

## GC/MS BATCH NUMBER: CW0104

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**ESSENTIAL OIL:** CATNIP  
**BOTANICAL NAME:** NEPETA CATARIA  
**ORIGIN:** CANADA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF CATNIP OIL	%
4 $\alpha$ ,7 $\alpha$ ,7 $\alpha$ $\beta$ -NEPETALACTONE	54.0
4 $\alpha$ ,7 $\alpha$ ,7 $\alpha$ -NEPETALACTONE	20.7
$\beta$ -CARYOPHYLLENE	5.8
NEPETALIC ACID C	2.9
4 $\alpha$ ,7 $\beta$ ,7 $\alpha$ -NEPETALACTONE	1.3
$\alpha$ -PINENE	1.2

Comments from Robert Tisserand: Lively, herbaceous-green, almost lemony odor profile. Constituents are in expected amounts.

Date : May 25, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 18E18-PTH1-1-CC

**Customer identification :** Catnip - Canada - CW010479R

**Type :** Essential oil

**Source :** *Nepeta cataria*

**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 :** Sarah-Eve Tremblay, M. Sc. A., Chimiste

**Analysis date :** May 24, 2018

Checked and approved by :



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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Light yellow liquid

**Refractive index:**  $1.4855 \pm 0.0003$  (20 °C)

*CONCLUSION*

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

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.01	0.01	Aliphatic alcohol
Isobutyral	0.02	0.01	Aliphatic aldehyde
3-Buten-2-one	0.01	0.05	Aliphatic ketone
Acetic acid	0.01	0.01	Aliphatic acid
Isovaleral	0.10	0.10	Aliphatic aldehyde
2-Methylbutyral	0.05	0.05	Aliphatic aldehyde
Penten-3-ol	0.09	0.09	Aliphatic alcohol
3-Pentanone	0.04	0.05	Aliphatic ketone
2-Ethylfuran	0.06	0.06	Furan
Isoamyl alcohol	0.01	0.02	Aliphatic alcohol
2-Methylbutanol	0.01	0.01	Aliphatic alcohol
Senecionitrile	0.36	0.40*	Aliphatic nitrile
Methyl 2-methylbutyrate	0.02	0.02	Aliphatic ester
Hexanal	0.04	0.04	Aliphatic aldehyde
Dimethyl sulfoxide	0.01	0.01	Aliphatic sulfoxide
Furfural	0.01	0.01	Aliphatic alcohol
(2E)-Hexenal	0.21	0.23	Aliphatic aldehyde
(3Z)-Hexenol	0.67	0.70	Aliphatic alcohol
(2E)-Hexenol	0.20	0.22	Aliphatic alcohol
Hexanol	0.10	0.10	Aliphatic alcohol
Styrene	0.03	0.03	Simple phenolic
(3Z)-Hexenyl formate	tr	tr	Aliphatic ester
$\alpha$ -Thujene	0.01	0.01	Monoterpene
$\alpha$ -Pinene	1.23	1.25	Monoterpene
Camphene	0.03*	0.04	Monoterpene
$\alpha$ -Fenchene	[0.03]*	tr	Monoterpene
$\beta$ -Pinene	0.64*	0.51	Monoterpene
Sabinene	[0.64]*	0.15	Monoterpene
3-Butenyl isothiocyanate	0.02	0.01	Aliphatic thioester
Octen-3-ol	0.06	0.05	Aliphatic alcohol
6-Methyl-5-hepten-2-one	0.02*	0.02	Aliphatic ketone
Octan-3-one	[0.02]*	0.19*	Aliphatic ketone
Myrcene	0.02*	0.01	Monoterpene
2-Pentylfuran	[0.02]*	0.01	Furan
$\alpha$ -Phellandrene	0.05	0.04	Monoterpene
Octanal	0.01	0.01	Aliphatic aldehyde
para-Cymene	0.01	[0.40]*	Monoterpene
1,8-Cineole	0.18*	tr*	Monoterpenic ether
Limonene	[0.18]*	0.17	Monoterpene
$\beta$ -Phellandrene	[0.18]*	[tr]*	Monoterpene
(Z)- $\beta$ -Ocimene	0.04	0.06	Monoterpene
Benzeneacetaldehyde	0.06	0.01	Simple phenolic
(E)- $\beta$ -Ocimene	0.17	[0.19]*	Monoterpene
$\gamma$ -Terpinene	tr	0.01	Monoterpene
cis-Linalool oxide (fur.)	0.01	0.02	Monoterpenic alcohol
trans-Linalool oxide (fur.)	0.01*	0.01	Monoterpenic alcohol
Terpinolene	[0.01]*	0.01	Monoterpene
Linalool	0.03	0.04	Monoterpenic alcohol

