

GC/MS BATCH NUMBER: Y50101

ESSENTIAL OIL: BLUE YARROW ORGANIC
BOTANICAL NAME: ACHILLEA MILLEFOLIUM
ORIGIN: BULGARIA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF BLUE YARROW ORGANIC OIL	%
SABINENE	12.4
GERMACRENE D + γ -MUUROLENE	11.7
β -PINENE	10.9
β -CARYOPHYLLENE	10.2
CHAMAZULENE	9.2
ARTEMISIA KETONE	7.3
trans- β -FARNESENE	3.5
1,8-CINEOLE	2.2
α -PINENE	2.0
CARYOPHYLLENE OXIDE	1.4
TERPINEN-4-ol	1.3
α -HUMULENE	1.3
CHRYSANTHENONE	1.2
(E,E)- α -FARNESENE	1.0

Comments from Robert Tisserand: Clear, dried herb, Chamomile-like odor quality. Contains 9% chamazulene.

Date : September 29, 2017

SAMPLE IDENTIFICATION

Internal code : 17128-PTH5-1-CC

Customer identification : Blue Yarrow Organic - 02A-2017-B

Type : Essential oil

Source : *Achillea millefolium*

Customer : Plant Therapy

ANALYSIS

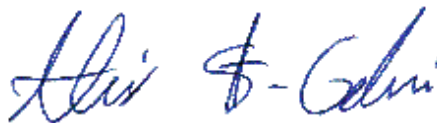
Method : PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Identifications double-checked by GC-MS

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

Analysis date : 2017-09-28

Checked and approved by :



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

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
2-Methylheptane	1.48	780	0.02	0.02	709	0.57	Alkane
Hexanal	1.71	805	0.02	0.02	1003	1.59	Aliphatic aldehyde
Santolinatriene	2.94	898	0.22	0.36	965	1.30*	Monoterpene
Tricyclene	3.22	915	0.02	0.01	910	1.07	Monoterpene
α -Thujene	3.30	920	0.26	[0.36]	965	1.30*	Monoterpene
α -Pinene	3.41	926	1.96	1.93	936	1.18	Monoterpene
Camphene	3.70	943	0.24	0.20	988	1.48	Monoterpene
Thuja-2,4(10)-diene	3.79	948	0.19	12.76	1056	2.04*	Monoterpene
Sabinene	4.16	970	12.38	[12.76]	1056	2.04*	Monoterpene
β -Pinene	4.23	974	10.89	9.76	1035	1.86	Monoterpene
Myrcene	4.47	989	0.51	0.91	1110	2.61††*	Monoterpene
Octen-3-ol	4.52	991	0.05	0.02	1395	6.78	Aliphatic alcohol
Yomogi alcohol	4.71	1002	0.32	0.39	1366	6.30*	Monoterp. alcohol
α -Phellandrene	4.74*	1004	0.07	[0.35]	1110	2.61*	Monoterpene
Δ 3-Carene	4.74*	1004	[0.07]	0.02	1104	2.52	Monoterpene
α -Terpinene	4.94	1015	0.42	[0.91]	1116	2.69††	Monoterpene
para-Cymene	5.13	1025	0.41	0.35	1201	3.77	Monoterpene
Limonene	5.17	1027	0.55	2.95	1139	2.98*	Monoterpene
β -Phellandrene	5.20	1029	0.20	[2.95]	1139	2.98*	Monoterpene
1,8-Cineole	5.23	1030	2.24	[2.95]	1139	2.98*	Monoterp. ether
<i>cis</i> - β -Ocimene	5.34	1037	0.13	0.87	1182	3.58*	Monoterpene
<i>trans</i> - β -Ocimene	5.53	1047	0.45	0.49	1206	3.85	Monoterpene
γ -Terpinene	5.72	1057	0.77	[0.87]	1182	3.58*	Monoterpene
Artemisia ketone	5.81	1062	7.26	7.13	1290	5.09	Monoterp. ketone
<i>cis</i> -Sabinene hydrate	6.05	1075	0.07	1.68	1416	7.30*	Monoterp. alcohol
Terpinolene	6.21*	1084	0.64	0.23	1222	4.08	Monoterpene
Artemisia alcohol	6.21*	1084	[0.64]	1.13	1446	7.99*	Monoterp. alcohol
Perillene	6.59	1102	0.09	0.05	1342	5.91	Monoterp. ether
Linalool	6.69	1106	0.28	0.24	1491	9.08	Monoterp. alcohol
α -Thujone	6.74	1108	0.06	0.33	1350	6.04*	Monoterp. ketone
Nonanal	6.79*	1109	0.20	0.10	1333	5.77	Aliphatic aldehyde
Filifolone	6.79*	1109	[0.20]	[0.33]	1350	6.04*	Monoterp. ketone
β -Thujone	7.01	1118	0.04	[0.39]	1366	6.30*	Monoterp. ketone
Chrysanthenone	7.12	1121	1.23	[1.13]	1446	7.99*	Monoterp. ketone
<i>trans</i> -Pinocarveol	7.68	1142	0.10	0.18	1562	11.68	Monoterp. alcohol
Camphor	7.76†	1145	0.84	[1.68]	1416	7.30*	Monoterp. ketone
<i>trans</i> -Verbenol	7.81†	1147	[0.84]	0.18	1608	13.55*	Monoterp. alcohol
meta-Mentha-4,6-dien-8-ol	8.03	1154	0.02				Monoterp. alcohol
<i>trans</i> -Chrysanthemol?	8.16	1159	0.40				Monoterp. alcohol
Lavandulol	8.35	1166	0.09	[0.18]	1608	13.55*	Monoterp. alcohol
<i>cis</i> -Chrysanthenol	8.42*	1169	0.79				Monoterp. alcohol

