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Evaluation of Physicochemical Parameters and Some Heavy Metals in Water Samples Used For Irrigation Purpose along River Tatsawarki In Tarauni L.G.A, Kano

S.A.A Shawai[1*], M. S. Nahannu[1], S. Abdulkadir[2], Sadiq Adamu Minjibir[2]

[1]Department of Chemistry, School of Science Education, Sa'adatu Rimi College of Education, Kumbotso P.M.B 3218, Kano state, Nigeria
[2]Department of Biology, School of Science Education, Sa'adatu Rimi College of Education, Kumbotso, P.M.B 3218, Kano state, Nigeria

**Corresponding Author: sadiqaashawai2020@yahoo.com (S.A.A. Shawai),* +2347060427808, +2348108366598

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Abstract- This study was conducted to determine the physicochemical and heavy metals concentration in wastewater used for irrigation purpose along AKTH/ Dental clinic in Tarauni local government, Kano state, Nigeria. The objectives were mainly to evaluate the presence of some physicochemical parameters, heavy metals and E. coli in the samples in the study area, compare with maximum allowable concentration (MAC) of physical, chemical, Heavy metals and E. coli in the samples as specified by WHO/NSDWQ/ Standards. A total of 10 sampling points were selected for the study, the surface water samples were collected and analyzed. Levels of various physicochemical parameters, concentration of some heavy metals and presence of E. coli were determined using standard analytical methods. The results indicated that all the parameters analyzed are within the maximum permissible limits (MPL) recommended by NSDWQ and WHO with exception of alkalinity and Total hardness(TH) level at all the sampling station, taste and odour were found to be objectionable. Also, only sampling station I_G shows turbidity level below 5NTU. The presence of E. coli were detected at all the sampling points. Thus, it is concluded that the current status of the water in most of the sampling sites considered for this study is fit as a source of irrigation. This paper also recommended that, the agencies concerned should provide a basis for regular monitoring of water quality status of the study area.

***Keywords*:** Wastewater, E. coli, heavy metals, hardness, physicochemical parameters

I. INTRODUCTION

Water is a major constituents of all living things [1]. For example, water makes up approximately two-third of the human body. Masood *et al*., [2] asserted that, water is a universal solvent important and essential to human beings for various activities such as cooking, drinking, agricultural, and industrial processes, human recreation and waste disposal. Ruma *et al*., [3] noted that, the availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. Water quality is a term that is rarely defined but frequently used, perhaps because it has no fixed definition, but obviously fairly well understood by users [2]. It was observed that, human activities are a major factor determining the quality of surface and groundwater through atmospheric pollution, effluent discharges, use of agricultural chemicals eroded soil and land use [3,4,5,6]. According to Bernard and Ayeni [7] the quality of groundwater depends on chemical constituents and their concentration, which are mostly derived from geological data of the particular region. The determination of water quality for human consumption is important for the wellbeing of the ever increasing population [8]. The properties of water includes; the amount of dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), organic content, pH value, temperature, infectious agents, toxic substances and mineral matter [2].

The quality of water is continuously changing as a result of the reaction of water with contact media affected by anthropogenic influences such as domestic or municipal waste [9]. Water pollution by effluents has become a question of considerable public and scientific concern in the light of evidence of their extreme toxicity to human health and to biological ecosystem [10]. Worldwide water bodies are primary means for disposal of waste, especially the effluents from industrial, municipal sewage, agricultural practices that are near them, and these effluents can alter the physical, chemical and biological nature of receiving water bodies [10]. The initial effect of waste is degrade physical quality of the water, which was later biological degradation