Nonanal	0.04	0.05	Aliphatic aldehyde
<i>trans</i> -Pinocarveol	0.01	0.42*	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.02	0.01	Monoterpenic alcohol
Lavandulol	0.09	0.12	Monoterpenic alcohol
Terpinen-4-ol	0.02	0.02	Monoterpenic alcohol
Dill ether	0.02	0.03	Monoterpenic ether
Methyl salicylate	0.03	0.03	Phenolic ester
<i>cis</i> -Dihydrocarvone	0.03*	0.01	Monoterpenic ketone
Hexyl butyrate	[0.03]*	0.02	Aliphatic ester
Dihydrocarveol	0.01	0.02	Monoterpenic alcohol
Unknown	0.40	[0.42]*	Oxygenated monoterpene
$\beta$ -Cyclocitral?	0.02	0.01	Monoterpenic aldehyde
Nerol	0.01	0.02	Monoterpenic alcohol
(3 <i>Z</i> )-Hexenyl isovalerate	0.02	tr	Aliphatic ester
Carvone	0.25*	0.25	Monoterpenic ketone
Neral	[0.25]*	0.02	Monoterpenic aldehyde
Geraniol	0.01	0.01	Monoterpenic alcohol
(2 <i>E</i> )-Decenal	0.01	0.01	Aliphatic aldehyde
Geranial	0.02	0.02	Monoterpenic aldehyde
Bornyl acetate	0.04	0.04	Monoterpenic ester
Tridecane	0.02	0.03	Alkane
4 $\alpha$ ,7 $\alpha$ ,7 $\alpha$ -Nepetalactone	20.60*	20.74	Monoterpenic lactone
Eugenol	[20.60]*	0.04	Phenylpropanoid
Nepetalactone isomer I	0.53		Unknown
4 $\alpha$ ,7 $\alpha$ ,7 $\beta$ -Nepetalactone	54.01	53.88	Monoterpenic lactone
4 $\alpha$ ,7 $\beta$ ,7 $\alpha$ -Nepetalactone	1.28	1.46	Monoterpenic lactone
Isocaryophyllene	0.15	0.14	Sesquiterpene
$\beta$ -Caryophyllene	5.73*	5.75	Sesquiterpene
Isodihydronepetalactone	[5.73]*	0.06	Monoterpenic lactone
Nepetalactone analog I	0.44	0.36	Monoterpenic lactone
Unknown	0.02		Unknown
$\alpha$ -Humulene	0.51	0.47	Sesquiterpene
Unknown	0.02		Unknown
( <i>E</i> )- $\beta$ -Farnesene	0.38	0.38	Sesquiterpene
( <i>E</i> )- $\beta$ -Ionone	0.05	0.02	Ionone or analog
Nepetalic acid A	0.20	3.58*	Monoterpenic acid
(3 <i>Z</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	0.16	0.01	Sesquiterpene
( <i>Z</i> )- $\alpha$ -Bisabolene	0.47*	0.11	Sesquiterpene
Nepetalic acid B	[0.47]*	[3.58]*	Monoterpenic acid
$\beta$ -Bisabolene	0.04	0.08	Sesquiterpene
Isocaryophyllene epoxide B	3.60*	0.03	Sesquiterpenic ether
Hexenyl benzoate isomer	[3.60]*	0.03	Phenolic ester
Nepetalic acid C	[3.60]*	[3.58]*	Monoterpenic acid
( <i>E</i> )-Nerolidol	0.02	0.02	Sesquiterpenic alcohol
Nepetalactone analog VII	0.05		Monoterpenic lactone
Caryophyllene oxide	0.59*	0.52	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.59]*	0.09	Sesquiterpenic ether
Humulene epoxide I	tr	0.16	Sesquiterpenic ether
Humulene epoxide II	0.03	0.04	Sesquiterpenic ether
Unknown	0.04		Unknown
Unknown	0.08*		Unknown
Unknown	[0.08]*		Unknown