Artemisyl acetate	8.42*	1169	[0.79]				Monoterp. ester
Borneol	8.64	1177	0.38	16.74	1616	14.00†*	Monoterp. alcohol
Terpinen-4-ol	8.81	1183	1.33	11.78	1517	10.00*	Monoterp. alcohol
Artemisia ketone analog	9.10	1193	0.10				Oxygenated monoterp.
α-Terpineol	9.46	1203	0.26	[7.28]	1616	14.00*	Monoterp. alcohol
<i>trans</i> -Chrysanthenyl acetate	10.47	1225	0.11	0.15	1469	8.55	Monoterp. ester
Artemisyl ester	10.98	1237	0.08				Monoterp. ester
Linalyl acetate	11.40	1246	0.10	0.73	1500	9.37*	Monoterp. ester
<i>cis</i> -Chrysanthenyl acetate	11.63	1251	0.15	[0.73]	1500	9.37*	Monoterp. ester
4-Thujen-2-α-yl acetate?	12.32	1266	0.51	0.58	1548	11.17*	Monoterp. ester
Bornyl acetate	12.90	1279	0.57	[0.73]	1500	9.37*	Monoterp. ester
<i>cis</i> -Chrysanthemyl acetate	13.21	1285	0.33	0.45	1544	10.99	Monoterp. ester
Lavandulyl acetate	13.35	1289	0.07	0.07	1553	11.35	Monoterp. ester
<i>trans</i> -Pinocarvyl acetate	13.61	1294	0.04	[0.58]	1548	11.17*	Monoterp. ester
Bicycloelemene	15.03	1317	0.03	0.13	1427	7.53*	Sesquiterpene
α-Terpinyl acetate	16.65	1341	0.07	[0.18]	1608	13.55*	Monoterp. ester
<i>cis</i> -Chrysanthenyl propionate?	16.86	1344	0.06				Monoterp. ester
α-Copaene	17.70*	1357	0.18	[0.13]	1427	7.53*	Sesquiterpene
Eugenol	17.70*	1357	[0.18]	0.09	2050	38.79	Phenylpropanoid
Neryl acetate	17.86	1360	0.05	1.03	1664	16.52*	Monoterp. ester
β-Bourbonene	18.13	1364	0.50	[1.13]	1446	7.99*	Sesquiterpene
Lavandulyl propionate?	18.30	1366	0.07				Monoterp. ester
β-Elemene	18.88	1375	0.22	[11.78]	1517	10.00*	Sesquiterpene
Geranyl acetate	19.38	1382	0.12	0.22	1701	18.50*	Monoterp. ester
β-Caryophyllene	20.76	1402	10.19	[11.78]	1517	10.00*	Sesquiterpene
β-Copaene	21.54	1411	0.11	[11.78]	1517	10.00*	Sesquiterpene
<i>trans</i> -α-Bergamotene	22.17	1419	0.06	[11.78]	1517	10.00*	Sesquiterpene
Sesquisabinene	22.92	1428	0.24	0.44	1593	12.85	Sesquiterpene
α-Humulene	23.43	1434	1.25	1.68	1577	12.24	Sesquiterpene
<i>trans</i> -β-Farnesene	24.63	1448	3.53	[7.28]	1616	14.00*	Sesquiterpene
Germacrene D	25.85*	1463	11.72	[16.74]	1619	14.12†*	Sesquiterpene
γ-Muurolene	25.85*	1463	[11.72]	[16.74]	1619	14.12†*	Sesquiterpene
Bicyclgermacrene	26.91	1475	0.93	1.04	1636	15.03	Sesquiterpene
<i>trans</i> -β-Bergamotene?	27.67	1485	0.11	0.87	1647	15.65*	Sesquiterpene
α-Zingiberene	27.85	1487	0.71	[0.87]	1647	15.65*	Sesquiterpene
γ-Cadinene	28.70	1497	0.08	[1.03]	1664	16.52*	Sesquiterpene
(<i>E,E</i>)-α-Farnesene	29.14	1503	1.04	1.45	1688	17.83*	Sesquiterpene
δ-Cadinene	29.38	1506	0.41	0.62	1667	16.69	Sesquiterpene
Lavandulyl 2-methylbutyrate	29.60	1509	0.09	[0.22]	1701	18.50*	Monoterp. ester
<i>trans</i> -Cadina-1,4-diene	30.24	1518	0.31	[1.45]	1688	17.83*	Sesquiterpene
<i>trans</i> -α-Bisabolene	31.46	1535	0.22	0.20	1712	19.27	Sesquiterpene

