

Date : January 18, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22A05-PTH01

Customer identification : Chamomile German - Egypt - C801052112R

Type : Essential oil

Source : *Matricaria chamomilla*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - 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 : January 14, 2022

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Dark blue liquid

Refractive index: 1.5057 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Isobutyral	tr	Aliphatic aldehyde
3-Buten-2-one	tr	Aliphatic ketone
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.02	Aliphatic aldehyde
Hexanal	0.01	Aliphatic aldehyde
Ethyl 2-methylbutyrate	0.13	Aliphatic ester
Ethyl isovalerate	0.01	Aliphatic ester
Hexanol	0.01	Aliphatic alcohol
Heptanal	0.01	Aliphatic aldehyde
Santolinatriene	0.01	Monoterpene
α -Pinene	0.02	Monoterpene
Camphene	0.02	Monoterpene
Propyl 2-methylbutyrate	0.07	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	0.04	Furan
Myrcene	0.02	Monoterpene
Unknown	0.01	Monoterpene
α -Phellandrene	0.01	Monoterpene
Octanal	0.06	Aliphatic aldehyde
Yomogi alcohol	0.06	Monoterpenic alcohol
Δ^3 -Carene	tr	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
α -Terpinene	0.01	Monoterpene
para-Cymene	0.11	Monoterpene
Limonene	0.04	Monoterpene
1,8-Cineole	0.03	Monoterpenic ether
(Z)- β -Ocimene	0.08	Monoterpene
Seudenone?	0.03	Aliphatic ketone
(E)- β -Ocimene	0.43	Monoterpene
γ -Terpinene	0.20	Monoterpene
Artemisia ketone	0.59	Monoterpenic ketone
Octanol	0.03	Aliphatic alcohol
Artemisia alcohol	0.19	Monoterpenic alcohol
Terpinolene	0.01	Monoterpene
para-Cymenene	0.02	Monoterpene
Linalool	0.03	Monoterpenic alcohol
Nonanal	0.08	Aliphatic aldehyde
Unknown	0.02	Oxygenated monoterpene
Camphor	0.02	Monoterpenic ketone
<i>trans</i> -Chrysanthemol	tr	Monoterpenic alcohol
Borneol	0.09	Monoterpenic alcohol
Artemisyl acetate	0.03	Monoterpenic ester

Nonanol	0.05	Aliphatic alcohol
Terpinen-4-ol	0.06	Monoterpenic alcohol
α -Terpineol	0.04	Monoterpenic alcohol
Safranal	0.05	Monoterpenic aldehyde
Decanal	0.01	Aliphatic aldehyde
Unknown	0.01	Unknown
Citronellol	0.02	Monoterpenic alcohol
(3Z)-Hexenyl isovalerate	0.03	Aliphatic ester
Carvone	0.07	Monoterpenic ketone
(2E)-Hexenyl isovalerate	0.02	Aliphatic ester
Hexyl isovalerate	0.04	Aliphatic ester
Geraniol	0.01	Monoterpenic alcohol
α -Ionene	0.01	Terpene derivative
4,8-Dimethylnona-3,8-dien-2-one	0.05	Terpenic ketone
(E)-4,8-Dimethylnona-3,8-dien-2-one	0.01	Terpenic ketone
Pelargonic acid	0.06	Aliphatic acid
Thymol	0.05	Monoterpenic alcohol
(2E,4E)-Decadienal	0.01	Aliphatic aldehyde
Bicycloelemene	0.05	Sesquiterpene
α -Longipinene	0.04	Sesquiterpene
Dehydro-ar-ionene	0.03	Miscellaneous
α -Copaene	0.06	Sesquiterpene
α -Isocomene	0.06	Sesquiterpene
Unknown	0.07	Sesquiterpene
β -Elemene	0.12	Sesquiterpene
(Z)-Jasmone	0.04	Jasmonate
Capric acid	0.94	Aliphatic acid
β -Isocomene	0.02	Sesquiterpene
β -Caryophyllene	0.11	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
Aromadendrene	0.09	Sesquiterpene
Striatene?	0.03	Sesquiterpene
α -Humulene	0.04	Sesquiterpene
allo-Aromadendrene	0.17	Sesquiterpene
(E)- β -Farnesene	18.19	Sesquiterpene
Dehydrosesquicineole	0.18	Sesquiterpenic ether
Germacrene D	1.82	Sesquiterpene
β -Selinene	0.18	Sesquiterpene
ar-Curcumene	0.05	Sesquiterpene
epi-Cubebol	0.02	Sesquiterpenic alcohol
Bicyclogermacrene	1.29	Sesquiterpene
Viridiflorene	0.11	Sesquiterpene
α -Selinene	0.07	Sesquiterpene
α -Zingiberene	0.06	Sesquiterpene
α -Muurolene	0.12	Sesquiterpene
(3Z,6E)- α -Farnesene	0.10	Sesquiterpene
3,6-Dihydrochamazulene	0.63	Azulene
(3E,6E)- α -Farnesene	0.90	Sesquiterpene
γ -Cadinene	0.27	Sesquiterpene
Dihydrochamazulene isomer I	0.17	Azulene
δ -Cadinene	0.32	Sesquiterpene
β -Sesquiphellandrene	0.05	Sesquiterpene