Nepetalactone analog II	0.04		Monoterpenic lactone
Unknown	0.06		Unknown
Unknown	0.04		Unknown
Unknown	0.01		Unknown
Unknown	0.20	0.20	Unknown
Unknown	0.06		Unknown
Unknown	0.07		Unknown
Unknown	1.68	1.28	Unknown
Unknown	0.38	0.35	Unknown
Unknown	0.05		Unknown
Unknown	0.02		Unknown
Phytone	0.07	0.06	Terpenic ketone
Hexahydrofarnesyl acetone	0.04*	0.04	Terpene derivative
Nepetalactone analog III	[0.04]*		Monoterpenic lactone
Unknown	0.04		Unknown
Unknown	0.05		Unknown
Unknown	0.22	0.22	Unknown
Unknown	0.05		Unknown
Nepetalactone analog IV	0.03		Monoterpenic lactone
Nepetalactone analog V	0.01		Aliphatic lactone
Nepetalactone analog VI	0.02		Monoterpenic lactone
Unknown	0.03		Unknown
Unknown	0.13	0.05	Unknown
Unknown	0.01		Unknown
Unknown	0.03		Unknown
Unknown	0.02		Unknown
Unknown	0.03		Unknown
Unknown	0.02		Unknown
Unknown	0.01		Unknown
Unknown	0.10		Unknown
Unknown	0.02		Unknown
Unknown	0.01		Unknown
Unknown	0.01		Unknown
<b>Total identified</b>	<b>94.50%</b>	<b>94.05%</b>	