α -Elemol	32.49	1550	0.13	0.12	1996	36.97	Sesquiterp. alcohol
Caryophyllene oxide	33.86*	1569	1.81	1.38	1838	28.02	Sesquiterp. ether
(E)-Nerolidol	33.86*	1569	[1.81]	0.63	2007	37.38	Sesquiterp. alcohol
Germacrene D-4-ol	33.96	1570	0.13	0.19	1951	34.94	Sesquiterp. alcohol
Spirojatamol	34.19	1574	0.20	0.30	1968	35.70	Sesquiterp. alcohol
Viridiflorol	34.84	1583	0.32	0.48	1978	36.14	Sesquiterp. alcohol
Humulene epoxide II	35.23	1588	0.05	0.09	1900	32.56	Sesquiterp. ether
β -Eudesmol	37.88*	1646	0.65	0.25	2114	40.72	Sesquiterp. alcohol
α -Bisabolol oxide B	37.88*	1646	[0.65]	0.44	2036	38.33	Sesquiterp. alcohol
α -Cadinol	38.11	1652	0.26	0.20	2132	41.20	Sesquiterp. alcohol
α -Bisabolone oxide	38.97	1673	0.29				Sesquiterp. ketone
α -Bisabolol	39.48	1686	0.12	0.21	2121	40.91	Sesquiterp. alcohol
Chamazulene	40.76	1722	9.22	9.25	2224	43.54	Azulene
α -Bisabolol oxide A	41.45	1744	0.30				Sesquiterp. alcohol
Phytone	44.44	1845	0.13	0.12	2077	39.59	Aliphatic ketone
cis-Spiroether	45.64	1888	0.26	0.37	2739	53.95	Polyne
Total identified			94.63%	94.61%			

