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INVESTIGATION OF THE USAGE OF EICHHORNIA CRASSIPES IN THE CLEANSING AND TREATMENT OF WASTE WATER

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ABSTRACT

The investigation of the usage of Eichhornia crassipes in the cleansing and treatment of waste water has been conducted. The study area of this investigation is the Warri River –NMU Jetty, which is situated on the Barrister Smooth Jetty of the Nigeria Port Authority (NPA) in Warri, Delta State of Nigeria. The Warri River is a cardinal navigational route in the Niger Delta geographical region, and it is quite a huge body of freshwater with latitude 5021'-6000'N together with longitude 5024'-6021'E that covers a surface area of 255 square kilometers doubled with a length of approximately 151 kilometers. Experimentally, three samples of water were taken at the NMU Jetty – along the NPA Warri River axis and a commonsensible number of water hyacinths in it and the Petroleum Training Institute, Effurun – Water Test Laboratory were utilized for the physical, chemical and biological test assessment and the following water parameters were collated in the test laboratory for the three samples of water – Sample A, Sample B and Sample C: pH, turbidity, total dissolved solids, total suspended solids, conductivity, total alkalinity, chloride, total hardness, biological oxygen demand, zinc, nitrate, total ion, lead and coliform count were taken and recorded. The results obtained show that the treated waste water has a high content of chloride of 592.19mg/L for the three samples of waste water treated as against the WHO standard of 250mg/L (max) and this will make the water to have detectable taste and harmful to human health, while the high content of coliform count of 50cfu/100ml indicates high risk of contracting a water-borne illness, and it needs to be checked. It is recommended a repeated water treatment should be embarked on the three treated samples waste water A, B and C respectively.

Keywords: Investigation, Usage, Eichhornia Crassipes, Cleansing, Treatment, Wastewater.

1. INTRODUCTION

The water hyacinth, which is also known as the Eichhornia crassipes, is a plant that grows and floats on the upper surface of freshwater. It can also be anchored in mud, substantiating it to be the most booming settlers' plant globally [1, 2, 3]. The achingly blistering ratable augmentation of the water generally results in the abatement of the height of penetrability together with the dissolved oxygen in the water bodies, variation in the water chemistry effect the flora together with the fauna; rise in the rate of water reduction as a result of loss of water from the soil via evaporation and by transpiration from the plant, and it is now put into consideration as a severe menace to biodiversity [4, 5].

Precisely, it reportedly opined at the International Water Hyacinth Consortium at the World Bank, Washington that further actionable measures should be moved in the direction of regulating weeds as their usage is not a factual measure of regulation [4]. Also, recently, significant awareness appears to have been given to the water hyacinths harvested for experimental purposes, like Fragmental defrayal of the cost of terminating plants from the waterways together with the usage as preference plant protein source in the feeding of livestock and fish respectively, as a result of the pertinacious challenge of the expensive cost of aquatic feeding [3, 6, 7].

Similarly, it was also reported that chemical appraisal of the Eichhornia crassipes shows that it entails very huge amounts of fibrous or cell wall materials that are majorly cellulose [8, 9], which were authenticated via [10] but loaded with large amounts of amino acid profile [11] and this is important due to the vitamins [12]. The large amount of fiber present in the whole Eichhornia crassipesplant meal has put huge confinement into the effectiveness of the usage by fish as feeding constituents [10, 13, 14]. Irrespective of the water hyacinth's large nutritional quality, its potential to use as waste water cleanser has been detailed by very many research scholars and this study [2,15,16,17].

Convoluted techniques are emanating every day in the areas of production of waste is rising astronomically and this is depreciating the quality of the environment, thereby advancing a very severe challenge. This challenge is somewhat complex when the question increases as regard to waste treatment together with waste disposability and this ushers in several categories of pollutants coupled with their bad causes to the health of human beings. Meanwhile, controlling these bad effectual outcomes, appropriate treatment of waste needs to be embarked upon together with standards that

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will bring it into allowable points and the disposability follow as well and treating waste water, it required biological together with biochemical techniques that are accessible [18].

