ISSN XXXX XXXX © 2019 IJESC

Research Article Volume 9 Issue No.4

Healing of Discernible Brackish from Municipal Drinking Water by Charcoal Filtration Method at Jijgiga, Ethiopia

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Abstract:
Jijiga is a city in eastern region of Ethiopia country and the Jijiga is capital of Somali Region (Ethiopia). Located in the Jijiga Zone approximately 80 km (50 miles) east of Harar and 60 km (37 miles) west of the border with Somalia, this city has an elevation of 1,609 meters above the sea level. The population of this city was 185000 in the year 2015. The elevation of this city is 1609m from sea level. The natural water source for jijiga is limited, most of the time people getting limited quantity of water. The main source of this city is a small pond and one spring. The rainy season also not that much. The municipality supplying water to every house based upon intermittent system, the time limit is morning only (8am to 9am). The municipality water contains discernible brackish. The public using this water for drinking and cooking purpose, it wills danger for human health. My focus is planning to remove discernible brackish by distinct method. My research results indicate the removal of discernible brackish from drinking water by simple charcoal filtration method for low cost.

Keywords: Discernible brackish, Human health, Filtration, Low cost, Main source, Municipality, Intermittent system, Distinct method.

I. INTRODUCTION

The climate condition of Jijgiga city is not constant and also the rainy season is yearly ten to twenty days. So the main source of jijgiga town is limited. The municipality depends upon one small pond and spring. But the source water of this town having more brackish. Especially discernible brackish is present in water after municipality treatment process. Increasing salinity levels will put pressure on the provision of town water supplies and increase treatment and infrastructure costs. My research is planning to implement low cost methodology for removal of discernible brackish from drinking water.

II. MATERIALS AND METHODOLOGY

The best methodology for removal of discernible brackish is filtration method. This is economical method also high efficiency up to 100%. In this method we are using filter media as sand and base material as gravel. In between sand and gravel I am going to use a charcoal. The size of sand is 0.35mm to 0.55mm and the gravel size is 20mm to 40mm. The size of charcoal is same as gravel size. For my experiments I am using a plastic container of size 20cm to 20cm (length and width) and the depth is 40cm. In this method, the gravel is filled at the bottom of the container at a depth of 10 cm. Then the charcoal is filled above the gravel layer at a depth of 10 cm. Then the sand is filled on top of the gravel layer at a depth of 10 cm. Both sand and gravel is thoroughly needed to clean before filling on the container. For more quantity of water treatment the depth of sand and gravel is 90 to 110 cm. Then the water is allowing slowly on top of the sand layer. The water is flowing through the voids of filter media. Mean while some quantity of the discernible brackish is settled on top of sand layer and some will settle on voids of the first layer. The remaining amount of discernible brackish is absorbed by charcoal. Only the water is reached to the second layer. Then the filtered water is collected separately to another container without discernible brackish. Now we can drink this portable water.

III. LABORATORY MEASUREMENT

Here I evaluated the water before the treatment and after the treatment process. I am using following methods for finding discernible brackish.

3.1 Apparatus:

1. Oven
2. Basin
3. Weighing machine

3.2 Procedure:

1. Take a dry empty basin and measure the accurate weight of the dry basin after heat few minutes (w_1 gm).
2. Take 25 ml of sample water in a dry basin and keep the basin in an oven for an hour. The heat will apply at a temperature 105^{o}c.
3. The water is evaporated due to the heating and Measure the accurate weight of the dry basin (w_2 gm).
4. The difference between the weights is the weight of total soluble salts. Which is expressed as ppm (mg/lit).
5. Volume of water taken = 25 ml

3.3 Calculations:

Weight of total discernible brackish = $w_2 - w_1$
This is present in 25 ml of water,
Therefore, discernible brackish content of water (ppm)
= $[(w_2-w_1) / 100] \times 10^6$
3.4 Before the treatment:
3.5 Observations 1:

Table.1. Readings Observed from the laboratory before treatment

Sl.No	Sample	Weight of empty basin (w_1) in gm	Weight of basin + residue(w_2) in gm
1	Tape water 1	53.77	53.85
2	Tape water 2	49.74	49.85
3	Tape water 3	53.95	54.10

This is the observations we got from the laboratory for first three samples before the treatment process. The discernible brackish is present in the samples.

