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Harmony H20 Report

1. Introduction Page 1
2. Methods used Page 2
3. Results Page 3-6
4. Discussion Page 7-8

1. Introduction

On the 29th of November 2024 a request was made to determine if the product 'Active Tray, XL 11cm' has the capabilities to alter the concentration of heavy metals and anion compounds in water samples.

Harmony H2O offer the Active tray to purchase online. The website claims it contains 60% water ortho clusters. Information on the website claims it can change the structure of water. This product is made of copper, works based on living water technology and takes full advantage of the energy of nature, interacting with specially formulated standard water inside the disc. This disc revitalizes all kinds of liquids such as water and juices.

The National Brownfield Institute used two analytical methods to see if the results would alter after using the disc. The techniques include X-ray fluorescence (XRF) and Ion chromatography.

2. Method Used

Within this experiment two analytical methods were utilized at the National Brownfield Institute. This included X-ray fluorescence (XRF) and Ion chromatography.

X-ray Fluorescence (XRF)

X-Ray Fluorescence (XRF) is a technique that can be used to determine the elemental composition of a wide range of materials and provide a quantitative analysis. There are two main advantages of this technique which includes that it is a non-destructive method and provides safe sample preparation without chemical waste. It also contains the ability to measure the fluorescent x-ray emitted from a sample when it becomes excited by a primary x-ray source. This method is widely used to detect toxic heavy metals such as lead, mercury, cadmium and others.

X-Ray Fluorescence (XRF) was performed on two spiked water samples to establish if there were any heavy metals present and concentrations pre disc treatment and post disc treatment. This was completed using the equipment at the National Brownfield Institute (NBI). The XRF Model used was S2 Puma, testing was performed on the 25th-29th of November 2024.

Ion Chromatography

Ion chromatography is a widely used technique for determining and separating anions within water samples. It can measure the concentrations of the major anions which include fluoride, chloride, nitrate, nitrite, bromide, phosphate and sulfate, in the parts-per-billion (ppb) range. The advantages of this technique are its reliability, has good accuracy and is high selectivity. The equipment used was a Dionex Aquion Ion Chromatography System with an autosampler. The software used to analyse and quantify the anions was chromeleon 7.

For X-Ray Fluorescence (XRF) analysis, two solutions of heavy metals were spiked and analysed through the machine to quantify the element composition/concentration. These samples were then placed on the disc for 24 hours. Once the 24 hours were completed the samples were then repeated on the X-Ray Fluorescence (XRF) equipment to see if there was a decrease. This was repeated twice for repeatability.

For the ion chromatography, one spiked sample with all seven anions were created and analysed, this sample was then placed onto the disc for 24 hours. Once the 24 hours were completed the sample was re-analysed on the instrument to see if the anions concentrations decreased. Another experiment conducted using the ion chromatography equipment involved two unknown spiked samples analysed and then placed onto the disc for 24 hours. Once the 24 hours was completed these samples were then re-run on the equipment to see if the concentrations of anions present were decreased. For the unknown spiked samples, sample preparation included pre-filtration using a sterile syringe and filter cap of 0.22 µm.

3. Results

The first experiment was conducted on 25th and 26th of November, two solutions, one containing copper, iron and manganese and one containing molybdenum, tungsten and lead were prepared and analysed via the X-Ray Fluorescence (XRF). The results are shown as pre before the use of the disc and post after the 24 hours use of the disc. These are shown in table 1 and table 2.

Table 1: Results from Solution 1 (Cu/Fe/Mn, Copper, Iron, Manganese)

Elements	Pre %	Post %	Change (-/+)
Aluminium	26.19	18.78	-28.29
Phosphorus	16.01	20.32	26.92
Sulphur	3.36	6.63	97.32
Chlorine	1.02	1.12	9.80
Potassium	35.54	41.30	16.20
Calcium	16.01	11.08	-30.79
Manganese	0.62	0.34	-45.16
Iron	0.60	0	-100
Copper	0.64	0.44	-31.25

Table 2: Results from Solution 2 (Mo/W/Pb, Molybdenum, Tungsten, Lead)

Elements	Pre %	Post %	Change (-/+)
Aluminium	6.42	10.34	61.06
Chlorine	1.82	0.19	-89.56
Calcium	5.94	8.07	35.86
Scandium	0.14	0	-100
Titanium	1.11	0	-100
Manganese	0.23	0	-100
Iron	2.45	0	-100
Nickel	0.09	0.20	122.22
Copper	0.30	0.26	-13.33
Zinc	0.02	0.04	100
Arsenic	0.09	0.94	944.44
Molybdenum	34.92	28.41	-18.64
Tungsten	46.20	40.82	-11.65
Lead	0.26	10.35	3880.77
Niobium	0	0.47	N. A
Tantalum	0	0.01	N. A

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Niobium	0	0.47	N. A
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For repeatability and reliability this test was repeated on the 27th and 28th of November. These results are shown in table 3 and table 4.