The study of the impingement of Eichhornia Crassipes in ameliorating the waste water properties because of industrial sewage administration is a severe problem in most countries that are underdeveloped [19]. The result of the work showed that the root powder of Eichhornia Crassipes with a dose of 1.5g/L together with a contact period of thirty minutes is effectual in conveying the waste water parameters into allowable scope.

The investigation of the impingements of Eichhornia crassipes on the treatment of water quality in a tidal estuarine environment was conducted by [20]. The investigation revealed that Eichhornia crassipes change the quality of water and that they affect dissolved oxygen together with turbidity, and that these parameters convalesce to the localized mean after treating it.

The study of the waste water treatment utilizing Eichhornia Crassipes was done by [21]. The investigation evaluates how water hyacinths affect two dissimilar kinds of sewer or drainage line – the first one is from the water closet while the second one is from the shower room. The result reveals a consequential decrement in the turbidity because of the disposal of flocs together with the abatement of organic materials observed in the water.

Furthermore, in this present work, the investigation of the usage of Eichhornia crassipes in the treatment and cleansing of waste water will be looked at.

2. METHODOLOGY

2.1 Material Used

The materials utilized in carrying out the different techniques required are: pH meter, beaker, buffer solution, 100ml beaker – evaporating dish, 100ml – measuring cylinder, hot plate, drying oven, analytical balance, glass filter or filter paper, desiccator, conductivity meter, beaker, conductivity standard solution, distilled water, 250ml – conical flasks, 10ml – measuring cylinder, clamp and stand, burette, atomic absorption spectrophotometer, turbiditric ASTM, standard methods of water and wastewater(SM 4500-SO_4^{2-}) and nitrate as nitrogen UV spectrophotometric screening(SM 4500-NO_3^-) respectively.

2.2 Methods

The study area of this investigation is in the Warri River –NMU Jetty, which is situated in Barrister Smooth Jetty of the Nigeria Port Authority (NPA) in Warri, Delta State of Nigeria. The Warri River is a cardinal navigational route in the Niger Delta geographical region, and it is quite a huge body of freshwater with latitude 5021'-6000'N together with longitude 5024'-6021'E that covers a surface area of 255square kilometers doubled with a length of approximately 151 kilometers.

Objectively, the growth rate was measured together with the evapotranspiration of water hyacinths test – the efficiency for parameters such as bio-oxygen demand disposal, total dissolved solids disposal, and it was compared to World Health Organization (WHO) standards. The test of the water quality standard of waste water - river water-was done with water hyacinths in it for fourteen days and also the appearance of lead ion in the roots of the water hyacinths. The different methods embarked upon are electrometric technique – SM4500H+B, conductivity SM2540B, EDTA titrimetric –SM2340 C and argentometric SM-4500 –CI-B respectively.

Experimentally, three samples of water were taken at the NMU Jetty along the NPA Warri River axis and a commonsensible number of water hyacinths in it and the Petroleum Training Institute, Effurun – Water Test Laboratory were utilized for the physical, chemical and biological test assessment. Then, it went via portable test assessment to ascertain the quality of the water assessment of some fixed parameters; it was kept to remain there with appropriate ventilation together with good light to boost the water hyacinths' life cycle for a week. The samples were brought back again to the laboratory for repeated portable tests to determine the positive impingement of Eichhornia crassipes on the water pollutants, and it was done for two weeks as it was earlier mentioned. The following water parameters were collated in the test laboratory for the three samples of water – Sample A, Sample B and Sample C: pH, turbidity, total dissolved solids, total suspended solids, conductivity, total alkalinity, chloride, total hardness, biological oxygen demand, zinc, nitrate, total ion, lead and coliform count were taken and recorded then compared to [19, 20, 21]

3. RESULTS AND DISCUSSION

3.1 Results

The results of the experimental test of the waste water conducted in the Water Test Laboratory of the Petroleum Training Institute, Effurun, Delta State, Nigeria are tabulated in Table 1. Table 1 entails the three samples of the waste

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water – Sample A, Sample B and Sample C respectively taken at different locations on the NMU Jetty and also the water parameters were compared to World Health Organisation standard to check whether it is okay.

