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Water Quality Assessment of Ake Stream, Near College of Advanced and Professional Studies Makurdi, Nigeria.

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Abstract: - Analysis of the physico-chemical and biological quality of Ake stream located near College of Advanced and Professional Studies Makurdi, Benue State Nigeria was examined over duration of 7 months. The survey was conducted in the period between April and September based on random sampling with a view to ascertaining the impurity level of the stream. The physico-chemical analysis gave average results for Temperature, Turbidity, Iron, Chromium and Sulphate as 28.7^{0}C, 200.5NTU, 2.0, 0.2 and 44.3mg/l respectively. The Bacterial load per 100ml of water ranged between 978 – 1800 giving average value of 1389. The overall results revealed that the stream is heavily stagnated, especially in terms of microbial load, which is an indication of human and feacal contamination. Most of the physical and chemical perimeters were above the maximum permissible levels, indicating that treatment is required before water from the source can be used for domestic applications.

Keywords*: - Analysis, Ake stream, Examined, Impurity, Domestic application.*

I. INTRODUCTION

Water is undoubtedly one of the most precious natural (divine) resources that exist in our planet, (Karthikeyan and others, 2007). The public health significance of water quality cannot be over emphasized since many infectious diseases are transmitted by water through the fecal-oral route.

It is thus, important that drinking water should be safe and portable. The bacterial qualities of surface water, pipe borne water and other natural water supplies in Nigeria have been reported to be unsatisfactory, with coliform counts far exceeding the level recommended by the World Health Organization (Edema et al 2001).

Ake stream, which is located in *Myade Asta* community of Makurdi local Government area of Benue State lies on undulating plain of River Benue, about 50m from the College of Advanced and Professional Studies Makurdi. The stream flows to River Benue.

Makurdi the headquarter of Benue State, lies within Longitude 70 45 ^{o}E and 80 00 ^{o}E and Latitude 70 45 ^{o}N and 80 15 ^{o}N. The area is located within the hot humid climate belt, with fairly high temperatures, especially between April and October, with the heaviest rainfall usually between July and September. It is however warm and humid during the rainy season with a mean temperature range of 26^{0}C to 30^{0}C, and mean rainfall of 1300mm.

The geological formation of Makurdi is underlain essentially by sand stones. Though in some areas one finds thin bed of clay, shale and limestone. The geology of the area influences the quality of water to be obtained. Streams on steep slopes flow swiftly; they often have better water quality than streams on gentler slopes. Streams on steep slopes also experiences more turbulence as water cascades over rocks and logs, adding oxygen to the water by mixing with the air. Streams located on mild slopes do not have the benefit of turbulent mixing to aerate the water. Swift-flowing streams, however, have greater energy for causing erosion.

The dwellers of this community face serious threats to the quality of life and safety with urbanization resulting into high degree of population densities and concentration of socio-economic activities. It has become increasingly difficult to meet the entire water requirement both in quantity and quality. The public water supply is generally inadequate and in most cases inaccessible, the supply is intermitted and unreliable thus resulting into high dependency on unsafe supplementary sources such as streams, and ponds which are harmful to human health (Kakulu Osibanjo,1992; Olajire and Imeppeoria, 2001; Nnodu and llo,2002). There is therefore the need

to determine the quality status of Ake stream which is one of the major sources of water supply in the community.

II. MATERIALS AND METHODS

Sample Collection

Stream samples were carefully collected in very clean disinfected containers. The samplings were done upstream, midstream and downstream at 10m apart by dipping at approximately 20-30cm below the water surface, projecting the mouth of the container against the flow direction. Samplings were done three (3) times a month, namely, beginning, middle and the end. A total of fifty four (54) samples were collected.

Sample Analysis

Samples were collected from April to October 2012. The laboratory analysis was done at the Benue State water board laboratory in Makurdi. The physical, chemical and bacteriological properties of the samples were analyzed immediately they were taken to the laboratory following standard procedures as described by (PEPA, 1991).

The equipment used for the determination of these parameters include: Hach direct reading spectrophotometer model DR/200 for turbidity, fluoride, suspended solids and colour. Mercury thermometer was used for temperature measurement conductivity meter model 50150 was used for determination of electrical conductivity. pH was obtained by colometric technique and chloride by mercuric nitrate method. Similarly, titrimetric and pillow methods were used for total hardness and total iron respectively. Sulphate and phosphate were determined by sulfaver 4 and phosver – 3 methods respectively. 1,5 – diphenlycarbohydrazide method was adopted for chromium determination and MPN-multiple technique was for coliform enumeration.

3.1 RESULTS AND DISCUSSION

The results from the seven months experimental analysis are as shown in figures 1 – 14. The properties and findings are as discussed below.