becomes evident in terms of number, variety and organization of the living organism in the water [10]. Contamination of the environment by effluents is viewed as an international problem because of the effect on the ecosystem in most countries.
According to Zulum *et al*., [11] the deterioration of standard of drinking water as a result of pollution produces devastating effects to most of the developing countries around the globe. Water covers about two third of the total land of the earth and it plays a vital role in the development of communities; hence a consistently good source of water is essential for the existence of the both human and animals. Water is mostly found through precipitation, underground and is said to be polluted if it is not suitable for intended use. Polluted water is world public health problems that make people to have contact with several water borne diseases such as metal pollution and chemical intoxication [11]. One of the major problems that cause threat to human health is faecal and metal contamination of water supplies [11]. The adverse impact is felt on the unique physical and chemical properties of water [12]. Quality of water is important for drinking, irrigation, fish production, recreation and other purposes [13,14,15]. The effects of these imports into the water not only affect the socio-economic functions of the water negatively, but also lead to the loss of structural biodiversity of the water bodies [12,13,16]. The physicochemical properties of water quality assessment give a proper indication of the status, productivity and sustainability of a water body [12,13,15,17,18]. The changes in the physicochemical characteristics like temperature, transparency and chemical elements of water such as dissolved oxygen, nitrate and phosphate provide valuable information on the quality of the water, the sources of the variations and their impacts on the functions and biodiversity of the reservoir [12,13,15,16]. Therefore, this study will assess the suitability of surface water used for irrigation and other purposes based on physicochemical parameters, some microbial contaminant and figure out if there is a health risk associated with the use of wastewater for various activities and any water rehabilitation mechanisms that increases the quality of water and to have sustainable water environment. In light of this situation, this research needs to be undertaken so as to emphasize on the safety of the public.

II. MATERIALS AND METHODS

Chemicals and reagents used were of standard grades. The analysis of the water samples were carried out in two different categories namely: physical analysis and chemical analysis.

2.1 SAMPLING COLLECTION

Ten samples from different points were collected from Tarauni local Government of Kano State using clean new polyethene plastic containers which were covered with Black polyethene bags to prevent growth of Algae [19].

2.2 PHYSICOCHEMICAL ANALYSIS

The pH, temperature and conductivity were determined immediately after sampling and the sample was stored at a temperature below 4°C, this is to prevent the growth of microorganisms as reported by [19].

III. RESULTS

The result of various physicochemical parameters recorded during present study at all the five sampling are presented in tables below. The results obtained were compared with the World Health Organization (WHO) and Nigerian standard for drinking water quality (NSDWQ).

Table 1: Physicochemical parameters of the water samples analyzed

S/no	Parameters	I_A	I_B	I_C	I_D	I_E
1	Turbidity	26	82.00	56.00	47.00	44.00
2	Ph	6.90	6.80	7.00	7.00	6.90
3	Temperature	28.9	29.5	28.3	29.4	28.8
4	EC	84.10	899.0	841.0	849.0	825.0
5	TDS	42.41	451.0	426.0	424.0	412.0
6	Taste	Obj	Obj	Obj	Obj	Obj
7	Odour	Obj	Obj	Obj	Obj	Obj
8	Colour	10	20	10	10	10
9	TH	404.02	386.50	493.80	462.70	293.55
10	SS	51.0	118	52.0	49.0	41.0
11	TSS	93.41	569.0	478.0	473.0	453.0
12	Chloride	88.83	90.87	108.57	97.22	93.5

13	T. Alkalinity	550.00	450.00	490.00	495.00	519.
14	E. coli	+	+	+	+	+

Table 2: Physicochemical parameters of the water samples analyzed

S/no	Parameters	I_F	I_G	I_H	I_I	I_J
1	Turbidity	45.0	0.00	14.00	91.00	44.00
2	pH	6.90	6.70	6.50	6.70	6.70
3	Temperature	29.1	29.2	28.4	29.7	28.4
4	EC	793.0	113.4	96.70	1226.0	669.0
5	TDS	393.0	57.00	48.40	612.0	334.0
6	Taste	Obj	Obj	Obj	Obj	Obj
7	Odour	Obj	Obj	Obj	Obj	Obj
8	Colour	10	5	10	20	5
9	TH	177.51	197.47	257.20	283.51	204.30
10	SS	458.0	60.00	64.40	702.0	403.0
11	TSS	65.00	03.00	16.00	90.00	69.00
12	Chloride	93.77	27.64	31.58	152.99	54.28
13	T. Alkslinity	505.0	295.0	302.0	456.0	527.0
14	E.Coli	+	+	+	+	+