Table 1: Experimental Test Results of the Treated Waste Water

S/No.	Water Parameters	Sample A	Sample B	Sample C	WHO Standard
1	pH	7.41	7.30	7.31	6.5 – 8.5
2	Turbidity(NTU)	21.0	21.0	21.0	50.0
3	Total Dissolved Solid (mg/L)	75.90	79.0	74.21	500.0
4	Total Suspended Solid (mg/L)	0.0051	0.0051	0.0051	100.0
5	Conductivity (us/cm)	155.99	155.99	155.99	250.0
6	Total Alkalinity (mg/L)	0.76	0.743	0.64	NA
7	Chloride (mg/L)	592.19	592.19	592.19	250
8	Total Hardness (mg/L)	0.43	0.38	0.33	500
9	Biological Oxygen Demand (mg/L)	15.13	15.10	15.10	20 -30
10	Nitrate (mg/L)	28	29	29	50
11	Total Iron (mg/L)	1.49	1.49	1.49	0 -30
12	Zn (mg/L)	0.0810	0.0802	0.0801	3.0
13	Lead (mg/L)	< 0.01	< 0.01	< 0.01	0.01
14	Coliform Count (cfu/100ml)	50	50	50	0

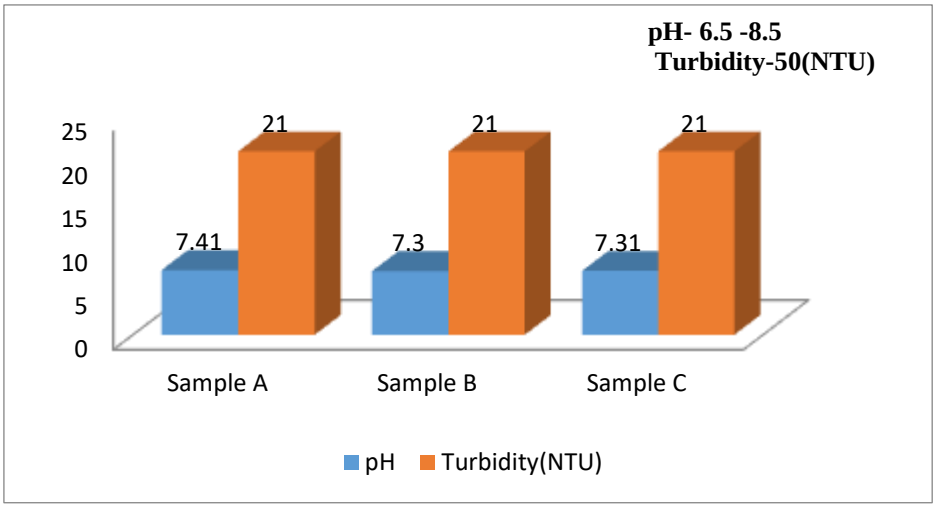

Figure 1: Bar Chart of pH and Turbidity of the Three Treated Waste Water Samples A, B and C