Physical Parameters

Apart from total dissolved solids (TDS) with average value of 52.9mg/l, colour and turbidity values were far above the acceptable limits specified by world Health organization. The distribution as seen in figures 1 – 4 shows maximum pollution between the rainy months of April and May. The average temperature of the stream as indicated in figure 2 agrees with the ambient temperature range of Makurdi and its environs.

Chemical Parameters

The pH of the water changed from being slightly basic (7.5) in July to slightly acidic (6.4) in August. This may be attributed to the geological formation of the area as shown in figure 5. The concentration of iron in the stream especially in the months of May to August indicates maximum levels between 0.27 and 5.74mg/l (figure 6); far above the recommended 0.05mg/l by WHO (1993). The same trend was observed for sulphate and chromium as indicated in figures 10 and 11 respectively. And so largely, only total hardness (figure 9) was found within acceptable limit as specified by World Health Organization (1993) of the assessed chemical parameters.

The chemical oxygen demand of the stream varied from 147 to 207mg/l and Biological oxygen demand (BOD) varied from 73 to 87mg/l throughout the study period (figures 12 & 13). Higher levels of COD were observed middle stream and downstream of the discharge points. This is considered undesirable since continuous effluent discharge is already impacting negatively on the quality of the freshwater, and capable of causing harm to the aquatic life downstream.

Biological Parameter

The result of the coliform count was high ranging from 978 to 1800MPN/100ml of water (see figure 14). The high limit is indicative of gross contamination which may be due to disposal of fecal waste in the stream. It may also be due to time of the study (April – October, 2012) which are months of rainy season usually associated with seepage due to runoff that contaminates surface waters (Isikwue and others, 2011).

III. CONCLUSION

The water quality assessment has revealed the negative impact on the physio-chemical and biological parameters of the stream. This is likely to pose health risk to the rural Ake community that rely on it as their main source of domestic water supply.

While measures should be put in place by relevant agencies in the state to create awareness on the dangers associated with the use of Ake stream for domestic consumption, government of Benue State is requested to

render assistance by providing portable water supply to the community. Meanwhile, boiling of water from the stream before domestic application by the community is recommended

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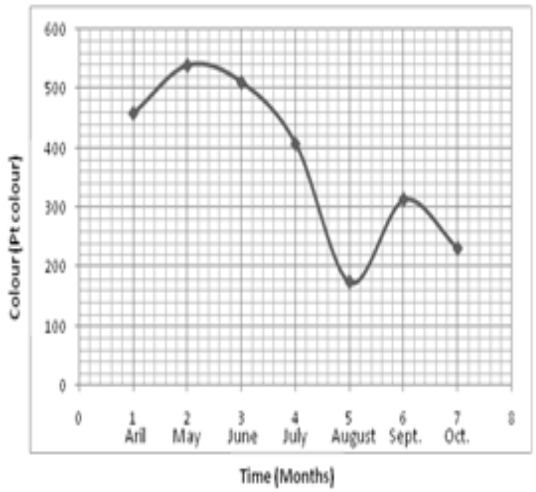