*: 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

Note: no correction factor was applied

OTHER DATA

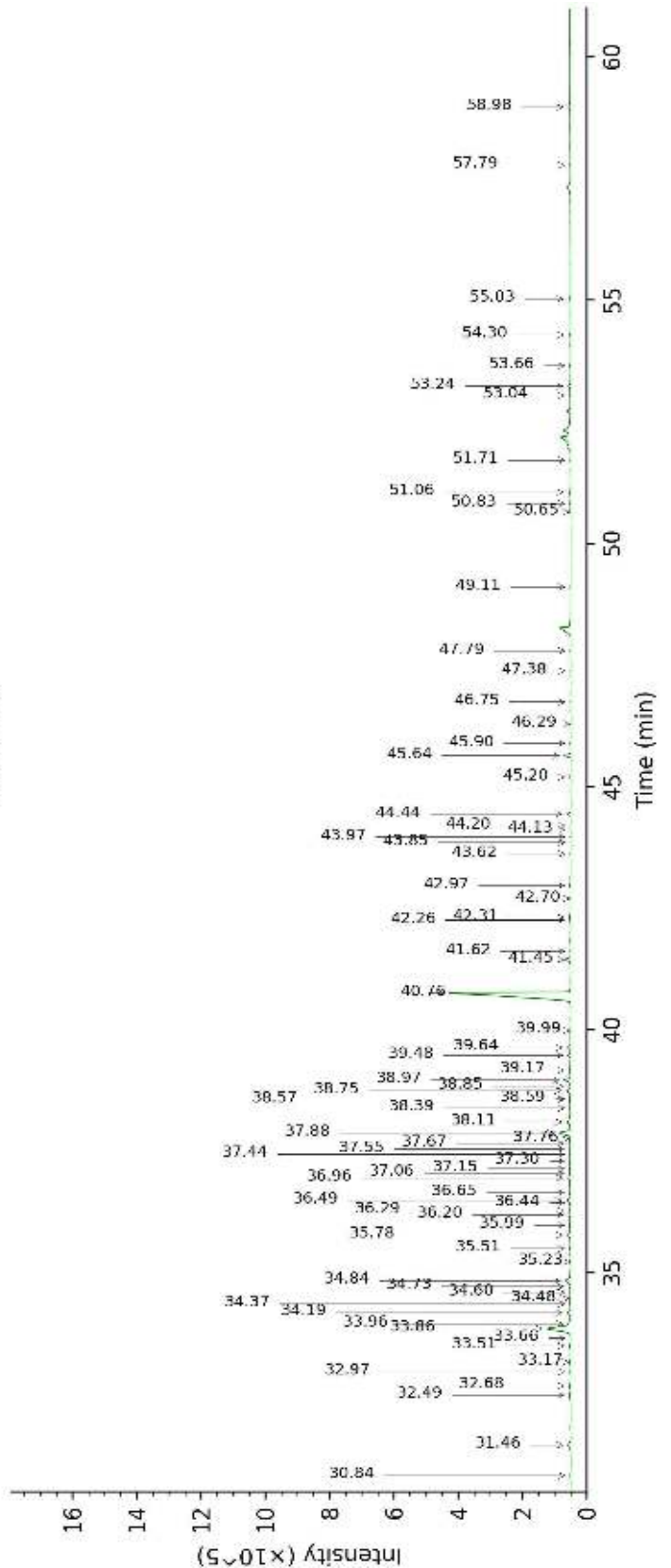
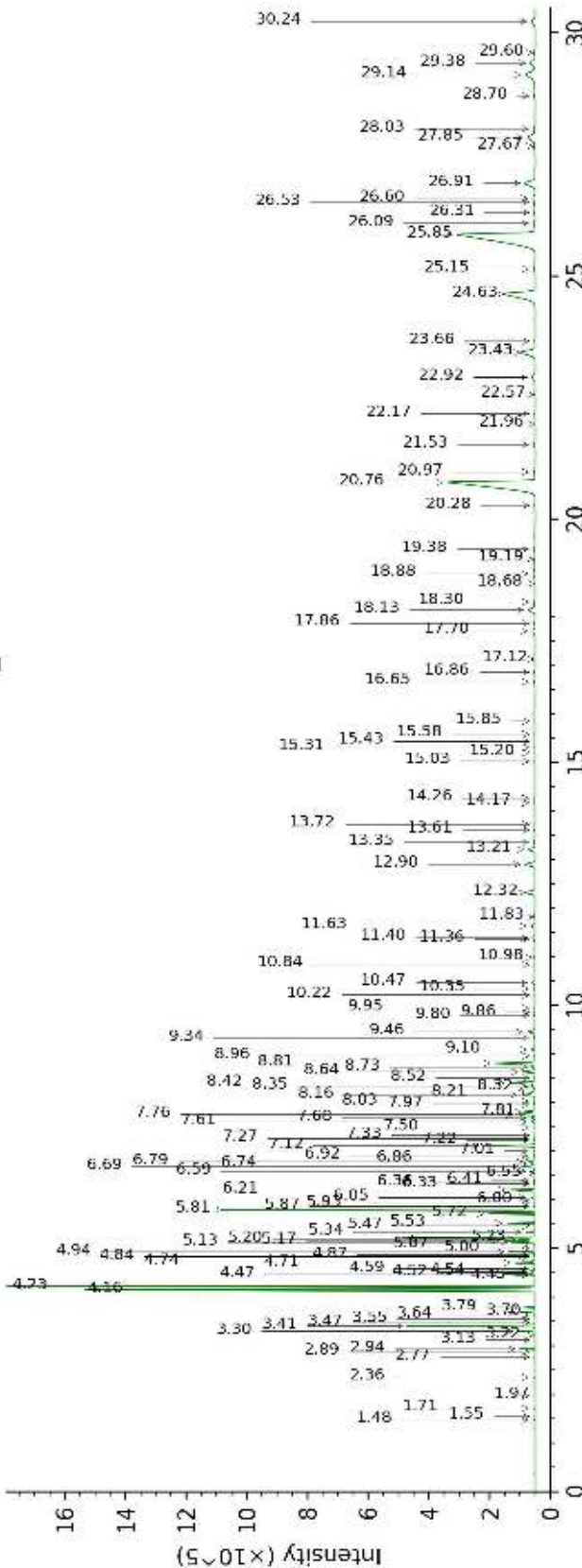
Physical aspect : Dark blue liquid

Refractive index : N/A (too dark)

CONCLUSION

No adulterant, contaminant or diluent were detected using this method.

17128-PTH5-1-CC_BP5



17128-PTH5-1-CC_WAX

