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Coliform Bacteria Analysis of River Amba, Lafia, Nasarawa State

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ABSTRACT

Coliform bacteria analysis of river Amba in lafia, Nasarawa State was carried out for twelve months. The period of studys covered both rainy and dry season. Water samples were collected monthly from four different locations (Gandu, Wadatan-Waje, Kofan-Kaura and Ungwan- Galadima) along the river course. Coliform bacteria analysis was carried out using Multiple Tube Method. The mean total coliform bacteria values recorded for Wadatan-Waje and Ungwan-Galadima during the rainy season were higher than that of dry season. During rainy season, the mean coliform bacteria load for Wadatan-Waje location was $16.3^{a}\pm0.00$ CFU/100ml while for dry season; it had mean coliform bacteria of $14.95^{e}\pm0.05$ CFU/100ml. Ungwan-Galadiman had 8.17 ± 0.27^{a} CFU/100ml mean coliform bacteria load during rainy season and a $6.00^{a}\pm0.27$ CFU/100ml during the dry season respectively. Conclusion was made that the mean coliform values varied along the sampling stations due to levels of discharges of untreated sewage.

Key words: Coliform, bacteria, analysis, River Amba and Nasarawa.

INTRODUCTION

Water is regarded as being polluted when it is unfit for its intended use (Turk, 1980). Surface water resources such as river, lakes and ponds located around the cities are heavily polluted as a result of discharge of effluents from municipal and industrial wastes (Haruna, 2008). The over production of higher trophic levels biomass and subsequent decay of dead plants could lead to oxygen depletion, death of aquatic organisms and development of anaerobic zone where bacteria action produce foul odour and bad tastes (EPA, 1976). The concern for the increase in the

level of pollution in surface and ground water cannot be over emphasized since a large proportion of rural and recently urban dwellers in Nigeria obtained domestic water, and sometimes drinking water from ponds, streams and shallow wells (Sangodoyin, 1990).

Sangodoyin (1989) examined the quality of river water of Ogunpa River in Ibadan, Nigeria and inferred that the quality of water is determined by several quality parameters such as temperature, dissolved oxygen, P^H and hardness. The discharge of waste water into surface waters and the resultant deleterious change in water ecology have been well documented (Law, 1980; Okoronkwo and Odeyemi, 1985). These workers also expressed concern over human health and the possible accumulation of human enteric pathogenic organisms by aquatic organism (Haruna, 2008). The incidence of water – borne diseases in rural areas of developing countries and resulting millions of death have also been reported (UNU, 1983). Some of these deaths have been traced to the use of water grossly polluted and untreated waste (Desilva, *et. al.*, 1988; UNEP, 1991). Exposure to contaminated water through consumption, recreation or irrigation is significant mode of transmission of gastrointestinal infection; outbreak has been associated with swimming in a crowded lake (Ackman, *et.al.*, 1997) and drinking of contaminated water (Olsen, *et.al.*, 2002).

In Lafia metropolis, water treatment for municipal use is obtained from the river Amba. There has not been any known recorded in-depth information on microbial load of river Amba. The objective of this study was to determine and analyse Coliform bacteria load of river Amba.

MATERIALS AND METHODS

The map of Lafia town showing the studied areas is shown in Fig.1

Figure 1 Map of River Amba sampling locations (ABCD) ▲

The study was carried out in Lafia, Nasarawa State. River Amba (Fig.1) is one of the longest river in Lafia and in Nasarawa State from where the state water Board obtain water to supply inhabitants of Lafia and its environs. Sampling location were Gandu, Wadatan-waje, Kofan-Kaura, and Ungwan-Galadima which are located along river course. The inhabitant of the four locations depends on the water from the Amba River or their domestic activities and consumption.

Sample Collection and Presentation

Water were collected from January to December using a fishing canoe to reach the sampling location in sample bottles which were pre-sterilized with acids, washed and dried at 121 ^{o}C in electric oven. Fresh sterile rubber hand gloves were worn on hands to avoid sample contamination. Air space of about 3cm was left in the sample for aeration. Samples were then taken to the laboratory for immediate analysis. Sample which were not analyzed immediately were preserved at 4 ^{o}C in a refrigerator for a period not exceeding 6 hours.

COLIFORM BACTERIA ANALYSIS

Total Coliform

Total coliform analysis was carried out using multiple tube method (APHA, 1999). The water sample under consideration was mixed with nutrient medium (MacConkey broth) and was incubated for 24 hours at temperature of 39^{oC}.