(2Z?,8Z?)-Matricaria ester	0.03	Polyyne ester
(E)- α -Bisabolene	0.04	Sesquiterpene
Sesquirosefuran?	0.06	Sesquiterpenic ether
(E)-Nerolidol	0.22	Sesquiterpenic alcohol
Spathulenol	0.56	Sesquiterpenic alcohol
(2Z?,8E?)-Matricaria ester	0.04	Polyyne ester
Dendrolasin	0.16	Sesquiterpenic ether
Globulol	0.12	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Viridiflorol	0.12	Sesquiterpenic alcohol
Ledol	0.08	Sesquiterpenic alcohol
Torilenol	0.15	Oxygenated sesquiterpene
5,6-Dihydrochamazulene	0.17	Azulene
(2,7Z)-Bisaboladien-4-ol	0.16	Sesquiterpenic alcohol
Unknown	0.09	Unknown
τ -Muurolool	0.07	Sesquiterpenic alcohol
τ -Cadinol	0.70	Sesquiterpenic alcohol
Unknown	0.09	Unknown
α -Bisabolol oxide B, epimer 2	5.09	Sesquiterpenic alcohol
α -Bisabolol oxide B, epimer 1	0.34	Sesquiterpenic alcohol
Ageratochromene	0.24	Chromane
epi- β -Bisabolol	0.13	Sesquiterpenic alcohol
β -Bisabolol	0.06	Sesquiterpenic alcohol
α -Bisabolol analog	0.02	Sesquiterpenic alcohol
Eudesma-4(15),7-dien-1 β -ol	0.13	Sesquiterpenic alcohol
Bisabolone oxide A	4.49	Sesquiterpenic ketone
α -Bisabolol	1.39	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1 α -ol	0.04	Sesquiterpenic alcohol
Chamazulene	2.45	Azulene
α -Bisabolol oxide A	37.31	Sesquiterpenic alcohol
Bisabolol oxide, epimer I	0.06	Sesquiterpenic alcohol
Benzyl benzoate	0.05	Phenolic ester
α -Costol?	0.16	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene
Phytone	0.22	Terpenic ketone
(Z)-Spiroether	4.32	Polyyne
(E)-Spiroether	0.45	Polyyne
(Z)-Tibetin spiroether	0.03	Polyyne
Methyl palmitate	0.07	Aliphatic ester
(E)-Tibetin spiroether	0.13	Polyyne
Palmitic acid	1.25	Aliphatic acid
Ethyl palmitate	0.02	Aliphatic ester
Eicosane	0.03	Alkane
Methyl linoleate	0.03	Aliphatic ester
Heneicosane	0.03	Alkane
Phytol	0.11	Diterpenic alcohol
Linoleic acid	0.38	Aliphatic acid
Oleic acid	0.44	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.04	Aliphatic acid
(9Z)-18-Octadecenolide?	0.11	Aliphatic lactone
Docosane	0.03	Alkane

Tricosane	0.36	Alkane
Tetracosane	0.10	Alkane
Pentacosane	0.73	Alkane
Hexacosane	0.08	Alkane
Heptacosane	0.15	Alkane
Unknown	0.44	Oxygenated triterpene
Unknown	0.16	Oxygenated triterpene
Consolidated total	94.32%	