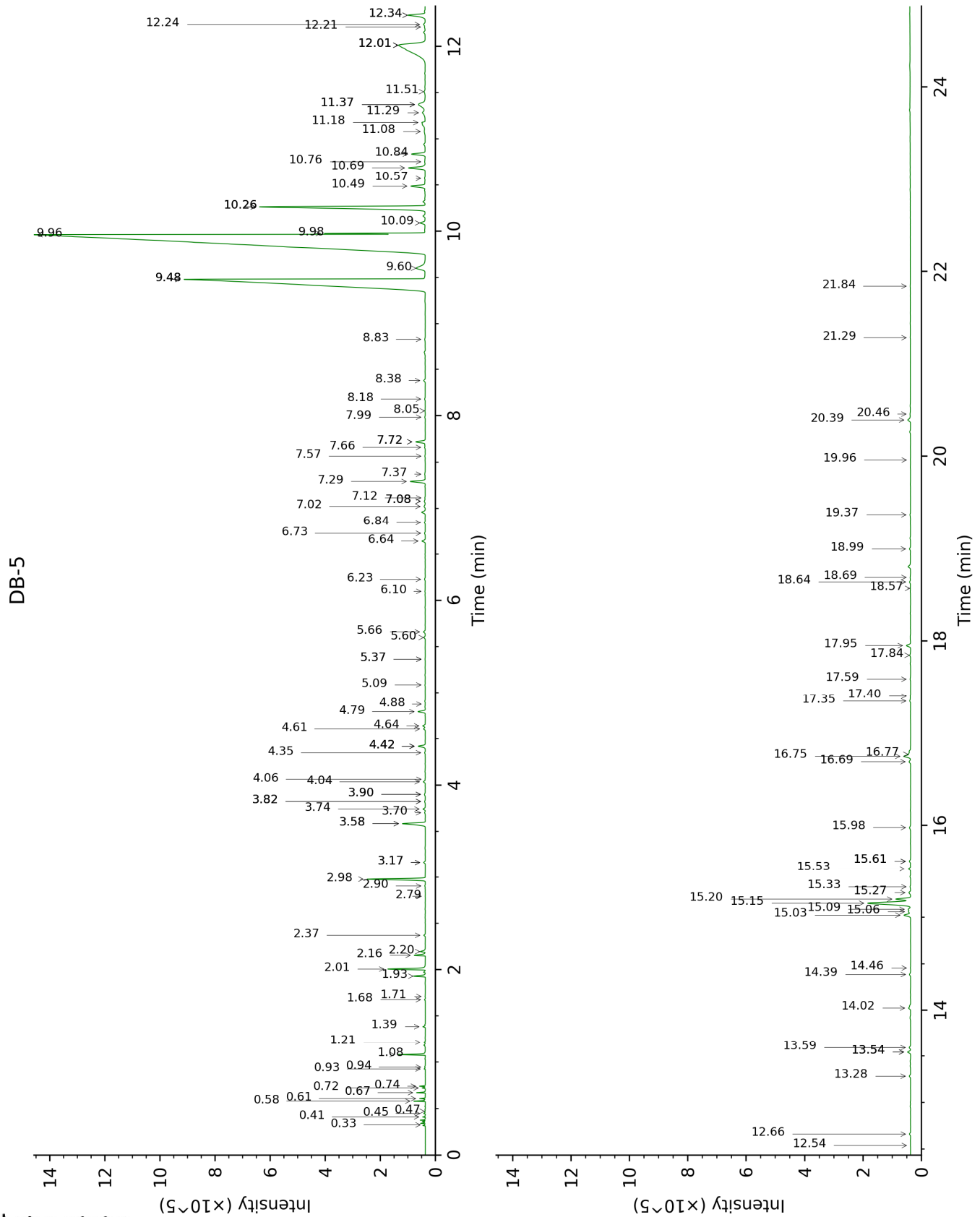
\*: Two or more compounds are coeluting on this column

[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.

