene oxide	12.49*†	1576	[0.36]	12.64	1913	0.07
Caryophyllene oxide isomer	12.49*†	1576	[0.36]	12.57	1906	0.02
Globulol	12.49*†	1576	[0.36]	13.70	2012	0.09
Viridiflorol	12.58	1584	0.10	13.81	2023	0.21
5,6-Dihydrochamazulene	12.88	1607	0.18	14.20*	2060	[1.13]
(2,7Z)-Bisaboladien-4-ol	12.99	1616	0.22	14.63*	2103	4.78
τ-Muurolol	13.22*	1635	0.72	14.85	2125	0.06
τ-Cadinol	13.22*	1635	[0.72]	14.70	2109	0.68
α-Bisabolol oxide B, epimer 1	13.41*	1651	5.44	14.30	2070	5.07
α-Bisabolol oxide B, epimer 2	13.41*	1651	[5.44]	14.33	2073	0.11
Ageratochromene	13.46	1654	0.35	16.71	2316	0.42
β-Bisabolol	13.59	1665	0.08	14.63*	2103	[4.78]
(E)-Bisabol-11-ol	13.63	1668	0.02	15.19	2158	0.04
Bisabolone oxide A	13.72	1676	4.45	14.63*	2103	[4.78]
α-Bisabolol	13.77	1680	1.44	15.23	2162	1.46
(2E,6Z)-Farnesol	14.00	1699	0.08	16.24†	2268	[1.11]
Herniarin	14.10	1707	0.11	20.94	2813	0.14
Chamazulene	14.21	1717	2.59	16.47	2292	2.81
α-Bisabolol oxide A	14.55	1746	41.22	17.02	2351	41.94
α-Costol?	14.81	1769	0.23			
Unknown [m/z 94, 109 (54), 43 (53), 69 (48), 79 (40)...]	14.88	1775	0.01	19.08*	2585	0.18
Phytone	15.68	1847	0.31	14.55	2095	0.23
(Z)-Spiroether	15.94	1871	5.29	20.89	2806	5.14
(E)-Spiroether	16.06	1881	0.64	22.03	2954	0.74
(Z)-Tibetin spiroether	16.31	1904	0.07			

(E)-Tibetin spiroether	16.65	1937	0.16			
Palmitic acid	17.02	1972	1.47	21.78	2920	1.05
Eicosane	17.36	2005	0.03	13.58	2001	0.02
Heneicosane	18.37	2105	0.03	14.63*	2103	[4.78]
Phytol	18.45	2113	0.15	19.08*	2585	[0.18]
Linoleic acid	18.59	2129	0.22			
Oleic acid	18.66	2135	0.39			
cis-Vaccenic acid?	18.71	2141	0.40			
(9Z)-18-Octadecenolide?	18.97	2168	0.12			
Docosane	19.33	2206	0.03	15.58	2198	0.03
Tricosane	20.26	2307	0.35	16.65	2310	0.16
Tetracosane	21.15	2408	0.09	17.59	2413	0.11
Pentacosane	22.01	2509	0.72	18.50	2517	0.78
Hexacosane	22.83	2610	0.04	19.35	2617	0.03
Heptacosane	23.64	2712	0.13	20.19	2719	0.13
Total identified		94.54%			93.42%	
Total reported		94.58%			93.42%	

*: 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