IV. DISCUSSION

4.2.1 PH, TOTAL HARDNESS AND TEMPERATURE

The pH values of water samples analyzed range from 6.50-7.40 and fall within the [20,21] permissible limit of 6.5-8.6. Hundred per cent of analyzed samples have pH values less than 7.0. The TH values ranged from 177.51-493.30 mg/L. based on [22] classification, all the samples fall under the "hard" class. The highest values was observed at I_C and the lowest at I_F. The result shows temperature ranged from 28.3-29.7^{0}C. High value was recorded at sampling point I_I and lowest at sampling point I_C.

4.2.2 ELECTRICAL CONDUCTIVITY, TOTAL DISSOLVED SOLID AND, TOTAL ALKALINITY

The EC values range from 84.10-899.00 µS/cm. High EC values was observed at point I_B indicating the presence of high amount of dissolved inorganic substances in ionized form in water. The TDS values lie above the WHO and NSDWQ limits. The values varies from 42.41-612.0 mg/L and high value was recorded at sampling point I_A and lowest at sampling point I_I. In present study average value of total alkalinity varied from minimum of 295.00 mg/L at I_G to a maximum of 550.00 mg/L at I_A within the permissible limit of 100mg/L prescribed by (WHO, 2006; NSDWQ, 2007). The high alkalinity value indicates the presence of weak and strong base such as carbonates, bicarbonates and hydroxides in the water body.

4.2.3 CHLORIDE, TURBIDITY, SUSPENDED SOLID AND TOTAL SUSPENDED SOLID

The concentrations of chloride varied between 27.64-152.99 mg/L with minimum at I_G and maximum at I_I. According to [20,21] prescribed the permissible limit of chloride to be 250mg/L. Chloride concentrations in all the sampling point are within the prescribed limit. The turbidity level in all the sample sites determined showed that they are within the recommended level of 5NTU [20, 21, 23] as shown in table 1 and 2. The turbidity values of the study area ranged between 0.00-91.00 NTU with high value at I_I and lowest at I_G. The result from the analysis shows that TSS values range from 41.00-702.00mg/L. The high values was recorded at I_I and I_E has the lower value.

4.2.4 COLOUR, ODOUR AND TASTE

It is observed from the results obtained, the physical parameters (colour, odour, taste) are coloured and unobjectionable for all the samples consider. The colour of the samples was found to be 5 TCU at sampling sites I_G and I_J and fall within the permissible limit set by [20, 21, 23] while the rest of the sampling points had colour above 5 TCU.

4.2.5 E. COLI

In this study, the presence of E. coli were detected. The presence of *E. coli* in water always indicates potentially dangerous contamination requiring immediate attention as reported by [24, 25]. The presence of E. coli in the samples from all the sampling stations, showed that heavy, recent pollution by human or animal wastes has occurred.

V. CONCLUSION

Contamination of water has severe implications for public health, particularly in small communities and developing countries where groundwater is the only source of drinking water and agricultural purpose [26]. Conformation with physicochemical standard is of special interest because of the capacity of water to spread diseases within a large population. From the observation and results it can be concluded that all the parameters analyzed are within the maximum permissible limits (MPL) recommended by NSDWQ and WHO with exception of alkalinity and Total hardness(TH) level at all the sampling station, taste and odour were found to be objectionable. Also, only sampling station I_G shows turbidity level below 5NTU. The presence of E. coli were detected at all the sampling points. Also the current status of the water in most of the sampling sites considered for this study is fit as a source of irrigation. This paper also recommended that, the agencies concerned should provide a basis for regular monitoring of water quality status of the study area.

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