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Evaluating of the Drinking Water Quality in Kassala-City, Sudan

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Abstract: Contaminated water may affect the health of millions of residents in the world. The main objective of this research work is to evaluate the drinking water quality in Sharg and Garb el-gash drinking water stations, which considered as important sources for civil uses, in Kassala city, eastern Sudan, during June 2016. For this purpose, chlorinated water samples were taken from drinking water pump station units and chemically analyzed at the laboratory of Kassala authority drinking water. The results revealed that, values of Acidity (7.5), Ammonia, Ammonium and Ferrous Cations; Nitrite, Nitrate, Fluoride and Chloride ions, Total Hardness were found to be: (0.03, 0.033, 0, 12.28, 0.03, 0.88, 0, 185) mg/l respectively. Turbidity were found to be 2.91 NTU, the results matched with both the Sudanese and world health organization standards. Hence, Kassala drinking water was free from chemical pollutants and almost suitable for domestic use.

Keywords: Drinking water quality; Turbidity; Chemical properties, Evaluating.

INTRODUCTION

Water is a molecule made up of two hydrogen atoms and one oxygen atom. It has the formula H_2O. It contains strong polar covalent bonds that hold the two hydrogen atoms and one oxygen atom together [1]. Water covers about 70% of Earth's surface. Pure water is colorless, odorless, and tasteless, even though it contributes no calories to the diet. Water also greatly affects the texture of foods, It gives crisp texture or turgor to fruits and vegetables, and it also affects perception of the tenderness of meat [2] and so common that you probably never think about how unique it is and how essential to life [3].

Water is the most vital element among the natural resources, and is critical for the survival of all living organisms including human, food production, and economic development. The quality of water is affected by human activities and is declining due to the rise of urbanization, population growth, industrial production, climate change and other factors. Increasing population, urbanization and industrialization has led to the decreased availability of water. Water pollution defined as the contamination of streams, lakes, seas, underground water or oceans by substances, which are harmful for living beings. The quality of used water is also being deteriorated as it is getting more and more polluted. This leads to some health hazards and harmful effects of water pollution [4, 5]. The presence of a safe and reliable source of water is thus as an essential prerequisite for the establishment of stable community [6]. The water pollution resulting in a serious threat to the well-being of both the Earth and its population [7].

MATERIALS AND METHODS

The study area, Kassala State lies between latitude 34^o 12` and $36^o$ 57` East, and between longitude 14^o 12` and $17^o$ 12` North.

Water samples were collected from Sharg and Garb El-Gash stations in Kassala city in eastern Sudan on June 2016. For each drinking water station, the Acidity, Turbidity and Temperature of water were measured using pH meter, Palinate Photometer, Turbidity meter and Thermometer respectively, each instrument was calibrated before using, then water samples from each station were analyzed using the suitable indicators for each measured parameters. All data were statistically analyzed according to simple means comparison using computer software package.

RESULTS AND DISCUSSION

The analysis results of the two drinking water stations in Kassala City, recorded in table 1, indicated that: the mean average values of the Acidity,

Ammonia, Ammonium and Ferrous cations, Nitrite, Nitrate, Fluoride and Chloride anions, Total Hardness , and Turbidity in Sharg and Garb El-gash were found to be: 7.5 ,0.036 mg/l , 0.04 mg/l, 0.03 mg/l , 0 mg/l, 7.78 mg/l, 0.88 mg/l , 0 mg/l, 230 mg/l, and 1.89 NTU, respectively. While in Garb el-gash, were found to be: 7.5, 0.024 mg/l, 0.026 mg/l, 0.02 mg/l, 0 mg/l, 16.80 mg/l, 0.88 mg/l, 0 mg/l, 140 mg/l, and 3.93 NTU, respectively. In this regard, [8] reported that, ammonia in the environment originates from metabolic, agricultural and industrial processes and from disinfection with chloramine. Natural levels in groundwater and surface water are usually below 0.2 mg/litre. Also, High levels of turbidity can protect microorganisms from the effects of disinfection, stimulate the growth of bacteria and give rise to a significant chlorine demand. The above might explain the results obtained in the current study.

Table-1: Comparison between water analysis results of Sharg and EL- Gash Stations June 2016 with the Sudanese and World Health Organization Standards

Parameters	Symbols	WHO std.	Sudanese std.	results of water analysis		Main average values	Units
				Sharg EL-Gash	Garb E L-Gash		
Acidity	PH	6.50 - 8.50	6.50 - 8.50	7.5	7.5	7.5	-
Ammonia	NH_3	0.20	-	0.036	0.024	0.03	mg/L
Nitrite ion	NO_2^-	2.00	2.00	0	0	0	mg/L
Nitrate ion	NO_3^-	50.00	50.00	7.78	16.80	12.28	mg/L
Ferrous ion	Fe^{++}	0.30	0.30	0.03	0.02	0.03	mg/L
Fluoride ion	F -	1.50	1.50	0.88	0.88	0.88	mg/L
Total Hardness	$CaCO_3$	500	-	230	140	185	mg/L
Ammonium cation	NH_4^+	-	0.20	0.04	0.026	0.033	mg/L
Chloride ion	Cl^-	250	150	0	0	0	mg/L
Turbidity	T	5	5	1.89	3.93	2.91	NTU

CONCLUSION

In conclusion, based on the above results, Chemical analysis of Kassala city drinking water stations, it has been found that the water of those stations is safe and free from Chemical Pollutants and matched with both the Sudanese and World Health Organization standards. This because the Sources of water is an underground water, which is difficult to be polluted by Chemicals.

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