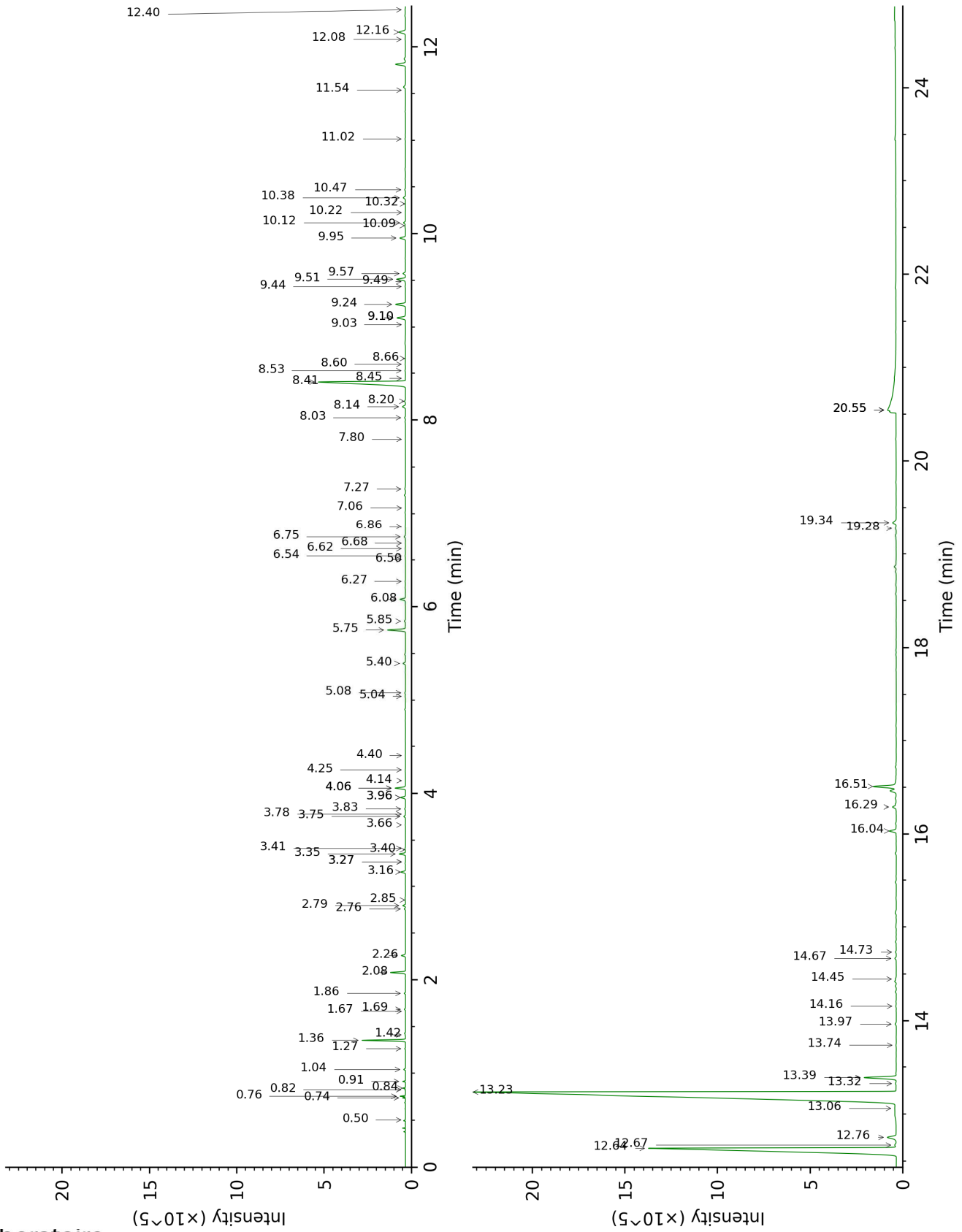
Note: no correction factor was applied

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DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.33	498	0.01	0.82	908	0.01
Isobutyral	0.41	540	0.02	0.50	786	0.01
3-Buten-2-one	0.45	575	0.01	0.84	911	0.05
Acetic acid	0.47	598	0.01	6.62	1414	0.01
Isovaleral	0.58	640	0.10	0.76	888	0.10
2-Methylbutyral	0.61	649	0.05	0.74	882	0.05
Penten-3-ol	0.67	672	0.09	2.80	1132	0.09
3-Pentanone	0.72	689	0.04	1.04	943	0.05
2-Ethylfuran	0.74	696	0.06	0.91	922	0.06
Isoamyl alcohol	0.92	728	0.01	3.41	1180	0.02
2-Methylbutanol	0.94	731	0.01	3.40	1179	0.01
Senecionitrile	1.08	751	0.36	4.06*	1228	0.40
Methyl 2-methylbutyrate	1.21	771	0.02	1.27	980	0.02
Hexanal	1.39	796	0.04	1.86	1048	0.04
Dimethyl sulfoxide	1.68	824	0.01	7.80	1501	0.01
Furfural	1.71	827	0.01	6.68	1418	0.01
(2E)-Hexenal	1.93	846	0.21	3.35	1176	0.23
(3Z)-Hexenol	2.01	853	0.67	5.75	1351	0.70
(2E)-Hexenol	2.16	866	0.20	6.08	1374	0.22
Hexanol	2.20	869	0.10	5.40	1325	0.10
Styrene	2.37	884	0.03	3.83	1212	0.03
(3Z)-Hexenyl formate	2.79	917	tr	4.14	1234	tr
$\alpha$ -Thujene	2.90	924	0.01	1.42	1004	0.01