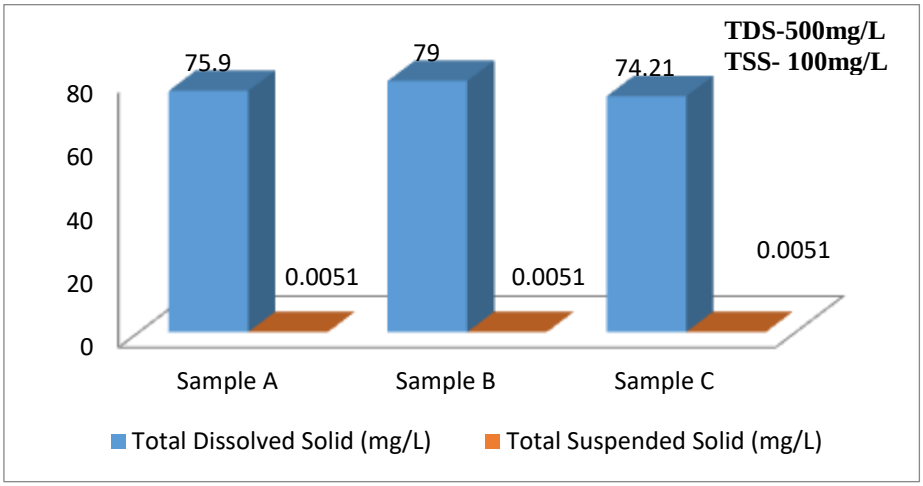

Figure 2: Bar Chart of TDS and TSS of the Three Treated Waste Water Samples A, B and C

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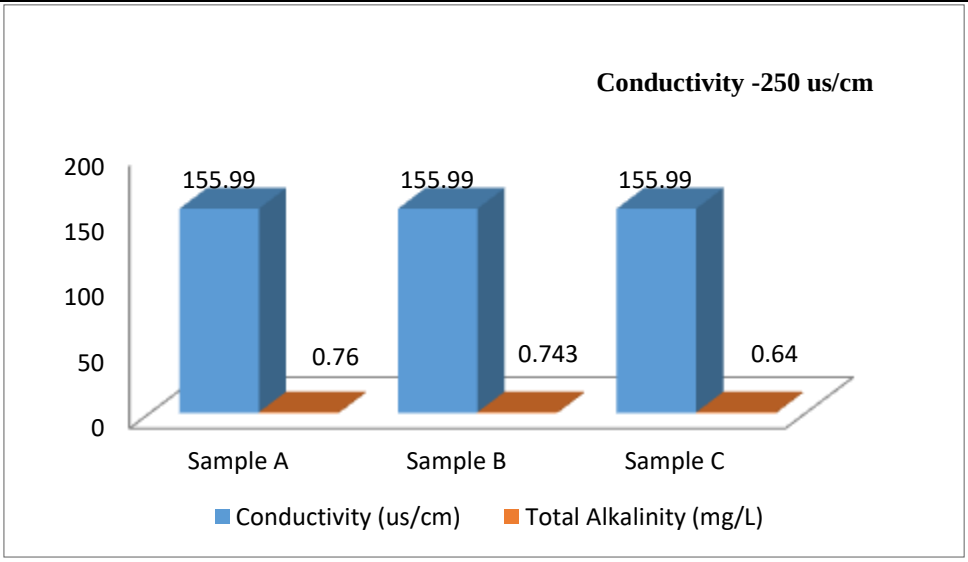

Figure 3: Bar Chart of Conductivity and Total Alkalinity of the Three Treated Waste Water Samples A, B and C