3.6 Results 1:

1. The discernible brackish present in the sample 1 (Tape water) is 800 ppm
2. The discernible brackish present in the sample 2 (Tape water) is 1100 ppm
3. The discernible brackish present in the sample 3 (Tape water) is 1500 ppm

3.7 After the treatment:

3.8 Observations 2:

Table .2. Readings Observed from the laboratory after the treatment

Sl.No	Sample	Weight of empty basin (w_1) in gm	Weight of basin + residue(w_2) in gm
1	Tape water 1	53.77	53.77
2	Tape water 2	49.74	49.74
3	Tape water 3	53.95	53.95

This is the observations we got from the laboratory for first three samples after the treatment process. The discernible brackish is not present in the samples.

3.9 Results 2:

1. The discernible brackish present in the sample 1 (Tape water) is 0 ppm
2. The discernible brackish present in the sample 2 (Tape water) is 0 ppm
3. The discernible brackish present in the sample 3 (Tape water) is 0 ppm

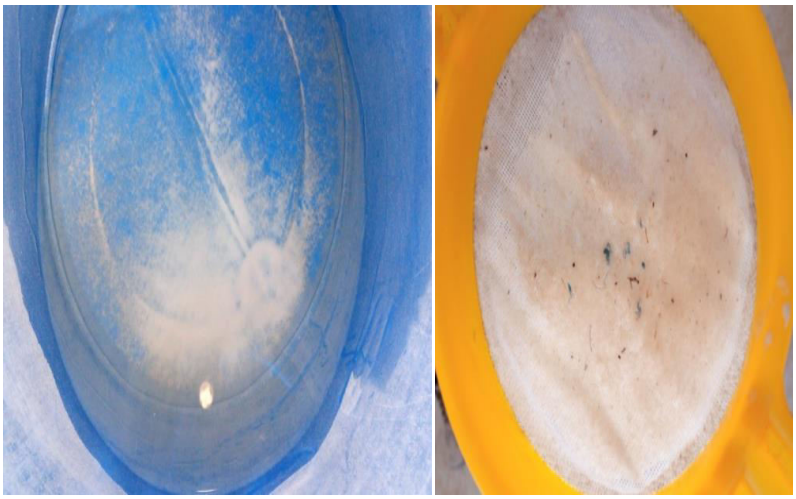

Figure.1. Discernible brackish presents before treatment

This figure 1 representing, discernible brackish present before the treatment. We can see the discernible brackish present in the container.

Figure .2. Laboratory Apparatus

This is the basin apparatus we used in the laboratory for finding the weight of settled discernible brackish. Like this we used three basins for three different samples.

Figure 3. Laboratory experiment

This is the sample Laboratory experiment setup for removal of discernible brackish from the Jijgiga municipality drinking water. This is a small container of size 20cm x 20cm x 40cm (length, width and depth). Inside the container there is gravel layer at bottom and above that a sand layer. The size of both I have mentioned above.

IV. RESULT AND DISCUSSION

From the result, before the treatment the Jijiga municipality water having 1133.33 ppm (average) of discernible brackish is present. After the treatment the Jijiga municipality water having 0 ppm (average) of discernible brackish. Due to these results, the filtration method is best and low cost method for removal of discernible brackish. So we can use this method for removal of discernible brackish.

V. CONCLUSION

The discernible brackish is present in Jijiga municipal water before the treatment 1133.33 ppm and after the treatment the discernible brackish is present 0 ppm. Based on the laboratory results (before and after the treatment) the discernible brackish is removed completely (100%) by charcoal from the Jijiga municipal water. Moreover this method is economical. We can use in our home itself.

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