$\alpha$ -Pinene	2.98	929	1.23	1.36	995	1.25
Camphene	3.16*	942	0.03	1.69	1031	0.04
$\alpha$ -Fenchene	3.16*	942	[0.03]	1.67	1029	tr
$\beta$ -Pinene	3.58*	970	0.64	2.08	1070	0.51
Sabinene	3.58*	970	[0.64]	2.26	1088	0.15
3-Butenyl isothiocyanate	3.70	978	0.02	6.50	1405	0.01
Octen-3-ol	3.74	981	0.06	6.75	1423	0.05
6-Methyl-5-hepten-2-one	3.82*	986	0.02	5.04	1300	0.02
Octan-3-one	3.82*	986	[0.02]	3.96*	1221	0.19
Myrcene	3.90*	991	0.02	2.85	1137	0.01
2-Pentylfuran	3.90*	991	[0.02]	3.66	1200	0.01
$\alpha$ -Phellandrene	4.04	1000	0.05	2.76	1130	0.04
Octanal	4.06	1002	0.01	4.40	1254	0.01
para-Cymene	4.35	1020	0.01	4.06*	1228	[0.40]
1,8-Cineole	4.42*	1025	0.18	3.27*	1169	tr
Limonene	4.42*	1025	[0.18]	3.16	1161	0.17
$\beta$ -Phellandrene	4.42*	1025	[0.18]	3.27*	1169	[tr]
(Z)- $\beta$ -Ocimene	4.61	1037	0.04	3.75	1207	0.06
Benzeneacetaldehyde	4.64	1039	0.06	8.66	1568	0.01
(E)- $\beta$ -Ocimene	4.79	1049	0.17	3.96*	1221	[0.19]
$\gamma$ -Terpinene	4.88	1054	tr	3.78	1208	0.01
cis-Linalool oxide (fur.)	5.09	1067	0.01	6.54	1408	0.02
trans-Linalool oxide (fur.)	5.37*	1085	0.01	6.86	1432	0.01
Terpinolene	5.37*	1085	[0.01]	4.25	1242	0.01