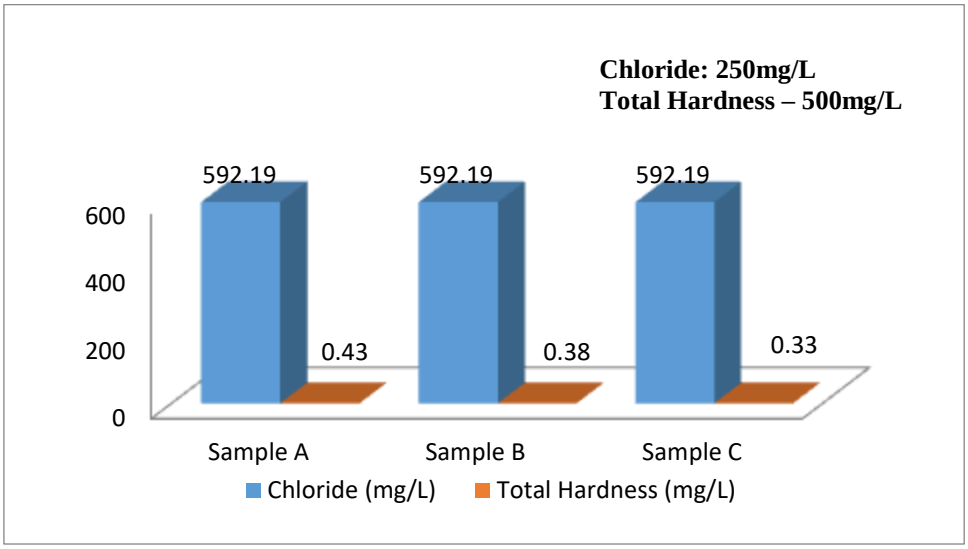

Figure 4: Bar Chart of Chloride and Total Hardiness of the Three Treated Waste Water Samples A, B and C

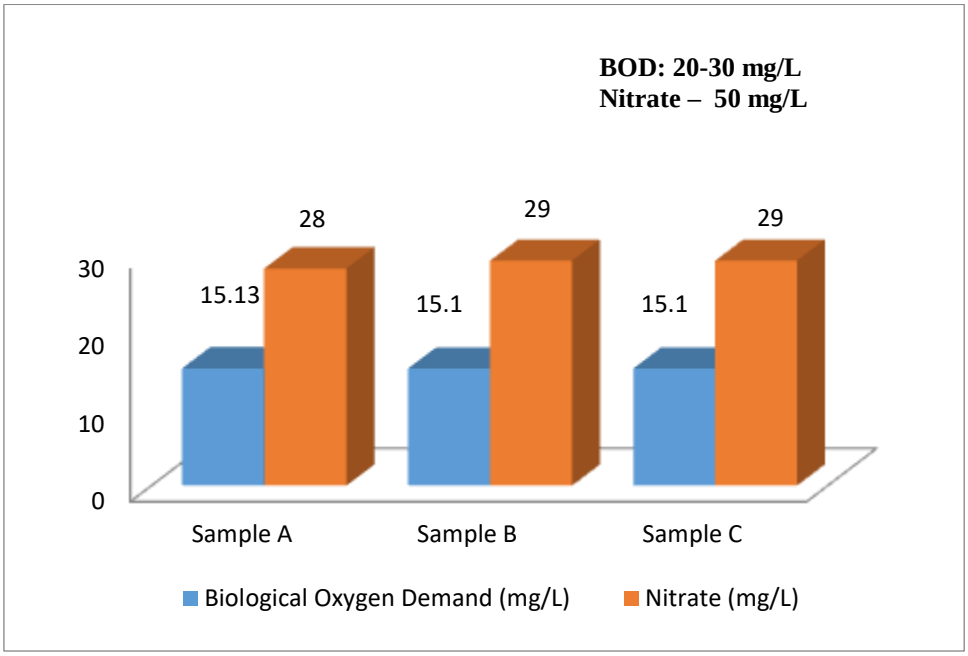

Figure 5: Bar Chart of BOD and Nitrate of the Three Treated Waste Water Samples A, B and C