Fig 1: *Colour of water samples*

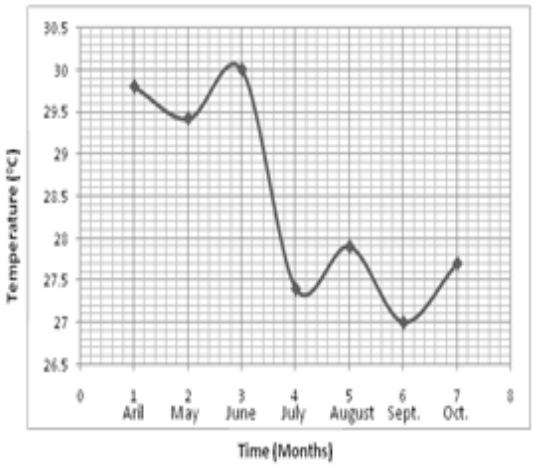

Fig 2: *Temperature of water samples*

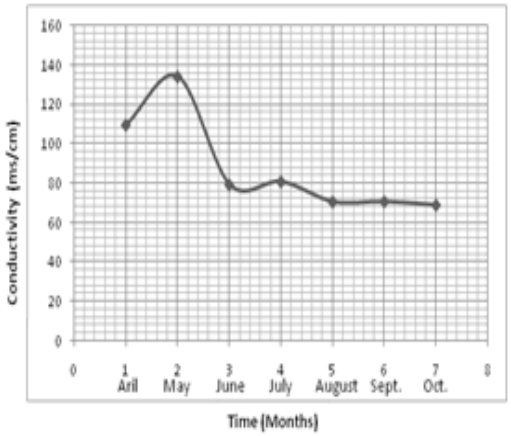

Fig 3: *Conductivity of water samples*

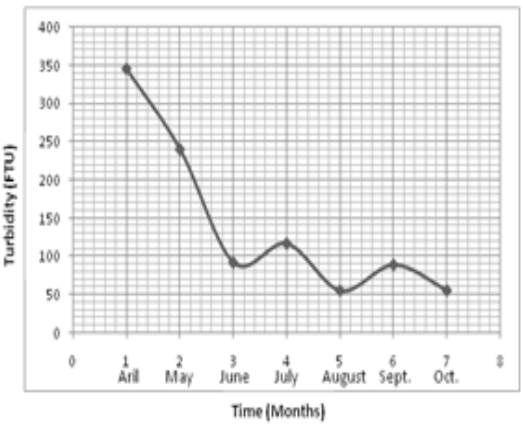

Fig 4: *Turbidity of water samples*

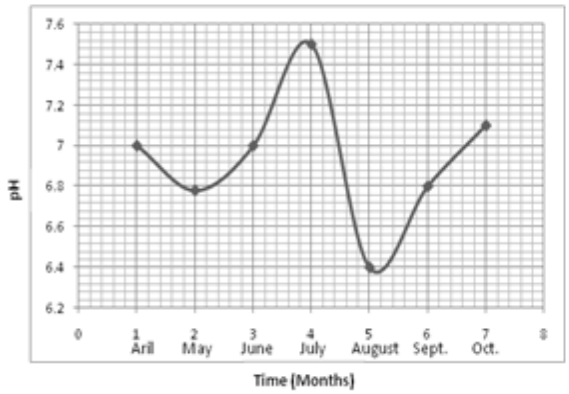

Fig 5: *pH of water samples*

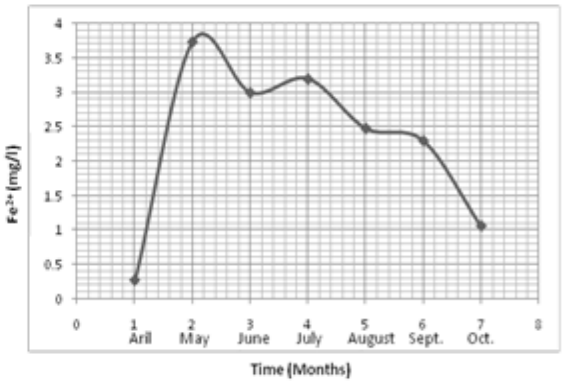

Fig 6: *Iron of water samples*

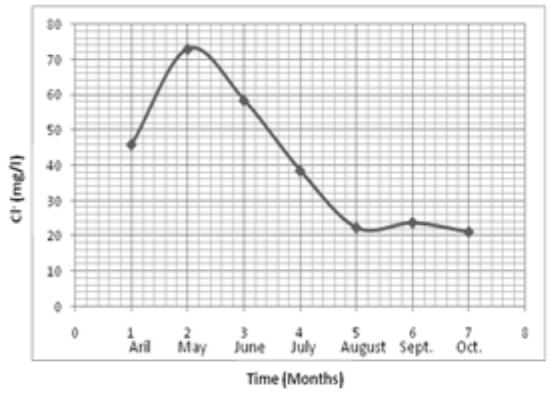

Fig 7: *Chloride of water samples*