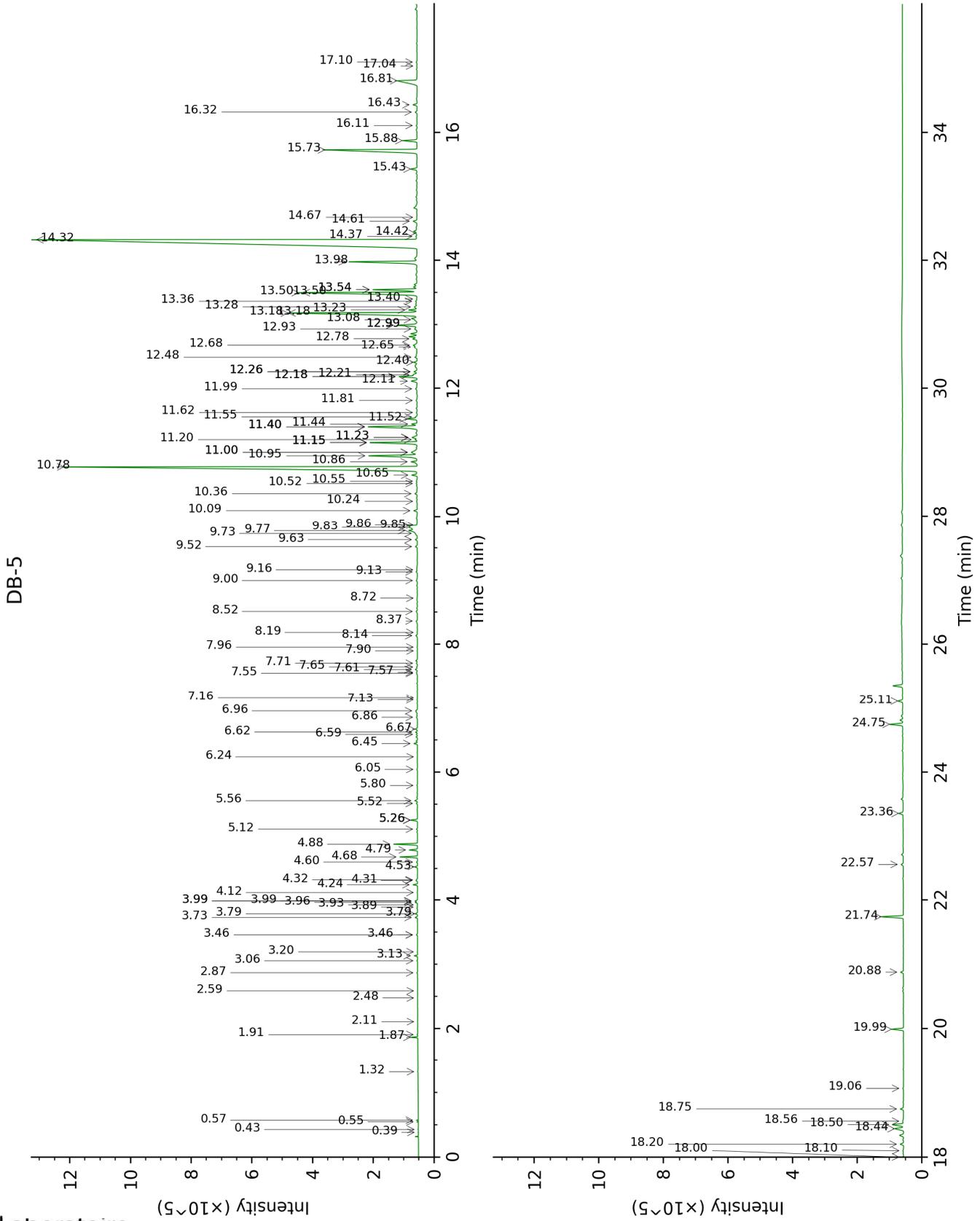
tr: The compound has been detected below 0.005% of total signal.