Linalool	5.60	1100	0.03	8.03	1519	0.04
Nonanal	5.66	1104	0.04	5.85	1357	0.05
<i>trans</i> -Pinocarveol	6.10	1132	0.01	9.10*	1603	0.42
<i>trans</i> -Verbenol	6.23	1140	0.02	9.49	1634	0.01
Lavandulol	6.64	1167	0.09	9.57	1641	0.12
Terpinen-4-ol	6.73	1172	0.02	8.53	1558	0.02
Dill ether	6.84	1180	0.02	7.27	1462	0.03
Methyl salicylate	7.02	1191	0.03	10.47	1714	0.03
<i>cis</i> -Dihydrocarvone	7.08*	1195	0.03	8.45	1552	0.01
Hexyl butyrate	7.08*	1195	[0.03]	6.27	1388	0.02
Dihydrocarveol	7.12	1197	0.01	10.32	1702	0.02
Unknown [m/z 123, 138 (67), 81 (60), 95 (42), 67 (41), 80 (33)]	7.29	1209	0.40	9.10*	1603	[0.42]
$\beta$ -Cyclocitral?	7.37	1214	0.02	8.60	1563	0.01
Nerol	7.56	1227	0.01	11.02	1761	0.02
(3 <i>Z</i> )-Hexenyl isovalerate	7.66	1233	0.02	7.06	1446	tr
Carvone	7.72*	1238	0.25	9.95	1672	0.25
Neral	7.72*	1238	[0.25]	9.44	1630	0.02
Geraniol	7.99	1255	0.01	11.54	1806	0.01
(2 <i>E</i> )-Decenal	8.05	1260	0.01	9.03	1597	0.01
Geranial	8.18	1268	0.02	10.08	1683	0.02
Bornyl acetate	8.38	1282	0.04	8.20	1533	0.04
Tridecane	8.83	1313	0.02	5.08	1302	0.03
4 $\alpha$ ,7 $\alpha$ ,7 $\alpha$ -Nepetalactone	9.48*	1359	20.60	12.64	1904	20.74
Eugenol	9.48*	1359	[20.60]	14.73	2103	0.04
Nepetalactone isomer I	9.60	1367	0.53			
4 $\alpha$ ,7 $\alpha$ ,7 $\beta$ -Nepetalactone	9.96	1393	54.01	13.24	1959	53.88
4 $\alpha$ ,7 $\beta$ ,7 $\alpha$ -Nepetalactone	9.98	1394	1.28	13.39	1974	1.46
Isocaryophyllene	10.09	1402	0.15	8.14	1528	0.14
$\beta$ -Caryophyllene	10.26*	1414	5.73	8.41	1549	5.75
Isodihydronepetalactone	10.26*	1414	[5.73]	13.97	2028	0.06
Nepetalactone analog I	10.49	1431	0.44	12.16	1861	0.36
Unknown [m/z 57, 71 (93), 43 (87), 85 (48), 41 (40), 81 (36), 55 (30)...]	10.57	1438	0.02			
$\alpha$ -Humulene	10.69	1446	0.51	9.24	1614	0.47
Unknown [m/z 57, 71 (92), 43 (69), 85 (49), 41 (31), 55 (23)...]	10.76	1452	0.02			
( <i>E</i> )- $\beta$ -Farnesene	10.84	1458	0.38	9.51	1636	0.38
( <i>E</i> )- $\beta$ -Ionone	11.08	1476	0.05	12.40	1882	0.02
Nepetalic acid A	11.18	1483	0.20	20.54*	2749	3.58
(3 <i>Z</i> ,6 <i>E</i> )- $\alpha$ -Farnesene	11.29	1491	0.16	10.22	1694	0.01
( <i>Z</i> )- $\alpha$ -Bisabolene	11.37*	1498	0.47	10.38	1707	0.11
Nepetalic acid B	11.37*	1498	[0.47]	20.54*	2749	[3.58]
$\beta$ -Bisabolene	11.51	1508	0.04	10.12	1685	0.08
Isocaryophyllene epoxide B	12.01*	1548	3.60	12.08	1854	0.03

Hexenyl benzoate isomer	12.01*	1548	[3.60]	14.16	2047	0.03
Nepetalic acid C	12.01*	1548	[3.60]	20.54*	2749	[3.58]
(E)-Nerolidol	12.21	1563	0.02	13.74	2006	0.02
Nepetalactone analog VII	12.24	1565	0.05			
Caryophyllene oxide	12.34*	1573	0.59	12.76	1915	0.52
Caryophyllene oxide isomer	12.34*	1573	[0.59]	12.67	1907	0.09
Humulene epoxide I	12.54	1589	tr	13.06	1943	0.16
Humulene epoxide II	12.66	1599	0.03	13.32	1968	0.04
Unknown [m/z 81, 95 (42), 43 (41), 137 (40), 123 (35), 41 (34)...]	13.28	1650	0.04			
Unknown [m/z 81, 43 (86), 109 (82), 166 (81), 71 (54), 41 (47)...]	13.54*	1671	0.08			
Unknown [m/z 81, 43 (84), 166 (84), 109 (74), 71 (58), 41 (58)...]	13.54*	1671	[0.08]			
Nepetalactone analog II	13.59	1676	0.04			
Unknown [m/z 81, 109 (68), 41 (57), 69 (53), 167 (36), 67 (31)...]	14.02	1712	0.06			
Unknown [m/z 153, 82 (85), 43 (81), 67 (69), 81 (46)...]	14.39	1743	0.04			
Unknown [m/z 153, 43 (81), 81 (59), 55 (40), 41 (37), 82 (33)...]	14.46	1749	0.01			
Unknown [m/z 82, 81 (67), 67 (64), 55 (42), 167 (39), 41 (24), 83 (23)...]	15.03	1799	0.20	16.29	2262	0.20
Unknown [m/z 81, 96 (74), 43 (57), 87 (50), 109 (46), 166 (43)...]	15.06	1802	0.06			
Unknown [m/z 81, 109 (56), 55 (56), 41 (40), 82 (36), 67 (35)...]	15.09	1804	0.07			
Unknown [m/z 82, 81 (68), 67 (65), 55 (46), 167 (34)...]	15.16	1810	1.68	16.51	2285	1.28
Unknown [m/z 81, 166 (95), 109 (80), 43 (64), 96 (51), 87 (41)...]	15.20	1814	0.38	16.04	2235	0.35
Unknown [m/z 82, 81 (64), 67 (61), 55 (37), 41 (24), 167 (23)...]	15.27	1821	0.05			
Unknown [m/z 81, 166 (64), 109 (60), 43 (55), 55 (45), 96 (43), 41 (42)...]	15.33	1827	0.02			
Phytone	15.53	1845	0.07	14.67	2096	0.06
Hexahydrofarnesyl	15.61*	1852	0.04	14.45	2075	0.04