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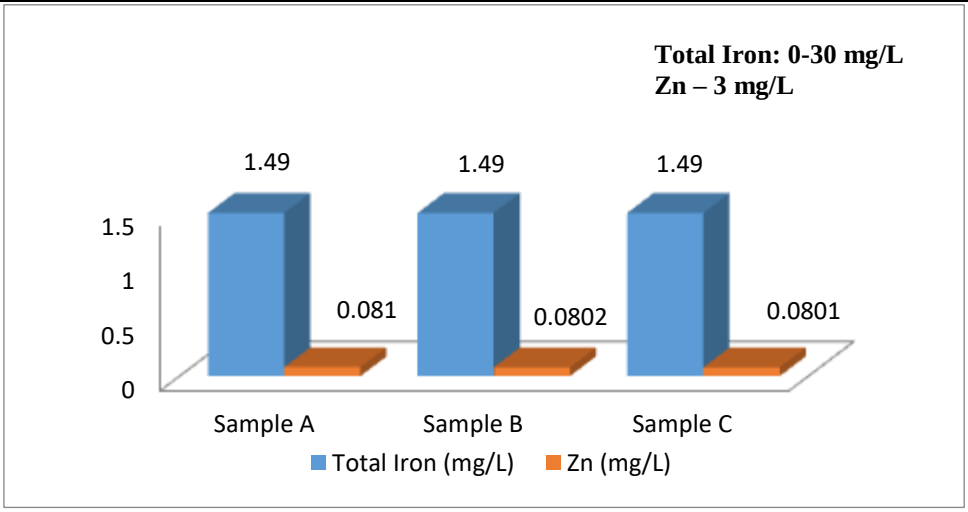

Figure 6: Bar Chart of Total Iron and Zinc of the Three Treated Waste Water Samples A, B and C

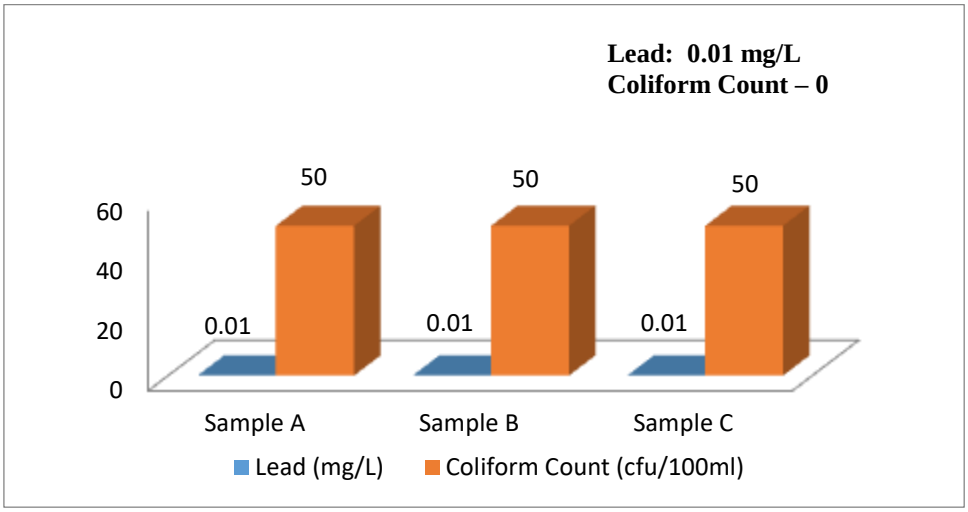

Figure 7: Bar Chart of Lead and Coliform Count of the Three Treated Waste Water Samples A, B and C