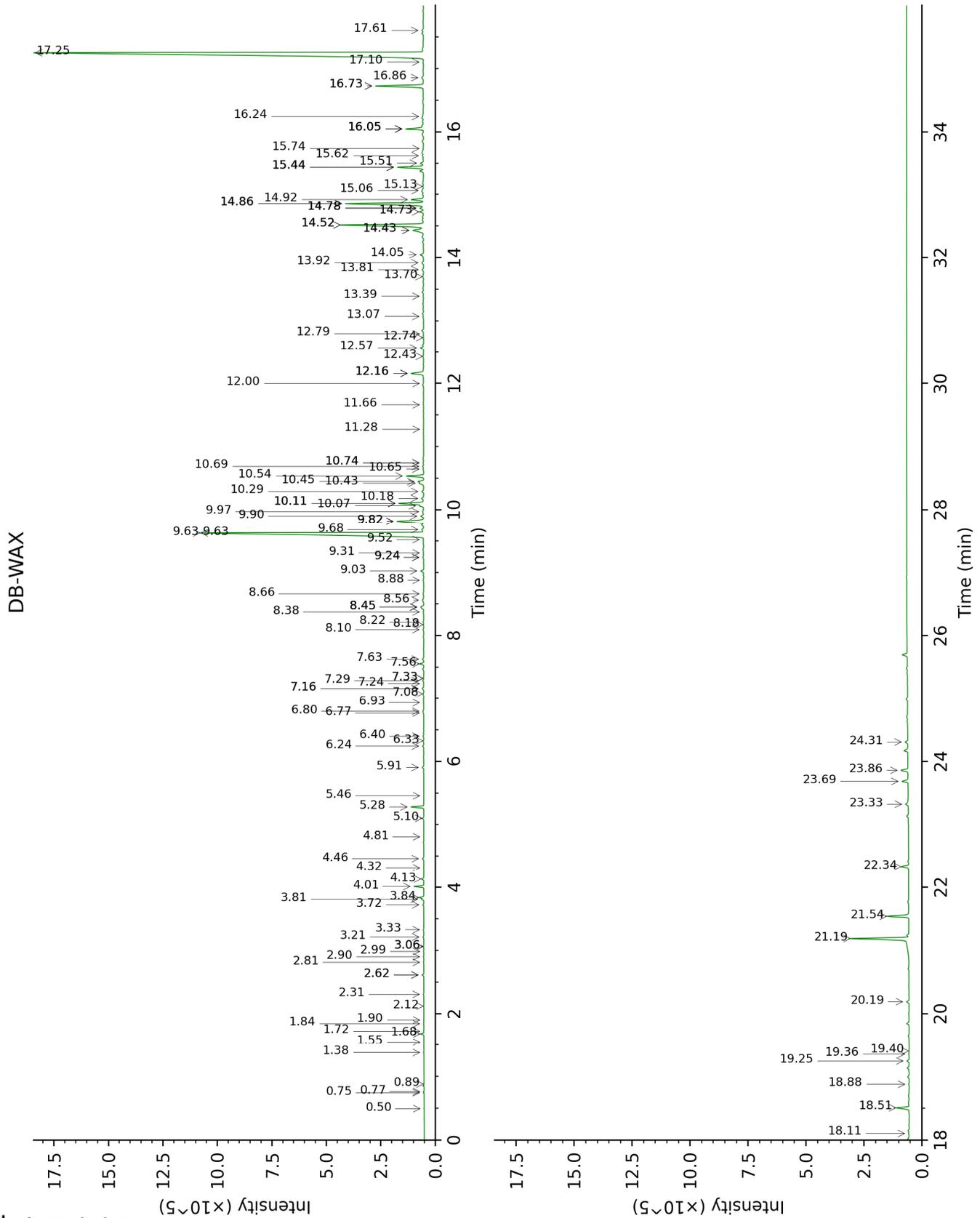
Note: no correction factor was applied

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	%
Isobutyral	0.38	536	tr	0.50	784	0.01
3-Buten-2-one	0.43	578	tr	0.88	912	0.01
Isovaleral	0.55	640	0.01	0.77	888	0.01
2-Methylbutyral	0.57	650	0.02	0.75	882	0.02
Hexanal	1.32	800	0.01	1.90	1045	0.01
Ethyl 2-methylbutyrate	1.87	849	0.13	1.68	1023	0.13
Ethyl isovalerate	1.91	853	0.01	1.84	1039	0.01
Hexanol	2.11	870	0.01	5.46	1323	0.01
Heptanal	2.48	903	0.01	3.06*	1147	0.02
Santolinatriene	2.59	911	0.01	1.55	1010	0.01
α-Pinene	2.87	930	0.02	1.38	992	0.02
Camphene	3.06	942	0.02	1.72	1027	0.02
Propyl 2-methylbutyrate	3.14	948	0.07	2.62*	1111	0.08
Benzaldehyde	3.20	952	0.01	7.33*	1459	0.02
β-Pinene	3.46*	970	0.03	2.12	1066	0.01
Sabinene	3.46*	970	[0.03]	2.31	1085	0.03
6-Methyl-5-hepten-2-one	3.73	988	0.06	5.10	1302	0.06
2-Pentylfuran	3.79*	992	0.07	3.72	1199	0.04
Myrcene	3.79*	992	[0.07]	2.90	1134	0.02
Unknown [m/z 93, 91 (46), 80 (44), 79 (42), 77 (33), 92 (20)... 136 (4)]	3.89	999	0.01	3.06*	1147	[0.02]
α-Phellandrene	3.93	1002	0.01	2.81	1127	0.02
Octanal	3.96	1004	0.06	4.46	1254	0.07
Yomogi alcohol	3.99*	1006	0.06	6.24	1379	0.06
Δ3-Carene	3.99*	1006	[0.06]	2.62*	1111	[0.08]
(3Z)-Hexenyl acetate	3.99*	1006	[0.06]	4.81	1280	0.01
α-Terpinene	4.12	1014	0.01	2.99	1141	0.01
para-Cymene	4.24	1022	0.11	4.13	1230	0.11
Limonene	4.31†	1026	0.06	3.22	1159	0.04
1,8-Cineole	4.32†	1026	[0.06]	3.33	1168	0.03
(Z)-β-Ocimene	4.53	1040	0.08	3.81	1206	0.10
Seudenone?	4.60	1044	0.03	8.38	1539	0.03
(E)-β-Ocimene	4.68	1050	0.43	4.02	1221	0.43
γ-Terpinene	4.79	1056	0.20	3.84	1208	0.21
Artemisia ketone	4.88	1062	0.59	5.28	1310	0.60
Octanol	5.12	1077	0.03	8.22	1526	0.04
Artemisia alcohol	5.26*	1086	0.19	7.56	1476	0.19
Terpinolene	5.26*	1086	[0.19]	4.32	1243	0.01
para-Cymenene	5.26*	1086	[0.19]	6.33	1385	0.02
Linalool	5.52	1102	0.03	8.10	1517	0.04
Nonanal	5.56	1105	0.08	5.91	1355	0.08

Unknown [m/z 43, 81 (62), 59 (60), 85 (49), 82 (38)... 154 (2)]	5.80	1120	0.02			