The production of acid which turns the purple macConkey broth yellow and gas caught in a small inverted tube (Durhm's tube) was confirmation of presence of coliform bacteria in water sample. Most Probable Number (MPN) of coliform bacteria was counted using Suntex 560 colony counter in CFU/100ml. The results were expressed as coliform forming units/100ml of water.

STATISTICAL ANALYSIS

Data were analyzed by One-way analysis of variance (ANOVA) using Statistical Product for Service Solution (SPSS version 16.0) for window. Statistical Significance differences between means were compared using Turkey (HSD) test.

RESULTS AND DISCUSSION

The means monthly values of coliform bacteria during rainy and dry season of the four locations for 12 months are presented in Table 1.

Table 1: Means monthly values of coliform bacteria during rainy and dry season of the four locations for 12 months

	coliform bacteria (CFU/100ml)	
Locations	Rainy season	Dry season
Gandu	$13.83^{a} \pm 0.03$	$21.00^{b} \pm 0.21$
Wadatan-Waje	$16.33^{a} \pm 0.00$	$14.95^{e} \pm 0.05$
Kofan-Kaura	$24.17^{b} \pm 0.12$	$26.17^{c} \pm 0.33$
Ungwan-Galadima	$8.17^{a} \pm 0.27$	$6.00^{d} \pm 0.13$

Means + SD of 3 replications within a row with the same superscript were not significantly different at $p>0.05$.

During rainy season, the mean coliform bacteria load count for Gandu location was 13.83[a] CFU/100ml while that of the dry season was 21.00[b] CFU/100ml.

During rainy season, Wadatan-Waje location had the mean coliform bacteria load of 16.33[a] CFU/100ml while in dry season; it had the mean coliform bacteria of 14.95[e] CFU/100ml.

The mean coliform bacteria load for Kofan- kaura during the rainy season was 24.17[b] CFU/100ml while it had 26.17[c] CFU/100ml mean bacterial coliform during the dry season .

Ungwan- galadima had 8.17[a] CFU/100ml mean coliform bacteria during the rainy season but had 6.00[d]±0.13 CFU/100ml mean bacterial coliform during the dry season.

The mean total coliform bacteria values for Amba river during rainy season for Wadatan- waje and Ungwan- Galadima locations were higher than during the dry season while for Gandu and Kofan- Kaura locations, the values were higher during the dry season than rainy season (Table 1). The mean total coliform bacteria from Ungwan- Galadima during the dry season was the least (6.00 CFU/100ml). The mean total coliform bacteria values obtained in this study from all the locations exceed WHO standard of 0 CFO/100ml. The high coliform values obtained in this study might be due to discharge of untreated sewage in bodies of surface water and non-point sources such as septic efferent, runoff and animal wastes (Fatoki, *et.al.,* 2001). Human waste contaminant in water causes water borne diseases such as diarrhea, typhoid fever and hepatitis (Root, *et.al.,* 1982; Esry and Habicht, 1986). Another study revealed that higher bacteria concentration was strongly associated with rainfall and sewage sources linked to total coliform and feacal coliforn (Crowther, *et.al.,* 2011). Increased in discharge of domestic and untreated sewage to different locations along the river have been

linked to increase risk of infection disease transmission (Kistemann, *et.al.,* 2002). Water pollution is of grave consequence because both terrestrial and aquatic life may be affected; it may cause disease due to the presence of some hazardous substances, which may distort the water quality, add odours and significantly hinder economic activities (Asonye, *et al.* 2007). In Nigeria like any other developing country of the world, the level of pollution of freshwater bodies is no longer safe for human consumption (Omoregie *et al.,* 2002). Earlier base line studies have identified elevated levels of certain trace metals in local freshwater systems (Asonye, *et al,* 2007) arising mainly from agricultural and industrial processes (Adakole, 2007).

CONCLUSION

Based on the results of this study, it is concluded that river Amba is polluted along its course with coliform bacteria. This will pose health risk to inhabitants who rely on the river as their source of domestic water.

RECOMMENDATIONS

The following recommendations are made to reduce the hazard pose by the river to the inhabitants of the area of study.

- Attention should be given to the bacteriological assessment of the water during treatment.
- People should be discouraged through public awareness programmes from drinking the untreated water from the river.
- Sanitary inspectors should regularly inspect the river and enforce sanitary rules.

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