3.2 Discussion

Figure 1 is a bar chart representing the pH and turbidity of the three treated waste water samples, A, B and C, and it shows after treatment that the pH of 7.41, 7.3 and 7.31 is okay when compared to the WHO standard of 6.5 – 8.5. The turbidity of 21NTU is less than the 50NTU of the WHO Standard, also showing that the water is clean. **Figure 2** illustrates the number of total dissolved solids and total suspended solids on the three treated waste water samples, and it indicates that the TDS of 75.59mg/L, 79.0mg/L and 74.21mg/L compared to WHO standard of 500mg/L is OK thereby showing that the TDS presence is minimal, and the TSS of the treated three waste water samples are 0.0051mg/L for Samples A, B and C respectively which when compared to the WHO standard of 100mg/L also showed that three waste water treated, there is no suspended solids. Meanwhile, **Figure 3** is a depiction of the conductivity together with the total alkalinity of the three treated waste water samples. The figure depicts a conductivity of 155.99us/cm for the three samples of the treated waste water and, when compared to the WHO standard of 250us/cm, it further reveals that the water is okay. The total alkalinity of 0.76mg/L, 0.743mg/L and 0.64mg/L of the three treated waste water samples shows that the waste water treatment is okay, taking also into consideration the value of the pH got. Precisely, **Figure 4** shows the test results of the chloride coupled with the total hardness of the three waste water treated. The chloride of 592.19mg/L for the three samples of waste water treated as against the WHO standard of 250mg/L (max) shows that the treated waste water will be highly concentrated with chloride, thereby giving rise to detectable taste and harmful to human health. The total hardness of 0.43mg/L, 0.38mg/L and 0.33mg/L comparable to the WHO standard of 500mg/L is okay and is good. While, **Figure 5** represents the bar chart of the BOD together with the nitrate of the three treated waste water samples, A, B and C, respectively. The biological oxygen demand of 15.13mg/L and 15.10mg/L of the three treated waste water samples, comparable to the WHO standard of 30mg/L (max), are okay and the nitrate of 28mg/L and 29mg/L compared to the WHO standard of 50mg/L is also good. Also, **Figure 6** elucidates the bar chart of the total iron doubled with that of zinc of the three treated waste water samples and the total iron of 1.49mg/L achievable during the test comparable to

WHO standard of 30 mg/L (max) shows that the number of iron content presence is permissible and the zinc of 0.0810mg/L, 0.0802mg/L and 0.0801mg/L compared of WHO standard of 3.0mg/L is also permissible as well. Furthermore, **Figure 7** illustrates the bar chart of the lead together with the coliform count of the three treated waste water samples, and it shows that the lead content of less than 0.01mg/L conforms the WHO standard of 0.01mg/L (max) is okay and the high content of coliform count of 50cfu/100ml indicates high risk of contracting a water-borne illness, and it needs to be checked.

4. CONCLUSION

The investigation of the usage of Eichhornia crassipes in the cleansing and treatment of waste water has been conducted. The study area of this investigation is in Warri River –NMU Jetty which is situated in Barrister Smooth Jetty of the Nigeria Port Authority (NPA) in Warri, Delta State of Nigeria. The Warri River is a cardinal navigational route in the Niger Delta geographical region, and it is quite a huge body of freshwater with latitude 5021'-6000'N together with longitude 5024'-6021'E that covers a surface area of 255square kilometers doubled with a length of approximately 151 kilometers. Experimentally, three samples of water were taken at the NMU Jetty along the NPA Warri River axis and a commonsensible number of water hyacinths in it and the Petroleum Training Institute, Effurun – Water Test Laboratory were utilized for the physical, chemical and biological test assessment. Then, it went via portable test assessment to ascertain the quality of the water assessment of some fixed parameters; it was kept to remain there with appropriate ventilation together with good light to boost the water hyacinth's life cycle for a week. The samples were brought back again to the laboratory for repeated portable tests to determine the positive impingement of Eichhornia crassipes on the water pollutants, and it was done for two weeks as it was earlier mentioned. The following water parameters were collated in the test laboratory for the three samples of water – Sample A, Sample B and Sample C: pH, turbidity, total dissolved solids, total suspended solids, conductivity, total alkalinity, chloride, total hardness, biological oxygen demand, zinc, nitrate, total ion, lead and coliform count were taken and recorded. The results obtained show that the treated waste water has a high content of chloride of 592.19mg/L for the three samples of waste water treated as against the WHO standard of 250mg/L (max) and this will make the water to have a detectable taste and harmful to human health, while the high content of coliform count of 50cfu/100ml indicates high risk of contracting a water-borne illness, and it needs to be checked. It is recommended a repeated water treatment should be embarked on the three treated samples waste water A, B and C respectively.

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