Camphor	6.05	1136	0.02	7.24	1453	0.02
<i>trans</i> -Chrysanthemol	6.24	1149	tr	9.63*	1638	18.41
Borneol	6.45	1162	0.09	9.82*	1653	1.82
Artemisyl acetate	6.59	1171	0.03	6.40	1390	0.04
Nonanol	6.62	1174	0.05	9.52	1629	0.03
Terpinen-4-ol	6.67	1177	0.06	8.66	1561	0.05
α -Terpineol	6.86	1189	0.04	9.82*	1653	[1.82]
Safranal	6.96	1195	0.05	8.88	1578	0.04
Decanal	7.13	1206	0.01	7.33*	1459	[0.02]
Unknown [m/z 109, 41 (42), 81 (39), 69 (32), 79 (25), 159 (23)... 174 (7)]	7.16	1208	0.01			
Citronellol	7.55	1234	0.02	10.74*	1730	0.04
(3 <i>Z</i>)-Hexenyl isovalerate	7.57	1236	0.03	7.16*	1447	0.10
Carvone	7.61	1239	0.07	10.07†	1673	1.63
(2 <i>E</i>)-Hexenyl isovalerate	7.65	1241	0.02	7.29	1456	0.06
Hexyl isovalerate	7.71	1245	0.04	6.77	1417	0.02
Geraniol	7.90	1258	0.01	11.66	1808	0.01
α -Ionene	7.96	1262	0.01	6.93	1430	0.02
4,8-Dimethylnona-3,8-dien-2-one	8.14	1274	0.05	9.24*	1606	0.06
(<i>E</i>)-4,8-Dimethylnona-3,8-dien-2-one	8.19	1277	0.01	9.24*	1606	[0.06]
Pelargonic acid	8.37	1289	0.06	15.44*	2163	1.47
Thymol	8.52	1299	0.05	15.13	2132	0.05
(2 <i>E</i> ,4 <i>E</i>)-Decadienal	8.72	1314	0.01	11.28	1775	0.02
Bicycloelemene	9.00	1333	0.05	7.08	1441	0.05
α -Longipinene	9.13	1342	0.04	6.80	1420	0.06
Dehydro-ar-ionene	9.16	1345	0.03			
α -Copaene	9.52	1370	0.06	7.16*	1447	[0.10]
α -Isocomene	9.63	1378	0.06	7.63	1482	0.07
Unknown [m/z 105, 120 (94), 119 (74), 161 (60), 91 (39), 93 (32)... 204 (20)]	9.73	1385	0.07			
β -Elemene	9.77†	1388	1.11	8.45*	1545	0.25
(<i>Z</i>)-Jasmone	9.83†	1392	[1.11]	12.43	1876	0.04
Capric acid	9.85†	1394	[1.11]	16.05*	2225	0.97
β -Isocomene	9.86	1394	0.02	8.18	1523	0.02
β -Caryophyllene	10.09	1411	0.11	8.45*	1545	[0.25]
β -Copaene	10.24	1422	0.03	8.45*	1545	[0.25]
Aromadendrene	10.36	1431	0.09	8.56	1553	0.11
Striatene?	10.52	1443	0.03			
α -Humulene	10.55	1445	0.04	9.31	1612	0.02
allo-Aromadendrene	10.65	1452	0.17	9.02	1589	0.17
(<i>E</i>)- β -Farnesene	10.78	1462	18.19	9.63*	1638	[18.41]