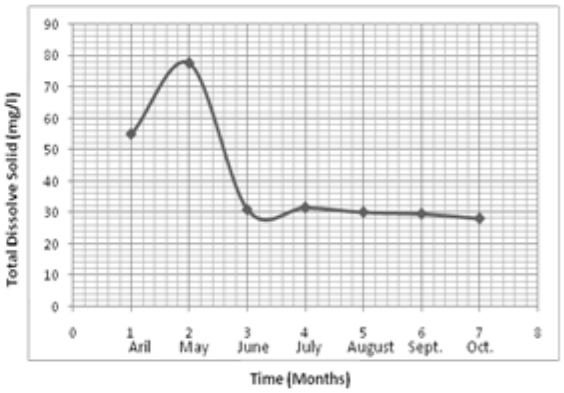

Fig 8: *TDS of water samples*

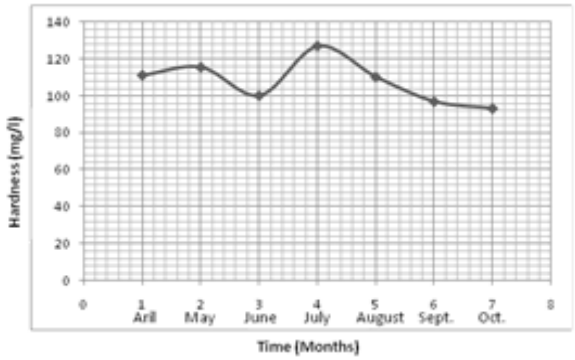

Fig 9: *Total hardness of water samples*

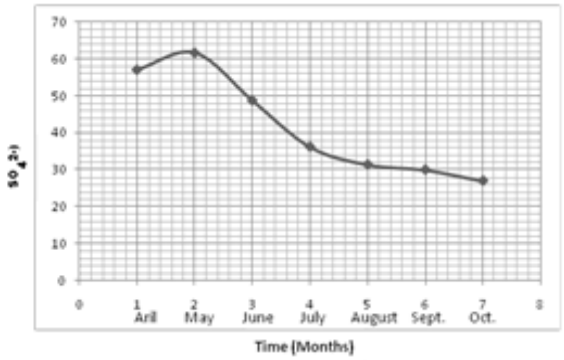

Fig 10: *Sulphate of water samples*

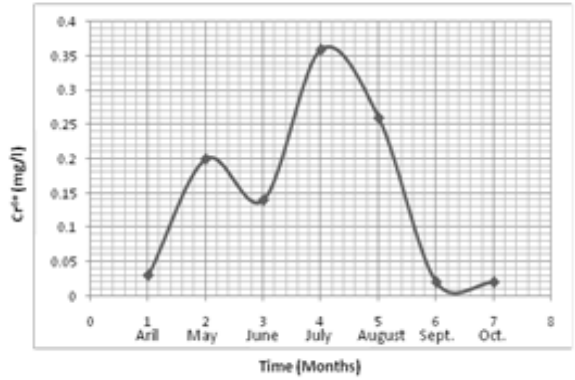

Fig 11: *Chromium of water samples*

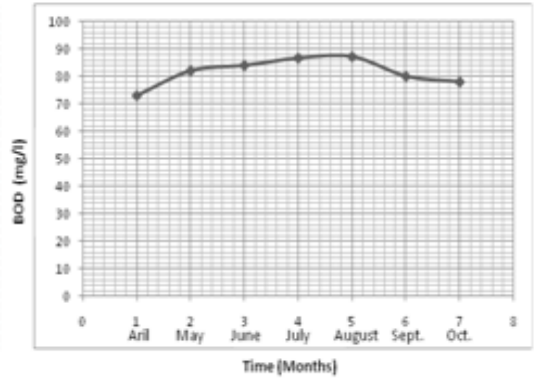

Fig 12: *BOD of water samples*

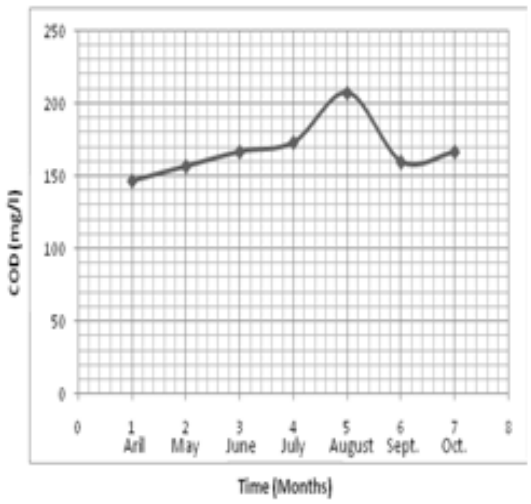

Fig 13: *COD of water samples*

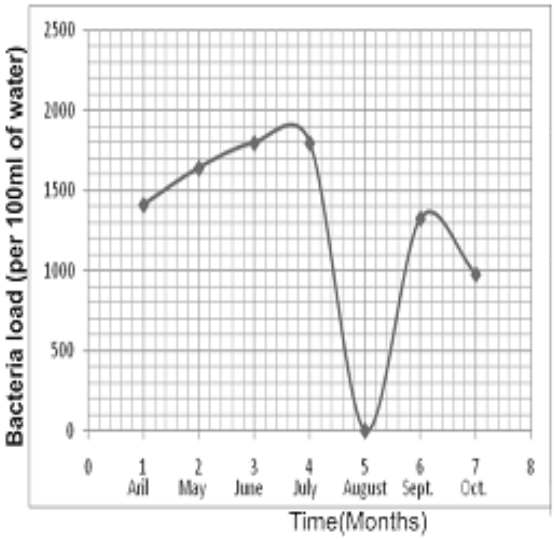

Fig 14: *Bacterial load of water*