acetone						
Nepetalactone analog III	15.61*	1852	[0.04]			
Unknown [m/z 82, 81 (73), 67 (50), 55 (49), 83 (46), 41 (35)...]	15.98	1886	0.04			
Unknown [m/z 82, 81 (84), 58 (57), 55 (48), 83 (47), 67 (46)...]	16.69	1952	0.05			
Unknown [m/z 82, 81 (65), 83 (47), 55 (42), 67 (41), 167 (38)...]	16.75	1958	0.22	19.34	2602	0.22
Unknown [m/z 82, 81 (76), 83 (45), 55 (39), 167 (36), 67 (30)...]	16.77	1960	0.05			
Nepetalactone analog IV	17.35	2016	0.03			
Nepetalactone analog V	17.40	2021	0.01			
Nepetalactone analog VI	17.59	2040	0.02			
Unknown [m/z 93, 81 (59), 69 (52), 121 (38), 80 (35), 41 (33)...]	17.84	2065	0.03			
Unknown [m/z 93, 69 (55), 81 (52), 80 (41), 121 (35), 41 (28)...]	17.95	2076	0.13	19.28	2594	0.05
Unknown [m/z 81, 69 (68), 41 (64), 55 (57), 67 (51), 43 (42)...]	18.57	2139	0.01			
Unknown [m/z 69, 81 (98), 93 (92), 41 (55), 80 (52), 68 (43)...]	18.64	2146	0.03			
Unknown [m/z 81, 69 (63), 41 (49), 95 (49), 55 (48), 67 (45)...]	18.69	2151	0.02			
Unknown [m/z 69, 81 (80), 93 (65), 41 (49), 80 (42), 121 (40)...]	18.99	2183	0.03			
Unknown [m/z 81, 93 (68), 69 (61), 83 (48), 41 (47), 67 (42)...]	19.37	2223	0.02			
Unknown [m/z 81, 43 (86), 44 (67), 166 (58), 55 (57), 67 (55)...]	19.96	2287	0.01			
Unknown [m/z 81, 91 (64), 131 (54), 120 (38), 195 (32), 41 (31)...]	20.39	2335	0.10			
Unknown [m/z 81, 166 (96), 55 (62), 69 (52), 109 (51), 41 (50)...]	20.46	2342	0.02			
Unknown [m/z 81, 167 (96), 166 (23), 123 (19), 43 (17), 55 (17)...]	21.29	2436	0.01			
Unknown [m/z 81, 167 (44), 91 (31), 131 (29), 93	21.84	2501	0.01			

(27), 105 (26), 146 (26)...		
<b>Total identified</b>	<b>94.50%</b>	<b>94.05%</b>
<b>Total reported</b>	<b>98.33%</b>	<b>96.16%</b>

\*: Two or more compounds are coeluting on this column

[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