Dehydrosesquicineole	10.86	1468	0.18	10.10*†	1676	[1.63]
Germacrene D	10.95	1475	1.82	9.82*	1653	[1.82]
β-Selinene	11.00*	1479	0.38	9.90	1660	0.18
ar-Curcumene	11.00*	1479	[0.38]	10.69	1725	0.05
epi-Cubebol	11.15*	1490	1.48	12.00	1838	0.02
Bicyclogermacrene	11.15*	1490	[1.48]	10.10*†	1676	[1.63]
Viridiflorene	11.15*	1490	[1.48]	9.68	1642	0.11
α-Selinene	11.15*	1490	[1.48]	9.97	1666	0.07
α-Zingiberene	11.20	1494	0.06	10.18	1683	0.12
α-Muurolene	11.23*	1496	0.22	10.10*†	1676	[1.63]
(3Z,6E)-α-Farnesene	11.23*	1496	[0.22]	10.29	1692	0.10
3,6-Dihydrochamazulene	11.40*	1509	1.88	12.16*	1852	0.86
(3E,6E)-α-Farnesene	11.40*	1509	[1.88]	10.54	1712	0.90
γ-Cadinene	11.40*	1509	[1.88]	10.42	1703	0.27
Dihydrochamazulene isomer I	11.44	1512	0.17	12.16*	1852	[0.86]
δ-Cadinene	11.52	1519	0.32	10.45	1705	0.31
β-Sesquiphellandrene	11.55	1521	0.05	10.65	1721	0.05
(2Z?,8Z?)-Matricaria ester	11.62	1526	0.03	16.24	2245	0.08
(E)-α-Bisabolene	11.81	1541	0.04	10.74*	1730	[0.04]
Sesquirosefuran?	11.99	1555	0.06	12.16*	1852	[0.86]
(E)-Nerolidol	12.11	1565	0.22	13.81	2003	0.09
Spathulenol	12.18*	1570	0.60	14.43*	2063	0.91
(2Z?,8E?)-Matricaria ester	12.18*	1570	[0.60]	17.10	2336	0.04
Dendrolasin	12.21	1572	0.16	12.57	1889	0.19
Globulol	12.26*	1576	0.12	13.92	2014	0.12
Caryophyllene oxide	12.26*	1576	[0.12]	12.80	1909	0.02
Caryophyllene oxide isomer	12.26*	1576	[0.12]	12.74	1904	0.02
Viridiflorol	12.40	1588	0.12	14.05	2026	0.20
Ledol	12.48	1594	0.08	13.39	1964	0.03
Torilenol	12.65	1608	0.15	15.51	2169	0.19
5,6-Dihydrochamazulene	12.68	1610	0.17	14.52*	2071	5.26
(2,7Z)-Bisaboladien-4-ol	12.78	1618	0.16	14.86*	2104	4.64
Unknown [m/z 93, 41 (52), 79 (46), 91 (45), 43 (38), 67 (37)...]	12.93	1631	0.09			
τ-Muurolol	12.99*	1636	0.75	15.06	2125	0.07
τ-Cadinol	12.99*	1636	[0.75]	14.92	2111	0.70
Unknown [m/z 123, 43 (86), 81 (75), 95 (73), 82 (68), 161 (64), 105 (63)... 220 (6)]	13.08	1643	0.09	13.07	1935	0.05
α-Bisabolol oxide B, epimer 2	13.18*	1652	5.54	14.52*	2071	[5.26]
α-Bisabolol oxide B, epimer 1	13.18*	1652	[5.54]	14.43*	2063	[0.91]