Table 3: Results from Solution 1 (Cu/Fe/Mn, Copper, Iron, Manganese)

Elements	Pre %	Post %	Change (-/+)
Aluminium	26.12	17.22	-34.07
Silicon	0	1.76	N. A
Phosphorus	11.29	20.24	79.27
Sulphur	4.33	8.08	86.61
Chlorine	0	1.42	N. A
Potassium	48.90	45.50	-6.96
Calcium	6.44	4.72	-26.71
Manganese	1.05	0.52	-50.48
Iron	0.94	0	-100
Copper	0.93	0.44	-52.69

Table 4: Results from Solution 2 (Mo/W/Pb, Molybdenum, Tungsten, Lead)

Elements	Pre %	Post %	Change (-/+)
Aluminium	3.27	6.78	107.34
Chlorine	0.10	2.57	2470
Calcium	2.05	1.30	-36.59
Nickel	0.10	0.13	30
Copper	0.32	0.30	-6.25
Zinc	0	0.10	N. A
Arsenic	0.54	0.34	-37.04
Niobium	0	0.51	N. A
Molybdenum	38.0	27.41	-27.87
Tantalum	0	0.07	N. A
Tungsten	53.50	53.94	0.82
Lead	2.11	6.55	210.43

On the 20th of November, one known spiked sample of seven anions were prepared and analysed on the ion chromatograph. This sample was then placed onto the disc for 24 hours and tested again to determine if there was any decrease in the concentrations of the anions present. For repeatable the ion chromatography produced three results per sample and an average was calculated. Results shown on table 5 and table 6.

Table 5: Results of spiked sample 1 pre disc treatment

Spiked sample 1	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	13.0729	12.6778	12.5822	12.3943	12.2513	12.7186	12.7559
Replicate 2	12.7585	12.3668	12.3144	12.1237	11.9755	12.4180	12.4212
Replicate 3	12.7667	12.3517	12.3436	12.1130	11.9507	12.4215	12.4075
Average	12.8660	12.4654	12.4134	12.2103	12.0592	12.5194	12.5282

Table 6: Results of spiked sample 1 post disc treatment

Spiked sample 1 post disc treated	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	13.1638	12.6846	12.9350	12.6123	12.4133	12.3565	11.9045
Replicate 2	13.0709	12.6627	12.8804	12.6937	12.5202	13.8398	12.8772
Replicate 3	12.7389	12.3466	12.3298	12.1499	12.0334	12.5085	12.4086
Average	12.9912	12.5646	12.7151	12.4853	12.3223	12.9016	12.3968

On the 3rd and 4th December an additional testing of two natural water samples was conducted. This is shown in table 7, table 8, table 9 and table 10. For repeatability three injections were performed on each sample to provide three results per anion present.

Table 7: Results pre disc treatment on natural water sample 1

Anions	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	0.6782	58.5526	0.4209	N. A	7.1938	N. A	N. A
Replicate 2	0.7813	59.0618	0.6057	N. A	7.0625	N. A	N. A
Replicate 3	0.7495	58.9676	0.5285	N. A	7.0291	N. A	N. A
Average	0.7363	58.8607	0.5184	N. A	7.0951	N. A	N. A

Table 8: Results post disc treatment on natural water sample 1

Anions	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	0.7040	60.2870	N. A	N. A	0.4717	N. A	N. A
Replicate 2	0.7425	60.4425	N. A	N. A	N. A	N. A	N. A
Replicate 3	0.9422	60.4380	N. A	N. A	N. A	N. A	N. A
Average	0.7962	60.3891	N. A	N. A	N. A	N. A	N. A

Table 9: Results pre disc treatment on natural water sample 2

Anions	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	0.7316	26.9566	0.3328	N. A	19.6144	N. A	N. A
Replicate 2	0.7699	27.1404	0.5059	N. A	7.8811	N. A	N. A
Replicate 3	0.7040	60.2820	0.4717	N. A	7.7272	N. A	N. A
Average	0.7352	38.1263	0.4368	N. A	11.7409	N. A	N. A

Table 10: Results post disc treatment on natural water sample 2

Anions	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	0.7291	27.6409	0.3364	N. A	19.8717	N. A	N. A
Replicate 2	0.7194	27.2024	0.2862	N. A	7.1049	N. A	N. A
Replicate 3	0.7311	27.2733	0.3270	N. A	7.2433	N. A	N. A
Average	0.7265	27.3722	0.3165	N. A	11.4066	N. A	N. A

On 10th December unknown sample 3 was obtained to perform ion chromatography. This sample was filtered before analysed. One vial was left for 24 hours on the discs and one vial was left next to the equipment. Once the 24 hours was completed, both vials were analysed in replicates of three. See table 11 and table 12 below for results.

Table 11: Results pre disc treatment on unknown sample 3.

Anions	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	0.8252	27.2021	0.5145	N. A	15.8746	N. A	N. A
Replicate 2	0.7998	27.5848	0.2055	0.1124	15.8029	N. A	N. A
Replicate 3	0.7982	27.3733	0.2201	N. A	15.9106	N. A	N. A
Average	0.80773	27.3867	0.3134	N. A	15.8627	N. A	N. A

Table 12: Results post disc treatment on unknown sample 3.

Anions	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate
Replicate 1	0.7645	27.1520	0.2504	N. A	15.9668	N. A	N. A
Replicate 2	0.7878	27.2704	0.2649	N. A	15.9149	N. A	N. A
Replicate 3	0.7596	27.2254	0.2431	N. A	15.9345	N. A	N. A
Average	0.7706	27.2159	0.2528	N. A	15.9387	N. A	N. A

Discussion

Results gathered from the X-Ray Fluorescence (XRF) experiment show that in the first experiment, solution 1 *(Cu/Fe/Mn, Copper, Iron, Manganese)* nine elements were initially detected in the sample. When comparing the results from pre disc treatment to post disc treatment, out of the nine elements, five elements had decreased their concentration whereas four elements increased their concentrations. When this experiment was repeated, ten elements were initially detected. When comparing the pre and post results from using the disc six elements had decreased concentrations and four had increased concentrations.

When comparing the results from the first experiment to the second experiment there were 90% repeatability as the elements decreasing and increasing were the same.

The results from solution 2 *(Mo/W/Pb, Molybdenum, Tungsten, Lead)* show 16 elements were detected on the first experiment. When comparing the pre and post results from using the disc, 50% of elements increased and 50% of elements decreased their concentration. This test was then repeated, and 12 elements were detected. The results comparison between pre and post disc treatment showed 66.7% repeatability for both decreased and increased concentrations of heavy metals in solution 2.

Results gathered from the ion chromatography show that the known spiked sample showed an 90% increase in seven anion concentrations. This is shown in table 13.

Table 13: Average of spiked sample 1

Anions present	Average Pre	Average Post	Change (-/+)
Fluoride	12.866	12.991	0.9716
Chloride	12.465	12.565	0.8023
Nitrite	12.413	12.715	2.4329
Bromide	12.210	12.485	2.2523
Nitrate	12.059	12.322	2.1801
Phosphate	12.519	12.902	3.0594
Sulfate	12.528	12.397	-1.0457

The second experiment concluded using the ion chromatography showed sample 1 contained four anions. When comparing the pre to post results there were varied increase concentrations of anions present after using the disc treatment. This is shown is table 14.

Table 14: Average of natural water sample 1

Anions present	Average		
	Pre	Post	Change (-/+)
Fluoride	0.55	0.80	45.455
Chloride	44.15	60.39	36.784
Nitrite	0.39	N. A	N. A
Nitrate	5.32	7.11	33.6466

For sample 2, four anions were again detected. There was a very small decrease in two anions and a larger decrease in chloride and nitrite. This is shown in table 15.

Table 15: Average of natural water sample 2

Anions present	Average		
	Pre	Post	Change (-/+)
Fluoride	0.74	0.73	-1.351
Chloride	38.13	27.37	-28.219
Nitrite	0.44	0.32	-27.273
Nitrate	11.74	11.41	-2.810

For sample 3 of the natural water sample four anions were again detected. An increase in nitrate was detected and small decrease in the other three anions was present. This is shown in table 16.

Table 16: Average of natural water sample 3

Anions present	Average		
	Pre	Post	Change (-/+)
Fluoride	0.8077	0.7706	-4.5932
Chloride	27.3867	27.2159	-0.6237
Nitrite	0.3134	0.2528	-19.336
Nitrate	15.8627	15.9387	0.4791

In conclusion, both heavy metals and anion presents were detectable after the use of the product. Further testing is recommended to determine if the product has the capabilities to decrease or completely remove both heavy metals and anion presents from water.