Ageratochromene	13.23	1655	0.24	16.86	2310	0.14
epi-β-Bisabolol	13.28	1659	0.13	14.78*	2097	0.22
β-Bisabolol	13.36	1667	0.06	14.78*	2097	[0.22]
α-Bisabolol analog	13.40	1670	0.02	15.44*	2163	[1.47]
Eudesma-4(15),7-dien-1β-ol	13.50*	1678	4.61	16.05*	2225	[0.97]
Bisabolone oxide A	13.50*	1678	[4.61]	14.86*	2104	[4.64]
α-Bisabolol	13.54*	1682	1.43	15.44*	2163	[1.47]
Germacra-4(15),5,10(14)-trien-1α-ol	13.54*	1682	[1.43]	16.05*	2225	[0.97]
Chamazulene	13.98	1718	2.45	16.73*	2295	2.83
α-Bisabolol oxide A	14.32	1748	37.31	17.25	2352	37.80
Bisabolol oxide, epimer I	14.37	1752	0.06			
Benzyl benzoate	14.42	1757	0.05	18.88	2534	0.03
α-Costol?	14.61	1773	0.16			
Unknown [m/z 94, 109 (54), 43 (53), 69 (48), 79 (40)...]	14.67	1778	0.02	19.36	2589	0.03
Phytone	15.43	1847	0.22	14.73	2091	0.24
(Z)-Spiroether	15.73	1874	4.32	21.19	2813	4.03
(E)-Spiroether	15.88	1887	0.45	22.34	2960	0.42
(Z)-Tibetin spiroether	16.11	1908	0.03			
Methyl palmitate	16.32	1928	0.07	15.62	2181	0.07
(E)-Tibetin spiroether	16.43	1939	0.13			
Palmitic acid	16.81	1975	1.25	21.54	2857	1.18
Ethyl palmitate	17.04	1997	0.02	16.05*	2225	[0.97]
Eicosane	17.10	2002	0.03	13.70	1993	0.08
Methyl linoleate	18.00	2092	0.03	18.10	2446	0.04
Heneicosane	18.10	2102	0.03	14.78*	2097	[0.22]
Phytol	18.20	2113	0.11	19.24	2576	0.13
Linoleic acid	18.44	2138	0.38	23.69	3145	0.36
Oleic acid	18.50	2144	0.44	23.33	3094	0.17
cis-Vaccenic acid?	18.56	2150	0.04			
(9Z)-18-Octadecenolide?	18.75	2169	0.11			
Docosane	19.06	2202	0.03	15.74	2192	0.03
Tricosane	19.99	2302	0.36	16.73*	2295	[2.83]
Tetracosane	20.88	2402	0.10	17.61	2390	0.10
Pentacosane	21.74	2502	0.73	18.51	2491	0.71
Hexacosane	22.57	2602	0.08	19.40	2595	0.01
Heptacosane	23.36	2702	0.15	20.19	2689	0.14
Unknown [m/z 69, 81 (32), 41 (31), 95 (16), 91 (14), 93 (13), 107 (12)... 408? (3)]	24.75	2884	0.44	23.86	3169	0.45
Unknown [m/z 69, 81 (36), 41 (31), 93 (24), 95 (19), 91 (14), 67 (13), 121 (12)... 408? (2)]	25.11	2933	0.16	24.31	3233	0.16

Total identified	93.64%	92.55%
Total reported	94.55%	93.24%

*: 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